PETITION TO LIST FOUR SKATE SPECIES UNDER THE U.S. ENDANGERED SPECIES ACT

(1) THORNY SKATE (*AMBLYRAJA RADIATA*)
(2) BARNDOOR SKATE (*DIPTURUS LAEVIS*)
(3) WINTER SKATE (*LEUCORAJA OCELLATA*)
(4) SMOOTH SKATE (*MALACORAJA SENTA*)

Thorny Skate
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Petition Submitted to the U.S. Secretary of Commerce, Acting through the National Oceanic and Atmospheric Administration and the National Marine Fisheries Service

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LIST OF ABBREVIATIONS

BS.....barndoor skate
C.F.R. .....Code of Federal Regulations
cm.....centimeters
DPS .....distinct population segment
EEZ .....Exclusive Economic Zone
ESA .....Endangered Species Act
Fed. Reg. .....Federal Register
FLMNH.....Florida Museum of Natural History
FMP.....Fisheries Management Plan
GOM .....Gulf of Mexico
IUCN.....International Union for Conservation of Nature
kg.....kilograms
km .....kilometers
m .....meters
mm .....millimeters
mt .....metric tons
NEFSC .....Northeast Fisheries Science Center
NMFS.....National Marine Fisheries Service
NOAA .....National Oceanic and Atmospheric Administration
RMA .....Regulated Mesh Area
SAFE.....Stock Assessment and Fishery Evaluation Report
SAW.....Stock Assessment Workshop
SS .....smooth skate
TS.....thorny skate
U.S.C. .....United States Code
WS.....winter skate

I. INTRODUCTION

Pursuant to the Endangered Species Act (ESA)[1] WildEarth Guardians and Friends of Animals hereby petition the Secretary of Commerce, acting through the National Oceanic and Atmospheric Administration (NOAA) and National Marine Fisheries Service[2] (NMFS) (hereinafter referred to collectively as "the Secretary"), to add four skate species to the ESA "threatened" and "endangered" species list. The four skate species are (1) the thorny skate (*Amblyraja radiata*); (2) barndoor skate (*Dipturus laevis*); (3) winter skate (*Leucoraja ocellata*); and (4) smooth skate (*Malacoraja senta*). Petitioners request the Secretary to list these four skate species as threatened or endangered species because they are imperiled throughout all or a significant portion of their respective ranges. In the alternative, petitioners request that the Secretary list as threatened or endangered any and all "distinct population segments" of these species that may exist: in particular, petitioners request designation of the United States population of thorny skate as a threatened or endangered distinct population segment. Finally, petitioners request the concurrent designation of critical habitat for each species in U.S. waters.

The Secretary must determine, "to the maximum extent practicable," within 90 days of receiving this petition whether it "presents substantial scientific or commercial information indicating that the petitioned action may be warranted."[3] This petition need not demonstrate conclusively that listing these four species is warranted; rather, the petition need only present information demonstrating that listing *may be* warranted.[4] There can be no reasonable dispute that the available information, in particular the International Union for Conservation of Nature's assessment that each of the petitioned species is "Critically Endangered" or "Endangered" (Exhibits 1, 6, 11 and 14), indicates that listing these skates as either "threatened" or "endangered" may be warranted. Accordingly, the Secretary should make a positive 90-day finding on this Petition and promptly commence a status review of the four species as required by the ESA.[5]

II. DESCRIPTION OF PETITIONERS

WildEarth Guardians is a nonprofit environmental advocacy organization that works to protect wildlife, wild places and wild waters in the United States. The organization has more than 12,000 members and supporters in the United States and maintains offices in New Mexico, Colorado and Arizona.

Friends of Animals is a nonprofit, international animal advocacy organization. Incorporated in the state of New York in 1957, the group advocates for the interests of animals in living free, on their own terms. Friends of Animals is present in Connecticut, New York, Washington, DC, Pennsylvania, California, and British Columbia and sponsors a variety of programs to protect, rescue, recover and reintroduce imperiled animals, including marine species.

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[1] 16 U.S.C. §§ 1531-1544.
[2] Recently renamed National Oceanic and Atmospheric Administration Fisheries Service.
[3] 16 U.S.C. § 1533(b)(3)(A).
[4] *Id.*
[5] 16 U.S.C. § 1533(b)(3)(B).

III. DESCRIPTION OF SKATE SPECIES

A. Thorny Skate

Figure 1 – Thorny skate; © Andy Murch, *elasmodiver.com* (used with permission).

1. Taxonomy

Amblyraja radiata is commonly known as the "maiden ray," "miller," "starry ray," "starry skate," "thornback," "thorny back," and "thorny skate."[6] It was first described by Donovan in 1808 as *Raja radiata*, but was transferred to the genus *Amblyraja* by McEachran and Dunne (1998).[7] We refer to the species as the "thorny skate" or "*Amblyraja radiata*" in this petition.

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[6] Florida Museum of Natural History, "Thorny Skate," *Icthyology* [hereinafter TS FLMNH] (Exhibit 4)

[7] D.W. Kulka et al. "*Amblyraja radiata*," *in* IUCN REDLIST OF ENDANGERED SPECIES (2011) [hereinafter TS IUCN report] (Exhibit 1); *see also* "*Amblyraja radiata*," *Integrated Taxonomic Information System* (Exhibit 2):

Kingdom	Animalia
Phylum	Chordata
Subphylum	Vertebrata
Class	Chondrichthyes
Subclass	Elasmobranchii
Superorder	Euselachii
Order	Rajiformes
Family	Rajidae
Genus	Amblyraja
Species	Amblyraja radiata

2. Species Description

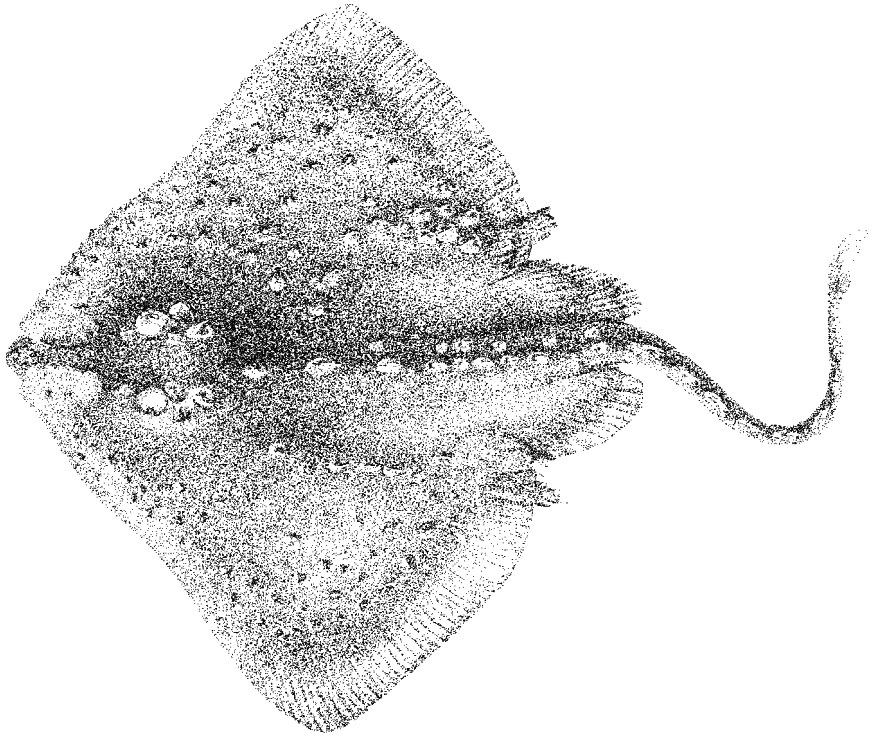

Figure 2 – Sketch of thorny skate, *Amblyraja radiata*.[8]

The most obvious distinguishing feature of the thorny skate is a row of large thorns that extends from its "neck" to the tip of its tail.[9] It also has two or three large thorns on its "shoulders."[10] Smaller thorns, called "prickles," are found on the dorsal surface, though adult females tend to have more prickles than adult males.[11] The skate's dorsal surface is brown, and may be spotted, though spots tend to be more pronounced in younger skates.[12] The ventral surface, on the other hand, is white, sometimes with brown spots. The thorny skate's snout is blunter and broader than those of other large skates (especially the barndoor skate).[13]

3. Reproduction and Growth

Like all skates, the thorny skate lays individual eggs in brown, leathery sacs commonly known as "mermaid's purses."[14] These rectangular sacs have long tendrils ("horns") at each corner, and are

[8] NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, THORNY SKATE, *AMBLYRAJA RADIATA*, LIFE HISTORY AND HABITAT CHARACTERISTICS 14 [hereinafter TS Tech Memo] (Exhibit 3).
[9] *Id.* at 1.
[10] TS FLMNH, Exhibit 4.
[11] *Id.*
[12] *Id.*
[13] *Id.*
[14] TS Tech Memo, Exhibit 3 at 1.

48-96 millimeters ("mm") long and 34-77 mm wide.[15] Eggs typically incubate for 2-2.5 years, but incubation may last as long as three years in cold waters.[16] Juvenile skates begin to feed 2-4 months after hatching, when they exhaust an "internal supply of yolk."[17]

Figure 3 – Thorny Skate egg capsule or "mermaid's purse."[18]

Thorny skates typically reach sexual maturity at 11 years.[19] Size at 50% sexual maturity varies widely with geographic location, from 44 centimeters (cm) off the coast of West Greenland to nearly 90 cm in the Gulf of Maine.[20] Maximum size also varies throughout its range, from 102 cm off of Nova Scotia to 80 cm in Massachusetts Bay.[21] Thorny skates may live as long as 20 years.[22]

Adult female thorny skates produce eggs year round, though studies indicate that more eggs are produced during summer.[23] Researchers have observed litters of 10-45 eggs,[24] but one study suggests that skates living in cold waters may produce only 10-20 eggs per litter.[25]

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[15] *Id.*
[16] *Id.* at 6.
[17] *Id.*
[18] Claude Nozères, "Thorny skate egg case," *Canadian Register of Marine Species*, *available at* www.marinespecies.org/carms/photogallery.php?album=1985&pic=35089.
[19] TS IUCN, Exhibit 1.
[20] *Id.*
[21] *Id.*
[22] TS Tech Memo, Exhibit 3 at 1.
[23] *Id.*
[24] TS IUCN, Exhibit 1.
[25] TS Tech Memo, Exhibit 3 at 1.

4. Predators and Prey

Skates are "opportunistic feeder[s]" that typically eat "the most abundant and available prey species in an area."[26] The NOAA technical memo reports that thorny skates prey on "hydrozoans, aschelminths, gastropods, bivalves, squids, octopus, polychaetes, pycnogonids, copepods, stomatopods (larvae), cumaceans, isopods, amphipods, mysids, euphausids, shrimps, hermit crabs, crabs, holothuroideans, and fishes."[27] The prey composition of thorny skates varies with size: skates less than 40 cm in length feed primarily on amphipods while skates larger than 40 cm eat mostly polychaetes and decapods.[28]

Thorny skate eggs are eaten by halibut, goosefish, Greenland sharks, and predatory gastropods.[29] One study suggests that adult and juvenile skates may also be preyed upon by seals, sharks, and halibut.[30]

5. Range and Habitat

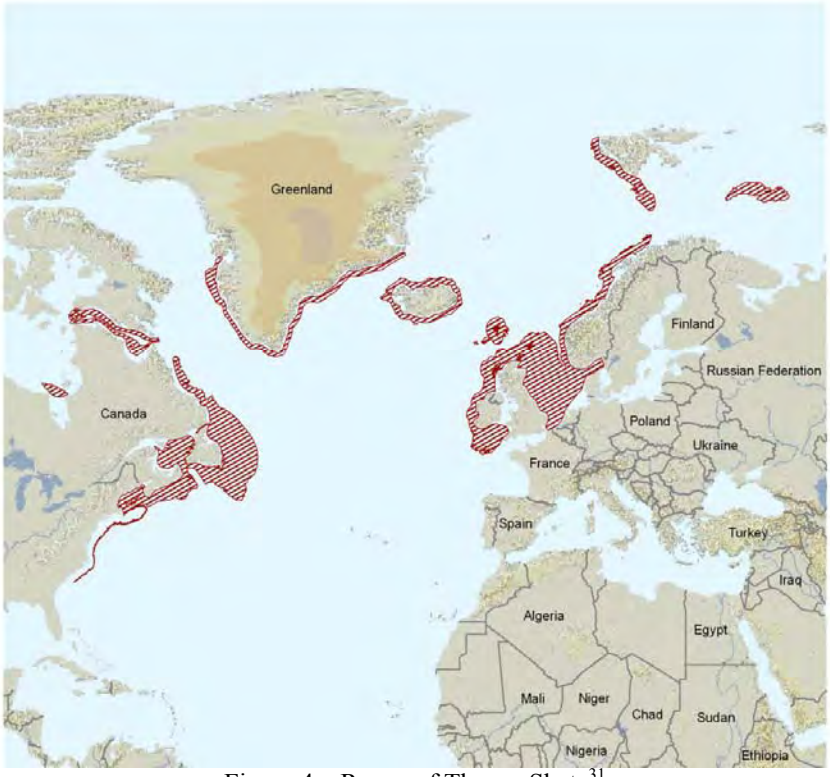

Figure 4 – Range of Thorny Skate[31]

[26] *Id.* at 2.
[27] *Id.* at 1.
[28] *Id.* at 2.
[29] *Id.* at 3.
[30] *Id.* at 4.
[31] TS IUCN, Exhibit 1.

In the western Atlantic, thorny skates are found as far north as western Greenland and as far south as South Carolina.[32] In the eastern Atlantic, they range from eastern Greenland and Iceland to the English Channel.[33]

Thorny skates are bottom-dwellers.[34] They are found in waters as shallow as 18 meters (m) and as deep as 1200 m, though they are most commonly caught at depths between 37-108 m.[35] They live in temperatures ranging from -1.3 degrees Centigrade (°C) to 14 °C, though studies suggest that the Nova Scotia population prefers 2-5 °C, while skates in warmer waters in the Gulf of Maine prefer 4-9 °C.[36] The species is found on a wide variety of substrata, including sand, gravel, broken shells, and soft mud.[37]

Thorny skates are relatively sedentary. One study revealed that, after as many as 20 years, most skates did not move more than 90 kilometers (km) from their starting location.[38] However, other research on thorny skates on Canada's Grand Banks suggests that they do "undergo a seasonal migration," moving to deeper waters during the winter and back to shallow waters during the summer.[39]

B. Barndoor Skate

Figure 5 – Barndoor skate; © Andy Murch, *elasmodiver.com* (used with permission).

[32] TS Tech Memo, Exhibit 3 at 1.
[33] *Id.*
[34] TS FLMNH, Exhibit 4
[35] TS Tech Memo, Exhibit 3 at 5.
[36] *Id.* at 6.
[37] *Id.*
[38] TS IUCN, Exhibit 1.
[39] *Id.*

1. Taxonomy

Dipturus laevis is commonly known as the "barndoor skate" and "barndoor winter skate."[40] It was first described by Mitchill in 1818.[41] We refer to the species as the "barndoor skate" or "*Dipturus laevis*" in this petition.

2. Species Description

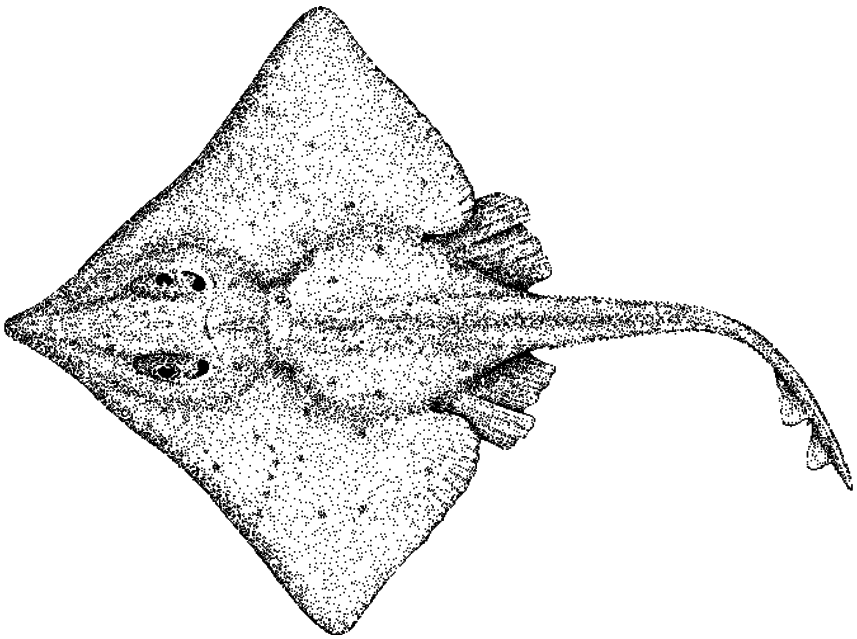

Figure 6 – Sketch of barndoor skate, *Dipturus laevis*.[42]

[40] Mary Jane Wettstein, Florida Museum of Natural History, "Barndoor Skate," *Icthyology* [hereinafter BS FLMNH] (Exhibit 10).

[41] K.N. Dulvy, International Union for Conservation of Nature, "*Dipturus laevis*," *in* IUCN REDLIST OF ENDANGERED SPECIES (2011) [hereinafter BS IUCN] (Exhibit 6); *see also* "*Dipturus laevis*," *Integrated Taxonomic Information System* (Exhibit 7):

Kingdom	Animalia
Phylum	Chordata
Subphylum	Vertebrata
Class	Chondrichthyes
Subclass	Elasmobranchii
Superorder	Euselachii
Order	Rajiformes
Family	Rajidae
Genus	Dipturus
Species	Dipturus laevis

[42] NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BARNDOOR SKATE, *DIPTURUS LAEVIS*: LIFE HISTORY AND CHARACTERISTICS 8 [hereinafter BS Tech Memo] (Exhibit 8).

The barndoor skate has a broad body with pointed fins and snout, with a shorter tail than those of other large skates.[43] Its primary distinguishing feature is a dark line that extends from the snout to the base of the tail.[44]

The barndoor skate's dorsal surface varies in color from brown to reddish brown with darker spots, often on the pectoral fins.[45] Its ventral surface is white to gray.[46]

3. Reproduction and Growth

Like all skates, the barndoor skate lays eggs encapsulated in rectangular leathery sacs known as "mermaid's purses."[47] The egg sacs produced by the barndoor skate are yellowish to greenish, with relatively short horns.[48] They are typically larger than the egg sacs of other skates: sacs as large as 132 mm long and 72 mm wide have been observed.[49]

Little is known about the life history of barndoor skates, but researchers assume that they, like other large skates, are slow-growing and long-lived.[50] One study using data from the closely-related species *Dipturus battis* estimated that barndoor skates reach maturity at 11 years and may grow as long as 153 cm.[51] More recent research suggests that the age at sexual maturity of male and female barndoor skates is about 6-7 years.[52] The largest barndoor skate observed to date was 147.3 cm long.[53] The lifespan of barndoor skates is unknown, but skates older than ten years have been observed.[54]

Researchers have observed females with mature egg capsules during the winter. However, it is not known whether females only produce eggs during the winter.[55] A study of females in captivity suggests that females produce about 75 eggs annually.[56]

4. Predators and Prey

Barndoor skates feed on a wide variety of benthic species, including "polychaetes, gastropods, bivalve mollusks, squids, crustaceans, hydroids, and fishes."[57] Small individuals prefer small

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[43] BS FLMNH, Exhibit 6.
[44] *Id.*
[45] *Id.*
[46] *Id.*
[47] BS Tech Memo, Exhibit 8 at 1.
[48] *Id.*
[49] *Id.*
[50] *Id.*
[51] *Id.*
[52] MEREDITH F. CAVANAGH & KIMBERLY DAMON-RANDALL, NEFSC, BARNDOOR SKATE STATUS REPORT 1. [hereinafter BS Status] (Exhibit 9).
[53] BS Tech Memo, Exhibit 8 at 1.
[54] KATHERINE SOSBEE, NEFSC, STATUS OF FISHERY RESOURCES OFF THE NORTHEASTERN U.S.: SKATES 1 (2006). [hereinafter Skates Status] (Exhibit 27).
[55] BS Tech Memo, Exhibit 8 at 1.
[56] BS Status, Exhibit 9 at 8.
[57] BS Tech Memo, Exhibit 8 at 1.

invertebrates, while large skates prefer larger invertebrates (including crabs and lobsters) and some fishes.[58]

Little is known about predators of barndoor skates, but they are probably preyed upon by sharks.[59] By analogy to a similar Pacific species, they may also be eaten by whales.[60]

5. Range and Habitat

Figure 7 – Range of Barndoor Skate.[61]

Barndoor skates have been observed in the Northwest Atlantic in the Gulf of St. Lawrence, the Gulf of Maine, and as far south as North Carolina.[62]

Barndoor skates are found close to shore and out to depths of about 750 m, though most have been observed at depths less than 150 m.[63] They are found "on mud bottoms as well as on sand and gravel" in water temperatures ranging from 1.2 – 20 °C.[64]

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[58] *Id.*
[59] *Id.*
[60] *Id.*
[61] BS IUCN, Exhibit 6.
[62] BS Tech Memo, Exhibit 8 at 1.
[63] *Id.* at 3.
[64] *Id.*

C. Smooth Skate

Figure 8 – Smooth skate; © Andy Murch, *elasmodiver.com* (used with permission).

1. Taxonomy

Malacoraja senta is commonly known as the "smooth skate," the "smooth-tailed skate," and, somewhat paradoxically, the "prickly skate."[65] It was first described by Garman in 1885.[66] We refer to the species as the "smooth skate" or as "*Malacoraja senta*" in this petition.

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[65] J. Sulikowski et al., "*Malacoraja senta*," *in* IUCN REDLIST OF ENDANGERED SPECIES (2011) [hereinafter SS IUCN] (Exhibit 11); NORTHEAST FISHERIES SCIENCE CENTER, STOCK ASSESSMENT AND FISHERY EVALUATION REPORT 10 [hereinafter SAFE] (Exhibit 26).

[66] SS IUCN; *see also* "*Malacoraja senta*," *Integrated Taxonomic Information System* (Exhibit 12):

Kingdom	Animalia
Phylum	Chordata
Subphylum	Vertebrata
Class	Chondrichthyes
Subclass	Elasmobranchii
Superorder	Euselachii
Order	Rajiformes
Family	Rajidae
Genus	Malacoraja
Species	Malacoraja senta

2. Species Description

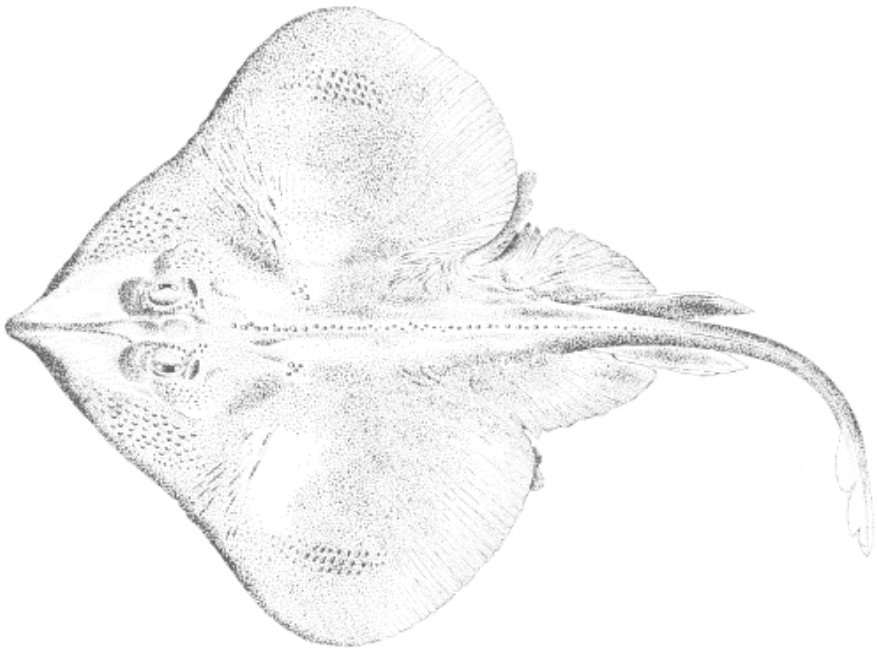

Figure 9 - Sketch of smooth skate, *Malacoraja senta*.[67]

The distinctive features of the smooth skate include an irregular row of small thorns, which runs along its back and along the first half of its tail.[68] Its dorsal surface is dark while its ventral surface is white.[69] Juveniles may also feature a pair of yellow lines along the dorsal surface of the tail.[70]

3. Reproduction and Growth

Like all skates, smooth skates lay eggs encapsulated in amber or brown egg cases commonly known as "mermaid's purses."[71] These egg capsules are rectangular and are typically 50-61 mm long and 35-46 mm wide.[72] Unlike other skate egg capsules, those of the smooth skate are "striated and covered with fibrous tendrils."[73]

Male smooth skates reach sexual maturity at a length of about 50 cm, while females reach maturity at 33-48 cm.[74] Researchers estimate that smooth skates reach sexual maturity when they are 5 years old.[75] The largest smooth skate recorded by the Northeast Fisheries Science Center

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[67] NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, SMOOTH SKATE, *MALACORAJA SENTA*: LIFE HISTORY AND CHARACTERISTICS 9 [hereinafter SS Tech Memo] (Exhibit 13).
[68] SS Tech Memo, Exhibit 13 at 1.
[69] *Id.*
[70] *Id.*
[71] *Id.*
[72] *Id.*
[73] *Id.*
[74] Skates Status, Exhibit 27 at 2.
[75] SS Tech Memo, Exhibit 13 at 1.

(NEFSC) was 71 cm long.[76] Female smooth skates containing egg capsules have been observed throughout the year.[77]

4. Predators and Prey

Smooth skates have a more specialized diet than other skates, and their prey consists exclusively of epifaunal crustaceans.[78] The NOAA technical memo notes that "[d]ecapod shrimps and euphausids are the[ir] primary food items although amphipods and mysids are also important."[79] Larger smooth skates may also eat fish.[80] This diet specialization may be the result of competition with thorny skates, which are generalists.[81]

Little is known about predators of *M. senta*, but its eggs and embryos are probably eaten by other skates.[82]

5. Range and Habitat

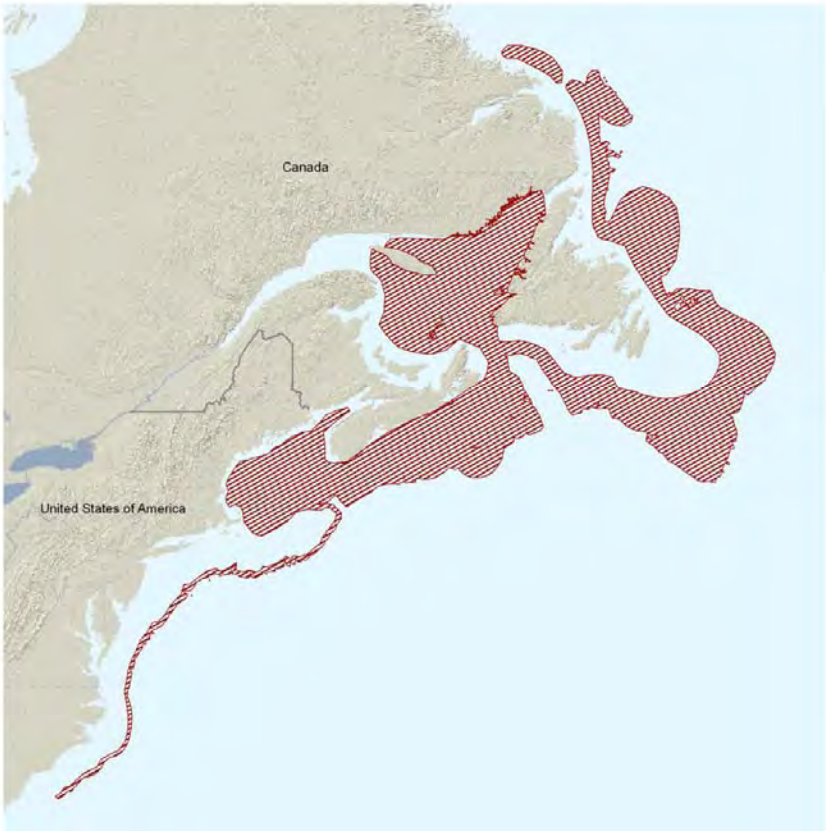

Figure 10 - Range of Smooth Skate.[83]

[76] *Id.*
[77] *Id.*
[78] *Id.*
[79] *Id.*
[80] *Id.*
[81] SS Tech Memo, Exhibit 13 at 2.
[82] *Id.*

Smooth skates "occur[] from the Gulf of St. Lawrence and the Labrador shelf to as far south as South Carolina" in the Northwest Atlantic Ocean.[84] However, the majority of the smooth skate population is located in the Gulf of Maine.[85]

Smooth skates are found in depths ranging from 31 to 874 m, but most are found between 110 and 457 m.[86] They are found on a variety of substrata, "on soft mud (silt and clay) bottoms in deeper areas, but also on sand, broken shells, gravel, and pebbles on the offshore banks of the Gulf of Maine."[87] They have been found in water temperatures ranging from -1.3 °C to 11.8 °C off of Nova Scotia and from 3 to 13 °C in the Gulf of Maine, though they seem to prefer temperatures between 3 and 8 °C.[88]

D. Winter Skate

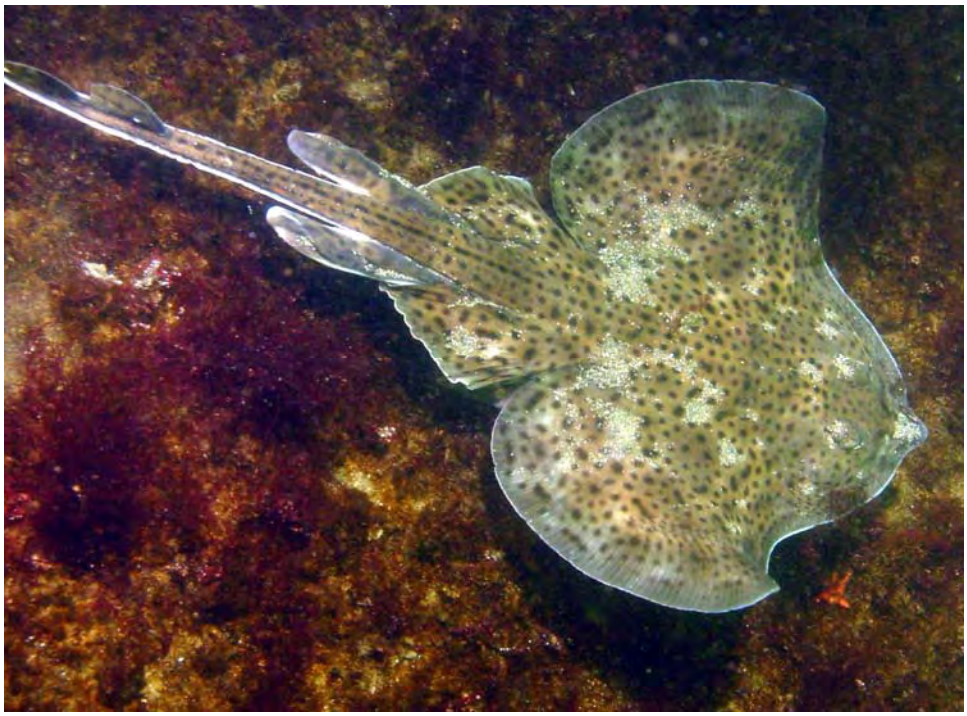

Figure 11 – Winter skate; © Andy Murch, *elasmodiver.com* (used with permission).

1. Taxonomy

Leucoraja ocellata is commonly known as the "winter skate," "eyed skate," "big skate," and "winter big skate."[89] The species was first described by Mitchill as *Raja ocellata* in 1815, but it

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[83] SS IUCN, Exhibit 11.
[84] SS Tech Memo, Exhibit 13 at 1.
[85] *Id.*
[86] *Id.* at 3.
[87] *Id.*
[88] *Id.*
[89] Florida Museum of Natural History, "Winter Skate," *Icthyology* [hereinafter WS FLMNH] (Exhibit 17).

was soon transferred to the genus *Leucoraja*.[90] We refer to this species as "winter skate" or as "*Leucoraja ocellata*" in this petition.

2. Species Description

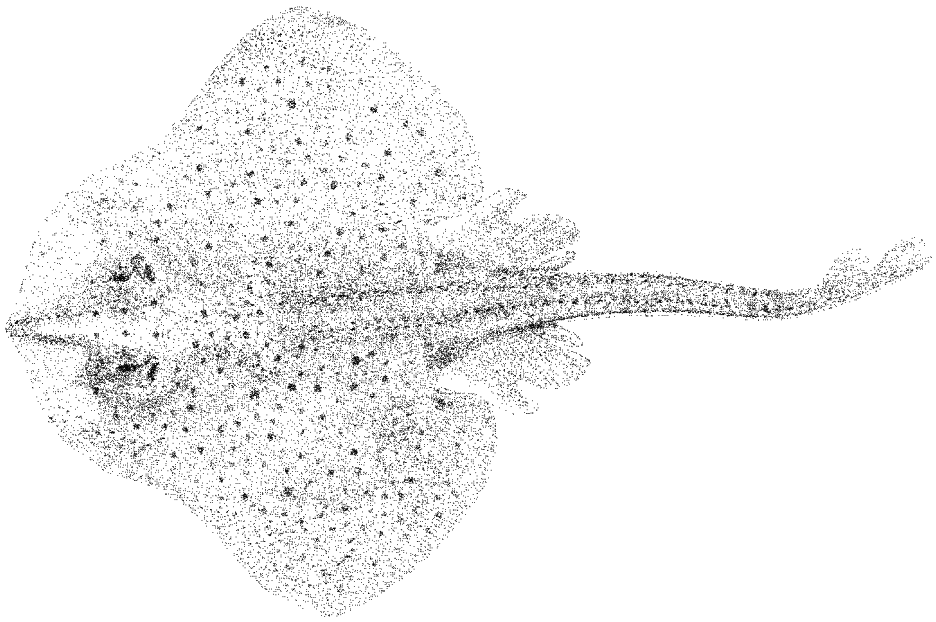

Figure 12 – Sketch of winter skate, *Leucoraja ocellata*.[91]

The snout and pectoral fins of the winter skate are blunt and rounded.[92] Its dorsal surface is brown with numerous small dark spots.[93] Juvenile winter skates are often confused with the more common little skate (*Leucoraja erinacea*);[94] the two species can only be differentiated by the "[n]umber of tooth rows, length at maturity, and location of pelvic denticles."[95]

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[90] *Id.*; *see also* "*Leucoraja ocellata*," *Integrated Taxonomic Information System* (Exhibit 15):

Kingdom	Animalia
Phylum	Chordata
Subphylum	Vertebrata
Class	Chondrichthyes
Subclass	Elasmobranchii
Superorder	Euselachii
Order	Rajiformes
Family	Rajidae
Genus	Leucoraja
Species	Leucoraja ocellata

[91] NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WINTER SKATE, *LEUCORAJA OCELLATA*: LIFE HISTORY AND CHARACTERISTICS 16 [hereinafter WS Tech Memo] (Exhibit 16).
[92] WS FLMNH, Exhibit 17.
[93] *Id.*
[94] WS Tech Memo, Exhibit 16 at 1.
[95] *Id.*

3. Reproduction and Growth

Like all skates, winter skates lay eggs in leathery, rectangular, brown capsules commonly known as "mermaid's purses."[96] These capsules range from 55-196 mm in length and 35-53 mm in width.[97] Female winter skates with complete egg capsules are more commonly observed in the summer and fall, but egg production may occur throughout the year.[98]

Individuals in the Gulf of Maine reach sexual maturity at sizes between 70 and 109 cm, but individuals at higher latitudes reach maturity at smaller sizes.[99] The maximum size of winter skates also decreases with increasing latitude: the largest skates in the Gulf of St. Lawrence are smaller than the largest skates observed in the Gulf of Maine.[100] The maximum length of winter skates recorded by NEFSC is 113 cm.[101] Based on this maximum length, age at maturity is estimated at seven years.[102] Researchers have observed winter skates as old as 20 years.[103]

4. Predators and Prey

Winter skates feed on polychaetes, amphipods, decapods, isopods, bivalves, and fishes.[104]

Predators of winter skates include sharks, other skates, gray seals, and gulls.[105]

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[96] *Id.*
[97] *Id.*
[98] *Id.*
[99] *Id.*
[100] WS Tech Memo, Exhibit 16 at 1.
[101] *Id.*
[102] *Id.*
[103] Skates Status, Exhibit 27 at 2.
[104] WS Tech Memo, Exhibit 16 at 1.
[105] *Id.* at 3.

5. Range and Habitat

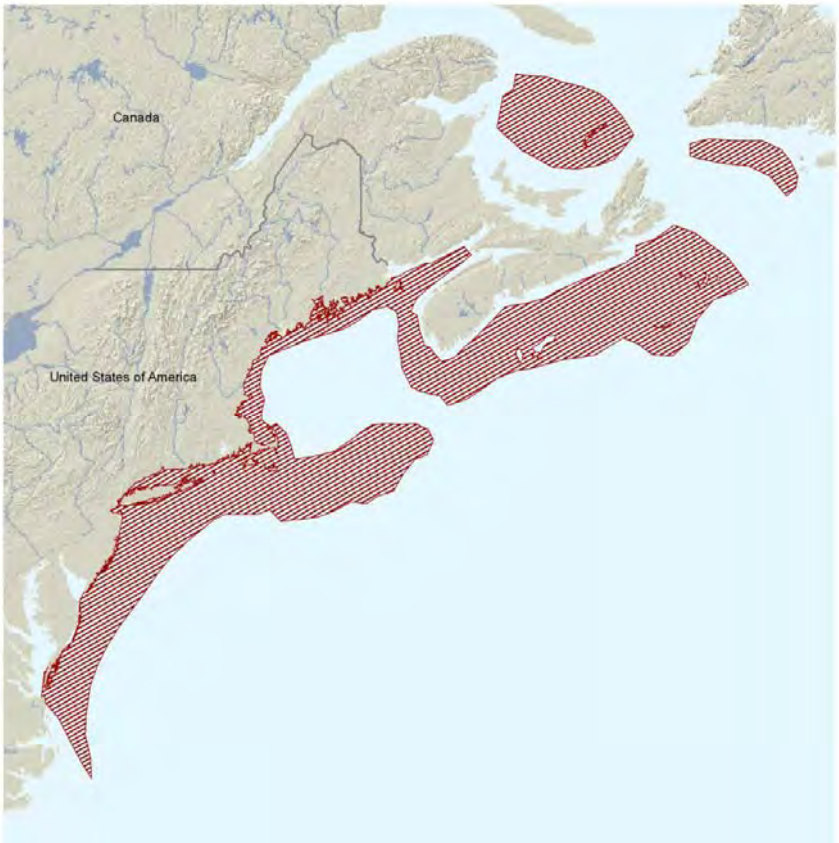

Figure 13 – Range of Winter Skate.[106]

Winter skates "occur[] from the south coast of Newfoundland and the southern Gulf of St. Lawrence to Cape Hatteras."[107] They are found at depths ranging from shoreline to 371 m, but most are observed in water less than 111 m deep.[108] At least some population segments appear to undergo a local seasonal migration, moving to shallower waters in autumn and to deeper waters in summer.[109]

Winter skates are typically only found on sand and gravel substrata; in fact, one study suggests that substratum type is a better determinate of winter skate distribution than depth.[110] Winter skates have been observed in temperatures ranging from -1.2 °C to 19 °C, although they appear to prefer water at temperatures between 5 and 9 °C.[111]

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[106] D.W. Kulka et al., International Union for Conservation of Nature, "*Leucoraja ocellata*," *in* IUCN REDLIST OF ENDANGERED SPECIES (2011) [hereinafter WS IUCN] (Exhibit 14).
[107] WS Tech Memo, Exhibit 16 at 1.
[108] *Id.* at 6.
[109] *Id.*
[110] *Id.* at 7.
[111] *Id.*

IV. ENDANGERED SPECIES ACT LISTING CRITERIA

The Endangered Species Act allows the Secretary (of Commerce) to list any species of (marine or anadromous) fish as "threatened" or "endangered." Section 3(8) of the ESA defines "fish or wildlife" to mean "any member of the animal kingdom, including without limitation any… *fish*,..."[112] Each of the four skates described in this Petition are "fish" within the meaning of the act.

The ESA defines an "endangered species" as a species "in danger of extinction throughout all or a significant portion of its range."[113] A "threatened" species is one that is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."[114] A "species" is defined to include "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature."[115]

The Secretary is required to list as threatened or endangered any species facing extinction due to any one of, or any combination of, the following five factors:

(A) the present or threatened destruction, modification, or curtailment of the species' habitat or range;

(B) overutilization for commercial, recreational, scientific, or educational purposes;

(C) disease or predation;

(D) the inadequacy of existing regulatory mechanisms; or

(E) other natural or manmade factors affecting the species' continued existence.[116]

The Secretary may only consider these five factors when deciding whether the list a species as threatened or endangered. In considering these factors, the Secretary must use only "the best available scientific and commercial information regarding a species' status, without reference to possible economic or other impacts of such determination."[117]

Each of the four species of skate is threatened by one or more of these factors, and so each is a threatened or endangered species within the meaning of the ESA.

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[112] 16 U.S.C. § 1532 (8) (emphasis added).
[113] *Id.* § 1532(6).
[114] *Id.* § 1532(20).
[115] *Id.* § 1532(16).
[116] *Id.* § 1533(a)(1).
[117] 50 C.F.R. § 424.11(b).

A. Thorny Skate

The International Union for Conservation of Nature (IUCN) lists the U.S. population of thorny skate as "Critically Endangered" and the Canadian population as "Vulnerable" throughout its range in the Northwest Atlantic Ocean.[118] The IUCN designates a species as "Critically Endangered" when it is "considered to be facing an extremely high risk of extinction in the wild" and "Vulnerable" when it is "considered to be facing a high risk of extinction in the wild."[119] Note that, unlike the ESA, the IUCN only lists a species or population if it is facing extinction rangewide, not merely extinction "throughout a significant portion of its range."[120] Therefore, the IUCN listing rubric is stricter than the ESA listing rubric.

In determining that the U.S. population of thorny skate is "Critically Endangered," the IUCN notes its "low relative abundance...the long-term population decline, lack of population increase with strict management laws, and the inability to monitor species specific landings."[121]

In determining that the Canadian population of thorny skate is "Vulnerable," the IUCN noted its "low abundance" and "long-term population decline."[122]

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[118] TS IUCN, Exhibit 1.

[119] The IUCN applies several strict quantitative criteria in making species designations. A species is only listed as Critically Endangered if (1) it has experienced or will experience a certain reduction in population size (80-90% over three generations or ten years, whichever is longer, depending on whether the factors contributing to population loss are reversible, have ceased, and/or are understood); (2) severe fragmentation or isolation, "continuing decline", or "extreme fluctuations" in population distribution, if the distribution is already below a certain limit; (3) very small population size ("fewer than 250 mature individuals") accompanied with continuing decline and/or fragmented population structure or "extreme fluctuations" in population; (4) extremely small population size ("fewer than 50 mature individuals"); or (5) "[q]uantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations, whichever is the longer." IUCN SPECIES SURVIVAL COMMISSION, IUCN RED LIST CATEGORIES AND CRITERIA 16-18 (2000) [hereinafter IUCN Criteria] (Exhibit 21).

A species is only listed as Endangered if (1) it has experienced or will experience a certain reduction in population size (50-70% over three generations or ten years, whichever is longer, depending on whether the factors contributing to population loss are reversible, have ceased, and/or are understood); (2) severe fragmentation or isolation, "continuing decline", or "extreme fluctuations" in population distribution, if the distribution is already below a certain limit; (3) small population size ("fewer than 2500 mature individuals") accompanied with continuing decline and/or fragmented population structure or "extreme fluctuations" in population; (4) very small population size ("fewer than 250 mature individuals"); or (5) "[q]uantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer." IUCN Criteria, Exhibit 21 at 18-20.

A species is only listed as Vulnerable if (1) it has experienced or will experience a certain reduction in population size (30-50% over three generations or ten years, whichever is longer, depending on whether the factors contributing to population loss are reversible, have ceased, and/or are understood); (2) severe fragmentation or isolation, "continuing decline", or "extreme fluctuations" in population distribution, if the distribution is already below a certain limit; (3) small population size ("fewer than 10,000 mature individuals") accompanied with continuing decline and/or fragmented population structure or "extreme fluctuations" in population; (4) very small population size ("fewer than 1000 mature individuals") or very restricted distribution; or (5) "[q]uantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years." IUCN Criteria, Exhibit 21 at 21-23.

[120] 16 U.S.C § 1532(6).

[121] TS IUCN, Exhibit 1.

[122] *Id.*

NMFS currently lists the thorny skate as a "Species of Concern."[123] In explaining this designation, NMFS notes the decline in its abundance over the last thirty years, the decline in median length of individuals observed by the NEFSC surveys, and reduced geographic range.[124]

1. Present or threatened destruction, modification, or curtailment of its habitat or range.

Research indicates that the use of groundfish trawling gear degrades benthic habitat structure by "direct removal or damage of epifauna, the reduction of bottom roughness, and the removal of structure forming organisms."[125] Such habitat degradation affects the availability of the thorny skates' prey (primarily bottom-dwelling fauna), as well as the skate's ability to avoid predators by "camouflag[ing] themselves around similarly colored substrate or bur[ying] themselves in the surrounding sediments to avoid detection."[126] Further, studies suggest that repeated, long-term degradation of benthic habitat will propagate changes in benthic community structure, including "a shift from larger bodied long-lived benthic organisms [to] smaller shorter-lived ones" and a loss of net "benthic productivity and thus biomass available for fish predators."[127]

The distribution of thorny skates on Grand Banks has been shrinking in recent years.[128] Although thorny skates were once found throughout Grand Banks, they have disappeared entirely from 25% of the area and "80% of the biomass is now concentrated into 20% of the area along the southwest slope of the Grand Bank."[129] The Grand Banks population has, however, remained stable.[130] As the IUCN report emphasizes, a similar pattern of hyper-aggregation was observed immediately before the collapse of a cod population,[131] and this unusual distributional phenomenon may presage a similar collapse in the Canadian thorny skate population.

2. Overutilization for commercial, recreational, scientific, or educational purposes.

The directed exploitation of skates was limited until the 1980's, when the demand for skates for human consumption or lobster bait began to increase.[132, 133] Landings have since grown at a halting rate, reaching a maximum of 19,000 metric tons (mt)[134] in 2007. Directed skate take will likely continue to increase as use of other groundfish becomes more restricted and less

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[123] TS SOC, Exhibit 5 at 1.
[124] *Id.* at 2.
[125] BS Status, Exhibit 9 at 59.
[126] *Id.*
[127] NEFSC, NMFS, FINAL AMENDMENT 3 TO THE FISHERY MANAGEMENT PLAN (FMP) FOR THE NORTHEAST SKATE COMPLEX 8-287. [hereinafter Amendment 3] (Exhibit 23).
[128] TS IUCN, Exhibit 1.
[129] *Id.*
[130] *Id.*
[131] *See* D.W. KULKA & C.M. MIRI, UPDATE ON THE STATUS OF THORNY SKATE 2 (2007) *cited in* TS IUCN (Exhibit 18).
[132] BS Tech Memo, Exhibit 8 at 4.
[133] TS Tech Memo, Exhibit 3 at 7.
[134] One metric ton equals 2,204.62 pounds. *See* "Tonne," *Wikipedia*, *available at* http://en.wikipedia.org/wiki/Tonne.

profitable.[135] Thorny skates, like other large skates, are also taken as bycatch in groundfish trawling.[136]

Directed bait commerce targets smaller-sized skates for use as lobster bait.[137] The bait catch consists primarily of smaller skate species, but also includes a significant number of young winter skates (which are very difficult to differentiate from little skates (*L.erinacea*)).[138]

Directed wing commerce targets large-sized skates preferred by dealers.[139] Although winter skates are targeted, crews also catch and land barndoor and thorny skates.[140] While there is only limited domestic demand for skate wings, there is a significant export market for human consumption, primarily to France, Greece, and Korea.[141]

Larger flatfish are particularly vulnerable when present in an area where trawling for smaller flatfish is occurring.[142] Groundfishing gear is size-selective, and any gear designed to catch small flatfish will also catch larger flatfish.[143] The larger fish are also caught at younger ages, i.e., before they have reached reproductive age.[144] Therefore, so long as the skate bait and wing trade continues to target the smaller little (*L.erinacea*) and winter skates, it will continue to threaten thorny skates as well.

Although as many as 19,000 mt of skates have been purposefully taken in a given year, the number of skates discarded in groundfish trawling has far exceeded that quantity in recent years: in 2002, for example, an estimated 49,296 mt of skates were discarded as bycatch.[145] Studies of skates and rays off of Australia and the Falkland Islands suggest that the acute discard mortality rate (i.e., mortality directly caused by discard) may be as high as 56%.[146] The delayed discard mortality rate (i.e., mortality indirectly caused by discard) has not been studied,[147] but, given the high acute discard mortality, it is probably significant as well.

Biomass of thorny skate in U.S. waters has declined steadily since the 1980s and is currently at an historic low as a result of direct take and mortality from bycatch.[148] Surveys demonstrate that the current biomass of thorny skate is 10-15% of the peak biomass recorded in the 1960s and 1970s.[149]

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[135] *See* SAFE, Exhibit 26 at 124 ("Participation in the skate wing fishery, however, has recently grown due to increasing restrictions on other, more profitable groundfish species.").
[136] TS IUCN.
[137] Amendment 3, Exhibit 23 at 7-214.
[138] *Id.*
[139] *Id.* at 7-217.
[140] *Id.*
[141] *Id.*
[142] *See* BS Status, Exhibit 9 at 11.
[143] *Id.*
[144] *Id.*
[145] SAFE, Exhibit 26 at 125, 142.
[146] *Id.* at 142.
[147] Amendment 3, Exhibit 23 at 7-235.
[148] TS IUCN, Exhibit 1.
[149] *Id.*

According to the latest NEFSC survey (completed in 2008),[150] the thorny skate population in U.S. waters is and continues to be "overfished."[151] The most recent (2005-2007) average thorny skate biomass index[152] reported by the NEFSC was 0.42 kilograms/tow, well below the biomass threshold[153] of 2.2 kg/tow, indicating that the population is severely reduced.[154] The 2005-2007 average biomass index is also 24% lower than the previous reported average biomass index (0.55 kg/tow, 2004-2006), indicating that unsustainable take is still occurring.[155]

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[150] The Skate FMP describes the NEFSC survey methodology: "Each survey uses a stratified random sampling design that provides comprehensive coverage of continental shelf waters from Cape Hatteras, North Carolina to the Scotian Shelf off Nova Scotia. The survey is designed to provide unbiased and relative estimates of fish abundance. Only two research vessels, the Albatross IV and the Delaware II, have been used to conduct the survey over the past 36 years. Both sampling gear (net, footgear) and tow specifications (vessel speed, winch payout, and retrieval) have been standardized to produce comparable annual estimates of abundance within the time series. Both differences in catchability between research vessels and changes in catchability resulting from gear changes have been quantitatively evaluated through designed comparison surveys. Survey coverage extends from inshore waters (15 m) to the edge of the continental shelf (200 m). Fixed sets of strata are used to produce indices of abundance and biomass for each stock unit, as defined by the SAW/SARC process. Indices of relative abundance have been developed from NEFSC bottom trawl surveys for the seven species in the skate complex, and these form the basis for most of the conclusions about the status of the complex. All statistically significant NEFSC gear, door, and vessel conversion factors were applied to little, winter, and thorny skate indices when applicable." NEFSC, NMFS FINAL FISHERY MANAGEMENT PLAN FOR THE NORTHEAST SKATE COMPLEX 260 [hereinafter Skate FMP] (Exhibit 24 and 25).

[151] SAFE, Exhibit 26 at 32.

[152] The biomass index for each year is the average mass (in kilograms) of skates of a certain species caught in a given tow (i.e., kilograms / tow). *See id.* Each tow is standardized as described in note 141, *supra*. The three-year average biomass index is the average of the biomass indices for each of three years. *See* SAFE at 12. For example, the 2005-2007 average biomass index is the average of the biomass indices for 2005, 2006, and 2007.

[153] The SAFE report defines the biomass threshold as "[a] limit reference point for biomass that defines an unacceptably low biomass [indicating that] a stock [is] at high risk (recruitment failure, depensation, collapse, reduced long term yields, etc)[, or a] biomass threshold that [defines] when a stock is overfished. A stock is overfished if its biomass is below $B_{threshold}$." SAFE at 174.

[154] SAFE, Exhibit 26 at 13.

[155] *Id.*

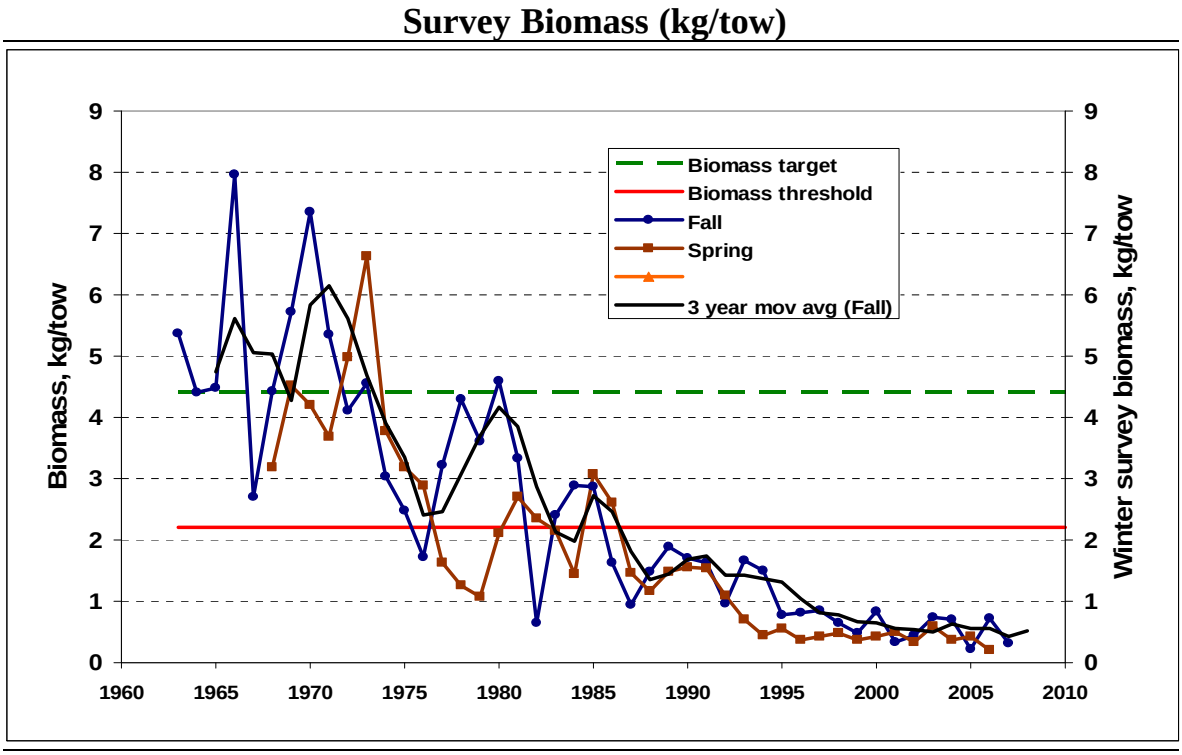

Figure 14 – Trend in NEFSC Survey Abundance: Thorny Skate.[156]

3. Disease or predation.

Predation of thorny skates has not been studied extensively, but thorny skates are probably eaten by halibut, goosefish, Greenland sharks, predatory gastropods, other skates, and possibly whales.[157] Most of this predation probably occurs while the skates are embryos or egg capsules.[158] Even a normal rate of predation could have a significant impacts on the already severely depleted thorny skate population. The Secretary should fully consider the risks posed to the thorny skate population from predation in assessing the status of this species.

Thorny skates are also host to a wide variety of parasites, including several species of protozoan, cestode and copepod parasites.[159] The Secretary should fully consider the risks posed to the thorny skate population by parasitism in assessing the status of this species.

4. Inadequacy of existing regulatory mechanisms.

NMFS regulations provide that "[a] vessel fishing in the [U.S. Exclusive Economic Zone (EEZ)] portion of the Skate Management Unit may not: (1) Retain, possess, or land barndoor or thorny skates taken in or from the EEZ portion of the Skate Management Unit. (2) Retain, possess, or land smooth skates taken in or from the [Gulf of Maine Regulated Mesh Area]."[160] Although the

[156] *Id.* at 33.
[157] TS Tech Memo, Exhibit 3 at 3-4.
[158] *Id.* at 3.
[159] TS FLMNH, Exhibit 4.
[160] 50 C.F.R. § 648.322(e);

NE Skate complex Fishery Management Plan (FMP) requires that vessels report skate landings by species,[161] over 99% of all landings are reported as "unclassified skates."[162] Because the species-specific reporting requirements are not enforced, the prohibition on landing and possessing thorny, barndoor and smooth skates is essentially meaningless. Moreover, these prohibitions do not extend to waters beyond the U.S. EEZ.[163] Furthermore, because estimates suggest that as many as 90% of the skates caught by the Canadian fleet are thorny skates, the number of thorny skates caught by the U.S. fleet in violation of NMFS regulations may be quite high.[164]

Further, the FMP only requires vessels to report discarded skates by size category ("large" or "small").[165] Although the exact quantity of discarded skates is unknown, estimates suggest that the mass of discarded skates may be as high as 50,000 mt per year.[166] As discussed above, the discard mortality rate for skates may be quite high.[167] Therefore, even if the regulations prohibiting landing and possession of thorny, barndoor and smooth skates were effectively enforced, they would do nothing to prevent discard mortality, which may account for a large percentage (even the majority) of human-induced mortality in these species. The recent Amendment to the FMP (effective June 16, 2010) does not implement any new regulations to reduce skate bycatch discard.[168]

5. Other natural or manmade factors.

The life history characteristics of large-size skates make them particularly vulnerable to exploitation: "[c]ompared to other fishes, large species of skates have slow growth, late maturity and low fecundity, making them vulnerable to overfishing."[169] Thorny skates do not reach sexual maturity until they are 11 years old and females typically lay only 10-45 eggs per litter.[170] Moreover, the egg capsules, which are subject to predation by a wide variety of predators,[171] incubate for as many as 2.5 years before hatching.[172] Thorny skate populations are therefore not likely to recover quickly from their current low levels, especially in the face of continued overutilization.[173]

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[161] Skate FMP, Exhibit 25 at 73.
[162] TS Tech Memo at 7; *see also* Amendment 3, Exhibit 23 at 7-221, Table 52.
[163] *See* 50 C.F.R. § 648.322(e).
[164] D.W. KULKA ET AL., AN ASSESSMENT OF THORNY SKATE ON THE GRAND BANKS OF NEWFOUNDLAND 1 (2006) (Exhibit 19).
[165] Skate FMP, Exhibit 25 at 73.
[166] SAFE, Exhibit 26 at 142.
[167] Amendment 3, Exhibit 23 at 7-235.
[168] *Id.* at 8-339 ("Skate discards are not actively managed by the Skate FMP and this amendment proposes no new regulations to manage skate discards….").
[169] NORTHEAST FISHERIES SCIENCE CENTER, 44TH NORTHEAST REGIONAL STOCK ASSESSMENT WORKSHOP ASSESSMENT SUMMARY REPORT 30 (2007) [hereinafter 44th SAW] (Exhibit 22); *see also* BS Status at 11 ("Body size is a good predictor of demography and vulnerability to exploitation in skates....Species of elasmobranchs greater than 100 cm are especially at risk....").
[170] TS IUCN, Exhibit 1.
[171] *See* TS Tech Memo, Exhibit 3 at 3.
[172] TS Tech Memo, Exhibit 3 at 6.
[173] SAFE, Exhibit 26 at 32.

Evidence suggests that a recent decline of thorny skates in the northern part of the Grand Banks correlates with a period of abnormally cold water temperatures.[174] Consequently, the thorny skate population may be threatened by changes in average water temperatures caused by climate change. The Secretary should fully consider the possible threat of climate change to the thorny skate population in assessing the status of this species.

6. The U.S. population of thorny skate is a "distinct population segment" within the meaning of the ESA.

Even if the Secretary determines that the thorny skate is not threatened or endangered throughout all or a significant portion of its range, she should list the population of thorny skates in U.S. waters as a threatened or endangered distinct population segment (DPS). [175] The U.S. population of thorny skate satisfies all of the requirements set out in the NMFS/FWS Policy Regarding the Recognition of Distinct Vertebrate Population Segments (DPS policy).

The DPS policy provides that a listing agency, in deciding whether to list a population as a threatened or endangered DPS, must consider the "discreteness" and "significance" of the population segment, as well as "the population segment's conservation status in relation to the Act's standards for listing."[176] A population segment is "discrete" if

1. It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors...[or]

2. It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.[177]

A population segment is "significant" if it is "important[] to the taxon to which it belongs."[178] In determining whether a population is important to the species, the agency may consider, among other relevant factors,

1. Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon,

2. Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon,

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[174] TS IUCN, Exhibit 1.
[175] "Species," as defined by the ESA, includes "*distinct population segments* of any species of vertebrate fish or wildlife which interbreeds when mature." 16 U.S.C. § 1532(16) (emphasis added).
[176] Policy Regarding Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act, 61 Fed. Reg. 4722, 4725 (Exhibit 28).
[177] *Id.*
[178] *Id.*

3. Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range, or

4. Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.[179]

Finally, the agency must determine that the population segment, considered as a species, meets one or more of the listing criteria.[180]

a. Discreteness

The U.S. population of thorny skate meets both of the criteria for discreteness presented in the DPS policy.

First, the U.S. population is physiologically distinct from the Canadian and Northeast Atlantic skate populations. Several studies have shown that thorny skates that live in warmer southern waters tend to be larger when they reach sexual maturity than skates found in colder, northern waters: for example, size at 50% maturity of male skates captured off of West Greenland was in the range of 44-50 cm, while size at 50% maturity for male skates captured in the Gulf of Maine was established at 86.5 cm.[181] Further, the maximum recorded size of skates in the Gulf of Maine (111 cm) is much larger than the maximum size recorded in the North Sea (Northeast Atlantic) (90 cm).[182] The larger skates in the U.S. population also produce larger egg capsules.[183]

The U.S. population also has some distinct behavioral characteristics. Because the diet of smaller skates differs from that of larger skates, thorny skates in the Gulf of Maine probably have a different prey profile from that of northern populations.[184] Further, while skates in Grand Banks reproduce only during autumn, thorny skates in the Gulf of Maine reproduce year-round.[185]

In addition to physiological and behavioral differences, evidence suggests that segments of the Northwest Atlantic skate population may be reproductively isolated. Studies of skate migration demonstrate that although thorny skates undergo seasonal migrations from shallow to deeper waters, they do not undergo any longer-range migrations, nor do they move far from their starting location during their lifetimes.[186]

The U.S. and Canadian populations of thorny skates are also separated by an international boundary. The differences in the regulatory regime, control of exploitation, and conservation

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[179] *Id.*
[180] *Id.*; *see* 16 U.S.C. § 1533(a)(1)(A)-(E).
[181] TS IUCN, Exhibit 1.
[182] *Id.*
[183] *Id.*
[184] TS Tech Memo, Exhibit 3 at 2.
[185] TS IUCN, Exhibit 1 (*citing* Sulikowski et al. 2005, del Rio 2001, 2002).
[186] *Id.* (*citing* Templeman 1987, Kulka and Miri 2003).

status across this border further indicate that the U.S. population is "discrete" within the meaning of the DPS policy.

While the IUCN lists the U.S. population of thorny skate as Critically Endangered, it lists the Canadian population as Vulnerable.[187] The decline of the Canadian population over the past 40 years has been much less severe than that of the U.S.: while the Grand Banks population has been more or less stable since the 1980's, U.S. populations have declined 85-90% since the 1970's.[188] Therefore, the conservation status of thorny skates varies significantly across the U.S.-Canada border.

The regulatory regime also differs significantly across this international border. While the U.S. Skate FMP prohibits landing thorny skates,[189] the Canadian government maintains directed wing commerce that removes as many as 11,800 mt of thorny skates from the Grand Banks every year.[190] Despite the much greater extent of exploitation in Canadian waters, the Grand Banks population remains relatively stable, while the U.S. population continues to decline.[191] The stark contrast between these regulatory regimes speaks to the vulnerability and sensitivity of the U.S. thorny skate population as compared to the Canadian population.

b. Significance

The U.S. population of thorny skates meets several of the criteria for significance presented in the DPS policy.

The U.S. population of thorny skates persists in an ecological setting unusual and unique for the taxon. Thorny skates off of the U.S. coast represent the southernmost population of the species in the world; some thorny skates have even been observed as far south as South Carolina.[192] These skates, which are larger than and have different diets from their boreal cousins, have adapted to the warm waters of New England and the Gulf of Maine.[193] As global temperatures continue to rise,[194] these adaptations to warmer temperatures will become even more important to this species' survival. Therefore, the conservation of this particular population with its particular warm-water adaptations is essential to the conservation of the species as a whole.

Further, loss of the U.S. population of thorny skates would result in a significant gap in the range of this species. Thorny skates are currently found in U.S. waters from the Gulf of Maine to South

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[187] *Id.*
[188] *Id.*
[189] 50 C.F.R. § 648.322(e).
[190] TS IUCN, Exhibit 1.
[191] *Id.*; *see also* SAFE, Exhibit 26 at 32 (U.S. thorny skate population subject to continued overfishing).
[192] TS IUCN, Exhibit 1.
[193] *Id.*; *see also* TS Tech Memo, Exhibit 3 at 6 (One study of thorny skates in the North Sea demonstrated that "[o]ne group of thorny skate that lived in a 'warmer' area developed their gonads and reached maturity at a lower size than the group that lived in the 'colder' area. The group of female skate that lived in the 'colder' area stored more energy in the liver than the group that lived in the 'warmer' area. These differences suggest a latitudinal influence in which temperature could play an important role.").
[194] *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: SYNTHESIS REPORT, at 31 (2007) (Exhibit 20).

Carolina.[195] The loss of the U.S. thorny skate population would mean the extirpation of the species from several hundred miles of continental shelf where it is now viable. Such a large gap in the species' range is *per se* significant.

Evidence suggests that the U.S. thorny skate population exhibits genetic characteristics that differ from those of other populations of the species. As is noted in the discussion of "discreteness" above, the U.S. thorny skate population differs markedly from the Canadian population in several ways. Although genetic comparisons of the Canadian and U.S. stocks have yet to be completed, the physiological and behavioral differences between the Canadian and U.S. populations suggest that they may be separate, genetically-isolated reproductive units.[196]

Accordingly, even if the Secretary finds that the thorny skate species does not merit listing rangewide, she should still list the U.S. population as a threatened or endangered DPS.

7. Critical Habitat

Pursuant to the ESA, petitioners further request that the Secretary designate critical habitat for thorny skates. The ESA provides that the Secretary "shall, concurrently with making a determination…that a species is an endangered species or a threatened species, designate any habitat of such species which is then considered to be critical habitat."[197] The Act defines "critical habitat" as

> (i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 1533 of this title, 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
>
> (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 1533 of this title, upon a determination by the Secretary that such areas are essential for the conservation of the species.[198]

The regulations implementing the ESA provide that, in designating critical habitat, the Secretary

> shall focus on the principal biological or physical constituent elements within the defined area that are essential to the conservation of the species. Known primary constituent elements shall be listed with the critical habitat description. Primary constituent elements may include, but are not limited to, the following: roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, host species or plant pollinator, geological formation, vegetation type, tide, and specific soil types.[199]

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[195] TS IUCN, Exhibit 1.
[196] *Id.*
[197] 16 U.S.C. § 1533(a)(3)(A)(i).
[198] *Id.* § 1532(5)(A).
[199] 50 C.F.R. § 424.12(b).

Research has found that thorny skates prefer sand, gravel, broken shells, and soft mud substrata at depths between 37 and 108 m.[200] Therefore, habitat conforming to these specifications is "essential to the conservation of" thorny skates. Accordingly, petitioners request that the Secretary designate as critical habitat all areas along the U.S. coast from the Gulf of Maine to South Carolina featuring these "primary constituent characteristics."

B. Barndoor Skate

The IUCN lists barndoor skates as "Endangered" throughout their range.[201] The IUCN designates a species as "Endangered" "when the best available evidence indicates that it [is]...considered to be facing a very high risk of extinction in the wild."[202] In listing the barndoor skate as "Endangered," the IUCN notes the species life history characteristics ("slow growth rate, late maturity, low fecundity and large body size"), which "render it particularly vulnerable to decline under exploitation," a precipitous population decline ("96 to 99% from mid-1960s to 1990s"), and its vulnerability to be taken as bycatch by trawlers.[203]

1. Present or threatened destruction, modification, or curtailment of its habitat or range.

Research indicates that the use of groundfish trawling gear degrades benthic habitat structure by "direct removal or damage of epifauna, the reduction of bottom roughness, and the removal of structure forming organisms."[204] Such habitat degradation affects the availability of the barndoor skates' prey (primarily bottom-dwelling fauna), as well as the skate's ability to avoid predators by "camouflag[ing] themselves around similarly colored substrate or bury[ing] themselves in the surrounding sediments to avoid detection."[205] Further, studies suggest that repeated, long-term degradation of benthic habitat will propagate changes in benthic community structure, including "a shift from larger bodied long-lived benthic organisms [to] smaller shorter-lived ones" and a loss of net "benthic productivity and thus biomass available for fish predators."[206]

2. Overutilization for commercial, recreational, scientific, or educational purposes.

The directed exploitation of skates was limited until the 1980s, when the demand for skates for human consumption or lobster bait began to increase.[207] Landings have since grown at a halting rate, reaching a new maximum of 19,000 mt in 2007.[208] Directed skate take will likely continue to increase as use of other groundfish becomes more restricted and less profitable.[209] Barndoor

[200] TS Tech Memo, Exhibit 3 at 5-6.
[201] BS IUCN, Exhibit 6.
[202] IUCN Criteria, Exhibit 21 at 14; *see also supra* note 116.
[203] BS IUCN, Exhibit 6.
[204] BS Status, Exhibit 9 at 59 (*citing* Auster and Langton, 1998).
[205] *Id.*
[206] Amendment 3, Exhibit 23 at 8-287.
[207] BS Tech Memo, Exhibit 8 at 4.
[208] SAFE, Exhibit 26 at 125.
[209] SAFE, Exhibit 26 at 124.

skates, along with other large skates, are also frequently taken as bycatch by in groundfish trawling.[210]

Although as many as 19,000 mt of skates have been purposefully taken in a given year, the number of skates discarded in groundfish trawling has far exceeded that quantity in recent years: in 2002, for example, an estimated 49,296 mt of skates were discarded as bycatch.[211] Studies of skates and rays off of Australia and the Falkland Islands suggest that the acute discard mortality rate (i.e., mortality directly caused by discard) may be as high as 56%.[212] The delayed discard mortality rate (i.e., mortality indirectly caused by discard) has not been studied,[213] but, given the high acute discard mortality, it is probably significant as well.

Larger flatfish are particularly vulnerable when present in an area where trawling for smaller flatfish is occurring.[214] Groundfishing gear is size-selective, and any gear designed to catch small flatfish[215] will also catch larger flatfish.[216] The larger fish are also caught at younger ages, i.e., before they have reached reproductive age.[217] Therefore, so long as the skate bait and wing trade continues to target the smaller little (*L.erinacea*) and winter skates, it will continue to threaten barndoor skates as well.

The biomass of barndoor skates declined throughout their range by 96-99% from the 1960s to the 1990s, most likely as a result of mortality as bycatch.[218] The population has experienced a slight increase in recent years, and the NEFSC has therefore concluded that it is neither overutilized, nor being overutilized. Although the potential increase gives conservationists some reason to be optimistic, researchers have suggested that it is difficult to tell whether the data demonstrate actual population resurgence.[219]

According to the latest NEFSC survey (completed in 2008), the barndoor skate population is "not overfished" and "not experiencing overfishing."[220] However, the 2005 biomass index is still less than 50% of the peak biomass observed during the 1960's, when the species was first surveyed.[221] Furthermore, the average biomass index of barndoor skate is still well below the target biomass index[222] established by the NEFSC.[223]

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[210] BS IUCN, Exhibit 6.
[211] SAFE, Exhibit 26 at 125, 142.
[212] *Id.* at 142.
[213] Amendment 3, Exhibit 23 at 7-235.
[214] *See* BS Status, Exhibit 9 at 11.
[215] Such as little skate; see discussion of the bait fishery, *supra* p. 20.
[216] BS Status, Exhibit 9 at 11.
[217] *Id.*; *see also id.* at 16 ("If barndoor skate individuals are subjected to fishing mortality between the age they are first vulnerable to fishing gear, or age of first recruitment...and age of maturation, the species will lose individuals who are capable of reproducing and thereby make it even more difficult to rebuild the population size.").
[218] BS IUCN, Exhibit 6.
[219] *Id.*
[220] SAFE, Exhibit 26 at 13.
[221] Skates Status, Exhibit 27 at 3.
[222] The SAFE report defines the biomass target as "[a] desirable biomass to maintain fishery stocks." SAFE, Exhibit 26 at 174. For species targeted by commercial fisheries, the biomass target is the abundance that would produce a maximum sustainable yield. *Id.* A population whose abundance is below the biomass target is therefore susceptible to depletion. *See id.*

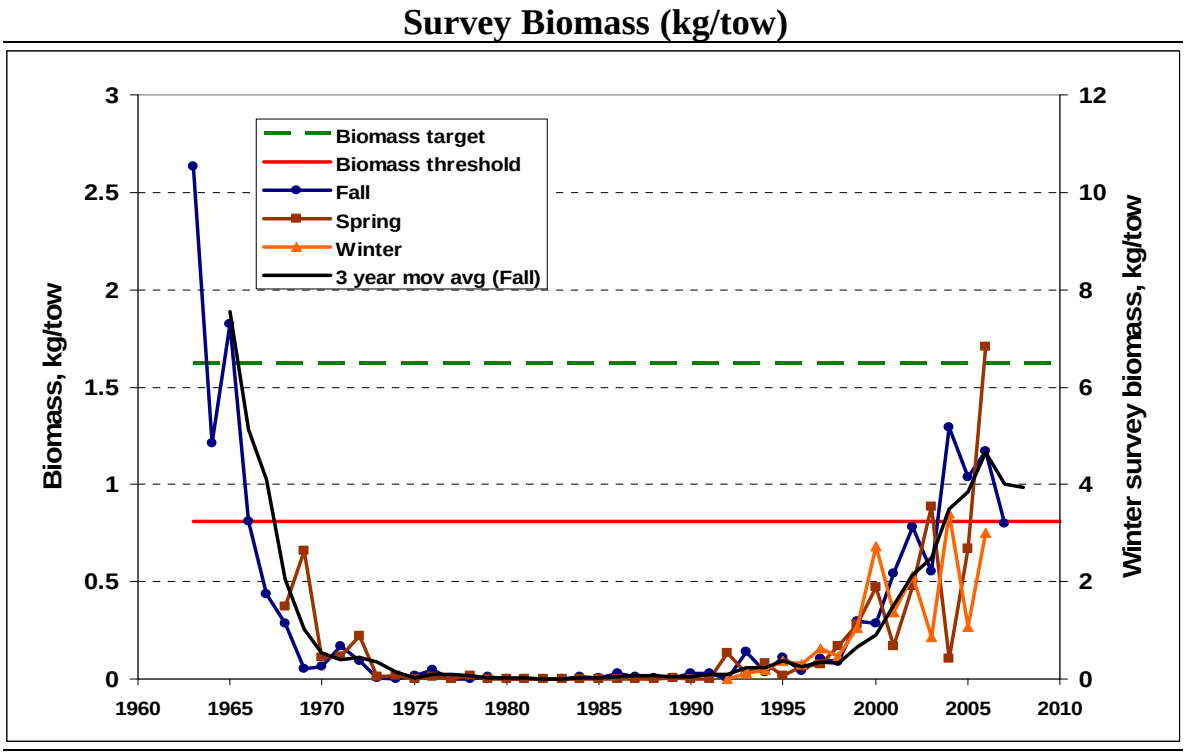

Figure 15 – Trend in NEFSC Survey Abundance: Barndoor Skate.[224]

3. Disease or predation.

Little is known about predation on barndoor skates. The species is probably eaten by sharks and whales.[225] Even a normal rate of predation could have a significant impact on the already depleted barndoor skate population. The Secretary should fully consider the risks posed to the barndoor skate population from predation in assessing the status of this species.

Barndoor skates are host to a numerous parasites, including turbellarians, trematodes, cestodes, nematodes and copepods.[226] The Secretary should fully consider the risks posed to the survival of the barndoor skate by parasitism in assessing the status of this species.

4. Inadequacy of existing regulatory mechanisms.

NMFS regulations provide that "[a] vessel fishing in the EEZ portion of the Skate Management Unit may not: (1) Retain, possess, or land barndoor or thorny skates taken in or from the EEZ portion of the Skate Management Unit. (2) Retain, possess, or land smooth skates taken in or from the GOM RMA."[227] Although the NE Skate complex FMP requires that vessels report skate

[223] *Id.* at 27.
[224] *Id.*
[225] BS Tech Memo, Exhibit 8 at 1.
[226] BS FLMNH, Exhibit 10.
[227] 50 C.F.R. § 648.322(e).

landings by species,[228] over 99% of all landings are reported as "unclassified skates."[229] Because the species-specific reporting requirements are not enforced, the prohibition on landing and possessing thorny, barndoor and smooth skates is essentially meaningless. Moreover, these prohibitions do not extend to waters beyond the U.S. EEZ.[230]

Further, the FMP only requires vessels to report discarded skate by size category ("large" or "small").[231] Therefore, even if the regulations prohibiting landing and possession of thorny, barndoor and smooth skates were effectively enforced, they would do nothing to prevent discard mortality, which may account for a large percentage (even the majority) of human-induced mortality in these species. The recent Amendment to the FMP (effective June 16, 2010) does not implement any new regulations to reduce skate bycatch discard.[232]

5. Other natural or manmade factors.

The particular life history characteristics of large-size skates make them especially vulnerable to exploitation: "[c]ompared to other fishes, large species of skates have slow growth, late maturity and low fecundity, making them vulnerable to overfishing."[233] One study suggests that the age of sexual maturity in male and female barndoor skates is about 6-7 years, although this is probably a low estimate, given the low abundance of the species at the time the study was conducted.[234] Females in captivity have produced as many as 75 eggs annually, but it is not known whether females in the wild exhibit similar fecundity.[235] The incubation time of barndoor skate eggs is shorter than that of other large skate eggs, but is still more than a year.[236] Because of these life history characteristics, barndoor skate populations are not likely to recover quickly from their current low levels and are more susceptible to exploitation.

6. Critical Habitat

Pursuant to the ESA, petitioners further request that the Secretary designate critical habitat for barndoor skates. The ESA provides that the Secretary "shall, concurrently with making a determination…that a species is an endangered species or a threatened species, designate any habitat of such species which is then considered to be critical habitat."[237] The regulations implementing the ESA further provide that, in designating critical habitat, the Secretary

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[228] Skate FMP, Exhibit 24 at 73.
[229] BS Tech Memo, Exhibit 8 at 4.
[230] *See* 50 C.F.R. § 648.322(e).
[231] Skate FMP, Exhibit 24 at 73.
[232] Amendment 3, Exhibit 23 at 8-339 ("Skate discards are not actively managed by the Skate FMP and this amendment proposes no new regulations to manage skate discards….").
[233] 44th SAW, at 30. *see also* Status of Barndoor skates, at 11 ("Body size is a good predictor of demography and vulnerability to exploitation in skates....[B]ased on body size alone, barndoor skates might be one of the more vulnerable skate species...").
[234] BS Status, Exhibit 9 at 10.
[235] Id. at 8.
[236] Id. at 9.
[237] 16 U.S.C. § 1533(a)(3)(A)(i).

> shall focus on the principal biological or physical constituent elements within the defined area that are essential to the conservation of the species. Known primary constituent elements shall be listed with the critical habitat description. Primary constituent elements may include, but are not limited to, the following: roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, host species or plant pollinator, geological formation, vegetation type, tide, and specific soil types.[238]

Research has demonstrated that barndoor skates prefer mud, sand, and gravel bottoms at depths between shoreline and 150 m.[239] Habitat conforming to these characteristics is "essential to the conservation of" the barndoor skate species. Accordingly, petitioners request that the Secretary designate as critical habitat all habitat along the U.S. coast from the Gulf of Maine to North Carolina featuring these "primary constituent characteristics."

C. Smooth Skate

The IUCN has designated smooth skates as "Endangered" throughout their range. The IUCN designates a species as "Endangered" "when the best available evidence indicates that it [is]...considered to be facing a very high risk of extinction in the wild."[240] In listing the smooth skate as "Endangered," the IUCN emphasized the "significant declines observed in the areas containing the majority of the population."[241]

1. Present or threatened destruction, modification, or curtailment of its habitat or range.

Research indicates that the use of groundfish trawling gear degrades benthic habitat structure by "direct removal or damage of epifauna, the reduction of bottom roughness, and the removal of structure forming organisms."[242] Such habitat degradation affects the availability of the smooth skates' prey (primarily bottom-dwelling fauna), as well as the skate's ability to avoid predators by "camouflag[ing] themselves around similarly colored substrate or bury[ing] themselves in the surrounding sediments to avoid detection."[243] Further, studies suggest that repeated, long-term degradation of benthic habitat will propagate changes in benthic community structure, including "a shift from larger bodied long-lived benthic organisms [to] smaller shorter-lived ones" and a loss of net "benthic productivity and thus biomass available for fish predators."[244] Because smooth skates, unlike other skates, are prey specialists,[245] they may be even more sensitive to habitat alteration than other skates.

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[238] 50 C.F.R. § 424.12(b).
[239] BS Tech Memo, Exhibit 8 at 6.
[240] IUCN Criteria, Exhibit 21 at 14; *see also supra* note 116.
[241] SS IUCN, Exhibit 11.
[242] BS Status, Exhibit 9 at 59 (*citing* Auster and Langton, 1998).
[243] *Id.*
[244] Amendment 3, Exhibit 23 at 8-287.
[245] SS Tech Memo, Exhibit 13 at 1.

2. Overutilization for commercial, recreational, scientific, or educational purposes.

The directed exploitation of skates was limited until the 1980's, when the demand for skates for human consumption and lobster bait began to increase.[246] Landings have since grown at a halting rate, reaching a maximum of 19,000 mt in 2007.[247] Directed skate take will likely continue to increase as use of other groundfish becomes more restricted and less profitable.[248] Smooth skates, like other large skates, are also taken as bycatch in groundfish trawling.

Although as many as 19,000 mt of skates have been purposefully taken in a given year, the number of skates discarded in groundfish trawling has far exceeded that quantity in recent years: in 2002, for example, an estimated 49,296 mt of skates were discarded as bycatch.[249] Studies of skates and rays off of Australia and the Falkland Islands have established that the acute discard mortality rate (i.e., mortality directly caused by discard) may be as high as 56%.[250] The delayed discard mortality rate (i.e., mortality indirectly caused by discard) has not been studied,[251] but, given the high acute discard mortality, it is probably significant as well.

Larger flatfish are particularly vulnerable when present in an area where trawling for smaller flatfish is occurring.[252] Groundfishing gear is size-selective, and any gear designed to catch small flatfish (such as little skate (*L.erinacea*); see discussion of the bait fishery, *supra*) will also catch larger flatfish.[253] The larger fish are also caught at younger ages, i.e., before they have reached reproductive age.[254] Therefore, so long as skate bait and wing trade continues to target winter and little (*L.erinacea*) skates, it will continue to threaten smooth skates as well.

The NEFSC biomass index for smooth skates declined continuously from the 1970s to the 1980s, partially as a result of mortality from bycatch. [255] The autumn survey index has since stabilized at about 25% of the peak observed during the 1970s.[256] Smooth skates were determined to be "overfished" in 2008, although the NEFSC concluded that the species was not subject to current "overfishing."[257] Still, the three-year moving average of the biomass index declined by over 22% between 2004-2006 and 2005-2007.[258]

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[246] *Id.* at 4.
[247] SAFE, Exhibit 26 at 125.
[248] *Id.* at 124. ("Participation in the skate wing fishery, however, has recently grown due to increasing restrictions on other, more profitable groundfish species.").
[249] *Id.* at 125, 142.
[250] *Id.* at 142.
[251] *Id.*
[252] *See* BS Status, Exhibit 9 at 11.
[253] *Id.*
[254] *Id.*
[255] *Id.* at 38.
[256] SAFE, Exhibit 26 at 38.
[257] *Id.*
[258] SAFE, Exhibit 26 at 13.

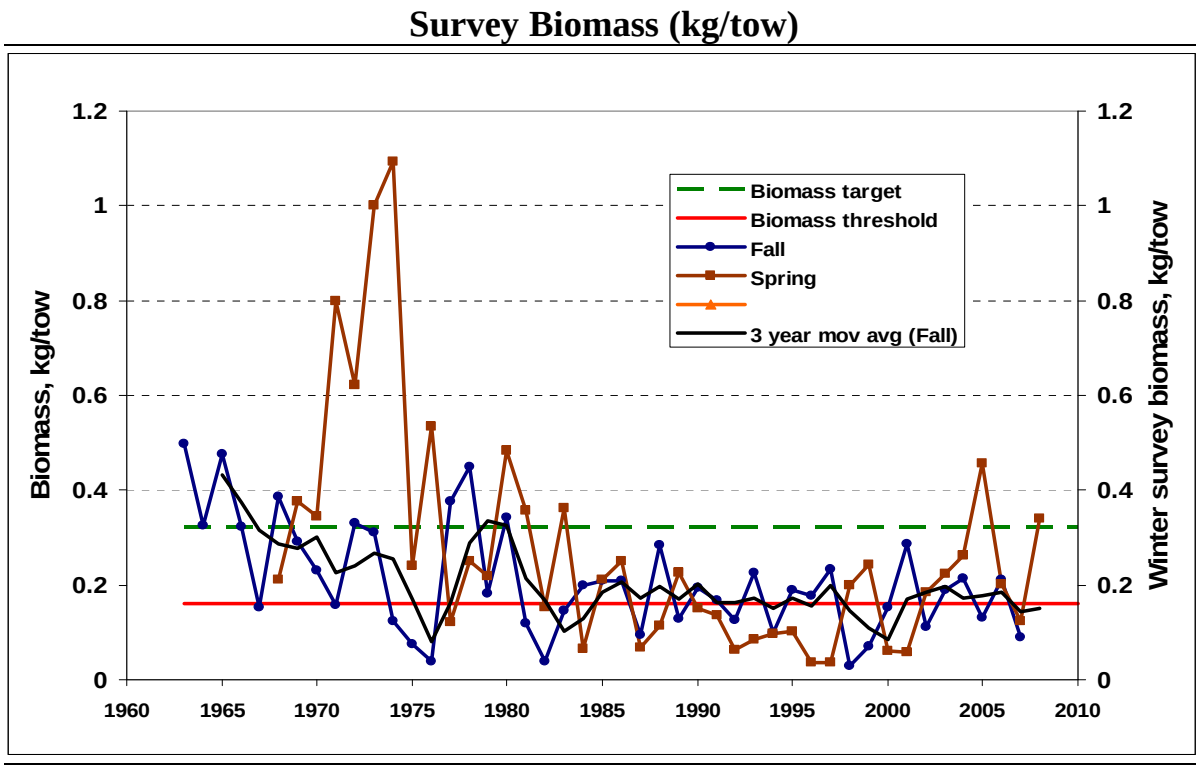

Figure 16 – Trend in NEFSC Survey Abundance: Smooth Skate.[259]

3. Disease or predation.

Smooth skates' eggs and embryos are probably eaten by other, larger skates.[260] Even a normal rate of predation could have a significant impact on the already severely depleted smooth skate population. The Secretary should fully consider the risks posed to the smooth skate population from predation in assessing the status of this species.

It is not reported whether smooth skates are subject to parasitism. However, they are probably infected by the same varieties of parasites that infect other large species of skate.[261] The Secretary should fully consider the risks posed to the smooth skate population by parasites in assessing the status of this species.

4. Inadequacy of existing regulatory mechanisms

NMFS regulations provide that "[a] vessel fishing in the EEZ portion of the Skate Management Unit may not: (1) Retain, possess, or land barndoor or thorny skates taken in or from the EEZ portion of the Skate Management Unit. (2) Retain, possess, or land smooth skates taken in or from the GOM RMA."[262] Although the NE Skate complex FMP requires that vessels report skate

[259] *Id.* at 39.
[260] SS Tech Memo, Exhibit 13 at 2.
[261] *See, e.g.,* TS FLMNH, Exhibit 4.
[262] 50 C.F.R. § 648.322(e).

landings by species,[263] over 99% of all landings are reported as "unclassified skates."[264] Because the species-specific reporting requirements are not enforced, the prohibition on landing and possessing thorny, barndoor and smooth skates is essentially meaningless. Moreover, the prohibition on landing smooth skates is limited to the Gulf of Maine Regulated Mesh Area, which only covers the Gulf of Maine.[265]

Further, the FMP only requires vessels to report discarded skate by size category ("large" or "small").[266] Therefore, even if the regulations prohibiting landing and possession of thorny, barndoor and smooth skates were effectively enforced, they would do nothing to prevent discard mortality, which may account for a large percentage (even the majority) of human-induced mortality in these species. The recent Amendment to the FMP (effective June 16, 2010) does not implement any new regulations to reduce skate bycatch discard.[267]

5. Other natural or manmade factors.

The particular life history characteristics of large-size skates make them especially vulnerable to exploitation: "[c]ompared to other fishes, large species of skates have slow growth, late maturity and low fecundity, making them vulnerable to overfishing."[268] Studies suggest that the average reproductive age of smooth skates is 10-13 years.[269] Females typically produce fewer than 100 eggs per year.[270] Although the incubation time of smooth skate eggs is not reported, analogy to other large skate species suggests that eggs may incubate for as many as 2.5 years.[271] Because of these life history characteristics, smooth skate populations are not likely to recover quickly from their current low levels and are particularly susceptible to overutilization.

One study has linked the recent decline in smooth skate abundance with a decrease in water temperature (resulting from climate change), but no corresponding recovery has been observed with an ensuing increase in water temperature.[272] This observation suggests that the smooth skate population may be adversely affected by climate.

The Canadian population of smooth skates is fragmented into four or five subpopulations separated by large areas in which smooth skates are not found at all.[273] This fragmentation threatens the viability of the Canadian population and the continued existence of the species as a whole.

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[263] Skate FMP, Exhibit 24 at 73.
[264] SS Tech Memo, Exhibit 13 at 4.
[265] *See* 50 C.F.R. § 648.322(e); *see also* 50 C.F.R. § 648.80(a) (defining boundaries of Gulf of Maine Regulated Mesh Area).
[266] Skate FMP, Exhibit 24 at 73.
[267] Amendment 3, Exhibit 23 at 8-339 ("Skate discards are not actively managed by the Skate FMP and this amendment proposes no new regulations to manage skate discards….").
[268] 44th SAW, Exhibit 22 at 30.
[269] SS IUCN, Exhibit 11.
[270] *Id.*
[271] *See* TS Tech Memo, Exhibit 3 at 6 (thorny skate eggs incubate for 2-2.5 years).
[272] SS IUCN, Exhibit 11.
[273] *Id.*

6. Critical Habitat

Pursuant to the ESA, petitioners further request that the Secretary designate critical habitat for smooth skates. The ESA provides that the Secretary "shall, concurrently with making a determination…that a species is an endangered species or a threatened species, designate any habitat of such species which is then considered to be critical habitat."[274] The regulations implementing the ESA further provide that, in designating critical habitat, the Secretary

> shall focus on the principal biological or physical constituent elements within the defined area that are essential to the conservation of the species. Known primary constituent elements shall be listed with the critical habitat description. Primary constituent elements may include, but are not limited to, the following: roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, host species or plant pollinator, geological formation, vegetation type, tide, and specific soil types.[275]

Research has demonstrated that smooth skates prefer mud, broken-shell, pebble, and gravel substrata at depths between than 110 and 457 m.[276] Habitat conforming to these characteristics is "essential to the conservation of" the winter skate species. Accordingly, petitioners request that the Secretary designate as critical habitat all habitat along the U.S. coast from the Gulf of Maine to North Carolina featuring these "primary constituent characteristics."

D. Winter Skate

The IUCN has designated winter skates as "Endangered" throughout their range.[277] The IUCN designates a species as "Endangered" "when the best available evidence indicates that it [is]...considered to be facing a very high risk of extinction in the wild."[278] In listing the winter skate as "Endangered," the IUCN notes a greater than 90% decline in the species' abundance in two major geographic areas, its general decline in U.S. waters, and the uncertainty surrounding the causes of these declines.[279]

1. Present or threatened destruction, modification, or curtailment of its habitat or range.

Research indicates that the use of groundfish trawling gear degrades benthic habitat structure by "direct removal or damage of epifauna, the reduction of bottom roughness, and the removal of structure forming organisms."[280] Such habitat degradation affects the availability of the winter skates' prey (primarily bottom-dwelling fauna), as well as the skate's ability to avoid predators by "camouflag[ing] themselves around similarly colored substrate or bury[ing] themselves in the surrounding sediments to avoid detection."[281] Further, studies suggest that repeated, long-term

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[274] 16 U.S.C. § 1533(a)(3)(A)(i).
[275] 50 C.F.R. § 424.12(b).
[276] SS Tech Memo, Exhibit 13 at 7.
[277] WS IUCN, Exhibit 14
[278] IUCN Criteria, Exhibit 21 at 14; *see also supra* note 116.
[279] WS IUCN, Exhibit 14.
[280] BS Status, Exhibit 9 at 59 (*citing* Auster and Langton, 1998).
[281] *Id.*

degradation of benthic habitat will propagate changes in benthic community structure, including "a shift from larger bodied long-lived benthic organisms [to] smaller shorter-lived ones" and a loss of net "benthic productivity and thus biomass available for fish predators."[282]

The range of winter skates has declined in at least one major geographic region: on the Eastern Scotian shelf, "[t]he area occupied by the population appears to have declined significantly since the mid 1980s."[283]

2. Overutilization for commercial, recreational, scientific, or educational purposes.

The directed exploitation in skates was limited until the 1980s, when the demand for skate wings for human consumption or lobster bait began to increase.[284] Landings have since grown at a halting rate, eventually reaching a maximum of 19,000 mt in 2007.[285] Directed skate take will likely continue to increase as use of other groundfish becomes more restricted and less profitable.[286] Winter skates, along with other large skates, are also frequently taken as bycatch in groundfish trawling.[287]

Winter skates are targeted by commerical interests. A recent dockside sampling survey demonstrated that about 95% of all skates landed by the New England wing fishery were winter skates.[288] Further, although the bait industry typically targets little skates (*L.erinacea*), and reportedly lands only a small percentage of winter skates, the risk of misidentifying juvenile winter skates as little skates makes these numbers unreliable.[289]

Although as many as 19,000 mt of skates have been purposefully taken in a given year, the number of skates discarded in groundfish trawling has far exceeded that quantity in recent years: in 2002, for example, an estimated 49,296 mt of skates were discarded as bycatch.[290] Benoit (2006) examined the acute mortality rate of discarded winter skate in Canada and estimated that at least 50% of winter skates die from discard.[291] The indirect effects of discard on the health and mortality of winter skates has not been studied,[292] but, given the high acute discard mortality, these effects are probably significant as well.

The NEFSC declared winter skates are "overfished" in 2007.[293] Although the most recent survey indicates that winter skates are not currently subject to "overfishing," as defined in the FMP, the three-year moving average of the winter skate biomass index has declined steadily over the past

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[282] Amendment 3, Exhibit 23 at 8-287.
[283] WS IUCN, Exhibit 14.
[284] WS Tech Memo, Exhibit 15 at 9.
[285] SAFE, Exhibit 26 at 125.
[286] SAFE, Exhibit 26 at 124.
[287] WS IUCN, Exhibit 14.
[288] SAFE, Exhibit 26 at 124.
[289] *Id.* at 121; *see also* WS IUCN, Exhibit 14 ("immature specimens [of little and winter skates] are often confused").
[290] SAFE, Exhibit 26 at 125, 142.
[291] *Id.* at 67 (*citing* Benoit (2006)).
[292] *Id.*
[293] SAFE, Exhibit 26 at 12.

decade, and declined 4% between 2004-2006 and 2005-2007.[294] Moreover, the effects from directed take for wings and as bait, combined with bycatch mortality from trawling, have lead to a dramatic decline in the winter skate population: 62% of the New England population has been lost since the 1980s.[295]

Bycatch alone has virtually wiped out the winter skate population in some major geographic areas. For example, in the southern Gulf of St. Lawrence, where commercial operations do not target winter skates, bycatch has eliminated an estimated 98% of mature individuals since the 1970s; in the eastern Gulf, the population has declined by 90% since the 1970s.[296]

Larger flatfish are particularly vulnerable when present in an area where trawling for smaller flatfish is occurring.[297] Groundfishing gear is size-selective, and any gear designed to catch small flatfish (such as little skate (*L.erinacea*)) will also catch larger flatfish.[298] The larger fish are also caught at younger ages, i.e., before they have reached reproductive age.[299] Therefore, so long as the skate bait and wing trade continues to target little skates, it will continue to threaten winter skates as well.

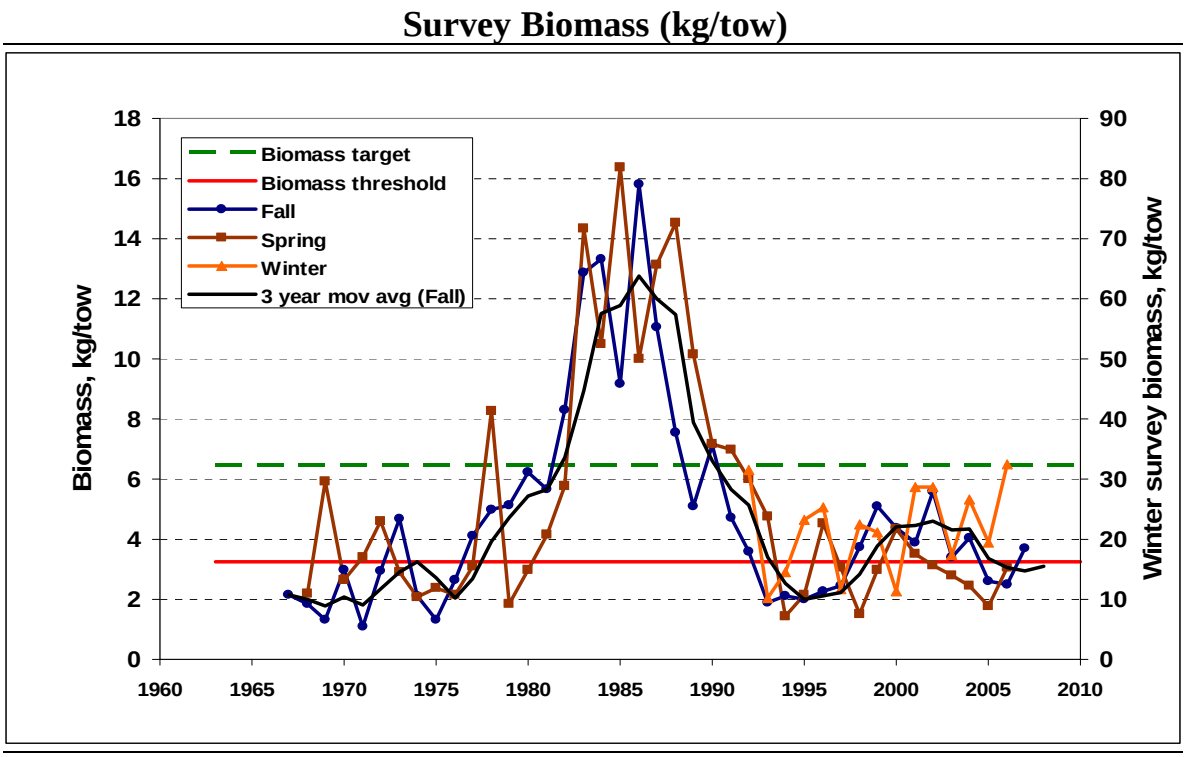

Figure 17 – Trend in NEFSC Survey Abundance: Winter Skate.[300]

[294] *Id.* at 13.
[295] *Id.* at 12.
[296] WS IUCN, Exhibit 14.
[297] *See* BS Status, Exhibit 9 at 11.
[298] *Id.*
[299] *Id.*
[300] SAFE, Exhibit 26 at 15.

3. Disease or predation.

Winter skates are preyed upon by sharks, other skates, gray seals, and gulls.[301] Even a normal rate of predation could have a significant impact on the already severely depleted winter skate population. The Secretary should fully consider the risks posed to the winter skate population from predation in assessing the status of this species.

Winter skates are host to "several parasites, including protozoans, myxosporidian, haematazoa, trematodes and nematodes."[302] The effects of these parasites on the continued viability of the winter skate population is unknown. The Secretary should fully assess the risks to the continued survival of winter skates posed by parasitism in assessing the status of this species.

4. Inadequacy of existing regulatory mechanisms.

There is currently no prohibition on the landing or discard of winter skates in U.S. waters.[303] On the contrary, the skate wing trade targets winter skates, and as much as 95% of the annual wing catch consists of winter skates.[304]

The NEFSC determined the winter skate population was "overfished" in 2007;[305] the species' biomass is currently only 38% of the peak biomass observed during the 1980's.[306] Although the winter skate biomass index continues to decline, the NEFSC survey has determined that it is not currently subjected to "overfishing."[307] Tellingly, the biomass of winter skate has declined "substantial[ly]" since implementation of the FMP in 2003.[308]

Juvenile winter skates are virtually indistinguishable from the much more common little skates (*L.erinacea*).[309] As a result, it would still be difficult to protect winter skates by enforcing reporting requirements on the bait fishery (which targets little skates).[310]

5. Other natural or manmade factors.

The life history characteristics of large-size skates make them especially vulnerable to exploitation: "[c]ompared to other fishes, large species of skates have slow growth, late maturity and low fecundity, making them vulnerable to overfishing."[311] Winter skates do not reach sexual maturity until they are at least 7 years old,[312] and females typically "produce few eggs each

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[301] WS Tech Memo, Exhibit 16 at 3.
[302] WS IUCN, Exhibit 14.
[303] *See* 50 C.F.R. § 648.322(e).
[304] Amendment 3, Exhibit 23 at 7-217.
[305] SAFE, Exhibit 26 at 12.
[306] *Id.*
[307] *Id.*
[308] Amendment 3, Exhibit 23 at 8-291
[309] WS Tech Memo, Exhibit 16 at 1.
[310] SAFE, Exhibit 26 at 121.
[311] 44th SAW, Exhibit 22 at 30; *see also* BS Status, Exhibit 9 at 11 ("Body size is a good predictor of demography and vulnerability to exploitation in skates....Species of elasmobranchs greater than 100 cm are especially at risk...").
[312] WS Tech Memo, Exhibit 16 at 1.

year."[313] Although the incubation time of winter skate eggs is not reported, analogy to other large skate species suggests that their eggs may incubate for as many as 2.5 years.[314] Because of these life history characteristics, winter skate populations are not likely to recover quickly from their current low levels, and are particularly susceptible to commercial depletion.

Canadian winter skate populations have experienced a decline in older, reproductively mature individuals in recent years.[315] Further, the industry seeking skate wings targets larger individuals, which further reduces the number of reproductive adults.[316] In U.S. waters, the median length of winter skates caught by recent NEFSC surveys was 45-52 cm, well below the estimated length at sexual maturity (70-109 cm in the Gulf of Maine).[317] These demographic trends are particularly worrisome in light of the species' slow growth and reproduction rates.

6. Critical Habitat

Pursuant to the ESA, petitioners further request that the Secretary designate critical habitat for winter skates. The ESA provides that the Secretary "shall, concurrently with making a determination…that a species is an endangered species or a threatened species, designate any habitat of such species which is then considered to be critical habitat."[318] The regulations implementing the ESA further provide that, in designating critical habitat, the Secretary

> shall focus on the principal biological or physical constituent elements within the defined area that are essential to the conservation of the species. Known primary constituent elements shall be listed with the critical habitat description. Primary constituent elements may include, but are not limited to, the following: roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, host species or plant pollinator, geological formation, vegetation type, tide, and specific soil types.[319]

Research has demonstrated that winter skates prefer sand and gravel bottoms at depths less than 111 m.[320] Therefore, habitat conforming to these characteristics is "essential to the conservation of" the winter skate species. Accordingly, petitioners request that the Secretary designate as critical habitat all areas along the U.S. coast from the Gulf of Maine to North Carolina featuring these "primary constituent characteristics."

V. SIMILARITY OF APPEARANCE PROVISION OF THE ESA

If the Secretary determines that some of the skate species included in this petition warrant listing while others do not, she should nevertheless treat those species not found to be "threatened" or

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[313] WS IUCN, Exhibit 14.
[314] *See* TS Tech Memo, Exhibit 3 at 6 (thorny skate eggs incubate for 2-2.5 years).
[315] WS IUCN, Exhibit 14.
[316] SAFE, Exhibit 26 at 124 ("Fishermen indicate that dealers prefer large-sized winter skates for the wing market.").
[317] SAFE, Exhibit 26 at 12; WS Tech Memo at 1.
[318] 16 U.S.C. § 1533(a)(3)(A)(i).
[319] 50 C.F.R. § 424.12(b).
[320] WS Tech Memo, Exhibit 16 at 12.

"endangered," as well as other members of the skate complex, as listed species in accordance with section 1533(e) of the ESA. This section provides that the Secretary may

> treat any species as an endangered or threatened species even through it is not listed pursuant to section 4 of this Act if he finds that—
>
> (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 Act.[321]

All the members of the U.S. skate complex that are not deemed to be "threatened" or "endangered" meet these three criteria.

A. Similarity in appearance such that enforcement personnel would have substantial difficulty in attempting to differentiate between listed and unlisted species.

As experience with the NMFS skate fishery regulations and the skate fishery FMP has shown, it is exceedingly difficult to enforce species-specific prohibitions on skate catch. The Final Amendment 3 to the Fishery Management Plan for the Northeast Skate Complex ("Final Amendment 3") indicates that "[d]ue to unresolved problems in skate species identification and large amounts of landings reported as unclassified species, monitoring and compliance with catch limits and targets for individual skate species would be impossible."[322] The Final Amendment accordingly implements catch limits at the skate complex level rather than at the species level. [323]

Further, skate wing crews commonly process skates while at sea, cutting off the wings and discarding the remaining carcass.[324] While it is already difficult to differentiate skates by species, it is even more difficult to differentiate skate *wings* by species. Therefore, even if the NEFSC tried to enforce species reporting requirements more strictly, the fact that many skates are processed at sea will further frustrate officials' efforts to identify landed skates by species.

Juvenile winter skates and little skates (*L.erinacea*) present particular problems for differentiation. As the winter skate NOAA technical memo notes, "[i]mmature winter skate are

[321] 16 U.S.C. § 1533(e).
[322] Amendment 3, Exhibit 23 at 5-68.
[323] *Id.*
[324] In fact, the current regulations promote this practice. *See* 50 C.F.R. 648.322(b)(4).

often confused with immature little skate."[325] As a result, the bait trade, which targets little skates, often inadvertently lands winter skates as well.[326]

If any of these skate species is listed under the ESA, the same problem of species identification will make enforcement of species-specific ESA take prohibitions very difficult or even impossible. In particular, if the winter skate is listed under the act, the risk of confusing juvenile winter skates and little skates will make enforcement of prohibitions on take of winter skates extremely difficult.

B. The effect of this substantial difficulty is an additional threat to an endangered or threatened species.

As is discussed above, a major deficiency of the U.S. regulatory regime governing skates is that it fails to effectively enforce prohibitions on landing and possession of thorny, barndoor, and smooth skates. Because commercial crews have difficulty distinguishing among skates—or because species identification is too costly—almost all skate landings are currently reported as "unclassified."[327] There is little reason to believe that a prohibition on take of these species under the ESA will be any more effective unless the prohibition extends to the entire skate complex.

This problem is exacerbated for winter skates, which are "often confused" with the more common little skates (*L.erinacea*) (directly targeted for bait).[328]

As a result, the problem of differentiating between different skate species will constitute an additional threat to any skates species listed under the ESA.

C. Such treatment of an unlisted species will substantially facilitate the enforcement and further the policy of this Act.

In order to effectively protect endangered skate species, it would be advisable to enforce take prohibitions for all species in the skate complex. The problems with species differentiation and enforcement of species-specific take prohibitions demonstrate that enforcement will not be effective unless the Secretary treats all members of the skate complex as subject to the same regulations.

VI. CONCLUSION

All four petitioned skate species are threatened by direct and indirect exploitation. The life history of these species, which make them especially vulnerable to exploitation, argue even more urgently for the adoption of strong regulatory protections provided by the ESA. Petitioners request that the Secretary list each of the four skate species, (1) thorny skate, *Amblyraja radiata*; (2) barndoor skate, *Dipturus laevis*; (3) smooth skate, *Malacoraja senta*; and (4) winter skate, *Leucoraja ocellata*, as "threatened" or "endangered" under the ESA. In the alternative,

[325] WS Tech Memo, Exhibit 16 at 1.
[326] SAFE, Exhibit 26 at 121.
[327] *See* TS IUCN, Exhibit 1.
[328] WS IUCN, Exhibit 14.

petitioners request that the Secretary list any distinct population segments of these four species under the act; in particular, petitioners seek the designation of the U.S. population of thorny skate as a “threatened” or “endangered” distinct population segment. Finally, petitioners request the concurrent designation of critical habitat for each species in U.S. waters.