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An annotated checklist of the chondrichthyan fishes inhabiting the northern Gulf of Mexico Part 1: Batoidea

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Abstract

Herein we consolidate the information available concerning the biodiversity of batoid fishes in the northern Gulf of Mexico, including nearly 70 years of survey data collected by the National Marine Fisheries Service, Mississippi Laboratories and their predecessors. We document 41 species proposed to occur in the northern Gulf of Mexico. However, the validity of several of these reports and their associated data is questioned. In addition, we provide information and remarks concerning the distribution, conservation status, taxonomy and recorded history for each species covered.

Key words: skate, ray, western North Atlantic

Introduction

The Gulf of Mexico (GOM) is one of the most productive ecosystems in North American waters, with the northern GOM alone producing over 1 billion pounds in fisheries landings annually (Karnauskas *et al.* 2013). The shrimp trawl fishery in the northern GOM is one of the most valuable fisheries in the United States (US). Unfortunately, this fishery also has a discard to landings ratio of 4.6 to 1, the fifth highest bycatch rate in the world (Parsons and Foster 2015). Although significant attention and effort has been focused on reducing the bycatch of teleost fishes, particularly those of commercial and recreational importance, little attention has been paid to the bycatch of chondrichthyan fishes. The batoid fishes are particularly vulnerable as their habits and biology make them susceptible to overexploitation, with very few taxa afforded any measure of protection (Kyne 2016). It is therefore important we have a clear understanding of the composition of species inhabiting a particular geographic range. Updated species inventories, such as the one presented here, can provide a means for monitoring biodiversity in a region. Therefore, the purpose of this publication is to provide a listing of the batoid species occurring in the waters of the northern GOM and to condense, supplement and clarify the sometimes conflicting information contained in more comprehensive guides (*e.g.* Bigelow and Schroeder 1953, McEachran and Fechhelm 1998, McEachran and de Carvahlo 2002, Last *et al.* 2016).

Methods

This checklist is limited to those species occurring, or having been reported to occur, in the northern GOM. We define the northern GOM as those waters north of the line extending from the Texas/Mexico border to the Dry Tortu-

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gas and eastward through the Florida Keys to the eastern end of Florida Bay, and including said Bay (Figure 1). We do not however, consider the southern shores of the Florida Keys to be contained within the GOM and therefore exclude any species only occurring in those waters, to the exclusion of those considered herein. This definition of the northern GOM is arbitrary to provide limitations to the scope of this work and does not reflect a natural boundary.

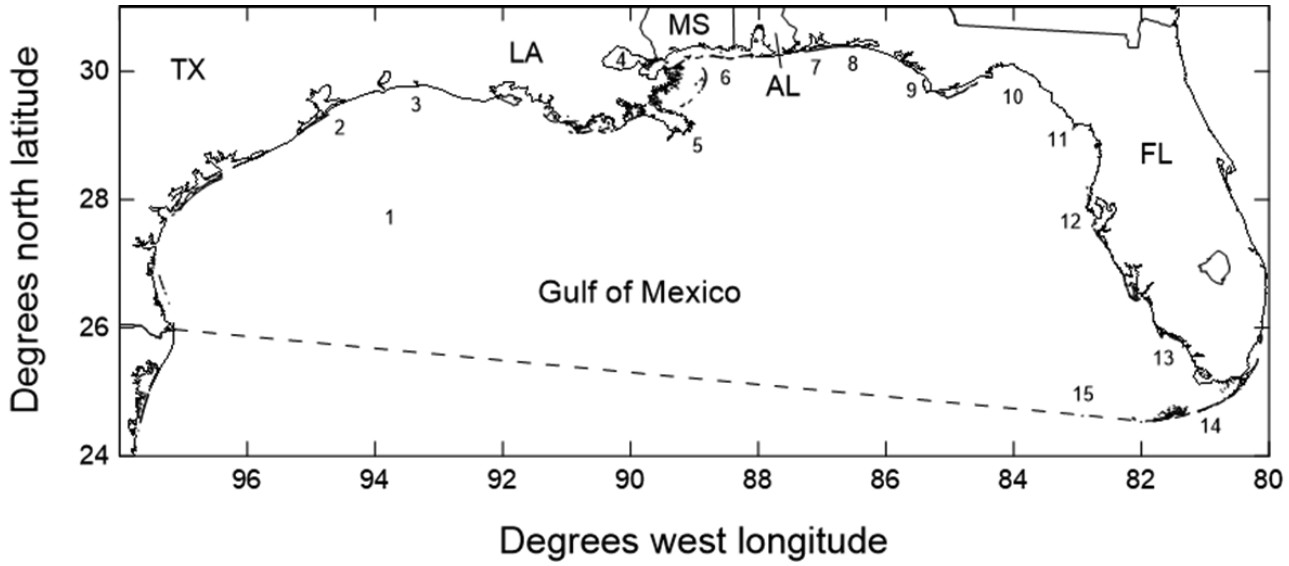

FIGURE 1. Map of the northern Gulf of Mexico. Area north of dashed line represents region covered by the checklist. Abbreviations TX, LA, MS, AL and FL indicate the states of Texas, Louisiana, Mississippi, Alabama and Florida, respectively. Numbers indicate approximate geographic locations identified within text. 1 = Flower Gardens National Marine Sanctuary, 2 = Galveston, TX , 3 = Lake Charles, LA , 4 = Lake Pontchartrain, LA, 5 = mouth of the Mississippi River, 6 = Horn Island, MS, 7 = Pensacola, FL, 8 = Destin, FL, 9 = Cape San Blas/Port St. Joe, FL, 10 = "Big Bend", 11 = Cedar Key, FL, 12 = Boca Ciega/Tampa bays, 13 =Everglades City, FL, 14 = Florida Keys, and 15 = Dry Tortugas, FL.

Although we limit the species included in this checklist to those inhabiting, in whole or in part, the waters described above, the discussions under the synonymy, remarks and conservation status sections consider the entire range of the species in question and are not confined to the northern GOM.

The information contained in this checklist is compiled from many sources, which are cited in the text where appropriate. However, there are several general sources that were consulted for most, if not all entries that deserve special note here as they are not consistently cited in the text. First and foremost, the original list of species suspected to occur in the northern GOM as well as the general taxonomic arrangement of this list and the accepted common names were derived from the *Rays of the World* (Last *et al.* 2016), which also served as a guide for general information on species distributions and identifying characters of each family, genus, and species. The common names listed were taken from both the seventh edition of the American Fisheries Society's *Common and Scientific Names of Fishes from the United States, Canada, and Mexico* (Page *et* al. 2013) and *Rays of the World* (Last *et al.* 2016). Bigelow and Schroeder's (1953) contribution to the *Fishes of the Western North Atlantic* concerning the batoid fishes continues to stand as one of the most comprehensive treatments of this group of fishes from the region. It is unparalleled in its comprehensive content and served as an invaluable reference for many sections of most entries in this checklist, particularly when it came to synonymy and first records in the GOM. McEachran and Fechhelm (1998) and McEachran and de Carvalho (2002) were utilized predominantly for distributional information but also served as resources for aids in identification and first records. Several online resources were utilized as well. *Eschmeyer's Catalog of Fishes: Genera, Species, References* (Fricke *et al.* 2019) was utilized for clarifying taxonomic history as well as gaining access to pertinent references and locating type specimens. The online portals Fishnet2 (www.fishnet2.org, 2019-03-19) and Integrated Digitized Biocollections (http://www.idigbio.org/portal, 2019-03-19) were utilized to access information concerning specimens housed in research and teaching collections. Institutional acronyms for research collections follow Sabaj Pérez (2016). Conservation status designations were taken from the International Union for the Conservation of Nature (IUCN) Red List (IUCN 2019) unless otherwise indicated.

In addition to the sources listed above, reports on exploratory fishing operations conducted by the United States

Fish and Wildlife Service's Bureau of Commercial Fisheries, Exploratory Fishing and Gear Research Station in Pascagoula , Mississippi from 1950 to 1960 (Springer and Bullis 1956, Bullis and Thompson 1965) were invaluable for corroborating locations of capture for many specimens and included over 2,500 sampling locations in the northern GOM. Most of the skates and rays collected during these operations were provided to Henry B. Bigelow and William C. Schroeder for identification (Springer and Bullis 1956) and served as the bases for several new species descriptions as well as first records from the GOM. Also, unpublished survey data collected from 1972 to 2018 by the US National Marine Fisheries Service (NMFS), Southeast Fisheries Science Center (SEFSC), Mississippi Laboratories, Resource Surveys Branch were utilized to provide additional information on species' geographic and depth ranges, including records of over 7,000 individuals from nearly 32,000 trawls. Finally, unpublished data collected by the SEFSC Fishery Observer Program from the shrimp trawl (1992–2018) and pelagic longline (2001–2018) fisheries were examined for occurrence and distributional information.

Results

Based on the available literature and referencing collection information, we list 41 species of batoid fishes proposed to occur in the northern GOM representing four orders, 14 families and 22 genera. The results are split into three sections: 1) species (37) that have been confirmed to occur in the northern GOM; 2) species (3) that have been reported as occurring in the northern GOM, or for which specimens reportedly originating from the northern GOM have been deposited in research collections, but for which there are no or suspect data to corroborate these reports; and 3) species (1) previously unreported from the northern GOM. We found substantial evidence for the occurrence of the majority of these species, although some are relatively rare. The occurrence of a few commonly reported species in the region however, is questionable.

Species with confirmed occurrence in the northern Gulf of Mexico

Class Chondrichthyes Huxley, 1880

Subclass Neoselachii Compagno, 1977

Order Rhinopristiformes Naylor *et al.*, 2012

Family Pristidae Bonaparte, 1838

Pristis Linck, 1790

Pristis pectinata Latham, 1794—smalltooth sawfish

Synonyms:
Pristis acutirostris Dumeril, 1865
Pristis annandalei Chaudhuri, 1908
Pristis granulosa Bloch & Schneider, 1801
Pristis megalodon Dumeril, 1865
Pristis mississippiensis Rafinesque, 1820
Pristis pectinatus Latham, 1794
Pristis serra Bloch & Schneider, 1801
Pristis woermanni Fischer, 1884
Pristobatus occa Dumeril, 1865

Distribution. Once widely distributed throughout the northern GOM the range of this species is predominantly restricted to the coastal and estuarine waters of the eastern GOM, mostly off the west coast of Florida. However, several recent reports of juvenile sawfish catches from the coastal waters of Mississippi and Louisiana are likely of this species, possibly indicating a small population in the north central GOM as well.

First Record in GOM. Rafinesque (1820) described *Pristis mississippiensis* as occurring in several freshwater rivers associated with the GOM and Lake Ponchartrain, an estuary of the GOM. De Carvalho and McEachran (2003) consider *P. mississippiensis* as a possible synonym of *P. pristis* (Linnaeus, 1758), likely based on Rafinesque (1820) reporting the occurrence of the proposed species far inland (Arkansas and Ohio Rivers). However, the description of the sole rostrum provided by Rafinesque (1820) more closely resembles *P. pectinata* (26-27 teeth on the rostrum); the species Bigelow and Schroeder (1953) and Faria *et al.* (2013) consider *P. mississippiensis* to be synonymous with. We also consider *P. mississippiensis* a synonym of *P. pectinata* and therefore suggest its description the first record of that species from the GOM region.

Remarks. The taxonomic history of this species is convoluted, due partially to its former widespread distribution. This species appears now to be restricted primarily to the Atlantic Ocean (Last *et al.* 2016) including the Mediterranean Sea and the GOM. However, synonymy of *Pristis annandalei* (described from a single specimen collected off the coast of Myanmar) with this species would apparently indicate historical populations in the Indian Ocean that have been extirpated.

Conservation Status. Critically Endangered, listed as Endangered under the United States Endangered Species Act.

Pristis pristis (Linnaeus, 1758)—largetooth sawfish

Synonyms:
Pristis antiquorum Latham, 1794
Pristis canaliculata Bloch & Schneider, 1801
Pristis microdon Latham, 1794
Pristis perotteti Valenciennes, 1841
Pristis typica Poey, 1861
Pristis zephyreus Jordan and Starks, 1895
Pristiopsis leichhardti Whitley, 1945
Squalus pristis Linnaeus, 1758

Distribution. This species has predominantly been reported from Texas waters with a few individuals from coastal waters of Louisiana and Florida. The waters of the southeastern U.S. are on the northern periphery of the natural range of this species and individuals captured historically in the waters of the northern GOM, predominantly off Texas, were likely transient individuals utilizing these waters during warmer months of the year. However, there are no recent records of this species from the northern GOM, indicating it may have been extirpated from the region (Burgess *et al.* 2009).

First Record in GOM. A rostrum collected prior to 1878 and deposited in the Ichthyology Collection at the Academy of Natural Sciences in Philadelphia (ANSP 17388; listed as *P. antiquorum* but verified as *P. pristis*) is the first verified record of this species in the GOM (Burgess *et al.* 2009), although it is not clear where in the GOM the specimen originated. Many previous records of sawfish originating from the Texas coast could refer to this species as it has been suggested that the ratio of *P. pristis* to *P. pectinata* in the area was historically around 1:1, but none of these records could be verified (Burgess *et al.* 2009). The mention of this species (as *P. perrotteti*) by Gunter (1941) as "probably" occurring off the Texas coast is likely the earliest in the scientific literature (Baughman 1943 confirmed Gunter's assertion two years later) although Burgess *et al.* (2009) list several records starting in 1917 based on images published in the popular press or included in personal correspondences.

Remarks. A recent revision of the sawfish family (Faria *et al.* 2013) has indicated the three species generally considered to comprise the largetooth sawfish group are actually a single globally distributed species. Like its congener *P. pectinata*, *P. pristis* has a long and convoluted taxonomic history complicated by frequent misidentification, much of which is condensed and summarized by Faria *et al.* (2013).

Conservation Status. Critically Endangered, listed as Endangered under the United States Endangered Species Act.

Family Rhinobatidae Müller and Henle, 1837

Pseudobatos Last, Séret and Naylor, 2016

Pseudobatos lentiginosus (Garman, 1880)—Atlantic guitarfish, freckled guitarfish

Synonyms:
Rhinobatos lentiginosus (Garman, 1880)
Rhinobatus lentiginosus Garman, 1880

Distribution. This species is relatively common throughout the northern GOM. Commonly reported as a coastal species inhabiting shallow waters from the shore out to approximately 30 m, although individuals of this species have been documented during NMFS SEFSC trawl surveys out to approximately 90 m depth.

First Record in GOM. The type specimen (MCZ S-97) described by Garman (1880) was collected from Florida by Louis Agassiz in 1853. However, it is not stated from where in Florida the specimen was collected, so it may or may not have come from the GOM. The first definitive account of this species occurring in the northern GOM is from Goode and Bean (1883) referencing a specimen collected from West Florida (USNM 5158) at an unknown date.

Remarks. Despite being relatively common in shallow waters, this species is little studied and requires focused research.

Conservation Status. Near Threatened

Order Torpediniformes de Buen, 1926

Family Narcinidae Gill, 1862

Narcine Henle, 1834

Narcine bancroftii (Griffith and Smith, 1834)—lesser electric ray, Caribbean numbfish

Synonyms:
Narcine brasiliensis corallina Garman, 1881
Narcine brasiliensis punctata Garman, 1881
Narcine umbrosa Jordan, 1884
Torpedo bancroftii Griffith and Smith, 1834
Torpedo pictus Gronow in Gray, 1854

Distribution. This species exhibits a strong habitat preference (Carlson *et al* 2017), being relatively abundant in shallow coastal waters over sand bottoms throughout the northern GOM. Although this species is commonly reported to inhabit waters from the shoreline to approximately 20 m in depth, individuals have been documented during NMFS SEFSC trawl surveys out to approximately 65 m depth.

First Record in GOM. An individual captured off Pensacola, Florida by Silas Stearns and David Starr Jordan in 1882 appears to be the first record of this species from the northern GOM. Although Jordan and Gilbert (1882) make no mention of this species in their report of the specimens obtained during the trip, Goode and Bean (1882) include it in their list of species from the GOM, likely based upon this specimen.

Remarks. Müller and Henle (1841) considered this species as being a variety of *Narcine brasiliensis* (von Olfers, 1831). Garman (1881) described two additional varieties of *N. brasiliensis* captured from the Florida Keys and St. Vincent Island in the Caribbean. *Narcine bancroftii* was resurrected by de Carvalho (1999) and the range of this species is proposed to include the waters of the western North Atlantic Ocean, including the GOM and Caribbean Sea, with *N. brasiliensis* limited to the coast of Brazil. This being the case, *N. brasiliensis corallina* and *N. brasiliensis punctata* should be considered as synonyms of *N. bancroftii*, as suggested by Carvahlo (1999), and not *N. brasiliensis* as currently suggested (Fricke *et al.*, 2019). Likewise, *Narcine umbrosa* and *Torpedo pictus* are currently considered synonyms of *N. brasiliensis* (Fricke *et al.*, 2019), described from Key West and the Antilles, respectively. Given the localities from which these two species were described, they too should be considered synonyms of *N. bancroftii* instead (de Carvalho 1999).

Conservation Status. Critically endangered, although this status has come into question and will likely change based on the information presented by Carlson *et al.* (2017).

Family Torpedinidae Bonaparte, 1838

***Tetronarce* Gill, 1862**

***Tetronarce occidentalis* (Storer, 1843)—western Atlantic torpedo**

Synonyms:
Narcacion occidentale Gill, 1861
Torpedo occidentalis Storer, 1843

Distribution. Northeastern GOM from the shoreline out to an approximate depth of 560 m.

First Record in GOM. A report by Gowanloch (1932) appears to be the first to suggest that this species (reported as *Torpedo nobiliana*) inhabits the northern GOM. Bigelow and Schroeder (1953) initially dismissed this report and suggested that it followed from what they considered to be erroneous reports of this species presence in Cuba (Poey 1868) and the Florida Keys (Fowler 1906). However, the capture of several specimens from the northern GOM between 1956 and 1958 caused them to revise this opinion (Bigelow and Schroeder 1962).

Remarks. This species was synonymized with *Torpedo nobiliana* by Krefft and Stehmann (1973) but was recently resurrected by Last *et al.* (2016) based on unpublished molecular evidence.

Conservation Status. Data Deficient, when assessed globally as *Tetronarce nobiliana*

Order Rajiformes Berg, 1940

Family Rajidae de Blainville, 1816

***Dactylobatus* Bean and Weed, 1909**

***Dactylobatus clarkii* (Bigelow and Schroeder, 1958)—hook skate**

Synonyms: *Raja clarkii* Bigelow and Schroeder, 1958

Distribution. Patchy throughout northern GOM from 370 to 1048 m depth.

First Record in GOM. This species was described by Bigelow and Schroeder (1958) based on three specimens (holotype USNM 156712, Figure 2, and paratypes MCZ 39618) collected from the northern GOM off of Florida aboard the RV Oregon in 1955 (Springer and Bullis 1956).

Remarks. This species is rare and little is known about its biology. However, recent observations made during deepwater habitat surveys conducted by the National Oceanic and Atmospheric Administration (NOAA) Office of Ocean Exploration and Research (OOER) in the northern GOM utilizing a remotely operated vehicle (ROV) have yielded additional insights into the morphology and habitat preferences of this species, including a new maximum depth record (1048m, C. Jones unpublished data).

Conservation Status. Data Deficient

***Dipturus* Rafinesque, 1810**

***Dipturus bullisi* (Bigelow and Schroeder, 1962)—lozenge skate, Tortugas skate**

Synonyms: *Raja bullisi* Bigelow and Schroeder, 1962

Distribution. Commonly considered as being patchily distributed throughout the northern GOM from depths of approximately 185 to 550 m, although NMFS SEFSC trawl surveys have reported this species as shallow as 125 m depth.

First Record in GOM. Bigelow and Schroeder (1962) based their description of this species on two specimens

(holotype USNM 196442, Figure 3, and paratype MCZ 40673) collected from the continental slope southwest of the Dry Tortugas aboard the RV Silver Bay in 1959 (Bullis and Thompson 1965) as well as several additional specimens (*e.g.* MCZ 39993, 39994, 41154, 41163 and 41168) collected from the same general area aboard the RV Oregon in 1955 (Springer and Bullis 1956).

Remarks. The genus *Dipturus* is currently under revision and the species from the GOM are of particular interest as little is known of their biology and habits.

Conservation Status. Data Deficient

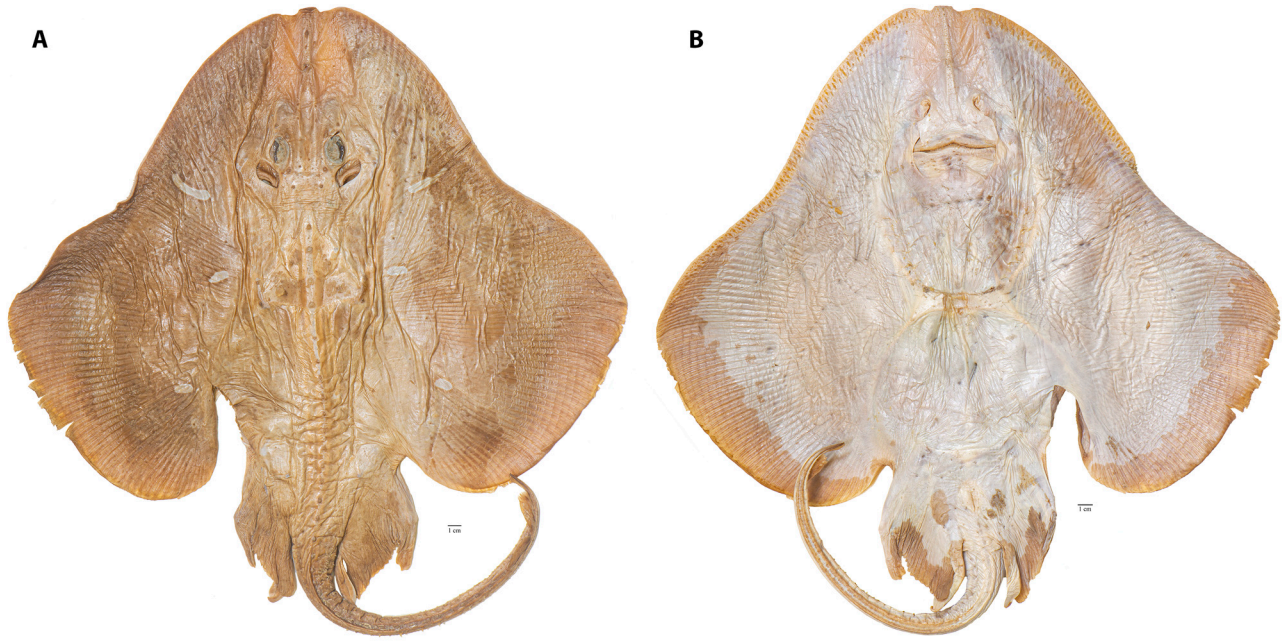

FIGURE 2. Dorsal (A) and ventral (B) perspectives of the holotype of *Dactylobatus clarkii* (USNM 156712) collected from the northern Gulf of Mexico. Photographs by Sandra J. Raredon, USNM.

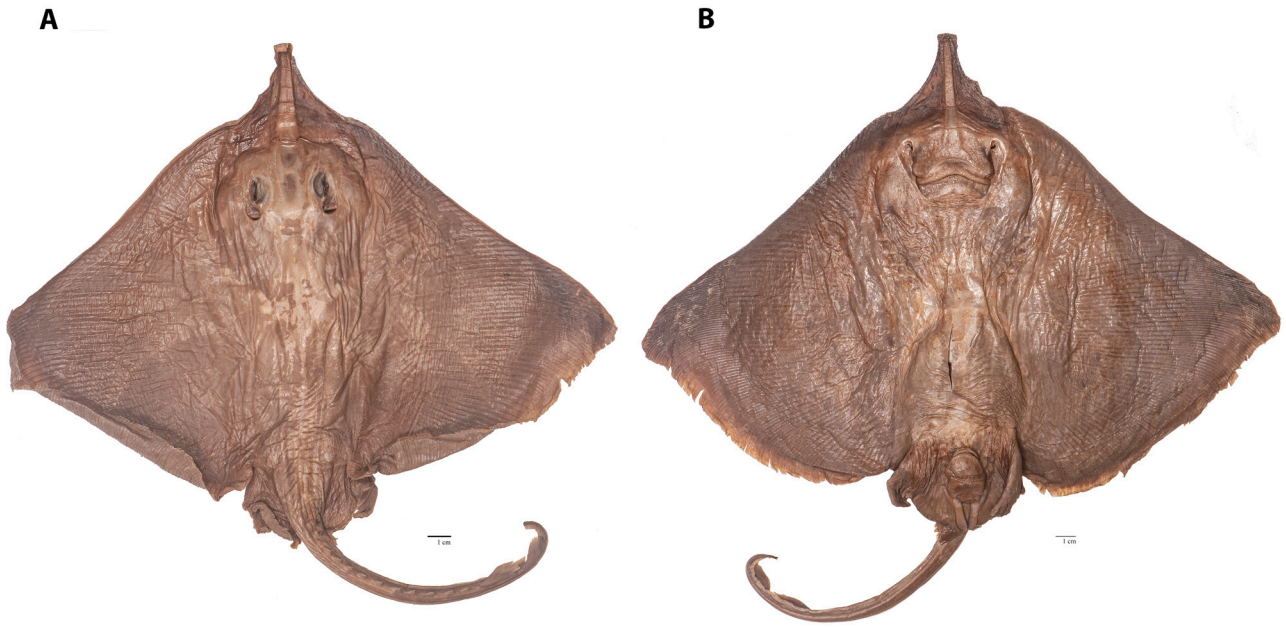

FIGURE 3. Dorsal (A) and ventral (B) perspectives of the holotype of *Dipturus bullisi* (USNM 196442) collected from the northern Gulf of Mexico. Photographs by Sandra J. Raredon, USNM.

Dipturus garricki (Bigelow and Schroeder, 1958)—San Blas skate

Synonyms: *Raja garricki* Bigelow and Schroeder, 1958

Distribution. Distributed throughout the northern GOM from the Florida panhandle to northeastern Texas from depths of approximately 275 to 475 m.

First Record in GOM. The description of this species (Bigelow and Schroeder 1958) was based on two specimens (holotype USNM 156711, Figure 4, and paratype MCZ 39616) collected in the northern GOM from the waters off northwestern Florida aboard the RV Oregon in 1955 (Springer and Bullis 1956).

Remarks. The genus *Dipturus* is currently under revision and the species from the GOM are of particular interest as little is known of their biology and habits.

Conservation Status. Data Deficient

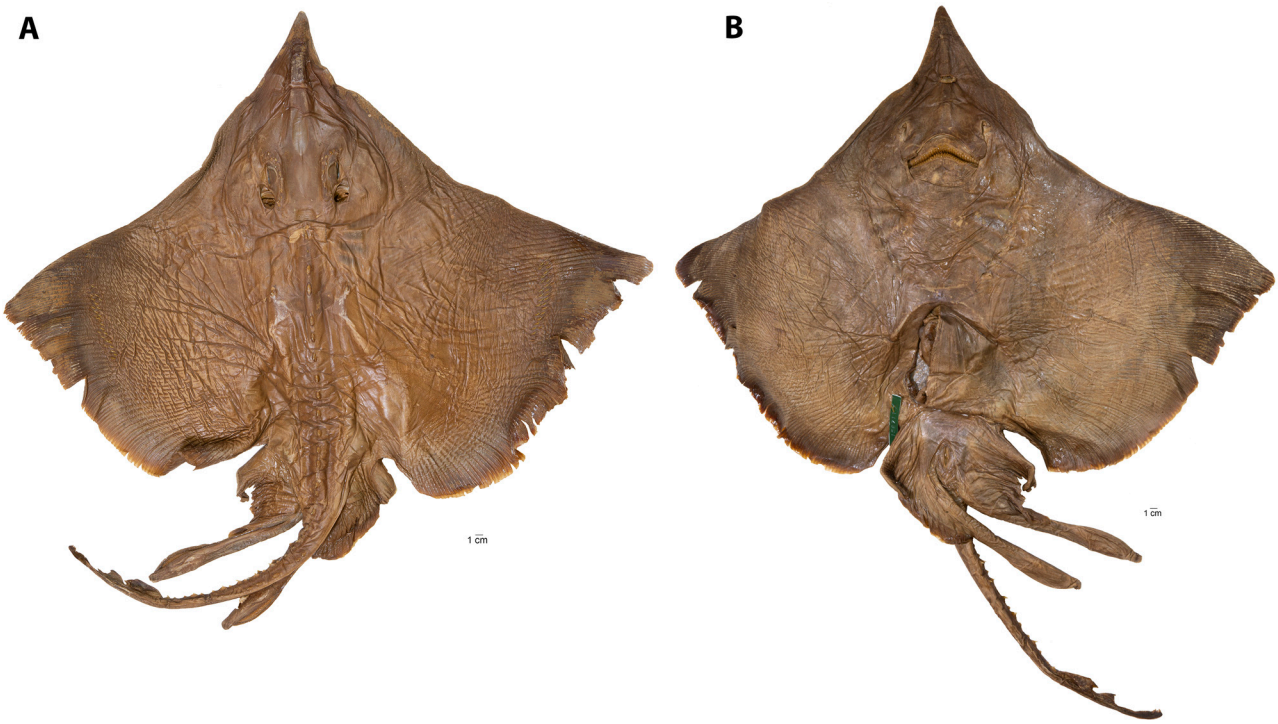

FIGURE 4. Dorsal (A) and ventral (B) perspectives of the holotype of *Dipturus garricki* (USNM 156711) collected from the northern Gulf of Mexico. Photographs by Sandra J. Raredon, USNM.

Dipturus olseni (Bigelow and Schroeder, 1951a)—spreadfin skate

Synonyms: *Raja olseni* Bigelow and Schroeder, 1951a

Distribution. Widely distributed in the northern GOM from Cape Coral, Florida to the Texas/Mexico border at depths between approximately 55 and 385 m.

First Record in GOM. The holotype (USNM 153556, Figure 5) and paratype (MCZ 37176) upon which the species description was based (Bigelow and Schroeder, 1951a) were both collected in November of 1950 aboard the RV Oregon from the northern GOM off of the southern Texas coast (Springer and Bullis 1956).

Remarks. This species appears to be endemic to the GOM. The genus *Dipturus* is currently under revision and species from the GOM are of particular interest as little is known of their biology and habits. Mature specimens appear to differ in several respects from juvenile forms, which are the predominant basis for current descriptions (C. Jones unpublished data).

Conservation Status. Data Deficient

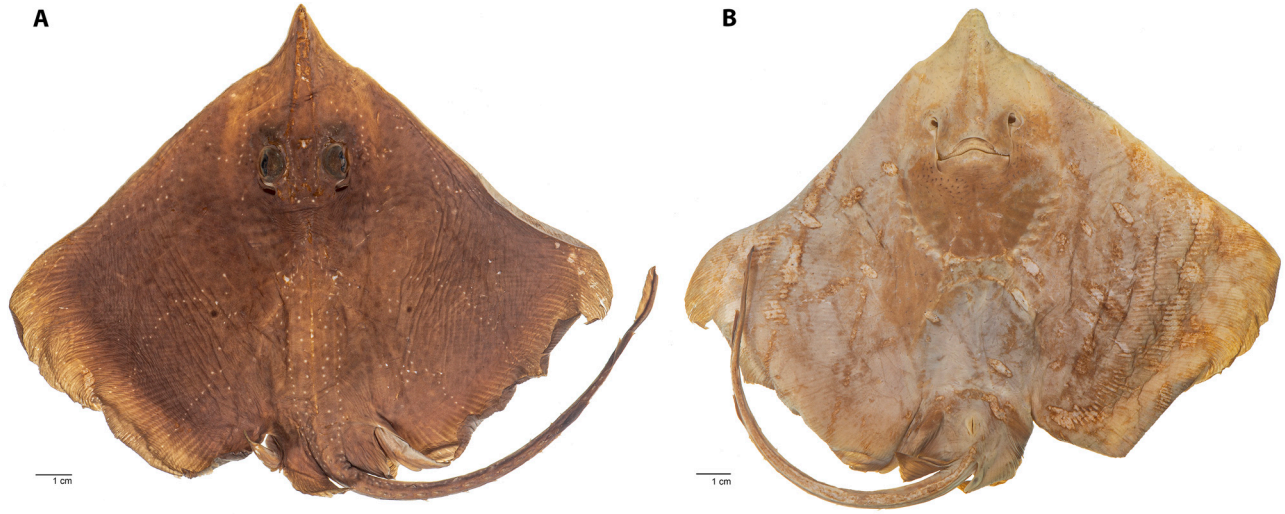

FIGURE 5. Dorsal (A) and ventral (B) perspectives of the holotype of *Dipturus olseni* (USNM 153556) collected from the northern Gulf of Mexico. Photographs by Sandra J. Raredon, USNM.

Dipturus oregoni (Bigelow and Schroeder, 1958)—hooktail skate

Synonyms: *Raja oregoni* Bigelow and Schroeder, 1958

Distribution. Widely distributed in the northern GOM from Port St. Joe, Florida to the Texas/Mexico border at depths between approximately 475 and 1,080 m.

First Record in GOM. This species was described (Bigelow and Schroeder 1958) based on two specimens (holotype USNM 156710, Figure 6, and paratype MCZ 39617) collected aboard the RV Oregon in 1955 from the northern GOM off the coasts of Alabama and northwestern Florida (Springer and Bullis 1956).

Remarks. The genus *Dipturus* is currently under revision and the species from the GOM are of particular interest as little is known of their biology and habits.

Conservation Status. Data Deficient

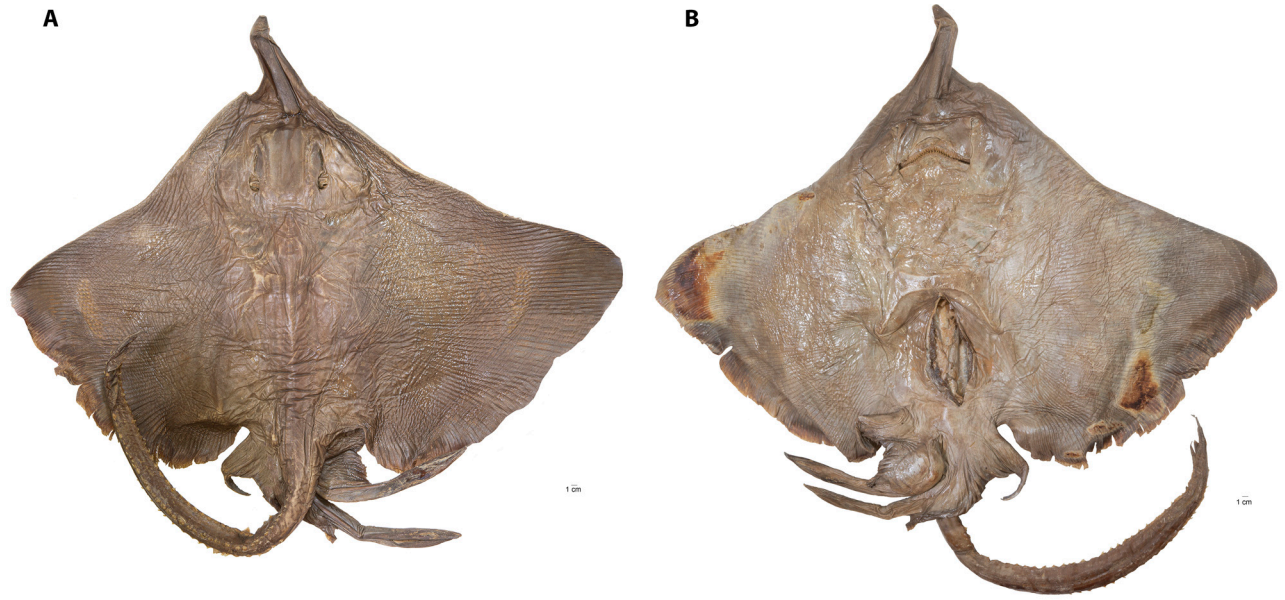

FIGURE 6. Dorsal (A) and ventral (B) perspectives of the holotype of *Dipturus oregoni* (USNM 156710) collected from the northern Gulf of Mexico. Photographs by Sandra J. Raredon, USNM.

Dipturus teevani (Bigelow and Schroeder, 1951a)—Caribbean skate

Synonyms:
Raja floridana Bigelow and Schroeder, 1962
Raja teevani Bigelow and Schroeder, 1951a

Distribution. Widely distributed in the northern GOM from Port St. Joe, Florida to the Texas/Mexico border at depths between approximately 310 and 940 m.

First Record in GOM. This species was originally described (Bigelow and Schroeder 1951a) from two specimens (holotype USNM 153557, Figure 7, and paratype MCZ 37189) collected in 1951 aboard the RV Oregon from the northern GOM off the northwestern coast of Florida (Springer and Bullis 1956).

Remarks. The genus *Dipturus* is currently under revision and the species from the GOM are of particular interest as little is known of their biology and habits.

Conservation Status. Data Deficient

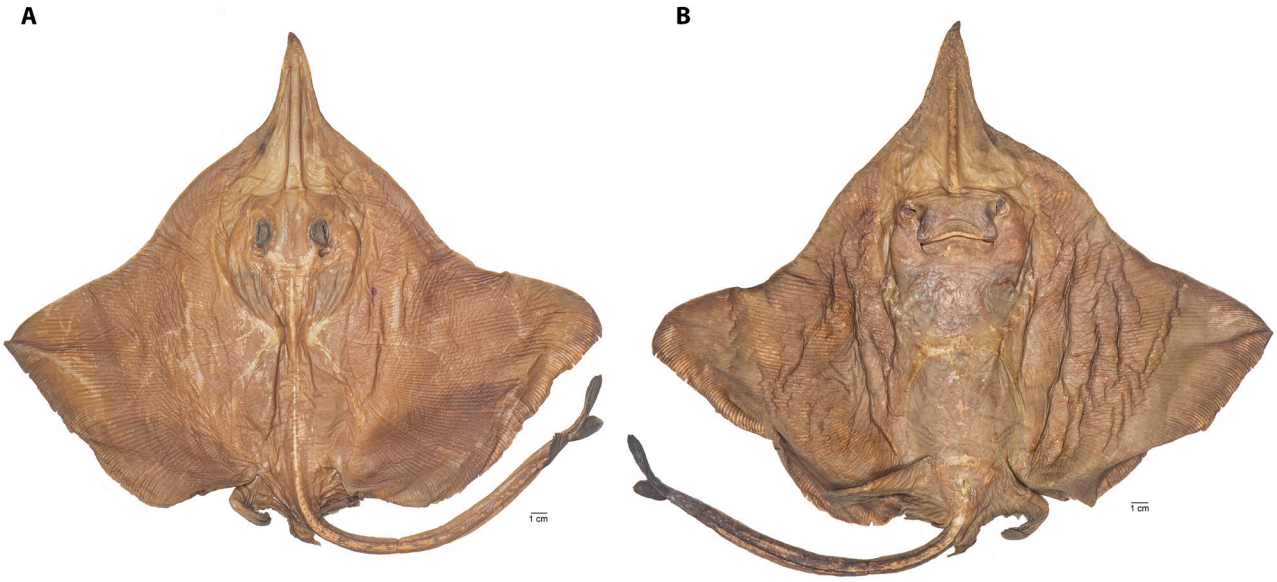

FIGURE 7. Dorsal (A) and ventral (B) perspectives of the holotype of *Dipturus teevani* (USNM 153557) collected from the northern Gulf of Mexico. Photographs by Sandra J. Raredon, USNM.

Leucoraja Malm, 1877

Leucoraja lentiginosa (Bigelow and Schroeder, 1951a)—freckled skate, freckle skate

Synonyms: *Raja lentiginosa* Bigelow and Schroeder, 1951a

Distribution. While generally reported from northwestern Florida to the Texas/Mexico border in the northern GOM, NMFS SEFSC trawl surveys have captured this species as far south as southern Florida, at the approximate level of Everglades City, Florida. This species has been reported from depths of 55 to 590 m.

First Record in GOM. This species was originally described (Bigelow and Schroeder 1951a) from specimens collected in 1951 in the GOM aboard the RV Oregon. While the holotype (USNM 153552) was collected from the Campeche Bank in the southern GOM, the type series contains paratypes (USNM 153553 to 153555 and MCZ 37197) collected from the northern GOM off of Cape San Blas and Pensacola, Florida (Springer and Bullis 1956).

Remarks. This species was considered by McEachran (1977) to be a subspecies of *Raja garmani*. McEachran and Dunn (1998) elevated the subgenus *Leucoraja* Malm, 1877 to the level of genus and separated *Leucoraja lentiginosa* from *Leucoraja garmani*. This separation has recently been supported by molecular work (G. Naylor, personal communication).

Conservation Status. Data Deficient

Rajella Stehmann, 1970

Rajella fuliginea (Bigelow and Schroeder, 1954)—sooty skate

Synonyms: *Raja fuliginea* Bigelow and Schroeder, 1954

Distribution. Distributed widely throughout the northern GOM from Port St. Joe, Florida to the Texas/Mexico border in waters from approximately 730 to 1,280 m in depth.

First Record in GOM. This species was originally described (Bigelow and Schroeder, 1954) from a single specimen (USNM 163367, Figure 8) collected aboard the RV Oregon in 1952 from the northwestern GOM, almost due south of Lake Charles, Louisiana (Springer and Bullis 1956).

Remarks. The biology of this species is very poorly known due to its depth preference being outside of the range of most fisheries and research operations.

Conservation Status. Least Concern

FIGURE 8. Dorsal (A) and ventral (B) perspectives of the holotype of *Rajella fuliginea* (USNM 163367) collected from the northern Gulf of Mexico. Photographs by Sandra J. Raredon, USNM.

Rajella purpuriventralis (Bigelow and Schroeder, 1962)—purplebelly skate

Synonyms:
Dipturus purpuriventralis (Bigelow and Schroeder, 1962)
Malacoraja purpuriventralis (Bigelow and Schroeder, 1962)
Raja purpuriventralis Bigelow and Schroeder, 1962

Distribution. Distributed widely throughout the northern GOM from Port St. Joe, Florida to the Texas/Mexico border in waters from approximately 730 to 2,010 m in depth.

First Record in GOM. The description of this species (Bigelow and Schroeder 1962) is based on a single specimen (USNM 196440, Figure 9) collected aboard the RV Oregon in 1959 from the north central GOM (Bullis and Thompson 1965).

Remarks. The biology of this species is very poorly known due to its depth preference being outside of the range of most fisheries and research operations, with most specimens collected being juveniles. However, recent expeditions conducted by NOAA in the northern GOM utilizing a ROV to explore deepwater habitats have captured videos of this species, including several of adults, leading to a greater understanding of their ontogenetic changes and habitat preferences (C. Jones unpublished data).

Conservation Status. Least concern

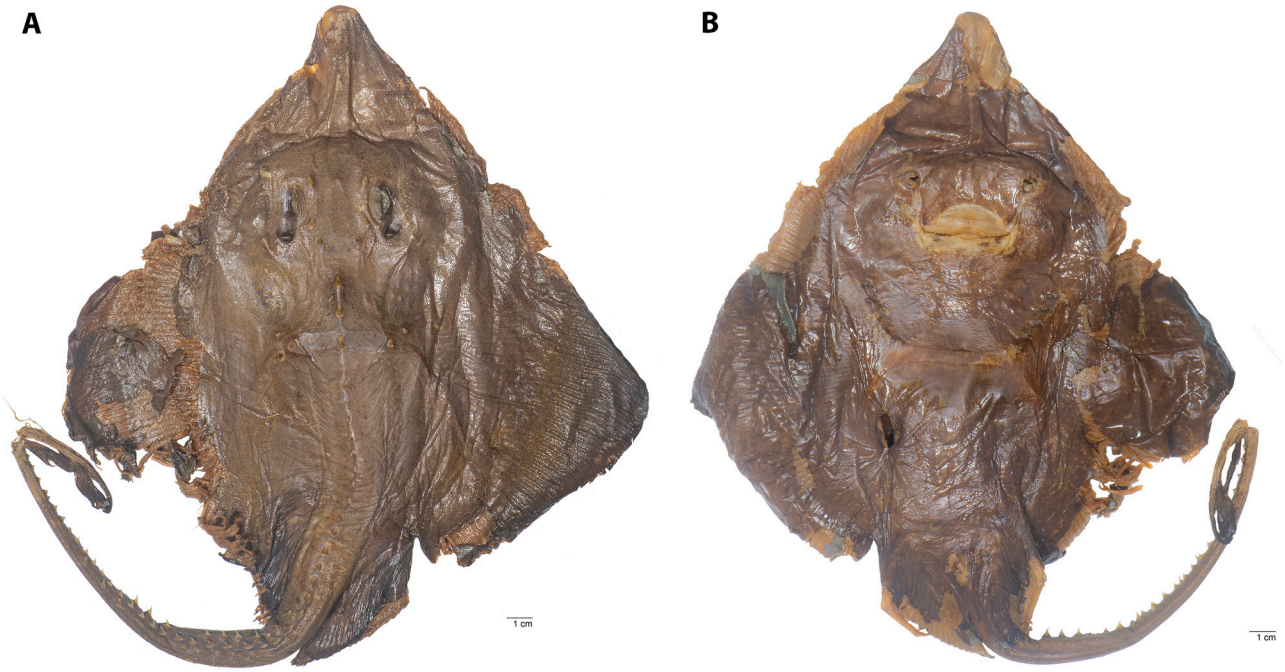

FIGURE 9. Dorsal (A) and ventral (B) perspectives of the holotype of *Rajella purpuriventralis* (USNM 196440) collected from the northern Gulf of Mexico. Photographs by Sandra J. Raredon, USNM.

Rostroraja Hulley, 1972

Rostroraja ackleyi (Garman, 1881)—ocellate skate

Synonyms:
Raja ackleyi Garman, 1881
Raja alia Garman, 1899

Distribution. Reported from a small area off the west central Florida coast in the northern GOM. Captured from depths of 30 to 385 m.

First Record in the northern GOM: This species was described (Garman 1881) based on specimens collected from the southern GOM in the vicinity of the Yucatan Banks (MCZ S-748). The first record in the northern GOM is reported by Bigelow and Schroeder (1953) as a specimen (MCZ 37186) collected aboard the RV Oregon north of the Dry Tortugas in 1951 (Springer and Bullis 1956).

Remarks. This species is potentially confused with *Rostroraja texana* (Chandler, 1921) due to similar coloration and proposed overlapping distribution. *Raja alia* is *nomen dubium* and currently considered a synonym of this species pending further investigation (Last *et al.* 2016). The placement of this and other *incertae sedis Raja* of the "Amphi-American Assemblage" (McEachran and Dunn 1998) in the previously monotypic genus *Rostroraja* Hulley, 1972 is provisional based on unpublished molecular data (Last *et al.* 2016).

Conservation Status. Data Deficient (as *Raja ackleyi*)

Rostroraja eglanteria (Bosc, 1800)—clearnose skate

Synonyms:
Raia americana DeKay, 1842
Raia desmarestia Lesueur, 1824
Raja diaphanes Mitchill, 1815
Raja eglanteria Bosc, 1800

Distribution. Distributed throughout the northern GOM but more common east of the Mississippi River than west. Commonly reported as distributed from the shore out to 120 m depth throughout their range, although NMFS SEFSC trawl surveys have reported this species from depths up to 380 m in the northern GOM.

First Record in GOM. The first published report of this species occurring in the northern GOM was by Bigelow and Schroeder (1953) based on a specimen (UMMZ 154934) collected near Pass-A-Grille Beach, Florida in Boca Ciega Bay in 1937. However, the first record of this species being collected in the waters of the northern GOM is a specimen (UF 683) collected in the vicinity of the Cedar Keys, Florida in 1930.

Remarks. The placement of this and other *incertae sedis Raja* of the "Amphi-American Assemblage" (McEachran and Dunn 1998) in the previously monotypic genus *Rostroraja* Hulley, 1972 is provisional based on unpublished molecular data (Last *et al.* 2016). Dyldin (2015) identified *Raia americana* as a synonym of *Amblyraja radiata* (Donovan, 1808). However, details of DeKay's (1842) description of *R. americana* (*e.g.* similarity, particularly in shape, to *R. desmarestia* and *Dipturus batis* (Linnaeus, 1758)) lead us to agree with both Garman (1913) and Bigelow and Schroeder (1953) in assigning *R. americana* to synonymy with *R. eglanteria*. *Raia desmarestia* is a likely synonym of *R. eglanteria* as well since the type locality (Florida) and description given by Lesueur (1824) match most closely with this species (Bigelow and Schroeder 1953, Séret and McEachran 1986). *Raja diaphanes* has been concluded by many authors to be a synonym of *Leucoraja ocellata* (*e.g.* Scott and Scott 1988, Fricke *et al.* 2019). However the description provided by Mitchill (1815) matches closely with *R. eglanteria* not *L. ocellata*, particularly in the description of the elongation and acuity of the snout, not to mention the transparency of the tissue adjacent to the snout. We therefore follow Bigelow and Schroeder (1953) in considering *R. diaphanes* a synonym of *R. eglanteria*.

Conservation Status. Least Concern (as *Raja eglanteria*)

Rostroraja texana (Chandler, 1921)—roundel skate

Synonyms:
Raia texana Chandler, 1921
Raja texana Chandler, 1921

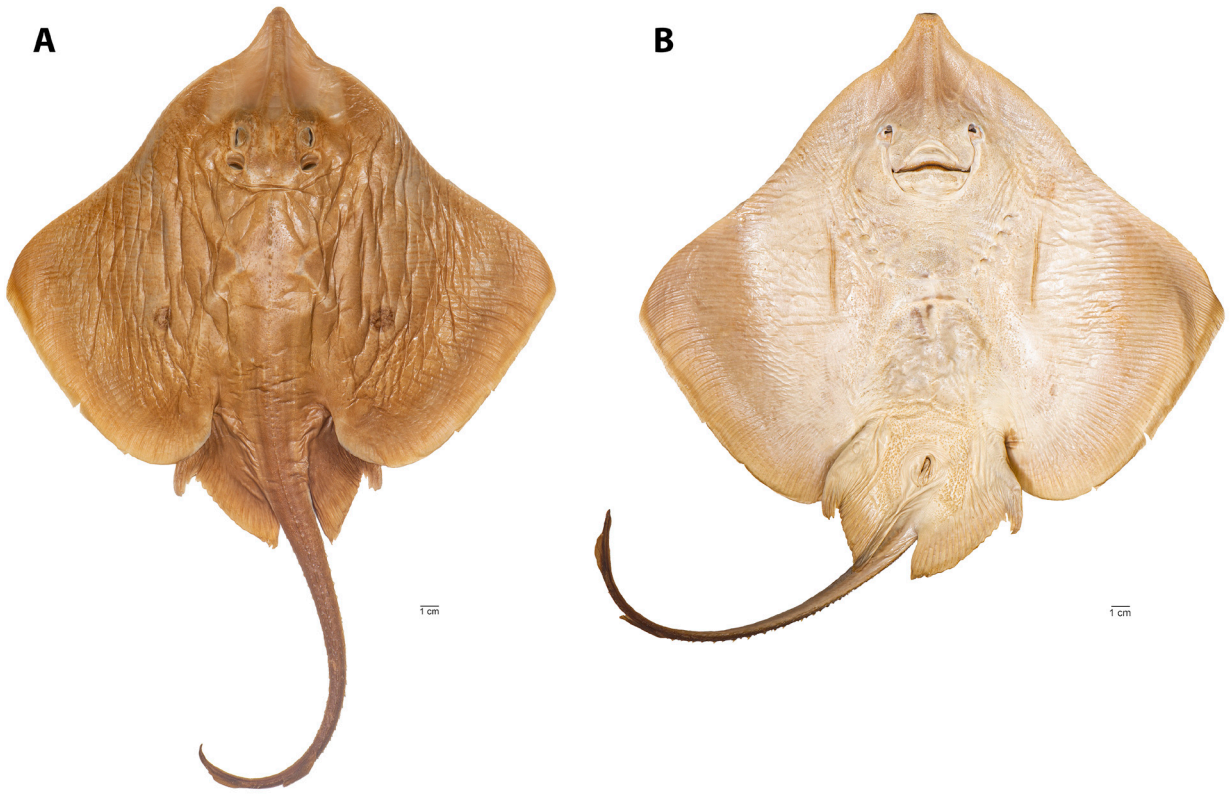

FIGURE 10. Dorsal (A) and ventral (B) perspectives of the holotype of *Rostroraja texana* (USNM 84162) collected from the northern Gulf of Mexico. Photographs by Sandra J. Raredon, USNM.

Distribution. Distributed throughout the northern GOM but more common west of the Mississippi River than east. Commonly reported as distributed from the shore out to 110 m depth throughout their range, although NMFS SEFSC trawl surveys have reported this species from depths up to 330 m in the northern GOM.

First Record in GOM. This species was described (Chandler 1921) based on a specimen (USNM 84162, Figure 10) collected near the jetties off Galveston, Texas in November of 1920. There is, however, a specimen collected earlier in the same year deposited in the Field Museum of Natural History (FMNH 40226).

Remarks. The placement of this and other *incertae sedis Raja* of the "Amphi-American Assemblage" (McEachran and Dunn 1998) in the previously monotypic genus *Rostroraja* Hulley, 1972 is provisional based on unpublished molecular data (Last *et al.* 2016). This species is similar in appearance to *Rostroraja ackleyi*, with which its range overlaps, possibly leading to misidentification between the two species.

Conservation Status. Data Deficient (as *Raja texana*)

Family Gurgesiellidae de buen, 1959

Cruriraja Bigelow and Schroeder, 1948

Cruriraja rugosa Bigelow and Schroeder, 1958—rough pygmy skate

Synonyms: None

Distribution. In the northern GOM, this species is distributed from the north western Florida coast to the Texas/Mexico border in approximately 370 to 915 m of water.

First Record in GOM. The description of this species (Bigelow and Schroeder 1958) was based on a single individual (USNM 156713, Figure 11) collected aboard the RV Oregon from the northeastern GOM in 1957.

Remarks. This is a deep water species that is rarely captured and, therefore, little is known of their biology.

Conservation Status. Data Deficient

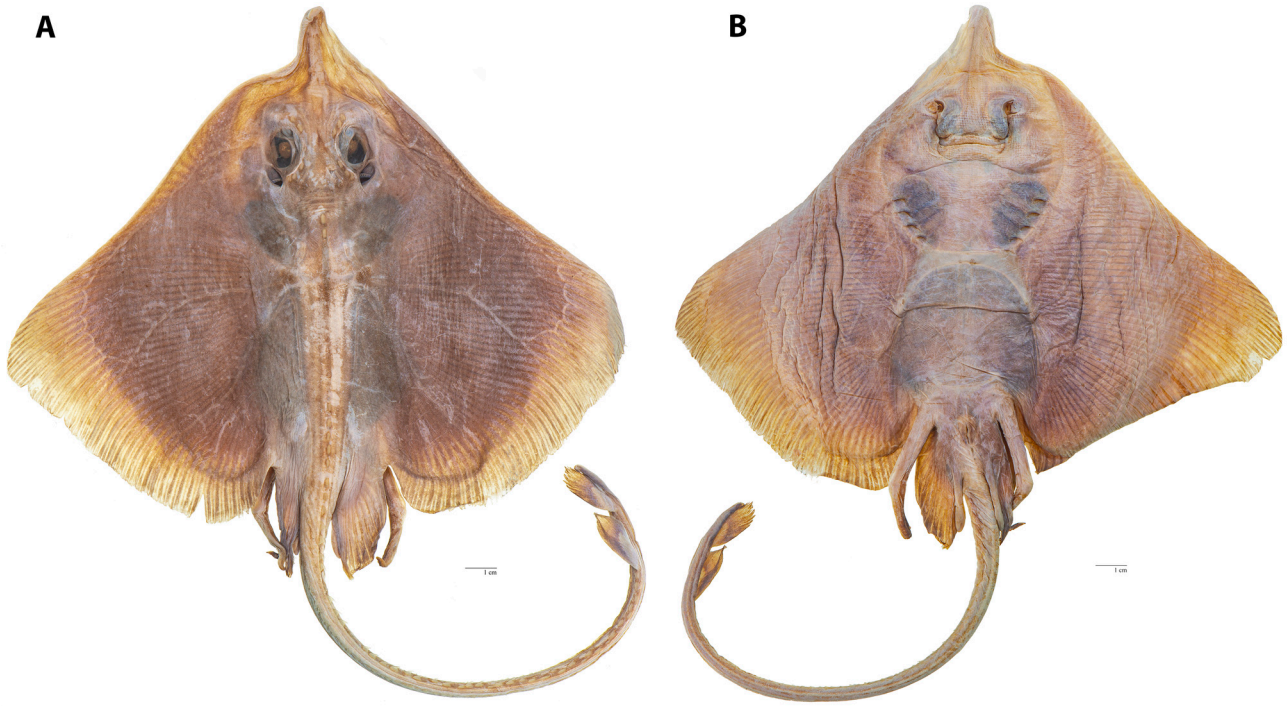

FIGURE 11. Dorsal (A) and ventral (B) perspectives of the holotype of *Cruriraja rugosa* (USNM 156713) collected from the northern Gulf of Mexico. Photographs by Sandra J. Raredon, USNM.

Fenestraja McEachran and Compagno, 1982

Fenestraja plutonia (Garman, 1881)—Pluto pygmy skate

Synonyms:
Breviraja plutonia (Garman, 1881)
Gurgesiella plutonia (Garman, 1881)
Raja acanthiderma Fowler, 1947
Raja plutonia Garman, 1881

Distribution. In the northern GOM, this species is distributed from the north western Florida coast to the mouth of the Mississippi River, ranging in depth from approximately 290 to 1,025 m.

First Record in GOM. The first record of this species from the northern GOM is a specimen (MCZ 38706) collected aboard the RV Oregon from the continental slope west of the Dry Tortugas in 1954 (Springer and Bullis 1956).

Remarks. This is a deep water species that is rarely captured and, therefore, little is known of their biology.

Conservation Status. Data Deficient

Fenestraja sinusmexicanus (Bigelow and Schroeder, 1950)—Gulf skate, Gulf pygmy skate

Synonyms:
Breviraja sinusmexicanus Bigelow and Schroeder, 1950
Gurgesiella sinusmexicanus (Bigelow and Schroeder, 1950)

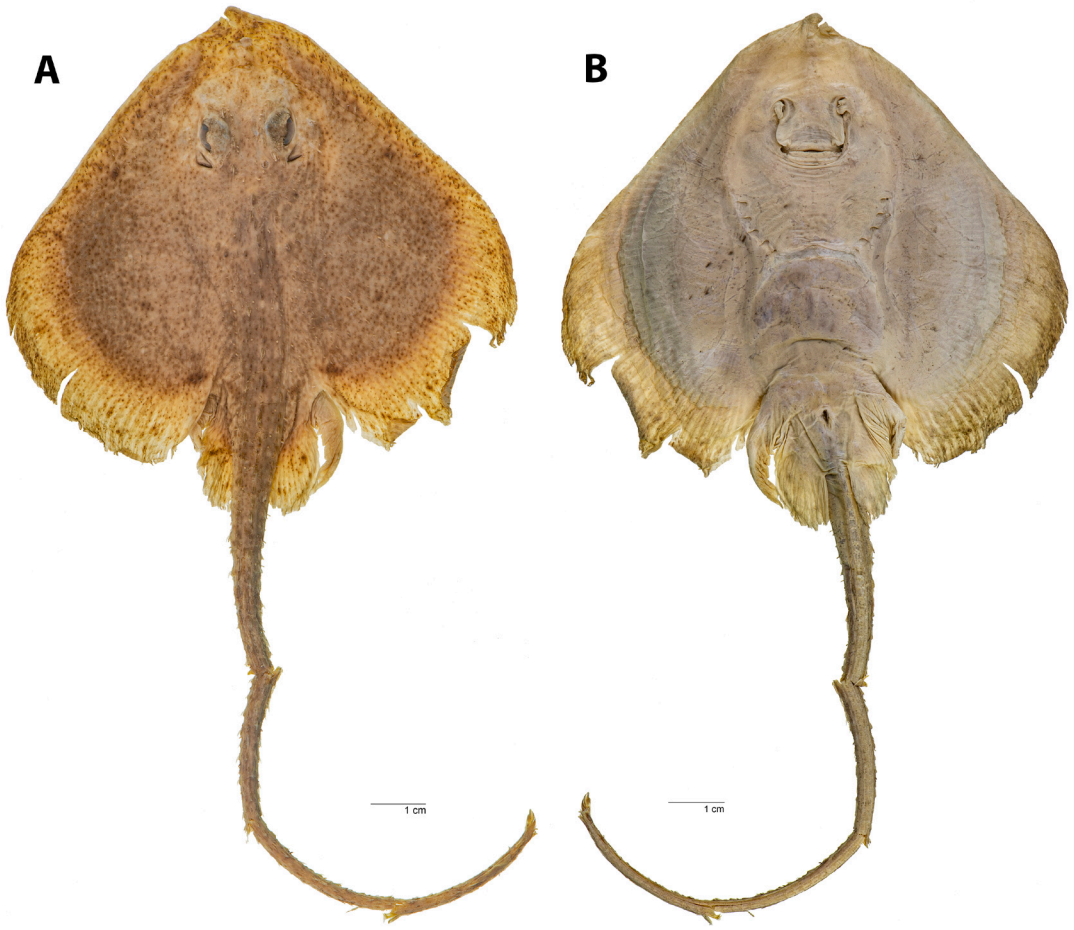

FIGURE 12. Dorsal (A) and ventral (B) perspectives of the holotype of *Fenestraja sinusmexicanus* (USNM 103376) collected from the northern Gulf of Mexico. Photographs by Sandra J. Raredon, USNM.

Distribution. From the Big Bend area of the north western Florida coast to the Texas/Mexico border in approximately 60 to 1095 m of water.

First Record in GOM. As the specific epithet suggests, the original description of this species (Bigelow and Schroeder 1950) was based on several specimens (holotype USNM 103376, Figure 12) collected from various locations in the northeastern GOM in 1885 (Townsend 1901).

Remarks. This is a deep water species that is rarely captured and, therefore, little is known of their biology. Recent deep water expeditions conducted by NOAA in the northern GOM utilizing an ROV managed to capture several videos of this species *in situ*.

Conservation Status. Data Deficient

Family Anacanthobatidae von Bonde and Swart, 1923

Springeria Bigelow and Schroeder, 1951b

Springeria folirostris Bigelow and Schroeder, 1951b—leafnose legskate

Synonyms: *Anacanthobatis folirostris* Bigelow and Schroeder, 1951b

Distribution. This species has been proposed to be endemic to the northern GOM by several authors (*e.g.* McEachran and Fechhelm 1998, Last *et al.* 2016). However, several specimens (UF 3984, IBUNAM-P9865, USNM 222431) have been collected from the southern GOM and a single individual (FMNH 90092) was collected from the continental slope off Honduras. In the northern GOM, this species occurs on the continental slope from the Texas/Mexico border to off northwestern Florida at depths ranging from 300 to 510 m.

First Record in GOM. The description of this species (Bigelow and Schroeder, 1951b) was based on two specimens (holotype USNM 152546, Figure 13, and paratype MCZ 37160) both collected in the same general area, on the continental slope off the mouth of the Mississippi River, in 1950.

Remarks. This is a deep water species that is rarely captured and, therefore, little is known of their biology.

Conservation Status. Data Deficient (as *Anacanthobatis folirostris*)

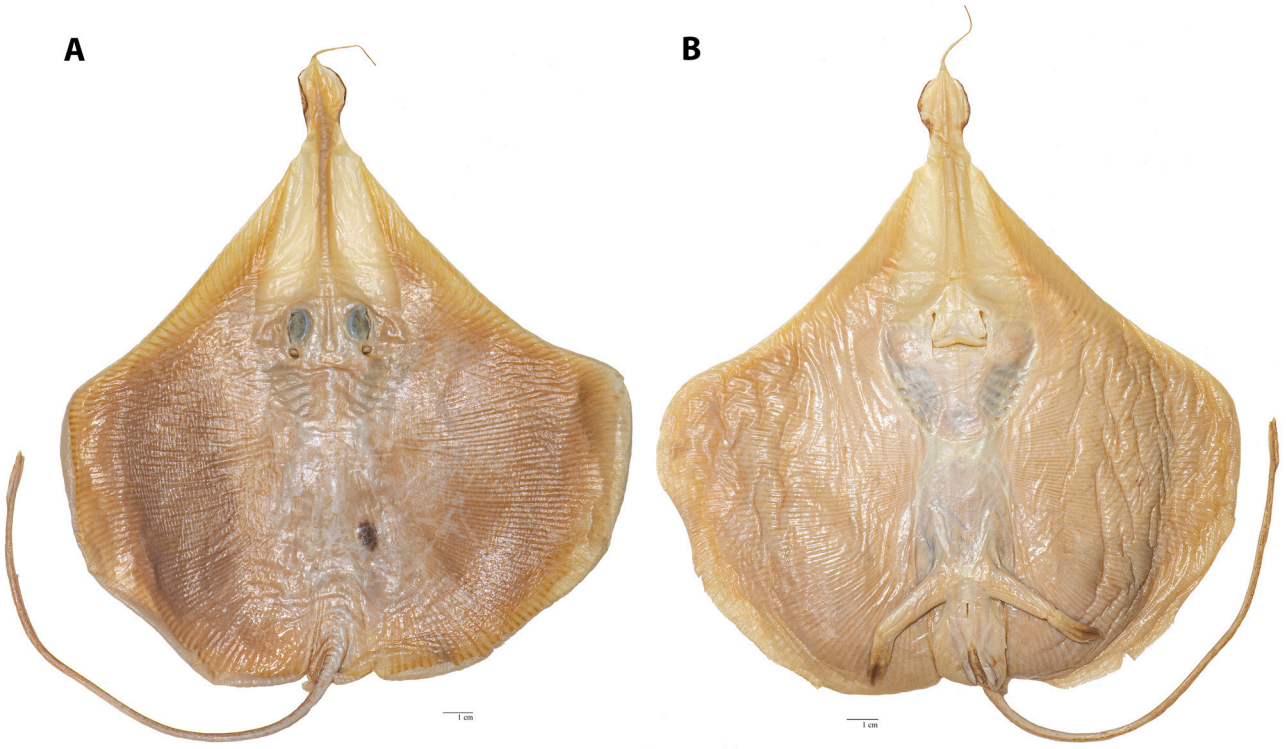

FIGURE 13. Dorsal (A) and ventral (B) perspectives of the holotype of *Springeria folirostris* (USNM 152546) collected from the northern Gulf of Mexico. Photographs by Sandra J. Raredon, USNM.

Order Myliobatiformes Compagno, 1973

Family Gymnuridae Fowler, 1934

***Gymnura* Kuhl in van Hasselt, 1823**

***Gymnura lessae* Yokota and de Carvalho, 2017**

Synonyms: None

Distribution. Throughout the northern GOM, from southern Florida to the Texas/Mexico border, in depths ranging from 9 to 64 m.

First Record in GOM. This species was first recorded from the northern GOM, as *Pteroplatea maclura* Lesueur, 1817, by Günther (1870) based on specimens procured from Texas at an unknown date.

Remarks. Yokota and de Carvalho (2017) recently revised the *Gymnura micrura* (Bloch and Schneider, 1801) species complex, identifying two additional species. *Gymnura micrura* is now restricted to the western Atlantic Ocean off of South America, while *G. lessae* inhabits the western North Atlantic waters off the United States, including the northern GOM.

Conservation Status. Data Deficient (when assessed together with *Gymnura micrura*)

Family Dasyatidae Jordan, 1888

***Bathytoshia* Whitley, 1933**

***Bathytoshia centroura* (Mitchill, 1815)—roughtail stingray**

Synonyms:
Dasyatis centroura (Mitchill, 1815)
Dasybatus centroura(Mitchill, 1815)
Dasybatus marinus Garman, 1913
Pastinaca acantura Gronow, 1854
Pastinaca centroura (Mitchill, 1815)
Pastinaca hastata DeKay, 1842
Raja centroura Mitchill, 1815
Trigon centroura (Mitchill, 1815)

Distribution. In the northern GOM, this species occurs from southern Florida to the Texas/Mexico border. It is usually reported from waters 9 to 100 m in depth in the northern GOM, although NMFS SEFSC trawl surveys have captured them as deep as 130m.

First Record in GOM. The first recorded capture of this species in the northern GOM was by Springer and Bullis (1956). Individuals were captured aboard the RV Oregon on either side of the mouth of the Mississippi River in approximately 55m of water.

Remarks. The genus *Bathytoshia* Whitley, 1933 was formerly considered a junior synonym of *Dasyatis* Rafinesque, 1810 until resurrected by Last *et al.* (2016) based on morphological and molecular evidence. Eastern Atlantic specimens formerly attributed to this species are now considered a separate species, *Bathytoshia lata* (Garman, 1880), with *Bathytoshia centroura* being restricted to the western Atlantic.

Conservation Status. Least Concern (when assessed together with *Bathytoshia lata* from the eastern Atlantic).

Hypanus Rafinesque, 1818

Hypanus americanus (Hildebrand & Schroeder, 1928)—southern stingray

Synonyms: *Dasyatis americana* Hildebrand & Schroeder, 1928

Distribution. This species is distributed throughout the northern GOM from southern Florida to the Texas/Mexico border. It inhabits estuarine and coastal waters and is commonly reported to 55 m in depth, although NMFS SEFSC trawl surveys have documented them as deep as 82 m.

First Record in GOM. Because of the similarity between *Hypanus americanus* and *Bathytoshia centroura*, it is difficult to separate reports of early collections of the two species, especially considering the specific epithet *hastata*, or some variation thereof, was variably used for both species (see Remarks below). However, it is probable the first documentation of *Hypanus americanus* from the northern GOM in the literature (as *Dasyatis hastata*) was by Gudger (1913) who reports making observations of this species while working in the Dry Tortugas.

Remarks. The genus *Hypanus* Rafinesque, 1818 was previously considered a junior synonym of *Dasyatis* until resurrected by Last *et al.* (2016) based predominantly on molecular evidence. DeKay (1842) described a species of dasyatid ray, *Pastinaca hastata*, similar in many ways to both what is currently referred to as *Hypanus americanus* and *Bathytoshia centroura*. His description does not include details necessary for determining which species is actually described (*e.g.* presence or absence of dorsal fin fold), however, Hildebrand and Schroeder (1928) considered *Pastinaca hastata* synonymous with what is now *Bathytoshia centroura*. They indicated the species described by Garman (1882) as *Dasybatis hastata* was in fact what is currently known as *Hypanus americanus*, but as the specific epithet *hastata* is synonymous with *Bathytoshia centroura*, that name was not available. If closer inspection reveals DeKay's (1842) description was of what is currently called *Hypanus americanus* and not of *Bathytoshia centroura*, the specific epithet *hastata* would take priority.

Conservation Status. Data Deficient

Hypanus sabinus (Lesueur, 1824)—Atlantic stingray

Synonyms:
Dasyatis sabina (Lesueur, 1824)
Dasybatis sabina (Lesueur, 1824)
Pastinaca sabina (Lesueur, 1824)
Trygon sabina Lesueur, 1824

Distribution. This species is distributed throughout the northern GOM, from southern Florida to the Texas/Mexico border. It is commonly reported from the shore out to approximately 25 m depth, although NMFS SEFSC trawl surveys have documented this species as deep as 60 m.

First Record in GOM. This species was first documented from the northern GOM by Müller and Henle (1841). It was indicated they examined several specimens of this species, at least one of which originated from the vicinity of New Orleans, Louisiana.

Remarks. The genus *Hypanus* Rafinesque, 1818 was previously considered a junior synonym of *Dasyatis* until resurrected by Last *et al.* (2016) based predominantly on molecular evidence.

Conservation Status. Least Concern

Hypanus say (Lesueur, 1817)—bluntnose stingray

Synonyms:
Amphotistius say (Lesueur, 1817)
Dasyatis say (Lesueur, 1817)
Dasybatis sayi (Lesueur, 1817)
Myliobatis say (Lesueur, 1817)
Raja say Lesueur, 1817
Trygon sayi (Lesueur, 1817)

Distribution. Distributed throughout the northern GOM, from southern Florida to the Texas/Mexico border, in estuaries and nearshore waters. This species is commonly reported from the shoreline out to approximately 9 m depth, although NMFS SEFSC trawl surveys have documented them as deep as 40 m.

First Record in GOM. This species was first reported from the northern GOM by Henshall (1894), who describes capturing an individual near the entrance to Tampa Bay in 1892.

Remarks. The genus *Hypanus* Rafinesque, 1818 was previously considered a junior synonym of *Dasyatis* until resurrected by Last *et al.* (2016) based predominantly on molecular evidence.

Conservation Status. Least Concern

Pteroplatytrygon Fowler, 1910

Pteroplatytrygon violacea (Bonaparte, 1832)—pelagic stingray

Synonyms:
Dasyatis atratus Ishiyama and Okada, 1955
Dasyatis guilerii Last, 1979
Trygon purpurea Smith, 1841
Trygon violacea Bonaparte, 1832

Distribution. This species occurs throughout the northern GOM, predominantly in oceanic waters beyond the 200 m isobath (McEachran and Fechhelm 1998, SEFSC unpublished data).

First Record in GOM. The first record of this species occurring in the northern GOM was a specimen captured by pelagic longline in April of 1980 (Branstetter and McEachran 1983).

Remarks. This is a relatively common, and in some cases significant, bycatch species in commercial pelagic trawl (Bonanomi *et al.* 2018) and longline (Pacheco *et al.* 2011, Dapp *et al.* 2013, Ferrari and Kotas 2013, Gilman *et al.* 2018) fisheries, including within the northern GOM (Weidner *et al.* 2017, Orbesen *et al.* 2017, SEFSC unpublished data).

Conservation Status. Least Concern

Family Urotrygonidae McEachran *et al.*, 1996

Urobatis Garman, 1913

Urobatis jamaicensis (Cuvier, 1816)—yellow stingray, yellow round ray

Synonyms:
Raia jamaicensis Cuvier, 1816
Trygon jamaicensis (Cuvier, 1816)
Trygonobatus torpedinus Desmarest, 1823
Urobatis sloani vermiculatus Garman, 1913
Urolophus jamaicensis (Cuvier, 1816)
Urotrygon jamaicensis (Cuvier, 1816)

Distribution. This species is reportedly distributed throughout the northern GOM in shallow water, although it appears more prevalent in the eastern GOM. Usually reported as near shore, including bays and estuaries, this species has been collected during NMFS SEFSC trawl surveys as deep as 25 m.

First Record in GOM. The first record of this species occurring in the northern GOM was reported by Longley and Hildebrand (1941) from the Dry Tortugas, Florida.

Remarks. Due in part to its generally widespread range and relative abundance, many aspects of the biology of this species have been studied. Spieler *et al.* (2013) provide a comprehensive review of the research available at the time of publication.

Conservation Status. Least Concern

Family Myliobatidae Bonaparte, 1835

***Myliobatis* Cuvier, 1816**

***Myliobatis freminvillei* Lesueur, 1824—bullnose ray, bullnose eagle ray**

Synonyms:
Aetobatus freminvillii (Lesueur, 1824)
Holorhinus freminvillei (Lesueur, 1824)
Myliobatis acuta Ayers, 1842
Myliobatis bispinosus Storer, 1842

Distribution. This species is distributed throughout the northern GOM, from the Texas/Mexico border to southern Florida, in coastal and estuarine waters. Deepwater ROV work conducted by the NOAA Office of Ocean Exploration and Research in 2012 captured video of a single individual resting on the bottom at a depth of 345 m, indicating at least limited use of deepwater habitats as well (C. Jones unpublished data).

First Record in GOM. The first report of this species in the northern GOM is possibly that of Evermann and Kendall (1894), as *Aetobatis freminvillei*, from Galveston, Texas. However, their report was based upon examination of a single dismembered tail, with uncertainty as to the identity of the original possessor. The first verified report of *Myliobatis freminvillei* occurring in the northern GOM came from Springer and Bullis (1956), who report capturing a single individual south of Horn Island off Mississippi in 1954.

Remarks. There is some uncertainty as to the specific identity of the original possessor of the jaws and tail which were the basis of Storer's (1842a) description of *Myliobatis bispinosus*, particularly since these parts (Holotype, MCZ 89509) appear to be missing (Fricke *et al.* 2018). However, Storer (1842b) further expounded on the specimen and given the combination of details presented in both descriptions (*i.*e. tooth morphology and arrangement, placement of dorsal fin) we conclude, in agreement with Bigelow and Schroeder (1953), that the species Storer (1842a) described is *Myliobatis freminvillei*.

Conservation Status. Data Deficient (as *Myliobatis fremenvilii*)

Family Aetobatidae Agassiz, 1858

***Aetobatus* Blainville, 1816**

***Aetobatus narinari* (Euphrasen, 1790)—spotted eagle ray, whitespotted eagle ray**

Synonyms:
Aetobatis latirostris Dumeril, 1861
Aetobatis narinari (Euphrasen, 1790)
Muliobatis marcgravii Billberg, 1833
Raja narinari Euphrasen, 1790
Raja tajara Bonnaterre, 1788

Distribution. This species is distributed throughout the northern GOM, from the Texas/Mexico border to southern Florida. It is regularly captured in shallow coastal waters but has also been recorded out to 150 m in depth during NMFS SEFSC trawl surveys.

First Record in GOM. The first record of this species from the northern GOM was a report by Bean (1885) of a specimen (USNM 37196) collected sometime before May 21st, 1885 (when it was received by the USNM) near Cedar Keys, Florida.

Remarks. This species, once believed to be circumtropical in distribution, was recently shown to be a complex of three closely related but distinct species; with *Aeotobatus narinari* occupying the Atlantic Ocean, *Aetobatus laticeps* Gill, 1865 occupying the eastern Pacific Ocean, and *Aetobatus ocellatus* (Kuhl, 1823) occupying the Indo-West and Central Pacific (White and Last 2016a).

Conservation Status. Near Threatened

Family Rhinopteridae Jordan and Evermann, 1896

***Rhinoptera* Cuvier, 1829**

***Rhinoptera bonasus* (Mitchill, 1815)—cownose ray, American cownose ray**

Synonyms:
Myliorhina lalandii (Valenciennes, 1841)
Raja bonasus Mitchill, 1815
Raja quadriloba Lesueur, 1817
Rhinoptera lalandii Valenciennes, 1841
Rhinoptera quadriloba (Lesueur, 1817)

Distribution. This species occurs throughout the northern GOM in shallow waters, including bays and estuaries. Although it can be found from the Texas/Mexico border to southern Florida, there is some evidence that this species may be more prevalent in the northeastern than in the northwestern GOM (Jones *et al.* 2017). This species regularly occurs from close to shore out to waters 30 m in depth, although NMFS SEFSC trawl surveys have captured individuals in waters up to 96 m in depth.

First Record in GOM. The first record of this species occurring in the northern GOM is a report by Goode and Bean (1879) of a single specimen (USNM 21221, verified by first author) collected by Silas Stearns between 1887 and 1889 in the vicinity of Pensacola, Florida.

Remarks. Recent studies (Naylor *et al*. 2012, Jones *et al.* 2017) have indicated the presence of a second rhinopterid species, *Rhinoptera brasiliensis* Müller, 1836, in the northern GOM (see below). The two species are morphologically very similar and therefore difficult to differentiate without detailed examination and/or genetic verification. It is likely, based upon historic reports (Bigelow and Schroeder 1953, Acero and Garzon 1982, Isaís and Dominguez 1996), that *Rhinoptera brasiliensis* has been present in the northern GOM for several decades, if not longer, bringing into question the validity of reports and research focusing on this species without confirming species identity (Jones *et al.* 2017). Care should be taken in applying the results of research focused on this species in the northern GOM until species-specific results can be obtained and compared.

Conservation Status. Near Threatened, although this status will likely change given the recent identification of a congener co-occurring throughout most of the species' range.

***Rhinoptera brasiliensis* Müller, 1836—Brazilian cownose ray, ticon cownose ray**

Synonyms: None

Distribution. This species is distributed throughout the northern GOM, from the Texas/Mexico border to southern Florida, although it appears to be more prevalent in the northwestern than the northeastern GOM. Although little is known of its habits in the northern GOM, being easily and historically confused with *Rhinoptera bonasus* (see above), it has been captured in near shore shallow waters out to waters 32 m in depth.

First Record in GOM. The first record of this species in the northern GOM was reported by Naylor *et al.* (2012). However, due to a lack of representative *Rhinoptera brasiliensis* DNA in their database, and the close genetic relatedness between *Rhinoptera brasiliensis* and *Rhinoptera steindachneri* Evermann and Jenkins, 1901 (Jones *et al.* 2017), those authors identified anomalous individuals from the northern GOM that were divergent from *Rhinoptera bonasus* as *Rhinoptera* c.f. *steindachneri,* as *Rhinoptera steindachneri* was the closest matching species represented in their dataset. Jones *et al.* (2017) verified the second species as *Rhinoptera brasiliensis*.

Remarks. As stated above, recent studies (Naylor *et al*. 2012, Jones *et al.* 2017) have indicated the presence of this species in the northern GOM. This species is morphologically very similar to *Rhinoptera bonasus* and the two species are therefore difficult to differentiate without detailed examination and/or genetic verification. It is likely, based upon historic reports (Bigelow and Schroeder 1953, Acero and Garzon 1982, Isaís and Dominguez 1996), that *Rhinoptera brasiliensis* has been present in the northern GOM for several decades, if not longer. It has been suggested (*e.g.* Fricke *et al.* 2019) that *Raja brasiliensis* Müller and Henle, 1841 is a synonym of *Rhinoptera brasiliensis*. However, Müller and Henle (1841) clearly describe *Raja brasiliensis* as a rajiform skate, claiming that it "could be a

variation of *Raja undulata*" (Müller and Henle 1841, our translation). As the only specimen of *Raja brasiliensis* was destroyed during World War II (Fricke *et al.* 2019), its exact identity may never be known. It is clear, however, from the description that *Raja brasiliensis* is not conspecific with *Rhinoptera brasiliensis*. The name *Rhinoptera jussieui* (Cuvier, 1829) has been used by many authors (e.g. Gunther 1870, Garman 1913) as synonymous with *Rhinoptera brasiliensis*. However, Cuvier's (1829) use of the name (as *Raja jussieui*) is in reference to a specimen (jaws) illustrated by Jussieu (1721) which the later author describes as originating from China. This may mean that *Rhinoptera jussieui* is the valid name for *Rhinoptera javanica* Müller and Henle, 1841, but certainly precludes it from being accepted as synonymous with *Rhinoptera brasiliensis* as that species is restricted to the western Atlantic Ocean.

Conservation Status. Endangered, although this status will likely change as their known range has been greatly expanded to include waters where they are less exposed to exploitation.

Family Mobulidae Gill, 1893

Mobula Rafinesque, 1810

Mobula birostris (Walbaum, 1792)—giant manta, giant manta ray

Synonyms:
Brachioptilon hamiltoni Hamilton and Newman, 1849
Cephaloptera diabolus Valenciennes, 1839
Cephalopterus manta Bancroft, 1829
Cephalopterus vampyrus Mitchill, 1824
Ceratoptera birostris (Walbaum, 1792)
Ceratoptera ehrenbergii Müller and Henle, 1841
Ceratoptera johnii Müller and Henle, 1841
Ceratoptera lesueurii Swainson, 1839
Ceratoptera orissa Lloyd, 1908
Diabolichthys elliotti Holmes, 1859
Manatia lacepedei Billberg, 1833
Manta americana Bancroft, 1829
Manta birostris (Walbaum, 1792)
Manta pinchoti Whitley, 1936
Manta raya Baer, 1899
Raja birostris Walbaum, 1792
Raja fimbriata Lacepède, 1802

Distribution. This species is largely pelagic and sightings have been made throughout the northern GOM (SEFSC, unpublished data). Pattengill-Semmens and Gittings (2003) indicate year round presence at the Flower Gardens Banks.

First Record in GOM. With the emergence of a second putative manta species in the northern GOM (*Mobula* cf. *birostris*, See Below), it is difficult to determine which sightings refer to *M. birostris* and which to *M.* cf. *birostris*. At present however, the first record of this species from the northern GOM appears to be a sighting by Royal Marine Captain Triscott from off the mouth of the Mississippi River in 1808 (Guyon 1849).

Remarks. The taxonomic history of this species is long and convoluted (see Synonyms above). Many proposed synonyms are based on poor descriptions or even poorer illustrations and in many cases the only evidence toward synonymy with *Mobula birostris* is the size of the individual(s) reported and/or the location of capture/sighting. The presence of a second putative manta species in the western Atlantic confuses the issue even further. In some cases (*e.g.* Lacapede 1802) there is associated information in a description that contradicts synonymy with *Mobula birostris* as much as confirms it. Until recently (Marshall *et al.* 2009), *Mobula alfredi* (Krefft, 1868) was considered a synonym of *Mobula birostris* and both of these species were previously placed in the genus *Manta* Bancroft, 1829 until that genus was invalidated by a recent revision (White *et al.* 2018). Childs (2001) and Stewart *et al.* (2018) both indicated that the Flower Garden Banks serve as important juvenile habitat for this species.

Conservation Status. Vulnerable (IUCN), and listed as Threatened under the United States Endangered Species Act.

Mobula cf. *birostris*

Synonyms: ?*Cephalopterus giorna* Lesueur, 1824

Distribution. Stevens *et al.* (2018) list this species as occurring throughout the northern GOM.

First Record in GOM. Until the species is formally described and the taxonomic history reviewed, it is difficult to determine when the species was first reported in the region. As it stands right now, the first report of the species from the northern GOM appears to be that of Stewart *et al.* (2018) from the Flower Garden Banks.

Remarks. Marshall *et al.* (2009) recognized *M.* cf. *birostris* as being distinct from *M. birostris* and suggested its synonymy with *C. giorna*. However, limited access to specimens for morphological examination has not allowed for formal description to this point. This species is now in the process of being formally described (A. Marshall, personal communication) which will no doubt shed additional light on the many unknowns surrounding its biology and zoogeography. *Mobula* cf. *birostris* has been confirmed as occurring regularly at the Flower Garden Banks National Marine Sanctuary (Stewart *et al.* 2018, Hosegood *et al.* In Review). Stewart *et al.* (2018) indicated that the Flower Garden Banks serve as important juvenile habitat for this species.

Conservation Status. Vulnerable (when assessed together with *M. birostris*). Until the species is formally described and separated from *M. birostris*, it is covered under the United States Endangered Species Act listing (Threatened) for that species.

Mobula hypostoma (Bancroft, 1831)—devil ray, Atlantic devilray

Synonyms:
Cephalopterus hypostomus Bancroft, 1831
Ceratobatis robertsii Boulenger, 1897
Cephaloptera massenoidea Hill, 1862
Cephaloptera olfersii Müller, 1836
Cephaloptera rochebrunei Vaillant, 1879

Distribution. Sightings of *Mobula hypostoma* have been made throughout the northern GOM. This pelagic ray is usually found in nearshore coastal waters, but may also be encountered offshore (White and Last 2016b). Pattengill-Semmens and Gittings (2003) indicate year round presence at the Flower Gardens Banks.

First Record in GOM. The first record of this species from the northern GOM is most likely that of Bere (1936).

Remarks. Boulenger (1897) described a specimen collected by Reverend J. Seed Roberts from Jamaica, which resembled *Mobula hypostoma* in all respects except that it lacked teeth in the lower jaw. Due to this inconsistency, he described the specimen as a new species, *Ceratobatis robertsii*. Notarbartolo-Di-Sciara (1987) examined the holotype and only specimen (BMNH 1897.7.1.40) of *Ceratobatis robertsii* for his revision of the *Mobula* genus. That author concluded, based on relative measurements and morphological similarity, that *Ceratobatis robertsii* is a synonym of *Mobula hypostoma* and that the lack of lower jaw teeth was a malformation. While *Ceratobatis robertsii* is most likely a synonym for *Mobula hypostoma*, there are several aspects of the description provided by Bigelow and Schroeder (1953) that conflict with descriptions of *Mobula hypostoma* (*e.g.* spiracle shape, denticle pattern, and mid dorsal ridge) and more closely resemble *Mobula tarapacana* (Philippi, 1892), although these may simply be further abberations. However, the sole specimen of *Ceratobatis robertsii* has a disc width of 770 mm (Bigelow and Schroeder 1953), which is significantly smaller than the size at birth (1050-1390 cm) reported for *Mobula tarapacana* (White and Last 2016b). A detailed discussion of the taxonomic history of this species is provided by White *et al.* (2018).

Conservation Status. Data Deficient

Mobula mobular (Bonnaterre, 1788)—spinetail devilray

Synonyms:
Aodon cornu Lacepède, 1798

Apterurus fabroni Rafinesque, 1810
Cephalopterus massena Risso, 1810
Cephaloptera japanica Müller & Henle, 1841
Cephalopterus edentula Griffini, 1903
Mobula auriculata Rafinesque, 1810
Mobula rancureli Cadenat, 1959
Raia mobular Bonnaterre, 1788
Raja vespertilio Walbaum, 1792
Raia aurita Suckow, 1799
Raia fabroniana Lacepède, 1800
Raja cephaloptera Bloch & Schneider, 1801
Raja giorna Lacepède, 1803
Raja diabolus Shaw, 1804
Squalus edentulus Brünnich, 1768

Distribution. Stevens *et al.* (2018) list this species as likely occurring throughout the northern Gulf of Mexico in offshore waters. Pelagic longline captures have occurred in waters ranging from nearly 1200 to over 2400 m deep.

First Record in GOM. Verified captures in the pelagic longline fishery date back to 2008, but the first mention of the species occurrence in the northern GOM in the literature was by Stevens *et al.* (2018).

Remarks. In their recent revision of the mobulid rays, White *et al.* (2018) considered *M. japonica* and *M. mobular* to be conspecific, with precedence given to *M. mobular*. This effectively extended the range of *M. mobular* circumglobally in tropical to warm temperate waters. The taxonomic history of this species is long and convoluted but well reviewed by White *et al.* (2018) and Notarbartolo di Sciara *et al.* (2020). The common name listed above reflects new insights discussed by Notarbartolo di Sciara *et al.* (2020). This species is encountered as bycatch in the pelagic longline fishery in the northern GOM (Figure 14, C. Jones unpublished data).

Conservation Status. Endangered, when assessed as *M. mobular* in European waters, Near Threatened when assessed as *M. japanica* globally. An updated assessment considering taxonomic changes and expansion of known range is required.

FIGURE 14. *Mobula mobular* captured by pelagic longline in the northern Gulf of Mexico. Photograph courtesy of NMFS SEFSC.

Mobula tarapacana (Philippi, 1892)—sicklefin devil ray, Chilean devilray

Synonyms:
Cephaloptera tarapacana Philippi, 1892
Mobula coilloti Cadenat and Rancurel, 1960
Mobula formosana Teng, 1962
Raja manatia Lacepède, 1802

Distribution. This species appears to be distributed throughout the northern GOM in offshore waters ranging from approximately 100 to over 2000 m in depth (C. Jones, unpublished data). The two sightings reported from the Flower Garden Banks (Childs 1997, see below) both occurred during the month of August and both were associated with annual water temperature maxima and coral spawning events. This may mean that while *Manta birostris* and *Mobula hypostoma* are year round residents at the West Flower Garden Banks (see distributional remarks for those species above), *Mobula tarapacana* could utilize the area only for feeding during annual coral spawning events (Childs 1997).

First Record in GOM. The first record of this species in the northern GOM is a report by Childs (1997) concerning a single individual captured on video during a monthly observation dive on the West Flower Garden Bank in August of 1993. In the same publication Childs (1997) documents a second sighting, also from West Flower Garden Bank, from August of 1995.

Remarks. Since it was first reported from the northern GOM (Childs 1997) this species has been observed several times, predominantly in West Florida Shelf waters during aerial surveys conducted by the NMFS SEFSC (C. Jones, unpublished data) from 1996 to 1998. This species is encountered as bycatch in the pelagic longline fishery in the northern GOM (Figure 15, C. Jones unpublished data).

Conservation Status. Vulnerable

FIGURE 15. *Mobula tarapacana* captured by pelagic longline in the northern Gulf of Mexico. Photograph courtesy of NMFS SEFSC.

Species with questionable occurrence in the northern Gulf of Mexico

Class Chondrichthyes Huxley, 1880

Subclass Neoselachii Compagno, 1977

Order Rajiformes Berg, 1940

Family Rajidae de Blainville, 1816

***Breviraja* Bigelow and Schroeder, 1948**

***Breviraja spinosa* Bigelow and Schroeder, 1950—spinose skate**

Synonyms: None

Distribution. The single representative of this species from the region (USNM 222437, Figure 16) was reportedly collected south of Destin off the Florida panhandle at a depth of approximately 670 m. Trawl data from NMFS SEFSC suggests that this species occurs throughout the northern GOM, in depths as shallow as 78 m. Generally accepted to occur off the east coast of the U.S. from North Carolina to the Florida Straits in depths ranging from 365 to 670 m.

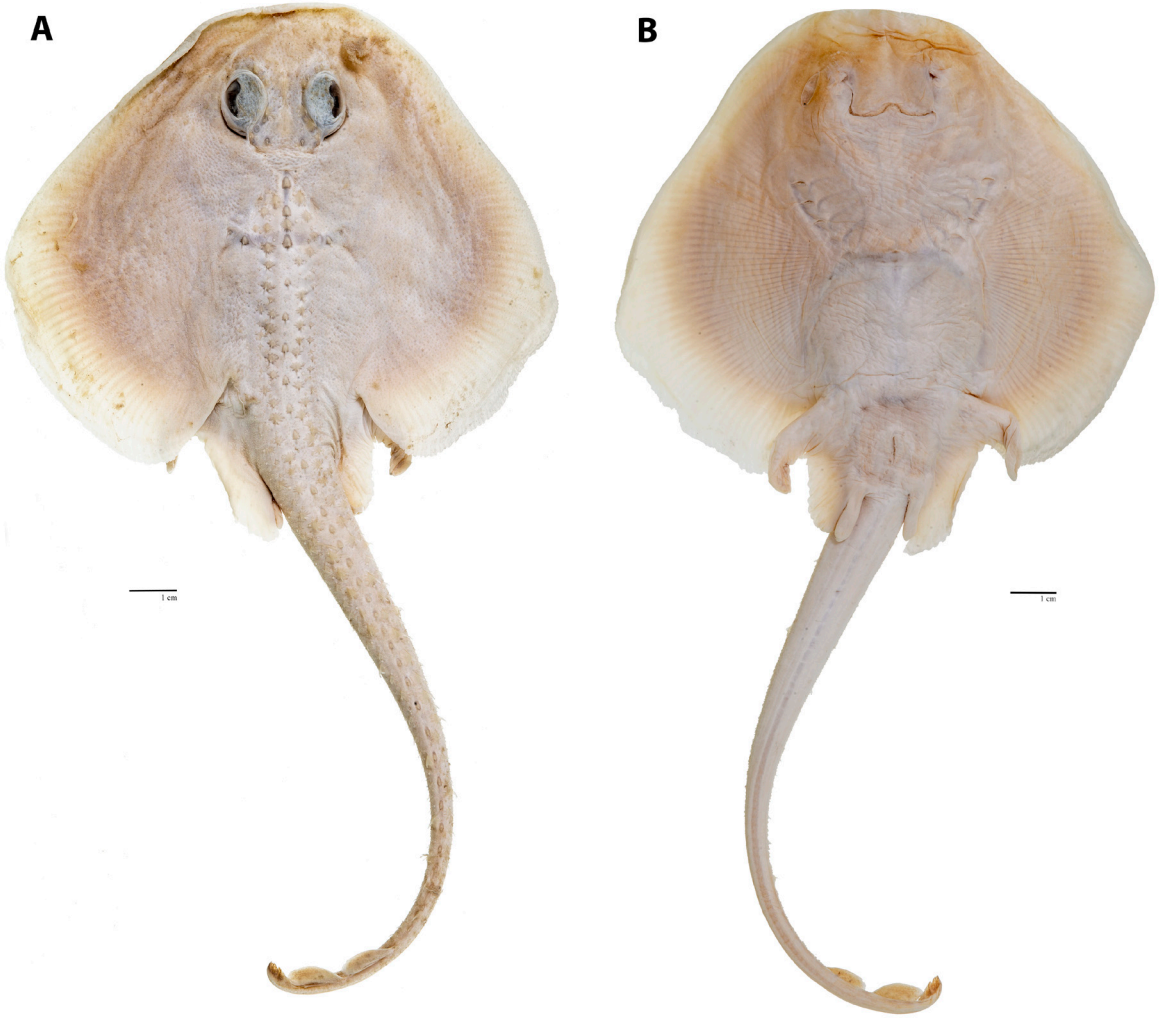

FIGURE 16. Dorsal (A) and ventral (B) perspectives of a specimen of *Breviraja spinosa* (USNM 222437) proposed to have been collected from the northern Gulf of Mexico. Photographs by Sandra J. Raredon, USNM.

First Record in GOM. Although they do not include the northern GOM in their reported distribution of this species, McEachran and Matheson (1985) include specimen USNM 222437, and provide the associated location data, in their list of material examined.

Remarks. McEachran and Fechhelm (1998) include this species in their guide to the fishes of the GOM but specify that the data associated with the USNM specimen are questionable. This assessment was backed up by McEachran and Matheson's (1985) decision to exclude the northern GOM from the distribution of *B. spinosa* despite including USNM 222437 in their material examined. If the specimen did, in fact, originate from the location proposed, it was not identified as *B. spinosa* in the field as the original datasheets do not record that species among those captured (SEFSC, unpublished data). If the identification was changed upon arrival at the USNM, the reason for the change was not recorded. It is possible that the specimen was collected outside the GOM during a previous survey, conducted earlier in the same year off Central and South America, but that would again put the specimen outside the known range for the species. Several specimens of *B. spinosa* were collected during that survey but would later be designated a separate species, *Breviraja nigriventralis* McEachran and Matheson, 1985. While USNM 222437 lacks any discernible markings (the specimen is either leucistic or has been bleached by preservation), its morphology and skeletal anatomy appear to match the description for *B. spinosa* provided by McEachran and Matheson (1985). Furthermore, between 1977 and 2014, 39 individual skates collected by NMFS SEFSC trawl surveys have been identified as *B. spinosa* in the field. However, further examination of specimens deposited in research collections has revealed that all individuals originating from the northern GOM that were originally identified as *B. spinosa*, with the exception of USNM 222437, were misidentified. Misidentifications appear to be common, with several species often identified as *B. spinosa* in the field (C. Jones unpublished data). If the species does occur in the northern GOM it is extremely rare and if collected in the future, representative specimens should be deposited in research collections with accurate locality data.

Conservation Status. Data Deficient

Dactylobatus Bean and Weed, 1909

Dactylobatus armatus Bean and Weed, 1909—skillet skate

Synonyms: None

Distribution. Presence in the northern GOM is questionable (see First Record and Remarks below). Reported as being patchily distributed and rare in north central GOM from waters 338 to 685 m in depth.

First Record in GOM. Although this species is commonly reported as being present in the northern GOM (*e.g.* McEachran and Fechhelm 1998, McEachran and de Carvalho 2002; Last *et al.* 2016) there seems to be no sound basis for this determination. There are, to our knowledge, no records of this species being collected from the northern GOM either in research collections or in the literature.

Remarks. It is doubtful that this species actually occurs in the northern GOM since there appear to be no records of its capture either in research collections or in the literature. It is included here on the basis that previous authors have perpetuated its existence in the northern GOM in several guides covering the area (*e.g.* McEachran and Fechhelm 1998, McEachran and de Carvalho 2002; Last *et al.* 2016). If it does occur in the northern GOM, it is extremely rare and if collected in the future, representative specimens should be deposited in research collections with accurate locality data.

Conservation Status. Data Deficient

Family Anacanthobatidae von Bonde and Swart, 1923

Springeria Bigelow and Schroeder, 1951b

Springeria longirostris (Bigelow and Schroeder, 1962)—longnose legskate

Synonyms: *Anacanthobatis longirostris* Bigelow and Schroeder, 1962

Distribution. The presence of this species in the northern GOM is questionable (See First Record and Remarks below). However, it has been reported as occurring in the northcentral GOM at depths ranging from 520 to 1050 m.

First Record in GOM. This species was originally described (Bigelow and Schroeder, 1962) based partially on a specimen (holotype USNM 196446) which is listed as "probably" originating from the northern GOM. There are, to our knowledge, no other confirmed specimens of this species collected from the GOM.

Remarks. As the origin of the holotype is questionable and no other specimens are confirmed as having been collected in the northern GOM (UF 184623, listed as *S. longirostris* and collected off Louisiana is actually *S. florirostris*), it is probable that this species does not occur in this region at all. If it does, it is extremely rare. All other specimens recorded from the western North Atlantic Ocean were collected off the east coast of Florida and in the Caribbean Sea off the Antilles, Colombia and Venezuela.

Conservation Status. Data Deficient (as *Anacanthobatis longirostris*)

Species previously unreported from the northern Gulf of Mexico

Class Chondrichthyes Huxley, 1880

Subclass Neoselachii Compagno, 1977

Order Rajiformes Berg, 1940

Family Rajidae de Blainville, 1816

Breviraja Bigelow and Schroeder, 1948

Breviraja claramaculata McEachran and Matheson, 1985—brightspot skate

Synonyms: None

Distribution. The range of this species is generally accepted to be limited to the east coast of the US from SC to the Florida Keys, although several specimens have reportedly been collected off NC as well. They are reported to occur at depths ranging from approximately 300 to 900 m. In the northern GOM, this species was sighted off the west Florida shelf in approximately 483 m of water during a deepwater ROV survey conducted by the NOAA OOER. In addition, a specimen (MCZ 39897, Figure 17) was reportedly collected from the northern GOM off the Florida panhandle at a depth of 30 m. However, the reported collection location of MCZ 39897 is questionable (see Remarks below).

First Record in GOM. To our knowledge this is the first record of the species from the northern GOM. Specimen MCZ 39897, collected aboard the RV Silver Bay in 1957, is the sole representative of this species originating from the region in a research collection, although the exact collection location of MCZ 39897 is in question (see Remarks below).

Remarks. The sole specimen representing this species from the region (MCZ 39897) was originally identified as *B. spinosa*. McEachran and Matheson (1985) determined that nominal *B. spinosa* were actually a suite of four separate species, *B. claramaculata* being one. However, despite this specimen being present in the MCZ collection at the time, the authors appear to have either not examined it or excluded it from their analysis due to suspicious locality data. It is improbable that this specimen was collected at the location provided when it was deposited in the MCZ collection. William Schroeder noted his concerns about the collection locality data in the MCZ ledger (A. Williston, personal communication) and Bigelow and Schroeder (1962) do not include this specimen in their updated description of the species and its range. There are several lines of evidence that lead us to question the locality data associated with this specimen. First, the depth at the proposed capture location is shallower, by an order of magnitude, than any other specimen of this species collected elsewhere. Second, the only batoid species listed as being collected at the proposed location by Bullis and Thompson (1965) is *Narcine brasiliensis* (now *N. bancroftii*), representatives of which are also deposited in the MCZ collection (MCZ 39898 and 39911). The specimen in ques-

tion was proposed to have been captured aboard the RV Silver Bay in 1957. The Silver Bay was active throughout the GOM in 1957 (Berry and Drummond 1967), with several sampling locations in the known depth range of this species. Therefore, it is possible that the specimen was collected at another location and mislabeled. Video footage taken during a deepwater ROV survey conducted off the west Florida shelf in 2014 by the NOAA OOER verifies that this species does indeed occur in the northern GOM (Figure 18). The fact that this is the first report of this species from the northern GOM indicates that it is extremely rare in the region and if collected in the future, representative specimens should be deposited in research collections with accurate locality data.

Conservation Status. Data Deficient

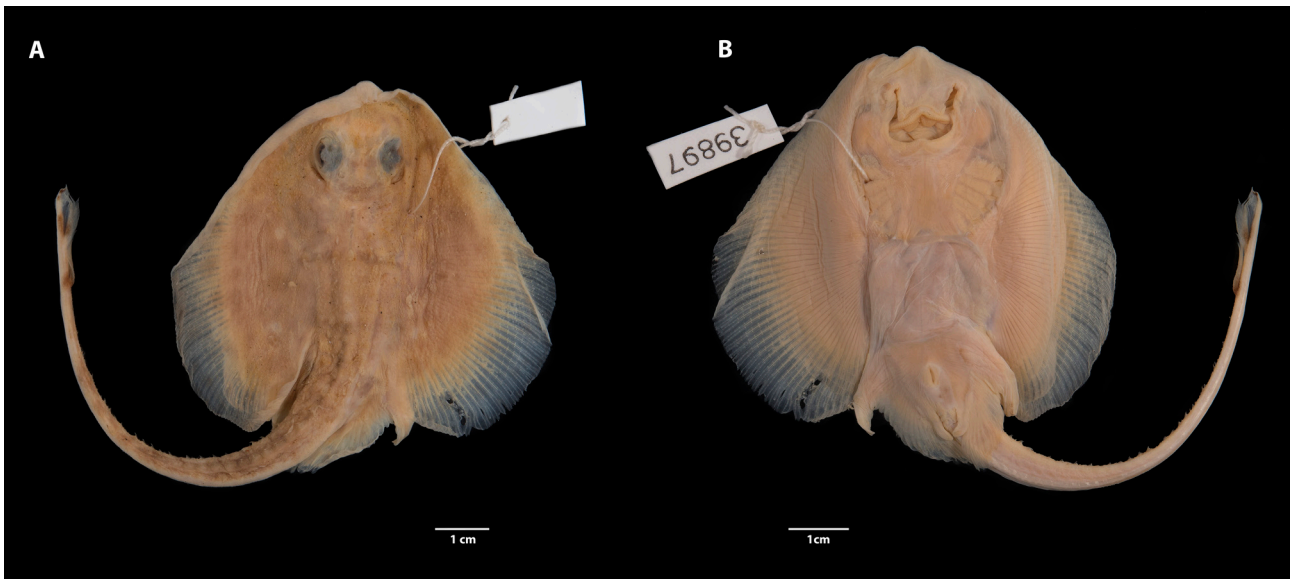

FIGURE 17. Dorsal (A) and ventral (B) perspectives of the sole specimen of *Breviraja claramaculata* (MCZ 39897) proposed to have been collected from the northern Gulf of Mexico. Photographs by Meaghan Hanlon, MCZ.

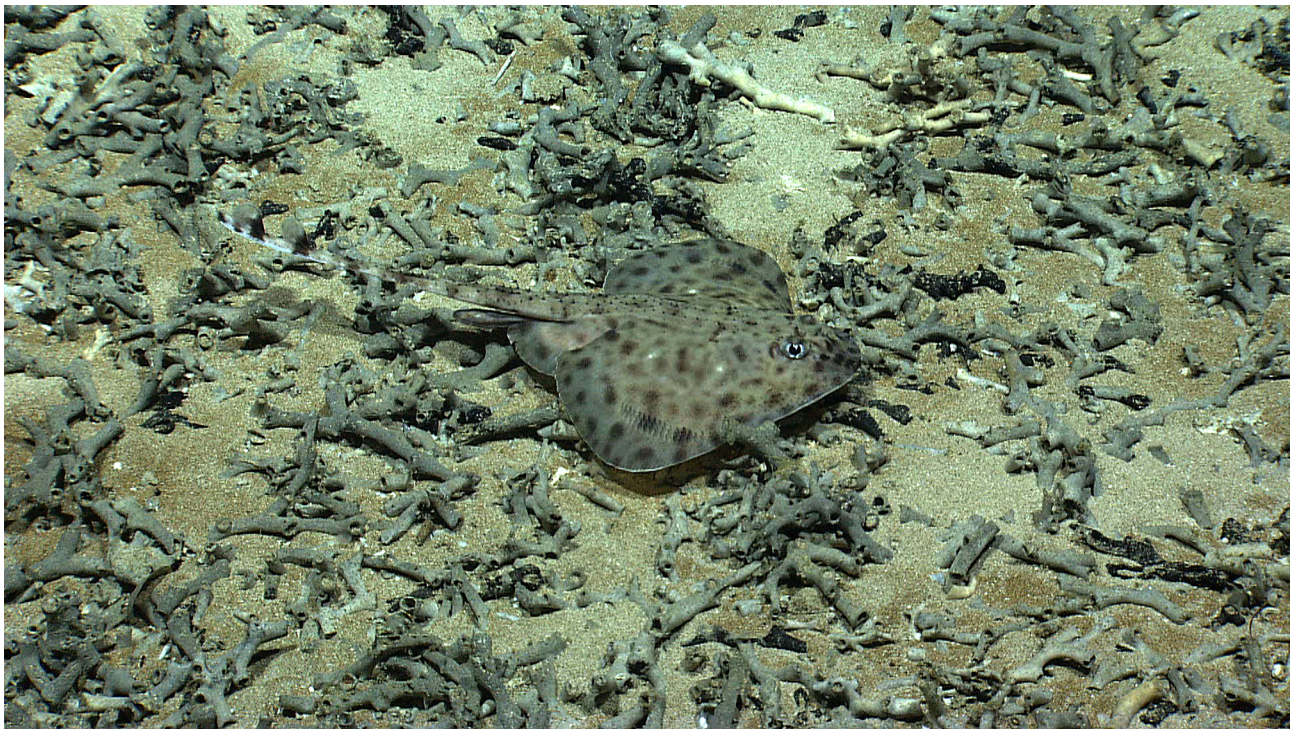

FIGURE 18. *Breviraja claramaculata* observed from the northern Gulf of Mexico during a deepwater ROV survey in 2014. Photograph derived from video provided by NOAA OOER.

Conclusions

Herein we have documented 41 species of batoid fishes proposed to occur in the northern GOM. However, we consider the occurrence of three of these species in the region as questionable. Although *Dactylobatus armatus* is consistently listed as occurring in the region (*e.g.* McEachran and Fechhelm 1998, McEachran and de Carvalho 2002, Last *et al.* 2016) little evidence could be found to support these reports. In contrast, *B. spinosa* is usually not listed as occurring in the region due to the questionable nature of the capture location information. Likewise, the holotype of *Springeria longirostris* is proposed to have possibly originated from the northern GOM, although no other specimens have been collected from the region. It is probable that none of these three species actually occur in the northern GOM. If they do, they are rare and additional representatives should be deposited in research collections when captured. Of the 38 species whose presence in the northern GOM is verifiable, nearly one-third (12) were originally described from material obtained from the northern GOM.

To our knowledge, this is the first report of *Breviraja claramaculata* from the northern Gulf of Mexico. While the origin of the sole museum specimen (MCZ 39897) representing this species remains in question, the fact that another specimen was sighted during ROV surveys in the northern GOM confirms the species occurrence in the area.

There are additional species that have reportedly been captured in the northern GOM but are not included in this list as there are neither specimens in collections nor published data to suggest their actual occurrence in the region. For example, two specimens (TCWC 7030.19 and USNM 378514) identified as *Cruriraja cadenati* Bigelow and Schroeder, 1962 reportedly collected from the northern GOM have been deposited in research collections. Under subsequent examination however, it was determined that neither TCWC 7030.19 nor USNM 378514 are *Cruriraja cadenati*. As the specimens are very small (possible newborn or excised embryos) and have been cleared and stained, it is difficult to say with certainty what species TCWC 7030.19 represents. However, several aspects of the skeletal anatomy of the specimens in this lot do not match those of *Cruriraja cadenati*, making it doubtful that they represent that species. On the other hand, USNM 378514 appears to be *Cruriraja rugosa* and not *Cruriraja cadenati*. Therefore, while there is a single report of *Cruriraja cadenati* being collected during a NMFS SEFSC trawl survey, that record too most likely constitutes a misidentification. In addition, several species occurring in the northern GOM are often confused with congeners that do not occur in the region. Neither *Myliobatis goodei* Garman, 1885 nor *Gymnura altavela* (Linnaeus, 1758) are reported to occur in the northern GOM. However, both species have been recorded as captured during NMFS SEFSC trawl surveys as well as in the shrimp fishery in the region (SEFSC, unpublished data). All specimens identified as *M. goodei* or *G. altavela* during these surveys subsequently examined by the first author were determined to be *M. freminvillei* or *G. lessae*, respectively, indicating that confusion between these species pairs is common (C. Jones, unpublished data). The many skate species occurring in the northern GOM are also commonly misidentified. The deepwater taxa seem to be the most confusing. The first author has identified specimens of *Leucoraja lentiginosa* that were originally identified as *Leucoraja garmani* (Whitley, 1939) in the field, and *Fenestraja sinusmexicanus* identified as *Leucoraja lentiginosa*. The species comprising the genus *Dipturus* in the northern GOM are in need of taxonomic review and many are easily confused. Care should be taken during field surveys to accurately identify species and if there is doubt as to the identity of a specimen(s), the individual(s) should be retained, submitted for expert review and deposited in a research collection. Photographs of fresh specimens should be taken at the time of collection, ideally accompanying retained specimens as many aspects change after death and with preservation, but certainly in the place of the physical specimen should retention not be possible.

Representative specimens deposited in well curated biological collections can play an important role in verifying catch records and describing both the current and historical geographical ranges of species. However, the collection data accompanying these specimens must be accurate for them to be useful for these purposes. Care must be taken by data collectors to ensure that specimens collected for research or deposition in collections are accompanied by accurate capture location and time/date data. In turn, researchers utilizing these specimens should take care to relay any obvious errors in associated data or changes in identification to curatorial staff. Furthermore, changes should be communicated to the original collector as these data could be utilized to examine trends in abundance, which are necessary for the assessment of stock health. Misidentifications can lead to errors in the assessment of exploited species and ultimately to misguided management decisions.

In addition to providing a list of species proposed to occur in the region, we have provided supplemental infor-

mation on the distributions and recorded history of each species, as well as notes on taxonomy and conservation. Over half of the batoid species occurring in the northern GOM are currently assessed as being data deficient by the IUCN (2019). The majority of these are deepwater species of which little to nothing is known of their biology. Nearly half of those remaining are listed as vulnerable or higher by the IUCN (2019), and three are currently listed under the US Endangered Species Act. Many of the species in this list are captured as bycatch in the various fisheries operating in the northern GOM (SEFSC, unpublished data), with many more likely to be affected as human activities continue to move further offshore, yet very few are afforded any measure of management or protection. Additional research is required to determine the effect of human activities on skate and ray populations inhabiting the northern GOM and to develop proper conservation and management recommendation.

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This list is dedicated to Dr. John "Wes" Tunnell, who dedicated his career to studying, cataloging and protecting the biodiversity of the Gulf of Mexico. We will forever be grateful for his advice and support during the writing of this list. We are also very grateful to Dr. John D. McEachran for his insights and suggestions. Dr. McEachran's work on the fishes of the Gulf of Mexico has long informed our work and is the basis for much of the information contained in this list. In addition, the authors would like to thank the following ichthyology collections staff for facilitating the research underlying this list by providing access to the specimens, associated data, photographs and x-rays: Andrew Williston and Meaghan Hanlon (MCZ), Kris Murphy (USNM), Caleb McMahan (FMNH), Rob Robins (UF), Adam Cohen (TNHC), and Heather Prestridge and Kevin Conway (TCWC). We also wish to thank Sascha Cushner (SEFSC) for her assistance in obtaining pelagic longline observer data and Elizabeth Scott-Denton (SEFSC) for providing access to the shrimp trawl fishery observer data. Finally, we wish to acknowledge the efforts of the crew and scientific party of the NOAA RV Okeanos Explorer for their collection of deepwater ROV footage leading to the further elucidation of the habits of several of the species listed herein.

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