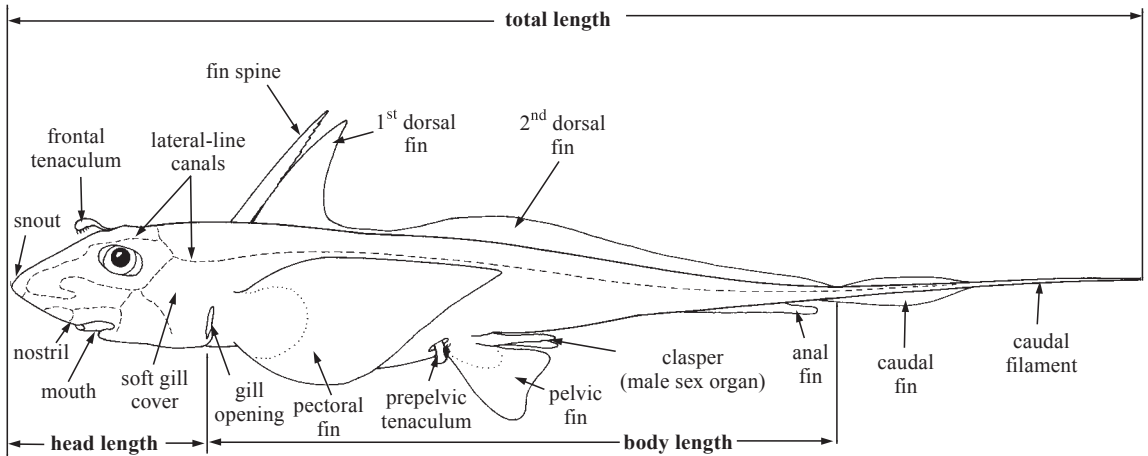


CHIMAERAS

by D.A. Didier, Academy of Natural Sciences, Philadelphia, Pennsylvania, USA

TECHNICAL TERMS AND MEASUREMENTS



GENERAL REMARKS

The chimaeroids are shark-like fishes characterized by large heads and elongate bodies that taper to a whip-like tail. In overall body shape they resemble grenadiers (*Macrouridae*), but they are true cartilaginous fishes (*Chondrichthyes*) with no bony skeleton, fin rays, or scales. There are currently 30 known species, but many new species have recently been discovered and the actual number is probably greater than 40. Although closely related to sharks, skates, and rays, the chimaeroid fishes exhibit some striking morphological differences. In particular, all chimaeroids have large eyes, a smooth, rubbery skin devoid of denticles (although tiny denticles are present on the dorsal surface of the head and body in hatchlings), and a fleshy operculum covers the four gill openings on each side of the head. A single gill opening is present anterior to the base of each pectoral fin; no spiracle is present. The mouth is small, ventral, and connected to the nostrils by a pair of deep grooves that channel water from the nostrils to the mouth. The teeth are formed into 3 pairs of non-replaceable hypermineralized tooth plates, 2 pairs in the upper jaw and 1 pair in the lower jaw, which protrude from the mouth like rodent's incisors, suggesting the common names ratfish or rabbitfish for some of the species. Other species are also commonly called spookfish or ghostshark because of their remarkable spectral appearance. The pectoral fins of chimaeras are broad and wing-like and serve to propel the fish through the water by a flapping motion. All chimaeroids have 2 dorsal fins, the first erectile, preceded by a stout and often toxic spine, the second long and spineless. The tail is elongate and tapering, typically ending in a long terminal filament and bearing a caudal fin with dorsal and ventral lobes that are unequal in size (externally heterocercal) or nearly equal in size (diphycercal). The lateral-line canals on the head, body and tail, are superficially prominent, in many species appearing as open grooves, sometimes with large dilations on the snout.

Chimaeroids are predatory, eating primarily hard foods that they crush with their tooth plates. Their diet consists primarily of benthic invertebrates including bivalves, gastropods, various crustaceans, polychaetes, and echinoderms. They also eat other fishes including chimaeroids. These fishes are entirely marine and have their greatest diversity in the deep temperate waters of the shelf and slope, generally at depths greater than 500 m up to 3 000 m; however, most species occur between 200 and 2 000 m. Species of chimaeroid fishes are distributed in all of the world's oceans from the arctic and subantarctic to the tropics, where they are deep-water slope inhabitants. They tend to occur on or near the bottom, none are known to be oceanic, and most occur near continental land masses or off oceanic islands and on the slopes of seamounts and underwater ridges. Some species are locally migratory and congregate in large breeding aggregations inshore, and many species tend to segregate into unisexual groups that are additionally separated by age. Many species are known from a very widespread geographic range, sometimes throughout an ocean basin spanning the northern and southern hemisphere, while other species appear to be more restricted in their range both vertically and horizontally; however, data on the geographic distribution of most species is based primarily on fishing records and more comprehensive sampling in deep waters will be needed to establish a complete picture of the geographic range for most species.

All chimaeroid fishes are oviparous. Males possess elaborate copulatory organs on their pelvic fins, which they use to transfer sperm to the female oviducts. Males also possess 2 additional organs used copulation. Unique to chimaeroids is a club-like frontal tenaculum armed with multiple rows of denticles which emerges from the top of the head in sexually mature males. It has been observed that the frontal tenaculum is used to


grasp the posterior edge of the pectoral fin of the female to aid in positioning the male during copulation. Additionally, a pair of blade-like pre-pelvic tenaculae armed with a row of spinous denticles are located in pouches anterior to the pelvic fins. These also aid in anchoring the male during copulation. Sperm storage has been observed in one species, and is likely to occur in all species. Females will deposit 2 large egg capsules, 1 from each oviduct, each of which contains a single egg. The egg capsules are generally spindle shaped, sometimes with broad lateral web-like flanges that vary in size and shape depending on the species. Egg capsules are laid in pairs on the bottom and the embryos may take from 6 to 12 months to develop. The hatchlings are formed like miniature adults. Mature chimaeroids range in size from 40 to over 100 cm in total length and sexual maturity in males and females usually occurs at > 40 cm body length. Very little is known about reproduction and development in chimaeroids and egg capsules and embryos have not been collected for most species.

The Chimaeroid fauna of the Western Central Atlantic is not especially diverse with only 2 of the 3 families represented, although of the 5 species present, 4 of the 6 genera are represented. Increased fishing in deep waters in this region indicates that species of chimaeroids may be more abundant in this region than previously reported. In addition, a sixth species may be present in this area in extremely great depths; however, this record is based only on a single captured video image and needs to be verified. In the Western Central Atlantic chimaeroid fishes are apparently little utilized and are unlikely to become an important fishery resource, although they are occasionally taken as minor bycatch in trawls. They are suitable for human consumption and can be processed for oil and fish meal. However, species of chimaeroids may be inadvertently subjected to overexploitation from fisheries due to a poor understanding of probable biological constraints, such as low abundance, long lives, and low fecundity.

KEY TO FAMILIES OCCURRING IN THE AREA

- 1a. Snout elongated and pointed; caudal-fin axis weakly raised (diphycercal but appears heterocercal) with the fin asymmetrical, epaxial caudal-fin lobe narrower than hypaxial lobe **Rhinochimaeridae**
- 1b. Snout short and bluntly rounded; caudal-fin axis horizontal (diphycercal) with the fin nearly symmetrical, epaxial and hypaxial lobes equal sized **Chimaeridae**

LIST OF FAMILIES AND SPECIES OCCURRING IN THE AREA

The symbol  is given when species accounts are included.

RHINOCHIMAERIDAE: Longnose chimaeras

 *Neoharriotta carri* Bullis and Carpenter, 1966.

 *Rhinochimaera atlantica* Holt and Byrne, 1909.

CHIMAERIDAE: Shortnose chimaeras

 *Chimaera cubana* Howell Rivero, 1936.

 *Hydrolagus alberti* Bigelow and Schroeder, 1951.

 *Hydrolagus mirabilis* (Collett, 1904).

References

Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the Western North Atlantic memoir 1, part 2. Sawfishes, guitarfishes, skates and rays, and chimaeroids. *Sears Found. for Mar. Res.*, New Haven, Yale Univ., pp. 515-562.

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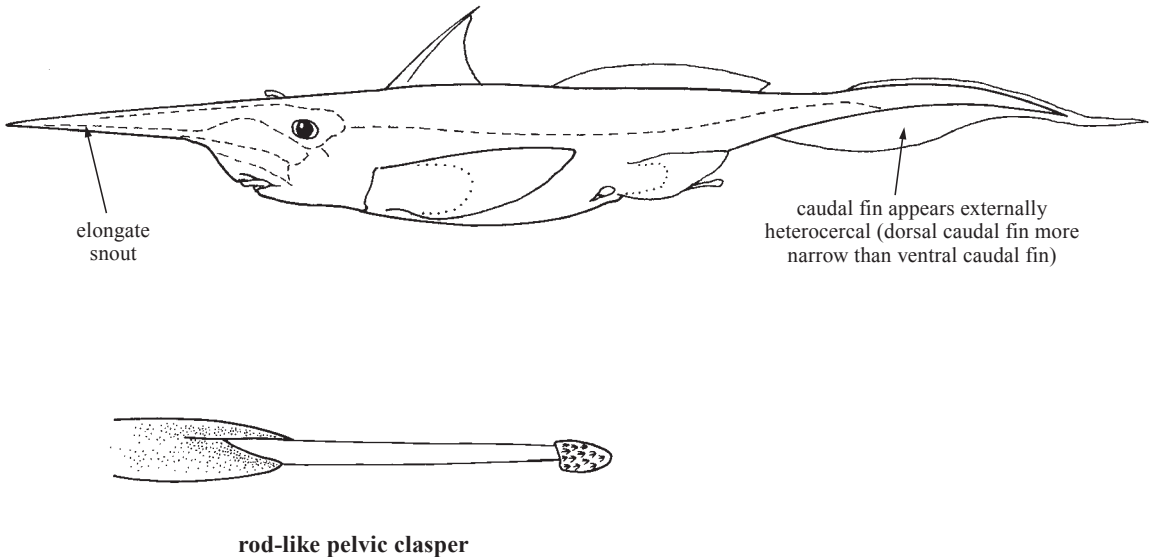
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RHINOCHIMAERIDAE

Longnose chimaeras (spookfishes)

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Diagnostic characters: Medium to large-sized shark-like fishes with large head, elongate spear-like snout, and somewhat compressed, elongate bodies with tail tapering to an elongate filament. Eyes large and prominent, bright green in fresh specimens. **Long, fleshy snout extends anterior to head tapering to a blunt point. Skin smooth**, often deciduous, flaking off in patches after capture. Gills covered by a fleshy operculum with only a single gill opening present anterior to pectoral fins; no spiracle present. Mouth small, ventral, connected to nostrils by deep grooves. **Teeth in the form of 3 pairs of non-replaceable tooth plates** with 2 pairs in the upper jaw, and a single pair in the lower jaw. Tooth plates appear as smooth shearing blades or robust with patches of dense hypermineralized tissue that appears as ridges and bumps on the surface. Pectoral and pelvic fins broad, somewhat ovoid in shape, with delicate external fin webs supported by cartilaginous rays (ceratotrichia). Two dorsal fins, the first erectile, preceded by an elongate, serrate spine, in some species toxic; the second elongate and spineless. Tail diphycercal; **caudal fin with narrow dorsal lobe and large ventral lobe appearing externally heterocercal. Lateral line canals appear as open grooves on the head and sides of body.** Adult males with bulbous, denticulate frontal tenaculum that rests in a pouch atop the head anterior to eyes; prepelvic tenaculae blade-like with large denticles along the medial edge, hidden in pouches anterior to the pectoral fins; and slender, rod-like pelvic claspers extending from pelvic fins with small, fleshy denticulate tip. **Colour:** greyish or brownish, often lighter or white ventrally, without distinct colour pattern.



Habitat, biology, and fisheries: These fishes generally inhabit deep waters and are usually found at depths around 1 000 to over 2 000 m. They appear to live on muddy bottoms where they primarily feed on a variety of benthic invertebrates as well as other fishes. Most species reach sexual maturity at about 40 cm body length measured from the distal edge of the gill opening to the origin of the dorsal caudal-fin lobe, females generally larger than males. All species are oviparous. Females lay pairs of eggs encased in an ovoid egg capsule with a fan-like lateral web that surrounds a hollow central chamber that is ovoid with lateral indentations in the centre. Due to their deep-water habitat, they have been poorly studied and almost nothing is known of their biology and reproduction. At present they are of minimal interest to fisheries and are primarily caught as bycatch in bottom trawl fisheries and may be utilized for fish meal or other fish products.

Similar families occurring in the area

This family is distinguished from the closely related family Chimaeridae by an elongate snout. The presence of slender rod-like claspers with a small bulbous, denticulate tip also characterizes members of this family.

Key to the species of Rhinochimaeridae occurring in the area

- 1a. Anal fin present (Fig. 2a); distal margin of dorsal caudal fin smooth; tooth plates with hypermineralized bumps and ridges; profile of head rounded at top of snout *Neoharriotta carri*
- 1b. Anal fin absent (Fig. 2b); distal margin of dorsal caudal fin in adults with 20 to 40 paired tubercles, large in males, just visible in females; tooth plates appear as smooth shearing blades; head and snout form a straight profile (Fig. 1) *Rhinochimaera atlantica*

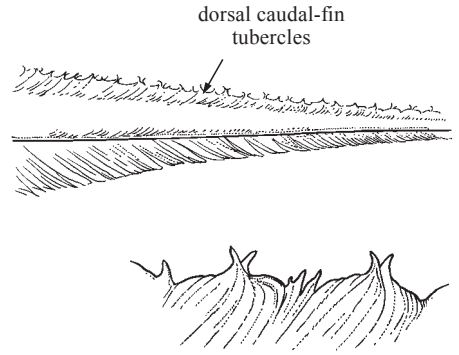


Fig. 1 caudal tubercles

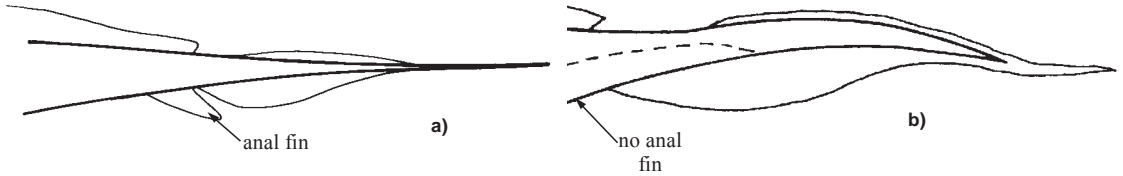



Fig. 2 lateral view of tails

List of species occurring in the area

The symbol  is given when species accounts are included.

 *Neoharriotta carri* Bullis and Carpenter, 1966.

 *Rhinochimaera atlantica* Holt and Byrne, 1909.

References

Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the Western North Atlantic memoir 1, part 2. Sawfishes, guitarfishes, skates and rays, and chimaeroids. *Sears Found. for Mar. Res.*, New Haven, Yale Univ., pp. 515-562.

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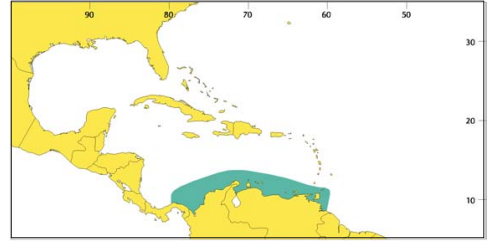
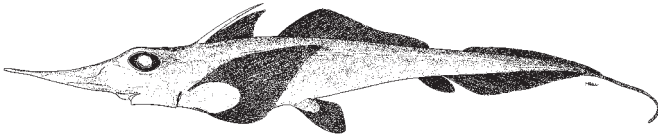
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Neoharriotta carri Bullis and Carpenter, 1966

En - Pale sicklefin chimaera, **Fr** - Chimère à nex mou pâle; **Sp** - Quimera pálida con hocico largo.

Small-bodied rhinochimaerid with maximum total length about 75 cm; maximum body length about 25 cm. A rare species typically found at the edge and slope of the continental shelf at depths of 240 to 600 m. Nothing is known of their biology, and no adult males have been recorded. Probably taken as bycatch in deep bottom trawls and bottom longlines, but not known to be utilized. Known distribution in the southern Caribbean off Panama, Colombia, and Venezuela.

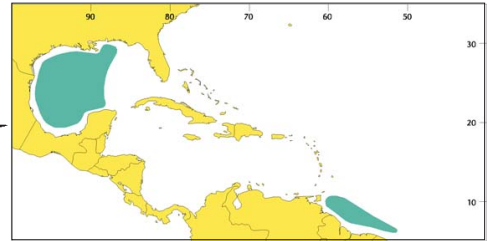
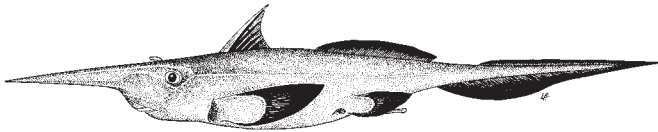


Rhinochimaera atlantica Holt and Byrne, 1909

RCT

En - Atlantic Spearnose chimaera; **Fr** - Chimère à nex mou; **Sp** - Quimera con hocico largo.

Large-bodied rhinochimaerid with maximum total length 1.5 m; maximum body length 65 cm. Not known to be part of the commercial catch in this region, but may be caught as bycatch in the northern Atlantic where it is more common. Typically found at depths greater than 1 000 m, ranging from 800 to 1 800 m depth. Rare in this region with specimens recorded from the Gulf of Mexico and off Suriname and French Guiana.

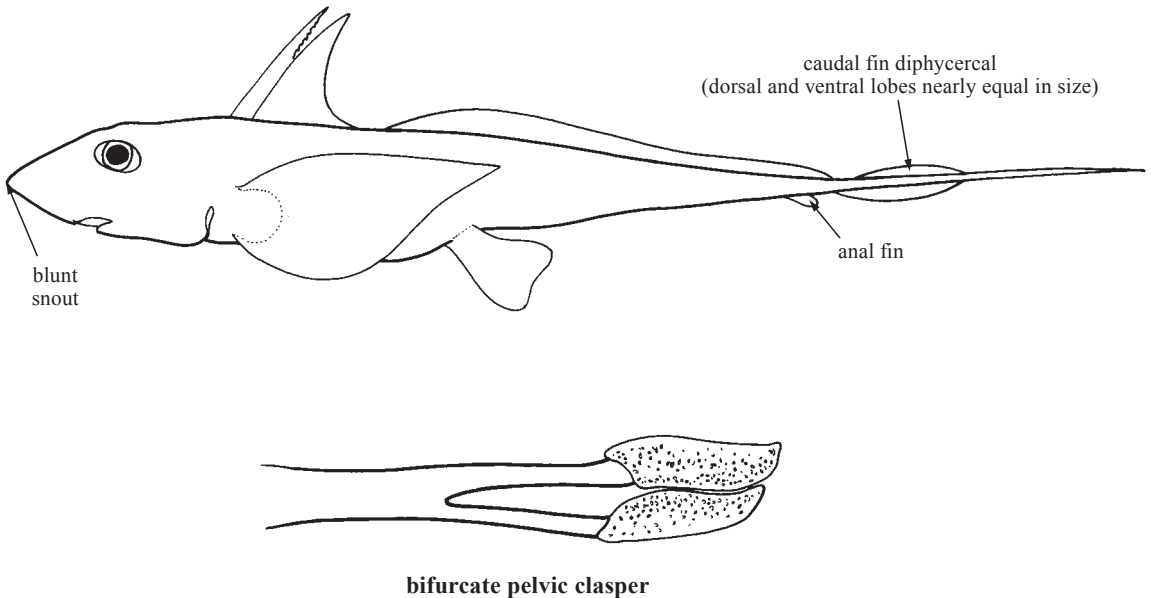


CHIMAERIDAE

Shortnose chimaeras (ratfishes, rabbitfishes, ghostsharks)

by D.A. Didier, Academy of Natural Sciences, Philadelphia, Pennsylvania, USA

Diagnostic characters: Medium-sized shark-like fishes with **large head, blunt snout, and somewhat compressed, elongate bodies, tail tapering to an elongate filament.** Eyes large and prominent, bright green in fresh specimens. Snout fleshy and bluntly pointed at tip. Mouth small, ventral, connected to nostrils by deep grooves. **Teeth in the form of 3 pairs of non-replaceable tooth plates** with 2 pairs in the upper jaw, and 1 pair in the lower jaw. Tooth plates robust with patches of dense hypermineralized tissue that appear as ridges and bumps on the surface. **Skin smooth**, often deciduous, flaking off in patches after capture. Gills covered by a fleshy operculum with only a **single gill opening present anterior to pectoral fins; no spiracle present.** Two dorsal fins, the first erectile, preceded by an elongate, serrate spine, in some species toxic; the second elongate and spineless. **Tail diphycercal with dorsal and ventral lobes of nearly equal size.** Pectoral and pelvic fins broad with delicate external fin webs supported by cartilaginous rays (ceratotrichia). **Lateral-line canals appear as open grooves on head and sides of body; canals on snout with large dilations.** Adult males with bulbous, denticulate frontal tentaculum that rests in a pouch atop the head anterior to eyes; prepelvic tenaculae blade-like with large denticles along medial edge, hidden in pouches anterior to pectoral fins; and **pelvic claspers bifurcate** with fleshy, denticulate tips. In some species the fleshy lobes separate, appearing as a third division of the clasper, but are not supported by an internal cartilaginous rod. **Colour:** pale to dark brown, darker dorsally, lighter or white ventrally, usually without distinct colour pattern.



Habitat, biology, and fisheries: These fishes generally inhabit deep waters and are usually found at depths greater than 200 m to over 1 000 m. They appear to live on or near muddy bottoms where they primarily feed on a variety of benthic invertebrates as well as other fishes. Most species reach sexual maturity at about 40 cm body length (measured from the distal edge of the gill opening to the origin of the dorsal caudal-fin lobe), females generally larger than males. All species are oviparous. Females lay pairs of spindle-shaped eggs that are deposited on the bottom. Embryological studies indicate that development may take as long as 9 to 12 months. At present they are of minimal interest to fisheries and are primarily caught as bycatch in bottom trawl fisheries and may be utilized for fish meal and other fish products. Some related species in the Pacific are being commercially fished and the commercial potential of species in the Atlantic is being explored.

Similar families occurring in the area

This family is easily distinguished from the closely related family Rhinochimaeridae by a blunt snout and lateral-line canals on the snout with large dilations.

Key to the species of Chimaeridae occurring in the area

- 1a.** Anal fin present, separated from ventral caudal fin by a deep notch (Fig. 1a); preopercular and horizontal lateral-line canals branch separately from the suborbital canal *Chimaera cubana*
- 1b.** Anal fin absent (Fig. 1b); origin of ventral caudal fin is a narrow, fleshy lobe along base of tail; preopercular and horizontal lateral line canals share a common branch from the suborbital canal → 2

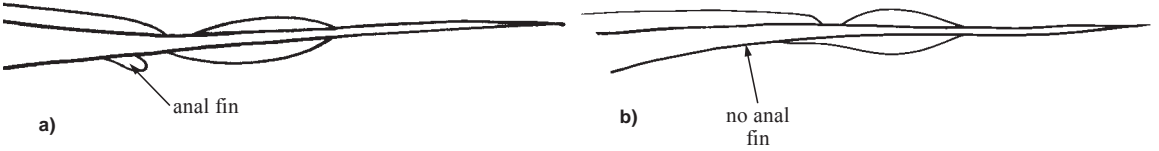






Fig. 1 lateral view of tail

- 2a.** Second dorsal fin elongate with straight distal margin *Hydrolagus alberti*
- 2a.** Second dorsal fin with distal margin deeply indented in the middle. *Hydrolagus mirabilis*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Chimaera cubana* Howell Rivero, 1936.
-  *Hydrolagus alberti* Bigelow and Schroeder, 1951.
-  *Hydrolagus mirabilis* (Collett, 1904).

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Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the Western North Atlantic memoir 1, part 2. Sawfishes, guitarfishes, skates and rays, and chimaeroids. *Sears Found. for Mar. Res.*, New Haven, Yale Univ., pp. 515-562.

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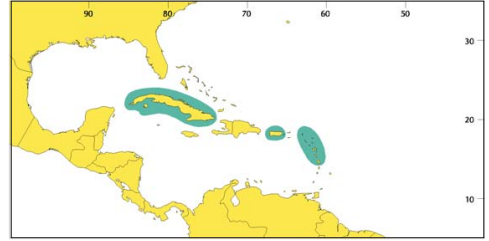
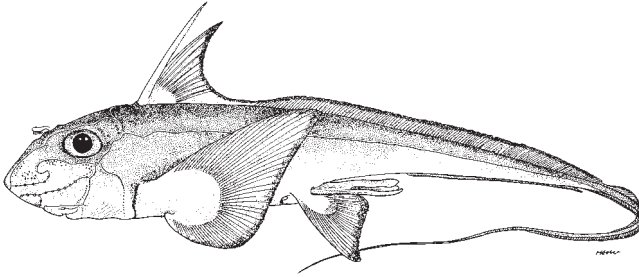
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Chimaera cubana Howell Rivero, 1936

CMU

En - Cuban chimaera; **Fr** - Chimère de Cuba; **Sp** - Quimera cubano.

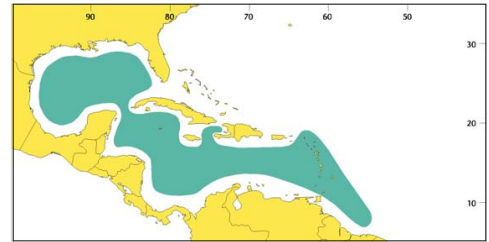
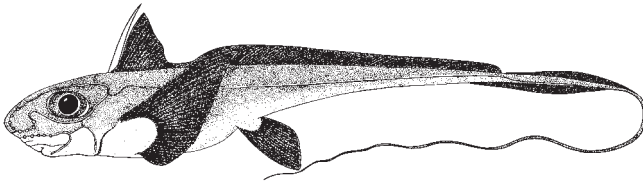
Small bodied form with maximum total length about 75 cm; maximum body length about 43 cm. Occurs in depths of at least 500 m. Nothing is known of its biology. Probably caught in bottom trawls and longlines, but not known to be utilized. Cuba, Puerto Rico, and northern islands of the Lesser Antilles.

***Hydrolagus alberti*** Bigelow and Schroeder, 1951

CYL

En - Gulf chimaera; **Fr** - Chimère golfe; **Sp** - Quimera del golfo.

Maximum total length about 1 m; maximum body length about 45 cm. The most common species of chimaeroid in this region, common at depths around 500 m, but known from depths up to at least 1 000 m. Probably feeds on bottom invertebrates. Taken as bycatch in bottom trawls and possibly bottom longlines, but not known to be utilized. Found throughout the Gulf of Mexico and Caribbean.

***Hydrolagus mirabilis*** (Collett, 1904)

CYH

En - Large-eyed rabbitfish; **Fr** - Chimère à gros yeux; **Sp** - Quimera ojón.

Small-bodied form with maximum total length about 75 cm; maximum body length about 35 cm. Rare in this region, currently known only from a few specimens collected in the Gulf of Mexico and off Suriname at depths ranging from 450 to over 1 000 m. Likely to have a wider distribution throughout the Gulf and Caribbean, probably at depths greater than 1 000 m. Not known to be taken as part of the commercial catch.

