



## Presence and distribution of Chimaeriformes in the Colombian Caribbean Sea

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**Abstract.** Georeferenced maps are presented for the Chimaeriformes species mentioned for Colombian Caribbean waters (*Chimaera cubana*, *Neoharriotta carri*, *Hydrolagus alberti* and *H. mirabilis*). Comments on their distribution, depth range and relative abundance patterns are given.

**Key words:** Geomaps, Chimaeriformes, soft-bottom, Colombia, Caribbean Sea

**Resumen.** Presencia y distribución de Chimaeriformes en el mar Caribe Colombiano. Se presentan mapas georeferenciados de las especies de Chimaeriformes mencionadas para aguas del Caribe Colombiano (*Chimaera cubana*, *Neoharriotta carri*, *Hydrolagus alberti* y *H. mirabilis*). Se comenta sobre su patrón de distribución, rango batimétrico y abundancia relativa.

**Palabras clave:** Geomapas, Chimaeriformes, fondos blandos, Colombia, Mar Caribe

A few cartilaginous fish species of the bathydemersal order Chimaeriformes, commonly known as chimaeras, have been mentioned in databases (Global Biodiversity Information Facility, GBIF) and literature (Nieto & Acero 1997, Rey-Carrasco & Acero 1988, Saavedra (2000), Caldas (2009), Mejia-Falla *et al.* 2011, Polanco *et al.* 2010, Paramo *et al.* 2012, Alvarez-Leon *et al.* 2013, Polanco 2015) as occurring in Colombian Caribbean waters. These species are *Chimaera cubana* (Howell-Rivero, 1936), *Neoharriotta carri* (Bullis & Carpenter, 1966), *Hydrolagus alberti* (Bigelow & Schroeder, 1951) and *H. mirabilis* (Collet, 1904). *C. cubana* was found in the Quitasueño bank that belongs to San Andres Islands Archipelago in jurisdiction of Colombian waters. *H. alberti* has been found in the San Andres and Providencia Archipelago and in the shelf and slope of the Colombian continental margin, while *N. carri* and *H. mirabilis* has been found in the shelf and slope of the Colombian continental margin but not, so far, in the San Andres and Providencia Archipelago. Globally *C. cubana*, *H. alberti* and *N. carri* are restricted to the north-western Atlantic, while *H.*

*mirabilis* distribution includes the north-eastern Atlantic and the south-eastern Atlantic, according to the geographic study of Weigmann (2016).

Georeferenced maps depicting the presence and distribution of Chimaeriformes in Colombia only exist for *Hydrolagus alberti* and *H. mirabilis* (García & Armenteras 2015). Here I present updated maps for the *Hydrolagus* species and for the first time, georeferenced maps for the other two species of Chimaeriformes in Colombia (Fig. 1). New locations come from GBIF (<http://www.gbif.org/>) database and from Polanco (2015) based on museum records. Thus, the *Hydrolagus* maps here supersedes the maps for the *Hydrolagus* species in Garcia & Armenteras (2015) for Colombian Caribbean waters.

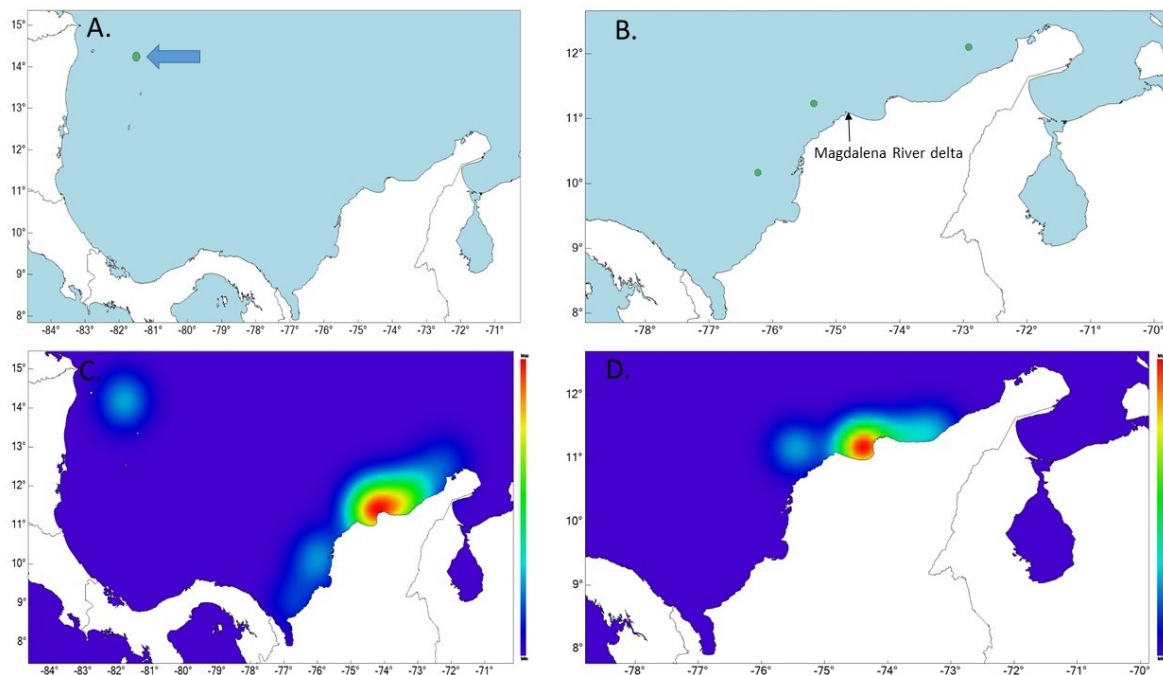
Locations coming from GBIF, Polanco (2015) and sources in García & Armenteras (2015) were straightforward to map. Locations given in other sources have to be approximated according to information in the corresponding document as none of them gave exact georeferenced location of encounters. Paramo *et al.* (2012) do not provide approximated or georeferenced location of stations where the chimaeras were trawled and Alvarez-Leon

et al. (2013) is a compilation of names. Georeferenced maps were constructed with the free software ModestR (<http://www.ipez.es/ModestR>; García-Roselló et al. 2013). When enough locations were available (more than three) a density map via a kernel smoothing was superimposed to the locations (Fig. 1).

Mean depth and depth ranges are given in Table I. In cases where only depth range is given (Rey & Acero 1988, Caldas et al. 2009 and Paramo et al. 2012), the values of the range were used to calculate mean depths. *Neoharriotta carri* local depth range goes beyond the global range provided

by Weigmann (2106), while for *Hydrolagus alberti* it is the lower limit that is surpassed (Table I). Thus, herewith the bathymetric extend of these species is updated. For the other species, their depth range is within the global limits (Table I) according to Weigmann (2016). In Table II the geographic coordinates of the locations are given indicating in which cases geographic coordinates were approximated.

There is a clear ordering in depth preference with *Chimaera cubana* occurring in comparatively shallow waters and *Hydrolagus mirabilis* occurring in comparatively deep waters (Table I).



**Figure 1.** Updated georeferenced maps showing the spatial distribution of the cartilaginous fishes of the order Chimaeriformes so far mentioned for the Colombia Caribbean Sea. A. *Chimaera cubana* with arrow signaling the Quitasueño bank. B. *Hydrolagus mirabilis*. C. *Hydrolagus alberti*. D. *Neoharriotta carri*.

**Table I.** Depth distribution of cartilaginous fishes of the bathydemersal order Chimaeriformes mentioned for Colombian Caribbean waters. Depth in m. Global depth range from Weigmann (2016).

Species	Mean depth, range	Global depth range	Sources
<i>Chimaera cubana</i>	297, 234-360, n=2	180-900	Caldas et al. (2009)
<i>Neoharriotta carri</i>	364, 90-630, n=7	240-600	GBIF, Rey & Acero (1988), Nieto & Acero (1997), Páramo et al. (2012)
<i>Hydrolagus alberti</i>	577, 223-1143, n=19	328-1470	GBIF, Rey & Acero (1988), Paramo et al. (2012), sources in García & Armenteras (2015)
<i>Hydrolagus mirabilis</i>	1010, 720-1299, n=2	450-2058	GBIF, sources in García & Armenteras (2015)

Low encounter rates in *C. cubana* and *H. mirabilis* probably obey to lack of monitoring in San Andres and Providencia archipelago, in the first case, and to lack of surveys in really depth bottoms in continental Colombian Caribbean, in the second. Most frequent encounters corresponds to *H. alberti* in contrast to low encounter rate for *Neoharriotta carri* (Tables I and II).

Georeferenced maps shown in Fig. 1 represent the most up to date quantitative visualization of the presence and distribution of Chimaeriformes in Colombian Caribbean waters. The qualitative map for *Neoharriotta carri* showed in Mejia-Falla *et al.* (2011) suggest a distribution of this species from the delta of the Magdalena River far north to the border with Venezuela. In contrast, georeferenced locations here restricts its occurrence to the low Guajira peninsula to the north, but extends its distribution to the south with one depth location to the south-west of the Magdalena River delta (Fig. 1). *Hydrolagus*

*alberti* qualitative distribution in Mejia-Falla *et al.* (2011) is similar to that of *N. carri* in that work. In the present case, the northern distribution is confirmed but the occurrence of this species to the south beyond the delta of the Magdalena River and nearing Panama is demonstrated as already shown in García & Armenteras (2015).

Clearly, *Hydrolagus mirabilis* is a deep species with a widespread but sparse (for now) distribution in the continental slope (Fig. 1). As for *Neoharriotta carri* it is probably scant, as it was not referred to in sources in García & Armenteras (2015) that cover a period of about 30 years demersal surveys and the complete Colombian Caribbean continental shelf.

Knowledge of marine biodiversity in Colombia has been restricted traditionally to species lists and at the most, distribution maps agreed upon by expert opinion (for an exception see García 2017).

**Table II.** Geographic coordinates of encounter localities of cartilaginous fishes of the bathydemersal order Chimaeriformes in the Colombian Caribbean Sea. GBIF= Global Biodiversity Information Facility. Sources in García & Armenteras (2015) can be seen in their Table I, page 19. \* indicates approximated coordinates

Species	Longitude	Latitude	Source
<i>Chimaera cubana</i>	-81,500	14,250	Caldas (2009)*
<i>Neoharriotta carri</i>	-75,500	11,116	GBIF
<i>Neoharriotta carri</i>	-74,530	11,050	GBIF
<i>Neoharriotta carri</i>	-74,450	11,170	GBIF
<i>Neoharriotta carri</i>	-74,436	11,150	GBIF
<i>Neoharriotta carri</i>	-73,333	11,383	Rey & Acero (1988)*
<i>Neoharriotta carri</i>	-73,866	11,283	Nieto & Acero (1997)*
<i>Neoharriotta carri</i>	-74,410	11,160	Polanco (2015)
<i>Hydrolagus mirabilis</i>	-72,916	12,100	García & Armenteras (2015)
<i>Hydrolagus mirabilis</i>	-75,350	11,233	García & Armenteras (2015)
<i>Hydrolagus mirabilis</i>	-76,233	10,166	GBIF
<i>Hydrolagus alberti</i>	-76,761	8,990	García & Armenteras (2015)
<i>Hydrolagus alberti</i>	-75,910	10,270	García & Armenteras (2015)
<i>Hydrolagus alberti</i>	-74,450	11,166	García & Armenteras (2015)
<i>Hydrolagus alberti</i>	-74,400	11,200	García & Armenteras (2015)
<i>Hydrolagus alberti</i>	-74,433	11,216	García & Armenteras (2015)
<i>Hydrolagus alberti</i>	-74,733	11,300	García & Armenteras (2015)
<i>Hydrolagus alberti</i>	-74,371	11,372	García & Armenteras (2015)
<i>Hydrolagus alberti</i>	-73,333	11,383	García & Armenteras (2015)
<i>Hydrolagus alberti</i>	-74,233	11,433	García & Armenteras (2015)
<i>Hydrolagus alberti</i>	-73,439	11,497	García & Armenteras (2015)
<i>Hydrolagus alberti</i>	-73,951	11,561	García & Armenteras (2015)
<i>Hydrolagus alberti</i>	-73,400	11,683	García & Armenteras (2015)
<i>Hydrolagus alberti</i>	-72,201	12,530	García & Armenteras (2015)
<i>Hydrolagus alberti</i>	-76,176	9,950	GBIF
<i>Hydrolagus alberti</i>	-74,408	11,646	GBIF
<i>Hydrolagus alberti</i>	-72,920	12,100	GBIF
<i>Hydrolagus alberti</i>	-73,440	11,500	Polanco (2015)
<i>Hydrolagus alberti</i>	-81,820	14,130	Polanco (2015)
<i>Hydrolagus alberti</i>	-81,830	14,170	Polanco (2015)

As necessary as lists are, they just tell a small part of the story. Crucial to management and protection measurements quantitative mapping depicting biodiversity patterns emerges as a need. In the present case the geographic and depth limits, as well as the distribution patterns found should be confirmed by further georeferenced sampling, before a complete picture of Chimaeriformes biodiversity shows up. Regular sampling would also allow testing hypothesis on dynamic changes in distribution in response to biological and ambient variables and processes, for instance, climate change.

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### References

- Alvarez-Leon, R., Orozco-Rey, R.H., Paramo-Fonseca, M.E. & Restrepo-Santa María, D. 2013. **Lista de los peces fósiles y actuales de Colombia: Nombres científicos válidos, distribución geográfica, diagnosis de referencia y nombres comunes e indígenas.** Ecoprints Diseño Gráfico y Audiovisual Ltda., Bogotá D.C.
- Caldas, J.P., Didier, D.A., Santos-Martínez, A. & Acero, A. 2009. New record of *Chimaera cubana* Howell-Rivero (Chondrichthyes: Holocephali: Chimaeridae) from the Western Caribbean Sea. **Pan-American Journal of Aquatic Sciences**, 4(4): 583-588.
- García-Roselló, E., Guisande, C., González-Dacosta, J., Heine, J., Pelayo-Villamil, P., Manjarrés-Hernández, A. *et al.* 2013. ModestR: A software tool for managing and analyzing species distribution map databases. **Ecography**, 36: 1202-1207.
- García, C.B. & Armenteras, D. 2015. **Atlas de la ictiofauna demersal de fondos blandos del Caribe continental Colombiano: Aproximación a su biodiversidad.** Universidad Nacional de Colombia, Facultad de Ciencias, Departamento de Biología, Bogotá D.C.
- García, C.B. 2017. What do we know of soft-bottom elasmobranch species richness in the Colombian Caribbean and of its spatial distribution? **Regional Studies in Marine Science**, 9: 62-68.
- Mejía-Falla, P.A., Navia, A.F. & Puentes, V. (Eds.). 2011. **Guía para la identificación de especies de tiburones, rayas y quimeras de Colombia.** Ministerio de Ambiente y Desarrollo Sostenible; Corporación para el Desarrollo Sostenible del Archipiélago de San Andrés, Providencia y Santa Catalina – CORALINA; Gobernación de San Andrés, Providencia y Santa Catalina, Fundación SQUALUS, Bogotá, D.C.
- Nieto, L.E. & Acero, A. 1997. Presencia de una quimera *Neoharriota carri* Bulis y Carpenter (1966) en el Parque Nacional Natural Tayrona, Santa Marta-Colombia. **Resúmenes IV Simposio Colombiano de Ictiología**, Santa Marta; 1997. p. 60.
- Paramo, J., Wolff, M. & Saint-Paul, U. 2012. Deep-sea fish assemblages in the Colombian Caribbean Sea. **Fisheries Research**, 125-126: 87-98.
- Polanco, A., Acero, A. & Garrido-Linares, M. 2010. Aportes a la diversidad íctica del Caribe colombiano. Pp. 317-314. *In*: INVEMAR (Ed.). **Biodiversidad del margen continental del Caribe colombiano.** Serie de Publicaciones Especiales INVEMAR 20.
- Polanco, A. 2015. Dynamics of the continental slope demersal fish community in the Colombian Caribbean – Deep-sea research in the Caribbean. **PhD Thesis.** Justus-Liebig University Giessen/Universidad Nacional de Colombia, Germany/Colombia, 192 p.
- Rey-Carrasco, I. & Acero, A. 1988. Registro de nuevos de peces cartilaginosos para el Caribe colombiano. **Actualidades Biológicas**, 17(63): 36-39.
- Saavedra, L.M. 2000. Ictiofauna del talud superior continental entre 200-500 m desde Castilletes hasta Cartagena en el Caribe colombiano. **Tesis de grado.** Fundación Universidad de Bogotá Jorge Tadeo Lozano, Bogotá D.C.
- Weigmann, S. 2016. Annotated checklist of the living sharks, batoids and chimaeras (Chondrichthyes) of the world, with a focus on biogeographical diversity. **Journal of Fish Biology**, 88(3): 837-1037.

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