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# Updated checklist of marine cartilaginous fishes from continental and insular Ecuador (Tropical Eastern Pacific Ocean)

by

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Sharks  
Rays  
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Chondrichthyes  
Mainland Ecuador  
Galápagos Islands

**Abstract.** – Ecuador, located on the central-eastern edge of the Pacific Ocean, has a high level of biological diversity, including no less than 800 species of marine fish. The ecological and economic importance, as well as the vulnerability of cartilaginous fish along the coasts of Ecuador and the Galápagos Islands, justify the need to produce an updated list of this group. Marine fish are generally listed separately and no updated national list has been produced recently. The objective of this work is to present an updated list of the continental and insular chondrichthyans of Ecuador based on field observations in the fishing ports of Santa Rosa de Salinas (Santa Elena province), Puerto López and Manta (Manabí province), alongside a review of the specialized literature. This group of fish includes 12 orders, 39 families, 65 genera, and 119 species. Of these, 64 are sharks, 48 are rays, and 7 are chimaeras.

**Résumé.** – Liste actualisée des poissons marins cartilagineux de l'Équateur continental et insulaire (océan Pacifique tropical est).

L'Équateur, situé sur la bordure centre-est de l'océan Pacifique, présente un niveau élevé de diversité biologique et notamment pas moins de 800 espèces de poissons marins. L'importance écologique et économique, ainsi que la vulnérabilité des poissons cartilagineux le long des côtes de l'Équateur et des îles Galápagos justifient la nécessité de produire une liste actualisée de ce groupe. Les poissons marins sont généralement répertoriés séparément dans ces deux territoires et aucune liste nationale n'a été produite récemment. L'objectif de ce travail est de présenter une liste actualisée des chondrichthyens continentaux et insulaires de l'Équateur, basée sur des observations de terrain dans les ports de pêche de Santa Rosa de Salinas (province de Santa Elena), Puerto López et Manta (province de Manabí) et sur une revue de la littérature spécialisée. Dans cette zone du Pacifique, le groupe des chondrichthyens comprend 12 ordres, 39 familles, 65 genres et 119 espèces. Parmi celles-ci, 64 sont des requins, 48 des raies et 7 des chimères.

## INTRODUCTION

Ecuador is a small country on the Pacific side of South America, whose coast stretches approximately 1250 km between 1°28'N and 3°23'S. The Galápagos Islands are located on the equator in the Pacific Ocean, around 1000 km west of Guayaquil. The coasts of mainland Ecuador and the Galápagos Islands are connected by the Carnegie Ridge, an underwater ridge with depths up to 2500 m. Water circulation along the Ecuadorian coast is directly influenced by the tropical currents coming from the Panamic basin and the northern branch of the Humboldt Current, which brings cold waters from the south. The fact that Ecuador is located on an oceanic front zone, with the presence of upwellings, explains the mixed fauna, such as tropical species from the north and temperate species from the south. This oceanographic configuration makes Ecuador an area of particularly rich marine biodiversity.

Of the 1,464 chondrichthyan species compiled by Fricke *et al.* (2020), 598 are sharks, 810 rays and 56 chimaeras.

Until now, the number of species for continental Ecuador was considered to be 101: 61 sharks, 33 rays, and 7 chimaeras (Martínez-Ortiz and García-Domínguez, 2013), while for the Galápagos Islands it was 56: 34 sharks, 20 rays, and at least 2 chimaeras (Hearn *et al.*, 2014; McCosker and Rosenblatt, 2010). Of these chondrichthyans, 43 are distributed across both areas.

This group of fish is important because of its ecological role in the health and stability of marine ecosystems. Many species of sharks are top predators of the marine ecosystems and therefore regulate the population of their prey (Stevens *et al.*, 2000). In addition to providing ecological services, elasmobranchs also provide food and have a commercial value because their fisheries generate foreign exchange and both direct and indirect employment in the country. During the period from September 2007 to December 2011, nearly 113,000 tons of sharks and rays were landed in Ecuadorian fishing ports (Subsecretaría de Recursos Pesqueros, 2012), including 30 species of sharks and 4 species of rays. However, due to their biological characteristics (slow growth,

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late maturity, and low fecundity), chondrichthyans are vulnerable to overfishing, as well as habitat loss and marine pollution (Dulvy *et al.*, 2014). In addition to the targeted fishing of sharks by surface longlines, trawling has a major impact on the catch of demersal elasmobranchs, mainly for angelsharks, dogfish, catsharks, rays, and guitarfish (Moreno-Vera *et al.*, 2018).

The last chondrichthyans survey for mainland Ecuador was done in 2013 (Martínez-Ortiz and García-Domínguez, 2013); it was in 2014 for the Galápagos Islands (Hearn *et al.*, 2014). This information has generally been compiled separately; therefore, obtaining updated information and a more accurate list of species was deemed necessary. The objective of this work was to produce an updated list of cartilaginous fish, with up-to-date nomenclature, for both continental and insular Ecuador, in the Central Eastern Pacific Ocean.

## MATERIAL AND METHODS

Between 2007 and 2018, the fishing ports of Manta, Puerto López (Manabí Province) and Santa Rosa (Santa Elena Province) were surveyed (Fig. 1). Manta was surveyed during April 2014, 2015, 2016, and 2017; Puerto López from November 2007 to June 2008; and Santa Rosa from February 2008 to January 2009, from June 2012 to May 2013, and from June 2017 to May 2018. It should be noted that Manta is the main national fish landing port and Santa Rosa is the second. For the Galápagos Islands, it was not possible to obtain information in the field, so the information used in this study was obtained from the specialized literature such as Grove and Lavenberg (1997), McCosker and Rosenblatt (2010), McCosker *et al.* (2012), Acuña-Marrero *et al.* (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016).

Van der Laan *et al.* (2020) was used for the classification and Fricke *et al.* (2020) for the nomenclature. For the systematic listing, we used the following sequence: subclass, cohort, order, family, species scientific name and common

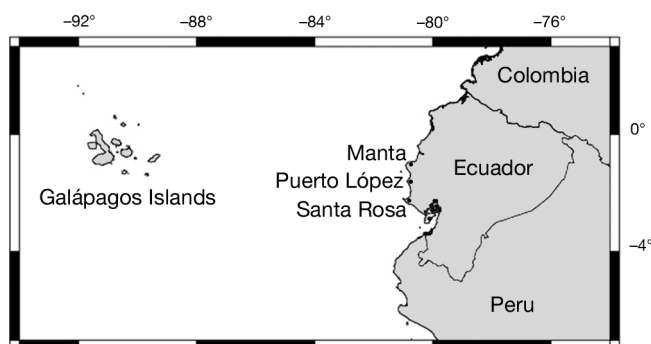


Figure 1. – Geographical location of the study areas (Manta, Puerto López, Santa Rosa and Galápagos Islands) from Ecuador, Central Eastern Pacific Ocean.

names in Spanish and English. Information is given about distribution in Ecuador (i.e. mainland and/or Galápagos) and IUCN Red list category (NE for Not Evaluated, DD for Data Deficient, LC for Least Concern, NT for Near Threatened, VU for Vulnerable, EN for Endangered, CR for Critically Endangered). Species recorded during the survey are indicated with “pers. obs.” (personal observation); references from the literature are given for the others.

## RESULTS

A total of 119 chondrichthyan species were recorded for both the mainland and the islands of Ecuador. Of these 119 species, there were 64 sharks (54%), 48 rays (40%), and 7 chimaeras (6%), distributed within 65 genera, 39 families, and 12 orders. A total of 52 species (44%) were recorded by the authors; the rest were obtained from the specialized literature.

### SUBCLASS NEOSELACHII

#### COHORT SELACHII

##### Order HEXANCHIFORMES

###### Family Hexanchidae

1. *Hexanchus griseus* (Bonnaterre, 1788) – Cañabota gris – Bluntnose sixgill shark  
Mainland. Ebert (2016). NT
2. *Notorynchus cepedianus* (Péron, 1807) – Cañabota gata – Broadnose sevengill shark  
Mainland. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013). DD

##### Order HETERODONTIFORMES

###### Family Heterodontidae

3. *Heterodontus francisci* (Girard, 1855) – Dormilón cornudo – Horn shark  
Mainland. Pers. obs., Béarez (1996), Martínez-Ortiz and García-Domínguez (2013). DD
4. *Heterodontus mexicanus* Taylor & Castro-Aguirre, 1972 – Dormilón búfalo – Mexican hornshark  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013), Tirado-Sánchez *et al.* (2016). DD
5. *Heterodontus quoyi* (Fréminville, 1840) – Dormilón de Galápagos – Galápagos bullhead shark  
Mainland/Galápagos. Béarez (1996), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). DD

**Order ORECTOLOBIFORMES****Family Rhincodontidae**

6. *Rhincodon typus* Smith, 1828 – Tiburón ballena – Whale shark  
Mainland/Galápagos. Pers. obs., Béarez (1996), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). EN

**Family Ginglymostomatidae**

7. *Ginglymostoma unami* Del Moral-Flores, Ramírez-Antonio, Angulo & Pérez-Ponce de León, 2015 – Gata nodriza – Pacific nurse shark  
Mainland. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013). NE

**Order LAMNIFORMES****Family Odontaspidae**

8. *Odontaspis ferox* (Risso, 1810) – Solrayo – Small-tooth sand tiger  
Mainland/Galápagos. Acuña-Marrero *et al.* (2013), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Ebert (2016), Estupiñán-Montaño *et al.* (2016), Tirado-Sánchez *et al.* (2016). VU
9. *Odontaspis noronhai* (Maul, 1955) – Solrayo – Big-eye sand tiger  
Mainland/Galápagos. Martínez-Ortiz and García-Domínguez (2013). LC

**Family Pseudocarchariidae**

10. *Pseudocarcharias kamoharai* (Matsubara, 1936) – Tiburón cocodrilo – Crocodile shark  
Mainland. Pers. obs., Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013), Ebert (2016). LC

**Family Lamnidae**

11. *Carcharodon carcharias* (Linnaeus, 1758) – Jaquetón blanco – Great white shark  
Mainland/Galápagos. Compagno *et al.* (1995), Béarez (1996), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). VU
12. *Isurus oxyrinchus* Rafinesque, 1810 – Marrajo dientuso – Shortfin mako  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). EN
13. *Isurus paucus* Guitart, 1966 – Marrajo carite – Longfin mako

Mainland. Pers. obs., Martínez-Ortiz and García-Domínguez (2013). EN

**Family Megachasmidae**

14. *Megachasma pelagios* Taylor, Compagno & Struhsaker, 1983 – Tiburón bocudo – Megamouh shark  
Mainland. Martínez-Ortiz and García-Domínguez (2013), Martínez-Ortiz *et al.* (2017). LC

**Family Cetorhinidae**

15. *Cetorhinus maximus* (Gunnerus, 1765) – Tiburón peregrino – Basking shark  
Mainland/Galápagos. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013), Ebert (2016). EN

**Family Alopiidae**

16. *Alopias pelagicus* Nakamura, 1935 – Tiburón zorro pelágico – Pelagic thresher  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). EN
17. *Alopias superciliosus* Lowe, 1841 – Tiburón zorro ojón – Bigeye thresher  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016), Ebert (2016). VU
18. *Alopias vulpinus* (Bonnaterre, 1788) – Tiburón zorro común – Common thresher  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013), Robertson and Allen (2015). VU

**Order CARCHARHINIFORMES****Family Pentanchidae**

19. *Apristurus brunneus* (Gilbert, 1892) – Pejegato marrón – Brown catshark  
Mainland. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013), Ebert (2016). DD
20. *Apristurus kampae* Taylor, 1972 – Pejegato trompudo – Longnose catshark  
Mainland/Galápagos. McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Ebert (2016), Tirado-Sánchez *et al.* (2016). DD
21. *Apristurus nasutus* de Buen, 1959 – Pejegato hocicón – Largenose catshark  
Mainland. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013), Ebert (2016). DD

22. *Apristurus stenseni* (Springer, 1979) – Pejegato panameño – Panama ghost catshark  
Galápagos. Hearn *et al.* (2014). DD

#### Family Scyliorhinidae

23. *Bythaelurus giddingsi* McCosker, Long & Baldwin, 2012 – Tiburón gato de Galápagos – Galápagos catshark  
Galápagos endemic. McCosker *et al.* (2012), Hearn *et al.* (2014), Ebert (2016). NE

#### Family Triakidae

24. *Galeorhinus galeus* (Linnaeus, 1758) – Cazón – Tope shark  
Mainland. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013). VU
25. *Mustelus albiginnis* Castro-Aguirre, Antuna-Mendiola, González-Acosta & De la Cruz-Agüero, 2005<sup>1</sup> – Tiburón de aleta lisa con margen blanco – White-margin fin smooth-hound  
Galápagos. Acuña-Marrero *et al.* (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). DD
26. *Mustelus dorsalis* Gill, 1864 – Tiburón de punta lisa – Sharptooth smooth-hound  
Mainland. Béarez (1996), Jiménez-Prado and Béarez (2004), Robertson and Allen (2015). DD
27. *Mustelus henlei* (Gill, 1863) – Musola parda – Brown smooth-hound (Fig. 2A)  
Mainland. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013). LC
28. *Mustelus lunulatus* Jordan & Gilbert, 1882 – Musola segadora – Sicklefins smooth-hound  
Mainland. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013), Briones-Mendoza *et al.* (2018). LC
29. *Mustelus mento* Cope, 1877 – Perro liso moteado – Speckled smooth-hound  
Mainland/Galápagos. Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). NT
30. *Mustelus whitneyi* Chirichigno F., 1973 – Musola prieta – Humpback smooth-hound  
Mainland. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013). VU
31. *Triakis acutipinna* Kato, 1968 – Tollo del Ecuador – Sharpfin houndshark  
Mainland endemic. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013). EN

32. *Triakis maculata* Kner & Steindachner, 1867 – Tollo manchado – Spotted houndshark  
Galápagos. McCosker and Rosenblatt (2010), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). VU

#### Family Carcharhinidae

33. *Carcharhinus albimarginatus* (Rüppell, 1837) – Tiburón de puntas blancas – Silvertip shark  
Mainland/Galápagos. Béarez (1996), McCosker and Rosenblatt (2010), Hearn *et al.* (2014), Robertson and Allen (2015), Tirado-Sánchez *et al.* (2016). VU
34. *Carcharhinus altimus* (Springer, 1950) – Tiburón baboso – Bignose shark  
Mainland/Galápagos. Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). DD
35. *Carcharhinus brachyurus* (Günther, 1870) – Tiburón cobrizo – Copper shark  
Mainland. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013). NT
36. *Carcharhinus cerdale* Gilbert, 1898 – Tiburón poroso; Pacific smalltail shark  
Mainland. Pers. obs., Jiménez-Prado and Béarez (2004), Castro (2011), Robertson and Allen (2015). NE
37. *Carcharhinus falciformis* (Müller & Henle, 1839) – Tiburón jaquetón – Silky shark (Fig. 2B)  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). VU
38. *Carcharhinus galapagensis* (Snodgrass & Heller, 1905) – Tiburón de Galápagos – Galápagos shark  
Mainland/Galápagos. Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). LC
39. *Carcharhinus leucas* (Müller & Henle, 1839) – Tiburón sarda – Bull shark  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013), Tirado-Sánchez *et al.* (2016). NT
40. *Carcharhinus limbatus* (Müller & Henle, 1839) – Tiburón macuira – Blacktip shark  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). NT

<sup>1</sup> Represents a controversial record that needs confirmation.

41. *Carcharhinus longimanus* (Poey, 1861) – Tiburón oceánico – Oceanic whitetip shark  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). CR
42. *Carcharhinus obscurus* (Lesueur, 1818) – Tiburón arenero – Dusky shark  
Mainland. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013). EN
43. *Carcharhinus plumbeus* (Nardo, 1827) – Tiburón trozo – Sandbar shark  
Mainland/Galápagos. Béarez (1996), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). VU
44. *Galeocerdo cuvier* (Péron & Lesueur, 1822) – Tintorería tigre – Tiger shark  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). NT
45. *Nasolamia velox* (Gilbert, 1898) – Cazón trompa blanca – Whitenose shark (Fig. 2C)  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). DD
46. *Negaprion fronto* (Jordan & Gilbert, 1882) – Tiburón galano – Lemon shark  
Mainland. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013), Del Moral-Flores *et al.* (2016). NT
47. *Prionace glauca* (Linnaeus, 1758) – Tiburón azul – Blue shark  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). NT
48. *Rhizoprionodon longurio* (Jordan & Gilbert, 1882) – Cazón picudo del Pacífico – Pacific sharpnose shark  
Mainland. Pers. obs., Béarez (1996), Martínez-Ortiz and García-Domínguez (2013). DD
49. *Triaenodon obesus* (Rüppell, 1837) – Tiburón coraleño ñato – Whitetip reef shark  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). NT
- Family Sphyrnidae**
50. *Sphyrna corona* Springer, 1940 – Cornuda coronada – Scalloped bonnethead  
Mainland. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013). NT
51. *Sphyrna lewini* (Griffith & Smith, 1834) – Cornuda común – Scalloped hammerhead  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). CR
52. *Sphyrna media* Springer, 1940 – Cornuda cuchara – Scoophead shark  
Mainland. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013). DD
53. *Sphyrna mokarran* (Rüppell, 1837) – Cornuda gigante – Great hammerhead  
Mainland/Galápagos. Béarez (1996), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). CR
54. *Sphyrna vespertina* Springer, 1940 – Cornuda de corona – Bonnethead shark  
Mainland/Galápagos. Pers. obs., Béarez (1996), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Del Moral-Flores *et al.* (2016), Tirado-Sánchez *et al.* (2016). LC
55. *Sphyrna zygaena* (Linnaeus, 1758) – Cornuda prieta – Smooth hammerhead  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). VU
- Order SQUALIFORMES**
- Family Dalatiidae**
56. *Isistius brasiliensis* (Quoy & Gaimard, 1824) – Tollo cigarro – Cookie-cutter shark  
Mainland/Galápagos. McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Ebert (2016), Tirado-Sánchez *et al.* (2016). LC
- Family Etmopteridae**
57. *Aculeola nigra* de Buen, 1959 – Tollo negro de cachos – Hooktooth dogfish

- Mainland. Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013). DD
58. *Centroscyllium nigrum* Garman, 1899 – Tollo negro peine – Cometooth dogfish  
Mainland/Galápagos. Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Ebert (2016), Tirado-Sánchez *et al.* (2016). DD
59. *Etmopterus litvinovi* Parin & Kotlyar, 1990 – Linterna ojuelo – Smalleye lanternshark  
Mainland. Martínez-Ortiz and García-Domínguez (2013). DD

#### Family Somniosidae

60. *Centroscymnus owstonii* Garman, 1906 – Sapata lija – Roughskin dogfish  
Mainland. Martínez-Ortiz and García-Domínguez (2013). VU
61. *Somniosus pacificus* Bigelow & Schroeder, 1944<sup>2</sup> – Tollo negro dormilón – Pacific sleeper shark  
Mainland. Martínez-Ortiz and García-Domínguez (2013). DD

#### Family Centrophoridae

62. *Centrophorus squamosus* (Bonnaterre, 1788) – Quelvacho negro – Leafscale gulper shark  
Mainland/Galápagos. Acuña-Marrero *et al.* (2013), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Ebert (2016), Tirado-Sánchez *et al.* (2016). VU

#### Family Echinorhinidae

63. *Echinorhinus cookei* Pietschmann, 1928 – Tiburón negro espinoso – Prickly shark  
Mainland/Galápagos. Pers. obs., Béarez (1996), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Ebert (2016), Tirado-Sánchez *et al.* (2016). DD

### Order SQUATINIFORMES

#### Family Squatinidae

64. *Squatina armata* (Philippi, 1887) – Pez ángel del Pacífico sur – Chilean angelshark (Fig. 2D)  
Mainland. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Acero *et al.* (2016). DD

### COHORT BATOIDEA

#### Order TORPEDINIFORMES

##### Family Narcinidae

65. *Diplobatis ommata* (Jordan & Gilbert, 1890) – Raya eléctrica ocelada – Ocellated electric ray  
Mainland. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013). VU
66. *Discopyge tschudii* Heckel, 1846 – Raya temblera – Apron ray  
Mainland. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013). NT
67. *Narcine entemedor* Jordan & Starks, 1895 – Raya eléctrica gigante – Giant electric ray  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013), Tirado-Sánchez *et al.* (2016). DD
68. *Narcine leoparda* Carvalho, 2001 – Raya eléctrica leopardo – Leopard numbfish  
Mainland. Pers. obs., Estupiñán-Montaña and Galván-Magaña (2015), Romero-Caicedo *et al.* (2015). NT

##### Family Torpedinidae

69. *Tetronarce tremens* (de Buen, 1959) – Torpedo chileno – Chilean torpedo  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). DD

### Order RHINOPRISTIFORMES

#### Family Trygonorrhinidae

70. *Zapteryx xyster* Jordan & Evermann, 1896 – Guitarra bruja – Southern banded guitarfish (Fig. 2E)  
Mainland. Pers. obs., Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013). DD

#### Family Rhinobatidae

71. *Pseudobatos glaucostigmus* (Jordan & Gilbert, 1883) – Guitarra punteada – Speckled guitarfish  
Mainland. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013). DD
72. *Pseudobatos leucorhynchus* (Günther, 1867) – Guitarra trompa blanca – Whitesnout guitarfish (Fig. 2F)  
Mainland. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013). NT
73. *Pseudobatos planiceps* (Garman, 1880) – Guitarra del Pacífico – Pacific guitarfish

<sup>2</sup> This record could rather represent *Somniosus antarcticus* Whitley, 1939.

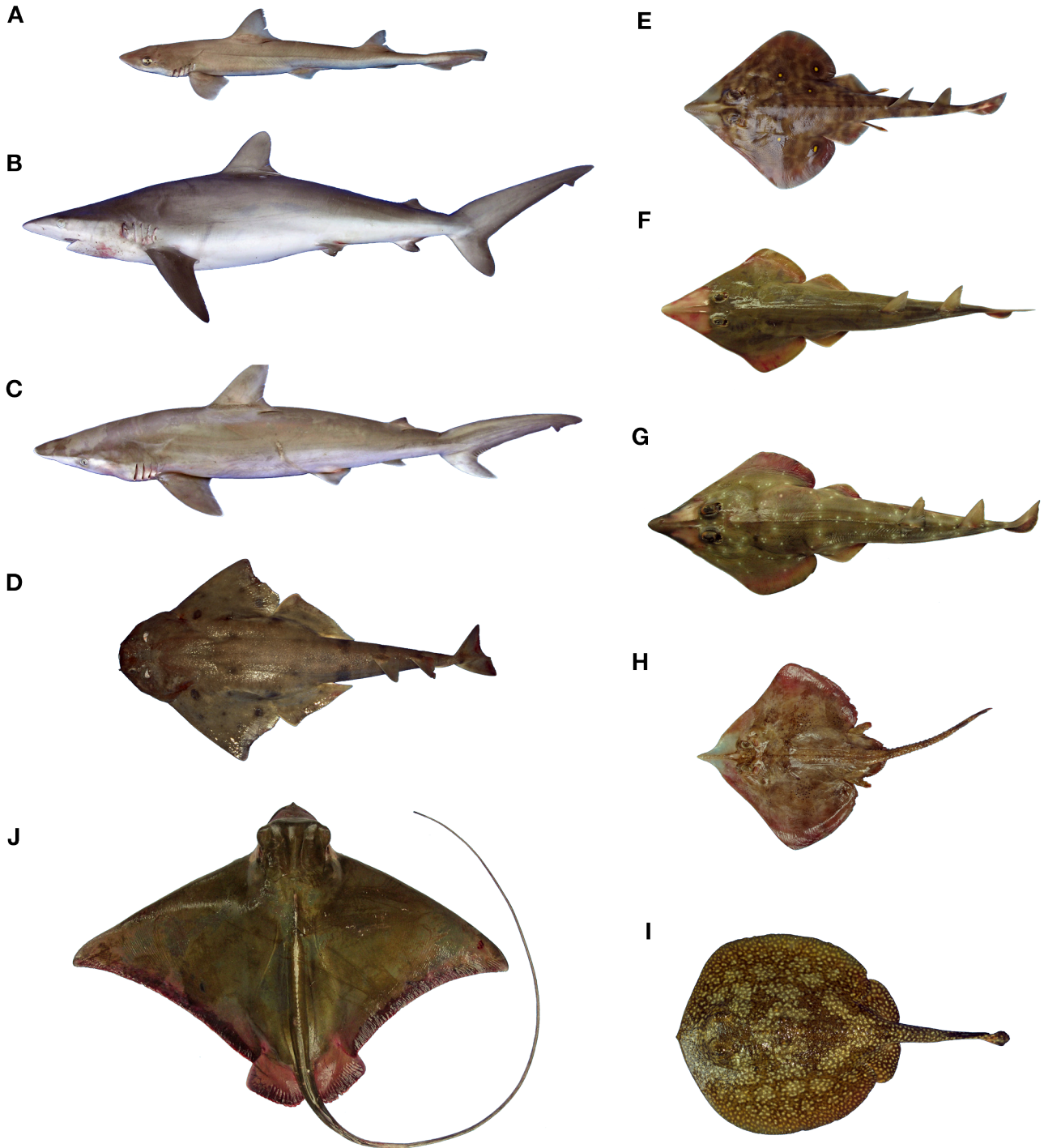


Figure 2. – Pictures of some common species from the Ecuadorian coastal small-scale fishery (© P. Béarez). **A:** *Mustelus henlei* (596 mm TL, Puerto López, 17 Nov. 2004). **B:** *Carcharhinus falciformis* (1095 mm TL, Puerto López, 13 May 2006). **C:** *Nasolamia velox* (1060 mm TL, Puerto López, 15 Dec. 2005). **D:** *Squatina armata* (940 mm TL, Salango, 22 Apr. 1994). **E:** *Zapteryx xyster* (410 mm TL, Puerto López, 19 Nov. 2011). **F:** *Pseudobatos leucorhynchus* (664 mm TL, Salango, 8 Nov. 2008). **G:** *Pseudobatos prahli* (765 mm TL, Puerto López, 8 Nov. 2008). **H:** *Rostroraja equatorialis* (560 mm TL, Puerto López, 19 Nov. 2011). **I:** *Urobatis halleri* (437 mm TL, Salango, 13 Jul. 1994). **J:** *Myliobatis peruvianus* (1920 mm TL, Salango, 11 Nov. 2008).

- Mainland/Galápagos. Pers. obs., Béarez (1996), Martínez-Ortiz and García-Domínguez (2013), Tirado-Sánchez *et al.* (2016). DD
74. *Pseudobatos prahli* Acero P. & Franke, 1995 – Guitarra de Gorgona – Gorgona guitarfish (Fig. 2G)  
Mainland. Pers. obs., Jiménez-Prado and Béarez (2004), Payán *et al.* (2010), Martínez-Ortiz and García-Domínguez (2013). DD

#### Family Pristidae

75. *Pristis pristis* (Linnaeus, 1758) – Pez sierra común – Common sawfish  
Mainland. Pers. obs., McEachran and Notarbartolo di Sciara (1995), Jiménez-Prado and Béarez (2004), Faria *et al.* (2013). CR

#### Order RAJIFORMES

##### Family Rajidae

76. *Dipturus ecuadoriensis* (Beebe & Tee-Van, 1941) – Raya de Ecuador – Ecuador skate  
Mainland endemic. Jiménez-Prado and Béarez (2004), Last *et al.* (2016). DD
77. *Rajella eisenhardti* Long & McCosker, 1999 – Raya de Galápagos – Galápagos grey skate  
Galápagos endemic. McCosker and Rosenblatt (2010), Hearn *et al.* (2014), Ebert (2016), Tirado-Sánchez *et al.* (2016). DD
78. *Rajella nigerrima* (de Buen, 1960) – Raya negra – Blackish skate  
Mainland. Martínez-Ortiz and García-Domínguez (2013), Ebert (2016). LC
79. *Rostroraja equatorialis* (Jordan & Bollman, 1890) – Raya ecuatorial – Equatorial ray (Fig. 2H)  
Mainland. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013). DD
80. *Rostroraja vezezi* (Chirichigno F., 1973) – Raya de Vélez – Velez ray  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). DD

##### Family Arhynchobatidae

81. *Bathyrāja abyssicola* (Gilbert, 1896) – Raya abisal – Deepsea skate  
Galápagos. Cerutti-Pereyra *et al.* (2018). DD
82. *Bathyrāja aguja* (Kendall & Radcliffe, 1912) – Raya aguja – Aguja skate  
Mainland. Martínez-Ortiz and García-Domínguez (2013). DD

83. *Bathyrāja peruana* McEachran & Miyake, 1984 – Raya peruana – Peruvian skate  
Mainland. Ebert (2016). DD
84. *Bathyrāja spinosissima* (Beebe & Tee-Van, 1941) – Raya blanca – Spiny skate  
Galápagos. McCosker and Rosenblatt (2010), Hearn *et al.* (2014), Ebert (2016), Tirado-Sánchez *et al.* (2016). LC
85. *Notoraja martinezi* Concha, Ebert & Long, 2016 – Raya de púas – Barbedwire-tailed skate  
Mainland. Ebert (2016). NE
86. *Sympterygia brevicaudata* (Cope, 1877) – Raya espinosa – Shorttail fanskate  
Mainland. Béarez (1996), Martínez-Ortiz and García-Domínguez (2013). DD

##### Family Gurgesiellidae

87. *Gurgesiella furvescens* de Buen, 1959 – Raya falsa sureña – Dusky finless skate  
Mainland/Galápagos. Grove and Lavenberg (1997), McCosker and Rosenblatt (2010), Hearn *et al.* (2014), Ebert (2016), Tirado-Sánchez *et al.* (2016). LC

#### Order MYLIOBATIFORMES

##### Family Dasyatidae

88. *Hypanus dipterurus* (Jordan & Gilbert, 1880) – Raya látigo diamante – Diamond stingray  
Mainland/Galápagos. Béarez (1996), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). DD
89. *Hypanus longus* (Garman, 1880) – Raya látigo coluda – Longtail stingray  
Mainland. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). DD
90. *Telatrygon acutirostra* (Nishida & Nakaya, 1988)<sup>3</sup> – Raya águda – Sharpnose stingray  
Mainland. Aguilar (2008). NT
91. *Pteroplatytrygon violacea* (Bonaparte, 1832) – Raya látigo violeta – Pelagic stingray  
Mainland/Galápagos. Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). LC
92. *Taeniurops meyeni* (Müller & Henle, 1841) – Raya redonda – Round ribbontail ray  
Galápagos. McCosker and Rosenblatt (2010), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). VU

<sup>3</sup> This record by Aguilar (2008) likely represents an undescribed species.

**Family Potamotrygonidae**

93. *Styracura pacifica* (Beebe & Tee-Van, 1941) – Chupare del Pacífico – Pacific chupare  
Galápagos. McCosker and Rosenblatt (2010), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). NE

**Family Urotrygonidae**

94. *Urobatis halleri* (Cooper, 1863) – Raya redonda de Haller – Haller's round ray (Fig. 2I)  
Mainland. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013). LC
95. *Urobatis tumbesensis* (Chirichigno F. & McEachran, 1979) – Raya psicodélica – Tumbes round stingray  
Mainland. Pers. obs., Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013). DD
96. *Urotrygon aspidura* (Jordan & Gilbert, 1882) – Raya redonda de rabo espinoso – Spiny-tail round ray  
Mainland. Béarez (1996), Jiménez-Prado and Béarez (2004). DD
97. *Urotrygon chilensis* (Günther, 1879) – Raya redonda chilena – Chilean round ray  
Mainland. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013). DD
98. *Urotrygon munda* Gill, 1863. – Raya redonda munda – Munda round ray  
Mainland. Jiménez-Prado and Béarez (2004), Robertson and Allen (2015). DD
99. *Urotrygon rogersi* (Jordan & Starks, 1895) – Raya redonda de Rogers – Roger's round ray  
Mainland. Pers. obs., Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013). DD

**Family Gymnuridae**

100. *Gymnura crebripunctata* (Peters, 1869) – Raya mariposa – Longsnout butterfly ray  
Mainland. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004). DD
101. *Gymnura marmorata* (Cooper, 1864) – Raya mariposa californiana – California butterfly ray  
Mainland. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013). LC

**Family Aetobatidae**

102. *Aetobatus laticeps* (Gill, 1865) – Chucho pintado – Pacific spotted eagle ray  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-

Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). NE

**Family Myliobatidae**

103. *Aetomylaeus asperrimus* (Gilbert, 1898) – Raya águila áspera – Rough eagle ray  
Mainland/Galápagos. McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). DD
104. *Myliobatis californica* Gill, 1865 – Raya murciélago – Bat eagle ray  
Galápagos. Grove and Lavenberg (1997), Tirado-Sánchez *et al.* (2016). LC
105. *Myliobatis longirostris* Applegate & Fitch, 1964 – Raya águila picuda – Snouted eagle ray  
Mainland. Pers. obs., Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013). NT
106. *Myliobatis peruvianus* Garman, 1913 – Raya águila peruana – Peruvian eagle ray (Fig. 2J)  
Mainland/Galápagos. Pers. obs., Béarez (1996), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). DD

**Family Rhinopteridae**

107. *Rhinoptera steindachneri* Evermann & Jerkins, 1891 – Gavilán negro – Pacific cownose ray  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Tirado-Sánchez *et al.* (2016). NT

**Family Mobulidae**

108. *Mobula birostris* (Walbaum, 1792) – Manta gigante – Giant manta ray  
Mainland/Galápagos. Béarez (1996), Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). VU
109. *Mobula mobular* (Bonnaterre, 1788) – Manta mobula – Devil fish  
Mainland/Galápagos. Tirado-Sánchez *et al.* (2016), Lezama-Ochoa *et al.* (2019). EN
110. *Mobula munkiana* Notarbartolo-di-Sciara, 1987 – Manta de Munk – Munk's devil ray  
Mainland/Galápagos. Pers. obs., Jiménez-Prado and Béarez (2004), McCosker and Rosenblatt (2010), Martínez-Ortiz and García-Domínguez (2013), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). VU
111. *Mobula tarapacana* (Philippi, 1892) – Manta cornuda – Chilean devil ray

Mainland/Galápagos. McCosker and Rosenblatt (2010), Hearn *et al.* (2014), Tirado-Sánchez *et al.* (2016). EN

112. *Mobula thurstoni* (Lloyd, 1908) – Diablo chupasangre – Smoothtail mobula  
Mainland/Galápagos. Pers. obs., Béarez (1996), Jiménez-Prado and Béarez (2004), Martínez-Ortiz and García-Domínguez (2013), Lezama-Ochoa *et al.* (2019). NT

## SUBCLASS HOLOCEPHALI

### Order CHIMAERIFORMES

#### Family Callorhynchidae

113. *Callorhynchus callorynchus* (Linnaeus, 1758) – Peje-gallo – Plownose chimaera  
Mainland. Pers. obs., Swing and Béarez (2006), Martínez-Ortiz and García-Domínguez (2013). LC

#### Family Chimaeridae

114. *Hydrolagus alphus* Quaranta, Didier, Long & Ebert, 2006 – Quimera de Galápagos – Whitespot ghostshark  
Galápagos endemic. McCosker and Rosenblatt (2010), Ebert (2016), Tirado-Sánchez *et al.* (2016). DD
115. *Hydrolagus macrophthalmus* de Buen, 1959 – Quimera de ojo grande – Bigeye chimaera  
Mainland. Martínez-Ortiz and García-Domínguez (2013), Ebert (2016). DD
116. *Hydrolagus mccoskeri* Barnett, Didier, Long & Ebert, 2006 – Quimera fantasma de Galápagos – Galápagos ghostshark  
Galápagos endemic. McCosker and Rosenblatt (2010), Ebert (2016), Tirado-Sánchez *et al.* (2016). DD
117. *Hydrolagus melanophasma* James, Ebert, Long & Didier, 2009 – Quimera negra del Pacífico oriental – Eastern Pacific black ghostshark  
Mainland. Aguirre-Villaseñor *et al.* (2013), Martínez-Ortiz and García-Domínguez (2013), Ebert (2016). LC

#### Family Rhinochimaeridae

118. *Harriotta raleighana* Goode & Bean, 1895 – Quimera de Raleigh – Narrownose chimaera  
Mainland. Martínez-Ortiz and García-Domínguez (2013), Robertson and Allen (2015). LC
119. *Rhinochimaera africana* Compagno, Stehmann & Ebert, 1990<sup>4</sup> – Pez fantasma africano – Paddlenose spookfish  
Mainland. Ebert (2016). DD

<sup>4</sup> The specimen mentioned as *Rhinochimaera* sp. by Martínez-Ortiz and García-Domínguez (2013: 24) probably represents this species.

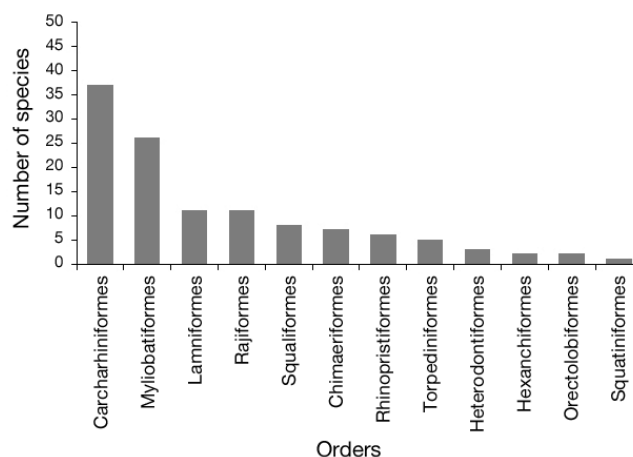


Figure 3. – Number of species per order of sharks, rays and chimaeras in Ecuador (n = 119).

The order with the highest number of species for sharks was Carcharhiniformes with 37 species, and the lowest was Squatiniformes with only 1 species. For rays the highest number of species was for Myliobatiformes with 25 species, and the lowest was Torpediniformes with 5 species. The order of Chimaeriformes included 7 species (Fig. 3).

Nearly half (58) of Ecuadorian chondrichthyans are only found along the mainland coast, while 12 are only found in Galápagos, and 49 are shared between the two regions. It is interesting to note that several families of rays (e.g. urotrygonids, gymnurids) with limited swimming ability are absent from the insular region. The endemism of Chondrichthyans is rather low (5%) in Ecuadorian waters, accounting for just 2 sharks, 2 rays, and 2 chimaeras. Among them, two are mainland endemics (*Triakis acutipinna*, *Dipturus ecuadoriensis*) and four are Galápagos endemics (*Bythaelurus giddingsi*, *Rajella eisenhardti*, *Hydrolagus alphus*, *H. mccoskeri*).

Among the 119 species of Ecuadorian chondrichthyans, 4 are Critically Endangered, 9 are Endangered, 17 are Vulnerable, 17 are Near Threatened, 18 are Least Concern, 48 are Data Deficient, and 6 are Not Evaluated. It is important to note the high proportion of species without data to assess their status. This shows the low level of knowledge about chondrichthyans in general, and in this region of the world in particular.

## DISCUSSION

The number of chondrichthyans reported for Ecuador in this study (119) is higher than that previously recorded for continental Ecuador (Martínez-Ortiz and García-Domínguez, 2013) and the Galápagos Islands (Hearn *et al.*, 2014), which totalled 112. It is also higher than what was recorded

in Peruvian waters according to Cornejo *et al.* (2015) who cited 115 species (66 sharks, 43 rays, and 6 chimaeras) and for Chilean waters, for which 96 species (53 sharks, 39 rays, and 4 chimaeras) were recorded by Lamilla and Bustamante (2005). This is also the case for Costa Rican Pacific waters, where only 87 species (42 sharks, 39 rays, and 6 chimaeras) were recorded by Espinoza *et al.* (2018), and Colombian Pacific waters which bears the lowest richness with only 67 species of elasmobranchs (36 sharks and 31 rays), recorded by Mejía-Falla and Navia (2019). However, the number of chondrichthyans reported here is lower than that of Mexican Pacific waters for which 123 species (63 sharks, 55 rays, and 5 chimaeras) were recorded by Ehemann *et al.* (2018).

Of the 1,464 chondrichthyan species compiled worldwide by Fricke *et al.* (2020), 8.1% exist in Ecuador: 10.7% sharks, 5.9% rays, and 12.5% chimaeras. Rays have the poorest representation. Of this total number of known chondrichthyans, Chile has 6.6%, Peru 7.9%, Colombia 4.6%, Costa Rica 5.9%, and Mexico 8.4%. The high diversity observed for Ecuadorian waters is due to the inclusion of the Galápagos Province in the study and the fact that Ecuador is located at the southern limit of the Panamic biogeographic Province (Briggs and Bowen, 2012; Jiménez-Prado and Béarez, 2004). It is therefore influenced by faunal elements from temperate waters of the Peruvian-Chilean Province, which significantly increases the marine Ecuadorian biodiversity.

The number of elasmobranchs reported in this study may be higher due to the fact that some unidentified species, which might prove to be undescribed species, were not taken into account. This is the case for *Galeus* sp. and *Hypanus* sp. recorded by McCosker and Rosenblatt (2010), and successively by Hearn *et al.* (2014) and Tirado-Sánchez *et al.* (2016). Also, a chimaera mentioned by McCosker and Rosenblatt (2010) as *Chimaera* sp. likely corresponds to *Chimaera orientalis* Angulo, López, Bussing & Murase, 2014, a species known from Costa Rica and Peru, which would bring the number of chimaeras to 8. On the other hand, the presence of several species (e.g. *Carcharodon carcharias*, *Mustelus albiginnis*, *Carcharhinus obscurus*, *Myliobatis californica*) is still doubtful and would require further investigation.

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