

Updated checklist of Azores Chondrichthyes (Vertebrata: Gnathostomata)

Luís M. D. Barcelos^{‡,§}, José M. N. Azevedo^{§,|}, João Pedro Barreiros^{‡,§}

‡ Centre for Ecology, Evolution and Environmental Changes (cE3c), Angra do Heroísmo, Portugal

§ University of the Azores, Angra do Heroísmo, Portugal

| Centre for Ecology, Evolution and Environmental Changes (cE3c), Ponta Delgada, Portugal

Corresponding author: Luís M. D. Barcelos (ldbarcelos@gmail.com)

Academic editor: Felipe Ottoni

Abstract

Background

Several lists of marine fish from Azores have been published in the past. Most of those publications are difficult to access on line and several were not published in peer-reviewed journals.

New information

This checklist updates all the chondrichthyan records for the Azores Exclusive Economic Zone (EEZ), according to the most recent taxonomic classification of cartilaginous fish, as well as providing information on the conservation status for all species. We also present recent literature data on rare species and recent records for Azores. This is the first comprehensive list of cartilaginous fishes from Azores to be published in the GBIF database.

Keywords

cartilaginous fishes, rays, sharks, species list

Introduction

Chondrichthyes are commonly known as cartilaginous fishes and includes chimeras, sharks and rays. They can be found from the cold deep-sea to subtropical and tropical waters (Greemberg 2009). Sharks and rays have a great recreational and ecological interest (Vieira et al. 2020); however, many species worldwide are declining due to global

overfishing (Worm et al. 2013). The total estimation for risk extinction, according to the IUCN Red List criteria, indicates that a quarter of all shark and ray species are threatened (Dulvy et al. 2014).

The first comprehensive chondrichthyan checklist for Azores was published over 20 years ago by Santos et al. (1997). After that, some updates were made, most of them integrated in marine fish or biodiversity lists (e.g. Porteiro et al. 2010). In the meantime, new publications have emerged regarding new records (e.g. Catarino et al. 2020) or with new information on species already recorded for Azores (e.g. Das and Afonso 2017, Barcelos et al. 2018). The present work gives taxonomic updates and information regarding the conservation status (IUCN) for all chondrichthyan species from the Azores' EEZ (see Suppl. material 1). This is the first complete and updated list of chondrichthyans that can be found in the GBIF online platform (Barcelos et al. 2020).

General description

Purpose: Updating Azorean biota checklists.

Project description

Title: Azores Chondrichthyes updated checklist

Personnel: Paulo Borges

Study area description: Azores Archipelago

Funding: Funding Institutions: Azores PO 2020 - ACORES-01-0145-FEDER-000072; TOTAL BUDGET: €299,901.83 EU Support: €254,916.56. This project was financed by FEDER in 85% and by Azorean Public funds by 15% through the Operational Programme Azores 2020. This work is also funded by FEDER funds through the COMPETE 2020 Programme and National Funds through FCT - Portuguese Foundation for Science and Technology under the Research Infrastructure PORBIOTA - Portuguese E-Infrastructure for Information and Research on Biodiversity, project number POCI-01-0145-FEDER-022127.

Geographic coverage

Description: The Azores EEZ (Exclusive Economic Zone).

Coordinates: 34 and 42.976 Latitude; -35.578 and -21 Longitude.

Taxonomic coverage

Description: This dataset covers all the sharks, rays and chimaeras so far known to occur within the Azores' EEZ.

Taxa included:

Rank	Scientific Name	Common Name
kingdom	Animalia	
phylum	Chordata	
class	Chondrichthyes	
subclass	Holocephali	
subclass	Elasmobranchii	
superorder	Holocephalimorpha	
superorder	Selachimorfa	
superorder	Batoidea	
order	Carcharhiniformes	Ground sharks
order	Chimaeriformes	Chimaeras
order	Hexanchiformes	Frill and cow sharks
order	Lamniformes	Mackerel sharks
order	Myliobatiformes	Stingrays
order	Orectolobiformes	Carpet sharks
order	Rajiformes	Skates and rays
order	Squaliformes	Bramble, sleeper and dogfish sharks
order	Torpediniformes	Electric rays
family	Rhinochimaeridae	
family	Chimaeridae	
family	Sphyrnidae	
family	Carcharhinidae	
family	Triakidae	
family	Pseudotriakidae	
family	Scyliorhinidae	
family	Pentanchidae	
family	Lamnidae	
family	Cetorhinidae	
family	Alopiidae	
family	Odontaspidae	

family	Rhincodontidae	
family	Dalatiidae	
family	Oxynotidae	
family	Somniosidae	
family	Etmopteridae	
family	Centrophoridae	
family	Hexanchidae	
family	Chlamydoselachidae	
family	Mobulidae	
family	Myliobatidae	
family	Dasyatidae	
family	Rajidae	
family	Torpedinidae	
species	<i>Rhinochimaera atlantica</i> Holt & Byrne, 1909	
species	<i>Hydrolagus pallidus</i> Hardy & Stehmann, 1990	
species	<i>Hydrolagus affinis</i> (de Brito Capello, 1868)	
species	<i>Chimaera opalescens</i> Luchetti, Iglésias & Sellos, 2011	
species	<i>Chimaera monstrosa</i> Linnaeus, 1758	
species	<i>Sphyrna zygaena</i> (Linnaeus, 1758)	
species	<i>Prionace glauca</i> (Linnaeus, 1758)	
species	<i>Galeocerdo cuvier</i> (Péron & Lesueur, 1822)	
species	<i>Carcharhinus longimanus</i> (Poey, 1861)	
species	<i>Carcharhinus leucas</i> (Valenciennes, 1839)	
species	<i>Carcharhinus galapagensis</i> (Snodgrass & Heller, 1905)	
species	<i>Galeorhinus galeus</i> (Linnaeus, 1758)	
species	<i>Pseudotriakis microdon</i> de Brito Capello, 1868	
species	<i>Scyliorhinus canicula</i> (Linnaeus, 1758)	
species	<i>Galeus murinus</i> (Collett, 1904)	
species	<i>Apristurus manis</i> (Springer 1979)	
species	<i>Apristurus laurussonii</i> (Saemundsson, 1922)	
species	<i>Lamna nasus</i> (Bonnaterre, 1788)	

species	<i>Isurus paucus</i> Guitart Manday, 1966	
species	<i>Isurus oxyrinchus</i> Rafinesque, 1810	
species	<i>Carcharodon carcharias</i> (Linnaeus, 1758)	
species	<i>Cetorhinus maximus</i> (Gunnerus, 1765)	
species	<i>Alopias vulpinus</i> (Bonnaterre, 1788)	
species	<i>Alopias superciliosus</i> (Lowe, 1841)	
species	<i>Odontaspis ferox</i> (Risso, 1810)	
species	<i>Rhincodon typus</i> Smith, 1828	
species	<i>Squaliolus laticaudus</i> Smith & Radcliffe, 1912	
species	<i>Dalatias licha</i> (Bonnaterre, 1788)	
species	<i>Oxynotus paradoxus</i> Frade, 1929	
species	<i>Zameus squamulosus</i> (Günther, 1877)	
species	<i>Somniosus rostratus</i> (Risso, 1827)	
species	<i>Somniosus microcephalus</i> (Bloch & Schneider, 1801)	
species	<i>Scymnodalatias garricki</i> Kukuev & Konovalenko, 1988	
species	<i>Centroselachus crepidater</i> (Barbosa du Bocage & de Brito Capello, 1864)	
species	<i>Centrosymnus owstonii</i> Garman, 1906	
species	<i>Centrosymnus coelolepis</i> Barbosa du Bocage & de Brito Capello, 1864	
species	<i>Etmopterus spinax</i> (Linnaeus, 1758)	
species	<i>Etmopterus pusillus</i> (Lowe, 1839)	
species	<i>Etmopterus princeps</i> Collett, 1904	
species	<i>Centroscyllium fabricii</i> (Reinhardt, 1825)	
species	<i>Deania profundorum</i> (Smith & Radcliffe, 1912)	
species	<i>Deania calcea</i> (Lowe, 1839)	
species	<i>Centrophorus squamosus</i> (Bonnaterre, 1788)	
species	<i>Centrophorus granulosus</i> (Bloch & Schneider, 1801)	
species	<i>Hexanchus griseus</i> (Bonnaterre, 1788)	
species	<i>Heptranchias perlo</i> (Bonnaterre, 1788)	
species	<i>Chlamydoselachus anguineus</i> Garman, 1884	
species	<i>Mobula tarapacana</i> (Philippi, 1892)	

species	<i>Mobula mobular</i> (Bonnaterre, 1788)	
species	<i>Mobula birostris</i> (Walbaum, 1792)	
species	<i>Myliobatis aquila</i> (Linnaeus, 1758)	
species	<i>Dasyatis pastinaca</i> (Linnaeus, 1758)	
species	<i>Pteroplatytrygon violacea</i> (Bonaparte, 1832)	
species	<i>Taeniurops grabatus</i> (Geoffroy St. Hilaire, 1817)	
species	<i>Dipturus batis</i> (Linnaeus, 1758)	
species	<i>Leucoraja fullonica</i> (Linnaeus, 1758)	
species	<i>Raja brachyura</i> Lafont, 1873	
species	<i>Raja clavata</i> Linnaeus, 1758	
species	<i>Raja maderensis</i> Lowe, 1838	
species	<i>Rajella bigelowi</i> (Stehmann, 1978)	
species	<i>Dipturus oxyrinchus</i> (Linnaeus, 1758)	
species	<i>Bathyraja richardsoni</i> (Garrick, 1961)	
species	<i>Tetronarce nobiliana</i> (Bonaparte, 1835)	

Traits coverage

Data coverage of traits

PLEASE FILL IN TRAIT INFORMATION HERE

Temporal coverage

Notes:

Usage licence

Usage licence: Creative Commons Public Domain Waiver (CC-Zero)

IP rights notes: This work is licensed under a Creative Commons Attribution (CC-BY) 4.0 Licence.

Data resources

Data package title: Azores chondrichthyes updated checklist

Resource **link:** http://ipt.gbif.pt/ipt/resource?r=azores_chondrichthyes_updated_checklist_vs_1&v=1.9

Alternative **identifiers:** http://ipt.gbif.pt/ipt/resource?r=azores_chondrichthyes_updated_checklist_vs_1

Number of data sets: 1

Data set name: Azores chondrichthyes updated checklist

Data format: Darwin Core

Description: This updated checklist of the chondrichthyans already identified within the Azores EEZ follows the last revised version published by Barreiros and Gadig (2011). Two new records have been registered and the taxonomy has been updated. New information regarding the specific occurrence of the rare *Odontaspis ferox* was recently published (see Barcelos et al. 2018). The first comprehensive chondrichthyan checklist was published by Santos et al. (1997) and later updated by Porteiro et al. (2010).

Column label	Column description
id	identification of the record
taxonID	identification of the taxon
acceptedNameUsageID	identification of the usage name
parentNameUsageID	identification of the parent usage name
scientificName	scientific name of the taxon
parentNameUsage	name from which the taxon name originates
kingdom	kingdom
phylum	phylum
class	class
order	order
family	family
genus	genus
specificEpithet	specific epithet
taxonRank	taxon rank
scientificNameAuthorship	scientific name authorship

Additional information

The following species are referred to the Azores' EEZ by some authors: *Bathytoshia centroura* (Das and Afonso 2017, Santos et al. 2020), *Deania hystricosa* (Compagno 2016), *Dipturus intermedius* (Santos et al. 2020) and *Bathyraja pallida* (Das and Afonso 2017, Santos et al. 2020). However, they were not included in this checklist because those authors, as well as other sources (e.g. IUCN's Red List) report their occurrence as either doubtful or 'need to be confirmed'. As such, this fact does not allow us to have a degree of confidence that these species were actually confirmed to occur within this checklist geographic area.

Author contributions

LMDB, JMNA and JPB published the updated checklist in GBIF IPT - Portugal and built the framework. LMDB developed this paper and uploaded all the files into the Arphahub platform. All authors read and edited the submitted version and agreed on its present version.

References

- Barcelos LD, Azevedo J, Pollerspöck J, Barreiros J (2018) Review of the records of the smalltooth sand tiger shark, *Odontaspis ferox* (Elasmobranchii: Lamniformes: Odontaspidae), in the Azores. Acta Ichthyologica et Piscatoria 48 (2): 189-194. <https://doi.org/10.3750/AIEP/02436>
- Barcelos LM, Azevedo J, Barreiros JP (2020) Azores Chondrichthyes updated checklist. 1.5. Universidade dos Açores. Release date: 2020-10-28. URL: <https://doi.org/10.15468/dfqxwo>
- Barreiros J, Gadig OF (2011) Sharks and rays from the Azores - An illustrated catalogue. IAC - Instituto Açoriano de Cultura, Angra do Heroísmo. [ISBN 978-989-8225-24-5]
- Catarino D, Jakobsen K, Jakobsen J, Giacomello E, Menezes G, Diogo H, Canha Â, Porteiro F, Melo O, Stefanni S (2020) First record of the opal chimaera, *Chimaera opalescens* (Holocephali: Chimaeridae) and revision of the occurrence of the rabbitfish *Chimaera monstrosa* in the Azores waters. Journal of Fish Biology 97: 1-13. <https://doi.org/10.1111/jfb.14432>
- Compagno LJ (2016) Sharks. In: Carpenter KE, Angelis N (Eds) The Living Marine Resources of the Eastern Central Atlantic. Volume 2 - Bivalves, gastropods, hagfishes, sharks, batoid fishes and chimeras. FAO specie. FAO, Rome, 213 pp.
- Das D, Afonso P (2017) Review of the diversity, ecology, and conservation of Elasmobranchs in the Azores Region, Mid-North Atlantic. Frontiers in Marine Science 4: 1-19. <https://doi.org/10.3389/fmars.2017.00354>
- Dulvy NK, Fowler SL, Musick JA, Cavanagh RD, Kyne PM, Harrison LR, Carlson JK, Davidson LN, Fordham SV, Francis MP, Pollock CM, Simpfendorfer CA, Burgess GH,

Carpenter KE, Compagno LJ, Ebert DA, Gibson C, Heupel MR, Livingstone SR, Sanciangco JC, Stevens JD, Valenti S, White WT (2014) Extinction risk and conservation of the world's sharks and rays. *eLife* 3: 1-34. <https://doi.org/10.7554/eLife.00590>

- Greemberg R (2009) Guide to European Elasmobranches. *Oceana*, 78 pp. URL: https://usa.oceana.org/sites/default/files/reports/Guide_Elasmobranches_Europe_ING1_0.pdf
- Porteiro FM, Menezes GM, Afonso P, Monteiro JG, Santos RS (2010) Marine fish (Chondrichthyes, Actinopterygii). In: Borges PA, Costa A, Cunha R, Gabriel R, Gonçalves V, Martins AF, Melo I, Parente M, Raposeiro P, Rodrigues P, Santos RS, Silva L, Vieira P, Vieira V (Eds) *A list of the terrestrial and marine biota from the Azores*. Principia, Cascais, 3 pp.
- Santos R, Porteiro F, Barreiros J (1997) Marine fishes of the Azores - Annotated checklist and bibliography: a catalogue of the Azorean marine ichthyodiversity. *Arquipelago-Life and Marine Sciences* (Suppl 1).
- Santos R, Novoa-Pabon A, Silva H, Pinho M (2020) Elasmobranch species richness, fisheries, abundance and size composition in the Azores archipelago (NE Atlantic). *Marine Biology Research* 16 (2): 103-116. <https://doi.org/10.1080/17451000.2020.1718713>
- Vieira EA, Souza LRd, Longo GO (2020) Diving into science and conservation: recreational divers can monitor reef assemblages. *Perspectives in Ecology and Conservation* 18 (1): 51-59. <https://doi.org/10.1016/j.pecon.2019.12.001>
- Worm B, Davis B, Kettener L, Ward-Paige C, Chapman D, Heithaus M, Kessel S, Gruber S (2013) Global catches, exploitation rates, and rebuilding options for sharks. *Marine Policy* 40 (1): 194-204. <https://doi.org/10.1016/j.marpol.2012.12.034>

Supplementary material

Suppl. material 1: Species list - taxon remarks and occurrence details

Authors: Barcelos LMD, Azevedo JMN, Barreiros JP

Data type: taxon remarks, occurrence details, IUCN conservation status

[Download file](#) (21.82 kb)