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Author-formatted, not peer-reviewed document posted on 02/08/2024

DOI: <https://doi.org/10.3897/arphapreprints.e133586>

**Shallow-reef fish assemblage from
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Atlantic**

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Shallow-reef fish assemblage from Fernando de Noronha Archipelago, SW Atlantic

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Abstract

Background

The paper presents an extensive dataset of the shallow-reef fish communities and habitat characteristics in the Fernando de Noronha Archipelago (SW Atlantic). The data was collected from August to October of 2006 in the Fernando de Noronha main island, which belongs to the Brazilian Oceanic Islands - PELD/ILOC (<https://deims.org/030bec0b-f6ac-4840-b226-af813258b14b>). To evaluate the shallow-reef fish communities, 165 visual censuses were performed in eight different localities in the Fernando de Noronha Island.

New information

The dataset reports a comprehensive compilation of the shallow reef fish abundance, of eight localities of the Fernando de Noronha Archipelago. The dataset reveals spatial heterogeneity among the selected localities in terms of fish abundance, composition and size.

Keywords

abundance, *Thalassoma noronhanum*, *Stegastes rocasensis*, endemic, oceanic island, Brazil

Introduction

Oceanic islands are ecologically relevant habitats because of their high biodiversity, which is characterized by high degree of endemism (Kier et al. 2009). Their geographic isolation contributes to provide relevant environments for studying the dispersal and establishment of different species. An important group on oceanic islands are the reef fishes, which occupy a particularly important niche serving as a model to study relevant ecological interactions (Fernández-Cisternas et al. 2021). Since the mid-1990s, knowledge of reef fishes and biogeographic patterns of islands in the South Atlantic has steadily increased. To date, there have been several studies focusing on the reef ichthyofauna of the Fernando de Noronha archipelago. Most of them focused on the ecological/behavioral nature of the species or deal with ecological interactions (Garla et al. 2017, Souza and Ilarri 2014, Pereira et al. 2012, Souza et al. 2011), and only a few deal with new occurrences (Garla and Garcia 2008), description of new species (Sampaio et al. 2004; Smith-Vaniz et al. 2018), biogeography (Mendes 2007) and compilation work (Soto 1997, Soto 2001, Schmid et al. 2020).

Although the archipelago has been the subject of several studies of ichthyofauna, few of these have aimed to characterize the structure of fish assemblage (Ilarri et al. 2017, Medeiros et al. 2011, Krajewski et al. 2011, Krajewski and Floeter 2011). Therefore, it is important to provide detailed information on shallow reef fish species, for the different localities of the Archipelago of Fernando de Noronha.

From August to October of 2006, the ichthyofauna of the shallow reef of Fernando de Noronha Archipelago was assessed daily through visual censuses in eight selected localities. The aim of this study was to document the abundance of the shallow reef fish species data collected through visual census in Fernando de Noronha Archipelago. In this study, we provide a wealth of biodiversity data from an area of remarkable importance for Atlantic reef fishes that is currently underrepresented in large-scale ecological studies.

Project description

Study area description: The study was conducted in northeastern Brazil, more specifically in the Fernando de Noronha Archipelago, an isolated group of volcanic islands, with one main island (<https://deims.org/030bec0b-f6ac-4840-b226-af813258b14b>) and 19 smaller adjacent islands and an area of 26 km², located 345 km off the northeast coast of Brazil (3°54'S, 32°25'W) (Fig. 1).

Data collection was conducted at eight different localities within the Fernando de Noronha main island: Atalaia, Baía dos Golfinhos, Boldró, Buraco da Raquel, Porto de Santo Antônio, Sancho, Sueste (open) and Sueste (protected). These sites were chosen to cover the diversity of habitats in the archipelago. Atalaia is a small reef lagoon with a predominance of sandy and rocky habitats. Baía dos Golfinhos is a calm and sheltered

rocky area characterized by large pebbles and volcanic sand. Boldró comprises a reef flat area with sand and a rocky plateau in the intertidal zone, it is an area exposed to currents. Buraco da Raquel comprises a reef lagoon characterized by sand and rocks mainly, exposed to currents. Porto de Santo António is characterized by a reef area with sandy and rocky habitats mainly, it is a calm and sheltered area. Sancho comprises a bay with sand and large pebbles and rocks, it is a calm and sheltered area. Sueste (open) is a bay with rock and sand that has a central plateau, it is a calm and sheltered area. Sueste (protected) is a bay with rocks, sand and pebbles, it is a calm and sheltered area.

Design description:

Funding: Financial support was provided by CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior) to the first author, and by the Graduate Program in Biological Science (Zoology) of Universidade Federal da Paraíba. Martina I. Ilarri is currently supported by national funds through FCT – Foundation for Science and Technology, Portugal, within the scope of UIDB/04423/2020 and UIDP/04423/2020 and a research contract (DL57/2016/CP1344/CT0018). A. T. Souza is funded by eLTER PLUS (European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 871128) and BioDT (<https://doi.org/10.3030/101057437>).

Sampling methods

Description: Study extent

Sampling description: To assess the shallow reef fish communities, a total of 165 visual census were performed from August to October 2006 (with a minimum of 20 censuses per locality). All observations were made by free diving in areas with depths up to six meters (m) during the day (from 0800 to 1800 h) (Fig. 2). To account for possible tidal and temporal influences, observations were distributed throughout the day (morning and afternoon) and different tidal regimes (ebb and flood). The fish assemblage was assessed using a belt-transect (30 x 2 m) based on the belt-transect visual-census method (Brock 1954). All censuses were made by the same diver swimming at a constant speed, having previously stood by for five minutes to minimise disturbance caused by the diver's presence (Russ 1989). Fishes were counted, measured and identified according to Carvalho-Filho (1999) and Humann and Deloach (2002a) (Fig. 3). Sampling was conducted randomly in selected areas of the eight localities with predominantly (75%) consolidated substrate (Rogers et al. 1994, Ohlhorst et al. 1988, Humann and Deloach 2002b, Littler et al. 1989, Luckhurst and Luckhurst 1978).

Quality control: While visual censuses are often used to estimate fish populations on reefs, they have several limitations. Observer bias and varying skill levels can affect accuracy and lead to inconsistent data. Fish behavior, such as avoiding divers or hiding, skews counts, especially for shy or nocturnal species. Water clarity and light conditions also affect visibility and identification. In addition, visual censuses usually only cover small

areas, so wider population trends may be missed. All of these factors limit the reliability and representativeness of visual censuses for comprehensive assessments of fish populations on reefs, and therefore these known issues must be taken into account when using this database.

Geographic coverage

Description: This study was carried out in eight different localities (Atalaia, Baía dos Golfinhos, Boldró, Buraco da Raquel, Porto de Santo Antônio, Sancho, Sueste (open), Sueste (protected) within the Archipelago of Fernando de Noronha, Southwestern Atlantic, Brazil.

Coordinates: -3.86886 and -3.83987 Latitude; -32.44712 and -32.40372 Longitude.

Taxonomic coverage

Description:

The dataset contains the records of 15,065 individuals belonging to 51 species and two unidentified species, from 29 families (Fig. 4) with *Thalassoma noronhanum* and *Stegastes rocasensis* representing the vast majority of the individuals (Fig. 4). On average, the largest individuals were recorded at Baía dos Golfinhos and Sancho, while Atalaia and Buraco da Raquel had the largest contribution of small fish individuals (Fig. 5). The taxon identification numbers (acceptedNameUsageID) were based on GBIF Backbone Taxonomy (GBIF Secretariat 2022), whereas the common name of the species (vernacularName) were based on FishBase (Froese and Pauly 2024).

Taxa included:

Rank	Scientific Name	Common Name
species	<i>Abudefduf saxatilis</i>	Sergeant-major
species	<i>Acanthostracion polygonius</i>	Honeycomb cowfish
species	<i>Acanthurus bahianus</i>	Barber surgeonfish
species	<i>Acanthurus chirurgus</i>	Doctorfish
species	<i>Acanthurus coeruleus</i>	Blue tang surgeonfish
species	<i>Aluterus scriptus</i>	Scribbled leatherjacket filefish
species	<i>Anisotremus surinamensis</i>	Black margate
species	<i>Aulostomus maculatus</i>	Trumpetfish
species	<i>Bothus lunatus</i>	Plate fish
species	<i>Cantherhines pullus</i>	Orangespotted filefish

species	<i>Carangoides bartholomaei</i>	Yellow jack
species	<i>Caranx crysos</i>	Blue runner
species	<i>Caranx latus</i>	Horse-eye jack
species	<i>Caranx lugubris</i>	Black jack
species	<i>Cephalopholis fulva</i>	Coney
species	<i>Chaetodon ocellatus</i>	Spotfin butterflyfish
species	<i>Chromis multilineata</i>	Brown chromis
species	<i>Coryphopterus glaucofraenum</i>	Bridled goby
species	<i>Doratonotus megalepis</i>	Dwarf wrasse
species	<i>Echidna catenata</i>	Chain moray
species	<i>Gymnothorax miliaris</i>	Goldentail moray
species	<i>Haemulon chrysargyreum</i>	Smallmouth grunt
species	<i>Haemulon parra</i>	Sailor's grunt
species	<i>Halichoeres dimidiatus</i>	
species	<i>Halichoeres radiatus</i>	Puddingwife wrasse
species	<i>Harengula jaguana</i>	Scaled herring
species	<i>Hemiramphus brasiliensis</i>	Ballyhoo halfbeak
species	<i>Holocentrus adscensionis</i>	Squirrelfish
species	<i>Hypanus americanus</i>	Southern stingray
genus	<i>Kyphosus</i>	
species	<i>Labrisomus nuchipinnis</i>	Hairy blenny
species	<i>Lactophrys trigonus</i>	Buffalo trunkfish
species	<i>Lutjanus jocu</i>	Dog snapper
species	<i>Malacoctenus triangulatus</i>	Saddled blenny
species	<i>Melichthys niger</i>	Black triggerfish
species	<i>Mulloidichthys martinicus</i>	Yellow goatfish
species	<i>Muraena retifera</i>	Reticulate moray
species	<i>Myrichthys ocellatus</i>	Goldspotted eel
species	<i>Myripristis jacobus</i>	Blackbar soldierfish
species	<i>Negaprion brevirostris</i>	Lemon shark
species	<i>Ophioblennius trinitatis</i>	

species	<i>Paranthias furcifer</i>	Creole-fish
species	<i>Platybelone argalus</i>	Keeltail needlefish
species	<i>Pomacanthus paru</i>	French angelfish
species	<i>Pseudupeneus maculatus</i>	Spotted goatfish
species	<i>Sparisoma amplum</i>	Reef parrotfish
species	<i>Sparisoma axillare</i>	Gray parrotfish
species	<i>Sparisoma frondosum</i>	Agassiz's parrotfish
genus	<i>Sparisoma</i>	
species	<i>Sphyaena barracuda</i>	Great barracuda
species	<i>Sphyaena guachancho</i>	Guachanche barracuda
species	<i>Stegastes rocasensis</i>	Rocas gregory
species	<i>Thalassoma noronhanum</i>	Noronha wrasse

Temporal coverage

Data range: 2006-8-28 - 2006-10-28.

Usage licence

Usage licence: Other

IP rights notes: **CC BY 4.0**

Data resources

Data package title: fdd-reef-fish

Resource link: ipt.pensoft.net/manage/resource.do?r=fdd-reef-fish

Number of data sets: 2

Data set name: reeffdn_data_gbif-events-data_20240426_v01

Download URL: GBIF link here: xxxx

Data format: CSV

Description: The dataset reeffdn_data_gbif-events-data_20240426_v01 includes 18 terms terms that follow the Darwin Core standard (Darwin Core Maintenance Group 2021) whenever possible. The dataset contains 2735 observations, being 375 from Atalaia, 418 from Baía dos Golfinhos, 299 from Boldró, 364 from Buraco da Raquel,

285 from Porto de Santo Antônio, 408 from Sancho, 270 from Sueste (open) and 316 from Sueste (protected). Events ranged from August 28th to October 28th 2006, with earliest events starting at 07h55 and the latest event starting at 17h15.

Column label	Column description
coordinateUncertaintyInMeters	The horizontal distance (in meters) from the given <code>dwc:decimalLatitude</code> and <code>dwc:decimalLongitude</code> describing the smallest circle containing the whole of the <code>dcterms:Location</code> . Leave the value empty if the uncertainty is unknown, cannot be estimated, or is not applicable (because there are no coordinates). Zero is not a valid value for this term.
country	The name of the country or major administrative unit in which the <code>dcterms:Location</code> occurs.
countryCode	The standard code for the country in which the <code>dcterms:Location</code> occurs.
decimalLatitude	The geographic latitude (in decimal degrees, using the spatial reference system given in <code>dwc:geodeticDatum</code>) of the geographic center of a <code>dcterms:Location</code> . Positive values are north of the Equator, negative values are south of it. Legal values lie between -90 and 90, inclusive
decimalLongitude	The geographic longitude (in decimal degrees, using the spatial reference system given in <code>dwc:geodeticDatum</code>) of the geographic center of a <code>dcterms:Location</code> . Positive values are east of the Greenwich Meridian, negative values are west of it. Legal values lie between -180 and 180, inclusive.
eventDate	The date-time or interval during which a <code>dwc:Event</code> occurred. For occurrences, this is the date-time when the <code>dwc:Event</code> was recorded. Not suitable for a time in a geological context.
eventID	An identifier for the set of information associated with a <code>dwc:Event</code> (something that occurs at a place and time). May be a global unique identifier or an identifier specific to the data set.
eventTime	The time or interval during which a <code>dwc:Event</code> occurred.
geodeticDatum	The ellipsoid, geodetic datum, or spatial reference system (SRS) upon which the geographic coordinates given in <code>dwc:decimalLatitude</code> and <code>dwc:decimalLongitude</code> are based.
samplingProtocol	The names of, references to, or descriptions of the methods or protocols used during a <code>dwc:Event</code> .
samplingEffort	The amount of effort expended during a <code>dwc:Event</code> .
sampleSizeValue	A numeric value for a measurement of the size (time duration, length, area, or volume) of a sample in a sampling <code>dwc:Event</code> .

sampleSizeUnit	The unit of measurement of the size (time duration, length, area, or volume) of a sample in a sampling dwc:Event.
startDayOfYear	The earliest integer day of the year on which the dwc:Event occurred (1 for January 1, 365 for December 31, except in a leap year, in which case it is 366).
locality	The specific description of the place.
locationID	An identifier for the set of dcterms:Location information. May be a global unique identifier or an identifier specific to the data set.
ownerInstitutionCode	The name (or acronym) in use by the institution having ownership of the object(s) or information referred to in the record.
occurrenceStatus	A statement about the presence or absence of a dwc:Taxon at a dcterms:Location.

Data set name: reeffdn_data_gbif-occurrences-data_20240425_v01

Download URL: GBIF link here: xxxx

Data format: CSV

Description: The dataset reeffdn_data_gbif-occurrences-data_20240425_v01 includes 34 terms that follow the Darwin Core standard (Darwin Core Maintenance Group 2021) whenever possible. The dataset contains 2735 observations, from 53 different taxonomic entities (51 species and 2 genus). A total of 15065 individuals were recorded, ranging from 3 to 130 cm of Total Length (TL). The dataset offers valuable insights into the biodiversity dynamics of the Fernando de Noronha Archipelago ecosystem during the specific time period.

Column label	Column description
coordinateUncertaintyInMeters	The horizontal distance (in meters) from the given dwc:decimalLatitude and dwc:decimalLongitude describing the smallest circle containing the whole of the dcterms:Location. Leave the value empty if the uncertainty is unknown, cannot be estimated, or is not applicable (because there are no coordinates). Zero is not a valid value for this term.
country	The name of the country or major administrative unit in which the dcterms:Location occurs.
countryCode	The standard code for the country in which the dcterms:Location occurs.
decimalLatitude	The geographic latitude (in decimal degrees, using the spatial reference system given in dwc:geodeticDatum) of the geographic center of a dcterms:Location. Positive values are north of the Equator, negative values are south of it. Legal values lie between -90 and 90, inclusive

decimalLongitude	The geographic longitude (in decimal degrees, using the spatial reference system given in dwc:geodeticDatum) of the geographic center of a dcterms:Location. Positive values are east of the Greenwich Meridian, negative values are west of it. Legal values lie between -180 and 180, inclusive.
eventDate	The date-time or interval during which a dwc:Event occurred. For occurrences, this is the date-time when the dwc:Event was recorded. Not suitable for a time in a geological context.
eventID	An identifier for the set of information associated with a dwc:Event (something that occurs at a place and time). May be a global unique identifier or an identifier specific to the data set.
eventTime	The time or interval during which a dwc:Event occurred.
geodeticDatum	The ellipsoid, geodetic datum, or spatial reference system (SRS) upon which the geographic coordinates given in dwc:decimalLatitude and dwc:decimalLongitude are based.
year	The four-digit year in which the dwc:Event occurred, according to the Common Era Calendar.
month	The integer month in which the dwc:Event occurred.
day	The integer day of the month on which the dwc:Event occurred.
continent	The name of the continent in which the dcterms:Location occurs.
stateProvince	The name of the next smaller administrative region than country (state, province, canton, department, region, etc.) in which the dcterms:Location occurs.
island	The name of the island on or near which the dcterms:Location occurs.
locality	The specific description of the place.
basisOfRecord	The specific nature of the data record.
occurrenceID	An identifier for the dwc:Occurrence (as opposed to a particular digital record of the dwc:Occurrence). In the absence of a persistent global unique identifier, construct one from a combination of identifiers in the record that will most closely make the dwc:occurrenceID globally unique.
kingdom	The full scientific name of the kingdom in which the dwc:Taxon is classified.
phylum	The full scientific name of the phylum or division in which the dwc:Taxon is classified.
order	The full scientific name of the order in which the dwc:Taxon is classified.
family	The full scientific name of the family in which the dwc:Taxon is classified.
genus	The full scientific name of the genus in which the dwc:Taxon is classified.
specificEpithet	The name of the first or species epithet of the dwc:scientificName.

scientificName	he full scientific name, with authorship and date information if known. When forming part of a dwc:Identification, this should be the name in lowest level taxonomic rank that can be determined. This term should not contain identification qualifications, which should instead be supplied in the dwc:identificationQualifier term.
establishmentMeans	Statement about whether a dwc:Organism has been introduced to a given place and time through the direct or indirect activity of modern humans.
taxonRank	The taxonomic rank of the most specific name in the dwc:scientificName.
taxonID	A global unique identifier for the taxon (name in a classification).
identifiedBy	A list (concatenated and separated) of names of people, groups, or organizations who assigned the dwc:Taxon to the subject.
dateIdentified	The date on which the subject was determined as representing the dwc:Taxon.
identificationReferences	A list (concatenated and separated) of references (publication, global unique identifier, URI) used in the dwc:Identification.
organismQuantity	A number or enumeration value for the quantity of dwc:Organisms.
organismQuantityType	The type of quantification system used for the quantity of dwc:Organisms.
dynamicProperties	A list of additional measurements, facts, characteristics, or assertions about the record. Meant to provide a mechanism for structured content.

Additional information

This work was carried out in accordance with Brazilian legal requirements, including those related to the conservation and protection of animals.

Acknowledgements

The authors would like to thank Águas Claras diving centre, for allowing free use of its facilities and to IBAMA for issuing research permits to the Fernando de Noronha National Marine Park. MII acknowledge support from CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior) and by the Graduate Program in Biological Science (Zoology) of Universidade Federal da Paraíba. Also, MII Is currently supported by national funds through FCT – Foundation for Science and Technology, Portugal, within the scope of the Strategic Funding to CIIMAR (UIDB/04423/2020 and UIDP/ 04423/2020) and research contract (DL57/2016/CP1344/CT0018). This study has received funding from the European Union's Horizon Europe Research and Innovation Programme under grant agreement No 101057437 (BioDT project, <https://doi.org/10.3030/101057437>). This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 871128 (eLTER PLUS). Open access funded by Helsinki University Library.

Author contributions

The authors have contributed to this data paper according to the following CRediT statements.

Conceptualisation: MII, ATS

Data curation: MII, ATS

Formal analysis: ATS

Funding acquisition: MII

Investigation: MII, LV, HMG, RSR, ATS

Methodology: MII, ATS

Project administration: MII

Resources: MII

Software: MII, ATS

Supervision: ATS

Validation: MII, ATS

Visualisation: MII, ATS

Writing - original draft: MII, ATS

Writing - review & editing: MII, LV, HMG, RSR, ATS

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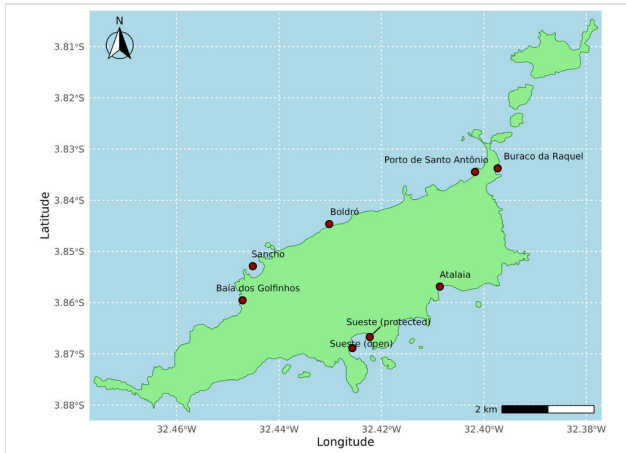


Figure 1.

Map of the Fernando de Noronha archipelago (SW, Atlantic) showing the eight sampled localities.



Figure 2.

A photo showing a researcher performing a visual census of reef fish in the Fernando de Noronha Archipelago, PE, Brazil. Photo by Allan T. Souza.



Figure 3.

A plate with representative reef fish species observed during the visual censuses in the Fernando de Noronha Archipelago, SW Atlantic. **A** *Stegastes rocasensis*; **B** *Bothus lunatus*; **C** *Sparisoma frondosum*; **D** *Caranx latus*; **E** *Myripristis jacobus*; **F** *Muraena retifera*. Photos by Allan T. Souza.

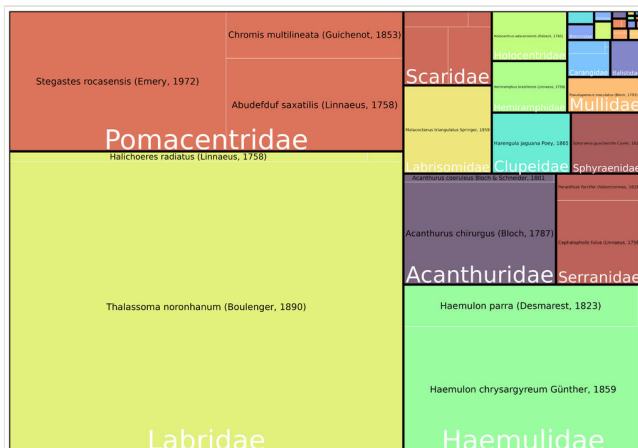


Figure 4.

Treemap showing the proportion of the most representative species per family observed in the visual censuses made in the Fernando de Noronha Archipelago, SW Atlantic. The area of each rectangle is proportional to the total abundance of all species sampled in this study.

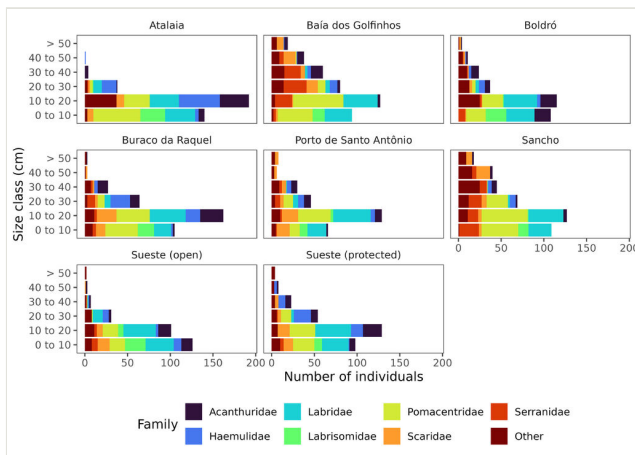


Figure 5.

Size class (0-10; 10-20; 20-30; 30-40; 40-50; >50 cm) per study area of the most representative fish families observed in the visual censuses made in the Fernando de Noronha Archipelago, SW Atlantic. Less representative families were pooled together and were displayed as Other in the graph.