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Research Article

The ichthyofauna of the Alcatrazes archipelago (São Sebastião, São Paulo, Brazil)

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Abstract

This checklist was compiled from fish species recorded in surveys carried out from 1987 to 2019 in the Alcatrazes Archipelago, in the southeastern Brazilian coast. A total of 231 fish species (22 elasmobranchs and 209 actinopterygians) were recorded in the Archipelago, combining *in situ* and bibliographic data. The families with the largest numbers of species were Labridae (21), Carangidae (16), Sciaenidae (14), Cyclopsettidae (8), Epinephelidae (8), and Pomacentridae (8). Of all the registered species, 74% presented economic importance, 21 species (8.9%) are illegally used for aquaria in the state of São Paulo. 35% of the species range from moderate to very high vulnerability, including mostly of the elasmobranch species (81.8%). In particular, 26 (11.3%), 22 (9.6%), and 44 (19.2%) species were listed globally, nationally and regionally, respectively, leastwise as vulnerable. Compared to other Brazilian reef systems, as the Laje de Santos Marine State Park, the Queimada Grande and Queimada Pequena islands, Alcatrazes showed greater fish biodiversity and also a similar species richness to the Abrolhos Bank. The Alcatrazes Archipelago may be pinpointed as an important fish biodiversity hotspot for Brazilian southeast ichthyofauna, sheltering species of endangered and economically importance.

Keywords: fish assemblage, species list, vulnerability, conservation, marine protected area

Introduction

Marine protected areas (MPAs) have been considered and promoted as important and interactive strategies to achieve effective global ocean ecosystem protection and conservation (Mascia et al., 2010; Toropova et al., 2010; Laffoley et al., 2019). Healthy marine ecosystems provide economic and social benefits for many critical services, such as food security, fisheries management, aquaculture, environmental education, marine tourism, and recreation, among others (Laffoley et al., 2019). MPAs also provide a range of ecological benefits, including increasing density and biomass, and individual size and diversity in all functional groups, reaching 20% and 30% higher relative to unprotected areas; supporting and restoring ecosystem structure, integrity, function, and

connectivity; an enhance in the fecundity and productivity of exploited populations (García-Charton et al., 2008; Pérez-Ruzafa et al., 2017; Laffoley et al., 2019).

Complimentary for MPAs management, inventories and checklists are important tools for biodiversity and ichthyofauna structure evaluation, providing records on fish communities richness and their temporal variations, and as a reference for environmental agencies and decision-makers (Rocha and Dias 2015). Some studies addressing the ichthyofauna composition of Brazilian MPAs were already published: Luiz Jr. et al. (2008) for the Laje de Santos Marine State Park; Moura et al. (2003) and Cardoso et al. (2019) for the Area of Relevant Ecological Interest of the Queimada Grande and the Queimada Pequena islands; Vaske Jr. et al. (2005) for the Environmental Protection Area of Saint Peter and Saint Paul Archipelago; and Moura et al. (2005) for the Abrolhos Marine National Park.

In the southwest Atlantic, the Alcatrazes Archipelago (São Sebastião, São Paulo, Brazil) embraces two no-take MPAs -the Tupinambás Ecological Station (TES, 1987) and the Alcatrazes Wildlife Refuge (AWR, 2016)-, preserving high biodiversity of terrestrial and marine species (ICMBio, 2017). A few studies have assessed the Alcatrazes Archipelago ichthyofauna: Gibran and Moura (2012) and Rolim et al. (2017) using visual census sampling and Paiva Filho et al. (1989) using otter-trawl. These studies, complemented with unpublished data, could enrich current biodiversity knowledge. Still, impacts of anthropic activities, namely commercial and sportive illegal fishing, tourism, harbor activities, and oil and gas exploration (Hoff et al., 2015), on biodiversity are not yet fully understood. In this study, we have compiled the first checklist of fish species inhabiting the surroundings of the Alcatrazes Archipelago, including data from geographic distribution; economic importance; vulnerability; and state, national and international conservation status. This inventory also provides valuable information for conservation and management purposes, other scientific studies on fish ecology, and determining the latest status of the fish fauna in the Alcatrazes Archipelago.

Material and Methods

Study area

The Alcatrazes Archipelago has its geological origin related to the uplift of the Serra do Mar coastal range and the subsidence of the Santos Basin, which occurred since the end of the Cretaceous, leading to the outcrop of Precambrian gneisses and granites and Cretaceous alkaline rocks (Furtado et al., 2008). Many islands appear as outcrops of the crystalline rocks as an offshore ward continuation of the Serra do Mar range (Dias et al., 2021). Some of these islands comprise the Alcatrazes Archipelago, located approximately 37 km off the continental coastline (24º10'S, 45º70'W; Figure 1).

Its position favors the action of waves coming from different directions and leading to distinct degrees of exposure. The Alcatrazes Archipelago has its geological origin related to the uplift of the Serra do Mar ridge and the subsidence of the Santos Basin, leading to strictly rocky structures (Furtado et al., 2008). The wave power is higher at the exposed side of the Alcatrazes main island due to the local geomorphology, with magnitudes varying seasonally: winter and autumn present more energetic southerly waves (Takase et al., 2021). Sandy sediments are predominant in submerged sectors of the Archipelago, with a greater contribution of gravel sediments near the Alcatrazes island (Hoff et al., 2015).

Based on literature reports, Alcatrazes Archipelago is important as nest area for marine birds (Muscat et al., 2014), and to the inland endemic vipers and anuran (Bataus & Reis, 2011), an endemic annelid (Nogueira et al., 2001), and a calcareous sponge (Lana et al., 2007). The fish biomass matches or even exceeds that found around oceanic islands such as Trindade and the São Pedro and São Paulo Archipelagos (SISBIOTA 2014), and it is characterized by high richness and large specimens (Gibran & Moura, 2012).

Data collection and analysis

The dataset on fish species inhabiting the Alcatrazes Archipelago consists of a literature review (Paiva Filho et al., 1989; Instituto Laje Viva, 2012; Gibran & Moura, 2012; Rolim et al., 2017; ICMBio, 2017) and four surveys conducted in September 2011, January 2014, December 2018 and July 2019. All these information sources are available in Table 1. Data from the 2011, 2014, 2018 and 2019 cruises were collected by ECORREP (Reproductive Ecology and Recruitment of Marine Organisms Lab.) and

presented in the master's thesis by Natasha Travenisk Hoff (2011 and 2014 - IOUSP), and in the graduation monograph by Renata Gomes (2018 and 2019 - IOUSP).

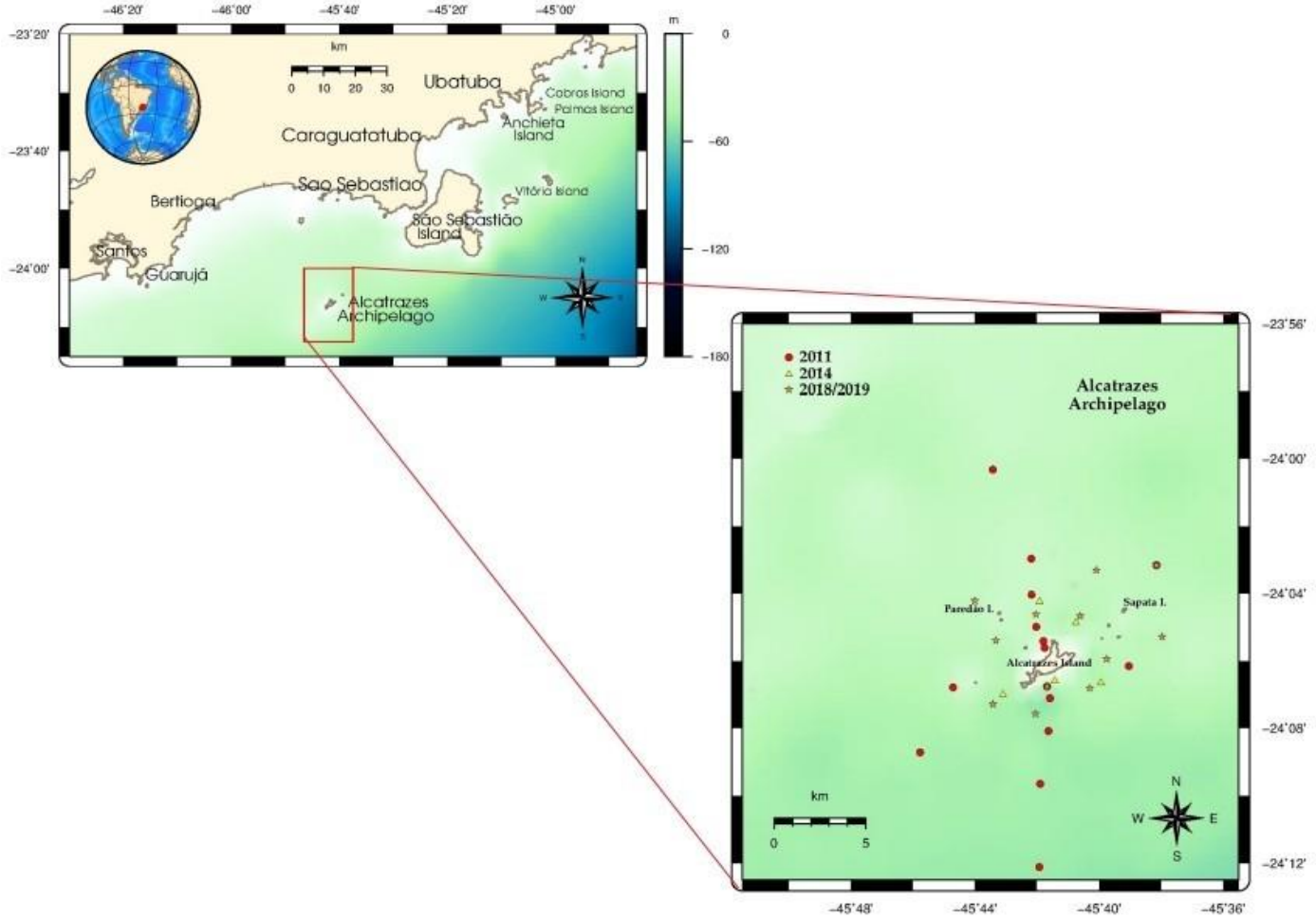

Figure 1. Map of the Alcatrazes Archipelago, São Paulo, Brazil, showing the sampling stations in 2011 (red dots), 2014 (yellow triangles), and 2018/2019 (orange stars).

Table 1. Details on year, methods and depth range of the different sources consulted **(**NA: not available).

Author	Year	Methot	Depth range
Paiva Filho et al. (1989)	1986	Otter trawling	23 - 52 m
Present study	2011	Otter trawling	27 - 56 m
Present study	2014	Otter trawling	33 - 53 m
Present study	2018-2019	Otter trawling	33 - 48.5 m
Laje Viva 2011-2012 report	2011-2012	Scuba diving	NA
Gibran & Moura (2012)	2006-2007	Scuba diving	6 - 24 m
Rolim et al. (2017)	2016-2017	BRUV (Baited Remote Underwater Video); DOV (Diver Operated Video); and compiled data	BRUV: 2 - 17 m DOV: 2.3 - 12.7 m
ICMBio (2017)	Compiled data		

The captures were made using an otter trawl net operated for about 10 minutes at a speed of two knots by the R/Vs Soloncy Moura (Instituto Chico Mendes de Conservação da Biodiversidade - ICMBio, Sep. 2011) and Alpha Delphini (Oceanographic Institute of the University of São Paulo, Jan. 2014). The location of the fifteen and five oceanographic stations sampled in each period, respectively, can be seen on the map in Figure 1. The sampling depths varied between 27 and 56 meters in 2011, between 33 and 53 meters in 2014, and from 33 to 43.5 m in 2018-2019. The actinopterygians collected in 2011 and 2014 were sacrificed by cooling and immediately frozen on board, and bony fish sampled in 2018/2019 were euthanized using solution of eugenol at 400 mg L^{-1}. In the laboratory, they were sorted and identified based on the identification keys of Figueiredo and Menezes (1978, 1980, 2000) and Menezes and Figueiredo (1980, 1985).

For all elasmobranch specimens, biological data were recorded onboard: all individuals were measured (weight, total length), had their sexes identified, were photographed for later identification based on Gomes et al. (2019), and immediately released to the sea alive and in survival conditions. FishBase (Froese & Pauly, 2021), the World Register of Marine Species – WoRMS (WoRMS Editorial Board 2021) and Frick et al. (2021) were used to update the nomenclature.

The species were classified into geographic distribution categories to evaluate the zoogeographic affinities based on Floeter et al. (2008), Luiz Jr et al. (2008), Eschmeyer et al. (2014), and Froese and Pauly (2021). The categories are described as follows: Circumtropical (CT), Eastern Pacific (EP); Trans-Atlantic (Western and Eastern Atlantic Ocean; TA); Western Atlantic (Northern and Southern Atlantic Ocean; WA); Southwest Atlantic (from Northern Brazil to Argentina; SWA), Southern Southwest Atlantic (Southeastern and Southern Brazil, Uruguay, and Argentina; SSWA), Caribbean (from Florida to Venezuela; Ca), Brazilian Province (from the Orinoco River Delta in Venezuela to the State of Santa Catarina in Brazil; Br).

The economic importance of the species was evaluated according to four categories: 1) aquarium (Brasil 2008); 2) food, related to human consumption; 3) animal nutrition; 4) none if no commercial purpose was identified. The last three categories' results were based on Figueiredo and Menezes (1978, 1980, 2000), Menezes and Figueiredo (1980, 1985), Spier et al. (2018), and Froese and Pauly (2021). For local commercialization in the São Paulo state, the *Companhia de Entrepostos e Armazéns Gerais de São Paulo* website (CEAGESP 2021) and Carvalho (2020) were consulted.

Vulnerability to the extinction of each species was determined based on the life history and ecological characteristics and included seven categories: low (L), low to moderate (LM), moderate (M), moderate to high (MH), high (H), high to very high (HVH), and very high (VH) (Froese and Pauly 2021). Regarding their international, national, and state conservation status, species were also classified according to the IUCN (2021), ICMBio (2018), and São Paulo (2018). This information provided a valuable assessment of the Alcatrazes MPAs importance in protecting endangered species.

Results

The Alcatrazes ichthyofauna sampled in 2011 comprised 2058 actinopterygians and 104 elasmobranchs distributed over 71 species and two genera from 39 families (Table 2). The most abundant species made up 81.9%, belonging to nine families: Sciaenidae, Sparidae, Triglidae, Batrachoididae, Monacanthidae, Dactylopteridae, Diodontidae, Cyclopsettidae, and Trygonorrhinidae. Sciaenidae and Cyclopsettidae were the most representative families, with 10 and 6 species each, followed by Carangidae (5 species) and Arhynchobatidae (4 species). In 2014, the 1189 actinopterygians and 96 elasmobranchs captured were distributed over 41 species from 28 families. The most abundant species made up 81.7%, belonging to nine families: Mullidae, Sparidae, Dactylopteridae, Cyclopsettidae, Triglidae, Trygonorrhinidae, and Batrachoididae. Arhynchobatidae, Paralichthyidae, and Sciaenidae were the most representative families, with four species each, followed by Carangidae (3 species).

When considering *in situ* and bibliographic data, a total of 231 fish species (209 Actinopterygii and 22 Elasmobranchii) distributed over 82 families were recorded in the Alcatrazes Archipelago (Table 2). Labridae was the richest family with 21 species, followed by Carangidae (16), Sciaenidae (14), Cyclopsettidae (8), Epinephelidae (8), and Pomacentridae (8). *Halichoeres* (7) and *Sparisoma* (6), both from Labridae family, were the dominant genera in the number of species, followed by *Chromis* (4), *Cynoscion* (4), *Gymnothorax* (4), *Mycteroperca* (4), *Paralichthys* (4), and *Seriola* (4).

At least four different methods were employed to assess the Alcatrazes Archipelago's ichthyofauna. From all registers, 17 (7.2%) were obtained exclusively through scuba diving. Another 101 taxa (42.6%) came solely from otter trawling reports; from those, 27 species (11.4%) were sampled only in our surveys in 2011 and 2014.

The geographic distribution of the species of the Alcatrazes Archipelago among the different categories shows that most of them are widely distributed over the WA (88, 37.1%), followed by the 44 species (18.6%), which are TA, 7.6% (18) occur in the SWA, 6.8% (16) are CT, 5.9% (14) are found in the Ca and Br, 6.5% (15) are endemic to the Br, and 5.5% (13) occur in the SSWA.

Regarding their economic importance, 74.3% of the registered species present some commercial purpose: 92 species (38.8%) and 13 species (5.5%), respectively, are used for human and animal consumption globally, and 80 species (33.8%) are legally allowed to be used as aquarium hobbies. Almost

80 species also present local importance: 26 species (11%) are used for human consumption, another 19 species (8%) are used for aquaria, and 30 species (12.7%) are used for both activities. We highlighted the illegal use of 21 species (8.9%) for aquaria in the state of São Paulo (Table 2).

A total of 50.2% of the species are categorized under low to moderate vulnerability to extinction, and 35% range from moderate to very high vulnerability (Table 2). From the 22 elasmobranchs registered in the Alcatrazes Archipelago, 81.8% (18) are described as highly to very highly vulnerable. Considering the three red lists, 88.6% (international), 91.6% (national), and 51.1% (state) species of the Alcatrazes cataloged species were assessed for their risk of extinction. According to the International Union for Conservation of Nature (IUCN), 163 species were listed as least concerned, 13 as deficient data, eight as near threatened, 14 as vulnerable, eight as endangered, and four as critically endangered. The Brazilian law classified more species than others: 152 species were classified as least concern, 27 as deficient data, 16 as near threatened, 12 as vulnerable, five as endangered, and five as critically endangered. The São Paulo state legislation listed fewer species in the area, nonetheless with higher risk of extinction (22 vulnerable, 20 endangered, 2 critically endangered), another 16 species almost threatened, and 77 species presenting insufficient data.

Table 2: Ichthyofauna recorded in the Alcatrazes Archipelago region, São Sebastião (SP). (References: 1. Paiva Filho et al. (1989); 2. present work (2011); 3. present work (2014); 4. Laje Viva Report 2011-2012; 5. Gibran & Moura (2012); 6. Rolim et al. (2017); 7. ICMBio (2017); 8. present work (2018-2019). Brazilian marine fish common name: Figueiredo & Menezes (1978, 1980, 2000), Menezes & Figueiredo (1980, 1985). G.D.: Geographic Distribution (Floeter *et al.*, 2008; Luiz Jr *et al.*, 2008; Eschmeyer *et al.*, 2014; Froese & Pauly, 2021): Circumtropical (CT), Eastern Pacific (EP); Trans-Atlantic (Western and Eastern Atlantic Ocean; TA); Western Atlantic (Northern and Southern Atlantic Ocean; WA); Southwest Atlantic (from Northern Brazil to Argentina; SWA), Southern Southwest Atlantic (Southeastern and Southern Brazil, Uruguay, and Argentina; SSWA), Caribbean (from Florida to Venezuela; Ca), Brazilian Province (from the Orinoco River Delta in Venezuela to the State of Santa Catarina in Brazil; Br). E.I.: Economic Importance: Figueiredo & Menezes (1978, 1980, 2000), Menezes & Figueiredo (1980, 1985), Brasil (2008), Spier *et al.* (2018), and Froese & Pauly (2021); AQ: aquarium; bold: species commercialized at São Paulo state (CEAGESP, 2021); red: species illegally commercialized for aquarium in Brazil (Carvalho, 2020). VinFB: Vulnerability (Froese & Pauly, 2021): low (L), low to moderate (LM), moderate (M), moderate to high (MH), high (H), high to very high (HVH), and very high (VH). Conservation status (IUCN, 2021; ICMBio, 2018; São Paulo, 2018): DD – data deficient; LC – least concern; NT – near threatened; VU – vulnerable; EN – endangered; CR – critically endangered; QAME – almost threatened).

Family	Scientific name	Brazilian common name	G.D.	E.I.	VinFB	IUCN	BR	SP	Source
Elasmobranchii									
Aetobatidae	*Aetobatus narinari* (Euphrasen, 1790)	Raia-pintada	CT	**AQ**	VH	NT	DD	QAME	4, 6
Arhynchobatidae	*Atlantoraja castelnaui* (Miranda Ribeiro, 1907)	Raia-chita	SWA	food	VH	CR	EN	EN	2, 3, 8
Arhynchobatidae	*Atlantoraja cyclophora* (Regan, 1903)	Raia-carimbada	WA	food	H	EN	NT	EN	2, 3, 8
Arhynchobatidae	*Psammobatis extenta* (Garman, 1913)	Raia-de-areia	SWA	No	LM	LC	DD	EN	2, 8
Arhynchobatidae	*Psammobatis* sp.								2, 3
Arhynchobatidae	*Rioraja agassizii* (Müller & Henle, 1841)	Raia-santa	SSWA	food	MH	VU	EN	EN	2, 3, 8
Dasyatidae	*Hypanus americana* (Hildebrand & Schroeder, 1928)	Raia-prego	WA	food	VH	NT	DD	QAME	5, 8
Dasyatidae	*Hypanus guttatus* (Bloch & Schneider, 1801)	Raia-lixa	Ca+Br	**AQ / food**	VH	NT	LC	QAME	8
Dasyatidae	*Dasyatis hypostigma* Santos & Carvalho, 2004	Raia-manteiga	SWA	food	H	EN	DD	-	4, 8
Dasyatidae	*Dasyatis* sp.								
Mobulidae	*Mobula birostris* (Walbaum, 1792)	Raia-manta, jamanta	CT	No	VH	EN	VU	VU	7
Myliobatidae	*Myliobatis freminvillii* Lesueur, 1824	Raia-sapo	WA	No	H	VU	EN	DD	2, 6, 8
Rhinopteridae	*Rhinoptera bonasus* (Mitchill, 1815)	Raia-manteiga	TA	food	HVH	VU	DD	EN	8
Rhinopteridae	*Rhinoptera brasiliensis* Müller, 1836	Raia-manteiga	SWA	food	HVH	VU	CR	EN	8
Rhinopteridae	*Rhinoptera steindachneri* Evermann & Jenkins, 1891		WA+EP	No	HVH	NT	-	-	4, 6
Rhinobatidae	*Pseudobatos horkelii* (Müller & Henle, 1841)	Raia-viola	SWA	food	HVH	CR	CR	EN	3, 8
Rhinobatidae	*Pseudobatos percellens* (Walbaum, 1792)	Raia-viola	TA	**AQ / food**	H	EN	DD	EN	8
Sphyrnidae	*Sphyrna lewini* (Griffith & Smith, 1834)	Tubarão-martelo	CT	food	VH	CR	CR	CR	7
Squalidae	*Squalus albicaudus* Viana, Carvalho & Gomes, 2016	Cação-bagre	Br	No	H	DD	DD	CR	2, 8
Squatinidae	*Squatina occulta* Vooren & da Silva, 1992	Cação-anjo-de-asa-curta	SWA	food	H	CR	CR	EN	3, 7, 8
Squatinidae	*Squatina guggenheim* Marini, 1936	Cação-anjo-espinhudo	SWA	food	H	EN	CR	EN	2, 8
Torpedinidae	*Tetronarce nobiliana* (Bonaparte, 1835)	Raia-elétrica	TA	No	VH	DD	NT	DD	7
Trygonorrhinidae	*Zapteryx brevirostris* (Müller & Henle, 1841)	Raia-viola-de-bico-curto, banjo	SWA	**AQ** / food	M	EN	VU	-	1, 2, 3, 8
Triakidae	*Mustelus higmani* Springer & Lowe, 1963	Canejo	WA	food	MH	EN	LC	-	7
Actinopterygii									
Acanthuridae	*Acanthurus bahianus* Castelnau, 1855	Peixe-cirurgião	WA	AQ	L	LC	LC	-	4, 5, 6
Acanthuridae	*Acanthurus chirurgus* (Bloch, 1787)	Peixe-cirurgião	TA	AQ	L	LC	LC	-	4, 5, 6
Acanthuridae	*Acanthurus coeruleus* Bloch & Schneider, 1801	Peixe-cirurgião	WA	AQ	H	LC	LC	-	4, 6
Achiridae	*Gymnachirus nudus* Kaup, 1858	Liguado-zebra	WA	AQ	L	LC	LC	DD	1
Antennariidae	*Antennarius striatus* (Shaw, 1794)	Peixe-pescador	CT	AQ	L	LC	DD	DD	7
Apogonidae	*Apogon pseudomaculatus* Longley, 1932	Apogon-de-duas-manchas	TA	AQ	L	LC	LC	DD	7
Apogonidae	*Apogon quadrisquamatus* Longley, 1934	Totó-dourado	WA	No	L	LC	DD	DD	7
Apogonidae	*Astrapogon puncticulatus* (Poey, 1867)	Apogon-bangai	WA	No	L	LC	LC	-	7
Ariidae	*Genidens barbus* (Lacepède, 1803)	Bagre-branco	SSWA	food	H	-	EN	VU	2, 8
Balistidae	*Balistes capriscus* Gmelin, 1789	Peixe-porco, peroá	TA	**AQ / food**	LM	VU	NT	VU	1, 2, 8
Balistidae	*Balistes vetula* Linnaeus, 1758	Peixe-porco	TA	No	M	NT	NT	DD	6
Batrachoididae	*Porichthys porosissimus* (Cuvier, 1829)	Mamangá-liso, mangangá	SSWA	AQ	LM	-	LC	-	1, 2, 3, 8
Batrachoididae	*Thalassophryne montevidensis* Berg, 1893	Peixe-sapo-venenoso	SWA	AQ	LM	-	LC	DD	2
Blenniidae	*Ophioblennius atlanticus* (Valenciennes, 1836)		TA	No	LM	LC	-	-	4

Blenniidae	*Parablennius marmoreus* (Poey, 1876)	Macaco-mármore	WA	AQ	L	LC	LC	-	5, 6
Blenniidae	*Parablennius pilicornis* (Cuvier, 1829)	Macaco-das-pedras	TA	AQ	LM	LC	LC	-	5, 6
Blenniidae	*Parablennius* sp.								4
Blenniidae	*Scartella cristata* (Linnaeus, 1758)	Macaco-verde	CT	No	L	LC	LC	-	4, 6
Belonidae	*Tylosurus acus* (Lacepède, 1803)	Peixe-agulha	CT	food	MH	-	LC	DD	7
Bothidae	*Bothus robinsi* Topp & Hoff, 1972	Linguado	WA	animal nutrition	M	LC	LC	DD	1
Bothidae	*Bothus* sp.	Linguado							3
Callionymidae	*Paradiplogrammus bairdi* Jordan, 1888	Peixe-pau	TA	No	L	LC	LC	DD	7
Carangidae	*Caranx ruber* (Bloch, 1793)		WA	food	H	LC	LC	DD	4
Carangidae	*Caranx crysos* (Mitchill, 1815)	Carapau	TA	**AQ / food**	LM	LC	LC	-	4, 6
Carangidae	*Caranx latus* Agassiz, 1831	Xaralete, arachimboia	TA	food	H	LC	LC	DD	4, 6
Carangidae	*Chloroscombrus chrysurus* (Linnaeus, 1766)	Palombeta, arriba	TA	**AQ / food**	LM	LC	LC	-	2, 8
Carangidae	*Decapterus punctatus* (Cuvier, 1829)	Carapau	TA	animal nutrition	LM	LC	LC	-	2, 3
Carangidae	*Pseudocaranx dentex* (Bloch & Schneider, 1801)	Garapoá, falsa-guarajuba	CT	food	HVH	LC	LC	DD	4, 6
Carangidae	*Selar crumenophthalmus* (Bloch, 1793)	Carapau, xixarro	CT	**food**	M	LC	LC	DD	7
Carangidae	*Selene setapinnis* (Mitchill, 1815)	Peixe-galo	WA	food	LM	LC	LC	QAME	2, 3, 8
Carangidae	*Selene vomer* (Linnaeus, 1758)	Galo-de-penacho	WA	**AQ / food**	LM	LC	LC	QAME	8
Carangidae	*Seriola dumerili* (Risso, 1810)	Olho-de-boi, arabaiana	CT	food	MH	LC	LC	DD	4, 6
Carangidae	*Seriola fasciata* (Bloch, 1793)	Arabaiana	TA	food	MH	LC	DD	DD	7
Carangidae	*Seriola lalandi* Valenciennes, 1833	Olhete, arabaiana	TA+EP	food	HVH	LC	LC	DD	4, 6
Carangidae	*Seriola rivoliana* Valenciennes, 1833	Remeiro, arabaiana	WA+EP	food	VH	LC	LC	DD	4
Carangidae	*Trachinotus carolinus* (Linnaeus, 1766)	Pampo, cangueiro	WA	**AQ / food**	M	LC	LC	-	2
Carangidae	*Trachurus lathami* Nichols, 1920	Xixarro	WA	food	M	LC	LC	QAME	2, 3, 8
Carangidae	*Uraspis helvola* (Forster, 1801)	Boca-de-algodão	CT	No	LM	LC	LC	DD	7
Chaenopsidae	*Emblemariopsis signifera* (Ginsburg, 1942)	Macaquinho-transparente	WA	No	L	LC	LC	-	5, 6
Chaenopsidae	*Emblemariopsis* sp.								4
Chaetodontidae	*Chaetodon striatus* Linnaeus, 1758	Peixe-borboleta, beijo-de-moça	WA	AQ	L	LC	LC	-	4, 5, 6
Chaetodontidae	*Chaetodon sedentarius* Poey, 1860	Bicudo	WA	AQ	L	LC	LC	DD	6
Chaetodontidae	*Prognathodes guyanensis* (Durand, 1960)	Borboleta-de-fundo	WA	No	L	LC	LC	DD	7
Congridae	*Heteroconger longissimus* Günther, 1870	Enguia-de-jardim	TA	No	LM	LC	DD	VU	7
Coryphaenidae	*Coryphaena hippurus* Linnaeus, 1758	Dourado	CT	food	M	LC	LC	-	7
Cyclopsettidae	*Citharichthys arenaceus* Evermann & Marsh, 1900	Linguado	WA	animal nutrition	L	LC	LC	-	2
Cyclopsettidae	*Citharichthys dinoceros* Goode & Bean, 1886	Linguado	WA	No	L	LC	LC	-	2, 3
Cyclopsettidae	*Citharichthys macrops* Dresel, 1885	Linguado-onça	WA	animal nutrition	L	LC	LC	DD	1, 8
Cyclopsettidae	*Cyclopsetta chittendeni* Bean, 1895	Linguado-pintado	WA	food	L	LC	LC	DD	1
Cyclopsettidae	*Etropus crossotus* Jordan & Gilbert, 1882	Linguado	WA+EP	animal nutrition	L	LC	LC	-	2, 8
Cyclopsettidae	*Etropus longimanus* Norman, 1933	Linguado	Br	No	L	-	LC	-	1, 2, 3, 8
Cyclopsettidae	*Syacium micrurum* Ranzani, 1842	Linguado	Ca+Br	food	LM	LC	LC	VU	1, 2, 8
Cyclopsettidae	*Syacium papillosum* (Linnaeus, 1758)	Linguado	WA	animal nutrition	LM	LC	LC	VU	1, 2, 8
Cynoglossidae	*Symphurus jenynsi* Evermann & Kendall, 1906	Língua-de-mulata	SWA	No	M	-	LC	-	1, 2, 3
Cynoglossidae	*Symphurus plagusia* (Bloch & Schneider, 1801)	Língua-de-mulata	Ca+Br	animal nutrition	L	LC	LC	-	7
Cynoglossidae	*Symphurus tessellatus* (Quoy & Gaimard, 1824)	Língua-de-mulata	Ca+SSWA+Br	animal nutrition	LM	LC	LC	-	2
Dactylopteridae	*Dactylopterus volitans* (Linnaeus, 1758)	Coió, voador-de-fundo	TA	AQ	LM	LC	LC	-	1, 2, 3, 8
Diodontidae	*Chilomycterus spinosus* (Linnaeus, 1758)	Baiacu-de-espinho	SWA	AQ	LM	LC	LC	-	2, 3, 8
Dorosomatidae	*Sardinella brasiliensis* (Steindachner, 1879)	Sardinha-verdadeira	SSWA	food	L	DD	DD	QAME	7
Echeneidae	*Echeneis* sp.	Rêmora, pegador							4
Engraulidae	*Lycengraulis grossidens* (Spix & Agassiz, 1829)	Manjubão	SWA	food	LM	LC	LC	-	7
Ephippidae	*Chaetodipterus faber* (Broussonet, 1782)	Paru, enxada	WA	AQ / food	MH	LC	LC	-	2, 4, 5, 6
Epinephelidae	*Epinephelus marginatus* (Lowe, 1834)	Garoupa-verdadeira	TA	**AQ / food**	HVH	VU	VU	EN	4, 5, 6
Epinephelidae	*Epinephelus morio* (Valenciennes, 1828)	Garoupa-são-tomé	WA	food	H	VU	VU	EN	6
Epinephelidae	*Hyporthodus niveatus* (Valenciennes, 1828)	Cherne-verdadeiro	WA	food	H	VU	VU	EN	7
Epinephelidae	*Mycteroperca acutirostris* (Valenciennes, 1828)	Badejo-mira	Ca+Br	**AQ / food**	H	LC	DD	QAME	4, 5, 6
Epinephelidae	*Mycteroperca bonaci* (Poey, 1860)	Sirigado	WA	**AQ / food**	H	NT	VU	EN	7
Epinephelidae	*Mycteroperca interstitialis* (Poey, 1860)	Badejo-amarelo	WA	food	HVH	VU	VU	EN	5
Epinephelidae	*Mycteroperca rubra* (Bloch, 1793)		TA	No	HVH	LC	-	-	7
Epinephelidae	*Paranthias furcifer* (Valenciennes, 1828)	Piraúna	TA	AQ	M	LC	-	DD	6, 7
Fistulariidae	*Fistularia petimba* Lacepède, 1803	Peixe-trombeta	CT	food	HVH	LC	LC	-	2, 3
Fistulariidae	*Fistularia tabacaria* Linnaeus, 1758	Peixe-trombeta	TA	AQ	HVH	LC	LC	DD	7
Gempylidae	*Thyrsites lepidopodea* Lesson 1831	Serrinha	SSWA	food	LM	-	LC	-	8
Gerreidae	*Diapterus auratus* Ranzani, 1842	Carapeba	WA	food	LM	LC	LC	DD	3
Gerreidae	*Diapterus rhombeus* (Cuvier, 1829)	Carapeba	Ca+Br	**AQ / food**	L	LC	LC	-	8
Gerreidae	*Eucinostomus argenteus* Baird & Girard, 1855	Carapicu	WA+EP	food	LM	LC	LC	-	2, 8
Gerreidae	*Eucinostomus gula* (Quoy & Gaimard, 1824)	Carapicu	WA	**AQ / food**	LM	LC	LC	DD	1, 2, 8
Gobiidae	*Coryphopterus glaucofraenum* Gill, 1863	Gobião de freio	WA	AQ	L	LC	LC	-	5, 6
Gobiidae	*Coryphopterus* sp.								4
Gobiidae	*Elacatinus figaro* Sazima, Moura & Rosa, 1997	Neon	Br	No	L	-	VU	VU	4, 5, 6
Gobiidae	*Gnatholepis thompsoni* Jordan, 1904		TA	No	L	LC	LC	DD	7
Haemulidae	*Anisotremus surinamensis* (Bloch, 1791)	Sargo-de-beiço, pirambú	WA	AQ / food	H	DD	DD	-	4
Haemulidae	*Anisotremus virginicus* (Linnaeus, 1758)	Salema	WA	AQ / food	H	LC	LC	-	4, 5, 6
Haemulidae	*Conodon nobilis* (Linnaeus, 1758)	Roncador, coró-amarelo	WA	AQ / food	LM	LC	LC	-	7
Haemulidae	*Haemulon aurolineatum* Cuvier, 1830	Corcoroca, xira-branca	WA	**AQ / food**	M	LC	LC	-	4, 5
Haemulidae	*Haemulon steindachneri* (Jordan & Gilbert, 1882)	Corcoroca-boca-larga	SWA+Ca	AQ	LM	LC	LC	-	5, 6
Haemulidae	*Orthopristis ruber* (Cuvier, 1830)	Corcoroca	SWA+Ca	AQ	LM	LC	LC	QAME	1, 2, 3, 8
Haemulidae	*Haemulopsis corvinaeformis* (Steindachner, 1868)		Br+Ca	AQ	L	LC	-	-	1
Holocentridae	*Holocentrus adscensionis* (Osbeck, 1765)	Jaguareçá	TA	**AQ / food**	M	LC	LC	-	4, 5, 6
Holocentridae	*Myripristis jacobus* Cuvier, 1829	Fogueira	TA	No	L	LC	LC	DD	5
Kyphosidae	*Kyphosus sectatrix* (Linnaeus, 1758)	Pirajica	TA	AQ	H	LC	-	-	4, 6

Kyphosidae	*Kyphosus* sp.								5
Labridae	*Bodianus pulchellus* (Poey, 1860)	Bodião-fogueira	TA	AQ	LM	LC	LC	DD	6
Labridae	*Bodianus rufus* (Linnaeus, 1758)	Bodiã-papagaio-verdadeiro	WA	No	M	LC	LC	DD	4, 5, 6
Labridae	*Bodianus brasiliensis* (Heiser, Moura & Robertson, 2000)	Bodião-fantasma	Br	AQ	M	LC	LC	-	4, 5, 6
Labridae	*Cryptotomus roseus* Cope, 1871	Batata, batata-da-pedra	WA	No	L	LC	LC	DD	7
Labridae	*Halichoeres bathyphilus* (Beebe & Tee-Van, 1932)		WA	No	LM	LC	-	-	7
Labridae	*Halichoeres brasiliensis* (Bloch, 1791)	Bodião-verde	SWA	AQ	MH	DD	LC	-	4, 5, 6
Labridae	*Halichoeres cyanocephalus* (Bloch, 1791)		WA	AQ	LM	LC	-	-	7
Labridae	*Halichoeres dimidiatus* (Agassiz, 1831)	Bodião-azul	Br	No	M	LC	LC	DD	4, 6
Labridae	*Halichoeres poeyi* (Steindachner, 1867)	Bodião-puxê	WA	AQ	LM	LC	LC	-	4, 5, 6
Labridae	*Halichoeres radiatus* (Linnaeus, 1758)	Bodião-bindalo	WA+Br	No	MH	LC	LC	-	7
Labridae	*Halichoeres sazimai* Luiz, Ferreira & Rocha, 2009	Bodião-sazima	Br	No	M	-	LC	-	5
Labridae	*Nicholsina usta* (Valenciennes, 1840)	Bodião	WA	food	L	LC	LC	DD	7
Labridae	*Scarus trispinosus* Valenciennes, 1840	Peixe-papagaio-azul, bodião-azul	Br	No	M	EN	EN	EN	7
Labridae	*Scarus zelindae* Moura, Figueiredo & Sazima, 2001	Peixe-papagaio-banana	Br	AQ	LM	DD	VU	EN	4, 6
Labridae	*Sparisoma amplum* (Ranzani, 1841)	Bodião	Br	AQ	LM	LC	NT	EN	4, 5, 6
Labridae	*Sparisoma atomarium* (Poey, 1861)		WA	No	L	LC	-	-	7
Labridae	*Sparisoma axillare* (Steindachner, 1878)	Peixe-papagaio-cinza	Br	AQ	M	DD	VU	EN	4, 5, 6
Labridae	*Sparisoma frondosum* (Agassiz, 1831)	Peixe-papagaio-cinza	Ca+Br	AQ	LM	DD	VU	EN	4, 5, 6
Labridae	*Sparisoma tuiupiranga* Gasparini, Joyeux & Floeter, 2003	Bodião, peixe-papagaio-vermelho	SE	No	L	LC	LC	DD	4, 5, 6
Labridae	*Sparisoma viride* (Bonnaterre, 1788)		WA	food	LM	LC	-	-	7
Labridae	*Xyrichtys novacula* (Linnaeus, 1758)	Bodião-curuá	EP+WA	AQ	M	LC	LC	-	7
Labrisomidae	*Labrisomus nuchipinnis* (Quoy & Gaimard, 1824)	Maria-da-toca-garrião	TA	AQ	L	LC	LC	-	5
Labrisomidae	*Malacoctenus delalandii* (Valenciennes, 1836)	Macaquinho-comum	WA	No	L	LC	LC	DD	5
Lophiidae	*Lophius gastrophysus* Miranda Ribeiro, 1915	Peixe-sapo, peixe-diabo	WA	No	MH	LC	NT	QAME	2, 3, 8
Lutjanidae	*Lutjanus analis* (Cuvier, 1828)	Cioba	WA+Ca	**AQ / food**	H	NT	NT	VU	6
Lutjanidae	*Lutjanus jocu* (Bloch & Schneider, 1801)	Dentão	TA	food	HVH	DD	NT	DD	7
Lutjanidae	*Lutjanus synagris* (Linnaeus, 1758)	Vermelho, ariocó	WA+Ca	food	M	NT	NT	DD	4, 6
Lutjanidae	*Ocyurus chrysurus* (Bloch, 1791)	Guaiúba	WA	No	H	DD	NT	VU	6
Lutjanidae	*Rhomboplites aurorubens* (Cuvier, 1829)	Vermelho	WA+Ca	food	MH	VU	NT	VU	1, 6
Latilidae	*Caulolatilus chrysops* (Valenciennes, 1833)	Batata, batata-da-pedra	WA	food	MH	LC	LC	-	2
Malacanthidae	*Malacanthus plumieri* (Bloch, 1786)	Pirá	WA	No	H	LC	LC	DD	6
Merlucciidae	*Merluccius hubbsi* Marini, 1933	Merluza	SSWA	food	H	-	NT	VU	3
Microdesmidae	*Ptereleotris helenae* (Randall, 1968)		WA	No	L	LC	-	-	7
Microdesmidae	*Ptereleotris randalli* Gasparini, Rocha & Floeter, 2001	Linha-azul	Br+SCa	No	L	LC	LC	-	4, 6
Molidae	*Mola mola* (Linnaeus, 1758)	Peixe-lua	CT	No	HVH	VU	LC	-	4
Monacanthidae	*Aluterus heudelotii* Hollard, 1855	Peixe-porco	TA	No	M	LC	LC	DD	7
Monacanthidae	*Cantherhines macrocerus* (Hollard, 1853)	Peixe-porco	WA	No	M	LC	LC	DD	6
Monacanthidae	*Cantherhines pullus* (Ranzani, 1842)	Peixe-porco	TA	AQ	LM	LC	LC	DD	7
Monacanthidae	*Stephanolepis hispidus* (Linnaeus, 1766)	Peixe-porco	TA	**AQ / food**	LM	LC	LC	-	2, 3, 8
Mullidae	*Mullus argentinae* Hubbs & Marini, 1933	Trilha	SSWA	**AQ / food**	LM	-	LC	QAME	2, 3, 8
Mullidae	*Pseudupeneus maculatus* (Bloch, 1793)	Salmonete	WA	**AQ / food**	M	LC	LC	DD	4, 6
Mullidae	*Upeneus parvus* Poey, 1852	Trilha	WA	AQ / **food**	LM	LC	LC	QAME	2, 3, 5
Muraenidae	*Gymnothorax conspersus* Poey, 1867		WA	No	HVH	LC	DD	-	7
Muraenidae	*Gymnothorax funebris* Ranzani, 1839	Moreia-verde	WA	AQ / food	VH	LC	DD	DD	6
Muraenidae	*Gymnothorax moringa* (Cuvier, 1829)	Aimoré	WA	**AQ** / food	VH	LC	DD	DD	6
Muraenidae	*Gymnothorax vicinus* (Castelnau, 1855)	Caramuru	TA	**AQ** / food	HVH	LC	DD	DD	6
Ogcocephalidae	*Ogcocephalus notatus* (Valenciennes, 1837)	Peixe-morcego	WA	No	M	LC	LC	-	2
Ogcocephalidae	*Ogcocephalus vespertilio* (Linnaeus, 1758)	Peixe-morcego	SWA+Ca	AQ	MH	LC	LC	-	1, 2, 3, 6, 8
Ophichthidae	*Echiophis intertinctus* (Richardson, 1848)		WA	No	HVH	LC	LC	DD	7
Ophichthidae	*Myrichthys breviceps* (Richardson, 1848)	Murucutuca-pintada	WA	AQ	MH	LC	LC	-	7
Ophichthidae	*Myrichthys ocellatus* (Lesueur, 1825)	Mututuca	WA	AQ	MH	LC	LC	-	7
Ophichthidae	*Ophichthus gomesii* (Castelnau, 1855)	Congro	WA	No	M	LC	LC	-	1
Ophidiidae	*Raneya brasiliensis* (Kaup, 1856)	Congro	SWA	No	LM	LC	LC	-	2
Ostraciidae	*Acanthostracion polygonius* Poey, 1876	Peixe-cofre	WA	**AQ**	LM	LC	LC	DD	4, 6
Paralichthyidae	*Paralichthys isosceles* Jordan, 1891	Linguado-areia	SWA	No	LM	DD	LC	DD	3
Paralichthyidae	*Paralichthys orbignyanus* (Valenciennes, 1839)	Linguado-vermelho	SSWA	food	H	DD	DD	VU	2
Paralichthyidae	*Paralichthys patagonicus* Jordan, 1889	Linguado-branco	SSWA+EP	food	MH	VU	NT	VU	1, 2, 3, 8
Paralichthyidae	*Paralichthys triocellatus* Miranda Ribeiro, 1903	Linguado-areia	SWA	No	MH	LC	LC	DD	2, 3
Paralichthyidae	*Xystreurys rasile* (Jordan, 1891)	Linguado-manteiga	SWA	No	LM	LC	LC	DD	3, 8
Pempheridae	*Pempheris schomburgkii* Müller & Troschel, 1848	Piaba do mar	WA	AQ	L	LC	LC	DD	4, 5, 6
Percophidae	*Percophis brasiliensis* Quoy & Gaimard, 1825	Tira-vira	SWA	food	M	-	LC	-	1, 2, 3, 8
Phycidae	*Urophycis brasiliensis* (Kaup, 1858)	Abrótea	SSWA	food	M	-	NT	QAME	3, 8
Pinguipedidae	*Pinguipes brasilianus* Cuvier, 1829	Michole-quati	SE+Pat	food	MH	-	LC	DD	7
Pomacanthidae	*Pomacanthus paru* (Bloch, 1787)	Frade, paru-da-pedra	WA	AQ	M	LC	DD	QAME	4, 5, 6
Pomacanthidae	*Centropyge aurantonotus* Burgess, 1974	Donzela-fogo	TA	AQ	L	LC	DD	VU	7
Pomacanthidae	*Holacanthus ciliaris* (Linnaeus, 1758)	Peixe-anjo	WA	AQ	H	LC	DD	VU	4, 6
Pomacanthidae	*Holacanthus tricolor* (Bloch, 1795)	Soldado	WA	AQ	MH	LC	DD	VU	5, 6
Pomacentridae	*Abudefduf saxatilis* (Linnaeus, 1758)	Sinhá-rosa	TA	AQ	LM	LC	LC	-	4, 5, 6
Pomacentridae	*Chromis enchrysura* Jordan & Gilbert, 1882	Donzela-de-rabo-amarelo	WA	No	L	LC	LC	DD	7
Pomacentridae	*Chromis flavicauda* (Günther, 1880)	Donzela-cobalto	Br	No	L	DD	LC	DD	7
Pomacentridae	*Chromis jubauna* Moura, 1995	Donzela-jubauna	Br+SCa	No	L	-	LC	DD	4, 6
Pomacentridae	*Chromis multilineata* (Guichenot, 1853)	Donzela-marrom	TA	AQ	LM	LC	LC	-	4, 5, 6
Pomacentridae	*Stegastes fuscus* Cuvier, 1830	Donzela	Br	AQ	M	LC	LC	-	4, 5, 6
Pomacentridae	*Stegastes pictus* (Castelnau, 1855)	Donzela-bicolor	Ca+Br	AQ	L	-	LC	-	4, 5, 6
Pomacentridae	*Stegastes variabilis* (Castelnau, 1855)	Donzela-amarela	WA	AQ	L	-	LC	-	4, 5, 6
Pomatomidae	*Pomatomus saltatrix* (Linnaeus, 1766)	Enchova	CT	food	H	VU	NT	VU	2
Priacanthidae	*Priacanthus arenatus* Cuvier, 1829	Olho-de-cão	TA	**AQ / food**	L	LC	LC	-	2, 5, 6, 8
Priacanthidae	*Heteropriacanthus cruentatus* (Lacepède, 1801)	Olho-de-cão	CT	AQ	LM	LC	LC	DD	2
Pristigasteridae	*Chirocentrodon bleekerianus* (Poey, 1867)	Sardinha-vidro	Ca+Br	animal nutrition	L	LC	LC	-	8
Pristigasteridae	*Pellona harroweri* (Fowler, 1917)	Sardinha-mole	Ca+Br	animal nutrition	L	LC	LC	-	2, 8
Sciaenidae	*Bairdiella ronchus* (Cuvier, 1830)	Cangauá, roncador, bororó	Ca+Br	animal	LM	LC	LC	DD	3

				nutrition					
Sciaenidae	*Ctenosciaena gracilicirrhus* (Metzelaar, 1919)	Canguá	Ca+Br	animal nutrition	LM	LC	LC	-	2, 3, 8
Sciaenidae	*Cynoscion acoupa* (Lacepède, 1801)	Pescada-amarela	SWA+Ca	food	MH	LC	NT	QAME	2, 8
Sciaenidae	*Cynoscion jamaicensis* (Vaillant & Bocourt, 1883)	Goete	SWA+Ca	food	LM	LC	LC	VU	2, 8
Sciaenidae	*Cynoscion microlepidotus* (Cuvier, 1830)	Pescada-de-dente, pescada-bicuda	Br	food	H	LC	LC	DD	2, 8
Sciaenidae	*Cynoscion striatus* (Cuvier, 1829)	Maria-mole	SSWA	food	M	-	-	-	2, 3, 8
Sciaenidae	*Isopisthus parvipinnis* (Cuvier, 1830)	Tortinha	Ca+Br	food	L	LC	LC	-	2
Sciaenidae	*Macrodon atricauda* (Günther, 1880)	Pescadinha, pescada-real	SSWA	No	L	-	LC	VU	2
Sciaenidae	*Menticirrhus americanus* (Linnaeus, 1758)	Betara, papa-terra	WA	**AQ / food**	M	LC	DD	QAME	2, 8
Sciaenidae	*Micropogonias furnieri* (Desmarest, 1823)	Corvina	SWA+Ca	**AQ / food**	H	LC	LC	VU	2, 3, 8
Sciaenidae	*Odontoscion dentex* (Cuvier, 1830)	Pescada-dentuça	WA	AQ	L	LC	LC	DD	5, 6
Sciaenidae	*Pareques acuminatus* (Bloch & Schneider, 1801	Bilro	WA	AQ	L	LC	DD	DD	6
Sciaenidae	*Umbrina canosai* Berg, 1895	Castanha	SSWA	food	LM	LC	LC	VU	8
Sciaenidae	*Umbrina coroides* Cuvier, 1830	Corvina-riscada, castanha-riscada	WA	**AQ / food**	LM	LC	LC	DD	2
Scorpaenidae	*Pontinus rathbuni* Goode & Bean, 1896		WA	No	M	LC	-	-	2, 8
Scorpaenidae	*Scorpaena brasiliensis* Cuvier, 1829	Peixe-pedra	WA	AQ	MH	LC	LC	-	7
Scorpaenidae	*Scorpaena isthmensis* Meek & Hildebrand, 1928	Peixe-pedra	WA	AQ	LM	LC	LC	DD	1
Serranidae	*Diplectrum formosum* (Linnaeus, 1766)	Michole-de-areia, canguito	WA	**AQ / food**	L	LC	LC	-	2
Serranidae	*Diplectrum radiale* (Quoy & Gaimard, 1824)	Michole-de-areia, jacundá	WA	AQ	LM	LC	LC	-	6, 8
Serranidae	*Dules auriga* Cuvier, 1829	Mariquita-de-penacho	SSWA	AQ	L	-	LC	-	1, 2, 3, 8
Serranidae	*Serranus baldwini* (Evermann & Marsh, 1899)	Badejinho-lanterna	WA	AQ	L	LC	LC	DD	5, 6
Sparidae	*Diplodus argenteus* (Valenciennes, 1830)	Marimbá	WA	**AQ / food**	M	LC	LC	-	4, 5, 6, 8
Sparidae	*Calamus penna* (Valenciennes, 1830)	Caratinga	WA	**AQ / food**	LM	LC	LC	DD	7
Sparidae	*Calamus pennatula* Guichenot, 1868	Peixe-pena-amarelo	WA	AQ	M	LC	LC	DD	4, 6
Sparidae	*Pagrus pagrus* (Linnaeus, 1758)	Pargo, pargo-rosa	TA	food	HVH	LC	DD	VU	1, 2, 3, 8
Sphyraenidae	*Sphyraena barracuda* (Edwards, 1771)	Barracuda	TA	food	VH	LC	LC	DD	2, 6
Sphyraenidae	*Sphyraena guachancho* Cuvier, 1829	Bicuda	TA	food	VH	LC	LC	DD	2, 6
Sphyraenidae	*Sphyraena tome* Fowler, 1903	Bicuda	SSWA	food	LM	-	DD	DD	7
Stromateidae	*Peprilus paru* (Linnaeus, 1758)	Gordinho	WA	food	L	LC	LC	-	2
Syngnathidae	*Hippocampus erectus* Perry, 1810	Cavalo-marinho	WA	AQ	LM	VU	VU	-	1
Syngnathidae	*Bryx dunckeri* (Metzelaar, 1919)	Peixe-cachimbo	WA	No	L	LC	LC	DD	7
Synodontidae	*Synodus intermedius* (Spix & Agassiz, 1829)	Peixe-lagarto	WA	AQ	LM	LC	LC	DD	4, 5, 6
Synodontidae	*Saurida brasiliensis* Norman, 1935	Peixe-lagarto	TA	animal nutrition	L	LC	LC	DD	7
Synodontidae	*Synodus foetens* (Linnaeus, 1766)	Peixe-lagarto	WA	AQ	LM	LC	LC	-	1, 2, 3, 8
Synodontidae	*Synodus synodus* (Linnaeus, 1758)	Peixe-lagarto	TA	AQ	LM	LC	LC	DD	4
Tetraodontidae	*Canthigaster figueiredoi* Moura & Castro, 2002	Baiacu-mirim	Br+SCa	AQ	L	LC	LC	DD	4, 5, 6
Tetraodontidae	*Canthigaster rostrata* (Bloch, 1786)	Baiacu	TA	No	L	LC	-	-	7
Tetraodontidae	*Lagocephalus laevigatus* (Linnaeus, 1766)	Baiacu-ará	TA	**AQ / food**	MH	LC	LC	-	8
Tetraodontidae	*Sphoeroides greeleyi* Gilbert, 1900	Baiacu	Ca+Br	AQ	L	LC	LC	-	1, 2, 3
Tetraodontidae	*Sphoeroides spengleri* (Bloch, 1785)	Baiacu	TA	AQ	L	LC	LC	DD	5, 6
Tetraodontidae	*Sphoeroides tyleri* Shipp, 1972	Baiacu	WA	No	L	LC	LC	DD	2
Trichiuridae	*Trichiurus lepturus* Linnaeus, 1758	Peixe-espada	CT	food	H	LC	LC	-	2
Triglidae	*Prionotus punctatus* (Bloch, 1793)	Cabrinha	SWA+Ca	food	H	LC	LC	-	1, 2, 3, 8

Discussion

Until the 2010s, the knowledge about the ichthyofauna of the Alcatrazes Archipelago was restricted to a report by Luederwaldt and Fonseca (1922) and Paiva Filho et al. (1989). Given the importance of this region for species protection and fisheries in the TES/AWR surroundings (ICMBio, 2017), our work provided an extensive checklist of fish species, including essential management information about geographic distribution, economic importance, vulnerability, and conservation status.

From the 594 species described for the coast of São Paulo (Menezes, 2011), a reasonably higher number of marine fish species compared to other similar Brazilian coastal regions, 29.3 % (174) were also observed in the Alcatrazes Archipelago, an expressive number considering the dimensions of the study area. Another 55 species can be added to the checklist published by Menezes (2011). The higher biodiversity of the ichthyofauna of the Alcatrazes Archipelago may be due to the co-occurrence of tropical, subtropical, and temperate species on the southeastern Brazilian coast, as observed by Luiz Jr. et al. (2008) in the Laje de Santos Marine State Park.

Comparing our checklist with data from others Brazilian reef systems, Alcatrazes (229) presented higher biodiversity than the Laje de Santos Marine State Park (196, SP; Luiz Jr. et al., 2008), the first Marine Protected Area totally closed for fishing in the state of São Paulo; the São Sebastião region (106, São Paulo state; Gibran and Moura, 2012); the Queimada Grande island (137, São Paulo state; Moura et al., 2003); the Queimada Pequena island (29, SP; Cardoso et al., 2019); the Saint Peter and Saint Paul Archipelago (100, Vaske Jr. et al., 2005); and similar species richness to the Abrolhos Bank (266, Bahia state; Moura et al., 2005). Regarding only the elasmobranchs, 12% of the 165 species registered in Brazil were also found in the Alcatrazes Archipelago, and we are adding one species (*Rhinoptera steindachneri*) to the checklist published by Rosa and Gadig (2014).

Regarding the most abundant families - Carangidae, Sciaenidae, and Paralichthyidae -, the first is described as pelagic predators that form shoals and are economically important, including sportive fishery

(Menezes & Figueiredo, 1980). Sciaenidae is the most abundant family on the coast of São Paulo, presenting great importance on the Brazilian southeast coast in terms of ecosystem structure and as a demersal fishery resource (Giannini & Paiva Filho, 1990; Rocha & Rossi-Wongtschowski, 1998; Muto et al., 2000; Rossi-Wongtschowski et al., 2008; Schmidt & Dias, 2012). Paralichthyid flounders are also of economic importance in the southwest Atlantic, mostly *Paralichthys patagonicus, P. orbignyanus*, and *Xystreurys rasile,* which are intensely exploited (Astarloa, 2002). Paiva Filho et al. (1989) point out a low richness in the Archipelago and the Pleuronectiformes, including the Achiridae, Bothidae, and Paralichthyidae families the most abundant group, differing from current data of Alcatrazes or any other study on the demersal ichthyofauna of the São Paulo coast.

Most species registered at the Alcatrazes Archipelago are widely distributed over the Western Atlantic. It is important to highlight the coastal Brazilian endemic species, which are protected by the TES and the AWR limits, namely *Squalus albicaudus*, an elasmobranch recently redescribed by Viana et al. (2016); *Elacatinus figaro* (Gobiidae), *Clepticus brasiliensis*, *Halichoeres dimidiatus*, *H. sazimai* (Labridae), *Chromis flavicauda*, *Stegastes fuscus* (Pomacentridae), *Scarus trispinosus*, *S. zelindae*, *Sparisoma amplum*, *S. axillare* (Scaridae), that are all associated to reef corals and rocky shores (Menezes & Figueiredo, 1985) and may present some economic interest for aquarium hobbies; *Cynoscion microlepidotus* (Sciaenidae), which has economic interest for food consumption (CEAGESP, 2021).

Artisanal fisheries represent more than 98% of the total landings on the coast of São Paulo, using mainly double-rig trawling and gillnet (PMAP-SP, 2020; 2021). It is known that fishing restrictions in MPAs can increase exploited species populations, leading to spillover to MPAs surrounding, supporting, and enhancing local fisheries (Russ, 2004; Goñi et al., 2008). Also, Brazil is one of the leading countries supplying the trade of marine aquarium fish globally, and the state of São Paulo is also one of the main harvesting areas for marine ornamentals trades (Gasparini et al., 2005; Gurjão & Lotufo, 2018). Considering that almost 75% of the species registered in the Alcatrazes Archipelago presented some economic importance, our study area can be considered a relevant supplier for economic activities in the surroundings, besides tourism.

About one-third of the observed ichthyofauna is more vulnerable to extinction, while most elasmobranch species (18) are classified at least as highly vulnerable, especially due to their K-strategies characteristics and fisheries effects in their populations. Given the main threats for the Archipelago, including illegal fishery (commercial and sportive), port activities, the exploration of oil and gas, and tourism activities (Hoff et al., 2015), the knowledge about vulnerability and risk assessment of local fish species highlights the ecological importance of the Alcatrazes Archipelago, in sheltering many threatened species. Our data also suggests another possible threat: illegal fishing for aquarium purposes, since at least 20 species are irregularly explored in Brazil.

Finally, the Alcatrazes Archipelago may be pinpointed as an important fish biodiversity hotspot for Brazilian southeast ichthyofauna, sheltering endangered and economically important species. By elasmobranch community structure, variation in the functional diversity and the application of a fishery indicator, Karlovic et al. (2021) showed that SACW and benthic habitat heterogeneity are responsible for species abundance, distribution of functional groups and diversity. On the other hand, the establishment of the MPA in Alcatrazes Archipelago improved fisheries indicators for a threatened species, the shortnose guitarfish, *Zapteryx brevirostris*, proving its effectiveness.

Despite the varied sampling methods and efforts across the Archipelago, a significant number of species was achieved, and this checklist could support environmental agencies and decision-makers on fishery resources and conservation issues.

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