



Marine ichthyofauna of Santa Catarina Island, Southern Brazil: checklist with comments on the species

Gisela Costa Ribeiro¹, André Pereira Cattani^{2,3}, Mauricio Hostim-Silva⁴, Leandro Clezar¹, Ana Carolina dos Passos⁵, Marcelo Soeth^{2,3}, Olímpio Rafael Cardoso^{3,6*} & Henry Louis Spach³

¹Universidade Federal de Santa Catarina, Núcleo de Estudos do Mar, CEP 88040-900, Florianópolis, SC, Brasil

²Universidade Federal do Paraná, Centro de Estudos do Mar, Programa de Pós-Graduação em Sistemas Costeiros e Oceânicos, CEP 83255-976, Pontal do Paraná, PR, Brasil

³Universidade Federal do Paraná, Centro de Estudos do Mar, Laboratório de Ecologia de Peixes Beira-mar, CEP 83255-971, Pontal do Paraná, PR, Brasil

⁴Universidade Federal do Espírito Santo, Departamento de Ciências da Saúde, Biológicas e Agrárias, CEP 29932-540, São Mateus, ES, Brasil

⁵Universidade Federal do Espírito Santo, Departamento de Oceanografia, Programa de Pós-Graduação em Oceanografia Ambiental, CEP 29075-910, Vitória, ES, Brasil

⁶Universidade Federal do Paraná, Programa de Pós-Graduação em Zoologia, CEP 80060-000, Curitiba, PR, Brasil

*Corresponding author: Olímpio Rafael Cardoso, e-mail: rafael.bioufrgs@gmail.com

RIBEIRO, G.C., CATTANI, A.P., HOSTIM-SILVA, M., CLEZAR, L., PASSOS, A.C., SOETH, M., CARDOSO, O.R., SPACH, H.L. **Marine ichthyofauna of Santa Catarina Island, Southern Brazil: checklist with comments on the species.** *Biota Neotropica*. 19(3): e20180684. <http://dx.doi.org/10.1590/1676-0611-BN-2018-0684>

Abstract: This study aimed to present a checklist of marine fishes from coastal environments of the Island of Santa Catarina, including comments on the zoogeographic affinities, conservation status of each species, and functional groups. A total of 169 fish species belonging to 30 orders and 58 families were recorded. The most speciose families were Sciaenidae, Carangidae and Engraulidae, representing 26,62% of the recorded species. *Anchoa* was the richest genus, followed by *Sphoeroides* and *Cynoscion*. Most of the species have their distribution limited to the western Atlantic, and two groups of fish were distinguished according to the species distributions: 1) species occurring in the Caribbean and in the Brazilian Province; and 2) Transatlantic species. Thirteen species are critically threatened, 10 are overexploited on the Brazilian coast, and 2 are threatened by extinction. Most of the species are either marine stragglers or marine migrants, and most of them are zoobenthivores, piscivores, or both.
Keywords: fish, species list, Southwest Atlantic.

Ictiofauna marinha da Ilha de Santa Catarina, Sul do Brasil: lista com comentários sobre as espécies

Resumo: Este estudo teve como objetivo apresentar uma lista de peixes marinhos de ambientes costeiros da Ilha de Santa Catarina, incluindo comentários sobre as afinidades zoogeográficas, estado de conservação de cada espécie e grupos funcionais. Um total de 169 espécies de peixes, pertencentes a 30 ordens e 58 famílias, foram registradas. As famílias mais especiosas foram Sciaenidae, Carangidae e Engraulidae, representando 26,62% das espécies registradas. *Anchoa* foi o gênero mais rico, seguido por *Sphoeroides* e *Cynoscion*. A maioria das espécies tem sua distribuição limitada ao Atlântico ocidental, e dois grupos de peixes foram distinguidos de acordo com as distribuições de espécies: 1) espécies ocorrentes no Caribe e na Província Brasileira; e 2) espécies Transatlânticas. Treze espécies estão criticamente ameaçadas, 10 são superexploradas na costa brasileira e 2 estão ameaçadas de extinção. A maioria das espécies é composta por visitantes marinhos ou migrantes marinhos, sendo a maioria deles zoobentívoros, piscívoros ou ambos.

Palavras-chave: peixe, lista de espécies, Atlântico Sudoeste.

Introduction

Diversity of estuarine environments is threatened by anthropogenic activities such as predatory fishing and port construction and activities, which can lead to species introduction, habitat loss, and environmental pollution. Thus, the compilation of fish records from South Atlantic is important because it improves the understanding of the geographic distribution and macroecological aspects of marine and estuarine fishes (Barletta & Blaber 2007), and assists in strategic planning for the conservation of the species as well (Barletta et al., 2010).

Coastal and estuarine areas are nurseries for the aquatic biota. Despite the great variety of ecosystems, knowledge about fish assembly from the Island of Santa Catarina is scarce. Only a few studies have been conducted, which focused on spatio-temporal patterns in specific environments (Clezar et al. 1997, Ribeiro et al. 1997, Ribeiro et al. 1999, Cartagena et al. 2011, Soeth 2015). Therefore, this study aimed to present a checklist of marine fishes from different coastal environments of the Island of Santa Catarina through a compilation of unpublished and published information from the literature. In addition, comments on the zoogeographic affinities, conservation status of each species, and functional groups are also provided.

Material and Methods

1. Study Site

The Island of Santa Catarina (28°37'S; 48°27'W) (Figure 1) is located near the tropical/subtropical border, and parallelly and contiguously to the continental margin. It has an elongated shape (N-NE/S-SW), an area of 431 km², and a coastline length of 180 km (Sierra de Ledo 1997). It is an insular environment composed by a variety of ecosystems, such as mangroves, lagoons, sandy beaches and rocky shores. Regarding its climate, the region is humid subtropical (Köppen Cfa), characterized by a well-defined seasonality, with the rainy period in the spring and summer (September to March, with monthly mean of 172 mm), and the dry period in the autumn and winter (April to August, with monthly mean of 74 mm) (Fonseca 2002).

The predominant wind patterns on the island is associated with the action of the Tropical Atlantic and Polar Atlantic air masses, which produce winds from the north and south quadrants, respectively (Abreu de Castilhos and Gré 1997). According to these authors, the dominant waves are mainly from the northeast, southeast and south, with the most significant heights coming from the south. The island also has semidiurnal tides (mean amplitude = 0.52 m) in the interior of the bays in the area near the island (Soriano-Sierra 1997).

2. Data Collection

This work was based on the compilation of information available in the literature as well as unpublished data obtained by the authors during the last 30 years. Former data was obtained from Google Scholar, Web of Science, and Portal de Periódicos da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES). We searched for articles focusing on fish species from different environments (e.g. bays, lagoons and mangroves) of the Island of Santa Catarina (e.g. Clezar et al. 1997, Nemar 1999, Daura Jorge 2007, Cartagena et al. 2011, Soeth 2015, Cattani et al., 2016a, Cattani et al., 2016b, Cattani et al., 2018).

3. Data Analysis

Taxonomic classification and nomenclature of fish species followed Craig & Hastings (2007), Smith & Craig (2007), Eschmeyer (2013), Carvalho-Filho et al. (2010), Figueiredo et al. (2010), Menezes et al. (2010) Nelson et al. (2016) and Betancur-R et al. (2017). *Mugil* sp. was used for species usually identified under the invalid name *Mugil gaimardianus* (Menezes et al. 2003). Orders and families are listed in alphabetical order, and species of each family are presented in alphabetical order as well.

In order to analyze the zoogeographic affinities, we classified each species according to the literature (Floeter et al. 2008, Luiz Jr. et al. 2008, Eschmeyer 2013, Froese & Pauly 2018) in the following categories of geographic distribution: CT = Circumtropical, TA = Transatlantic (occurs in western and eastern Atlantic Ocean), WA = Western Atlantic (occurs in northern and southern Atlantic Ocean), SWA = Southwestern Atlantic (occurs from northern Brazil to Argentina), SSWA = Southern Southwestern Atlantic (species with temperate affinities that occurs in Argentina, Uruguay, and southern and southeastern Brazil), Ca = Caribbean (from Florida to Venezuela), Br = Brazilian Province (area between the Orinoco Delta in Venezuela and Santa Catarina state, in Brazil: *sensu* Briggs 1995; Floeter & Gasparini 2000) and EP = Eastern Pacific. Species were also classified according to the type of environment they were collected (bays, lagoons and mangroves).

Fish species were classified into the following estuarine functional groups, proposed by Elliot et al. (2007): marine stragglers (MS) (species that spawn at sea and enter estuaries in low numbers; stenohaline environments with salinity around 35), marine migrants (MM) (species that spawn at sea and enter estuaries in large numbers as juveniles; euryhaline environments), estuarine species (ES), anadromous (AN) (species that undergo their growth at sea and migrate into rivers to spawn), amphidromous (AM) (migrate between the sea and freshwater; migration in neither direction is related to reproduction), and freshwater migrants (FM) (found in moderate numbers in estuaries and oligohaline environments). Species were also classified into trophic functional groups (Elliot et al. 2007): zooplanktivore (ZP) (feeds on zooplankton), detritivore (DV) (feeds on detritus and/or microphytobenthos), herbivore (HV) (grazes on macroalgae and macrophytes or phytoplankton), omnivore (OV) (feeds on filamentous algae, macrophytes, periphyton, epifauna and infauna), piscivore (PV) (feeds on finfish and large nektonic invertebrates), zoobenthivore (ZB) (feeds on invertebrates that live just above, on or in the sediment) and opportunist (OP) (feeds on a diverse range of food).

The conservation status of each species followed the International Red List of threatened species proposed by the IUCN (2018), by the Brazilian red list of threatened species proposed by the MMA (2016), and by regional conservation status based on the list proposed by State Council of the Environment of Santa Catarina - CONSEMA (2011). All specimens were deposited in the fish collection of the Núcleo de Estudos do Mar - NEMAR, Universidade Federal de Santa Catarina.

Results

The ichthyofauna of the Island of Santa Catarina comprises 169 species (165 Actinopterygii and 4 Elasmobranchii) distributed into 30 orders and 58 families. Perciformes was the most speciose order (32), followed by Clupeiformes (18), Pleuronectiformes (14) and

Ichthyofauna of Santa Catarina Island, Brazil

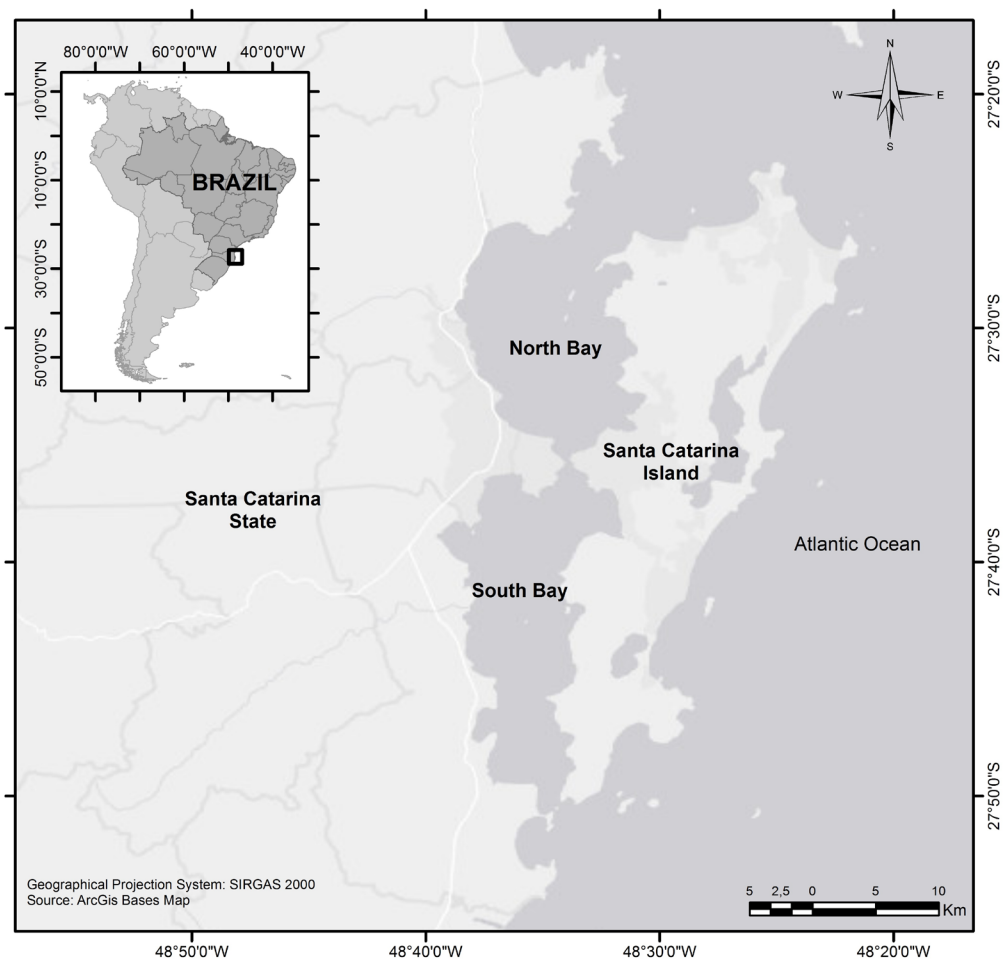


Figure 1. Location of the Island of Santa Catarina, Southern Brazil.

Tetraodontiformes (13) (Table 1). Concerning the families, Sciaenidae was the most recorded (20), followed by Carangidae (14), Engraulidae (11), Epinephelidae and Gobiidae (8 each). *Anchoa*, *Sphoeroides* and *Cynoscion* were the richest genera, with 6, 5 and 4 species, respectively.

Regarding the geographic distribution, 37,86% (64) occur in the Western North Atlantic, 14,20% (24) occur on both sides of the Atlantic, 13,01% (22) occur in the Caribbean and in the Brazilian Province, 9,46% (16) occur only in the Southern Southwestern Atlantic, 5,91% (10) occur in the Caribbean and in the Southwestern Atlantic, 4,73% (8) are distributed in tropical areas worldwide, 4,14% (7) occur only in the Southwestern Atlantic, 3,55% (6) occur only in the Brazilian Province, 2,36% (4) occur in the Western Atlantic and in the Eastern Pacific, 0,59% (1) occur in the Brazilian Province and in the Southwestern Atlantic and 1,18% (2) occur on both sides of the Atlantic and in the Eastern Pacific.

Fifty nine species (34,91%) were classified as marine stragglers (MS), 51 (30,17%) as marine migrants (MM), 19 (11,24%) as estuarine (ES), and five species (2,95%) as amphidromous. Each of the other functional groups (anadromous, catadromous, estuarine migrant, estuarine resident, freshwater migrant and semi-catadromous) accounted for less than 2%. Twenty-nine species (17,15%) did not fit in any category due to the lack of information available in the literature (Table 1).

Regarding the trophic functional groups, seventy seven species (45,56%) were classified as zoobenthivorous, twenty-seven species (15,97%) as piscivorous, sixteen (9,46%) as zooplanktivore, and sixteen (9,46%) as piscivorous and zoobenthivore. Each of the other trophic functional groups (detritivores, herbivores, opportunists and omnivores) accounted for less than 3%. Twenty one species (12,42%) did not fall into any category due to lack of information in the literature. Concerning the type of environment each species was found, thirty-four species (20,11%) were recorded in bays, lagoons and mangroves, fifty (29,58%) only in bays, twenty (11,83%) only in lagoons, and three (1,74%) only in mangroves (Table 1).

One hundred and forty-eight species that inhabit the Island of Santa Catarina are listed in the IUCN red list (2018), representing 87.57% of all species identified. Ten species (5.78% of the total) are listed in the MMA red list (2016), and nine species are present in both lists. Of the 148 IUCN red list species, 126 are classified as least concern, nine as vulnerable, six as near threatened and seven with deficient data. Of the ten species listed in the MMA red list, *Epinephelus itajara* and *Gymnura altavela* are categorized as critically endangered, *Epinephelus marginatus*, *Epinephelus morio*, *Hyporthodus niveatus*, *Mycteroperca bonaci*, *Hippocampus reidi* and *Zapteryx brevirostris* as vulnerable, and

Table 1. Taxonomic classification of the ichthyofauna recorded on the Island of Santa Catarina, Brazil. Geographic Distribution: CT = Circumtropical; TA = Transatlantic; WA = Western Atlantic; SWA = Southwestern Atlantic; SSWA = Southern Southwestern Atlantic; Ca = Caribbean; Br = Brazilian Province; EP = Eastern Pacific. Estuarine use and functional groups (EUFG): MS = marine stragglers; MM = marine migrants; ES = estuarine species; AN = anadromous; AM = amphidromous; FM = freshwater migrants. Trophic functional groups (TFG): ZP = zooplanktivore; DV = detritivore; HV = herbivore; OV = omnivore; PV = piscivore; ZB = zoobenthivore; OP = opportunist. Conservation status according to the international list proposed by IUCN (2018), Brazilian red list proposed by MMA (2016) and to regional list proposed by CONSEMA (2011): †† = overexploited; § = vulnerable; ‡ = near threatened; • = critically endangered; † = endangered; * = least concern; # = data deficient.

List of Species	Geographic Range	Bays	Lagoons	Mangroove	EUFG	TFG	Voucher number
Actinopterygii							
Acanthuriformes							
Sciaenidae							
<i>Bairdiella ronchus</i> (Cuvier, 1830)*	Ca+Br	x		x	MM	PV	SCIA 2010.001.PIS 493
<i>Ctenosciaena gracilicirrhus</i> (Metzelaar, 1919)*	Ca+Br	x			MS	ZB	SCIA 1982.025.PIS517
<i>Cynoscion guatucupa</i> (Cuvier 1830)	SSWA	x			MS	ZB	SCIA 1983.056.PIS548
<i>Cynoscion jamaicensis</i> (Vaillant & Bocourt, 1883)*	Ca+SWA	x		x	MM	PV/ZB	SCIA 1983.038.PIS530
<i>Cynoscion leiarchus</i> (Cuvier, 1830)*	Ca+Br	x		x	MS	PV	SCIA 1988.089.PIS581
<i>Cynoscion microlepidotus</i> (Cuvier, 1830)*	Br	x		x	MS		SCIA 1998.104.PIS596
<i>Isopisthus parvipinnis</i> (Cuvier, 1830)*	Ca+Br	x		x	MM	ZB	SCIA 2011.132.PIS624
<i>Larimus breviceps</i> Cuvier, 1830*	Ca+Br	x			MS	ZB	SCIA 2011.133.PIS625
<i>Macrodon ancylodon</i> (Bloch & Schneider, 1801)*	Ca+Br	x			MM	PV/ZB	SCIA 1984.064.PIS556
<i>Menticirrhus americanus</i> (Linnaeus, 1758)*	WA	x		x	MM	ZB	SCIA 1999.110.PIS602
<i>Menticirrhus littoralis</i> (Holbrook, 1847)*	WA	x	x		MS	ZB	SCIA 1991.100.PIS592
<i>Micropogonias furnieri</i> (Desmarest, 1823) ††/*	Ca+SWA	x	x	x	MM	ZB	SCIA 1988.084.PIS576
<i>Odontoscion dentex</i> (Cuvier, 1830)*	WA	x				ZB	
<i>Paralonchurus brasiliensis</i> (Steindachner, 1875)*	Ca+SWA	x	x		MS	ZB	SCIA 1986.073.PIS565
<i>Pogonias cromis</i> (Linnaeus, 1766)*/†	WA	x		x	MS	ZB	SCIA 1999.108.PIS600
<i>Stellifer brasiliensis</i> (Schultz, 1945)	Br	x			MM		SCIA 1982.007.PIS499
<i>Stellifer rastrifer</i> (Jordan, 1889)*	Br+SSWA	x	x	x	MM	ZB	SCIA 1984.066.PIS558
<i>Stellifer stellifer</i> (Bloch, 1790)#	Br	x			MS		
<i>Umbrina canosai</i> Berg, 1895 ††	SSWA	x			MS	ZB	SCIA 2003.131.PIS623
<i>Umbrina coroides</i> Cuvier, 1830*	WA	x	x		MS	ZB	SCIA 1988.091.PIS583
Anabantiformes							
Polynemidae							
<i>Polydactylus virginicus</i> (Linnaeus, 1758)*	WA	x			MM	ZB	POLY 2011.001.1218
Anguilliformes							
Muraenidae							
<i>Gymnothorax ocellatus</i> Agassiz, 1831*	Ca+SWA	x			ES	ZB	MURAE 2010.004.1202
Ophichthidae							
<i>Ophichthus cylindroideus</i> (Ranzani, 1839)*	WA	x					OPHC 1980.003.1127
<i>Ophichthus gomesii</i> (Castelnau, 1855)*	WA	x	x	x	MS		OPHC 1986.004.1128
Atheriniformes							
Atherinopsidae							
<i>Atherinella brasiliensis</i> (Quoy & Gaimard, 1825)*	Ca+Br	x	x	x	ES	OP	ATHE 1987.009.644
<i>Odontesthes argentinensis</i> (Valenciennes, 1835)	SSWA	x	x				ATHE 2011.075.1135
Aulopiformes							
Synodontidae							
<i>Synodus foetens</i> (Linnaeus, 1766)*	WA	x	x	x	MS	PV	SYNO 1988.004.481
Batrachoidiformes							
Batrachoididae							
<i>Porichthys porosissimus</i> (Cuvier, 1829)	SSWA	x			MM	ZB	BATRA 1984.009.109

Continuation Table 1.

List of Species	Geographic Range	Bays	Lagoons	Mangroove	EUFG	TFG	Voucher number
Beloniformes							
Belonidae							
<i>Strongylura marina</i> (Walbaum, 1792)*	WA	x	x	x	MM	PV	BELO 1988.001.128
<i>Strongylura timucu</i> (Walbaum, 1792)*	WA			x	MM	PV	BELO 1989.008.135
Hemiramphidae							
<i>Hemiramphus brasiliensis</i> (Linnaeus, 1758)*	TA		x		MM	PV/ZB	HEMI 1988.004.1170
<i>Hyporhamphus unifasciatus</i> (Ranzani, 1841)*	WA+EP	x	x		MS	OV	HEMI 1986.001.1167
Blenniiformes							
Blenniidae							
<i>Hypleurochilus fissicornis</i> (Quoy e Gaimard, 1824)*	TA		x			ZB	BLÉN 1984.002.121
<i>Parablennius pilicornis</i> (Cuvier, 1829)*	TA		x	x	MS	ZB	BLÉN 1989.004.123
<i>Scartella cristata</i> (Linnaeus, 1758) *	TA		x			HV	BLÉN 1979.001.120
Labrisomidae							
<i>Labrisomus nuchipinnis</i> (Quoy & Gaimard, 1824)*	TA	x				ZB	LABRI 1994.001.1166
Carangiformes							
Carangidae							
<i>Caranx hippos</i> (Linnaeus, 1766)*	TA		x	x	MS	PV	CARA 1984.012.416
<i>Caranx latus</i> Agassiz, 1829*	TA	x	x		MM	ZB	CARA 1989.051.455
<i>Chloroscombrus chrysurus</i> (Linnaeus, 1766)*	TA	x			MS	OP	CARA 1980.002.406
<i>Hemicaranx amblyrhynchus</i> (Cuvier, 1833)*	WA	x			MM	ZB	CARA 2005.079.715
<i>Oligoplites palometa</i> (Cuvier, 1832)*	Ca+Br	x	x	x	MM	PV	CARA 1986.024.428
<i>Oligoplites saliens</i> (Bloch, 1793)*	Ca+SWA	x		x	MM	ZP	CARA 1988.033.437
<i>Oligoplites saurus</i> (Bloch e Schneider, 1801)*	WA	x	x	x	MM	PV	CARA 2005.072.476
<i>Selene setapinnis</i> (Mitchill, 1815)*	WA	x			MM	PV	CARA 2003.073.477
<i>Selene vomer</i> (Linnaeus, 1758)*	WA	x	x	x	MM	ZB	CARA 1984.016.420
<i>Trachinotus carolinus</i> (Linnaeus, 1766)*	WA	x	x		MS	ZB	CARA 2005.077.713
<i>Trachinotus falcatus</i> (Linnaeus, 1758)*	WA	x	x		MS	ZB	CARA 1988.045.449
<i>Trachinotus marginatus</i> Cuvier, 1832*	SSWA		x		MS		CARA 1989.056.460
<i>Trachurus lathami</i> Nichols, 1920*	WA	x				PV/ZB	CARA 2003.070.474
<i>Uraspis secunda</i> (Poey, 1860)*	CT			x	MS		CARA 1986.027.431
Clupeiformes							
Clupeidae							
<i>Brevoortia pectinata</i> (Jenyns, 1842)*	SWA		x		ES	ZP	CLUP 1988.025.812
<i>Harengula clupeola</i> (Cuvier, 1829)*	WA	x	x	x	MS	ZP	CLUP 1999.038.825
<i>Opisthonema oglinum</i> (Lesueur, 1818)*	WA	x	x	x	MS	ZP	CLUP 1988.024.811
<i>Platanichthys platana</i> (Regan, 1917)*	SSWA	x	x		ES	ZP	CLUP 1998.035.822
<i>Sardinella brasiliensis</i> (Steindachner, 1879) ††/ #	SSWA	x	x	x	MM	ZP	CLUP 1987.020.807
Engraulidae							
<i>Anchoa filifera</i> (Fowler, 1915)*	Ca+Br	x			ES		ENGR 1982.016.857
<i>Anchoa januaria</i> (Steindachner, 1879)*	Br	x	x	x	ES	OP	ENGR 1988.049.890
<i>Anchoa lyolepis</i> (Evermann & Marsh, 1900)	WA	x	x		MS	ZP	ENGR 1989.062.903
<i>Anchoa marinii</i> Hildebrand, 1943*	SSWA	x		x	MM	ZP	
<i>Anchoa spinifer</i> (Valenciennes, 1848)*	Ca+Br+EP	x			ES	PV/ZB	ENGR 1984.031.872
<i>Anchoa tricolor</i> (Spix & Agassiz, 1829)*	SWA	x	x		MM	ZP	ENGR 1988.048.889
<i>Anchovia clupeoides</i> (Swainson, 1839)*	Ca+Br	x		x	MM	ZP	
<i>Anchoviella lepidostole</i> (Fowler, 1911)*	Ca+Br+EP	x			ES	PV/ZB	ENGR 1984.031.872
<i>Cetengraulis edentulus</i> (Cuvier, 1829)*	Ca+Br	x	x	x	MM	ZP	ENGR 1999.080.921

Continuation Table 1.

List of Species	Geographic Range	Bays	Lagoons	Mangroove	EUFG	TFG	Voucher number
<i>Engraulis anchoita</i> Hubbs & Marini, 1935‡	SSWA	x	x		MS	ZP	ENGR 2002.082.923
<i>Lycengraulis grossidens</i> (Spix & Agassiz, 1829)*	Br+SWA	x	x	x	A N	PV	ENGR 1988.051.892
Pristigasteridae							
<i>Chirocentrodon bleekermanus</i> (Poey, 1867)*	Ca+Br	x	x		MS	PV	CLUP 1984.016.803
<i>Pellona harroweri</i> (Fowler, 1917)*	Ca+Br	x	x		MS	PV	PRIST 1982.005.834
Elopiformes							
Elopidae							
<i>Albula vulpes</i> (Linnaeus, 1758) ‡	WA	x			AM	ZB	ELOP 1990.003.394
<i>Elops saurus</i> Linnaeus, 1766*	WA	x	x	x	AM	PV	ELOP 1988.002.393
Gadiformes							
Bregmacerotidae							
<i>Bregmaceros atlanticus</i> Goode & Bean, 1886 *	CT		x		MM	ZP	BREG 1988.001.386
Phycidae							
<i>Urophycis brasiliensis</i> (Kaup, 1858)	SSWA	x				ZB	PHYCI 1983.004.1116
Gobiesociformes							
Gobiesocidae							
<i>Gobiesox barbatus</i> Starks, 1913*	WA	x			ES		GOBIE 1993.001.1111
Gobiiformes							
Gobiidae							
<i>Awaous tajasica</i> (Lichtenstein, 1822)	WA		x		AM	ZB	GOBI 1984.012.1044
<i>Bathygobius soporator</i> (Valenciennes, 1837)*	TA		x	x	MM	ZB	GOBI 1986.019.1051
<i>Ctenogobius boleosoma</i> (Jordan & Gilbert, 1882)*	WA		x		AM	ZB	GOBI 1988.028.1060
<i>Ctenogobius shufeldti</i> (Jordan & Eigenmann, 1887)*	WA		x		ER	OP	GOBI 1983.007.1039
<i>Ctenogobius stigmaticus</i> (Poey, 1860)*	WA		x		ES	ZB	GOBI 1988.036.1068
<i>Gobionellus oceanicus</i> (Pallas, 1770)*	WA	x	x	x	ES	ZB	GOBI 1988.033.1065
<i>Microgobius meeki</i> Evermann & Marsh, 1899*	Ca+Br	x			MS	ZB	GOBI 1982.002.1034
<i>Parrella macropteryx</i> Ginsburg, 1939*	WA	x				DV	GOBI 1984.008.1040
Pomacentridae							
<i>Abudefduf saxatilis</i> (Linnaeus, 1758 *)	TA		x			ZB	POMAC 1991.001.1112
Istiophoriformes							
Sphyraenidae							
<i>Sphyraena guachancho</i> Cuvier, 1829*	TA	x		x	ES	PV	SPHYR 1983.001.1165
Lophiiformes							
Ogcocephalidae							
<i>Ogcocephalus vespertilio</i> (Linnaeus, 1758)	Ca+SWA	x				ZB	OGCOC 1990.001.1276
Moroniformes							
Ephippidae							
<i>Chaetodipterus faber</i> (Broussonet, 1782)*	WA	x		x	MS	HV	EPHI 1988.006.401
Mugiliformes							
Mugilidae							
<i>Mugil curema</i> Valenciennes, 1836*	TA+EP	x	x	x	MM	DV	MUGI 1986.001.716
<i>Mugil liza</i> Valenciennes, 1836 ††/#	WA	x	x	x	CA	DV	MUGI 1987.010.725
<i>Mugil</i> sp Desmarest, 1831			x	x	MM		MUGI 1989.023.738
Perciformes							
Centropomidae							
<i>Centropomus parallelus</i> Poey, 1860*	WA	x	x	x	SC	ZB	CENT 1987.002.141

Continuation Table 1.

List of Species	Geographic Range	Bays	Lagoons	Mangroove	EUFG	TFG	Voucher number
<i>Centropomus undecimalis</i> (Bloch, 1792)*	WA			x	SC	PV	CENT 1998.018.157
Epinephelidae							
<i>Epinephelus itajara</i> (Lichtenstein, 1822) ††/§/•/†	WA	x			MM	ZB	
<i>Epinephelus marginatus</i> (Lowe, 1834) §	TA	x	x		MM	PV	SERRA 1986.004.1286
<i>Epinephelus morio</i> (Valenciennes, 1828) §	TA	x			MM	PV/ZB	
<i>Hyporthodus niveatus</i> (Valenciennes, 1828) §	WA	x	x		MM	PV/ZB	SERRA 1988.005.1287
<i>Mycteroperca acutirostris</i> (Valenciennes, 1828)*	TA	x	x		MS	ZB	SERRA 1992.009.1291
<i>Mycteroperca bonaci</i> (Poey, 1860) ††/‡/§	WA	x			MS	PV	
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) §	WA	x			MM	PV/ZB	
<i>Rypticus randalli</i> Courtenay, 1967*	Ca+Br	x			MS		
Gerreidae							
<i>Diapterus auratus</i> Ranzani, 1842*	WA	x		x	EM	ZB	GERRE 2010.065.1031
<i>Diapterus rhombeus</i> (Cuvier, 1829)*	Ca+Br	x	x	x	MS	ZB	GERRE 1997.041.1007
<i>Eucinostomus argenteus</i> Baird & Girard, 1855*	WA+EP	x	x	x	MM	OV	GERRE 1988.024.990
<i>Eucinostomus gula</i> (Quoy & Gaimard, 1824)*	WA	x	x	x	MM	ZB	GERRE 1987.019.985
<i>Eucinostomus lefroyi</i> (Goode, 1874)*	Ca+Br		x	x	ES	ZP	GERRE 1988.032.998
<i>Eucinostomus melanopterus</i> (Bleeker, 1863)*	TA	x	x	x	MM	ZB	GERRE 1986.010.976
<i>Eugerres brasiliensis</i> (Cuvier, 1830)*	WA		x	x	MS	ZB	GERRE 1984.008.974
Haemulidae							
<i>Anisotremus surinamensis</i> (Bloch, 1791)#	WA	x	x		MS	ZB	HAEMU. 1993.017.1156
<i>Conodon nobilis</i> (Linnaeus, 1758)*	WA	x			MM	ZB	HAEMU. 1983.002.1141
<i>Genyatremus luteus</i> (Bloch, 1790)#	Ca+Br			x	MS	ZB	
<i>Haemulon aurolineatum</i> Cuvier, 1830*	WA		x			ZB	HAEMU. 1984.004.1143
<i>Haemulon steindachneri</i> (Jordan & Gilbert, 1882)*	Ca+SWA		x		MS	ZB	HAEMU. 1989.013.1152
<i>Orthopristis ruber</i> (Cuvier, 1830)*	Ca+SWA	x	x	x	MS		HAEMU. 1988.006.1145
<i>Pomadasys corvinaeformis</i> (Steindachner, 1868)*	Ca+SWA	x			MM	PV/ZB	HAEMU. 2010.024.1163
Lutjanidae							
<i>Lutjanus analis</i> (Cuvier, 1828) ††/‡	WA	x	x		MM	PV	LUTJA 1989.002.1178
<i>Lutjanus jocu</i> (Bloch & Schneider, 1801)#	WA		x		MM	PV/ZB	LUTJA 1987.001.1177
Pomatomidae							
<i>Pomatomus saltatrix</i> (Linnaeus, 1766) ††/§	CT	x	x	x	MS	PV	POMA 1988.014.1097
Priacanthidae							
<i>Cookeolus japonicus</i> (Cuvier, 1829)*	CT	x				ZB	PRIAC 2005.002.1174
<i>Heteropriacanthus cruentatus</i> (Lacepède, 1801)*	CT	x				ZB	PRIAC 2011.004.1176
<i>Priacanthus arenatus</i> Cuvier, 1829*	TA+EP	x				PV/ZB	PRIAC 1983.001.1173
Serranidae							
<i>Diplectrum formosum</i> (Linnaeus, 1766)*	WA		x			PV/ZB	SERRA 1986.003.1285
<i>Diplectrum radiale</i> (Quoy & Gaimard, 1824)*	WA	x		x	MS	PV	SERRA 1982.001.1283
Pleuronectiformes							
Achiridae							
<i>Achirus declivis</i> Chabanaud, 1940*	WA	x			MS	ZB	ACHI 2005.022.190
<i>Achirus lineatus</i> (Linnaeus, 1758)*	WA	x	x	x	ES	ZB	ACHI 2010.026.296
<i>Catathyridium garmani</i> (Jordan, 1889)	SSWA	x			AM		
<i>Gymnachirus nudus</i> Kaup, 1858*	WA	x	x				ACHI 2003.016.184
<i>Trinectes paulistanus</i> (Miranda Ribeiro, 1915)*	Ca+Br	x			MS	ZB	ACHI 2011.024.294
Cynoglossidae							
<i>Symphurus tessellatus</i> (Quoy & Gaimard, 1824)*	Ca+Br+SSWA	x	x	x	MM	ZB	CYNO 1998.033.329

Continuation Table 1.

List of Species	Geographic Range	Bays	Lagoons	Mangroove	EUFG	TFG	Voucher number
Paralichthyidae							
<i>Citharichthys arenaceus</i> Evermann & Marsh, 1900*	WA			x	MS	ZB	PARA 1988.017. PIS 943
<i>Citharichthys macrops</i> Dresel, 1885*	WA	x		x	MS	ZB	PARA 2002.036. PIS 962
<i>Citharichthys spilopterus</i> Günther, 1862*	WA	x	x	x	ES	ZB	PARA 1982.003. PIS 929
<i>Etropus crossotus</i> Jordan & Gilbert, 1882*	WA+EP	x		x	MM	ZB	PARA 1983.010. PIS 936
<i>Paralichthys brasiliensis</i> (Ranzani, 1842)	SWA	x			MS		
<i>Paralichthys orbignyanus</i> (Valenciennes, 1839)	SSWA	x			MM	ZB	
<i>Paralichthys patagonicus</i> Jordan, 1889	SSWA+EP	x				PV	PARA 2002.040. PIS 966
Pleuronectidae							
<i>Oncopterus darwinii</i> Steindachner, 1874	SSWA	x			MS	ZB	PLEUR. 2012.001.925
Scombriformes							
Gempylidae							
<i>Thyrsopterus lepidopoides</i> (Cuvier, 1832)	WA+EP		x			PV	GEMP 1993.001.404
Scombridae							
<i>Scomberomorus brasiliensis</i> (Colete, Russo & Zavalla-Camim, 1978)*	Ca+Br	x		x	MS	PV	SCOMB 2011.001.1194
Trichiuridae							
<i>Trichiurus lepturus</i> Linnaeus, 1758*	CT	x		x	MS	PV	TRICH 2012.013.1217
Scorpaeniformes							
Scorpaenidae							
<i>Scorpaena isthmensis</i> Meek & Hildebrand, 1928*	WA	x			MS		SCORP 1982.001.1136
<i>Scorpaena plumieri</i> Bloch, 1789*	WA	x	x			PV/ZB	SCORP 1987.002.1137
Triglidae							
<i>Prionotus nudigula</i> Ginsburg, 1950	SSWA	x			MS	PV	TRIGL 2010.024.1275
<i>Prionotus punctatus</i> (Bloch, 1793)*	Ca+SWA	x	x	x	MS	ZB	TRIGL 1989.017.1268
Siluriformes							
Ariidae							
<i>Cathorops spixii</i> (Agassiz, 1829)	Ca+Br	X		x	ES	ZB	ARII 1987.025.215
<i>Genidens barbatus</i> (Lacepède, 1803) ††/†	SSWA	x		x	MM		ARII 1999.098.288
<i>Genidens genidens</i> (Cuvier, 1829)*	SSWA	x	x	x	MM	ZB	ARII 1987.024.214
Spariformes							
Lobotidae							
<i>Lobotes surinamensis</i> (Bloch, 1790)*	CT		x		MS	ZB	
Sparidae							
<i>Archosargus rhomboidalis</i> (Linnaeus, 1758)*	WA	x	x	x	MS	ZB	SPAR 1989.012.774
<i>Diplodus argenteus</i> (Valenciennes, 1830)*	SWA	x	x		MM	ZB	SPAR 1988.006.768
Syngnathiformes							
Dactylopteridae							
<i>Dactylopterus volitans</i> (Linnaeus, 1758)*	TA	x	x	x	MS	ZB	DACT 1989.003.390
Fistulariidae							
<i>Fistularia tabacaria</i> Linnaeus, 1758*	TA		x		MM	PV	FISTU 1993.001.787
Syngnathidae							
<i>Hippocampus reidi</i> Ginsburg, 1933 ††/‡//§	WA	x	x		MM	ZP	SYNG 1992.003.490
<i>Syngnathus folletti</i> Herald, 1942*	SWA	x	x		MS		SYNG 1989.002.489
Tetraodontiformes							
Balistidae							
<i>Balistes capriscus</i> Gmelin, 1789§	TA		x				BALI 1981.002.1186

Continuation Table 1.

List of Species	Geographic Range	Bays	Lagoons	Mangroove	EUFG	TFG	Voucher number
Diodontidae							
<i>Chilomycterus schoepfii</i> (Walbaum, 1792) *	WA	x	x		ES	ZB	DIOD 2011.008.1110
<i>Chilomycterus spinosus spinosus</i> (Linnaeus, 1758)	SWA	x		x	MM	ZB	DIOD 1999.002.1104
Monacanthidae							
<i>Aluterus schoepfii</i> (Walbaum, 1792)*	TA		x			HV	MONA. 1988.002.1188
<i>Monacanthus ciliatus</i> (Mitchill, 1818)*	TA		x			HV	MONA. 1992.006.1192
<i>Stephanolepis hispidus</i> (Linnaeus, 1766)*	TA	x	x		MS	ZB	MONA. 1987.001.1187
Ostraciidae							
<i>Lactophrys trigonus</i> (Linnaeus, 1758)*	WA	x				ZB	OSTRA 2001.001.1124
Tetraodontidae							
<i>Lagocephalus laevigatus</i> (Linnaeus, 1766)*	WA	x	x	x	MM	PV/ZB	TETRA 1991.019.1238
<i>Spherooides greeleyi</i> Gilbert, 1900*	Ca+Br	x		x	ES	ZB	TETRA 2011.032.1251
<i>Spherooides pachygaster</i> (Müller & Troschel, 1848)*	CT	x				ZB	
<i>Spherooides spengleri</i> (Bloch, 1785)*	TA	x	x	x		ZB	TETRA 2010.031.1250
<i>Spherooides testudineus</i> (Linnaeus, 1758)*	WA	x	x	x	ES	ZB	TETRA 1998.024.1243
<i>Spherooides tyleri</i> Shipp, 1972	Br	x				ZB	TETRA 2004.028.1247
Trachiniiformes							
Uranoscopidae							
<i>Astrocopus y-graecum</i> (Cuvier, 1829)	WA	x			MS	PV	URANO 2012.001.1203
Chondrichthyes							
Myliobatiformes							
Gymnuridae							
<i>Gymnura altavela</i> (Linnaeus, 1758) §/•	TA	x				PV/ZB	
Pristiiformes							
Rhinobatidae							
<i>Pseudobatos percellens</i> (Walbaum, 1792) ‡	TA	x			MS	ZB	RHINO 2005.002.1279
<i>Zapteryx brevirostris</i> (Muller & Henle, 1841) §	SWA	x					RHINO 2005.003.1280
Torpediniiformes							
Narcinidae							
<i>Narcine brasiliensis</i> (Olfers, 1831)#	WA		x		MS	ZB	NARCI 1991.001.1277

Pogonias cromis and *Genidens barbatus* as endangered. Only two species (*Epinephelus itajara* – endangered; *Hippocampus reidi* – vulnerable) are listed in the regional extinction list (CONSEMA, 2011) (Table 1).

Discussion

In Western Atlantic estuaries, Sciaenidae, Engraulidae, Ariidae and Gerreidae are among the seven most representative families in abundance in bottom trawling (Vieira & Musick 1994). Members of the families Sciaenidae and Engraulidae possess a wide tolerance to variations in salinity and temperature, which favors their occurrence in both estuarine and coastal waters along the Atlantic coast of South America (Camargo & Isaac 2003). The total species richness reported for the Island of Santa Catarina was relatively high when compared to other areas, such as Guaratuba Bay (southern coast of Paraná) (87 spp.; Chaves & Corrêa 1998, Chaves & Vendel 2001) and Babitonga Bay (northern coast of Santa Catarina) (150 spp.; Vilar et al. 2011). These

differences may have arisen because of differences in area among sites (Guaratuba Bay- 48 km², Babitonga Bay-130 km², Island of Santa Catarina- 431 km²) and/or because of the higher sampling effort in our study area (in number of samplings and variety of environments).

In terms of number of species, the total species richness of the Island of Santa Catarina is relatively higher than that of most of the coastal areas from the Western Atlantic [Paranaguá Estuarine Complex, southern Brazil (213 spp.; Passos et al. 2012); Guaratuba Bay, southern Brazil (87 spp.; Chaves & Corrêa 1998, Chaves & Vendel 2001); Rio da Prata estuary, northern Argentina (60 spp.; Jaureguizar et al. 2004); Caeté River estuary, northern Brazil (120 spp.; Marceniuk et al. 2017); Sergipe River estuary (136 spp.; Alcântara 2006); Curuçá estuary (98 spp.; Hercos 2006, Giarrizzo & Krumme 2007, Sarpedonti et al. 2008); Babitonga Bay (152 spp.; Vilar et al. 2011); Mataripe estuary (36 spp.; Dias et al. 2011); Paraguaçu River estuary (124 spp.; Reis-Filho et al. 2010), estuaries of northern Espírito Santo (57 spp.; Hostim-Silva et al. 2013)], and other tropical areas (number of species varying from 81

to 197; Blaber 2002), including estuaries of the biogeographic zones of the Indo-Pacific. Differences in species richness and composition may be difficult to explain since multiple specific factors can drive fish assemblage patterns, such as habitat diversity, rainfall patterns and hydrographic and oceanographic patterns. These factors act at distinct intensities and scales, leading to differences in fauna composition and richness between areas. However, these differences may be a result of insufficient sampling in the contrasting environments and/or the use of distinct fishing gear in tropical areas around the world (Blaber 2002).

The majority of the species are widely distributed in the Western Atlantic, but the segregation of species into two groups with distinct distribution is also evident. One includes species that occur in the Caribbean and in the Brazilian Province, and have affinities with the Caribbean fauna. The other, which encompasses species that occur in the Southwestern Atlantic, possesses temperate affinities and species similar to those that occur in Argentina and Uruguay.

This study provides a checklist of fish species from the Island of Santa Catarina based on a robust dataset constructed over the last 30 years. Once this study considered the diverse environments of the island (bays, lagoons and mangroves), it increased, therefore, the detectability of the species from this region. The ichthyofauna of the Island of Santa Catarina is composed by species with affinities with the tropical fauna of the Brazilian coast and the temperate fauna from Argentina and Uruguay. The species richness of the study area is relatively high when compared to other areas from Western Atlantic, emphasizing the importance of this region for the conservation of the aquatic biodiversity. In addition, some of the species reported in this study are listed in inventories of conservation status. Thus, it is suggested the monitoring of this fauna and more regional samplings for gathering more information about fish species from the Island of Santa Catarina (including the invasive species), mainly for conservation and management proposals.

Author Contributions

Gisela Costa Ribeiro: Contribution to data collection.

André Pereira Cattani: Contribution to data analysis and interpretation; Contribution to manuscript preparation.

Mauricio Hostim-Silva: Contribution to data collection.

Leandro Clezar: Contribution to data collection.

Ana Carolina dos Passos: Substantial contribution in the concept and design of the study; Contribution to manuscript preparation.

Marcelo Soeth: Substantial contribution in the concept and design of the study; Contribution to critical revision, adding intellectual content.

Olímpio Rafael Cardoso: Contribution to manuscript preparation; Contribution to critical revision, adding intellectual content.

Henry Louis Spach: Substantial contribution in the concept and design of the study; Contribution to manuscript preparation; Contribution to critical revision, adding intellectual content.

Conflicts of interest

The authors declare that they have no conflict of interest related to the publication of this manuscript.

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Received: 26/10/2018

Revised: 22/03/2019

Accepted: 01/04/2019

Published online: 06/05/2019

Erratum

Erratum: Ichthyofauna marine of the Island of Santa Catarina, Southern Brazil: checklist with comments on the species

In the article “Ichthyofauna marine of the Island of Santa Catarina, Southern Brazil: checklist with comments on the species” with the DOI code number <http://dx.doi.org/10.1590/1676-0611-BN-2018-0684>, published at *Biota Neotropica* 19(3): e20180684, the title should be

Marine ichthyofauna of Santa Catarina Island, Southern Brazil: checklist with comments on the species

Instead of:

Ichthyofauna marine of the Island of Santa Catarina, Southern Brazil: checklist with comments on the species