

Fish fauna from the shallow infralittoral of the Paranaguá Bay

**ENVIRONMENTAL DRIVERS OF FISH ASSEMBLAGES FROM
THE SHALLOW INFRA-LITTORAL AREAS OF THE
PARANAGUÁ BAY, SOUTHERN BRAZIL**

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Table S1. Fish fauna captured in the Paranaguá Bay Complex, absolute abundance at sampling sites, total (N) and relative (%) abundance. Sampling sites: Gamboa dos Papagaios (P1), Gamboa do Sucuriu (P2), Gamboa do Baguaçu (P3), Ponta do Poço (P4) e Pontal do Sul (P5). Habitat use (HU): MS = marine stragglers; ER = estuarine residents; MM = marine migrants; EM = estuarine migrants; and SC = semi-catadroms. Geographic Distribution (GD): CT = Circuntropical, TA = Trans-Atlantic, WA = Western Atlantic, SWA = Southern West Atlantic, SSWA = Southern Southwest Atlantic, CA = Caribbean, BR = Brazilian Province and EP = Eastern Pacific. National (MMA) and global (IUCN) conservation status: NE = not evaluated, LC = least concern, NT = near threatened, DD = data deficient, VU = vulnerable, EN = endangered and CR = critically endangered.

Family	Species	P1	P2	P3	P4	P5	N	%	HU	GD	MMA	IUCN
Narcinidae	<i>Narcine brasiliensis</i> (Olfers, 1831)		1				1	0.02	MS	WA	NE	DD
Rhinobatidae	<i>Pseudobatos percellens</i> (Walbaum, 1792)	3	9	1	4		17	0.26	MS	SWA	NE	NT
Muraenidae	<i>Gymnothorax ocellatus</i> (Agassiz, 1831)		2				2	0.03	MS	CA+SWA	DD	LC
Clupeidae	<i>Harengula clupeola</i> (Cuvier, 1829)	7	2				9	0.14	MS	WA	NE	LC
	<i>Opisthonema oglinum</i> (Lesueur, 1818)				1	1	2	0.03	MM	WA	NE	LC
Engraulidae	<i>Anchoa tricolor</i> (Spix & Agassiz, 1829)					1	1	0.02	ER	SWA	NE	NE
	<i>Anchovia clupeoides</i> (Swainson, 1839)	2					2	0.03	MM	CA+Br	NE	LC
	<i>Anchoviella lepidentostole</i> (Fowler, 1911)				3		3	0.05	SC	BR	NE	LC
	<i>Cetengraulis edentulus</i> (Cuvier, 1829)	1	1		2		4	0.06	EM	CA+BR	NE	LC
	<i>Lycengraulis grossidens</i> (Agassiz, 1829)	1					1	0.02	MS	BR+SWA	NE	LC
Pristigasteridae	<i>Pellona harroweri</i> (Fowler, 1917)				57	37	94	1.42	MS	CA+BR	NE	LC
Ariidae	<i>Cathorops spixii</i> (Agassiz, 1829)	562	677	1	123	1	1364	20.59	ER	CA+BR	NE	NE
	<i>Genidens genidens</i> (Cuvier, 1829)	73	61	71		1	206	3.11	MM	SSWA	NE	LC
Synodontidae	<i>Synodus foetens</i> (Linnaeus, 1766)	8	3	4	1	3	19	0.29	MS	WA	NE	LC
Phycidae	<i>Urophycis brasiliensis</i> (Kaup, 1858)					1	1	0.02	MS	SSWA	NE	NE

Fistulariidae	<i>Fistularia tabacaria</i> (Linnaeus, 1758)	1				1	0.02	MS	TA	NE	LC	
Syngnathidae	<i>Hippocampus reidi</i> (Ginsburg, 1933)	27	1			28	0.42	ER	WA	VU	NT	
	<i>Syngnathus folletti</i> (Herald, 1942)	1				1	0.02	MS	SWA	NE	LC	
Scorpaenidae	<i>Scorpaena brasiliensis</i> (Cuvier, 1829)	4				4	0.06	MS	WA	NE	LC	
	<i>Scorpaena isthmensis</i> (Meek & Hildebrand, 1928)	1				1	0.02	MS	WA	NE	LC	
Dactylopteridae	<i>Dactylopterus volitans</i> (Linnaeus, 1758)	1	7	30		38	0.57	MM	TA	NE	LC	
Triglidae	<i>Prionotus punctatus</i> (Bloch, 1793)	80	220	46	59	64	469	7.08	MM	CA+SWA	NE	LC
Serranidae	<i>Diplectrum radiale</i> (Quoy & Gaimard, 1824)	45	187	9	10	251	3.79	MM	WA	NE	LC	
	<i>Rypticus randalli</i> (Couternay, 1967)	3				3	0.05	MS	CA+BR	NE	LC	
Carangidae	<i>Chloroscombus chrysurus</i> (Linnaeus, 1766)	8	50	9	28	326	421	6.36	MS	TA	NE	LC
	<i>Oligoplites saurus</i> (Bloch & Schneider, 1801)				3	5	8	0.12	MM	WA	NE	LC
	<i>Selene vomer</i> (Linnaeus, 1758)	11	5	2	1	4	23	0.35	MS	WA	NE	LC
Gerreidae	<i>Diapterus rhombeus</i> (Cuvier, 1829)		1				1	0.02	ER	CA+BR	NE	LC
	<i>Eucinostomus argenteus</i> (Baird & Girard, 1855)	60	121	4	2	9	196	2.96	ER	WA+EP	NE	LC
	<i>Eucinostomus gula</i> (Quoy & Gaimard, 1824)	2					2	0.03	MM	WA	NE	LC
Haemulidae	<i>Anisotremus surinamensis</i> (Bloch, 1791)	181	493	50	34	58	816	12.32	MM	WA	NE	DD
	<i>Boridia grossidens</i> (Cuvier, 1830)	1					1	0.02	MS	SSWA	NE	NE
	<i>Genyatremus luteus</i> (Bloch, 1795)	8	1				9	0.14	ER	CA+BR	NE	DD
	<i>Orthopristis ruber</i> (Cuvier, 1830)	17	36			1	54	0.82	MS	CA+SWA	NE	LC
Sciaenidae	<i>Bairdiella ronchus</i> (Cuvier, 1830)	14	10				24	0.36	MS	CA+BR	NE	LC
	<i>Ctenosciaena gracilicirrhus</i> (Metzelaar, 1919)	90	13		1		104	1.57	MS	CA+BR	NE	LC
	<i>Cynoscion leiarchus</i> (Cuvier, 1830)	40	1	2	2	2	47	0.71	EM	CA+BR	NE	LC
	<i>Cynoscion microlepidotus</i> (Cuvier, 1830)	273	53			2	328	4.95	ER	BR	NE	LC
	<i>Isopisthus parvipinnis</i> (Cuvier, 1830)	4			1	3	8	0.12	MM	CA+BR	NE	LC
	<i>Menticirrhus americanos</i> (Linnaeus, 1758)	42	18	17	35	9	121	1.83	ER	WA	NE	LC

	<i>Menticirrhus littoralis</i> (Holbrook, 1847)	11	8	3	22	1	45	0.68	ER	WA	NE	LC
	<i>Micropogonias furnieri</i> (Desmarest, 1823)	170	17				187	2.82	EM	CA+SWA	NE	LC
	<i>Stellifer brasiliensis</i> (Schultz, 1945)	5	2				7	0.11	ER	BR	NE	NE
	<i>Stellifer rastrifer</i> (Jordan, 1889)	20	1		10		31	0.47	ER	BR+SSWA	NE	LC
	<i>Stellifer stellifer</i> (Bloch, 1790)		2				2	0.03	ER	BR	NE	DD
Ephippidae	<i>Chaetodipterus faber</i> (Broussonet, 1782)	120	298	1	1	9	429	6.48	MM	WA	NE	LC
Paralichthyidae	<i>Citharichthys</i> sp.	43	44	11	35	22	155	2.34	--	--	--	--
	<i>Etropus crossotus</i> (Jordan & Gilbert, 1882)	166	145	65	37	46	459	6.93	ER	WA+EP	NE	LC
Achiridae	<i>Achirus lineatus</i> (Linnaeus, 1758)	23	27	2	4		56	0.85	ER	WA	NE	LC
Cynoglossidae	<i>Symphurus tessellatus</i> (Quoy & Gaimard, 1824)	39	5		1		45	0.68	ER	CA+BR+SSWA	NE	LC
Monacanthidae	<i>Stephanolepis hispidus</i> (Linnaeus, 1766)	9	103	4		1	117	1.77	MS	TA	NE	LC
Tetraodontidae	<i>Lagocephalus laevigatus</i> (Linnaeus, 1766)	1			1		2	0.03	MS	TA	NE	LC
	<i>Sphoeroides greeleyi</i> (Gilbert, 1900)	40	129	6	1	1	177	2.67	MM	CA+BR	NE	LC
	<i>Sphoeroides testudineus</i> (Linnaeus, 1758)	47	96	2	6		151	2.28	ER	WA	NE	LC
Diodontidae	<i>Chilomycterus spinosus spinosus</i> (Linnaeus, 1758)	8	59	4	3	1	75	1.13	MS	SWA	NE	LC

Table S2. Qualitative description of the bottom cover at each sampling site. Presence (x) and absence (-) of items. Fish assemblage data (abundance, richness, and diversity index). Sampling sites: Gamboa dos Papagaios (P1), Gamboa do Sucuriu (P2), Gamboa do Baguaçu (P3), Ponta do Poço (P4) e Pontal do Sul (P5).

Bottom cover items and fish assemblage		P1	P2	P3	P4	P5
Bottom cover items	Leaves	x	x	x	x	-
	<i>Craniella cranium</i>	-	x	-	-	-
	<i>Bugula neritina</i>	-	x	-	-	-
	<i>Renilla reniformis</i>	-	x	-	-	-
	<i>Callipodium</i> sp	-	x	-	-	-
	<i>Leptogornia setacea</i>	-	x	-	-	-
	<i>Luidia alternata alternata</i>	x	x	-	-	-
	<i>Clavelina oblonga</i>	-	x	-	-	-
	Mollusks	x	x	x	x	-
	Crustaceans	x	x	x	x	-
Fish assemblage	Abundance	2239	2942	339	484	619
	Richness	40	42	23	28	26
	Diversity index (H')	1.19	1.14	1.02	1.07	0.79

Table S3. Mean and standard error of environmental variables [Temperature (°C), salinity, dissolved oxygen (ml/L), pH, seston (mg/L), phosphate (µM), total nitrogen (mg/L), and silicate (µM)] from sampling sites. Different letters indicate statistically significant differences (Tukey tests, $p < 0.05$). *Significant values (ANOVA, $p < 0.05$).

Environmental variables	Sampling sites					P
	Gamboa dos Papagaios	Gamboa do Sucuriu	Gamboa do Baguaçu	Ponta do Poço	Pontal do Sul	
Temperature	23.53 ± 1.00 ^a	23.60 ± 1.02 ^a	22.76 ± 1.15 ^a	21.43 ± 1.26 ^a	22.72 ± 1.13 ^a	0.659
Salinity	30.99 ± 0.70 ^a	31.67 ± 0.79 ^a	33.18 ± 0.60 ^{a,b}	35.11 ± 0.54 ^b	35.91 ± 0.50 ^{b,c}	0.000*
Dissolved oxygen	4.68 ± 0.22 ^a	4.51 ± 0.27 ^a	4.81 ± 0.16 ^a	4.93 ± 0.15 ^a	5.00 ± 0.14 ^a	0.399
pH	8.08 ± 0.02 ^a	8.11 ± 0.02 ^{a,c}	8.16 ± 0.02 ^{a,b,c}	8.20 ± 0.02 ^{b,c}	8.19 ± 0.02 ^{b,c}	0.000*
Seston	39.99 ± 9.39 ^a	42.70 ± 10.27 ^a	42.41 ± 10.43 ^a	52.18 ± 10.36 ^a	39.99 ± 9.39 ^a	0.905
Phosphate	0.36 ± 0.04 ^a	0.38 ± 0.04 ^a	0.39 ± 0.05 ^a	0.37 ± 0.05 ^a	0.32 ± 0.04 ^a	0.504
Inorganic nitrogen	1.25 ± 0.13 ^a	1.11 ± 0.15 ^a	1.18 ± 0.15 ^a	1.05 ± 0.13 ^a	1.40 ± 0.21 ^a	0.555
Silicate	8.51 ± 0.94 ^a	9.31 ± 0.97 ^a	8.02 ± 0.65 ^a	8.43 ± 1.10 ^a	9.31 ± 1.38 ^a	0.872