

Supplementary Information

Table 4 Sterols levels detected in sediments of Acaraú River. Values expressed as ng g⁻¹.

	COP	COL	COLESTAN	ERG	ESTIG	B-SITO
ACR01	83.18	754.62	120.17	442.11	218.94	386.17
ACR02	32.85	191.56	66.96	431.04	130.55	491.96
ACR03	6.00	120.49	9.38	43.00	22.18	70.47
ACR04	22.40	213.29	15.68	89.81	39.64	178.83
ACR05	14.98	224.84	14.67	105.22	38.03	178.88
ACR06	13.49	241.37	63.90	172.94	32.87	145.26
ACR07	40.28	218.13	143.04	567.67	213.68	379.81
ACR08	50.18	288.81	32.05	68.24	207.86	714.13
ACR09	79.24	215.91	13.40	204.66	306.76	766.71
ACR10	124.09	438.15	188.25	885.65	209.29	679.39

Table 5 EDCs levels detected in sediments of Acaraú River. Values expressed as ng g⁻¹.

	DES	DIE	17 α -E2	17 β -E2	E1	MES	E3	17- α EE2
ACR01	1474.07	50.53	35.90		40.11	59.43	40.70	51.19
ACR02		0.10	5.10		35.92	53.47	0.99	78.72
ACR03		6.54		3.94	4.68	95.23	24.31	107.97
ACR04	3.29			1.53		59.83	0.07	75.07
ACR05	3.29			1.53		59.85	0.07	75.09
ACR06	186.14	0.77		0.08	27.03	92.68	17.72	66.15
ACR07	138.70	5.35	208.40	29.50		251.67	25.41	153.81
ACR08	137.15	3.07	2.02		73.83	58.24	8.47	119.66
ACR09	206.91	44.42	7.33	18.95	4.84	2.77	55.18	123.22
ACR10	63.82		0.30		72.15	112.84	16.23	89.78

Table 6 Data on diethylstilbestrol toxicity compiled from the ECOTOX database. LOEC = Lowest Observed Effect Concentration; EC = Effect Concentration; IC = Inhibitory Concentration; LC = Lethal Concentration.

Species Scientific Name	Species Group	Media Type	Effect mg L ⁻¹	Effect	Endpoint
<i>Raphidocelis subcapitata</i>	Algae	Fresh water	3.7	Population	EC ₅₀
<i>Lithobates pipiens</i>	Amphibians	Fresh water	1	Biochemistry	LOEC
<i>Lithobates pipiens</i>	Amphibians	Fresh water	0.01	Biochemistry	LOEC
<i>Daphnia magna</i>	Crustaceans	Fresh water	3.71	Development	EC ₅₀
<i>Daphnia magna</i>	Crustaceans	Fresh water	1.87	Development	EC ₅₀
<i>Daphnia magna</i>	Crustaceans	Fresh water	2.03	Intoxication	EC ₅₀
<i>Daphnia magna</i>	Crustaceans	Fresh water	1.55	Intoxication	EC ₅₀
<i>Daphnia magna</i>	Crustaceans	Fresh water	1.09	Mortality	LC ₅₀
<i>Daphnia magna</i>	Crustaceans	Fresh water	0.5	Mortality	LC ₅₀
<i>Daphnia magna</i>	Crustaceans	Fresh water	1.2	Mortality	LC ₅₀
<i>Daphnia magna</i>	Crustaceans	Fresh water	0.2	Reproduction	LOEC
<i>Daphnia magna</i>	Crustaceans	Fresh water	0.1	Growth	LOEC
<i>Oreochromis mossambicus</i>	Fish	Fresh water	2	Physiology	LOEC
<i>Tilapia aurea</i>	Fish	Fresh water	100	Population	LOEC
<i>Danio rerio</i>	Fish	Fresh water	0.8050668	Mortality	LOEC
<i>Dugesia japonica</i>	Worms	Fresh water	0.16	Growth	IC ₅₀
<i>Dugesia japonica</i>	Worms	Fresh water	0.52	Mortality	LC ₅₀
<i>Dugesia japonica</i>	Worms	Fresh water	0.56	Mortality	LC ₅₀
<i>Dugesia japonica</i>	Worms	Fresh water	0.61	Mortality	LC ₅₀
<i>Dugesia japonica</i>	Worms	Fresh water	0.8	Mortality	LC ₅₀
<i>Dugesia japonica</i>	Worms	Fresh water	0.7	Mortality	LC ₅₀
<i>Dugesia japonica</i>	Worms	Fresh water	0.5	Mortality	LC ₅₀
<i>Dugesia japonica</i>	Worms	Fresh water	0.6	Mortality	LC ₅₀
<i>Dugesia japonica</i>	Worms	Fresh water	0.5	Growth	LOEC
<i>Tisbe battagliai</i>	Crustaceans	Salt water	0.0316	Mortality	LC ₅₀
<i>Nitocra spinipes</i>	Crustaceans	Salt water	0.29	Mortality	LC ₅₀
<i>Tisbe battagliai</i>	Crustaceans	Salt water	0.0316	Mortality	LC ₅₀
<i>Tisbe battagliai</i>	Crustaceans	Salt water	0.1	Mortality	LOEC
<i>Nitocra spinipes</i>	Crustaceans	Salt water	0.03	Reproduction	LOEC
<i>Tisbe battagliai</i>	Crustaceans	Salt water	0.1	Reproduction	LOEC

Table 7 Data on 17 α -ethinylestradiol toxicity compiled from the ECOTOX database. LOEC = Lowest Observed Effect Concentration; EC = Effect Concentration; LC = Lethal Concentration.

Species Scientific Name	Species Group	Media Type	Effect mg L ⁻¹	Effect	Endpoint
<i>Neomysis integer</i>	Crustaceans	Salt water	1.2	Mortality	LC ₅₀
<i>Acartia tonsa</i>	Crustaceans	Salt water	0.088	Development	EC ₅₀
<i>Acartia tonsa</i>	Crustaceans	Salt water	1.1	Mortality	LC ₅₀
<i>Nitocra spinipes</i>	Crustaceans	Salt water	0.51	Mortality	LC ₅₀
<i>Tisbe battagliai</i>	Crustaceans	Salt water	0.1	Mortality	LC ₅₀
<i>Solea senegalensis</i>	Fish	Salt water	1	Biochemistry	LOEC
<i>Oryzias melastigma</i>	Fish	Salt water	0.00001	Genetics	LOEC
<i>Lipophrys pholis</i>	Fish	Salt water	0.000015	Genetics	LOEC
<i>Syngnathus abaster</i>	Fish	Salt water	0.00000608	Behavior	LOEC
<i>Gadus morhua</i>	Fish	Salt water	5	Enzyme(s)	LOEC
<i>Gadus morhua</i>	Fish	Salt water	5	Enzyme(s)	LOEC
<i>Gadus morhua</i>	Fish	Salt water	5	Enzyme(s)	LOEC
<i>Pomatoschistus minutus</i>	Fish	Salt water	0.000011	Genetics	LOEC
<i>Sparus aurata</i>	Fish	Salt water	0.00005	Mortality	LOEC
<i>Oryzias melastigma</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Pomatoschistus minutus</i>	Fish	Salt water	0.000004	Reproduction	LOEC
<i>Gadus morhua</i>	Fish	Salt water	2.964094	Genetics	LOEC
<i>Gadus morhua</i>	Fish	Salt water	0.002964094	Genetics	LOEC
<i>Gadus morhua</i>	Fish	Salt water	2.964094	Genetics	LOEC
<i>Syngnathus scovelli</i>	Fish	Salt water	0.0001	Development	LOEC
<i>Syngnathus scovelli</i>	Fish	Salt water	0.000001	Reproduction	LOEC
<i>Pomatoschistus minutus</i>	Fish	Salt water	0.000011	Reproduction	LOEC
<i>Syngnathus abaster</i>	Fish	Salt water	0.000009	Behavior	LOEC
<i>Oryzias melastigma</i>	Fish	Salt water	0.00001	Genetics	LOEC
<i>Oryzias melastigma</i>	Fish	Salt water	0.00001	Genetics	LOEC
<i>Solea senegalensis</i>	Fish	Salt water	1	Enzyme(s)	LOEC
<i>Dicentrarchus labrax</i>	Fish	Salt water	0.000017	Biochemistry	EC ₁₀
<i>Dicentrarchus labrax</i>	Fish	Salt water	0.000029	Biochemistry	EC ₅₀
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.01	Development	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.00005	Development	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0000036	Biochemistry	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0000036	Reproduction	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.00001	Hormone(s)	LOEC

<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.000015	Behavior	LOEC
<i>Dicentrarchus labrax</i>	Fish	Salt water	0.0000149	Biochemistry	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.001	Development	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.0001	Biochemistry	LOEC
<i>Cyprinodon variegatus</i>	Fish	Salt water	0.000832	Biochemistry	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.00005	Development	LOEC
<i>Dicentrarchus labrax</i>	Fish	Salt water	10	Growth	LOEC
<i>Danio rerio</i>	Fish	Salt water	0.2964094	Genetics	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.01	Development	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.00001765	Biochemistry	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.00000101	Genetics	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.00005	Development	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.0001	Reproduction	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.01	Mortality	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.000001	Hormone(s)	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.01	Injury	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.01	Development	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.001	Development	LOEC
<i>Menidia beryllina</i>	Fish	Salt water	0.000001	Biochemistry	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.0001	Biochemistry	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.00005	Morphology	LOEC
<i>Zoarces viviparus</i>	Fish	Salt water	0.000005	Biochemistry	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.00005	Morphology	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.0001	Morphology	LOEC
<i>Danio rerio</i>	Fish	Salt water	0.2964094	Behavior	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.0001	Population	LOEC
<i>Danio rerio</i>	Fish	Salt water	0.2964094	Behavior	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.0001	Biochemistry	LOEC
<i>Danio rerio</i>	Fish	Salt water	0.02964094	Behavior	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.000001	Reproduction	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.00001	Mortality	LOEC
<i>Danio rerio</i>	Fish	Salt water	0.2964094	Behavior	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.0001	Population	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.01	Growth	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.01	Development	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.0001	Reproduction	LOEC

<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.0000041	Biochemistry	LOEC
<i>Danio rerio</i>	Fish	Salt water	0.2964094	Behavior	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.00005	Development	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.0001	Reproduction	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.0002479	Morphology	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.00005	Population	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.0000679	Genetics	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.00005	Biochemistry	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.0001	Hormone(s)	LOEC
<i>Fundulus heteroclitus</i>	Fish	Salt water	0.01	Development	LOEC
<i>Zoarces viviparus</i>	Fish	Salt water	0.000005	Morphology	LOEC
<i>Paracentrotus lividus</i>	Echinoderm	Salt water	0.0000037	Development	EC ₁₀
<i>Paracentrotus lividus</i>	Echinoderm	Salt water	0.0000027	Reproduction	EC ₁₀
<i>Strongylocentrotus purpuratus</i>	Echinoderm	Salt water	0.0303	Development	EC ₅₀
<i>Paracentrotus lividus</i>	Echinoderm	Salt water	0.000005	Reproduction	LOEC
<i>Paracentrotus lividus</i>	Echinoderm	Salt water	0.00005	Development	LOEC
<i>Saccostrea glomerata</i>	Molluscs	Salt water	0.00005	Biochemistry	LOEC
<i>Mytilus galloprovincialis</i>	Molluscs	Salt water	0.000142	Reproduction	EC ₁₀
<i>Mytilus galloprovincialis</i>	Molluscs	Salt water	0.0000025	Development	EC ₁₀
<i>Mytilus galloprovincialis</i>	Molluscs	Salt water	0.000005	Development	LOEC
<i>Mytilus galloprovincialis</i>	Molluscs	Salt water	0.0005	Reproduction	LOEC
<i>Mytilus edulis</i>	Molluscs	Salt water	0.0000042	Genetics	LOEC

Table 8 Data on 17 α -estradiol toxicity compiled from the ECOTOX database. LOEC = Lowest Observed Effect Concentration.

Species Scientific Name	Species Group	Media Type	Effect mg L ⁻¹	Effect	Endpoint
<i>Gobiocypris rarus</i>	Fish	Fresh water	0.00005	Biochemistry	LOEC
<i>Clarias gariepinus</i>	Fish	Fresh water	10	Biochemistry	LOEC

Table 9 Data on 17 β -estradiol toxicity compiled from the ECOTOX database. LOEC = Lowest Observed Effect Concentration; EC = Effect Concentration; LC = Lethal Concentration.

Species Scientific Name	Species Group	Media Type	Effect mg L ⁻¹	Effect	Endpoint
<i>Elminius modestus</i>	Crustaceans	Salt water	0.01	Development	LOEC
<i>Balanus amphitrite</i>	Crustaceans	Salt water	0.001	Population	LOEC
<i>Balanus amphitrite</i>	Crustaceans	Salt water	0.0001	Population	LOEC
<i>Elminius modestus</i>	Crustaceans	Salt water	0.01	Population	LOEC
<i>Acartia tonsa</i>	Crustaceans	Salt water	0.72	Development	EC ₅₀
<i>Americamysis bahia</i>	Crustaceans	Salt water	1.69	Mortality	LC ₅₀
<i>Americamysis bahia</i>	Crustaceans	Salt water	0.89	Mortality	LC ₅₀
<i>Tisbe battagliai</i>	Crustaceans	Salt water	0.1	Mortality	LC ₅₀
<i>Nitocra spinipes</i>	Crustaceans	Salt water	1.6	Mortality	LC ₅₀
<i>Tigriopus japonicus</i>	Crustaceans	Salt water	3.35	Mortality	LC ₅₀
<i>Tisbe battagliai</i>	Crustaceans	Salt water	0.1	Mortality	LC ₅₀
<i>Tisbe battagliai</i>	Crustaceans	Salt water	0.1	Mortality	LC ₅₀
<i>Tisbe battagliai</i>	Crustaceans	Salt water	0.1	Mortality	LC ₅₀
<i>Eurytemora affinis</i>	Crustaceans	Salt water	0.045	Mortality	LC ₅₀
<i>Nitocra spinipes</i>	Crustaceans	Salt water	0.05	Population	LOEC
<i>Tisbe battagliai</i>	Crustaceans	Salt water	0.1	Mortality	LOEC
<i>Eurytemora affinis</i>	Crustaceans	Salt water	0.018	Mortality	LOEC
<i>Tisbe battagliai</i>	Crustaceans	Salt water	0.1	Reproduction	LOEC
<i>Tisbe battagliai</i>	Crustaceans	Salt water	0.1	Mortality	LOEC
<i>Tigriopus japonicus</i>	Crustaceans	Salt water	0.00001	Development	LOEC
<i>Rivulus marmoratus</i>	Fish	Salt water	0.62	Mortality	LC ₅₀
<i>Rivulus marmoratus</i>	Fish	Salt water	1.29	Mortality	LC ₅₀
<i>Rivulus marmoratus</i>	Fish	Salt water	4.26	Mortality	LC ₅₀
<i>Rivulus marmoratus</i>	Fish	Salt water	1.1	Mortality	LC ₉₅
<i>Rivulus marmoratus</i>	Fish	Salt water	3.61	Mortality	LC ₉₅
<i>Rivulus marmoratus</i>	Fish	Salt water	7.71	Mortality	LC ₉₅
<i>Acanthogobius flavimanus</i>	Fish	Salt water	0.0000807	Biochemistry	LOEC
<i>Pomatoschistus minutus</i>	Fish	Salt water	0.000097	Morphology	LOEC
<i>Rivulus marmoratus</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Pomatoschistus minutus</i>	Fish	Salt water	0.000669	Reproduction	LOEC
<i>Pomatoschistus minutus</i>	Fish	Salt water	0.000097	Morphology	LOEC
<i>Pomatoschistus minutus</i>	Fish	Salt water	0.000016	Morphology	LOEC
<i>Rivulus marmoratus</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Platichthys flesus</i>	Fish	Salt water	0.000333	Biochemistry	LOEC
<i>Oryzias melastigma</i>	Fish	Salt water	0.01	Genetics	LOEC

<i>Gobius niger</i>	Fish	Salt water	0.0035	Genetics	LOEC
<i>Rivulus marmoratus</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Acanthogobius flavimanus</i>	Fish	Salt water	0.000606	Biochemistry	LOEC
<i>Solea solea</i>	Fish	Salt water	0.002723874	Genetics	LOEC
<i>Rivulus marmoratus</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Solea solea</i>	Fish	Salt water	0.002723874	Biochemistry	LOEC
<i>Rivulus marmoratus</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Sparus aurata</i>	Fish	Salt water	0.1	Genetics	LOEC
<i>Platichthys flesus</i>	Fish	Salt water	0.5	Biochemistry	LOEC
<i>Oryzias melastigma</i>	Fish	Salt water	0.000003	Biochemistry	LOEC
<i>Rivulus marmoratus</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Lateolabrax japonicus</i>	Fish	Salt water	0.0002	Cell(s)	LOEC
<i>Lateolabrax japonicus</i>	Fish	Salt water	0.002	Cell(s)	LOEC
<i>Oryzias melastigma</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Oryzias melastigma</i>	Fish	Salt water	0.00001	Genetics	LOEC
<i>Liza aurata</i>	Fish	Salt water	0.002	Enzyme(s)	LOEC
<i>Rivulus marmoratus</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Gobius niger</i>	Fish	Salt water	0.0035	Genetics	LOEC
<i>Oryzias melastigma</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Gobius niger</i>	Fish	Salt water	0.0035	Genetics	LOEC
<i>Rivulus marmoratus</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Oryzias melastigma</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Liza aurata</i>	Fish	Salt water	0.07	Genetics	LOEC
<i>Rivulus marmoratus</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Liza aurata</i>	Fish	Salt water	0.07	Genetics	LOEC
<i>Platichthys flesus</i>	Fish	Salt water	10	Genetics	LOEC
<i>Halichoeres trimaculatus</i>	Fish	Salt water	0.004	Reproduction	LOEC
<i>Rivulus marmoratus</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Halichoeres trimaculatus</i>	Fish	Salt water	0.004	Reproduction	LOEC
<i>Rivulus marmoratus</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Acanthogobius flavimanus</i>	Fish	Salt water	0.0444	Genetics	LOEC
<i>Acanthogobius flavimanus</i>	Fish	Salt water	0.00366	Biochemistry	LOEC
<i>Lateolabrax japonicus</i>	Fish	Salt water	0.0002	Cell(s)	LOEC
<i>Lateolabrax japonicus</i>	Fish	Salt water	0.002	Enzyme(s)	LOEC
<i>Sparus aurata</i>	Fish	Salt water	10	Genetics	LOEC
<i>Lateolabrax japonicus</i>	Fish	Salt water	0.002	Immunological	LOEC
<i>Lateolabrax japonicus</i>	Fish	Salt water	0.0002	Immunological	LOEC
<i>Sparus aurata</i>	Fish	Salt water	10	Genetics	LOEC

<i>Lateolabrax japonicus</i>	Fish	Salt water	0.002	Cell(s)	LOEC
<i>Lateolabrax japonicus</i>	Fish	Salt water	0.0002	Enzyme(s)	LOEC
<i>Tautogolabrus adspersus</i>	Fish	Salt water	2.5	Reproduction	LOEC
<i>Rivulus marmoratus</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Dicentrarchus labrax</i>	Fish	Salt water	0.000031	Biochemistry	EC ₁₀
<i>Dicentrarchus labrax</i>	Fish	Salt water	0.000104	Biochemistry	EC ₅₀
<i>Danio rerio</i>	Fish	Salt water	17.4327936	Mortality	LC ₁₀₀
<i>Fundulus heteroclitus</i>	Fish	Salt water	5.09364438	Mortality	LC ₅₀
<i>Fundulus heteroclitus</i>	Fish	Salt water	11.19512214	Mortality	LC ₅₀
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.001	Growth	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.01	Development	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0005	Biochemistry	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.001	Development	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0005	Biochemistry	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.01	Growth	LOEC
<i>Cyprinodon variegatus</i>	Fish	Salt water	0.001622	Biochemistry	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.01	Growth	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0005	Accumulation	LOEC
<i>Danio rerio</i>	Fish	Salt water	0.2723874	Behavior	LOEC
<i>Paralichthys dentatus</i>	Fish	Salt water	0.0207014424	Accumulation	LOEC
<i>Dicentrarchus labrax</i>	Fish	Salt water	10	Morphology	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.01	Growth	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0005	Growth	LOEC
<i>Paralichthys dentatus</i>	Fish	Salt water	0.02723874	Accumulation	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.01	Growth	LOEC
<i>Cyprinodon variegatus</i>	Fish	Salt water	0.001622	Genetics	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.001	Morphology	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.01	Development	LOEC
<i>Dicentrarchus labrax</i>	Fish	Salt water	10	Population	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.001	Growth	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.0001	Genetics	LOEC
<i>Paralichthys dentatus</i>	Fish	Salt water	0.02723874	Accumulation	LOEC
<i>Paralichthys dentatus</i>	Fish	Salt water	0.0144365322	Accumulation	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0005	Genetics	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.001	Development	LOEC
<i>Dicentrarchus labrax</i>	Fish	Salt water	5	Development	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.001	Growth	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0005	Genetics	LOEC

<i>Paralichthys dentatus</i>	Fish	Salt water	0.0236977038	Accumulation	LOEC
<i>Paralichthys dentatus</i>	Fish	Salt water	0.02723874	Accumulation	LOEC
<i>Paralichthys dentatus</i>	Fish	Salt water	0.001361937	Accumulation	LOEC
<i>Paralichthys dentatus</i>	Fish	Salt water	0.02723874	Accumulation	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0005	Morphology	LOEC
<i>Paralichthys dentatus</i>	Fish	Salt water	0.0128022078	Accumulation	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.01	Development	LOEC
<i>Dicentrarchus labrax</i>	Fish	Salt water	0.0356827494	Enzyme(s)	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.001	Development	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.001	Growth	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0005	Genetics	LOEC
<i>Dicentrarchus labrax</i>	Fish	Salt water	10	Growth	LOEC
<i>Paralichthys dentatus</i>	Fish	Salt water	0.0302350014	Accumulation	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.001	Growth	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.01	Development	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0005	Cell(s)	LOEC
<i>Dicentrarchus labrax</i>	Fish	Salt water	0.0356827494	Biochemistry	LOEC
<i>Dicentrarchus labrax</i>	Fish	Salt water	10	Cell(s)	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0005	Biochemistry	LOEC
<i>Paralichthys dentatus</i>	Fish	Salt water	0.0010895496	Accumulation	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0005	Morphology	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0005	Accumulation	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.00001	Development	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0005	Morphology	LOEC
<i>Paralichthys dentatus</i>	Fish	Salt water	0.02723874	Accumulation	LOEC
<i>Paralichthys dentatus</i>	Fish	Salt water	0.0073544598	Accumulation	LOEC
<i>Gasterosteus aculeatus</i>	Fish	Salt water	0.001	Biochemistry	LOEC
<i>Zoarcetes viviparus</i>	Fish	Salt water	0.0005	Biochemistry	LOEC
<i>Oncorhynchus tshawytscha</i>	Fish	Salt water	5	Biochemistry	LOEC
<i>Oncorhynchus mykiss</i>	Fish	Salt water	5	Biochemistry	LOEC
<i>Salmo salar</i>	Fish	Salt water	0.0001	Growth	LOEC
<i>Oncorhynchus mykiss</i>	Fish	Salt water	5	Biochemistry	LOEC
<i>Strongylocentrotus purpuratus</i>	Echinoderm	Salt water	0.0142	Development	EC ₅₀
<i>Strongylocentrotus purpuratus</i>	Echinoderm	Salt water	0.0005	Development	LOEC
<i>Dendraster excentricus</i>	Echinoderm	Salt water	10	Reproduction	LOEC
<i>Strongylocentrotus purpuratus</i>	Echinoderm	Salt water	0.5	Development	LOEC
<i>Strongylocentrotus purpuratus</i>	Echinoderm	Salt water	0.0005	Development	LOEC
<i>Dendraster excentricus</i>	Echinoderm	Salt water	10	Development	LOEC

<i>Strongylocentrotus purpuratus</i>	Echinoderm	Salt water	0.0005	Development	LOEC
<i>Strongylocentrotus purpuratus</i>	Echinoderm	Salt water	0.5	Development	LOEC
<i>Placopecten magellanicus</i>	Molluscs	Salt water	200	Reproduction	LOEC
<i>Mya arenaria</i>	Molluscs	Salt water	0.3	Biochemistry	LOEC
<i>Placopecten magellanicus</i>	Molluscs	Salt water	200	Reproduction	LOEC
<i>Scrobicularia plana</i>	Molluscs	Salt water	0.001	Genetics	LOEC
<i>Placopecten magellanicus</i>	Molluscs	Salt water	200	Reproduction	LOEC
<i>Mytilus galloprovincialis</i>	Molluscs	Salt water	0.1361937	Cell(s)	LOEC
<i>Mytilus edulis</i>	Molluscs	Salt water	0.0000307	Genetics	LOEC
<i>Mytilus edulis</i>	Molluscs	Salt water	0.0000306	Genetics	LOEC
<i>Mytilus galloprovincialis</i>	Molluscs	Salt water	0.1361937	Genetics	LOEC
<i>Platynereis dumerilii</i>	Worms	Salt water	0.1	Cell(s)	LOEC
<i>Platynereis dumerilii</i>	Worms	Salt water	0.01	Cell(s)	LOEC

Table 10 Data on Estrone toxicity compiled from the ECOTOX database. LOEC = Lowest Observed Effect Concentration; EC = Effect Concentration; LC = Lethal Concentration.

Species Scientific Name	Species Group	Media Type	Effect mg L ⁻¹	Effect	Endpoint
<i>Neomysis integer</i>	Crustaceans	Fresh water	10	Mortality	LC ₅₀
<i>Neomysis integer</i>	Crustaceans	Fresh water	0.001	Biochemistry	LOEC
<i>Acartia tonsa</i>	Crustaceans	Salt water	0.41	Development	EC ₅₀
<i>Tisbe battagliai</i>	Crustaceans	Salt water	0.1	Mortality	LC ₅₀
<i>Melanotaenia fluviatilis</i>	Fish	Fresh water	0.000312	Biochemistry	LOEC
<i>Oryzias javanicus</i>	Fish	Salt water	0.003701	Morphology	LOEC
<i>Oryzias javanicus</i>	Fish	Salt water	0.001188	Reproduction	LOEC
<i>Oryzias javanicus</i>	Fish	Salt water	0.003701	Morphology	LOEC
<i>Oryzias javanicus</i>	Fish	Salt water	0.000484	Mortality	LOEC
<i>Gambusia holbrooki</i>	Fish	Fresh water	0.000194	Biochemistry	LOEC
<i>Oryzias javanicus</i>	Fish	Salt water	0.000484	Biochemistry	LOEC
<i>Salmo trutta</i>	Fish	Fresh water	0.000086	Biochemistry	EC ₁₀
<i>Danio rerio</i>	Fish	Fresh water	0.000139	Biochemistry	EC ₁₀
<i>Danio rerio</i>	Fish	Fresh water	0.000195	Morphology	EC ₁₀
<i>Salmo trutta</i>	Fish	Fresh water	0.000047	Biochemistry	EC ₁₀
<i>Danio rerio</i>	Fish	Fresh water	0.000465	Morphology	EC ₅₀
<i>Salmo trutta</i>	Fish	Fresh water	0.000085	Biochemistry	EC ₅₀
<i>Danio rerio</i>	Fish	Fresh water	0.000078	Biochemistry	EC ₅₀
<i>Salmo trutta</i>	Fish	Fresh water	0.000088	Biochemistry	EC ₅₀
<i>Danio rerio</i>	Fish	Fresh water	0.00020358974	Biochemistry	EC ₅₀
<i>Salmo trutta</i>	Fish	Fresh water	0.000123	Biochemistry	EC ₉₀
<i>Salmo trutta</i>	Fish	Fresh water	0.000091	Biochemistry	EC ₉₀
<i>Oryzias latipes</i>	Fish	Fresh water	0.0005	Morphology	LOEC
<i>Oryzias latipes</i>	Fish	Fresh water	0.00005	Reproduction	LOEC
<i>Oryzias latipes</i>	Fish	Fresh water	0.000005	Morphology	LOEC
<i>Salmo trutta</i>	Fish	Fresh water	0.000134	Biochemistry	LOEC
<i>Salmo trutta</i>	Fish	Fresh water	0.000087	Biochemistry	LOEC
<i>Oryzias latipes</i>	Fish	Fresh water	0.00005	Reproduction	LOEC
<i>Ictalurus punctatus</i>	Fish	Fresh water	1	Biochemistry	LOEC
<i>Danio rerio</i>	Fish	Fresh water	0.00098955969	Morphology	LOEC
<i>Danio rerio</i>	Fish	Fresh water	0.000014	Biochemistry	LOEC
<i>Danio rerio</i>	Fish	Fresh water	0.0000498	Population	LOEC
<i>Pimephales promelas</i>	Fish	Fresh water	0.0001	Biochemistry	LOEC
<i>Pimephales promelas</i>	Fish	Fresh water	0.00005	Development	LOEC
<i>Pimephales promelas</i>	Fish	Fresh water	0.000034	Biochemistry	LOEC

<i>Pimephales promelas</i>	Fish	Fresh water	0.000098	Biochemistry	LOEC
<i>Oryzias latipes</i>	Fish	Fresh water	0.01	Growth	LOEC
<i>Oryzias latipes</i>	Fish	Fresh water	0.001	Population	LOEC
<i>Oryzias latipes</i>	Fish	Fresh water	0.003999	Biochemistry	LOEC
<i>Oncorhynchus mykiss</i>	Fish	Fresh water	0.0000033	Biochemistry	LOEC
<i>Strongylocentrotus purpuratus</i>	Echinoderm	Salt water	0.6044	Development	EC ₅₀
<i>Dugesia japonica</i>	Worms	Fresh water	50	Mortality	LC ₅₀

Table 11 Data on Estriol toxicity compiled from the ECOTOX database. LOEC = Lowest Observed Effect Concentration; EC = Effect Concentration; LC = Lethal Concentration.

Species Scientific Name	Species Group	Media Type	Effect mg L ⁻¹	Effect	Endpoint
<i>Danio rerio</i>	Fish	Fresh water	0.0217	Population	LOEC
<i>Oryzias latipes</i>	Fish	Fresh water	0.0004622	Morphology	LOEC
<i>Oryzias latipes</i>	Fish	Fresh water	0.001	Morphology	LOEC
<i>Danio rerio</i>	Fish	Fresh water	0.0006	Biochemistry	LOEC
<i>Ictalurus punctatus</i>	Fish	Fresh water	1	Biochemistry	LOEC
<i>Oryzias latipes</i>	Fish	Fresh water	0.0004622	Genetics	LOEC
<i>Oryzias latipes</i>	Fish	Fresh water	0.0045166	Development	LOEC
<i>Oryzias latipes</i>	Fish	Fresh water	0.0000465	Genetics	LOEC
<i>Oryzias latipes</i>	Fish	Fresh water	0.0004622	Mortality	LOEC
<i>Oryzias latipes</i>	Fish	Fresh water	0.0045166	Morphology	LOEC
<i>Strongylocentrotus purpuratus</i>	Echinoderm	Salt water	1.5154	Development	EC ₅₀
<i>Dugesia japonica</i>	Worms	Fresh water	100	Mortality	LC ₅₀

Table 12 Parameters for the risk quotient (RQ) calculations.

Compound	Acronym	Log K _{oc}	PNEC (ng L ⁻¹)
Diethylstilbestrol	DES	5.76	7570
Dienestrol	DIE	4.19	7.6
Mestranol	MeEE2	4.80	0.0011
17 α -Ethinylestradiol	17- α EE2	4.20	1.1
17 α -Estradiol	17 α -E2	5.33	22.4
17 β -Estradiol	17 β -E2	4.00	119
Estrone	E1	4.10	6.8
Estriol	E3	3.84	1530

Table 13 Risk quotient (RQ) calculations for concentrations of natural and synthetic hormones in sediments of Acaraú River. NC = not calculated.

	ACR-01	ACR-02	ACR-03	ACR-04	ACR-05	ACR-06	ACR-07	ACR-08	ACR-09	ACR-10
DES	0.135	NC	NC	0.000	0.001	0.009	0.011	0.005	0.006	0.001
DIE	6.376	0.004	0.794	NC	NC	0.050	0.582	0.151	1.752	NC
MeEE2	47167	14735	72672	23742	197917	37528	172188	18056	687	11968
17- α EE2	46	25	94	34	284	31	120	42	35	11
17 α -E2	1.206	0.059	NC	NC	NC	NC	6.034	0.027	0.077	0.001
17 β -E2	NC	NC	0.03184	0.00643	0.05357	0.00034	0.21371	NC	0.04976	NC
E1	5.79729	1.80267	0.65041	NC	NC	1.99325	NC	4.16836	0.21861	1.39414
E3	0.01125	0.00023	0.00385	0.00002	0.00020	0.00109	0.01491	0.00175	0.00514	0.00121

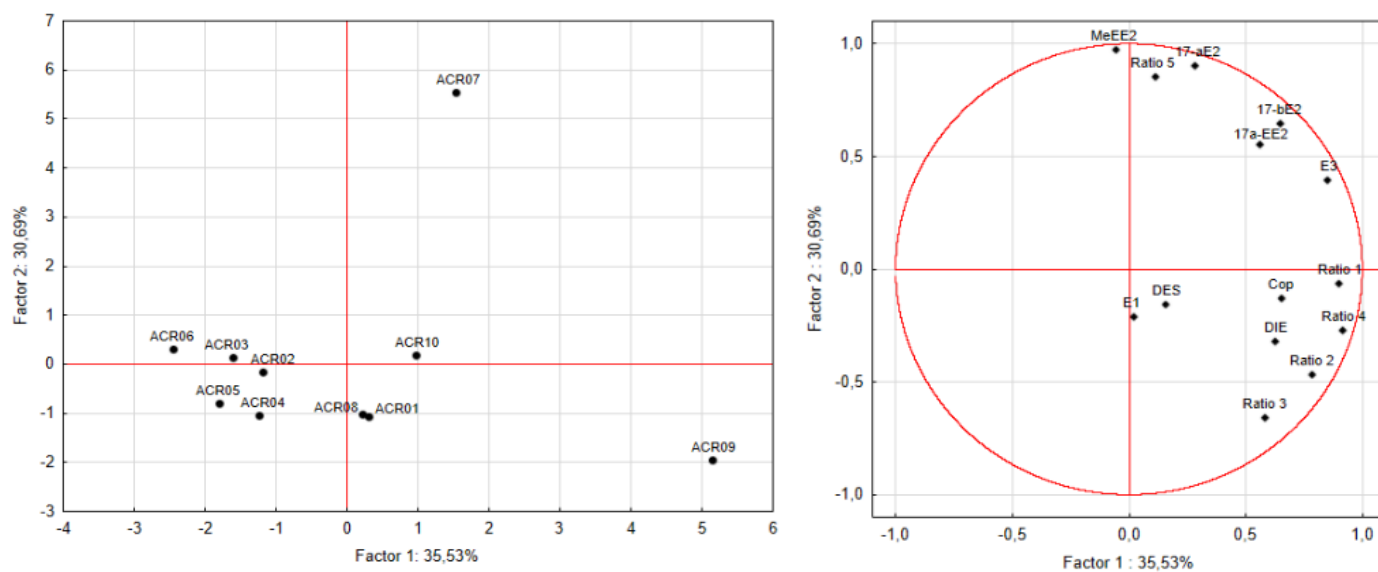


Fig. 5 PCA of EDCs and sterol concentrations and diagnostic ratios.

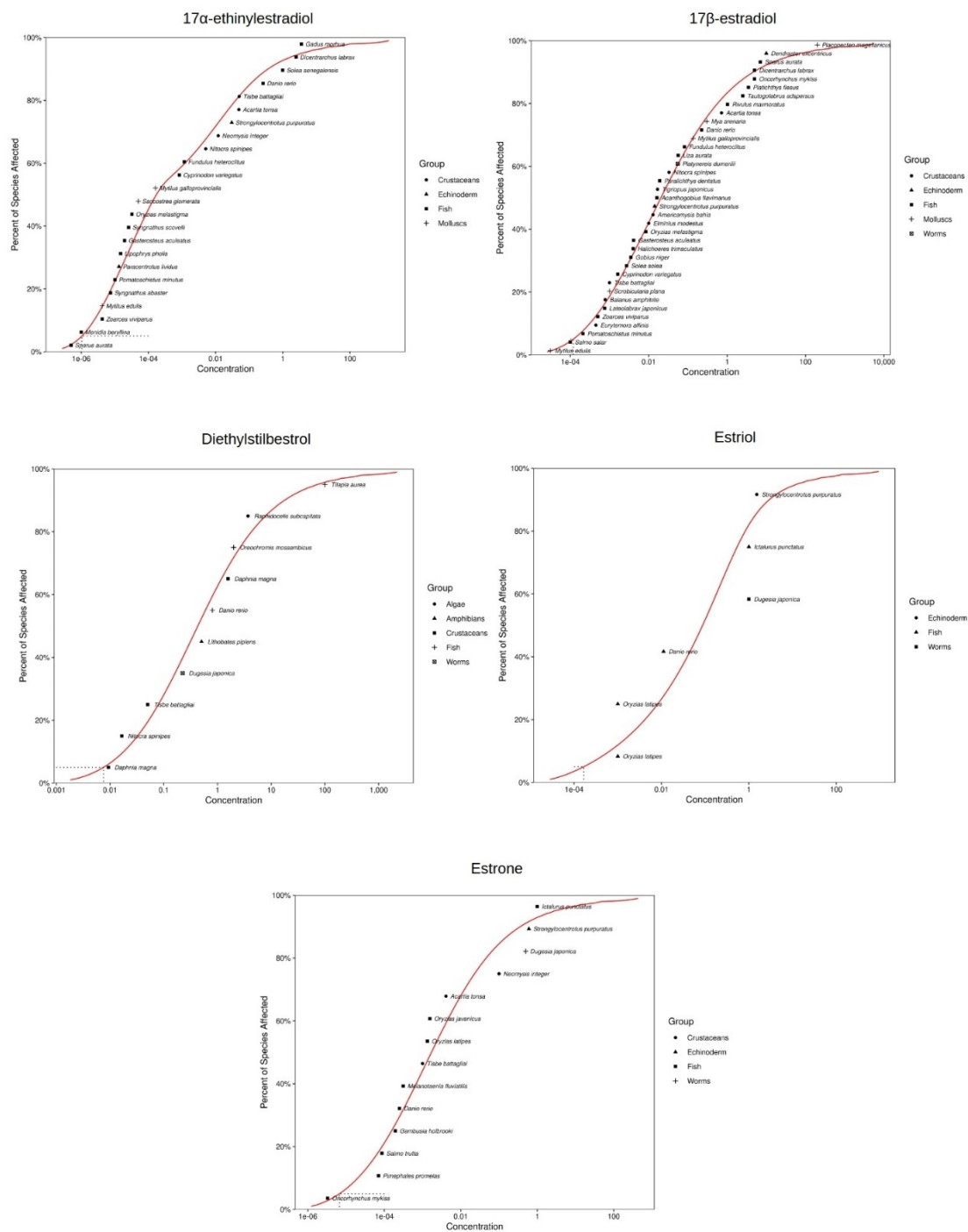


Fig. 6 SSD for natural and synthetic hormones based on data from ECOTOX database.