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The icthyofauna (Teleostei) of the Rio Caeté estuary, northeast Pará, Brazil, with a species identification key from northern Brazilian coast

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Abstract. Faunal inventories are a direct strategy for assessing biodiversity and evaluating a region's potential for scientific and commercial purposes. However, marine fish have been adequately inventoried in few regions of the world. Despite their biogeographic, ecological and commercial importance, the fish fauna of the northeastern Brazilian coast is the least studied and sampled within the Brazilian Exclusive Economic Zone. Here, the icthyofauna of the rio Caeté estuary is evaluated based on material deposited in zoological collections, partly as a result of recent inventory efforts. This research effort resulted in the documentation of 120 species of Teleostei belonging to 16 orders and 48 families identified by examining 22,295 specimens distributed among 1,086 collection lots. Complementing this work, we discuss the lack of taxonomic knowledge about the marine fish of the north coast of Brazil and the resulting challenges for carrying out biogeographic and conservation research in the region. Hoping to improve this situation we provide a taxonomic key for the fish species of the Caeté estuary and the coastal species registered from the northern Brazilian coast.

Key Words: Biological inventories, biodiversity, biogeography, taxonomic impediment, conservation

Resumo. **A ictiofauna (Teleostei) do rio Caeté, nordeste do Pará, Brasil.** Inventários biológicos representam uma importante fonte de informação sobre a biota disponível para a comunidade científica. Contudo, em poucas regiões do mundo a fauna de peixes marinhos foi satisfatoriamente inventariada. Apesar de sua relevância em termos biogeográficos, ecológicos e comerciais, a fauna de peixes da costa Norte do Brasil é a menos amostrada e estudada da Zona Econômica Exclusiva Brasileira. No presente estudo, a ictiofauna do estuário do rio Caeté foi avaliada com base em material depositado em coleções zoológicas, parcialmente como resultado de esforço de inventariamento recente. O esforço resultou no registro de 120 espécies de Teleósteos, pertencentes a 16 ordens e 48 famílias, reconhecidas com base no exame de 22.295 exemplares distribuídos em 1.086 lotes. Complementarmente é abordada a lacuna no conhecimento taxonômico das espécies de peixes marinhos e estuarinos da costa Norte do Brasil, e os entraves para realização de estudos biogeográficos e da biologia da conservação na região. Procurando diminuir a lacuna no conhecimento taxonômico, os autores apresentam uma chave de identificação para as espécies encontradas no estuário do rio Caeté, assim como espécies costeiras com registro na costa Norte do Brasil.

Palavras-chave: Inventário Biológico, biodiversidade, biogeografia, impedimento taxonômico, conservação.

Introduction

Faunal inventories are a direct strategy for assessing biodiversity and evaluating a region's potential for scientific and commercial purposes (Silveira *et al.* 2010). Species lists resulting from inventories are particularly important in biogeographic studies (Nunes & Pacheco 2004; Miranda & Marques 2011). Assessing biological diversity through species description (alpha taxonomy) depends on material deposited in zoological collections, mostly acquired through biological inventories. Zoological materials obtained from faunal inventories are a source of data on biodiversity that serve multiple scientific disciplines including taxonomy, phylogenetics, biogeography, natural history, ecology and conservation.

Marine fish have been adequately inventoried in few regions of the world (Eschmeyer *et al.* 2010). In Brazil, improving inventory efforts in recent decades have increased our knowledge of the fish fauna of coral reefs and deep ocean waters. However the fish fauna of the northern coast of Brazil is still poorly known, despite its importance in terms of biogeography, ecology and commercial fisheries (Marceniuk *et al.* 2013). Indeed, in Brazil's Exclusive Economic Zone, the northern coastal area is the least studied and sampled. The majority of fish species registered for the region have been recognized by inference from species records to the north, in the Guianas, or from the northeast coast of Brazil, with relatively few species attested by specimens collected in the region (Menezes *et al.* 2003). The poor reliability of species records from the north coast of Brazil is a direct reflection of the lack of representative material in scientific collections and the limited number of researchers working on taxonomy and systematics in the region (Marceniuk *et al.* 2013).

Important contributions have been published on various aspects of the fish fauna of the northern coast of Brazil (Camargo & Isaac 1998, 2001, 2004, Castro 2001, Barletta *et al*. 1998, 2003, 2005, Krumme & Saint-Paul 2003, Espírito-Santo, R. *et al.* 2005, Giarrizo *et al.* 2006), while molecular studies have demonstrated discontinuities or lack of gene flow among various species of the region (de Oliveira *et al.* 2014, Barbosa *et al.* 2014, Rodrigues *et al.* 2013, Santos *et al.* 2003, 2006, 2012). However taxonomic studies of material from the northern coast of Brazil are almost nonexistent, leading to the severe limitations in our knowledge about the taxonomy of the regional fish fauna (Marceniuk *et al.* 2013). This situation is made clear when we look to the main sources used to identify fish from the region, the multi-volume manual on the marine fish of southeast Brazil (Figueiredo 1977, Figueiredo & Menezes 1978, 1980, 2000, Menezes & Figueiredo 1980, 1985) and the identification guides published by FAO (Fischer 1978, Carpenter 2003), respectively elaborated on the basis of material collected from southern Brazil and the Caribbean. This gap represents a serious taxonomic limitation and an impediment for biogeography studies and conservation biology (Miranda & Marques 2011).

Using material deposited in zoological collections, this study describes the taxonomic composition of the fish fauna of the rio Caeté estuary and revises the nomenclature used in prior studies. An identification key is presented for the species identified or cited for the northern coast of Brazil as well as photographic documentation of the species examined.

Methods

Study area: The north coast of Brazil extends over more than 2,500 km along the states of Amapá, Pará and Maranhão, from the mouth of the Oiapoque river, in Amapá (4° 16' N, 51° 30' W) the mouth of the rio Parnaíba, in Maranhão (2° 47' S, 41° 50' W) (Ekau & Knoppers 1999) (Fig. 1). The oceanographic conditions of the continental shelf are influenced by the Brazil current, driven by the tropical trade winds that predominate in the region to generate a macrotidal coastline (Hayes 1979). The region is influenced by a series of rivers that contribute some 180,000 cubic meters per second of fresh water (Curtin & Legeckis 1986, ANA 2005) that can diminish salinity to 32 to 34 psu during peak discharge season of the Amazon river, which can attain 240,000 cubic meters per second (Lentz 1995, Grodsky *et al.* 2014). Together with the Orinoco, with a maximum discharge of 70,000 cubic meters per second, these rivers contribute to a plume of about 160,000 km² of water with reduced salinity and high sediment content (Hu *et al.* 2004, Grodsky *et al.* 2014) (Fig. 1). The region also contains the largest continuous mangrove swamps in the world, about 10,717 km² (Schaffer-Novelli *et al*. 1990; Kjerfve & Lacerda 1993).

The rio Caeté estuary stretches from the city of Bragança to Pirimirim and Ponta do Cupim in northeast Pará, with an extension of about 30 km and 11 km maximum width (Camargo & Isaac 1998). The estuary forms part of a larger tidal wetlands stretching between Pará and Maranhão,

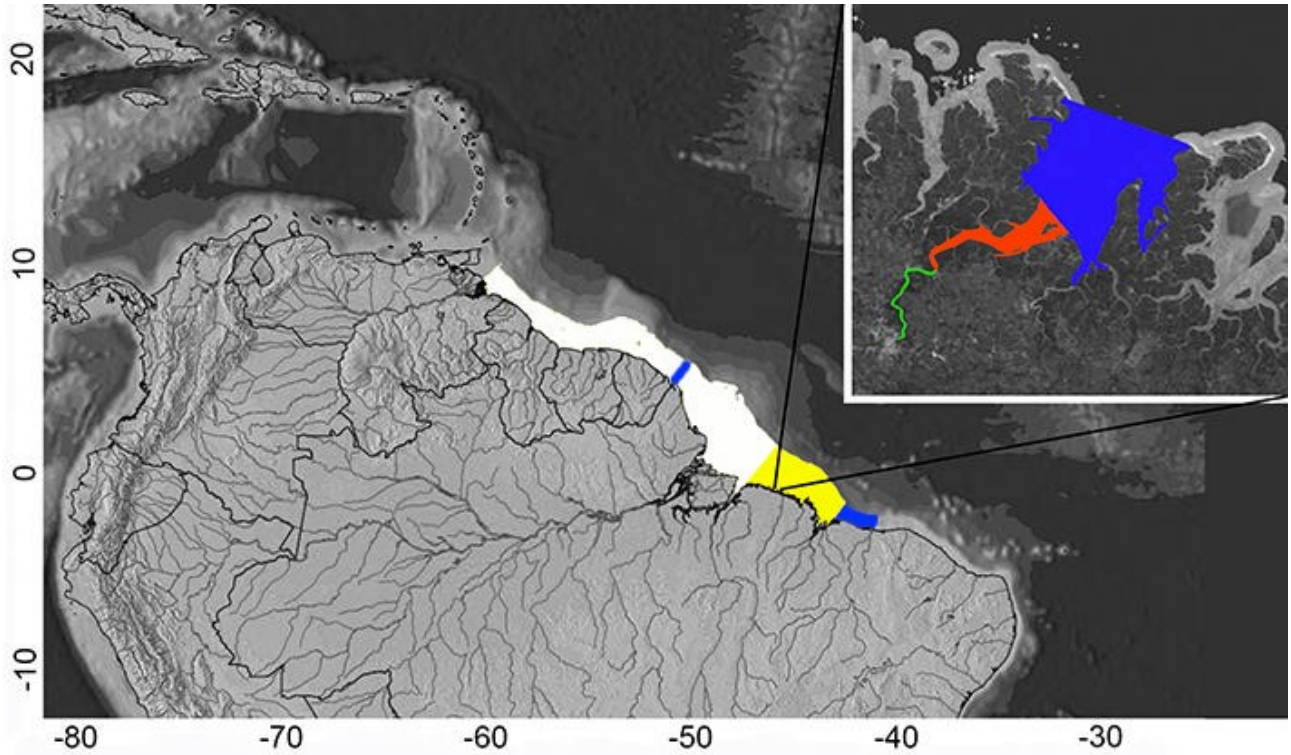

Figure 1. Northeast coast South America, highlighting the area of influence of the Orinoco-Amazon plume (white), north coast of Brazil (northern limit and southern portion in dark blue), and Maranhão-Pará wetlands (yellow). Caeté estuary highlight, upper portion (green), middle portion (red), and lower portion (blue).

designated as *Reentrâncias Maranhenses*, characterized by numerous funnel-shaped river entrances, shallow bays with sandy or muddy bottoms, sand dunes, sandy beaches and mangrove swamps (Kemf *et al.* 1969). The climate is hot and humid, with an average temperature of 25.7°C and annual precipitation in excess of 2545 mm (Barletta *et al.* 2003) divided between a rainy season from January to July and a dry season from August to December. Here, the Caeté estuary was divided into three distinct areas (upper, middle, and lower, Fig.1), following Barletta et al. (2005).

Material examined: The material examined belongs to ichthyological collections from Museu Paraense Emílio Goeldi, Belém, Pará (MPEG, 977 lots, with 21.914 specimens), Acervo Zoológico da Universidade Santa Cecília, Santos, São Paulo (AZUSC, 68 lots, with 239 specimens), and Laboratório de Biologia e Genética de Peixes at Universidade de São Paulo, Botucatu, São Paulo (LBP, 41 lots, with 142 specimens). The Goeldi ichthyological collections include material obtained by Barletta, as described in Barletta et al. (2003) and Barletta et al. (2005), and material collected by APM between May 2013 and July 2014. AZUSC and LBP zoological collections was obtained by APM and MMR between October and November 2015. All APM collections were obtained under IBAMA license no. 39585.

APM collections were made with the collaboration of local fishermen (see Acknowledgements) using a variety of technologies including fishhook, deep bait lines (*espihnel*), haul seine, gill net, throw net, and local techniques known as *picaré* (funnel-shaped haul seine), *puçá* (scoop net), weirs and tidal fish traps. The samples were obtained in the localities of Caratateua (0°59'33"S-46°32'24"W), Bacuriteua (0°59'25"S-46°44'56"W), Furo Grande (0°51'13"-46°37'01"), and Furo da Ostra (0°54'44"S-46°38'21"W).

Species were identified using the descriptions and collection keys proposed by Figueiredo & Menezes (1978, 1980, 2000), Menezes & Figueiredo (1980, 1985), Carpenter (2003), Marceniuk (2007), Marceniuk *et al.* (2012), and Menezes *et al.* (2015), as well as by comparison with specimens deposited in the ichthyological collections of the Museu de Zoologia da Universidade de São Paulo (MZUSP) and consultation with specialists. The nomenclature adopted follows Eschmeyer (2015).

Tables and Figures: Species presented in tables and figures are grouped by order and family following

Eschmeyer (2015), and genera and species are presented in alphabetical order by family. Species are recognized as marine, estuarine or marine-estuarine on Figueiredo & Menezes (1978, 1980, 2000), Menezes & Figueiredo (1980, 1985) and Carpenter (2003). Distribution areas for species are based on Menezes *et al*. (2003) and Carpenter (2003) and on information obtained from Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio; http://www.icmbio.gov.br/portal/biodiversidade/fauna-brasileira/lista-de-especies.html). Fish are classified according to their use of life areas as pelagic (living in the main water column), benthic (those that live near the bottom) and demersal (those that live on the sea floor). Data are presented on minimum and maximum length of specimens examined and maximum known length (Froese & Pauly 2015). Also provided are total number of specimens and collection lots examined for each species. Presence/absence of prior registers of these species in Brazilian scientific collections was obtained via consultation of the online databases of Neodat (http://www.mnrj.ufrj.br/search.htm) and SpeciesLink (http://www.splink.org.br/), and presence/absence of species for estuary regions in different Brazilian political units based on Ribeiro (2007). Areas of occurrence within the rio Caeté estuary follow the definitions in Barletta et al. (2005). Species under some degree of threat are classified according to ICMBio's List of Endangered Species.

Taxonomic procedures: The *Eigenmannia* specimens analyzed in this work do not present diagnostic features of any species in Peixoto *et al*. (2015) of "*Eigenmannia trilineata* species-group" and thus probably represent a new species. However, the specimens share some characteristics with this group, and for this reason we treat the specimens as "*E. trilineata* species-group". Other specimens are identified dubiously to species level, such as *Atherinella* aff. *brasiliensis*, *Bairdiella* cf. *ronchus*, *Citharichthys* cf. *spilopterus*, *Eigenmannia* aff. *macrops*, *Hemicaranx* cf. *amblyrhynchus*, *Microgobius* cf. *meeki*, *Ophioscion* cf. *punctatissimus*, *Porichthys* cf. *plectrodon*, either because they are part of ongoing systematic work (Marceniuk et al., in preparation), or because of differences detected between these taxa and their allied species. *Anchoviella* spp. expresses the presence of more than one species in the genus without defined nomenclature.

Identification key: The identification key includes marine-estuarine species from the study area, as well as species recorded from the Brazilian north coast by Menezes et al. (2003). The keys were prepared based on Figueiredo & Menezes (1978, 1980, 2000), Fisher (1978), Menezes & Figueiredo (1980, 1985), Cervigon et al. (1992), Carpenter (2003), Marceniuk (2007), McBride et al. (2010), Marceniuk et al. (2012), Knudsen & Clements (2013), Menezes et al. (2015), Marceniuk et al. (*in press*), and Caires & Guimarães-Costa (*in prep.*), with modifications an adaptations based on the material examined.

Results

Our research effort in the Caeté estuary provided 120 species of Teleostei belonging to 16 orders and 48 families identified by examining 22,295 specimens distributed among 1,086 lots (Figs. 1-19). The most diverse families were Sciaenidae (18 spp.), Ariidae (11 spp.), Carangidae (9 spp.), Haemulidae (8 spp.), and Engraulidae (7 spp.) (Table I). The most abundant species were *Anchoviella* spp. (present in 153 collection lots, n=5,838), *Stellifer rastrifer* (69 collections, n=9,034), *Anchoa spinifer* (66 collections, n=1,564), *Aspredo aspredo* (31 lots, n=637), *Lycengraulis grossidens* (30 lots, n=689), *Cetengraulis edentulus* (28 lots, n=201), and *Cathorops arenatus* (27 lots, n=1.141).

Of the 120 species recorded in the Caeté estuary, 52 are found throughout the entire Atlantic coast of South America, 21 are known from the Caribbean to the South Atlantic, and 25 are endemic to the Orinoco-Amazon plume. *Pterygoplichthys joselimaianus* was known to be endemic to the rio Tocantins and *Eigenmannia* gr. *trilineata* is endemic to the Paraná-Paraguai river basin (Table I, column A). In terms of habit, 12 species (10%) are found only in fresh water, 7 (5.8%) both fresh water and estuarine, 8 (6.7%) are estuarine, 53 (44.2%) are marine and estuarine, 36 (30%) are marine and 4 (3.3%) occur in freshwater, marine and estuary environments (Table I, column B). Of these, 74 (61.2%) are demersal, 37 (31.5%) are pelagic and 9 (8.1%) benthic (Table I, column C). In the upper part of the estuary 18 species were recorded, 24 species in the middle and 114 in the lower part of the estuary, with at least 13 species were found throughout the entire Caeté estuary (Table I, column D, Fig. 1).

Fourteen species were recorded for the first time in estuarine zones of Brazil, with four registered for the first time for estuarine regions of

northern Brazil (Table I, column E). Comparing with material found in Brazilian zoological collections, 19 species were recorded for the first time in the northern coast of Brazil, and other 3 represent new recorded for the state of Pará (Table I, column F). In comparison with prior lists of the fish fauna of the rio Caeté estuary, 49 (40.8%) were cited for the region for the first time, while 41 (34.2%) of those mentioned in prior studies were not encountered (Barletta *et al.* 2003, 2005, Ferreira 2011).

Three species are listed as threatened or endangered: *Epinephelus itajara*, as "critically endangered" and *Megalops atlanticus* and *Sciades parkeri* as "vulnerable."

Discussion

Good taxonomic knowledge and correct species identification are essential prerequisites for documenting biodiversity. The proper naming of organisms allows us to record, transmit and recover reliable information about ecology, biology and distribution of the species. Gaps in taxonomic knowledge have been recognized by the signatory nations of the Convention on Biodiversity as the "taxonomic impediment" to biodiversity management. Lack of specialists and absence of reference material in zoological collections are the main obstacles for refining taxonomic knowledge (Amaral & Jablonski 2005).

Uneven inventory effort of the Brazilian marine fauna was pointed out by Marceniuk *et al.* (2013). They mention that in absolute numbers, marine and estuary fish of northern Brazil represent only 3.9% of the overall collection lots cataloged in Brazilian collections, a direct reflection of the lack of inventory effort and reduced number of taxonomic specialists working in this region (Couto *et al.* 2003, Amaral & Jablonski 2005). The same gap in knowledge was also revealed in recent taxonomic revisions of the family Ariidae (Marceniuk 2007, Marceniuk *et al.* 2012) and Mugilidae (Menezes *et al.* 2015) families. The recent revision work, made possible the first recorded of the *parati*, *Mugil brevirostris* (Fig. 16c) and *M. rubrioculus* (Fig. 16e) for the north coast of Brazil (Ribeiro 2007). Likewise, the recognition of the marine catfish *Cathorops arenatus* (fig. 6f) and *C. agassizii* (fig. 6e), traditionally included in the species complex *C. spixii* (sensu Taylor & Menezes 1978), illustrates the necessity of taxonomic revision to improve our knowledge of the estuarine species of the region. Even more recently, two distinct species of the genus *Peprilus* Cuvier 1829 have been designated *Peprilus crenulatus* (Fig. 17f) and *Peprilus xanthurus* (Fig. 17g), correcting the erroneous use of the name *Peprilus paru* (Linnaeus 1758), for the Atlantic coast of South America (Marceniuk *et. al.*, 2016). In the same fashion, examination of comparative material from northeastern and southern Brazil show morphological differences with the northern coastal species, treated here as *affinis* (aff.), *confer* (cf.), or group (gr.), highlighting the necessity for further study to clarify the taxonomic status of these species.

The large number of new species records from Pará state also calls attention to the need for more ichthyological studies along the northern Brazilian coast (see column F in table I). Differences in the number of species encountered in this study, compared with prior work (Barletta *et al.* 2003, 2005, Ferreira 2011), reveals flaws in the species guides and identification manuals currently in use for the region. Although we are not yet certain as to the causes of this discrepancy, we consider these flaws result from a lack of identification guides based on specimens collected at region.

Biogeography: Deficient taxonomic knowledge is the primary limitation for carrying out biogeographic studies. In this context the absence of reliable taxonomic identifications, represents a restriction to the definition of geographic area with presence or absence of a given species. Especially for the western Atlantic, many species currently show extremely wide distribution ranges from the United States to Argentina (Carpenter 2003), suggesting that taxonomic revision may be necessary. Molecular studies represent a important step to increase the knowledge of some groups of marine-estuarine fish of the northern Brazilian coast, as the genera *Centropomus* Lacepède 1802, *Macrodon* Schinz 1822, *Ophioscion* Gill, 1863, and *Stellifer* Oken 1817 (de Oliveira et al. 2014, Barbosa *et al*. 2014, Rodrigues et al. 2013, Santos et al. 2003, 2006, 2012, da Silva et al. in press). However collection effort is still necessary to identify possible barriers to gene flow and the distribution limit of the species. Likewise, inadequate knowledge of phylogenetic relationship also limits our ability to make biogeographic inferences (Miranda & Marques 2011).

The north coast of Brazil is well defined biogeographically, condition determined by the influence of the Orinoco and Amazon river basins. The tectonic evolution of the Amazon basin and the

formation of the current configuration of the rio Amazon estuary occurred about 10 million years ago, resulting in profound modifications of the environmental conditions and the composition of the marine fauna Aguilera et al. (2014). The Orinoco-Amazon plume represents a coastal barrier formed by the discharge of freshwater and sediments that alters the physical and chemical properties of the coastal waters from Venezuela to northern Brazil (Briggs, 1995). Turbid water with low salinity and a muddy substrate reduces the connectivity between species of the coral reefs of the Caribbean and northeastern Brazil, characterized by clear, high salinity water (Rocha 2002). Nonetheless, the Orinoco-Amazon plume represents a permeable barrier, allowing species tolerant to salinity variations to cross through (Luiz et al. 2011). These various aspects make the Orinoco-Amazon plume an important barrier to gene flow and the main factor influencing the coral reefs species endemism in the tropical Atlantic (Joyeux *et al*. 2001, Floeter *et al*. 2008).

Despite all these important features, the fish fauna of the region is still poorly known. Barthem (1985) suggested that the area contains a large number of endemic forms, predominately freshwater and estuarine residents, while Vieira & Musick (1994) recognized regional variations separating the tropical fauna (Colombia to northeast Brazil), from the subtropical one (São Paulo to Rio Grande do Sul), which correspond to biogeographic provinces of Brazil and Argentina proposed by Briggs (1995). Independently, different authors have considered the estuarine areas of the northeast coast of South America, from the Gulf of Paria to southern Brazil as having a similar fish fauna, composed mostly by marine species tolerant of variations in salinity (Yanez-Arancibia & Nugent 1977, Cervigon 1991, Blaber 2000). Araujo & Azevedo (2001) come to the same conclusion, finding no clear zoogeographical patterns.

Especially the fish fauna of the rio Caeté estuary is strongly influenced by salinity variations, which in turn are driven by seasonal variation in rainfall and river discharge, the most important factor structuring the estuarine ichthyofauna (Barletta et al. 2005). In the first half of the year, higher rainfall forces saltier ocean waters farther from the coast, while in the dry season during the second half of the year, the reverse happens, increasing salinity within the estuary and bringing species associated with the rocky substrate of the coast of Maranhão (Rocha & Rosa 2001). Strongly influenced by variation of rainfall and river discharge, the Bragança/Caeté estuary is characterized by a typical fish fauna composed of 20.8% of species restricted to the Orinoco-Amazon plume (sensu Carpenter 2003, Table I, column A), but also 73.3% of typically marine species with a wide distribution like *Trachinocephalus myops*, usually rare in estuary zones, as well as reef-dwelling species from the families Haemulidae, Pomacanthidae and Sparidae (Table I). Of the 72 estuarine species found in the rio Caeté estuary, 40.3% are cited for the entire Atlantic coast of the Americas. Of the recognized endemic species of the Orinoco-Amazon plume, at least 11 are mentioned for the northeast coast of Brazil (Table I, column E), while *Mugil incilis* is recorded as far as the coast of Maranhão (Menezes et al. 2015). Two freshwater species, *Loricaria cataphracta* and *Eigenmannia* aff. *macrops*, were registered here for the first time in the Caeté estuary (Barletta et al. 2003, 2005, Ferreira 2011). Only four are pelagic, and ten also occur in freshwater, while *Cynoscion steindachneri* and Sciades parkeri are marine (Table I). The marine catfish of the Ariidae stand out, with 11 representatives found in the north coast of Brazil, six of which are restricted to the area of influence of the Orinoco-Amazon plume and the Maranhão-Pará wetlands, or Reentrâncias Maranhenses-Paraneses (Marceniuk & Menezes 2007).

Conservation: Estuarine environments are extremely important for fish communities since they provide shelter and protection for juvenile fish, refuge for adults during the reproductive station and high food availability (Blaber 2000). Fish biologists especially have paid close attention to estuarine fish communities because many species have commercial value (Blaber 2000, Elliot & Hemingway 2002). Likewise, the fish of the Caeté estuary are important both economically and socially for the local population, since at least 85% of the species caught by local traditional fishermen inhabit the estuary in at least some phase of their life cycle (Barletta et al., 1998; Barletta et al. 2003).

Although representing an important natural resource, estuarine fish of the north coast of Brazil are still poorly studied (Marceniuk, et al., 2013). This in turn implies limited capacity to develop adequate conservation and management policies, with deleterious consequences not only to maintenance of biodiversity but also for establishing strategies of rational use of natural resources from the region. Therefore, it is expected that researchers working in different fields, like ecology, fishing engineering and molecular biology feel stimulated to

contribute to the improving zoological collections from the northern region of Brazil, depositing specimens with georeferenced data and stimulating the production of taxonomy and biogeography studies that represent the basic information for making decisions about biodiversity conservation.

Figure 2. Species of the order Elopiformes, family Elopidae, (a) *Elops saurus*, MPEG 32873, 233 mm SL; family Megalopidae, (b) *Megalops atlanticus*, MPEG 33669, 382 mm SL.

Figure 3. Species of the order Anguilliformes, family Ophichthidae, (a) *Myrophis punctatus* MPEG 32848, 158 mm SL.

Table I. The icthyofauna (Teleostei) of the Rio Caeté estuary. **A.** Distribution area. **B.** Habitat preference: fresh water (FW); estuarine (E); marine (M). **C.** Lifestyle: pelagic (P); demersal (D); bentonic (B). **D**. Occurrence in the River Caeté estuary: upper estuary (A); middle estuary (B); lower estuary (C). **E.** Occurrence in Brazilian estuarine area: North (Nt); Northeast (Ne); Southeast (Se); South (St); first record (F). **F.** Previous record in zoological collections: with previous record (X); without previous record to the state of Amapá state (AP), without previous record to the state of Maranhão state (MA); first record for the Pará state (PA); first record for North coast (F). **G.** Number of collection lots examined. **H.** Number of specimens examined. **I.** Maximum and minimum recorded size, maximum size in the literature between parentheses, Standard length (* Total length).

Order	Family	Species		A	B	C	D	E	F	G	H	I
Elopiformes	Elopidae	*Elops saurus* Linnaeus, 1766	fig. 2a.	all W. Atlantic	M, E	P	C	Nt,Ne,Se,St	X	2	2	288-299 (1000*)
	Megalopidae	*Megalops atlanticus* Valenciennes, 1847	fig. 2b.	all W. Atlantic	M, E	D	C	Nt,Ne	X	4	4	338-382 (2500*)
Anguilliformes	Ophichthidae	*Myrophis punctatus* Lütken, 1852	fig. 3a.	all W. Atlantic	M, E	P	A-B-C	Nt,Ne,Se,St	X	14	104	82-359 (353)
Clupeiformes	Clupeidae	*Opisthonema oglinum* (Lesueur, 1818)	fig. 4a.	all W. Atlantic	M	P	C	Nt,Ne,Se,St	X	3	4	262-334 (380*)
	Clupeidae	*Rhinosardinia amazonica* (Steindachner, 1879)	fig. 4b	Orinoco-Amazon	FW, E	P	B-C	Nt,Ne	X	9	319	25-110 (80)
	Engraulidae	*Anchoa spinifer* (Valenciennes, 1848)	fig. 4c.	Caribbean to S.A.	FW, M, E	P	A-B-C	Nt,Ne	X	66	1564	13-179 (240*)
	Engraulidae	*Anchovia surinamensis* (Bleeker, 1865)	fig. 4d.	Orinoco-Amazon	FW, E	P	C	Nt	X	4	8	77-174 (150*)
	Engraulidae	*Anchoviella* spp.	fig. 4e.	-	M, E	P	A-B-C	-	X	153	5838	
	Engraulidae	*Cetengraulis edentulus* (Cuvier, 1829)	fig. 4f.	all W. Atlantic	M, E	P	A-B-C	Nt,Ne,Se,St	X	28	201	24-163 (150*)
	Engraulidae	*Lycengraulis batesii* (Günther, 1868)	fig. 4g.	Orinoco-Amazon	FW	P	C	Nt	X	1	1	150 (300*)
	Engraulidae	*Lycengraulis grossidens* (Spix & Agassiz, 1829)	fig. 4h.	Caribbean to S.A.	FW, E	P	A-B-C	Nt,Ne,Se,St	X	30	689	20-617 (235)
	Engraulidae	*Pterengraulis atherinoides* (Linnaeus, 1766)	fig. 4i.	Orinoco-Amazon	FW, E	D	B-C	Nt,Ne	X	10	232	89-203 (300*)
	Pristigasteridae	*Odontognathus mucronatus* Lacepède, 1800	fig. 4j.	Atlantic South America	M, E	D	B-C	Nt,Ne,Se	X	20	261	21-143 (160*)
	Pristigasteridae	*Pellona flavipinnis* (Valenciennes, 1837)	fig. 4k.	Atlantic South America	FW, E	D	C	Nt,Ne	X	1	3	315-354 (730*)
	Pristigasteridae	*Pellona harroweri* (Fowler, 1917)	fig. 4l	Caribbean to S.A.	M, E	D	C	Nt,Ne,Se,St	X	2	3	100-255 (180*)
Aulopiformes	Synodontidae	*Trachinocephalus myops* (Forster, 1801)	fig. 5a.	all W. Atlantic	M	B	C	F	X	1	1	170
Siluriformes	Ariidae	*Amphiarius rugispinis* (Valenciennes, 1840)	fig. 6a.	Orinoco-Amazon	M, E	D	B-C	Nt,Ne	X	10	20	116-333 (450)
	Ariidae	*Aspistor quadriscutis* (Valenciennes, 1840)	fig. 6b.	Orinoco-Amazon	M, E	D	B-C	Nt	X	9	21	99-316 (500)
	Ariidae	*Bagre bagre* (Linnaeus, 1766)	fig. 6c.	Caribbean to S.A.	M, E	D	B-C	Nt,Ne,Se	X	21	28	155-332 (550)
	Ariidae	*Bagre marinus* (Mitchill, 1815)	fig. 6d.	all W. Atlantic	M	D	C	Nt,Ne,Se	X	1	1	82 (690)
	Ariidae	*Cathorops agassizii* (Eigenmann & Eigenmann, 1888)	fig. 6e.	Atlantic South America	FW	D	B-C	Nt	X	13	43	53-180 (220)
	Ariidae	*Cathorops arenatus* (Valenciennes, 1840)	fig. 6f.	Orinoco-Amazon	M, E	D	A-B-C	Nt	X	27	1141	35-185 (250)

Order	Family	Species		A	B	C	D	E	F	G	H	I
	Ariidae	*Cathorops spixii* (Agassiz, 1829)	fig. 6g.	Atlantic South America	M, E	D	B-C	Nt,Ne,Se,St	X	4	218	36-179 (300)
	Ariidae	*Sciades herzbergii* (Bloch, 1794)	fig. 6h.	Caribbean to S.A.	E	P	C	Nt,Ne	X	7	37	215-250
	Ariidae	*Sciades parkeri* (Traill, 1832)	fig. 6i.	Orinoco-Amazon	M	D	C	Nt,Ne	X	1	1	223
	Ariidae	*Sciades passany* (Valenciennes, 1840)	fig. 6j.	Orinoco-Amazon	E	D	C	Nt	X	8	12	196-358
	Ariidae	*Sciades proops* (Valenciennes, 1840)	fig. 6k.	Orinoco-Amazon	M	D	C	Nt,Ne	X	10	44	101-385
	Auchenipteridae	*Pseudauchenipterus nodosus* (Bloch, 1794)	fig. 7a.	Orinoco-Amazon	FW	D	B-C	Nt,Ne	X	9	56	47-175 (220)
	Pimelodidae	*Brachyplatystoma vaillantii* (Valenciennes, 1840)	fig. 7b.	Orinoco-Amazon	FW	D	B	Nt,Ne	X	5	33	190-330 (1500*)
	Pimelodidae	*Pimelodus blochii* Valenciennes, 1840	fig. 7c.	Caribbean to S.A.	FW	P	A	Nt	X	6	22	26-290 (350*)
Siluriformes	Aspredinidae	*Aspredinichthys filamentosus* (Valenciennes, 1840)	fig. 7d.	Orinoco-Amazon	M, E	D	A-B-C	Nt	X	13	36	66-222 (218)
	Aspredinidae	*Aspredinichthys tibicen* (Valenciennes, 1840)	fig. 7e.	Orinoco-Amazon	M, E	D	A-B-C	Nt	X	12	61	11-218 (210)
	Aspredinidae	*Aspredo aspredo* (Linnaeus, 1758)	fig. 7f.	Orinoco-Amazon	M, E	D	A-C	Nt,Ne	X	31	637	14-297 (383)
	Loricariidae	*Hypostomus watwata* Hancock, 1828	fig. 7g.	Orinoco-Amazon	FW	B	C	Nt	X	3	8	339-442 (450)
	Loricariidae	*Loricaria cataphracta* Linnaeus, 1758	fig. 7h..	Orinoco-Amazon	FW	B	C	F	X	2	5	275-315 (295)
	Loricariidae	*Pterygoplichthys joselimaianus* (Weber, 1991)		Tocantins River basin.	FW	D	C	F	X	1	1	425 (305)
Gymnotiformes	Sternopygidae	*Eigenmannia aff. macrops* (Boulenger, 1897)		Orinoco-Amazon	FW	D	A	F	X	1	1	120 (252)
	Sternopygidae	*Eigenmannia gr. trilineata* López & Castello, 1966	fig. 8a.	Paraguay-Paraná River basin	FW	D	A	F	X	22	89	98-227
	Sternopygidae	*Sternopygus macrurus* (Bloch & Schneider, 1801)	fig. 8b.	Caribbean to S.A.	FW	P	A	F	X	1	2	338-418 (1410*)
Batrachoidiformes	Batrachoididae	*Batrachoides surinamensis* (Bloch & Schneider, 1801)	fig. 9a.	Caribbean to S.A.	E	D	C	Nt,Ne	X	11	27	207-475 (570)
	Batrachoididae	*Porichthys plectrodon* Jordan & Gilbert, 1882	fig. 9b.	North America to northern Brazil	M	B	C	F	F	1	1	150
	Batrachoididae	*Thalassophryne nattereri* Steindachner, 1876	fig. 9c.	Atlantic South America	M	D	C	Nt,Ne	F	1	1	120 (440*)
Lophiiformes	Ogcocephalidae	*Ogcocephalus vespertilio* (Linnaeus, 1758)	fig. 9d.	all W. Atlantic	M	P	C	Nt,Ne,Se	X	1	1	175 (305*)
Atheriniformes	Atherinopsidae	*Atherinella* aff. *brasiliensis* (Quoy & Gaimard, 1825)	fig. 9e.	Atlantic South America	M, E	P	C	Nt,Ne,Se,St	X	4	14	72-110
Cyprinodontiformes	Anablepidae	*Anableps anableps* (Linnaeus, 1758)	fig. 9f.	Orinoco-Amazon	E	D	C	Nt	X	7	21	100-255 (300*)
	Anablepidae	*Anableps microlepis* Müller & Troschel, 1844	fig. 9g.	Orinoco-Amazon	E	D	C	Nt,Ne	X	2	6	96-210 (320*)
Beloniformes	Belonidae	*Strongylura timucu* (Walbaum, 1792)	fig. 10a.	all W. Atlantic	E	P	C	Nt,Ne,Se,St	X	3	6	352-493 (610)
	Hemiramphidae	*Hyporhamphus roberti* (Valenciennes, 1847)	fig. 10b.	Caribbean to S.A.	M, E	P	C	Nt,Ne	F	3	17	88-170 (320*)
	Exocoetidae	*Cheilopogon melanurus* (Valenciennes, 1847)	fig. 10c.	all W. Atlantic	M	P	C	Nt	F	1	1	141 (320*)
Syngnathiformes	Syngnathinae	*Syngnathus pelagicus* Linnaeus, 1758	fig. 10d.	all W. Atlantic	M	P	C	Ne, St	F	1	1	208 (181)

Order	Family	Species		A	B	C	D	E	F	G	H	I
Scorpaeniformes	Dactylopteridae	*Dactylopterus volitans* (Linnaeus, 1758)	fig. 10e.	all W. Atlantic	M	D	C	Nt,Ne,Se,St	F	2	3	122-163 (500)
	Triglidae	*Prionotus punctatus* (Bloch, 1793)	fig. 10f.	all W. Atlantic	M, E	P	C	Nt,Ne,Se,St	Ap	1	2	75-80
Perciformes	Centropomidae	*Centropomus parallelus* Poey, 1860	fig. 11a.	all W. Atlantic	M, E	D	C	Nt,Ne,Se,St	X	5	7	263-285 (720*)
	Centropomidae	*Centropomus undecimalis* (Bloch, 1792)	fig. 11b.	all W. Atlantic	M, E	D	C	Nt,Ne,Se,St	Ma	5	8	215-330 (1400*)
	Serranidae	*Epinephelus itajara* (Lichtenstein, 1822)	fig. 11c.	all W. Atlantic	M, E	D	C	Nt,Ne,Se,St	X	6	12	200-346 (2500*)
	Rachycentridae	*Rachycentron canadum* (Linnaeus, 1766)	fig. 11d.	all W. Atlantic	M	D	C	Nt,Ne	F	1	2	558-628 (2000*)
	Carangidae	*Caranx hippos* (Linnaeus, 1766)	fig. 12a.	all W. Atlantic	M, E	P	C	Nt,Ne,Se,St	X	2	2	83-291 (1240*)
	Carangidae	*Caranx latus* Agassiz, 1831	fig. 12b.	all W. Atlantic	M	P	C	Nt,Ne,Se,St	PA	1	3	145-155 (1010*)
	Carangidae	*Chloroscombrus chrysurus* (Linnaeus, 1766)	fig. 12c.	all W. Atlantic	M, E	P	C	Nt,Ne,Se,St	X	8	167	40-292 (650¨)
	Carangidae	*Hemicaranx* cf. *amblyrhynchus* (Cuvier, 1833)	fig. 12d.	all W. Atlantic	M	P	C	Se	X	9	22	95-315 (500*)
	Carangidae	*Oligoplites palometa* (Cuvier, 1832)	fig. 12e.	Caribbean to S.A.	M, E	P	C	Nt,Ne,Se,St	X	1	1	143 (497*)
	Carangidae	*Oligoplites saurus* (Bloch & Schneider, 1801)	fig. 12f.	all W. Atlantic	M, E	P	C	Nt,Ne,Se,St	X	12	28	47-183 (350*)
	Carangidae	*Selene vomer* (Linnaeus, 1758)	fig. 12g.	all W. Atlantic	M, E	P	C	Nt,Ne,Se,St	X	7	33	45-428 (483*)
	Carangidae	*Trachinotus carolinus* (Linnaeus, 1766)	fig. 12h.	all W. Atlantic	M, E	P	C	Nt,Ne,Se,St	X	1	1	225-267 (640*)
	Carangidae	*Trachinotus falcatus* (Linnaeus, 1758)	Fig 12i	all W. Atlantic	M	P	C	Nt,Ne,Se,St	X	2	5	74-236 (1220)
Perciformes	Lutjanidae	*Lutjanus jocu* (Bloch & Schneider, 1801)	fig. 13a.	all W. Atlantic	M, E	D	C	Nt,Ne, St	X	9	15	100-239 (1280*)
	Lutjanidae	*Lutjanus synagris* (Linnaeus, 1758)	fig. 13b.	all W. Atlantic	M	D	C	Nt,Ne, St	Ma	1	1	224 (600*)
	Lobotidae	*Lobotes surinamensis* (Bloch, 1790)	fig. 13c.	all W. Atlantic	M, E	D	C	Nt,Ne,Se,St	Ma	2	3	180-227 (1100*)
	Gerreidae	*Diapterus auratus* Ranzani, 1842	fig. 13d.	all W. Atlantic	FW, M, E	D	C	Nt,Ne,Se	F	4	11	85-160 (340*)
	Gerreidae	*Eucinostomus argenteus* Baird & Girard, 1855	fig. 13e.	all W. Atlantic	M, E	D	C	Nt,Ne,Se,St	X	1	4	52-105 (200*)
	Gerreidae	*Eucinostomus gula* (Quoy & Gaimard, 1824)	fig. 13f.	all W. Atlantic	M, E	D	C	Nt,Ne,Se,St	Ma	2	4	94-72 (230*)
	Haemulidae	*Anisotremus* cf. *surinamensis* (Bloch, 1791)	fig. 14a.	all W. Atlantic	M	D	C	St	F	1	1	260 (760*)
	Haemulidae	*Anisotremus virginicus* (Linnaeus, 1758)	fig. 14b.	all W. Atlantic	M	D	C	Ne, St	Ma	5	14	200-378 (406*)
	Haemulidae	*Conodon nobilis* (Linnaeus, 1758)	fig. 14c.	all W. Atlantic	M	D	C	Nt,Ne,Se,St	Ap	6	9	85-222 (336*)
	Haemulidae	*Genyatremus luteus* (Bloch, 1790)	fig. 14d.	Caribbean to S.A.	M, E	D	B-C	Nt,Ne, St	X	17	36	32-245 (370*)
	Haemulidae	*Haemulon parra* (Desmarest, 1823)	fig. 14e.	all W. Atlantic	M	D	C	F	Ma	2	2	373-413 (412*)
	Haemulidae	*Haemulon steindachneri* (Jordan & Gilbert, 1882)	fig. 14f.	all W. Atlantic	M	D	C	F	F	3	4	254-266 (300*)

Order	Family	Species		A	B	C	D	E	F	G	H	I
	Haemulidae	*Haemulopsis corvinaeformis* (Steindachner, 1868)	fig. 14g.	Caribbean to S.A.	M, E	D	C	F	F	1	1	220-222
	Haemulidae	*Orthopristis ruber* (Cuvier, 1830)	fig. 14h.	Caribbean to S.A.	M	D	C	Nt,Ne,Se,St	F	1	5	170-190 (400*)
	Sparidae	*Calamus penna* (Valenciennes, 1830)	fig. 14i.	all W. Atlantic	M	D	C	F	F	1	1	270 (460*)
	Sciaenidae	*Bairdiella* cf. *ronchus* (Cuvier,1830)	fig. 15a.	all W. Atlantic	M, E	D	C	Nt,Ne,Se,St	Ma	9	12	138-190 (350*)
	Sciaenidae	*Cynoscion acoupa* (Lacepède, 1801)	fig. 15b.	Caribbean to S.A.	M	D	C	Nt,Ne	X	2	10	140-245 (1100*)
	Sciaenidae	*Cynoscion jamaicensis* (Vaillant & Bocourt,1883)	fig. 15c.	Caribbean to S.A.	M	D	C	Nt,Se,St	F	1	1	292 (500*)
	Sciaenidae	*Cynoscion leiarchus* (Cuvier, 1830)	fig. 15d.	Caribbean to S.A.	M	D	C	Nt,Ne,Se,St	PA	1	5	87-132 (350*)
	Sciaenidae	*Cynoscion microlepidotus* (Cuvier, 1830)	fig. 15e.	Atlantic South America	M, E	D	C	Nt,Ne Se,St	X	4	6	162-293 (920*)
	Sciaenidae	*Cynoscion* steindachneri (Jordan, 1889)	fig. 15f.	Orinoco-Amazon	M	D	C	Nt	X	7	21	98-309 (500*)
	Sciaenidae	*Larimus breviceps* Cuvier, 1830	fig. 15g.	all W. Atlantic	M, E	D	C	Nt,Ne,Se,St	F	1	1	167 (310*)
	Sciaenidae	*Lonchurus lanceolatus* (Bloch, 1788)	fig. 15h.	Atlantic South America	M, E	D	C	Nt	X	5	8	50-218 (300*)
	Sciaenidae	*Macrodon ancylodon* (Bloch & Schneider, 1801)	fig. 15i.	Atlantic South America	M, E	D	A-B-C	Nt,Ne,Se,St	X	26	140	15-261 (450*)
	Sciaenidae	*Menticirrhus americanus* (Linnaeus, 1758)	fig. 15j.	all W. Atlantic	M, E	D	C	Nt,Ne,Se,St	X	2	2	206-213 (500*)
	Sciaenidae	*Menticirrhus littoralis* (Holbrook, 1847)	fig. 15k.	all W. Atlantic	M	D	C	Nt,Ne,Se,St	F	3	12	35-137 (483*)
	Sciaenidae	*Micropogonias furnieri* (Desmarest, 1823)	fig. 15l.	all W. Atlantic	M, E	D	C	Nt,Ne,Se,St	X	4	18	74-191 (600)
	Sciaenidae	*Nebris microps* Cuvier, 1830	fig. 15m	Atlantic South America	M, E	D	C	Nt,Ne,	X	1	2	320-330 (400*)
	Sciaenidae	*Paralonchurus brasiliensis* (Steindachner, 1875)	fig. 15n.	all W. Atlantic	M, E	D	C	Nt,Ne,Se,St	X	1	1	120-182 (300*)
	Sciaenidae	*Plagioscion squamosissimus* (Heckel, 1840)	fig. 15o.	Orinoco-Amazon	FW	D	C	Nt,Ne	X	5	8	117-180 (800*)
	Sciaenidae	*Stellifer brasiliensis* (Schultz, 1945)	fig. 15p.	Atlantic South America	E	D	C	Nt,Ne,Se,St	X	9	50	22-152 (145)
	Sciaenidae	*Stellifer rastrifer* (Jordan, 1889)	fig. 15q.	Caribbean to S.A.	M, E	B	A-B-C	Nt,Ne,Se,St	X	69	9034	7-156 (200*)
	Sciaenidae	*Stellifer stellifer* (Bloch, 1790)	fig. 15r.	Caribbean to S.A.	M, E	D	A-C	Nt,Ne,Se,St	X	6	28	46-149 (142*)
	Polynemidae	*Polydactylus virginicus* (Linnaeus, 1758)	fig. 16a.	all W. Atlantic	M	P	C	Nt,Ne,Se,St	X	2	2	72-107 (330*)
	Pomacanthidae	*Pomacanthus paru* (Bloch, 1787)	fig. 16b.	all W. Atlantic	M	P	C	Nt,Ne,Se	Pa	1	1	296 (441*)
	Mugilidae	*Mugil brevirostris* (Ribeiro, 1915)	fig. 16c.	Atlantic South America	M, E	P	C	F	X	7	58	45-204 (590*)
	Mugilidae	*Mugil curema* Valenciennes 1836	fig. 16d.	All Brazilian coast	M, E	P	C	Nt,Ne,Se,St	X	1	11	78-138 (700*)
	Mugilidae	*Mugil incilis* Hancock, 1830	fig. 16e.	Orinoco-Amazon	M, E	P	C	Nt,Ne,Se,St	X	3	16	247-374 (400*)
	Mugilidae	*Mugil rubrioculus* Harrison et al., 2007	Fig. 16f.	Caribbean to S.A.	M, E	P	C	F	X	12	27	56-290 (258)
Perciformes	Eleotridae	*Guavina guavina* (Valenciennes, 1837)	fig. 17a.	all W. Atlantic	FW, E	D	A	Nt,Ne,Se	X	2	8	179-199 (300)

Order	Family	Species		A	B	C	D	E	F	G	H	I
	Gobiidae	*Gobionellus oceanicus* (Pallas, 1770)	fig. 17b.	all W. Atlantic	FW, M, E	D	C	Nt,Ne,Se,St	F	1	1	159 (300*)
	Ephippidae	*Chaetodipterus faber* (Broussonet 1782)	fig. 17c.	all W. Atlantic	M, E	P	C	Nt,Ne,Se,St	X	13	46	34-148 (910*)
	Trichiuridae	*Trichiurus lepturus* Linnaeus, 1758	fig. 17d.	Circumglobal	M, E	P	C	Nt,Ne,Se,St	X	4	4	317-830 (2340*)
	Scombridae	*Scomberomorus brasiliensis* Collette, et al., 1978	fig. 17e.	all W. Atlantic	M	D	C	Nt,Ne,Se,St	X	2	5	45-384 (1250)
	Stromateidae	*Peprilus crenulatus* Cuvier, 1829	fig. 17f.	Atlantic South America	M	D	C	Nt,Ne,Se,St	X	9	28	115 (300*)
	Stromateidae	*Peprilus xanthurus* (Quoy & Gaimard, 1825)	fig. 17g.	Atlantic South America	M	D	C	Nt,Ne,Se,St	X	1	1	71-135 (300*)
Pleuronectiformes	Paralichthyidae	*Citharichthys* cf. *spilopterus* Günther, 1862	fig. 18a.	all W. Atlantic	M, E	B	C	Nt,Ne,Se,St	X	4	15	73-138 (200*)
	Achiridae	*Achirus achirus* (Linnaeus, 1758)	fig. 18b.	Orinoco-Amazon	FW, E	B	C	Nt, Ne	X	15	31	60-320 (370*)
	Achiridae	*Apionichthys dumerili* Kaup, 1858	fig. 18c.	Orinoco-Amazon	M, E	B	B-C	Nt	X	3	3	35-67 (124)
	Cynoglossidae	*Symphurus diomedeanus* (Goode & Bean, 1885)	fig. 18d.	all W. Atlantic	E	B	C	F	F	3	7	80-112 (220)
Tetraodontiformes	Tetraodontidae	*Colomesus psittacus* (Bloch & Schneider, 1801)	fig. 19a.	Atlantic South America	FW, M, E	D	A-B-C	Nt,Ne	X	25	152	11-235 (289)
	Tetraodontidae	*Lagocephalus laevigatus* (Linnaeus 1766)	fig. 19b.	Caribbean to S.A.	M	D	B-C	Nt,Ne,Se,St	X	3	3	41-94 (1000*)
	Tetraodontidae	*Sphoeroides testudineus* (Linnaeus 1758)	fig. 19c.	all W. Atlantic	M	D	C	Nt,Ne,Se,St	X	4	12	70-225 (388*)
	Diodontidae	*Chilomycterus antillarum* Jordan & Rutter, 1897	fig. 19e.	Caribbean to S.A.	M	D	C	Nt,Ne	X	1	1	80 (300*)
	Diodontidae	*Chilomycterus spinosus*(Linnaeus, 1758)	fig. 19f.	Atlantic South America	M, E	D	C	Nt,Ne, Se,St	F	1	2	14 (250)

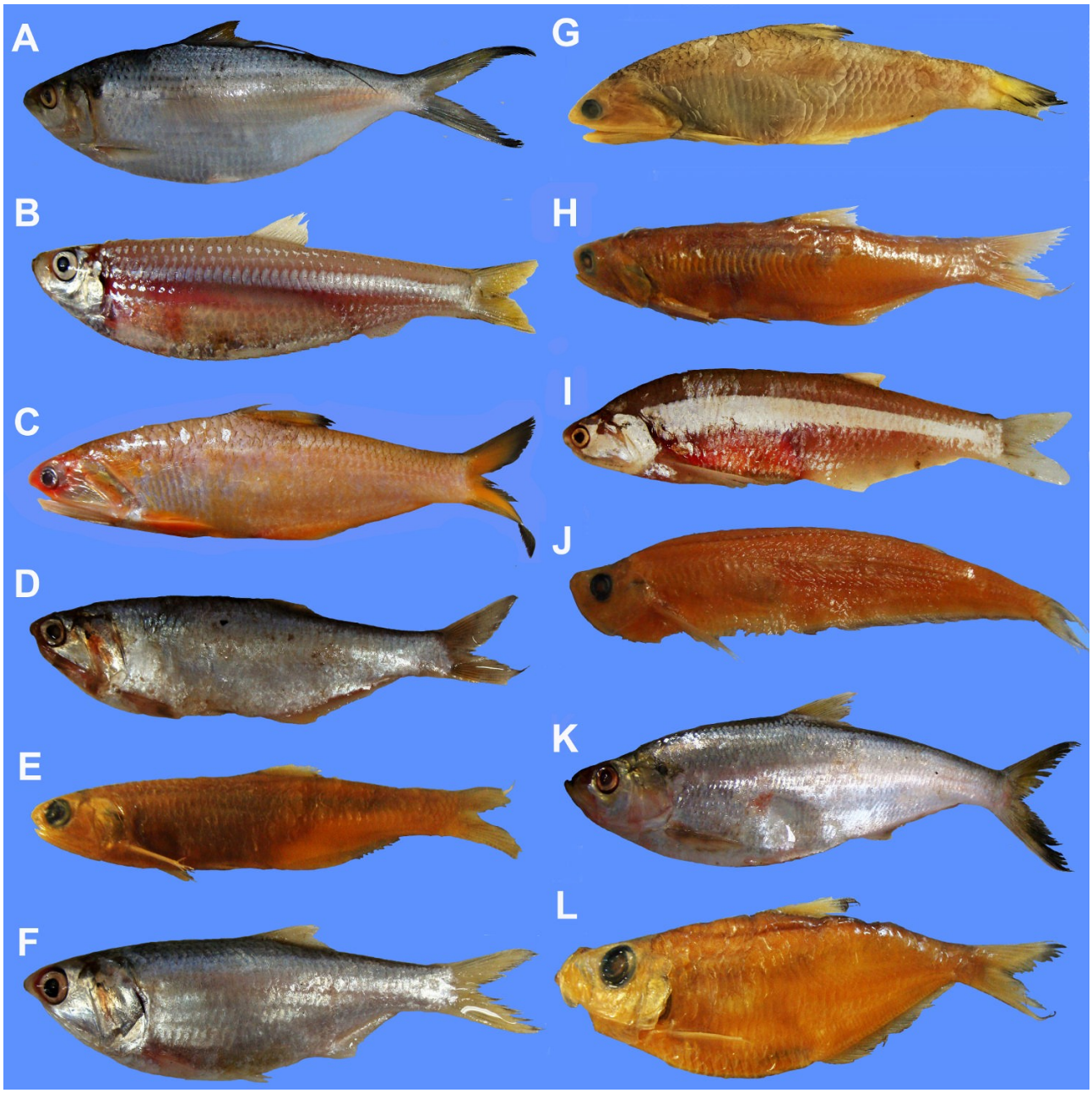

Figure 4. Species of the order Clupeiformes, family Clupeidae, (a) *Opisthonema oglinum*, MPEG 32866, 189 mm SL; (b) *Rhinosardinia amazonica*, MPEG 33161, 87 mm SL; family Engraulidae, (c) *Anchoa spinifer*, MPEG 32865, 114 mm SL; (d) *Anchovia surinamensis*, MPEG 32997, 138 mm SL; (e) *Anchoviella* sp., MPEG 31634, 64 mm SL; (f) *Cetengraulis edentulus*, MPEG 32974, 106 mm SL; (g) *Lycengraulis batesii* LBP 21388, 150 mm SL; (h) *Lycengraulis grossidens*, MPEG 32017, 107 mm SL; (i) *Pterengraulis atherinoides*, MPEG 33003, 138 mm SL; family Pristigasteridae, (j) *Odontognathus mucronatus*, MPEG 32891, 127 mm SL; (k) *Pellona flavipinnis*, MPEG 33673, 111 mm SL; (l) *Pellona harroweri*, MPEG 32897, 118 mm SL.

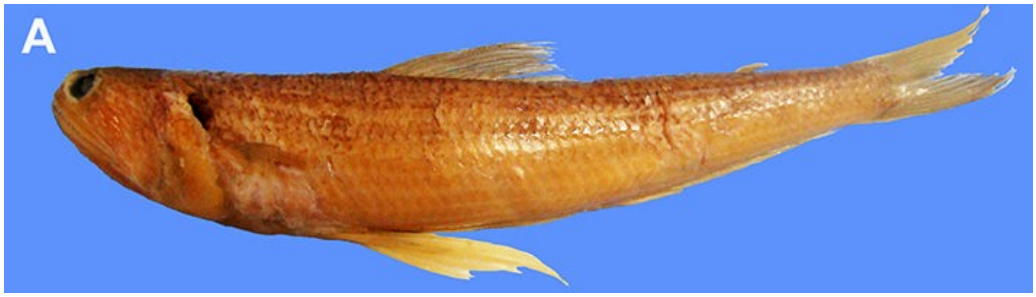

Figure 5. Species of the order Aulopiformes, family Synodontidae *Trachinocephalus myops*, MPEG 33634, 164 mm SL.

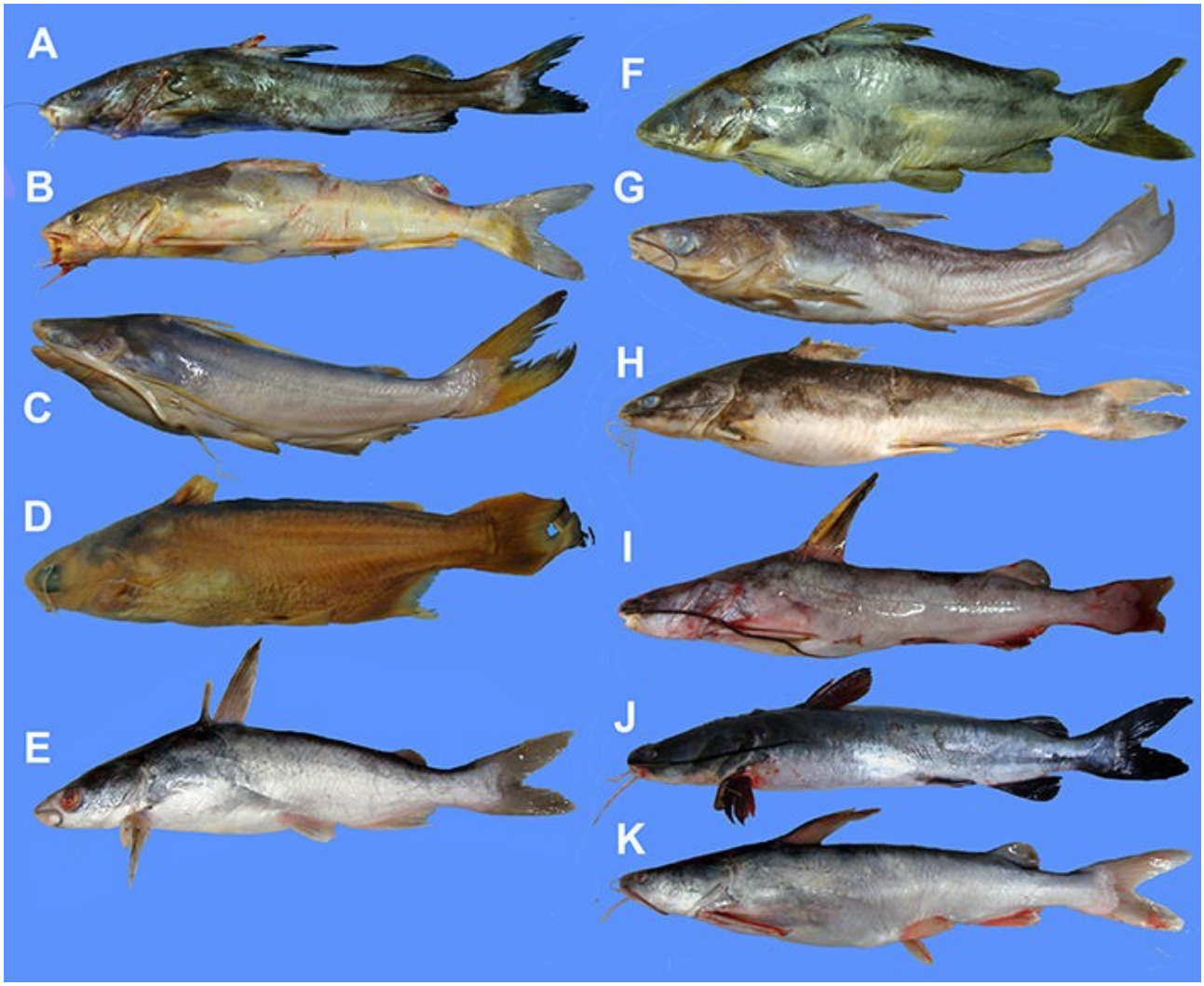

Figure 6. Species of the order Siluriformes, family Ariidae, (a) *Amphiarius rugispinis*, MPEG 30636, 333 mm SL, (b) *Aspistor quadriscutis*, MPEG 30662, 244 mm SL; (c) *Bagre bagre*, MPEG 30639, 176 mm SL; (d) *Bagre marinus*, MPEG uncatalogued, 63 mm SL; (e) *Cathorops agassizii*, MPEG 30666, 85 mm SL; (f) *Cathorops arenatus*, MPEG 30657, 195 mm SL; (g) *Cathorops spixii*, MPEG 30676, 134 mm SL; (h) *Sciades herzbergii*, MPEG 30619, 250 mm SL; (i) *Sciades parkeri*, MPEG 30688, 223 mm SL; (j) *Sciades passany*, MPEG 30669, 244 mm SL; (k) *Sciades proops*, MPEG 30687, 200 mm SL.

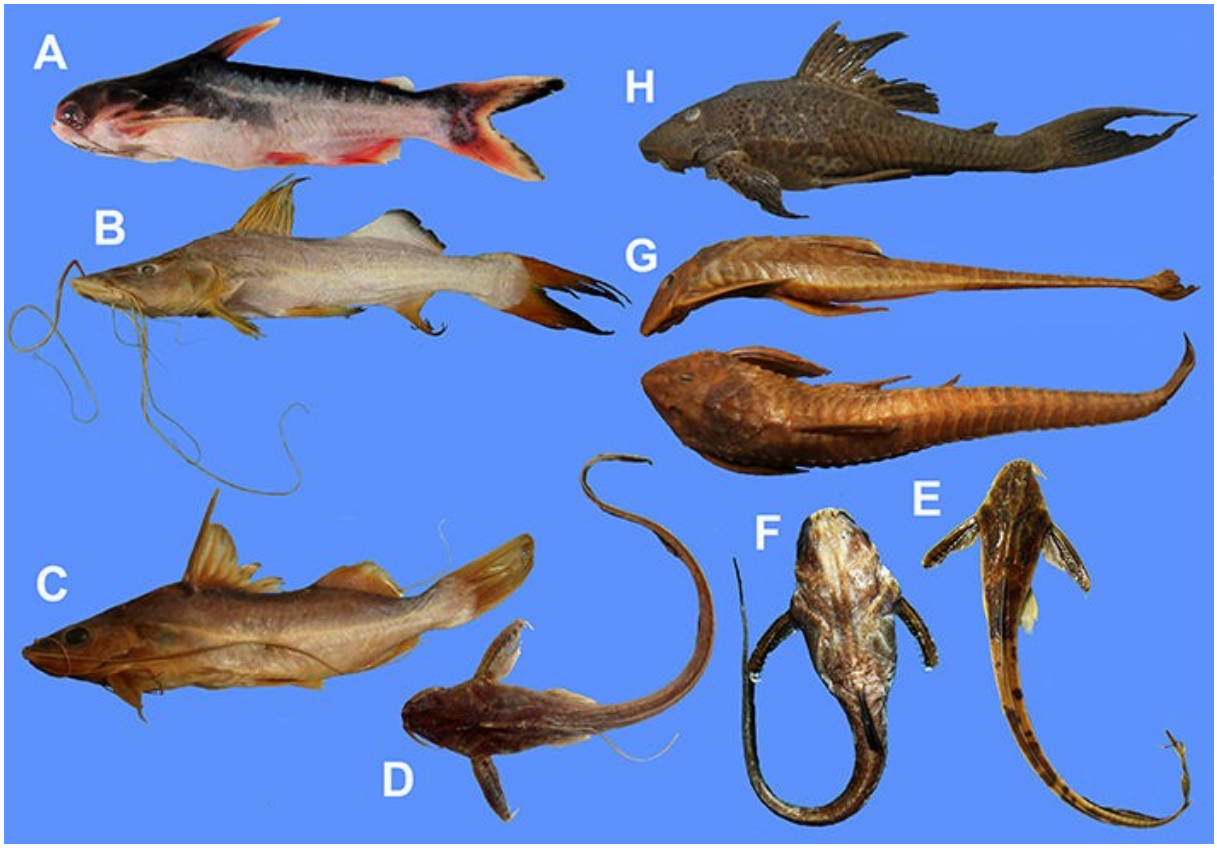

Figure 7. Species of the order Siluriformes, family Auchenipteridae, (a) *Pseudauchenipterus nodosus*, MPEG 33021, 102 mm SL; family Pimelodidae, (b) *Brachyplatystoma vaillantii*, MPEG 32884, 177 mm SL; (c) *Pimelodus blochii*, MPEG 32883, 160 mm SL; family Aspredinidae, (d) *Aspredinichthys filamentosus*, MPEG 32726, 169 mm SL; (e) *Aspredinichthys tibicen*, MPEG 33639, 133 mm SL; (f) *Aspredo aspredo*, MPEG 33663, 197 mm SL; family Loricariidae, (g) *Loricaria cataphracta*, MPEG 32823, 264 mm SL; (h) *Hypostomus watwata* MPEG 32776, 275 mm SL.

Figure 8. Species of the order Gymnotiformes, family Sternopygidae, (a) *Eigenmannia gr. trilineata*, MPEG 31960, 204 mm SL; (b) *Sternopygus macrurus*, MPEG 32827, 418 mm SL.

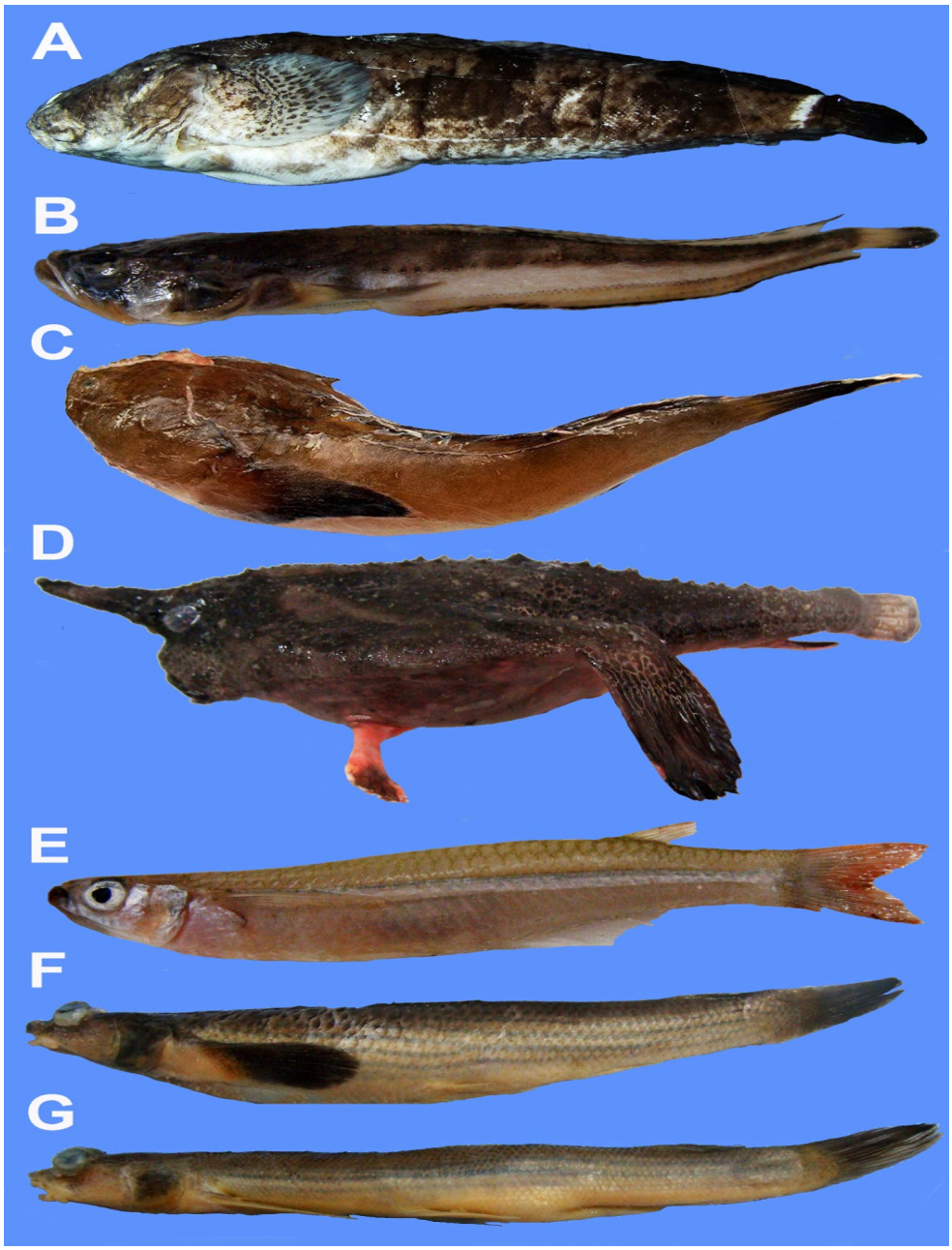

Figure 9.- Species of the order Batrachoidiformes, family Batrachoididae, (a) *Batrachoides surinamensis*, MPEG 32945, 217 mm SL; (b) *Porichthys plectrodon*, MPEG 33162, 97 mm SL; (c) *Thalassophryne nattereri*, LBP 21587, 120 mm SL; ordem Lophiiformes, family Ogcocephalidae, (d) *Ogcocephalus vespertilio*, MPEG 32999, 152 mm SL; ordem Atheriniformes, family Atherinopsidae, (e) *Atherinella* aff. *brasiliensis*, MPEG 33236, 80 mm SL; ordem Cyprinodontiformes, family Anablepidae, (f) *Anableps anableps*, MPEG 32754, 140 mm SL; (g) *Anableps microlepis*, MPEG 32791, 174 mm SL.

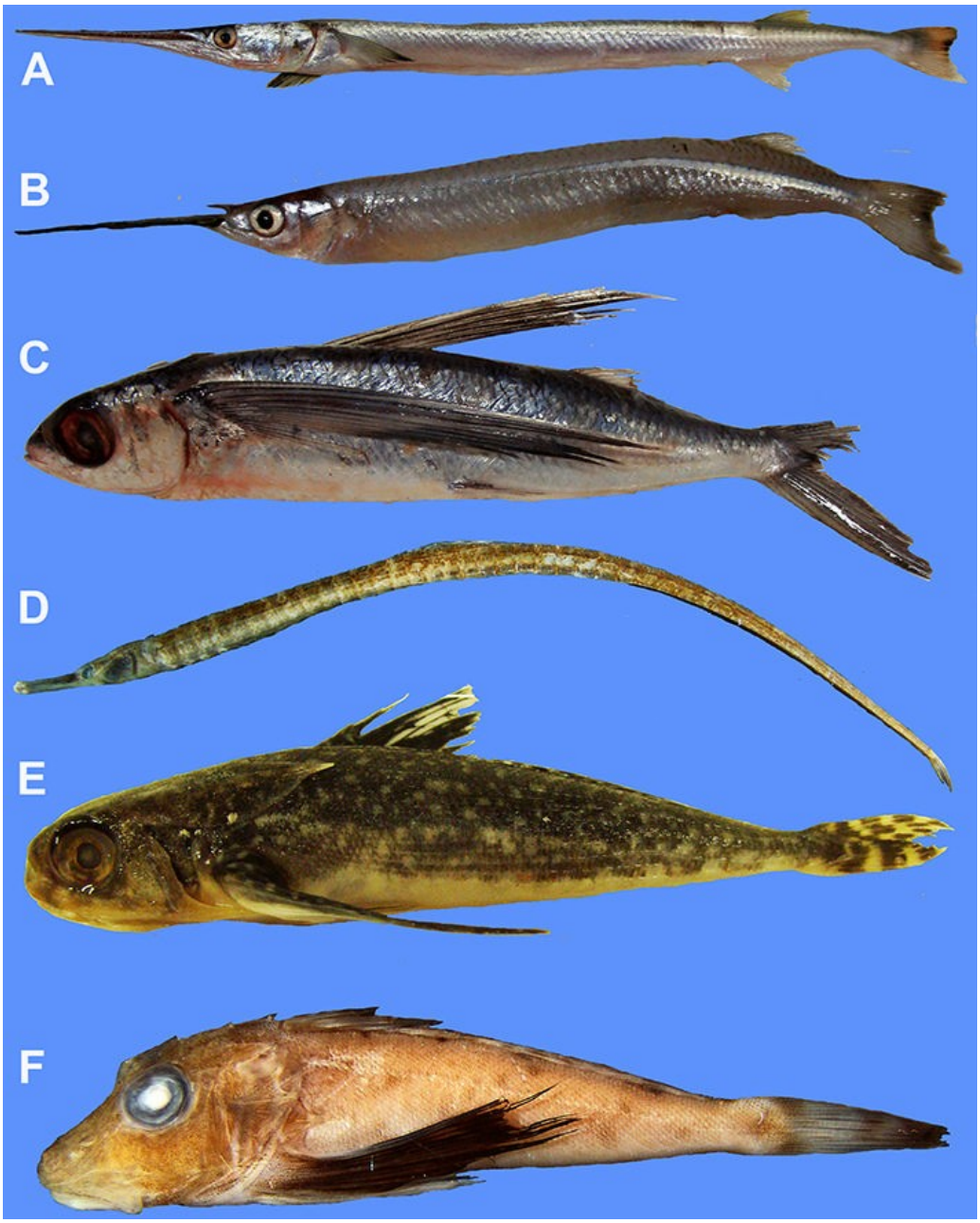

Figure 10. Species of the order Beloniformes, family Belonidae, (a) *Strongylura timucu*, MPEG 32847, 352 mm SL; family Hemiramphidae, (b) *Hyporhamphus roberti*, MPEG 32949, 153 mm SL; family Exocoetidae, (c) *Cheilopogon melanurus*, MPEG 32900, 113 mm SL; ordem Syngnathiformes, family Syngnathidae, (d) *Syngnathus pelagicus*, MPEG 32862, 208 mm SL; ordem Scorpaeniformes, family Dactylopteridae, (e) *Dactylopterus volitans*, MPEG 33043, 160 mm SL; family Triglidae, (f) *Prionotus punctatus*, MPEG 32849, 338 mm SL.

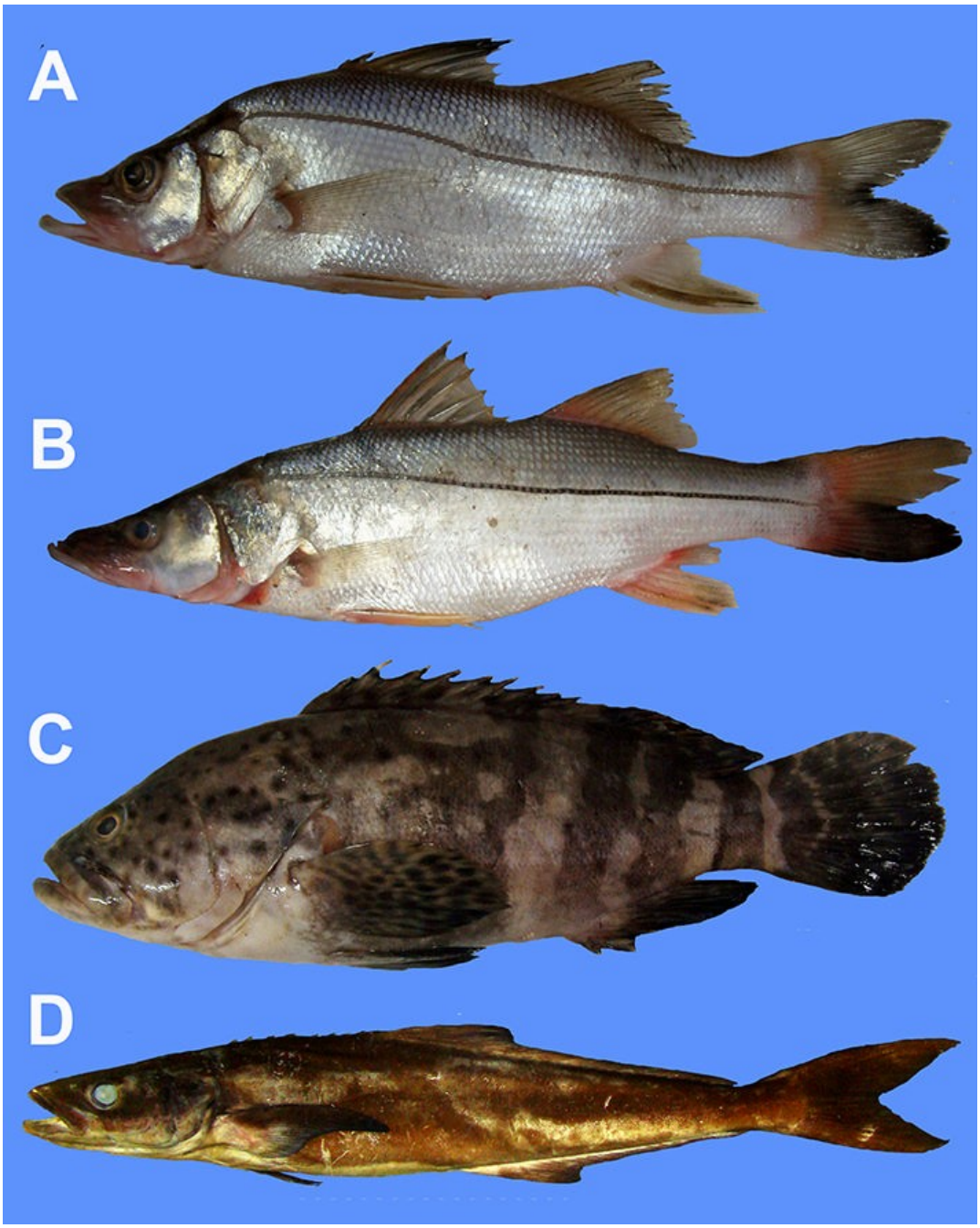

Figure 11. Species of the order Perciformes, family Centropomidae, (a) *Centropomus parallelus*, MPEG 33351, 227 mm SL; (b) *Centropomus undecimalis*, MPEG 33345, 272 mm SL; family Serranidae, (c) *Epinephelus itajara*, MPEG 33004, 157 mm SL; family Rachycentridae, (d) *Rachycentron canadum*, MPEG 33667, 557 mm SL.

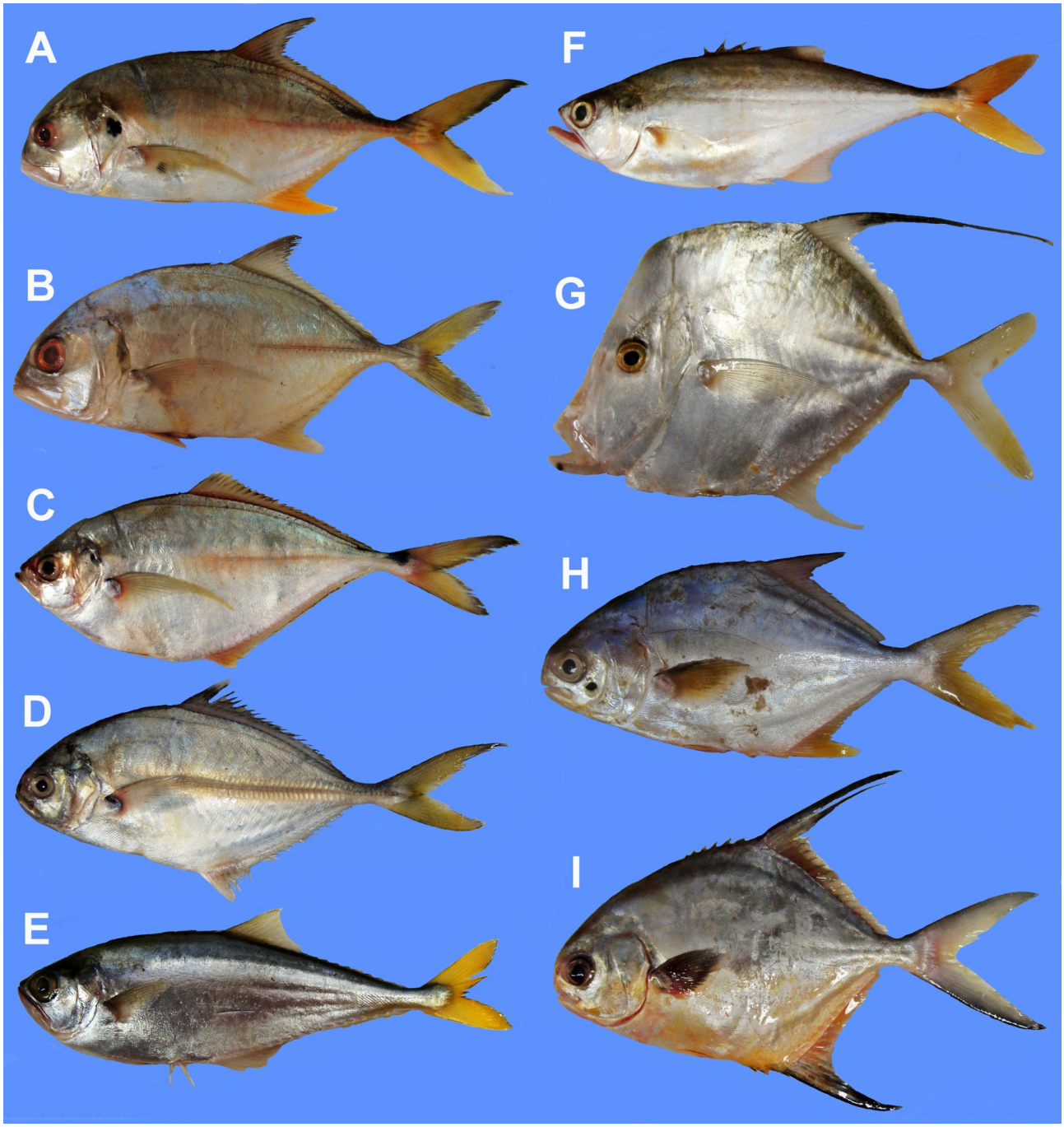

Figure 12. Species of the order Perciformes, family Carangidae, (a) *Caranx hippos*, MPEG 33321, 226 mm SL; (b) *Caranx latus*, LBP 21386, 155 mm SL; (c) *Chloroscombrus chrysurus*, MPEG 33320, 192 mm SL; (d) *Hemicaranx* cf. *amblyrhynchus*, MPEG 33645, 170 mm SL; (e) *Oligoplites palometa*, MPEG 32916, 117 mm SL; (f) *Oligoplites saurus*, MPEG 32907, 144 mm SL; (g) *Selene vomer*, MPEG 32977, 110 mm SL; (h) *Trachinotus carolinus*, MPEG 32982, 188 mm S; (i) *Trachinotus falcatus*, MPEG 33668, 173 mm SL.

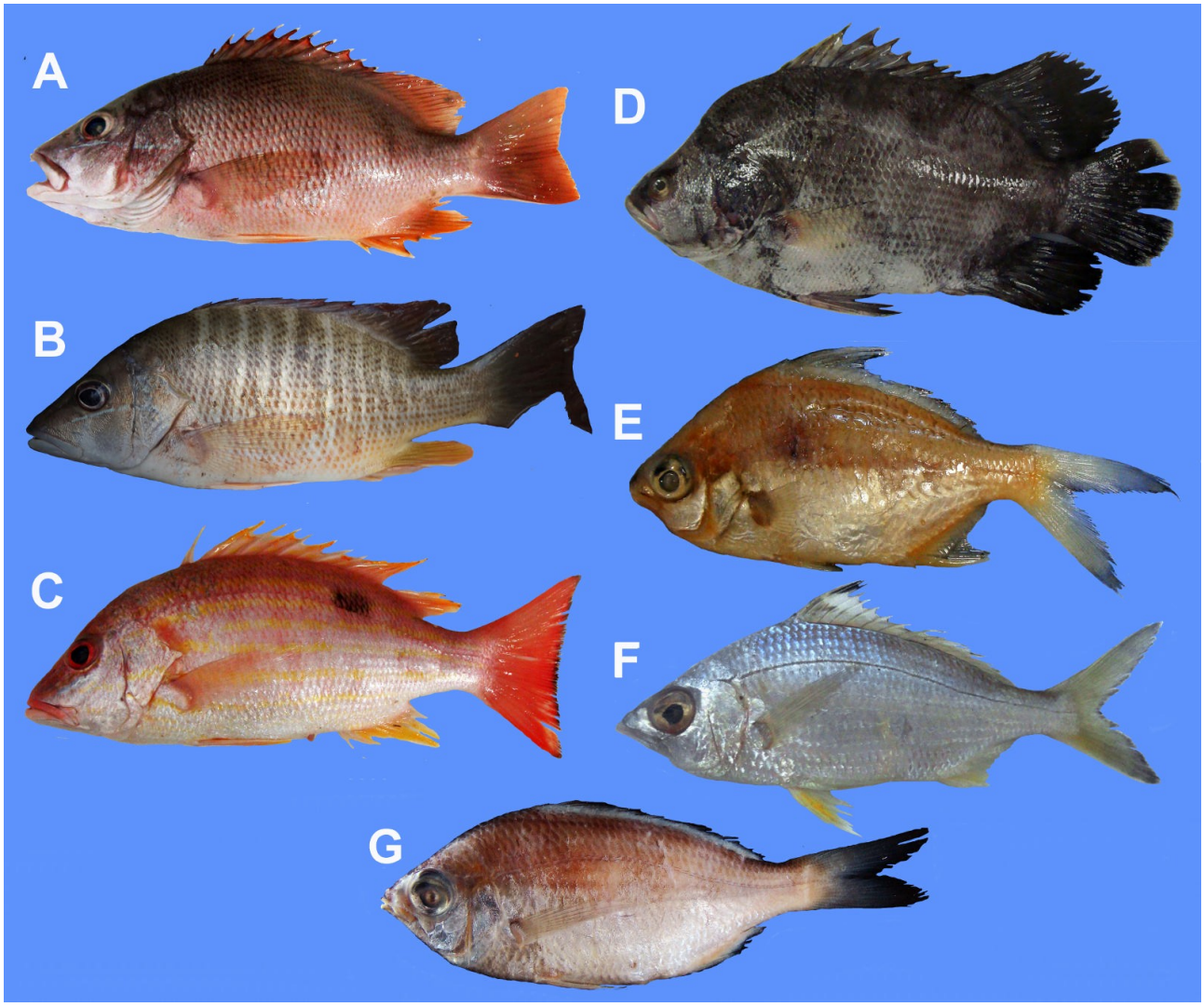

Figure 13. Species of the order Perciformes, family Lutjanidae, (a) *Lutjanus jocu*, MPEG 32840, 148 mm SL; (b) *Lutnajus jocu*, MPEG 32841, 150 mm SL; (c) *Lutjanus synagris*, MPEG 32948, 170 mm SL; family Lobotidae, (d) *Lobotes surinamensis*, MPEG 32749, 145 mm SL; family Gerreidae, (e) *Diapterus auratus*, MPEG 32901, 101 mm SL; (f) *Eucinostomus argenteus*, LBP 21586, 103 mm SL; (g) *Eucinostomus gula*, MPEG 32864, 72 mm SL.

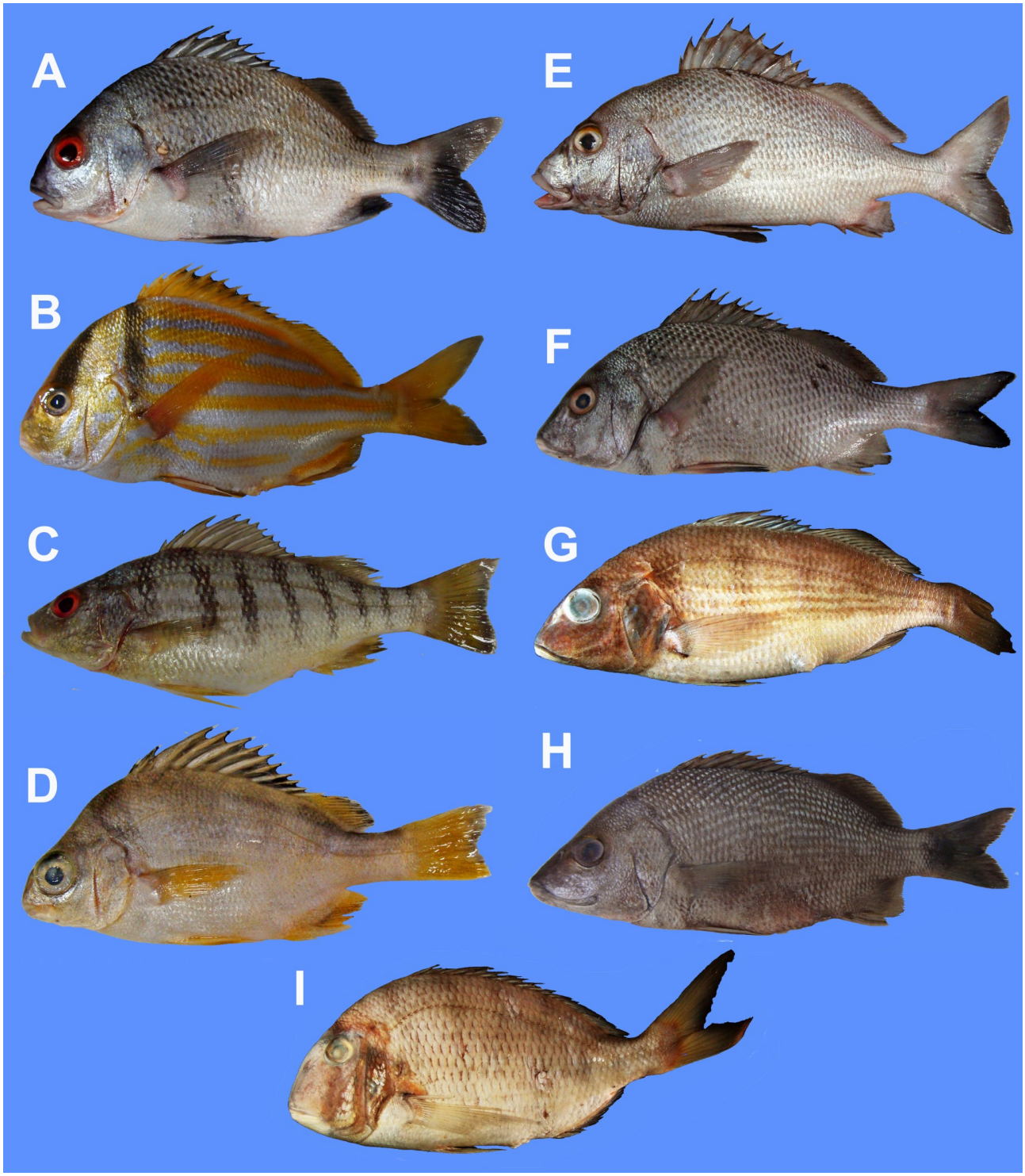

Figure 14. Species of the order Perciformes, family Haemulidae, (a) *Anisotremus surinamensis*, MPEG 33254, 222 mm SL; (b) *Anisotremus virginicus*, MPEG 33318, 163 SL; (c) *Conodon nobilis*, MPEG 32889, 125 mm SL; (d) *Genyatremus luteus*, MPEG 33047, 70 mm SL; (e) *Haemulon parra*, MPEG 33671, 338 mm SL; (f) *Haemulon steindachneri*, MPEG 33240, 204 mm SL; (g) *Haemulopsis corvinaeformis*, MPEG 33640, 179 mm SL; (h) *Orthopristis ruber*, LBP 21413, 190 mm SL; family Sparidae, (i) *Calamus penna*, MPEG 32876, 269 mm SL.

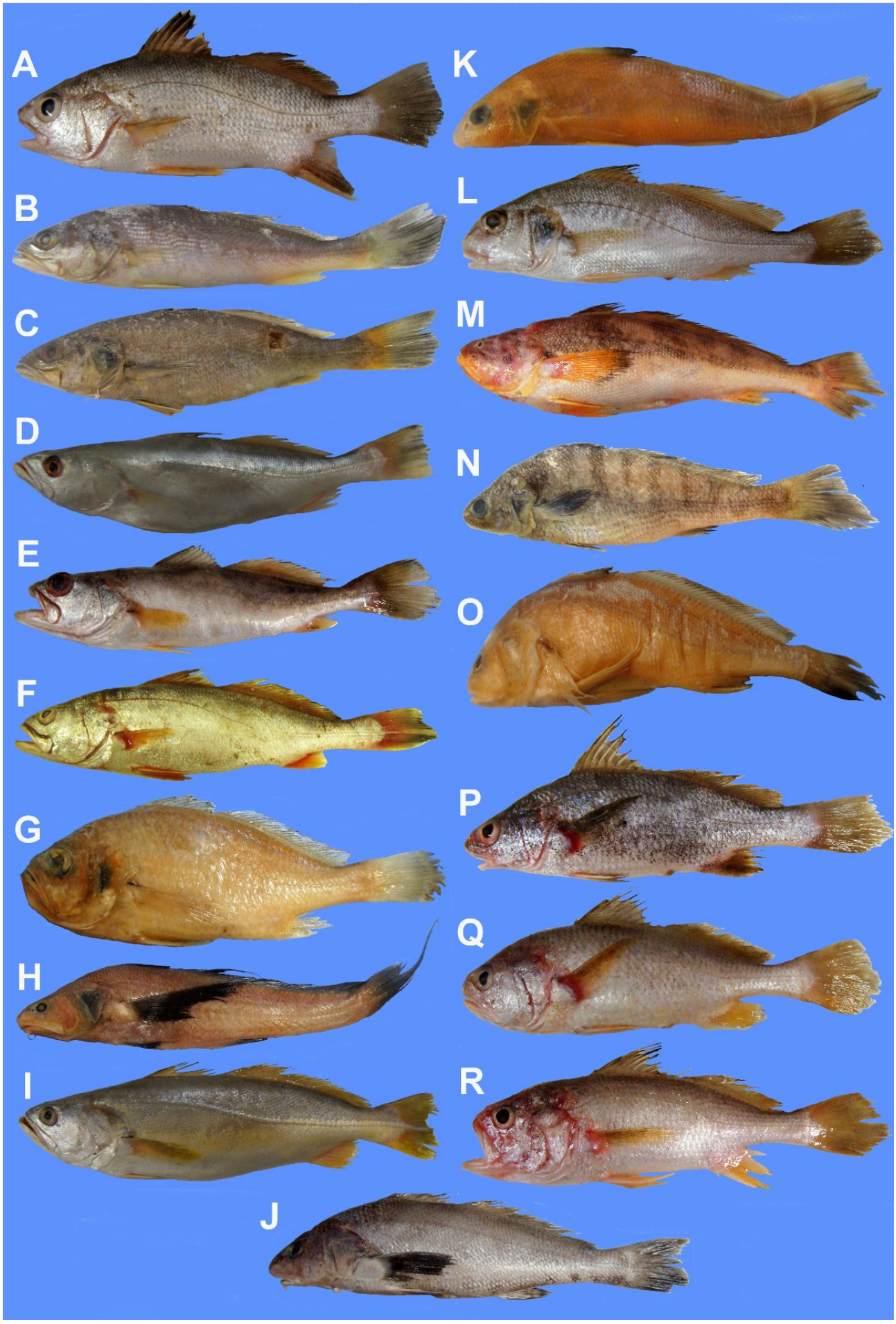
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Figure 15 (on previous page). Species of the order Perciformes, family Sciaenidae, (a) *Bairdiella ronchus*, MPEG 33627, 115 mm SL; (b) *Cynoscion acoupa*, AZUSC 4637, 176 mm SL; (c) *Cynoscion jamaicensis*, AZUSC 4650, 292 mm SL; (d) *Cynoscion leiarchus*, LBP 21588, 132 mm SL; (e) *Cynoscion microlepidotus*, MPEG 32970, 132 mm SL; (f) *Cynoscion steindachneri*, MPEG 33352, 250 mm SL; (g) *Larimus breviceps*, MPEG 33614, 134 mm SL; (h) *Lonchurus lanceolatus*, MPEG 32898, 141 mm SL; (i) *Macrodon ancylodon*, AZUSC4651, 250 mm SL; (j) *Menticirrhus americanus*, MPEG 32830, 165 mm SL; (k) *Menticirrhus littoralis*, MPEG 33244, 109 mm SL; (l) *Micropogonias furnieri*, MPEG 33160, 96 mm SL; (m) *Nebris microps*, MPEG 32845, 273 mm SL; (n) *Paralonchurus brasiliensis*, AZUSC 4646, 255 mm SL; (o) *Plagioscion squamosissimus*, MPEG 32893, 137 mm SL; (p) *Stellifer brasiliensis*, MPEG 33284, 112 mm SL; (q) *Stellifer rastrifer*, MPEG 33040, 120 mm SL; (r) *Stellifer stellifer*, MPEG 32910, 107 mm SL.

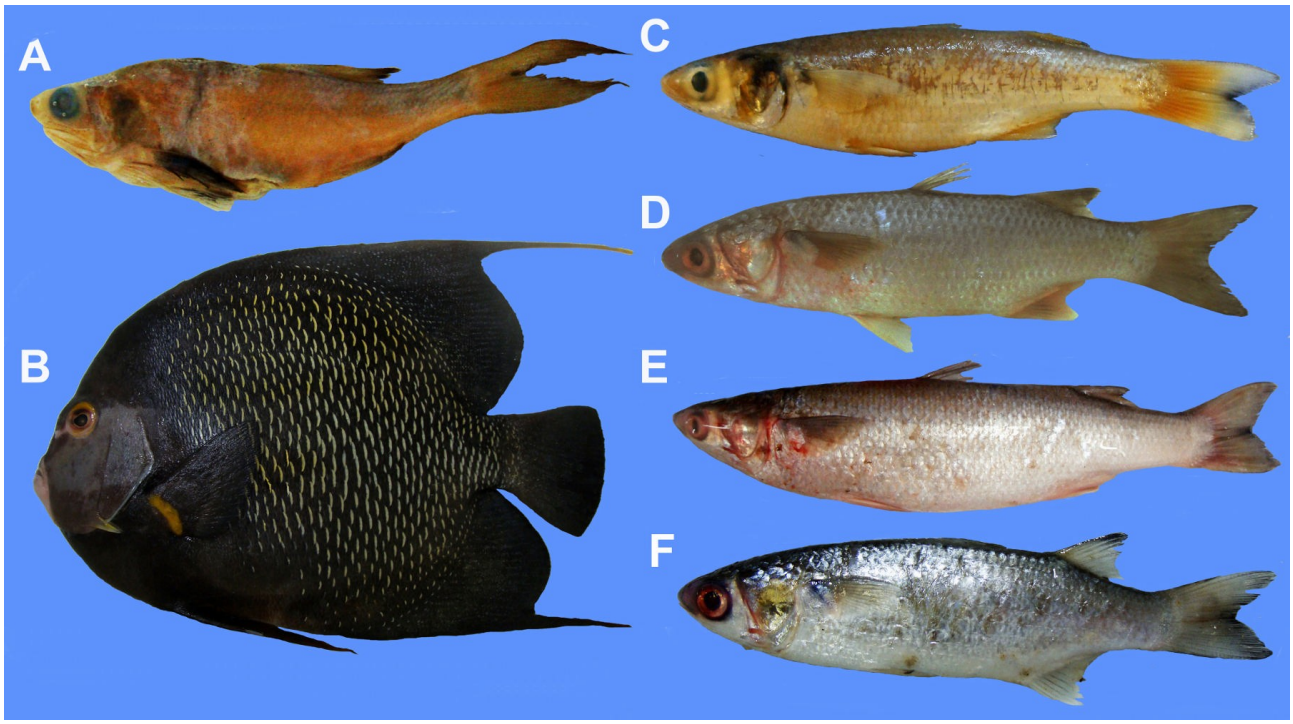

Figure 16. Species of the order Perciformes, family Polynemidae, (a) *Polydactylus virginicus*, MPEG 32888, 78 mm SL; family Pomacanthidae, (b) *Pomacanthus paru*, MPEG 33670, 296 mm SL; family Mugilidae, (c) *Mugil brevirostris*, MPEG 32744, 162 mm SL; (d) *Mugil curema*, LBP 21585, 138 mm SL; (e) *Mugil incilis*, MPEG 33674, 320 mm SL; (f) *Mugil rubrioculus*, MPEG 33025, 78 mm SL.

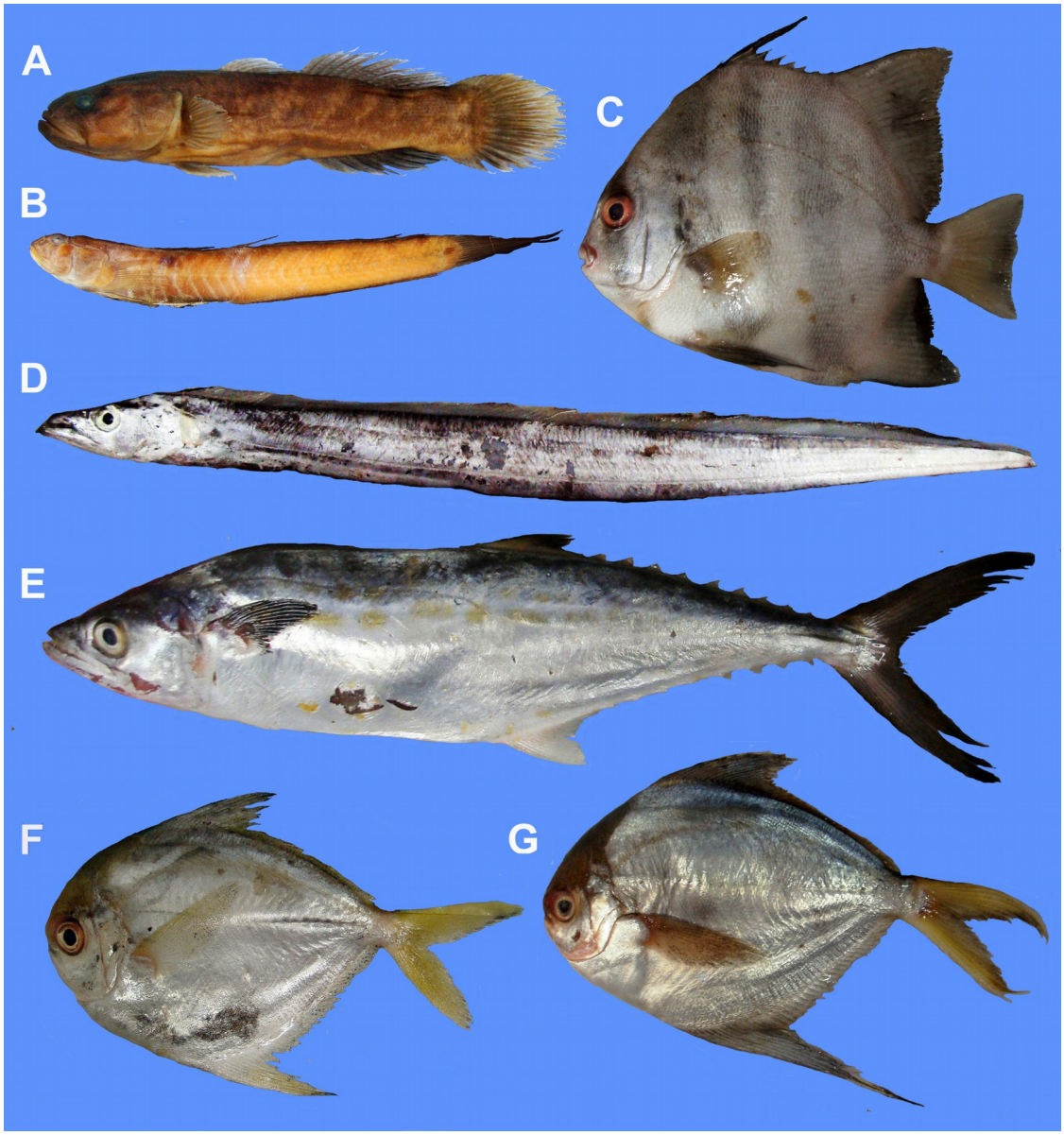

Figure 17. Species of the order Perciformes, family Eleotridae, (a) *Guavina guavina*, MPEG 32774, 158 mm SL; family Gobiidae, (b) *Gobionellus oceanicus*, MPEG 33222, 123 mm SL; family Ephippidae, (c) *Chaetodipterus faber*, MPEG 32947, 97 mm SL; family Trichiuridae, (d) *Trichiurus lepturus*, MPEG 32992, 317 mm SL; family Scombridae, (e) *Scomberomorus brasiliensis*, MPEG 33360, 207 mm SL; family Stromateidae, (f) *Peprilus crenulatus*, MPEG 33283, 125 mm SL; (g) *Peprilus xanthurus*, MPEG 33285, 115 mm SL.

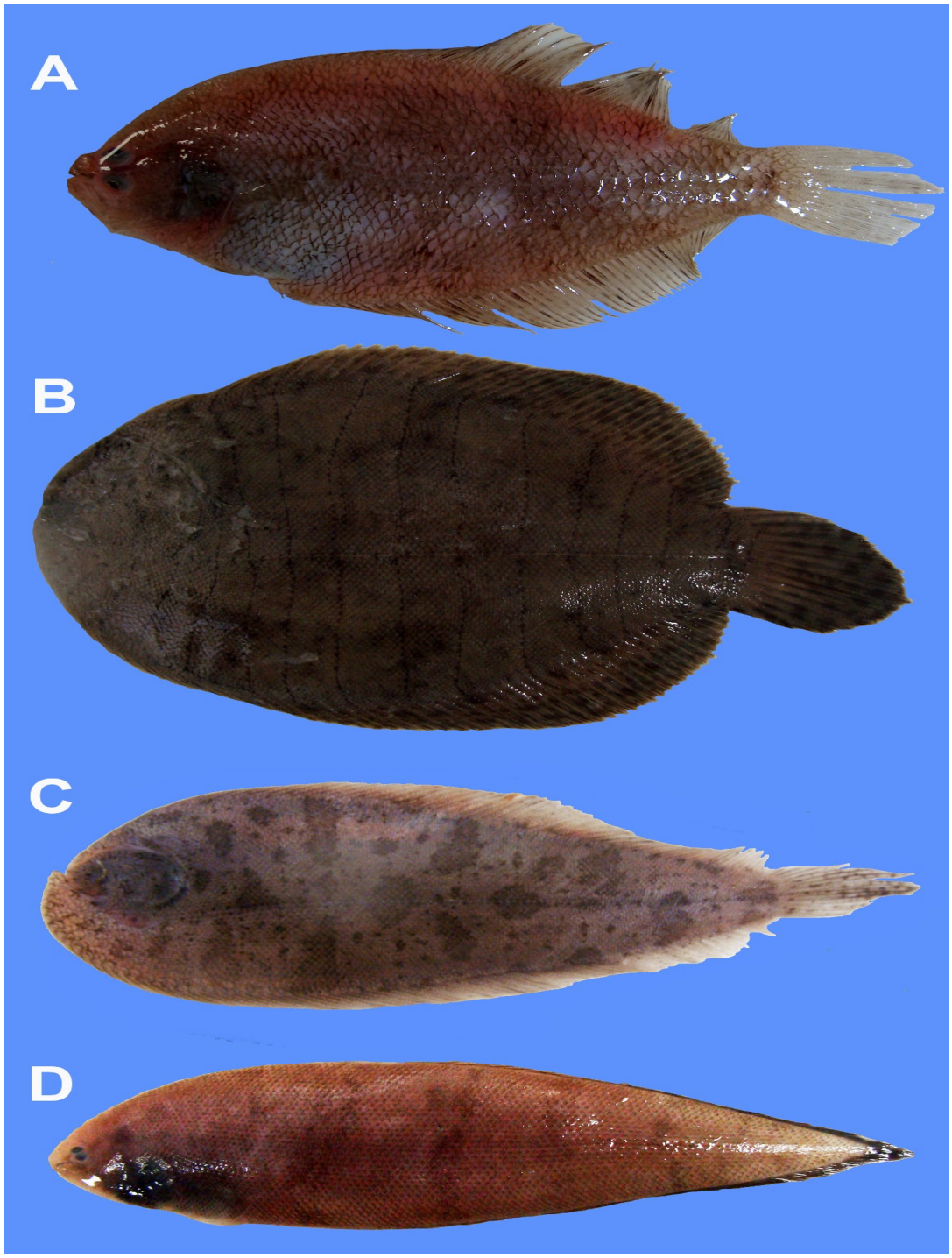

Figure 18. Species of the order Pleuronectiformes, family Paralichthyidae, (a) *Citharichthys cf. spilopterus*, MPEG 32919, 230 mm SL; family Achiridae, (b) *Achirus achirus*, MPEG 32952, 206 mm SL; (c) *Apionichthys dumerili*, AZUSC 4720, 105 mm SL; family Cynoglossidae, (d) *Symphurus diomedianus*, MPEG 33158, 112 mm SL.

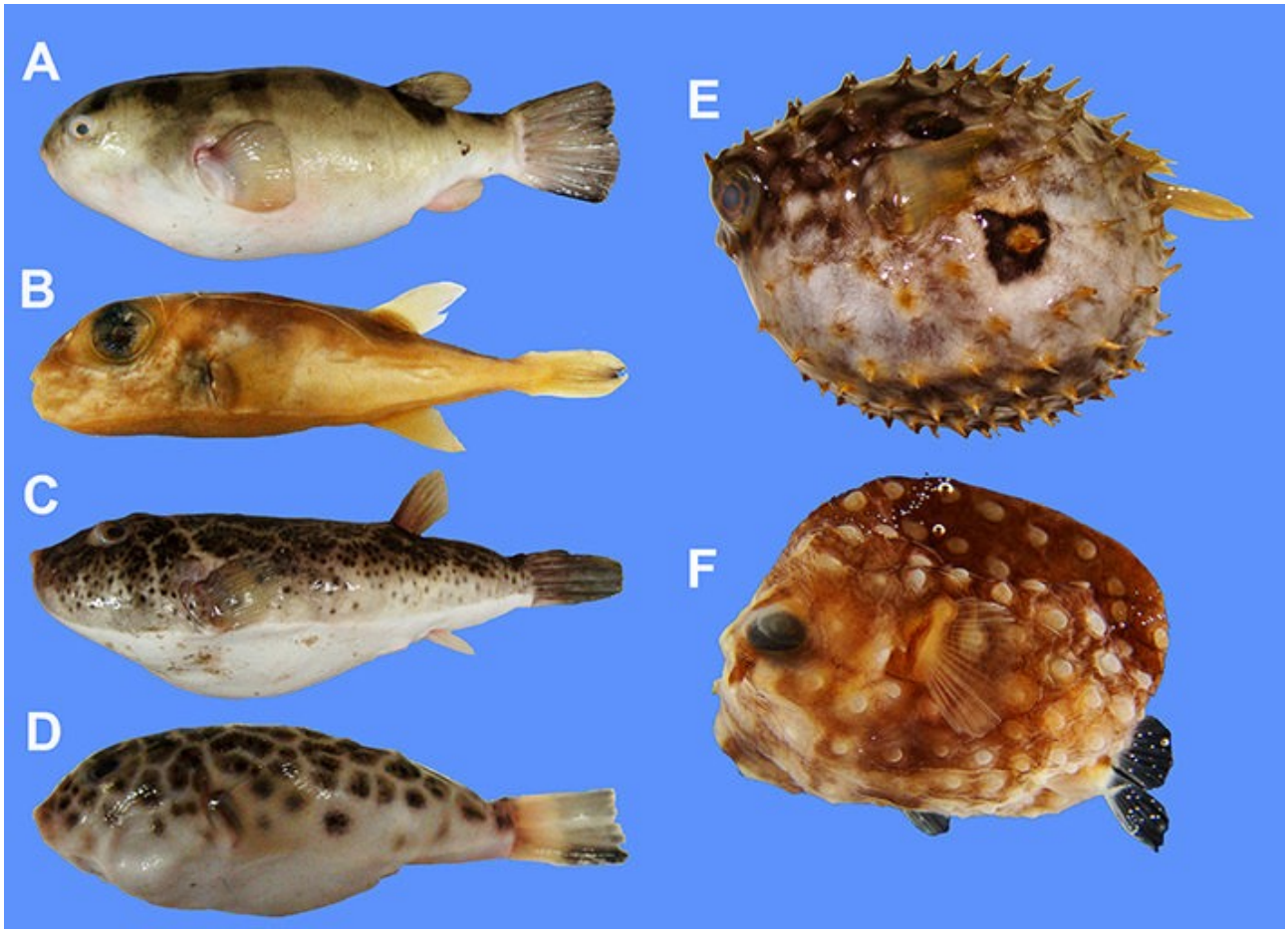

Figure 19. Species of the order Tetraodontiformes, family Tetraodontidae, (a) *Colomesus psittacus*, MPEG 32746, 218 mm SL; (b) *Lagocephalus laevigatus*, MPEG 33630, 69 mm SL; (c) *Sphoeroides testudineus* (adult), MPEG 32768, 151 mm SL; family (d) *Sphoeroides testudineus* (young), MPEG 32768, 90 mm SL; family Diodontidae, (e) *Chilomycterus antillarum*, MPEG 32896, 80 mm SL; (f) *Chilomycterus spinosus*, MPEG 33225, 14 mm SL.

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Identification key to the fish families from Caeté estuary and northern Brazilian coast

1a. One dorsal fin (sometimes absent) with soft, segmented rays; dorsal fin spine, if present, single and joined to soft rays ... 2
1b. One or two dorsal fins, the anterior portion (or first dorsal fin) with at least two unsegmented spines (if only one spine, generally separated from segmented rays); posterior portion of dorsal fin (or 2nd dorsal fin) with soft and segmented rays ... 34

2a. Eyes on the same side of the head (flounders) ... 3
2b. Eyes never on the same side of the head ... 7

3a. Eyes on the right side ... 4
3b. Eyes on the left side ... 5

4a. Lower lip wide, with slender dermal fimbriae; posterior narine channel-like, elongated ... Achiridae
4b. Lower lip slender, without fimbriae; posterior naris small, oval (Poecilopsettidae) ... *Poecilopsetta inermis*

5a. Dorsal and anal fin bases separated from caudal fin ... 6
5b. Dorsal and anal fin bases joined to caudal fin ... Cynoglossidae

6a. Pelvic fin on blind side not larger and not more anterior than that on eyed side; anterior branch of lateral line reaching lower eye ... Paralichthyidae
6b. Pelvic fin on blind side much larger and more anterior than that on eyed side; anterior branch of lateral line not reaching head ... Bothidae

7a. Trunk covered with bony rings; snout very long, tubular, jaws without teeth; pelvic fin absent (Syngnathidae) ... *Syngnathus pelagicus*
7b. Trunk without bony rings; snout usually not tubular; jaws usually with teeth; pelvic fin usually present ... 8

8a. Body disk-like, dorsoventrally flattened, losangular or oval in dorsal view; pectoral attached laterally on disk, leg-like; fishing lure above mouth; head rostrum present ... Ogcocephalidae
8b. Body usually not disk-like; pectorals not leg-like; fishing lure absent; head rostrum usually absent ... 9

9a. Head disk-like; pelvic fins with 4 rays and joined to form part of adhesive disk located between head and trunk, with flattened papillae along its ventral margin (Gobiesocidae) ... *Gobiesox barbatulus*
9b. Head not disk-like; pelvic fins, if present, usually not forming adhesive disk (if forming disk, not joined to pectoral fin)... 10

10a. Body globe-like, sometimes with spines or bony plates; scales absent ... 11
10b. Body not globe-like; scales usually present (sometimes absent, but not forming spines) ... 13

11a. Body rigid, covered with polygonal bony plates, leaving free only fin bases ... Ostraciidae
11b. Body not rigid, without polygonal bony plates, capable of inflating by intake of air or water ... 12

12a. Body with many large spines; teeth fused in two plates, one on upper jaw and another on lower jaw ... Diodontidae
12b. Body without spines; teeth fused in four plates, two on upper jaw and two on lower jaw ... Tetraodontidae

13a. Upper margin of head with large, laminar sucker organ (Echeneidae) ... *Echeneis naucrates*
13b. Upper margin of head without sucker organ ... 14

14a. Belly with scutes, forming a serrated egde ... 15
14b. Belly without scutes ... 16

15a. Anal fin with 30 or more rays ... Pristigasteridae
15b. Anal fin with less than 30 rays ... Clupeidae

16a. Two maxillary and 1-2 pairs of mental barbels; body naked or covered with bony plates ... 17
16b. Barbels usually absent; body usually covered with scales ... 21

17a. Body covered with rows of bony plates; mouth round, with lips suctorial and covered with papillae ... Loricariidae
17b. Body naked; mouth not suctorial ... 18

18a. Eye small, less than 10% of head length; whip-like tail present; anal fin longer than preanal distance ... Aspredinidae
18b. Eye larger, more than 10% of head length; whip-like tail absent; anal fin shorter than preanal distance ... 19

19a. Nuchal plate inflated posterolaterally; base of dorsal spine swollen in adults ... (Auchenipteridae) ... *Pseudauchenipterus nodosus*
19b. Nuchal plate not inflated posterolaterally; base of dorsal spine not swollen in adults ... 20

20a. Nostrils apart from each other for a distance larger than their diameter; dorsal spine usually slender, not stouter than segmented rays ... Pimelodidae
20b. Nostrils apart from each other for a distance smaller than their diameter; dorsal spine stouter than segmented rays ... Ariidae

21a. Body much elongate, serpentiform or threadlike; dorsal and anal fins, when present, joined to caudal fin ... 22

21b. Body not serpentiform or threadlike; dorsal and anal fins, when present, separated from caudal fin ... 27

22a. Dorsal fin absent and anal fin present, long; electric organ present, at least in anteroventral portion of the flanks ... Sternopygidae
22b. Dorsal and anal fins otherwise; electric organ absent ... 23

23a. Jaws with large, arrow-like teeth ... Trichiuridae
23b. Jaws without arrow-like teeth; teeth usually small, conical, or caniniform … (Anguilliformes) ... 24

24a. Branchial region swollen, supported by a basket of many free; slender and recurved branchiostegal rays that overlap below ... Ophichthidae
24b. Branchial region not swollen, with stout, not overlapping branchiostegal rays ... 25

25a. Pectoral fin absent; posterior nostril aligned to upper border of eye ... Muraenidae
25b. Pectoral fin usually present; posterior nostril in front or below to horizontal line that passes in the middle of the eye ... 26

26a. Lips thick; posterior nostril in front of horizontal line that passes in the middle of the eye ... Congridae
26b. Lips usually thin; posterior nostril below horizontal line that passes in the middle of the eye ... Chlopsidae

27a. Adipose fin present ... Synodontidae
27b. Adipose fin absent ... 28

28a. Eyes raised above the top of the head, with cornea half-divided by horizontal band of conjuntive tissue ... Anablepidae
28b. Eyes raised or not above the top of the head, without half-divided cornea ... 29

29a. Branchiostegal rays 23-35; pelvic fin with 10-16 rays ... 30
29b. Branchiostegal rays usually less than 20; if more than 20 branchiostegal rays, less than 10 pelvic fin rays ... 31

30a. Lower jaw prognathous; last dorsal fin ray thread-like; 41-46 lateral line scales (Megalopidae) ... *Megalops atlanticus*

30b. Lower jaw not prognathous; last dorsal fin ray not thread-like; 100-110 lateral line scales (Elopidae) ... *Elops smithi*

31a. Snout rounded, pig-like; upper jaw long, with fine villiform teeth (rarely caniniform); lateral line absent ... Engraulidae
31b. Snout not pig-like; upper jaw short, if long, without villiform teeth; lateral line present displaced ventrally near belly margin ... 32

32a. Lower jaw usually elongated; pectoral fin not reaching anal fin origin ... 33
32b. Lower jaw small, barely reaching anterior eye border; pectoral fin large, overlapping anal fin origin ... Exocoetidae

33a. Only lower jaw elongated (sometimes short); snout not crocodile-like ... Hemiramphidae
33b. Both jaws long; upper jaw with caniniform teeth; snout crocodile-like ... Belonidae

34a. Body compressed, oval or losangular in lateral view; skin rough, with small scales or prickles; pelvic fin absent, or minute, without rays and forming a small blump on ventral margin; branchial aperture short, equal to eye diameter; first dorsal fin with 2-3 large, rigid spines ... 35
34b. Body usually fusiform; skin usually smooth, covered with large scales; pelvic fin usually present, with developed rays; branchial aperture longer than eye diameter; first dorsal fin with more than three spines (if less than three, spines small) ... 36

35a. Three smooth dorsal spines; jaws with 8 teeth on outer row; pectoral, dorsal and anal segmented rays branched ... Balistidae
35b. Two dorsal spines, first one large, serrated; jaws with 6 teeth or less on outer row; pectoral, dorsal and anal segmented rays unbranched ... Monacanthidae

36a. Large crest or stay present on infraorbital region ... 37
36b. Crest or stay absent on infraorbital region ... 39

37a. Opercle spine reaching beyond pectoral fin base; pectoral fin nearly reaching caudal fin base (Dactylopteridae) ... *Dactylopterus volitans*
37b. Opercular spine not reaching pectoral fin base; pectoral fin tip far from reaching caudal fin base ... 38

38a. Snout with two short and straight rostral projections; three lowermost pectoral rays stout and detached from remaining rays (Triglidae) ... *Prionotus punctatus*
38b. Snout without rostral projections; all pectoral rays joined ... Scorpaenidae

39a. First dorsal fin with 2-3 very short, stout, detached spines; pelvic fin origin in front of pectoral fin base ... Batrachoididae
39b. First dorsal fin (or anterior spinous portion of dorsal fin) with 3 or more usually large and joined spines; pelvic fin origin below or behind pectoral fin base ... 40

40a. First or two first anal fin spines stout and separated from other anal elements; lateral line scutes usually present ... Carangidae
40b First or two first anal fin spines not separated from other anal elements (sometimes absent); lateral line scutes absent ... 41

41a. Scales usually small, embedded in skin, forming a corselet on anterior portion of trunk; posterior dorsal and anal fins detached, forming finlets, with 1-3 keels on caudal peduncle ... Scombridae
41b. Scales usually large; finlets and keels absent ... 42

42a. Dorsal fin spines at least three times shorter than soft segmented rays ... 43
42b. Dorsal fin spines two times shorter than soft segmented rays or larger ... 45

43a. Body deep, nearly as high as long; upper jaw unmovable and covered with skin; dorsal fin spines barely visible, usually under the skin; pelvic fin absent ... Stromateidae
43b. Body not so deep, height 25% of standard length or less; upper jaw movable and not covered with skin; dorsal fin spines evident; pelvic fin present ... 44

44a. Spines of first dorsal joined by membrane; 2nd dorsal with 23-28 rays; jaws with a unique row of large, compressed, sharp or molariform teeth (Pomatomidae) ... *Pomatomus saltatrix*
44b. Spines of first dorsal separated from each other; 2nd dorsal with 28-33 rays; jaws with 2-3 rows of small, villiform teeth (Rachycentridae) ... *Rachycentron canadum*

45a. Two dorsal fins separated from each other by a distance longer equal or longer than base of first dorsal; spines of first dorsal fin slender and flexible ... 46
45b. One dorsal fin with joined spinous and soft portions, or two dorsal fins separated from each other by a distance shorter than length of first dorsal fin base ... 49

46a. Eye covered with adipose tissue ... 47
46b. Eye not covered with adipose tissue ... 48

47a. First dorsal with 4 spines; all pectoral rays similar in shape ... Mugilidae
47b. First dorsal fin with 7-8 spines; 3-16 lowermost pectoral rays threadlike and separated from remaining rays... (Polynemidae) ... *Polydactylus virginicus*

48a. Mouth small, with minute teeth; first dorsal with 4 spines; anal fin long, its origin below or in front of vertical line that passes through origin of first dorsal fin; usually with horizontal silvery stripe on flanks ... (Atherinopsidae) ... *Atherinella* aff. *brasiliensis*
48b. Mouth very large, with large caniniform teeth; fisrt dorsal with 5 spines; anal fin short, its origin below to origin of the 2nd dorsal fin; without horizontal silvery stripe ... Sphyraenidae

49a. Mouth very protactile, forming a tube when open; ventral margin of head concave when mouth is closed ... Gerreidae
49b. Mouth not forming a tube when open; ventral margin of head convex when mouth is closed ... 50

50a. Body deep, compressed; head with dorsal profile much inclined; longest dorsal and anal fins reaching base of caudal fin; caudal peduncle almost as long as deep ... (Lobotidae) ... *Lobotes surinamensis*
50b. Body fusiform, if deep, disk-like in lateral view; head with dorsal profile not so steep; longest dorsal and anal fin rays usually not reaching caudal fin base; caudal peduncle much longer than deep 51

51a. Opercle with 3 (rarely two) large and flat spines, sometimes hidden by skin; teeth on jaws fine, caniniform and depressible ... Serranidae
51b Opercle without spines; teeth not depressible ... 52

52a. Lateral line extending to tip of caudal fin ... 53
52b. Lateral line extending to base of caudal fin, or absent ... 54

53a. Second dorsal fin with 21-44 soft, segmented rays ... Sciaenidae
53b. Second dorsal fin with 8-11 soft, segmented rays ... Centropomidae

54a. Body deep, compressed and oval in lateral view ... 55
54b. Body not deep, not much compressed and usually fusiform in lateral view ... 59

55a. One large, sharp spine on either side of caudal peduncle .... (Acanthuridae) ... *Acanthurus coeruleus*
55b. No spine on caudal peduncle ... 56

56a. Nine spines on dorsal fin; jaws with many rows of slender, brushlike teeth 57
56b. Ten to thirteen spines on dorsal fin; jaws with one series of caniniform, incisiviform or molariform teeth ... 58

57a. Large, sharp spine on preopercle ... (Pomacanthidae) ... *Pomacanthus paru*.
57b. Preopercle spine absent ... (Ephippidae) ... *Chaetodipterus faber.*

58a. Teeth base not set horizontally; teeth caniniform or molariform, usually in several rows on jaws; fin bases and area below eye without scales ... Sparidae
59b. Teeth base set horizontally; teeth incisiviform, hockey-strick shaped, in one series and forming a kind of radially striated bony plate inside mouth; fin bases and area below eye with scales ... (Kyphosidae) ... *Kyphosus vaigiensis*

59a. Lateral line absent on trunk; head with rows of sensory papillae ... 60
59b. Lateral line present; head usually without rows of sensory papillae ... 61

60a. Six branchiostegal rays; pelvic fins separated on base, not forming a disk; length of caudal peduncle larger than length of anal fin base … Eleotridae
60b. Five branchiostegal rays; pelvic fins joined to each other, forming a disk; length of caudal peduncle shorter than length of anal fin base … Gobiidae

61a. Two first pelvic rays unbranched, thickened; upper jaw huge in males, overcoming rear eye margin (Opistognathidae) ... *Opistognathus lonchurus*.
61b. Pelvic rays not thickened; upper jaw not reaching rear eye margin ... 61

62a. Infraorbital region scaled; mental region with pores (1 central followed by a pair of pores, or two pairs); jaws with many villiform teeth ... Haemulidae
62b. Infraorbital region naked; mental region without pores; jaws with few large, usually caniniform teeth ... Lutjanidae.

Identification key to the species of family Achiridae

1a. Body naked; many narrow vertical and irregular brown stripes on flanks, over lighter ground color ... *Gymnachirus nudus*
1b. Body scaled; no dark stripes on flanks ... 2

2a. Pectoral fin absent; mouth aperture not visible in frontal view ... *Apionichthys dumerili*
2b. Pectoral fin present; mouth visible in frontal view ... 3

3a. Branchial aperture on blind side with thickened border and lined with cirri; branchial filaments joined to isthmus; long sulcus over upper lip on blind side present ... *Hypoclinemus mentalis*
3b. Branchial aperture on blind side with thin border and not lined with cirri; branchial filaments free in branchial aperture; sulcus over upper lip absent (*Achirus*) ... 4

4a. 59-68 dorsal rays; 3-4 pectoral rays ... *Achirus achirus*
4b. 49-60 dorsal rays; usually 5-6 pectoral rays ... 5

4a. Caudal fin on eyed side with round or irregular dark blotches; posterior portion of trunk dark on blind side ... *Achirus lineatus*
4b. Caudal fin on eyed side without blotches; posterior portion of trunk light or tan on blind side ... *Achirus declivis*

Identification key to the species of family Ariidae

1a. Maxillary barbel threadlike, flat in cross section; a unique pair of mental barbells ... (*Bagre*)... 2
1b. Maxillary barbel round in cross section; two pairs of mental barbels ... 3

2a. Anal fin with 29-34 rays, ventrally slightly convex along ... *B. bagre*
2b. Anal fin with 19-22 rays, ventrally markedly convex ... *B. marinus*

3a. Adipose fin short, length of the base shorter than 50% of the length of anal fin base ... (*Cathorops*) ... 4
3b.Adipose fin long, length of the base longer than 50% of the length of anal fin base.... 6

4a. Maxillary barbels not surpassing pectoral fin base; and mental barbels not reaching rear border of opercle; eyes large, 2.1-5.9 times in maxillary barbel length .... *Cathorops agassizii*.
4b. Barbels long, maxillary surpassing pectoral fin base and mental reaching rear border of opercle; eyes small, 6.0-11.6 times in maxillary barbel length 5

5a. 41-42 vertebrae free from Weber apparatus; orbital diameter 2.8-4.1 in body width at the level of supracleithrum ... *Cathorops spixii*
5b. 39-40 vertebrae free from Weber apparatus; orbital diameter 4.1-6.0 times in body width at the level of supracleithrum ... *Cathorops arenatus*

6a. Adipose fin base nearly as long as anal fin base; mouth small, with thick lips ... 7
6b. Adipose fin base longer than anal fin base; mouth large, with thin lips ... (*Sciades*) ... 10

7a. Nuchal plate wide, quadrangular or butterfly-shaped ... *Aspistor quadriscutis*
7b. Nuchal plate small, V-shaped ... 8

8a. Toothplate present on vomer; accessory toothplate wide, posteriorly elongated and with molariform teeth ... *Notarius grandicassis*
8b. Toothplate absent on vomer; accessory toothplate small, round, with acicular teeth ... (*Amphiarius*) ... 9

9a. 16-17 rakers on first branchial arch, rarely 15; 17-20 rakers on 2nd branchial arch ... *Amphiarius rugispinis*
9b. 13-15 rakers on first branchial arch, rarely 15; 14-15 rakers on 2nd branchial arch ... *Amphiarius phrygiatus*.

10a. Posterior nostrils connected to each other by a membrane ... 11

10b. Posterior nostrils not connected to each other by a membrane ... 12

11a. Nuchal plate subquadrangular, with a notch in anterior border; maxillary barbels barely reaching pectoral spine base in young specimens (<200 mm SL) ... *Sciades proops*.
11b. Nuchal plate rounded, without a notch in anterior border; maxillary barbels surpassing pectoral spine base in young specimens (<200 mm SL) ... *Sciades parkeri*.

12a. Accessory toothplates perfectly parallel to pre-maxilar ... *Sciades passany*.
12b. Accessory toothplates U-shpaed, projected posteriorly ... 13.

13a. Nuchal plate small, V-shaped ... *Sciades herzbergii*.
13b. Nuchal plate large, shield-shaped ... *Sciades couma*.

Identification key to the species of family Anablepidae

1a. Less than 80 transversal rows of scales above lateral line ... *Anableps anableps*
1b. More than 80 transversal rows of scales above lateral line ... *Anableps microlepis*

Identification key to the species of family Aspredinidae

1a. Seven or more pairs of barbels in ventral margin of head and belly ... (*Aspredinichthys*) ... 2
1b. Two pairs of barbels on head ventral surface, absent on belly... *Aspredo aspredo*

1a. Snout tip without spine; seven pairs of barbels on ventral head surface and belly... *Aspredinichthys filamentosus*
1b. Snout tip with four spines; ten pairs of barbels on ventral head surface and belly ... *Aspredinichthys tibicen*

Identification key to the species of family Balistidae

1a. Two curved purple lines present on head, below eye; dorsal fin rays 29-31; anal fin rays 27-28 … *Balistes vetula*
1b. Curved purple lines absent on head; dorsal fin rays 26-29; anal fin rays 23-26 … *Balistes capriscus*

Identification key to the species of family Batrachoididae

1a. First dorsal with two spines; subopercle spines absent; body naked ... 2
1b. First dorsal with three spines; 1-2 subopercle spines present; body covered with small scales ... *Batrachoides surinamensis*

2a. Solid spines on first dorsal fin and opercle; 2nd dorsal with 29-39 segmented rays; three rows of photophores on trunk, those from ventral profile disposed as "U"... *Porichthys cf. plectrodon*
2b. Hollow spines on first dorsal fin and opercle; 2nd dorsal with 17-21 segmented rays; photophores on trunk absent ... (*Thalassophryne*) …….3

3a. Pectoral and caudal fins without white margin; black evident marks dorsally on trunk usually present ... *Thalassophryne maculosa*
3b. Pectoral and caudal fins with white margin; body darkened in some areas, but usually without clear marks or spots ... *Thalassophryne nattereri*

Identification key to the species of family Belonidae

1a. Body much compressed; many vertical dark stripes on flanks; anal fin with 24-28 rays ... *Ablennes hians*
1b. Body round or quadrate in cross section; dark vertical stripes absent on flanks; anal fin with 13-24 rays ... 2

2a. Caudal peduncle depressed, with a large keel on each side; gill rakers present ... *Platybelone argalus*
2b. Caudal peduncle not depressed, with keels small or absent; gill rakers absent ... 3

3a. 12-17 rays in dorsal fin; keel absent on caudal peduncle; caudal fin lobes nearly of the same size ... (*Strongylura*) ... 4
3b. 21-26 rays in dorsal fin; small, black keel on each side of caudal peduncle; lower caudal fin lobe much larger than upper lobe ... (*Tylosurus*) ... 5

4a. 120-185 transversal rows of scales in predorsal region ... *Strongylura timucu*
4b. 213-304 transversal rows of scales in predorsal region ... *Strongylura marina*

5a. 320-390 transversal rows of scales in predorsal region; 90-95 vertebrae; young and adults with vertical teeth in maxillae ... *Tylosurus acus*
5b. 240-290 transversal rows of scales in predorsal region; 80-84 vertebrae; young specimens with antrorse teeth in maxillae ... *Tylosurus crocodilus*

Identification key to the species of family Bothidae

1a. Pectoral fin absent in blind side ... *Monolene antillarum*
1b. Pectoral fin present in blind side ... 2

2a. Upper jaw very long, surpassing the rear border of the lower eye; body depth less of 40% SL ... *Chascanopsetta lugubris*
2b. Upper jaw not reaching the rear border of the lower eye; body depth more than 40% SL ... 3

3a. Eyes close to each other, with one tentacle in upper border; interorbital space smaller than eye length; 74-83 dorsal rays and 60-67 anal rays ... *Engyophris senta*
3b. Eyes apart from each other, usually without tentacle in upper border; interorbital space wider than eye length; 90-105 dorsal rays and 70-60 anal rays ... (*Bothus*) ... 4

4a. Body depth more than 60% SL; 76-91 dorsal rays, 58-68 anal rays ... 5
4b. Body depth less than 60% SL; 90-99 dorsal rays, 70-76 anal rays ... 6

5a. Caudal fin with a medial row of two large dark brown spots ... *Bothus robinsi*
5b. Caudal fin base with a vertical row of two dark brown spots ... *Bothus ocellatus*

6a. Head dorsal margin uniformly convex; eyes aligned in a vertical row and with a papilla in posterior border ... *Bothus maculiferus*
6b. Head dorsal margin with a concavity in front of the upper eye; eyes not aligned in a vertical row and without papilla in posterior border ... *Bothus lunatus*

Identification key to the species of family Carangidae

1a. Scutes present on posterior straight portion of lateral line ... 2
1b. Scutes absent on posterior straight portion of lateral line ... 10

2a. Body with tiny scales embedded in skin, almost not visible with the naked eye... 3
2b. Body with larger scales, embedded or not in skin ... 4

3a. Head dorsal profile steep, almost vertical; pelvic fin shorter than upper jaw ... *Selene vomer*
3b. Head dorsal profile concave; pelvic fin longer than upper jaw ... *Alectis ciliaris*

4a. Dark upper spot on caudal peduncle; 5-15 small scutes on straight portion of lateral line; ventral profile more convex than dorsal ... *Chloroscombrus chrysurus*
4b. Usually without upper dark spot on caudal peduncle (if present, with a large spot on opercle); 23-56 usually large scutes on straight portion of lateral line; ventral profile less convex than dorsal ... 5

5a. Last rays of dorsal and anal fins broadly joined to other rays; large fleshy projection on ventral margin of pectoral girdle ... *Selar crumenophthalmus*
5b. Last rays of dorsal and anal fins joined from other rays only in base; projection on ventral margin of pectoral girdle small or absent ... 6

6a. Body elongated, depth less than 40% SL; a unique teeth row on upper jaw; upper lobe of caudal fin larger than lower lobe; no keels on caudal peduncle; only one dark spot on pectoral fin base ... *Hemicaranx amblyrhynchus*
6b. Body high, depth nearly 40% of SL; upper jaw with two or more teeth rows; lobes of caudal fin nearly equal; two keels on caudal peduncle; two large dark spots, one on the upper opercle margin and other on pectoral fin base ... (*Caranx*) ...7

7a. Chest naked expect for a small patch of prepelvic scales; dark spot on upper opercular margin present ... *Caranx hippos*
7b. Chest scaled; dark spot on upper opercular margin absent ... 8

8a. 46-56 scutes on lateral line; lower limb of gill arch with 25-28 rakers ... *Caranx chrysos*
8b. less than 40 scutes on lateral line; lower limb of gill arch with 16-21 rakers ... 9

9a. Body silvery blue dorsally, silvery on flanks; caudal fin yellow; longest dorsal and anal fins shorter than head, head depth much smaller than length ... *Caranx latus*
9b. Body grey or brown; caudal fin brown or grey with dark margin; longest dorsal and anal fins longer than head, head depth nearly equal to length ... *Caranx lugubris*

10a. Body depth less than 40% SL, covered with long scales, embedded in skin; 11-15 finlets in dorsal and anal fins (*Oligoplites*) ... 11
10b. Body depth more than 40% SL, covered with oval, exposed scales; finlets absent ... (*Trachinotus*) ... 13

11a. Lower jaw profile much convex; 1 row of caniniform teeth on premaxilla; 17-20 rakers on lower branch of branchial arch ... *Oligoplites saliens*
11b. Lower jaw profile slightly convex; 2 or 1 rows of villiform teeth on premaxilla; 11-18 rakers on lower branch of branchial arch ... 12

12a. Two rows of caniniform on premaxilla; 13-16 rakers on lower branch of branchial arch……..... *Oligoplites saurus*
12b. One band of small, villiform teeth on premaxilla; 11-14 rakers on lower branch of branchial arch... *Oligoplites palometa*

13a. Anal fin with 23-27 rays ... *Trachinotus cayennensis*
13b. Anal fin with 16-24 rays ... 14

13a. 17-21 segmented dorsal rays; 16-19 anal rays; caudal and anal fins darkened ... *Trachinotus falcatus*
13b. 22-27 segmented dorsal rays; 20-24 anal rays; caudal and anal fins dusky with yellow hue... *Trachinotus carolinus*

Identification key to the species of family Centropomidae

1a. 7 (rarely 8) anal fin rays; pectoral fin shorter than pelvic fin; head slightly pointing upward ... *Centropomus pectinatus*
1b. 6 (rarely 5 or 7) anal fin rays; pectoral fin with equal length to pelvic fin; head straight ... 2

2a. 49-59 transversal rows of scales between pectoral fin base and caudal fin base ... *Centropomus ensiferus*
2b. 67-92 transversal rows of scales between pectoral fin base and caudal fin base ... 3

3a. 79-92 transversal rows of scales between pectoral base and caudal fin base; body depth 67-81% HL; maximum total length less than 70 cm ... *Centropomus parallelus*
3b. 67-78 transversal rows of scales between pectoral base and caudal fin base; body depth 59-64% HL; maximum total length to 130 cm ... *Centropomus undecimalis*

Identification key to the species of family Chlopsidae

1a. Pectoral fin present; head color tan ... *Kaupichthys hyoproroides*
1b. Pectoral fin absent; head dark on upper half and lighter on lower half ... *Chlopsis bicolor*

Identification key to the species of family Clupeidae

1a. Last dorsal ray threadlike ... *Opisthonema oglinum*
1b. Last dorsal ray not threadlike... 2

2a. Spine on dorsal margin of upper jaw; 44-45 gill rakers; top of head without slits ... *Rhinosardina amazonica*
2b. No spine on upper jaw; 80 or more gill rakers; top of head with 8-10 longutidinal slits ... *Sardinella aurita*

Identification key to the species of family Congridae

1a. Preanal distance longer than 40% TL; tail tip stiff; dorsal and anal rays not segmented ... 2
1b. Preanal distance usually shorter than 40% TL; tail tip soft; dorsal and anal rays segmented ... 4

2a. Branchial aperture reaching in front of upper pectoral fin base; 1-2 teeth rows on jaws, forming a cutting edge; 31-36 preanal pores ... *Paraconger guianensis*
2b. Branchial aperture restricted to lower pectoral fin base; 2 or more teeth rows on jaws, forming bands; 47-59 preanal pores ... (*Ariosoma*) ... 3

3a. Two postorbital pores ... *Ariosoma selenops*
3b. Postorbital pores absent ... *Ariosoma anale*

4a. Two teeth rows on jaws, separated from each other by an edentulous groove ... *Xenomystax congroides*
4b. Two or more teeth rows on jaws, not separated from each other by a groove ... 5

5a. Teeth on vomer uniformly small, conical; upper labial flange evident ... *Rhynchoconger gracilior*
5b. Some teeth on vomer enlarged or caniniform; upper labial flange small ... (*Bathycongrus*) ... 6

6a. More than 40 preanal pores ... *Bathycongrus vicinalis*
6b. Less than 40 preanal pores ... *Bathycongrus bullisi*

Identification key to the species of family Cynoglossidae

1a. 10 rays on caudal fin; small papilla present on eye ... *Symphurus diomedeanus*
1b. 12 rays on caudal fin; small papilla on eye absent ... 2

1a. Dark spot present on ventral margin of ocular-side opercle ... *Symphurus tesselatus*
1b. Dark spot absent on ventral margin of ocular-side opercle ... *Symphurus plagusia*

Identification key to the species of family Diodontidae

1a. 1-2 spines on caudal peduncle; small black spots on fins and trunk ... *Chilomycterus reticulatus*
1b. No spines on caudal peduncle; fins without black spots and two large black blotches on trunk ... *Chilomycterus spinosus*

Identification key to the species of family Engraulidae

1a. Anal fin origin behind dorsal fin origin ... 2
1b. Anal fin origin anterior to dorsal fin origin ... *Pterengraulis atherinoides*

2a. Teeth on jaws large, caniniform and spaced ... (*Lycengraulis*) … 3
2b. Teeth on jaws fine, villiform and closely spaced ... 4

3a. 12-15 rakers on lower limb of gill arch ... *Lycengraulis batesii*

3b. More than 15 rakers on lower limb of gill arch ... *Lycengraulis grossidens*

4a. Branchiostegal membrane broadly connected to isthmus; 8 branchiostegal rays ... *Cetengraulis edentulus*
4b. Branchiostegal membrane not connected to isthmus; 9 branchiostegal rays ... 5

5a. 45 or more rakers on lower branch of branchial arch ... (*Anchovia*) ... 6
5b. Less than 45 rakers on lower branch of branchial arch ... 7

6a. Upper jaw tip round, not reaching preopercle; 20-25 anal fin rays ... *Anchovia surinamensis*
6b. Upper jaw tip pointed, reaching preopercle; 28-35 anal fin rays ... *Anchovia clupeoides*

7a. Upper jaw long, tip pointed ... (*Anchoa*) ... 13
7b. Upper jaw long, tip round ... 8

8a. Pseudobranch larger than eye length ... *Engraulis eurystole*
8b. Pseudobranch smaller than eye length ... (*Anchoviella*) ... 9

9a. Anal fin origin below or behind last dorsal fin ray ... 10
9b. Anal fin origin anteriorly to last dorsal fin ray … 11

10a. 28-35 rakers on lower branch of branchial arch; 14-16 pectoral fin rays ... *Anchoviella cayennensis*
10b. 21-26 rakers on lower branch of branchial arch; 11-13 pectoral fin rays ... *Anchoviella guianensis*

11a. 15-21 rakers on lower branch of branchial arch, upper jaw very small, surpassing vertical passing on rear eye border by 6% SL or shorter ... *Anchoviella jamesi*
11b. 19-27 rakers on lower branch of branchial arch, upper jaw surpassing vertical passing on rear eye border by 8-11% SL ... 12

12a. Snout barely prominent from premaxilla, anterior tip of lower jaw beneath snout tip; 23-27 rakers on lower branch of branchial arch ... *Anchoviella brevirostris*
12b. Snout tip advanced from lower jaw tip; 19-25 rakers on lower branch of branchial arch ... *Anchoviella lepidentostole*

13a. Pseudobranch length longer than eye diameter ... *Anchoa lyolepis*
13b. Pseudobranch length shorter than eye diameter ... 14

14a. Rear opercular margin with small spinelike projection; 36 or more anal fin rays ... *Anchoa spinifer*
14b. Pectoral fin reaching pelvic base; snout length nearly half eye diameter; 17-21 rakers on lower branch of branchial arch; 25-28 anal rays ... *Anchoa pectoralis*

Identification key to the species of family Eleotridae

1a. Interorbital space and snout serrated, with a row of short spines; large black spot on pectoral fin base ... *Butis koilomatodon*
1b. Interorbital space and snout smooth; large black spot on pectoral fin base absent ... 2

2a. Spine present on anteroventral portion of preopercle ... *Eleotris pisonis*
2b. Spine absent on preopercle ... 3

6a. Small cycloid scales on trunk, 80-110 in lateral row ... *Guavina guavina*
6b. Large ctenoid scales, 25-35 in lateral row ... *Dormitator maculatus*

Identification key to the species of family Exocoetidae

1a. Pectoral fin not reaching anal fin origin, its base nearer to pelvic fin base than to anal ... *Exocoetus volitans*
1b. Pectoral fin reaching anal fin origin, its base nearer to anal fin origin than to pelvic fin base ... 2

2a. Anal fin origin nearly below dorsal fin origin ... (*Hirundichthys*) ... 3
2b. Anal fin origin below or behind third dorsal fin ray ... *Cheilopogon melanurus*

3a. Teeth present on palatines; medial portion of pectoral fin with large, semicircular white spot ... *Hirundichthys speculiger*
3b. Teeth absent on palatines; medial portion of pectoral fin with small, slender white stripe... *Hirundichthys affinis*

Identification key to the species of family Gerreidae

1a. Body color silvery with oval black blotches on flanks, forming irregular vertical stripes; naked area over premaxillary process does not reach anterior eye border … *Gerres cinereus*
1b. Body color silvery without black stripes or blotches on flanks; naked area over premaxillary process reaches anterior eye border ... 2

2a. Body depth less than 3 times in SL; preopercle serrated; 12-18 rakers on lower branch of first branchial arch... (*Diapterus*) ... 3
2b. Body depth more than 3 times in SL; preopercle smooth; 7-9 rakers on lower branch of first branchial arch (*Eucinostomus*) ... 4

3a. 8 soft rays on anal fin; 12-15 rakers on lower branch of first branchial arch ... *Diapterus auratus*
3b. 9 soft rays on anal fin; 16-18 rakers on lower branch of first branchial arch ... *Diapterus rhombeus*

4a. First dorsal fin with large deep black blotch bordered dorsally with pale area; 9 rakers on lower limb of gill arch ... *Eucinostomus melanopterus*
4b. First dorsal fin without large deep black blotch; 8 rakers on lower limb of gill arch ... 5

5a. Body depth 38.1-41.2% SL; naked area over premaxillary process delimited anteriorly by a scale ... *Eucinostomus gula*
5b. Body depth 32.7-36.5% SL; naked area over premaxillary process not delimited anteriorly by a scale ... *Eucinostomus argenteus*

Identification key to the species of family Gobiidae

1a. Body long, depth less than 10% of body length; dorsal fins connected by membrane, dorsal and anal fins united with caudal fin base; eye very small, length more than 10 times in head length ... *Gobioides*
1b. Body short, depth more than 10% of body length; dorsal fins separate; last dorsal and anal fin rays separated from caudal fin base; eye diameter less than 10 times in head length ... 2

2a. Mouth inferior; teeth compressed with bilobed tips; 2 dusky spots at base of caudal fin ... *Evorthodus lyricus*
2b. Mouth terminal; teeth conical; dusky spots at base of caudal fin usually absentTeeth conical (Fig 2B); scales present below eye; one dark stripe below eye, without dark spots at base of caudal fin ... 3

3a. Shoulder girdle, under gill cover, with fleshy lobes (Fig. 3); six vertical dark brown stripes on trunk ... *Awaous flavus*
3b. Shoulder girdle, under gill cover, without fleshy lobes; vertical dark stripes on trunk absent ... 4

4a. Upper 3-5 pectoral rays filamentous, distally separated from other rays … (*Bathygobius*) … 5
4b. Rays not filamentous, all of them united by a membrane ... 6

5a. First dorsal fin with evident, vertical or diagonal black mark; spots on flanks, when present, not forming an evident row ... *Bathygobius soporator*
5b. First dorsal fin without black mark; ventral portion of flanks with two horizontal rows of 7-8 dark or brown blotches ... *Bathygobius geminatus* (formerly treated as *B. mystacium* in Brazil)

6a. Six spines in first dorsal fin ... 7
6b. Seven spines in first dorsal fin ... 11

7a. Anterior interorbital pore single; 22-28 (usually 26 or less) scales in lateral series on trunk ... *Coryphopterus glaucofraenum*
7b. Paired anterior interorbital pores; 28-90 (usually more than 30) scales in lateral series on trunk ... 8

8a. Large postocular sensory canal (behind the eye) reaching to scapular region above posterior edge of gill cover, with 4 pores; 14-15 elements in anal fin; dark spot, when present, below first dorsal fin ... *Gobionellus oceanicus*
8b. Sensory canals behind the eye short, with two pores terminating above the preopercle; 11-13 elements in anal fin; dark spot in front of 1st dorsal fin origin, behind head ... 9

9a. Three vertically elongated dark brown spots below eye ... *Ctenogobius stigmaticus*
9a. Elongated dark brown spots below eye absent ... 10

10a. 11 rays on 2nd dorsal fin and 12 rays on anal fin; chin with irregular dark line, without pale spots ... *Ctenogobius boleosoma*

10b. 12 rays on 2nd dorsal fin and 13 rays on anal fin; chin and remaining head parts with evident black-encircled light spots ... *Ctenogobius smaragdus*

11a. Body compressed; mouth very large, inclined, with caniniform teeth in males; second dorsal fin with 1 flexible spine and 14-18 rays ... *Microgobius meeki*
11b. Body stout; mouth not inclined, without caniniform teeth; second dorsal fin with 1 flexible spine and 10-13 rays ... 12

12a. Body naked; barbels on lower jaw and below eye; interorbital pore absent ... (*Barbulifer*) …13
12b. Body with scales at least on caudal fin base; no barbels; a single interorbital pore … *Gobiosoma* sp.

13a. Barbel on snout present; two preopercular pores; body color variable, usually with a row of pale spots on ventral portion of flanks ... *Barbulifer ceuthoecus*
13b. Barbel on snout absent; three preopercular pores; body color variable, usually without pale spots on flanks, but with dark double irregular bars … *Barbulifer enigmaticus*

Identification key to the species of family Haemulidae

1a. 11 spines in first dorsal; preopercle coarsely serrated, with two large spines; 7-8 vertical dark-brown stripes on flanks ... *Conodon nobilis*
1b. 12 spines in first dorsal; preopercle mildly serrated, without large spines; dark-brown stripes on flanks absent ... 2

2a. Second dorsal and anal fins densely covered with scales; mouth cavity red in fresh specimens ... (*Haemulon*) ... 3
2b. Second dorsal and anal fins covered with scales only in their bases; mouth cavity not red in fresh specimens ... 5

3a. 13-14 dorsal fin spines; body silvery with thin longitudinal yellow stripes on flanks; large black spot usually present on caudal fin base ... *Haemulon aurolineatum*
3b. 12 dorsal fin spines; body silvery with irregular dark or grey stripes on flanks; large black spot present or absent on caudal fin base ... 4

4a. Color silvery with dark brown marks on center of scales, forming oblique stripes; without spot on caudal fin base; caudal fin tips darkened; nearly half pectoral fin covered with scales; black spot on caudal fin base absent ... *Haemulon parra*
4b. Color silvery with bright grey marks on center of scales, forming oblique stripes; large spot on caudal fin base; caudal fin tips dusky; pectoral fin covered with scales only in base; large black on caudal fin base usually present ... *Haemulon steindachneri*

5a. Two pairs of pores, not followed by a large central sulcus, in mandibular symphysis; 13 spines on first dorsal and 12 rays on second dorsal ... *Genyatremus luteus*
5b. One pair of pores, followed by a large central sulcus, in mandibular symphysis; 13 spines on first dorsal and 15 or more rays on second dorsal ... 6

6a. Body depth larger than 40% SL; lips thick; spots or stripes evident on trunk ... (*Anisotremus*) ... 7
6b. Body depth less than 40% SL; lips thin; body silvery with small grey spots on center of scales ... 8

7a. Alternating dark and light (blue in fresh specimens) horizontal stripes on trunk; large vertical dark stripe across the eye to lower jaw and other vertical stripe through trunk, across pectoral base; eye silvery ... *Anisotremus virginicus*
7b. Body grey, without stripes on trunk; large black blotch from pectoral fin base to belly; eye red ... *Anisotremus cf. surinamensis*

8a. Anal soft fin rays 6-7... *Haemulopsis corvinaeformis*
8b. Anal soft fin rays 9-13 ... *Orthopristis ruber*

Identification key to the species of family Hemiramphidae

1a. Lower jaw not swordlike ... *Oxyporhamphus micropterus*
1b. Lower jaw swordlike ... 2

2a. 21-25 dorsal rays; 19-24 anal rays; 7-9 pectoral rays; pectoral fin long, two times larger than head length from premaxilla tip ... *Euleptorhamphus velox*
2b. 12-17 dorsal rays; 10-18 anal rays; 9-12 pectoral rays; pectoral fin short, nearly equal to head length from premaxilla tip ... 3

3a. Caudal fin forked; scales absent on snout; 10-13 anal rays ... (*Hemiramphus*) ... 4

3b. Caudal fin slightly emarginated; scales present on snout; 14-17 anal rays ... (*Hyporhamphus*) ... 5

4a. Pectoral fin reaching nostril when deflected forward; upper caudal lobe blue; total gill rakers 22-29 ... *Hemiramphus balao*
4b. Pectoral fin not reaching nostril when deflected forward; upper caudal lobe orange red; total gill rakers 28-36 ... *Hemiramphus brasiliensis*

5a. Dorsal and anal fins broadly covered with scales ... *Hyporhamphus unifasciatus*
5b. Dorsal and anal fins naked or with scales only anteriorly ... *Hyporhamphus roberti*

Identification key to the species of family Loricariidae

1a. Tail long, dorsoventrally flattened; preanal distance shorter than postanal distance; three long, slender teeth on premaxilla; mouth disk covered with filaments; color light-brown, with inconspicuous dark-brown transversal bars on caudal peduncle ... *Loricaria cataphracta*
1b. Tail short, stout, laterally flattened; preanal distance longer than postanal distance; more than three teeth on premaxilla; mouth disk with small papillae; color light-brown, with small dark spots on belly ... *Hypostomus watwata*

Identification key to the species of family Lutjanidae

1a. Head dorsal profile flat in frontal view; last dorsal and anal fin rays larger than penultimate rays ... (*Pristipomoides*) ... 2
1b. Head dorsal profile convex in frontal view; last dorsal and anal fin rays not longer than penultimate rays ... 3

2a. Body depth less than 30% SL; 28-32 rakers on first gill arch ... *Pristopomoides freemani*
2b. Body depth more than 30% SL; 24-28 rakers on first gill arch ... *Pristopomoides aquilionaris*

3a. Scales on upper jaw present; caudal fin with a filament (sometimes broken); last spines of first dorsal fin remarkably shorter than first rays of second dorsal; color bright read, pink on belly ... *Etelis oculatus*
3b. Scales on upper jaw absent; caudal fin without filament; last spines of first dorsal fin not much shorter than first rays of second dorsal; color variable ... 4

4a. 17-22 developed rakers on the lower branch of gill arch; caudal fin forked ... 5
4b. 16 or less (rarely 17) developed rakers on the lower branch of gill arch; caudal fin truncate or slightly emarginated ... (*Lutjanus*) ... 6

5a. 12-13 spines on 1st dorsal fin; color red, pink on belly and with thin, olive-green horizontal stripes on flanks ... *Rhomboplites aurorubens*
5b. 9-11 spines on 1st dorsal fin; color red or blue, with large horizontal yellow stripe from snout, beneath the eye, to caudal peduncle ... *Ocyurus chrysurus*

6a. Triangular white mark from beneath eye to lower jaw; tooth on upper jaw very large ... 7
6b. Triangular white mark absent; teeth on upper jaw moderately large ... 8

7a. Irregular vertical brown stripes on flanks; blue line underneath eye not reaching opercle ... *Lutjanus jocu*
7b. Flanks red or blue and without marks; blue line underneath eye reaching or overcoming opercle ... *Lutjanus cf. jocu*

8a. Ground color red, rosy or silvery with seven horizontal yellow stripes on flanks; large, pupil-like black spot below 2nd dorsal fin and underneath lateral line ... *Lutjanus synagris*
8b. Yellow stripes absent on flanks; black spot below 2nd dorsal fin, if present, smaller than pupil ... 9

9a. Ground color olive-green dorsally, red ventrally; small black spot beneath 2nd dorsal fin; blue stripe beneath eye; anal fin pointed ... *Lutjanus analis*
9b. Ground color grey or red; no black spot beneath 2nd dorsal fin; no blue stripe beneath eye; anal fin rounded or pointed ... 10

10a. Ground color brown or grey, lighter ventrally, sometimes with 6-7 weak vertical dark stripes; lips thick; teeth on upper jaw as large as from lower; anal fin rounded; vomerian tooth plate without posterior projection ... *Lutjanus cyanopterus*
10b. Ground color red, without vertical dark stripes; lips thin; teeth from upper jaw much larger than from lower jaw; anal fin rounded or pointed; vomerian tooth plate with posterior projection ... 11

11a. Dark spot present on pectoral base; anal fin rounded ... *Lutjanus buccanella*
11b. Dark spot absent on pectoral base; anal fin pointed ... 12

12a. 16-19 longitudinal rows of scales underneath lateral line; iris red in life ... *Lutjanus purpureus*
12b. 20-24 longitudinal rows of scales underneath lateral line; iris yellow in life ... *Lutjanus vivanus*

Identification key to the species of family Monacanthidae

1a. Pelvic fin visible only under magnification ... (*Aluterus*) ... 2
1b. Pelvic fin minute, but visible in naked eye as a small bump usually covered with scales ... 4

2a. 32-41 rays on second dorsal; 35-44 anal rays; color with alternating dark (orange in life) and light irregular blotches, covered with small black spots ... *Aluterus schoepfii*
2b. 43-50 rays on second dorsal; color otherwise; 46-52 anal rays... 3

3a. Snout profile straight or slightly convex; ground color brown of grey with inconpicuous dark dots dorsally ... *Aluterus monoceros*
3b. Snout profile with a small concavity; ground color grey or yellow with many vermicular blue blotches and pupil-like dark spots ... *Aluterus scriptus*

4a. Two pairs of spines on each side of caudal peduncle; ground color dark (brown, yellow or orange in life) with a light saddle mark on flank, along with light spots (sometimes absent) ... *Cantherines macrocerus*
4b. Spines absent on caudal peduncle; eight alternating dark and light horizontal stripes on flanks ... *Cantherines pullus*

Identification key to the species of family Mugilidae

1a. Eight segmented rays in anal fin ... *Mugil liza*
1b. Nine segmented rays in anal fin ... 2

2a. 41-44 transversal rows of scales between pectoral axil and caudal fin base; origin of first dorsal fin closer to snout tip than to caudal base ... *Mugil incilis*
2b. 35-40 transversal rows of scales between pectoral axil and caudal fin base; origin of first dorsal fin midway between snout tip than to caudal base, or closer than caudal fin base than to snout tip... 3

3a. Pectoral fin rays 14-16, pectoral reaching or over coming the vertical line that passes through origin of first dorsal fin origin ... *Mugil brevirostris*
3b. Pectoral fin rays 16-18, pectoral not reaching vertical that passes through origin of first dorsal fin origin ... 4

4a. Dark spot on anterior portion of second dorsal fin, small; inconspicuous spot on pectoral fin base; iris red in fresh specimens ... *Mugil rubrioculus*
4b. No dark spot on anterior portion of second dorsal fin; large, evident spot on pectoral fin base; iris silvery in fresh specimens ... *Mugil curema*

Identification key to the species of family Ogcocephalidae

1a. 10-12 pectoral rays; rostrum short, 3-5 times in disk length ... *Ogcocephalus parvus*
1b. 12-15 pectoral rays; rostrum usually less than 3 times in disk length ... 2

2a. Mouth width 1.8-2.5 times in disk length; 4 lateral line scales on premaxilla; pupil oval, without flap over iris ... *Ogcocephalus notatus*
2b. Mouth width more than 2.5 times in disk length; 3 lateral line scales on premaxilla; pupil kidney-shaped, with a flap over iris ... 3

3a. Rostrum length 1.4-3.1 times in disk length; color with light lines over darker spots; usually 14 pectoral rays ... *Ogcocephalus vespertilio*
3b. Rostrum length more than 3.2 times in disk length; color with dark stripes radiating from eye; usually 12-13 pectoral rays ... *Ogcocephalus nasutus*

Identification key to the species of family Ophichthidae

1a. Tail tip stiff, without rays; branchial aperture as long as pectoral fin base ... 2
1b. Tail tip soft, with rays; branchial aperture shorter than pectoral fin base ... (*Myrophis*) ... 4

2a. Fins absent; branchial aperture on ventral margin; posterior nostril inside upper lip; eye nearly

five times smaller than snout ... *Ichthyapus ophioneus*
2b. Fins present; branchial aperture laterally, near pectoral fin base; posterior nostril above upper lip; eye nearly three times smaller than snout ... (*Ophichthus*) ... 3

3a. One small tentacle on anterior naris; two tooth series on vomer; ground color brown; dorsal, anal and caudal fins dark distally ... *Ophichthus cylindroideus*
3b. No tentacle on anterior naris; 2-3 tooth series on vomer; ground color brown; fins not dark distally ... *Ophichthus gomesii*

4a. Two postorbital pores; 19-22 predorsal vertebrae ... *Myrophis platyrhynchus*
4b. One postorbitral pore; 26-34 predorsal vertebrae ... 5

5a. Predorsal distance 2 times or more longer head length; 30-34 predorsal vertebrae ... *Myrophis punctatus*
5b. Predorsal distance less than 2 times longer head length; 26-29 predorsal vertebrae ... *Myrophis plumbeus*

Identification key to the species of family Ostraciidae

1a. 13 (rarely 11) pectoral rays; trunk with dark polygonal marks, sometimes delimiting lighter central areas ... *Acanthostracion polygonius*
1b. 11-12 (rarely 13) pectoral rays; trunk with vermicular dark streaks ... *Acanthostracion quadricornis*

Identification key to the species of family Paralichthyidae

1a. Anterior portion of lateral line arched ... 2
1b. Anterior portion of lateral line straight ... 3

2a. Pelvic fin on blind side larger than on eyed side; 1-2 anterior most dorsal rays threadlike; teeth on jaws fine; four large black spots on eyed side, large spot on pelvic base ... *Ancylopsetta kumperae*
2b. Pelvic fin on blind side equal to that on eyed side; no threadlike ray on dorsal fin; large, caniniform teeth on jaws; without spot on pelvic fin base ... *Paralichthys brasiliensis*

3a. Mouth small, upper jaw barely reaching posteriorly the anterior border of lower eye ... *Etropus crossotus*
3b. Mouth overcoming the anterior border of lower eye ... 4

4a. Two teeth rows on upper jaw; eyes apart from each other and not aligned in a vertical line, more so in males ... (*Syacium*) ... 5
4b. One teeth row in upper jaw; eyes aligned in a vertical line in both sexes ... 6

5a. Interorbital space large, to 75% of head length; position of eyes asymmetrical, anterior borders of eyes very apart to a vertical line, more so in males; males with two dark purple line between anterior border of upper eye and snout tip ... *Syacium papillosum*
5b. Interorbital space not much larger than eye; anterior borders of eyes nearly aligned to a vertical line, even in males; purple stripes absent on head in males ... *Syacium micrurum*

6a. Trunk with cycloid scales; gill rakers short and stout ... (*Cyclopsetta*) ... 7
6b. Trunk with ctenoid scales; gill rakers long ... (*Citharichthys*) ... 8

7a. Dark oval spot on the center of caudal fin; dark spot distally in pectoral fin; 11-13 pectoral fin rays ... *Cyclopsetta fimbriata*
7b. Vertical row of three dark spots nearby tip of caudal fin; black spot underneath pectoral fin; 14-16 pectoral fin rays ... *Cyclopsetta chittendeni*

8a. Eye 30% or more of head length; males with a large antrorse spine on snout ... *Citharichthys cornutus*
8b. Eye less than 25% or head length; snout spine absent even in males ... 9

9a. Body covered with small dark spots; large oval blotches on caudal fin ... *Citharichthys macrops*
9b. Body usually without or with weak spots; caudal fin with fine dark brown dots along rays ... *Citharichthys spilopterus*

Identification key to the species of family Pimelodidae

1a. Eyes more than 4 times in snout; maximum total length 120 cm ...… *2*

1b. Eyes less than 3 times in snout; maximum total length 35 cm ... *Pimelodus blochii*

2a. Head much broad, nearly rounded in cross section, interorbital space wide, nearly 8-10 times larger than eyes; body stout, dorsally grayish with small black dots ... *Zungaro zungaro*
2b. Head not rounded in cross section, somewhat flattened dorsally; interorbital space less than 8 times larger than eyes; body color otherwise ... (*Brachyplatystoma*) ... 3

3a. Adipose fin larger than anal fin ... *Brachyplatystoma vaillanti*
3b. Adipose fin shorter than anal fin ... *Brachyplatystoma filamentosum*

Identification key to the species of family Pristigasteridae

1a. Large caniniform teeth on jaws, larger on symphysis ... *Chirocentrodon bleekerianus*
1b. Teeth minute, not caniniform ... 2

2a. Upper jaw very long, overcoming branchial aperture; belly scute series with a hiatus below pectoral fin; pelvic fins absent; 70-85 anal rays ... *Odontognathus mucronatus*
2b. Upper jaw not reaching branchial aperture; pelvic fins present; a continuous row of scutes on belly; 34-46 anal rays ... (*Pellona*) ... 3

3a. 5-7 ventral scutes posteriorly to pelvic fin base ... *Pellona harroweri*
3b. 8-14 ventral scutes posteriorly to pelvic fin base... 4

4a. Lower gill rakers 11-14; body fresh color yellowish ... *Pellona castelnaena*
4b. Lower gill rakers 20-33; body fresh color silvery ... *Pellona flavipinnis*

Identification key to the species of family Sciaenidae

1a. One or more barbels present on lower jaw (sometimes absent in young specimens) ... 2
1b. Barbels absent on lower jaw ... 9

2a. One barbel on the tip of lower jaw (mental barbel)... 3
2b. Two or more barbel rows along ventral margin of the lower jaw... 6

3a. Mental barbel tentacle-like ... *Ctenosciaena gracilicirrhus*
3b. Mental barbel rigid, with round tip ... 4

4a. Body deep, compressed in cross section; belly profile convex; 8-10 vertical dark-brown stripes on flanks ... *Umbrina coroides*
4b. Body not deep and not compressed in cross section; belly profile flat; no vertical dark stripes on flanks ... (*Menticirrhus*) ... 5

5a. Trunk silvery; pectoral fin ligth or slightly dusky; belly scales much smaller than that on flanks ... *Menticirrhus littoralis*
5b. Trunk brown dorsally and silvery elsewhere, with dark spot on center of scales forming narrow oblique stripes; pectoral fin darkened distally; belly scales the same size as that from the flanks ... *Menticirrhus americanus*

6a. Preopercle smooth; pectoral fin long, reaching anal fin base; 31-39 anal rays ... (*Lonchurus*) ... 7
6b. Preopercle serrated; pectoral fin not reaching anal fin base; 23-30 anal rays ... 8

7a. Two mental barbels, each one in front of one pore; pectoral fin reaching caudal peduncle; 37-39 segmented rays on dorsal fin ... *Lonchurus lanceolatus*
7b. Six mental barbels surrounding a central pore; pectoral fin not reaching caudal peduncle 31-34 segmented rays on dorsal fin ... *Lonchurus elegans*

8a. 3-5 barbel clusters on each side of lower jaw; trunk with oblique dark or grey stripes on flanks; umeral spot absent; caudal fin truncated ... *Micropogonias furnieri*
8b. 10-12 barbel clusters on each side of lower jaw; trunk with 7-10 vertical dark stripes on flanks, umeral dark spot present; caudal fin losangular ... *Paralonchurus brasiliensis*

9a. Dorsal fins separated from each by a distance larger than length of first dorsal base; anal fin base as long as 2nd dorsal base, with 18-20 segmented rays... *Isopisthus parvipinnis*
9b. Dorsal fins joined; anal fin base much shorter than 2n dorsal base, with 7-13 segmented rays ... 10

10a. Eye diameter 7-11 times in head length ... *Nebris microps*

10b. Eye diameter less than 7 times in head length ... 11

11a. First dorsal fin sail-like; body silvery, with black stripes ... 12
11b. First dorsal fin not sail-like; body silvery groundcolor absent, with black stripes over whitish ... 13

12a. Length of longest dorsal spine larger than head length; three wide, body with 3 wide, oblique black stripes; 47-55 2nd dorsal rays ... *Equetus lanceolatus*
12b. Length of longest dorsal spine smaller than head length; body with 5-6 slender longitudinal black stripes; 38-44 2nd dorsal rays ... *Pareques acuminatus*

13a. Mouth inclined, almost vertical; 28-36 gill rakers on first arch ... *Larimus breviceps*
13b. Mouth not so inclined; 25 or less gill rakers on first arch ... 14

14a. Teeth on jaws large, caniniform, in one row ... 15
14b. Teeth on jaws small, conical, in two or more bands ... 23

15a. Eye diameter 4 times or less in head length; lower jaw not prognathous; snout shorter than eye; teeth nearly equal in length along jaws; black spot present on pectoral base ... *Odontoscion dentex*
15b. Eye diameter 5 times or more in head length; lower jaw inclined, prognathous; snout longer than eye; one long hook-like tooth on upper jaw; pectoral base dusky ... 16

16a. Arrow-like teeth on jaws, those from lower jaw long and exposed ... *Macrodon ancylodon*
16b. Teeth not arrow-like, those from lower jaw only with tips exposed ... (*Cynoscion*) ... 17

17a. Trunk scales cycloid, larger in lateral line ... 18
17b. Trunk scales ctenoid, those from lateral line not larger than other scales ... 20

18a. Caudal fin truncated in adults; lower jaw with closely set teeth; anal fin with 10-12 segmented rays; dark stripe along 2nd dorsal base; to 110 transversal rows of scales on trunk ... *Cynoscion leiarchus*
18b. Caudal fin losangular in adults; lower jaw with spaced, progressively larger teeth; anal fin with 7-10 segmented rays; dark stripe on dorsal base absent; to 140 or more transversal rows of scales on trunk ... 19

19a. Trunk compressed in cross section; head large, less than 4 times in SL; fins densely covered with scales; 2nd dorsal with 22-25 segmented rays ... *Cynoscion microlepidotus*
19b. Trunk rounded in cross section; head more than 4 times in SL; fins only with a basal sheath of scales; 2nd dorsal with 27-31 segmented rays ... *Cynoscion virescens*

20a. Caudal fin emarginated or truncated in adults ... 21
20b. Caudal fin rhomboidal in adults ... 22

21a. Dorsal and anal fins naked or with only to 2 basal rows of scales ... *Cynoscion similis*
21b. Dorsal and anal fins densely covered with scales ... *Cynoscion jamaicensis*

22a. Pectoral fin shorter than pelvic fin; opercle without dark spot ... *Cynoscion steindachneri*
22b. Pectoral fin longer than pelvic fin; dark spot on opercle ... *Cynoscion acoupa*

23a. Lateral line pored scales surrounded by many layers of small scales ... (*Plagioscion*)…24
23b. Lateral line pored scales without many associated scales ... 25

24a. Distance from anus to origin of anal fin 1.9–3.5 in HL; pectoral fin short, when adpressed falling short of vertical through anus, its length 4.3–5.0 in SL ... *Plagioscion auratus*
24b. Distance from anus to origin of anal fin 3.6–5.6 in HL; Pectoral fin long, when adpressed reaching or surpassing vertical through anus, its length 2.7–4.2 in SL ... *Plagioscion squamosissimus*

25a. Head cavernous, weakly ossified; interorbital space 3.5 times or less in head length ... (*Stellifer*) ... 27
25b. Head not cavernous, ossified; interorbital space 4 times or more in head length ... 26

26a. Mouth large, terminal; caudal fin rounded or rhomboidal; 2nd anal spine longer than anal rays, very stout; rakers of first gill arch nearly as long as branchial filaments ... *Bairdiella ronchus*
26b. Mouth small, subterminal; caudal fin rhomboidal, emarginated on upper lobe; anal spines, not longer than rays; rakers of first gill arch much

shorter than branchial filaments ... *Ophioscion cf. punctatissimus*

27a. 2-3 large spines on preopercle; mouth terminal ... 28
27b. 4 or more weak spines on finely serrated preopercle; mouth subterminal ... 29

28a. 3 spines on preopercle; 33-39 rakers on first gill arch; 17-20 segmented rays on 2nd dorsal ... *Stellifer stellifer*
28b. 2 spines on preopercle; 36 or more rakers on first gill arch; 20-24 segmented rays on 2nd dorsal ... *Stellifer rastrifer*

29a. Predorsal scales cycloid to interorbital space; teeth larger near symphysis ... 30
29b. Predorsal scales ctenoid to interorbital space; tooth size homogeneous ... 31

30a. Eye 5.2-6.8 in head length ... *Stellifer microps*
30b. Eye 4.1-5.6 in head length ... *Stellifer brasiliensis*

31a. Mouth subterminal, snout projecting in front of mouth; total gill rakers 22-26 ... *Stellifer naso*
31b. Mouth terminal, lower jaw even to upper jaw; total gill rakers 29-36... *Stellifer* sp. B. Chao

Identification key to the species of family Scombridae

1a. Snout longer than postorbital portion; gill rakers absent ... *Acanthocybium solandri*
1b. Snout shorter than postorbital portion; gill rakers present ... 2

2a. Two small keels on each side of caudal peduncle; 5 finlets in dorsal and anal fins ... *Scomber colias*
2b. Two small and a large keel on each side of caudal peduncle; 7-10 finlets in dorsal and anal fins ... 3

3a. Body dark-brown, silvery on flanks and belly, without spots; lateral line abruptely inclined downward ... *Scomberomorus cavalla*
3b. Body with spots or marks on flanks; lateral line slightly inclined downward ... 4

4a. Flanks with a narrow horizontal gold stripe and long gold marks ... *Scomberomorus regalis*
4b. Flanks with large oval dark brown or bronze spots ... *Scomberomorus brasiliensis*

Identification key to the species of family Scorpaenidae

1a. 13 spines on first dorsal; teeth absent in palatines ... *Scorpaenodes caribbaeus*
1b. 12 spines on first dorsal; teeth present in palatines ... 2

2a. Lateral line with 4-5 scales; small dark dots on caudal peduncle ... *Phenacoscorpius nebris*
2b. Lateral line with more than 5 scales, often reaching caudal peduncle ... 3

3a. Flank scales ctenoid ... 4
3b. Flank scales cycloid ... 5

4a. Pectoral fin rays unbranched; orbital crest with 2-5 spines; two downward bony processes on branchial isthmus ... *Pontinus nematophthalmus*
4b. Pectoral rays branched; orbital crest with 7 or more small spines; no bony processes on branchial isthmus ... *Idiastion kyphos*

5a. Head weakly ossified; trunk scales small, more than 100 transversal rows ... 6
5b. Head ossified, usually with a large concavity in dorsal profile; trunk scales large, to 50 transversal rows ... (*Scorpaena*) ... 7

6a. Ground color red, with dark brown spots on head and upper trunk; 20-25 pectoral rays; eye larger than interorbital space ... *Setarches guentheri*
6b. Ground color darkbrown to black, without spots; 18-20 pectoral rays; eye smaller than interorbital space ... *Ectreposebastes imus*

7a. Infraorbital ridge with 4 spines ... 8
7b. Infraorbital ridge with 2 spines ... 9

8a. White dots over jet black groundcolor in axil of pectoral fin ... *Scorpaena plumieri*
8b. Black dots over light groundcolor in axil of pectoral fin ... *Scorpaena díspar*

9a. Dorsal head profile without concavity ... *Scorpaena calcarata*
9b. Dorsal head profile with steep occiptal concavity ... 10

10a. Dark spot on first dorsal fin... 11
10b. No dark spot on first dorsal fin ... 12

11a. Trunk with two irregular dark brown stripes; infraorbital ridge elevated, with spines; 16-17 pectoral rays ... *Scorpaena bergi*
11b. Trunk with a large umeral dark spot over pectoral fin, and small black dots; infraorbital ridge low, without spines; 18-19 pectoral rays ... *Scorpaena isthmensis*

12a. Supplementary spine on first preopercular spine ... *Scorpaena melasma*
12b. Supplementary spine absent on first preopercular spine ... 13

13a. Dark dots over light groundcolor in axil of pectoral fin; large dark blotch over pectoral fin ... *Scorpaena brasiliensis*
13b. Axil of pectoral fins without dots; no spot over pectoral fin ... 14

14a. Eye length more than 1.5 times larger than snout length; pectoral fin reaching last anal ray ... *Scorpaena agassizi*
14b. Eye length less than 1.5 times larger than snout length; pectoral fin not reaching last anal ray ... *Scorpaena petricola*

Identification key to the species of family Serranidae

1a. Teeth on upper jaw not depressible; body color brown, usually with one brown stripe below eye and similar vertical stripe on trunk beneath 2nd and 3rd dorsal spines (and two horizontal thin brown stripes behind it in young specimens); two pale areas on pelvic base and around anus ... *Serranus phoebe*
1b. Teeth on upper jaw not depressible; body color otherwise ... 2

2a. Eight spines on first dorsal fin, life color red with small iridescent bluish spots, or pale with small dark spots ... *Cepaholopholis fulva*
2b. 10-12 spines on first dorsal fin; body color otherwise ... 3

3a. 10-13 anal-fin rays; body light brown with small reddish-brown spots on the head and trunk, trunk spots forming larger and rectangular spots separated by lighter areas ... *Mycteroperca bonaci*
3b. 7-9 anal fin rays; body without reddish-brown spots and not forming larger and rectangular spots ... (*Epinephelus*) ... 4

4a. Body slightly compressed, width two times in body height; eyes almost the same size as the snout; posterior margin of the caudal fin truncate or emarginate; long spines on the first dorsal fin, second and third on the series with larger size than the others; body reddish-brown, with light spots in the previous portion of the body, black spots around the eyes and red mouth ... *Epinephelus morio*
4b. Body very wide, with a width almost equal to the height; eye much smaller than the snout; posterior margin of the caudal fin convex; short spines in the first dorsal fin, all about the same size; body mottled, with pale spots and irregular dark and black spots all over the body ... *Epinephelus itajara*

Identification key to the species of family Sparidae

1a. 43-49 lateral line scales; without canine teeth extended in the outer series of the jaws; usually 15 rays on the pectoral fin; top of the pectoral base with small dark spot ... *Calamus penna*
1b. 50-57 lateral line scales; with enlarged canine teeth in the outer series of the jaws, the third in the upper jaw highly developed and often curved in adults; usually 14 rays on the pectoral fin; top of the pectoral base without dark spot ... *Calamus calamus*

Identification key to the species of family Sphyraenidae

1a. 75-87 lateral line scales; body dark brown superiorly with narrow transverse dark bands, and inferior silver with dark spots ... *Sphyraena barracuda*
1b. more than 100 lateral line scales; body without dark spots in the lower portion of the flanks ... 2

2a. 150-160 lateral line scales ... *Sphyraena sphyraena*
2b. Less than 130 lateral line scales ... 3

3a. Pectoral fin reaching vertical line through the base of the pelvic fin ... *Sphyraena guachancho*
3b. Pectoral fin reaching not vertical line through the base of the pelvic fin ... *Sphyraena picudilla*

Identification key to the species of family Sternopygidae

1a. Free orbital margin; dark spot elongated behind the operculum ... *Sternopygus macrurus*

1b. Orbital margin covered with skin; dark spot behind the operculum almost always absent ... 2

2a. Flanks with three longitudinal lines apparent, dark, narrow, one along the dorsal edge of the body other in the middle portion and the other along the base of the anal ... *Eigenmannia gr. trinileata*
1b. Flanks without three apparent longitudinal lines ... *Eigenmannia aff. macrops*

Identification key to the species of family Stromateidae

1a. Small eyes and long anal fin; diameter of the orbit fitting 4.3 to 5.1 times in the anal fin height ... *Peprilus xanthurus.*
1b. Large eyes and short anal fin; diameter of the orbit fitting 2.2 to 4.0 times in the anal fin height ... *Peprilus crenulatus.*

Identification key to the species of family Synodontidae.

1a. 8 pelvic fin rays, the most internal biggest than the outermost ... 2
1b. 9 pelvic fin rays, the most internal minor than the outermost ... (*Saurida*) ... 5

2a. 11-17 anal-fin rays ... 3
2b. 8-11 anal-fin rays ... (*Synodus*) ... 4

3a. 11-14 anal-fin rays; snout two times longer than eye; caudal fin emarginated; pectoral fin long, almost reaching the vertical through the last ray of the dorsal fin... *Bathysaurus ferox*
3b. 15-17 anal-fin rays; snout shorter than eye; caudal fin forked; pectoral fin short, barely surpassing vertical through the origin of the dorsal fin... *Trachinocephalus myops*

4a. Snout rounded, slightly shorter than the eye; upper jaw with a dark spot; predorsal series with longitudinal 15-18 scales ... *Synodus synodus*
4b. Snout very pointed and sharp, longer than the eye; upper jaw without dark spot; predorsal series with longitudinal 20-30 scales ... *Synodus bondi*

5a. 40-50 scales in lateral line ... *Saurida brasiliensis*
5b. 51-60 scales in lateral line ... *Saurida caribbaea*

Identification key to the species of family Tetraodontidae.

1a. 13-15 dorsal-fin rays; 12 or more anal-fin rays; caudal fin lunate ... (*Lagocephalus*) ... 2
1b. 9-12 dorsal-fin rays; less than 12 anal-fin rays; caudal fin truncated ... 3

2a. 13-16 rays on the pectoral fin; dark spots on the flanks, especially around of pectoral fin base ... *Lagocephalus lagocephalus*
2b. 17-18 rays on the pectoral fin; homogeneous color without spots on the flanks and of pectoral fin base ... *Lagocephalus laevigatus*

3a. 10-12 dorsal-fin rays; about five transverse dark bands on the dorsal side and flanks of the body; interorbital region without a lighter band ... *Colomesus psittacus*
3b. 8-9 dorsal-fin rays; body without transverse dark bands ... (*Sphoeroides*) ... 4

4a. Simple pair of blackened tentacular lappets behind the eyes; snout with light vermicular streaks; trunk with a series of 1-5 large dark spots ... *Sphoeroides dorsalis*
4b. Black tentacular folds absent, many white lappets on body; snout without light vermicular streaks; trunk color otherwise ... 5

5a. Trunk dark brown dorsally and whitish ventrally, ventral portion of flanks with a row of 11-15 large, dark spots; caudal fin black, with a lighter and medial vertical bar ... *Sphoeroides spengleri*
5b. Ventral portion of flanks without a row of dark spots; caudal fin without evident, dark vertical bar ... 6

6a. Interorbital region uniformly dark brown; body with dark brown spots forming large, irregular blotches ... *Sphoeroides greeleyi*
6b. Interorbital region with two lighter transverse bands; body light brown, with regular large dark spots, lined by evident light margins ... *Sphoeroides testudineus*

Identification key to the species of Family Trichiuridae.

1a. Caudal fin present, forked; dorsal spines smaller than the rays ... *Benthodesmus elongatus*.
1b. Caudal fin absent, caudal peduncle threadlike; dorsal spines the same size as the rays ... *Trichiurus lepturus*.

References

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