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Lists of Species

A collection of fishes from tributaries of the lower Kouilou, Noumbi and smaller coastal basin systems, Republic of the Congo, Lower Guinea, west-central Africa

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Abstract: A list of fishes is reported from right bank tributaries of the lower Kouilou River, left bank tributaries of the Noumbi River, and a series of independent coastal catchments near Madingo-Kayes in the Kouilou Province of the Republic of Congo. Thirty-two sites were sampled in a variety of aquatic habitats in the wet and dry seasons of 2012. Fifty-five fish species distributed in 29 families were collected, three of which represent putatively undescribed species. The most diverse families in the study region were the Cichlidae and the Mormyridae. This paper provides a comparison and update to earlier species lists reported for the general area and offers a baseline that may be used as a point of departure for future ichthyological assessments.

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Introduction

The study region (Figure 1) is located northwest of Pointe-Noire in the Republic of Congo and forms part of the Ogooue-Nyanga-Kouilou-Niari Freshwater ecoregion in the Lower Guinean ichthyofaunal province (FEOW 2012; Stiassny *et al*. 2007). More locally, the survey encompasses an area draining southeast to the Kouilou River, northwest to the Noumbi River and southwest into a series of smaller independent coastal basins.

Rivers in the region experience a bimodal flood regime, where the first flood period occurs in November and the second in April, with little or no rain falling between June and August. The largest river draining the region is the Kouilou which becomes a low gradient system below Sounda Gorge, meandering through dense forest before emptying into the Atlantic Ocean. The aquatic ecosystems of this ecoregion are considered to be notably rich in freshwater species that show high levels of endemicity and considerable habitat heterogeneity, encompassing a wide range of lentic and lotic habitats (Brooks *et al.* 2011).

Many systems in the ecoregion remain to be sampled, and this is particularly the case for the small coastal basins (Daget and Stauch 1968; Teugels *et al.* 1991; Mamonekene and Teugels 1993; FEOW 2012). Additionally, very little information is available on the life history, distribution and ecology of freshwater species in this entire region (Mamonekene and Stiassny, 2012). Whilst ichthyological information for the Republic of Congo is generally fragmented and sparse, collections in the lower Kouilou River were made in the early 1960's (Daget 1961) and were later reported by Daget and Stauch (1968). That study reported 61 species from Sounda Gorge to the Kouilou estuary some 75 km downstream (Figure 1). A more recent study was undertaken by Teugels *et al*. (1991) to document the fauna of the lower Kouilou catchment and 103 species, of which 68 were considered as primary freshwater species, were reported. Here we report data for sites from a variety of habitat types that include collections made in tributaries of the Kouilou, Noumbi and various independent coastal basins as a temporal comparison to previous collections in the area.

Materials and Methods

Sites and habitat types

The list of species reported in this paper is based on collections made in 2012 during wet (May) and dry (July/August) season surveys. Sampling sites were distributed over a variety of lentic and lotic habitat types, namely: forest streams (sites 1–11), coastal savannah streams (sites 12–14), rivers (sites 15–16), swamp forests (sites 17–18), savannah wetlands (sites 19–20), lakes (sites 21–30), estuaries (site 31) and mangroves (site 32) (Figure 1 and Table 1). Photographs, written descriptions and geospatial data were collected for each site. For the purpose of this study, ichthyological survey results are presented per aquatic habitat type (Table 2) where general habitat types are divided based on the characteristics below (Figure 2). A comparison of the current data per basin, to data from the following sources is provided in Table 3: Daget and Stauch (1968), Teugels *et al.* (1991) and Stiassny *et al*. (2007).

Forest streams refer to streams in the central and northern section of the study area which do not exhibit a clear distinction between riparian vegetation and surrounding forest vegetation (Figure 2A). Forest streams are generally characterised by steep gradients and partially open to closed canopies. The streams are shallow (< 1 m), relatively narrow (1–10 m) with substrates dominated

by woody debris, sand, aquatic and marginal vegetation. The fringing forest consists of the dominant tree species *Dacryodes pubescens, Daniella soyauxii, Irvingia grandifolia* and *Caesalpiniaceae sp.*

Coastal savannah streams occur in the southern section of the study area in the savannah region and drain coastal catchments (Figure 2B). These streams have a distinct channel and riparian fringe, moderate depth (< 2 m) and width (1–10 m), and a reduced gradient. Coastal savannah streams have partially open to open canopies and are mostly sandy with marginal vegetation as dominant cover. The sites were fringed by a forest-wetland-grassland mosaic.

Rivers are major drainages consisting of an open canopy, a defined channel and an undefined riparian zone (Figure 2C). They are deep (> 2 m) and wide (> 10 m) with a moderate water velocity. Sampled river sites in this study consisted of affluents of the Kouilou River with seasonally flooded riparian forest characterised species such as *Kigelia africana, Entada mannii, Mucuna flagellipes* and *Raphia hookeri.* Increased inundation during the wet season creates flooded forests in the region comprised of species such as the stilt rooted *Xylopia rubescens, Aman trobilacea* and *Ctenolophon englerianus*.

Swamp forests are low energy systems where the water table is near to or at the surface (Figure 2D). They are characterised by undefined channels, closed canopies and slow flowing water running through dense vegetation. Swamp forests have a low gradient with water surface width ranging from 1–10 m and a macro-channel width of > 100 m. Leaf litter and debris are the dominant substrate in these systems. Similar to swamp forests, savannah wetlands are low energy systems where the water table is shallow (Figure 2E). Savannah wetlands are characterised by slow flowing, shallow waters without woody vegetation. They have an open canopy and are dominated by grasses, sedges and forbs. Savannah wetlands cover a large area with disperse flows (> 100 m), but have relatively narrow active channels (1–5 m).

Lakes are standing water bodies located throughout the landscape with a large variability in the surrounding vegetation (*e.g.,* Figure 2F). They are relatively deep (3–8 m) and have a water surface width of 100 m or more with clear waters and open canopies. Estuaries (Figure 2G) and mangrove (Figure 2H) sites were situated in the sublittoral zone. The latter contained saline woodland elements in their adjacent aquatic zones.

Sampling and Collection

Fish sampling efforts were site specific and based on habitat type and accessibility. Several sampling techniques were employed, including cast nets (Figure 3A), fyke nets (Figure 3B), monofilament gill nests (Figure 3C), seine nets (Figure 3D), electrofishing (Figure 3E), dip nets (Figure 3F), hook and line (Figure 3G) and observation of local fishermen's catch (Figure 3H). Fishes were collected according to the guidelines for the use of fishes in research (AFS/AIFRB/ASIH 2003). Taxonomic nomenclature follows Eschmeyer (2010). Some species were observed in the field but not collected, and were only reported if a strong positive identification could be made of the specimen in the field. All vouchers were deposited in the Ichthyology Department of the American Museum of Natural History (AMNH) in New York, USA. Data are accessible online at the AMNH vertebrate zoology database http://sci-web-001.amnh.org/db/emuwebamnh/. Tissue samples for DNA analysis were taken for vouchers. All fishes were collected and exported with permission of the Congolese

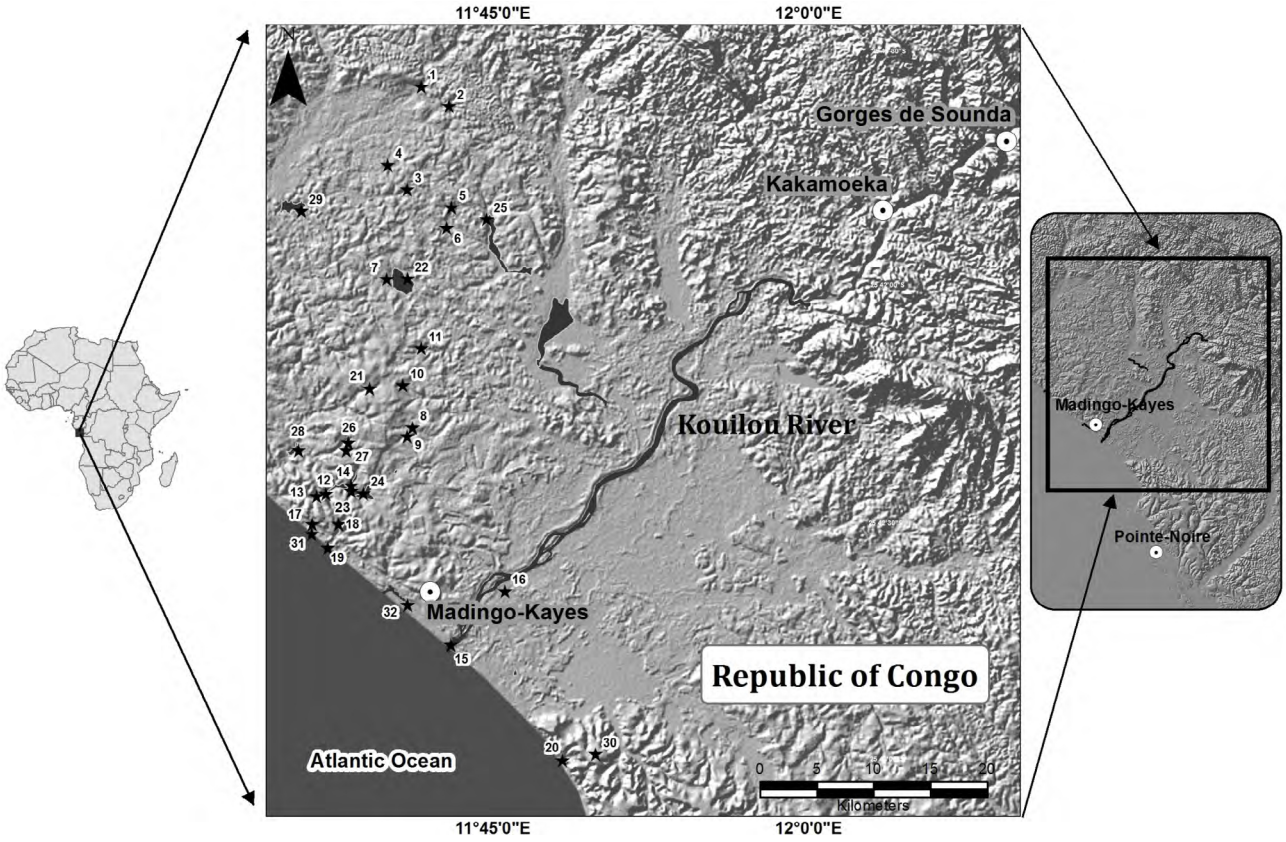

Figure 1. Location of study sites in the Kouilou, Noumbi and independent coastal basins, Lower Guinea ichthyofaunal province, Republic of the Congo.

Table 1. Site data showing habitat type and dominant cover type. S = Sand; C = Cobbles; LL = Leaf Litter; M = Mud; MV = Marginal Vegetation; AV = Aquatic Vegetation; PM = Peat Mats.

SITES	Y	X	HABITAT TYPE	CATCHMENT	DESCRIPTION	COVER	VEGETATION
1	-4.03363	11.69338	Forest Stream	Noumbi	Dongo River	S, C, MV	Forest
2	-4.04931	11.71534	Forest Stream	Noumbi	Tributary of Bondo River	S, MV	Degraded forest
3	-4.11511	11.68185	Forest Stream	Noumbi	Louvandji River	S, MV	Forest
4	-4.09574	11.66641	Forest Stream	Noumbi	Tributary Bondo River	S, LL	Forest
5	-4.12930	11.71724	Forest Stream	Kouilou	Headwaters of Bilondou River	S, M, LL	Degraded forest
6	-4.14549	11.71325	Forest Stream	Kouilou	Headwaters of Mbosso River	M, LL	Degraded forest
7	-4.18616	11.66600	Forest Stream	Noumbi	Tintinda River	S, AV, MV	Degraded forest
8	-4.30366	11.68610	Forest Stream	Kouilou	Bikwashi River	S, M, LL	Degraded forest
9	-4.31081	11.68192	Forest Stream	Kouilou	Zimbou River	S, AV, MV	Degraded forest
10	-4.27034	11.67874	Forest Stream	Kouilou	Tchianga River	S, AV, MV	Degraded forest
11	-4.24090	11.69330	Forest Stream	Kouilou	Ntonou River	S, MV, LL	Degraded forest
12	-4.35642	11.61763	Coastal Savannah Stream	Coastal	Louandjili River	S, AV, MV	Degraded forest
13	-4.35809	11.61009	Coastal Savannah Stream	Coastal	Louandjili River	S, AV, MV	Degraded forest
14	-4.35390	11.63758	Coastal Savannah Stream	Coastal	Stream between Lakes Louandjili and Ndembo	S, M, MV	Degraded forest
15	-4.47578	11.71686	River	Kouilou	Kouilou River	S, MV	Flooded coastal forest
16	-4.43326	11.75949	River	Kouilou	Tributary of Kouilou	S, M, MV, AV	Seasonally flooded forest
17	-4.38008	11.60697	Swamp Forest	Coastal	Coastal Tributary	S, M, LL	Littoral forest
18	-4.38036	11.62746	Swamp Forest	Coastal	Coastal Tributary	S, M, LL	Gallery forest in degraded savannah grassland mosiac
19	-4.39904	11.61915	Savannah Wetland	Coastal	Coastal Tributary	M, MV	Littoral forest
20	-4.56720	11.80502	Savannah Wetland	Coastal	Coastal Tributary	M, MV	Gallery forest in degraded savannah
21	-4.27282	11.65215	Lake	Coastal	Lake in Tchilenzi River Catchment	M, MV, PM	Grassland savannah mosaic
22	-4.18590	11.68230	Lake	Noumbi	Lake Youbi	M, S, AV, MV	Gallery forest in degraded savannah grassland mosiac
23	-4.34962	11.63756	Lake	Coastal	Lake Louandjili	M, S, MV	Grassland savannah mosaic
24	-4.35571	11.64728	Lake	Coastal	Lake Ndembo	M, S, MV	Grassland savannah mosaic
25	-4.13882	11.74482	Lake	Kouilou	Lake Koubambi	M, S, MV	Forest
26	-4.31593	11.63544	Lake	Coastal	Lake Tchitombi	M, S, AV, MV	Degraded savannah with *Eucalyptus* plantations
27	-4.32196	11.63378	Lake	Coastal	Lake Ngonzo	M, S, MV	Degraded savannah with *Eucalyptus* plantations
28	-4.32179	11.59580	Lake	Coastal	Lake Tchifoubou	M, S, AV,MV	Gallery forest in degraded savannah grassland mosiac
29	-4.13209	11.59843	Lake	Noumbi	Lake Yangala	M, S, MV	Forest
30	-4.56228	11.83128	Lake	Coastal	Lake Foni	M, S, MV	Degraded savannah
31	-4.38795	11.60622	Estuary	Coastal	Coastal Tributary	S	Littoral forest with *Hyphaene* elements
32	-4.44418	11.68235	Mangrove	Coastal	Tributary of Yombo River	M, S, AV, MV	Littoral forest with *Hyphaene* elements

Direction Générale de l'Economie Forestière, Direction de la Faune et des Aires Protégées (Permit No. 1125542, on file at AMNH).

Results and Discussion

For the present study a total of 55 species, distributed in 29 families and 12 orders are represented in Table 2, with their distribution amongst habitat types in the local study area indicated. Of the 55 species noted in the study, 42 are considered as primary freshwater species. The families with highest species richness were the Cichlidae (9 spp., 16%), Mormyridae (5 spp., 9%), Clariidae (4 spp., 7%), Distichodontidae (3 spp., 6%) and Nothobranchiidae (3 spp., 6%). The remainder of the 24 families were comprised of one or two species each. The most diverse orders were Perciformes (19 spp., 35%), Siluriformes (9 spp., 17%) and Characiformes (7 spp., 13%), many of the remaining orders were represented by a single species.

In the study area 29 species (54%) were collected in forest streams; 24 species (44%) in lakes, 18 species (33%) in rivers, 8 species (15%) in swamp forests, 7 species (13%) in coastal savannah streams, 4 species in savannah wetlands and estuaries respectively (7%) and 3 species in mangroves (6%). Where previous studies focused mainly on the main rivers, major affluents and lakes in a larger geographic area (Daget and Stauch 1968; Teugels *et al*. 1991), the current study intensely sampled a smaller area on the catchment divide between the Kouilou and Noumbi near the coast and included numerous smaller tributaries on the right bank of the lower Kouilou River. The low diversity recorded in the coastal savannah streams, savannah wetlands and mangroves is likely an artefact of limited sampling in these habitat types.

Forest streams and rivers exhibited a notable number of fishes that were sampled in these habitats exclusively. Lakes and estuaries showed a lower number of exclusive species, where the remainder of the habitat

Figure 2. Examples of major habitat types sampled: A) Forest stream; B) Coastal savannah stream; C) Kouilou River; D) Swamp forest; E) Savannah wetland; F) Lake Ngonzo; G) Estuary opening to the Atlantic Ocean; H) Mangrove.

Figure 3. Fishing techniques applied in the survey: A) Cast nets; B) Fyke nets; C) Gill nets; D) Seine nets; E) Electrofishing; F) Scoop nets; G) Hook and line; H) Observation of local fishermen's catch showing *Heterotis niloticus* and *Parachanna* sp.

types did not show any exclusive species. Twelve species (22%) in the study were exclusively sampled in forest streams, and included the mormyrids *Oxymormyrus zanclirostris*, *Paramormyrops kingsleyae* and *Isichthys henryi*, *Neolebias ansorgii*, '*Barbus*' *holotaenia*, *Phractura brevicauda*, *Malapterurus oguensis*, *Synodontis batesii*, *Ctenopoma nigropannosum*, *Chromidotilapia kingsleyae*, *Mastacembelus marchei* and *Enneacampus kaupi.* With the exception of *Marcusenius moorii* and *Petrocephalus micropthalmus*, other mormyrids were found only in forest streams, which represent favourable conditions for this family.

Nine species were exclusively sampled in rivers in the surveys (17%), namely *Pellonula leonensis*, *Aplocheilichthys* cf. *spilauchen*, *Eleotris senegalensis*, *Bathygobius soporator*, *Pomadasys jubelini*, *Polydactylus quadrifilis*, *Citharichthys stampflii*, *Cynoglossus senegalensis* and *Liza grandisquamis*. *Sarotherodon nigripinnis* was only sampled in coastal savannah streams draining the isolated coastal catchments. The Cichlidae showed a high species richness in lakes. Two species of cichlids were exclusively sampled in Lakes namely, *Oreochromis schwebischi* and *Thysochromis sp*. *Trachinotus teraia*, *Eucinostomus melanopterus* and *Liza falcipinnis* were exclusively sampled in the estuary.

The discoveries of three taxa that appear to represent putatively undescribed species are noted in Table 2 and Figure 4. Specimens tentatively identified as *A.* cf. *spilauchen* (Figure 4A) were collected near the mouth of the Kouilou River and require further taxonomic elucidation (van der Zee 2013, pers. comm.). *Thysochromis ansorgii* has previously been recorded by Teugels *et al.* (1991) in Lake Koubambi and the presence of this species was considered as a significant southerly range extension from its previously recorded localities in the coastal basins in the south of Côte d'Ivoire, south western Ghana and Nigeria. Preliminary examination of *Thysochromis* specimens collected from Lake Youbi (Figure 4B) and Lake Yangala in the current study reveal obvious differences with *T. ansorgii* and these specimens are considered as member of a putatively undescribed species (Stiassny 2013, pers. comm.). *Marcusenius* cf. *friteli* (Figure 4C) potentially also represents an undescribed taxon (Sullivan 2013, pers. comm.), and the variation in a group of *M. moorii* sampled at lake Tchitombi is particularly striking (Figure 4C and D).

The occurrence of the mochokid catfish, *S. batesii* and the clariid catfish *Clarias pachynema* represents a range extension for these species and is the first record of the species for the Kouilou system. Prior to the present study *S. batesii* had been recorded in the Lower Guinea in the Nyong and Ntem Rivers (Cameroon), the Ivindo, Ogowe and Ouzibi rivers (Gabon) and the Rio Muni Equatorial Guinea, where *C. pachynema* was recorded in the Sanaga (Cameroon), Ogowe and Oeme (Benin) systems (Stiassny *et al*. 2007; Moelants 2010).

A large portion of the biomass of the area was made up of just three species, the alestid *Bryconalestes longipinnis,* the mormyrid *M. moorii* and the cichlid *Hemichromis elongatus. Hemichromis elongatus* was particularly prolific, occurring in large abundances in most habitats sampled and exploiting both brackish and freshwaters (Table 2).

The species-rich Cyprinidae, which represents a large portion of fish diversity in central Africa (Brooks *et al*. 2011), is represented by only a single species, '*B'. holotaenia*, in the study area. Twenty cyprinid species, including representatives of '*Barbus',* Garra, Labeo, *Labeobarbus, Raiamas* and *Varicorhinus* were recorded in previous collections (Daget and Stauch 1968; Teugels *et al*. 1991; Stiassny *et al.* 2007) and nearby regions (Mamonekene and Stiassny 2012). Interestingly most cyprinid species in the region appear to be restricted to the Ntombo River (a major left bank affluent of the Kouilou), the Loeme River, and the Kouilou River and affluents between Kakamoeka and Sounda Gorge north east of the study area.

Fishermen were observed collecting *Heterotis niloticus* and *Parachanna sp.* in many of the lakes and in the lagoon. Vreven *et al.* (2007) reviewed the timeframe of introductions of alien species into the Lower Guinean ichthyofaunal province and noted multiple introductions of *H. niloticus* throughout the region. *Heterotis niloticus* has a Nilo-Sudanic origin and it is speculated that it was introduced to the coastal region after the mid sixties, as it was not yet reported by Daget and Stauch (1968) who made their collections between 1962 and 1964. Welcomme (1988) reported the introduction of *H. niloticus* in the Congo from Cameroon in 1950, but was not specific about the area to which they were introduced. According to local fishermen, the introduction of this species has coincided with the local decline and extinction of other species (Teugels *et al.* 1991).

When combining data from all studies (Daget and Stauch 1968; Teugels *et al.* 1991; Stiassny *et al*. 2007) a total of 152 species in 39 families and 14 orders were recorded for the lower Kouilou, Noumbi and independent coastal basins (Table 3). This tally includes sites on major left and right bank affluents of the Kouilou River up to Sounda Gorge near Kakamoeka. After a review of the available data it appears that identification of several species cited by Daget & Stauch (1968) are unclear and require clarification, specifically for the Nothobranchiidae and the Clariidae families, and for the cichlid species *Hemichromis fasciatus*. *Epiplatys sexfasciatus* is restricted to the Ogowe system, and *Aphyosemion louessense* is known from localities in the Kouilou system upstream of the Sounda Gorge (van der Zee 2014, pers. comm.). There is a complete separation of coastal plain and inland *Aphyosemion* species due to the Du Chaillu Massif geography and variation in climate, and it is unlikely that these species were sampled in the lower Kouilou catchment (van der Zee 2014, pers. comm.).

Figure 4. Putatively undescribed species of the area: A) *Aplocheilichthys* cf. *spilauchen* immediately post mortem; B) *Thysochromis* sp. collected from Lake Youbi immediately post mortem; C) *Marcusenius* cf. *friteli* collected in Lake Tchitombi (Site 26), and D) morphological variation in specimen of *Marcusenius moorii* collected in Lake Tchitombi (Site 26).

Table 2. List of species collected in the study region shown per habitat type. FS = Forest Streams, CSS = Coastal Savannah Stream, R = River, SF = Swamp Forest, SW = Savannah Wetland, L = Lake, E = Estuary and M = Mangrove.

TAXON	AMNH Number	FS	CSS	R	SF	SW	L	E	M
CLUPEIFORMES									
Clupeidae (1)									
Pellonula leonensis Boulenger, 1916	AMNH 258349	-	-	X	-	-	-	-	-
OSTEOGLOSSIFORMES									
Arapaimidae (1)									
Heterotis niloticus (Cuvier, 1829), introduced	Observed	-	-	-	-	-	X	-	-
Mormyridae (6)									
Marcusenius moorii (Günther, 1867)	AMNH 258426, 258443, 258392, 258420, 258355	X	X	-	-	-	X	-	-
Marcusenius cf. *friteli* (Pellegrin, 1904)	Observed	-	-	-	-	-	X	-	-
Oxymormyrus zanclirostris (Günther, 1867)	Observed	X	-	-	-	-	-	-	-
Paramormyrops kingsleyae (Günther 1896)	AMNH 258102	X	-	-	-	-	-	-	-
Petrocephalus microphthalmus Pellegrin, 1908	AMNH 258419, 258123	X	-	-	-	-	X	-	-
Isichthys henryi Gill, 1863	AMNH 258399	X	-	-	-	-	-	-	-
CHARACIFORMES									
Hepsetidae (1)									
Hepsetus lineata Pellegrin 1926	AMNH 258347, 258122	X	-	X	-	-	X	-	-
Alestidae (2)									
Bryconalestes longipinnis (Günther, 1864)	AMNH 258424, 258452, 258383, 258387, 258398, 258401, 258406	X	X	X	-	X	X	-	-
Nannopetersius ansorgii (Boulenger, 1910)	AMNH 258386, 258412, 258133, 258121, 258095	X	-	-	-	-	X	-	-
Distichodontidae (3)									
Nannaethiops unitaeniatus Günther, 1872	AMNH 257929	X	-	-	-	-	-	-	-
Nannocharax parvus Pellegrin, 1906	AMNH 258451, 258397, 258411, 258110, 258128, 258141, 258101	X	-	-	-	-	X	-	-
Neolebias ansorgii Boulenger, 1912	AMNH 257927, 258439, 257928, 258447, 258448, 258459	X	-	-	X	X	X	-	-
CYPRINIFORMES									
Cyprinidae (1)									
'Barbus' holotaenia Boulenger, 1904	AMNH 258385, 258144, 258104	X	-	-	-	-	-	-	-
SILURIFORMES									
Amphiliidae (1)									
Phractura brevicauda Boulenger, 1911	AMNH 258391, 258418, 258142, 258103	X	-	-	-	-	-	-	-
Claroteidae (2)									
Chrysichthys auratus (Geoffrey Saint-Hilaire, 1809)	Observed	-	-	X	-	-	X	-	-
Chrysichthys nigrodigitatus (Lacepède, 1803)	AMNH 258455	-	-	X	-	-	X	-	-
Clariidae (4)									
Channallabes apus (Günther, 1873)	AMNH 258431, 258460	-	-	-	X	-	-	-	X
Clarias angolensis Steindachner, 1866	AMNH 258357, 258376	-	-	-	-	-	X	-	X
Clarias gabonensis Günther, 1867	AMNH 258425, 258442, 258422, 258457	-	X	-	X	-	X	-	-
Clarias pachynema Boulenger, 1903	AMNH 258432, 258441, 258344, 258371	-	X	-	X	-	-	-	-
Malapteruridae (1)									
Malapterurus oguensis Sauvage, 1879	AMNH 258417	X	-	-	-	-	-	-	-
Mochokidae (1)									
Synodontis batesii Boulenger, 1907	AMNH 258113, 258152	X	-	-	-	-	-	-	-
CYPRINODONTIFORMES									
Nothobranchiidae (3)									
Aphyosemion australe (Rachow, 1921)	AMNH 258429, 258438	X	-	-	X	-	-	-	-
Epiplatys ansorgii (Boulenger, 1911)	AMNH 258445, 258396, 258408, 258151, 258400	X	-	-	X	-	X	-	-
Epiplatys singa (Boulenger, 1899)	AMNH 258428, 258458, 258456, 258137	X	X	-	X	X	X	-	X
Poeciliidae (2)									
Aplocheilichthys cf. *spilauchen* (Duméril, 1861)	AMNH 258331	-	-	X	-	-	-	-	-
Plataplochilus cabindae (Boulenger, 1911)	AMNH 258450, 258395, 258410, 258150	X	-	X	-	-	X	-	-
PERCIFORMES									
Anabantidae (2)									
Ctenopoma nigropannosum Reichenow, 1875	Observed	X	-	-	-	-	-	-	-
Microctenopoma nanum (Günther, 1896)	AMNH 258430, 258404	X	-	-	X	-	-	-	-
Carangidae (1)									
Trachinotus teraia Cuvier, 1832	AMNH 258436	-	-	-	-	-	-	X	-
Channidae (1)									
Parachanna sp.	Observed	X	-	-	-	-	X	-	-
Cichlidae (8)									
Chromidotilapia kingsleyae Boulenger, 1898	AMNH 258388, 258403, 258414, 258149, 258097	X	-	-	-	-	-	-	-
Hemichromis elongatus (Guichenot, 1861)	AMNH 258421, 258440, 258416, 258342, 258381	X	X	X	-	-	X	X	X
Oreochromis schwebischi (Sauvage, 1884)	Observed	-	-	-	-	-	X	-	-
Parananochromis sp.	Observed						X		

Table 2. *Continued.*

TAXON	AMNH Number	FS	CSS	R	SF	SW	L	E	M
Pelvicachromis subocellatus (Günther, 1872)	AMNH 258389, 258402, 258337, 258352, 258361, 258098	X	-	-	-	-	X	-	-
Sarotherodon nigripinnis dolloi (Boulenger, 1899)	Observed	-	X	-	-	-	-	-	-
Thysochromis sp.	AMNH 258106, 258135	-	-	-	-	-	X	-	-
Tilapia cabrae Boulenger, 1899	AMNH 258330	-	-	X	-	-	X	-	-
Tilapia guineensis (Günther, 1862)	AMNH 258454, 258415, 258327, 258325	X	-	X	-	X	X	-	-
Eleotridae (2)									
Eleotris daganensis Steindachner, 1870	AMNH 258390, 258366	X	-	-	-	-	X	-	-
Eleotris senegalensis Steindachner, 1870	AMNH 258348	-	-	X	-	-	-	-	-
Gerreidae (1)									
Eucinostomus melanopterus (Bleeker, 1863)	AMNH 258435	-	-	-	-	-	-	X	-
Gobiidae (1)									
Bathygobius soporator (Valenciennes, 1837)	AMNH 258332	-	-	X	-	-	-	-	-
Haemulidae (1)									
Pomadasys jubelini (Cuvier, 1830)	Observed	-	-	X	-	-	-	-	-
Polynemidae (1)									
Polydactylus quadrifilis (Cuvier, 1829)	Observed	-	-	X	-	-	-	-	-
PLEURONECTIFORMES									
Paralichthyidae (1)									
Citharichthys stampflii (Steindachner, 1894)	Observed	-	-	X	-	-	-	-	-
Cynoglossidae (1)									
Cynoglossus senegalensis (Kaup, 1858)	Observed	-	-	X	-	-	-	-	-
SYNBRANCHIFORMES									
Mastacembelidae (1)									
Mastacembelus marchei Sauvage, 1879	AMNH 258105	X	-	-	-	-	-	-	-
SYNGNATHIFORMES									
Syngnathidae (1)									
Enneacampus kaupi (Bleeker, 1863)	AMNH 258384, 258145	X	-	-	-	-	-	-	-
MUGILIFORMES									
Mugilidae (2)									
Liza falcipinnis (Valenciennes, 1836)	AMNH 258434	-	-	-	-	-	-	X	-
Liza grandisquamis (Valenciennes, 1836)	AMNH 258333	-	-	X	-	-	-	-	-
LEPIDOSIRENIFORMES									
Protopteridae (1)									
Protopterus dolloi Boulenger, 1900	Observed	-	-	X	-	-	X	-	-

Table 3. Species collected in the study area shown per basin and compared to previous data collected in the area . K = Kouilou basin; N = Noumbi basin; CB = Independent Coastal basins.

TAXON	Walsh *et al.* (Present Study)			Daget & Stauch (1968)		Teugels *et al.* (1991)			Stiassny *et al.* (2007)			Primary Freshwater (Whitfield, 2005)
	K	N	CB	K	N	K	N	CB	K	N	CB	
CLUPEIFORMES												
Clupeidae (5)												
Ethmalosa fimbriata (Bowdich, 1825)	-	-	-	-	X	-	-	-	X	-	-	
Odaxothrissa ansorgii (Boulenger, 1910)	-	-	-	X	X	X	-	-	X	-	-	
Pellonula leonensis Boulenger, 1916	X	-	-	-	X	X	-	-	X	X	-	Y
Pellonula vorax Günther, 1868	-	-	-	X	X	X	-	-	-	-	-	Y
Sardinella maderensis (Lowe, 1838)	-	-	-	-	-	X	-	-	X	X	-	
OSTEOGLOSSIFORMES												
Arapaimidae (1)												
Heterotis niloticus (Cuvier, 1829), introduced	X	-	-	-	-	X	-	-	-	-	-	Y
Mormyridae (8)												
Brienomyrus brachyistius (Gill, 1862)	-	-	-	X	X	X	-	-	X	X	-	Y
Isichthys henryi Gill, 1863	-	X	-	X	X	X	-	-	X	X	-	Y
Marcusenius moorii (Günther, 1867)	X	X	X	X	X	X	-	-	X	-	-	Y
Marcusenius cf. friteli (Pellegrin, 1904)	-	-	X	-	-	-	-	-	-	-	-	Y
Oxymormyrus zanclirostris (Günther, 1867)	X	-	-	-	-	X	-	-	X	-	-	Y
Paramormyrops kingsleyae (Günther 1896)	X	X	-	X	X	X	-	-	X	-	-	Y
Petrocephalus microphthalmus Pellegrin, 1908	X	X	-	X	X	X	-	-	X	X	-	Y
Pollimyrus pedunculatus (David & Poll, 1937)	-	-	-	-	-	X	-	-	X	-	-	Y
CHARACIFORMES												
Alestidae (4)												
Alestes tholloni Pellegrin, 1901	-	-	-	X	-	-	-	-	X	-	-	Y

Table 3. *Continued.*

TAXON	Walsh *et al.* (Present Study)			Daget & Stauch (1968)		Teugels *et al.* (1991)			Stiassny *et al.* (2007)			Primary Freshwater (Whitfield, 2005)
	K	N	CB	K	N	K	N	CB	K	N	CB	
Brycinus kingsleyae (Günther, 1896)	-	-	-	-	-	X	-	-	X	-	-	Y
Bryconalestes longipinnis (Günther, 1864)	X	X	X	X	X	X	-	-	X	X	X	Y
Nannopetersius ansorgii (Boulenger, 1910)	X	X	-	-	X	X	-	-	X	-	-	Y
Distichodontidae (5)												
Distichodus notospilus Günther, 1867	-	-	-	X	-	X	-	-	X	X	-	Y
Nannaethiops unitaeniatus Günther, 1872	-	X	-	X	-	X	-	-	X	-	-	Y
Nannocharax parvus Pellegrin, 1906	X	X	-	X	X	X	-	-	X	-	-	Y
Neolebias ansorgii Boulenger, 1912	X	X	X	X	X	X	-	-	X	-	-	Y
Neolebias spilotaenia Boulenger, 1912	-	-	-	-	-	X	-	-	X	-	-	Y
Hepsetidae (1)												
Hepsetus lineata Pellegrin 1926	X	X	-	X	-	X	-	-	X	X	X	Y
CYPRINIFORMES												
Cyprinidae (20)												
'Barbus' camptacanthus (Bleeker, 1863)	-	-	-	X	-	X	-	-	X	-	-	Y
'Barbus' carens Boulenger, 1912	-	-	-	X	-	X	-	-	X	-	-	Y
'Barbus' guirali Thominot, 1886	-	-	-	X	-	-	-	-	X	-	X	Y
'Barbus' holotaenia Boulenger, 1904	X	X	-	-	-	X	-	-	X	X	X	Y
'Barbus' rouxi Daget, 1962	-	-	-	X	-	-	-	-	X	-	-	Y
'Barbus' rubrostigma Poll & Lambert, 1964	-	-	-	-	-	X	-	-	X	-	-	Y
'Barbus' stauchi Daget, 1967	-	-	-	X	-	-	-	-	X	-	X	Y
'Barbus' trispilomimus Boulenger, 1907	-	-	-	X	-	X	-	-	X	-	-	Y
Labeo annectens Boulenger, 1903	-	-	-	-	-	X	-	-	X	-	-	Y
Labeo camerunensis Trewavas,1974	-	-	-	-	-	-	-	-	X	-	-	Y
Labeobarbus cardozoi (Boulenger, 1912)	-	-	-	X	-	-	-	-	-	-	-	Y
Labeobarbus compiniei (Sauvage, 1879)	-	-	-	-	-	X	-	-	X	-	-	Y
Labeo lukulae Boulenger, 1902	-	-	-	-	-	-	-	-	X	-	-	Y
Labeobarbus progenys (Boulenger, 1903)	-	-	-	X	-	-	-	-	X	-	-	Y
Labeobarbus roylii (Boulenger, 1912)	-	-	-	X	-	-	-	-	X	-	-	Y
Opsaridium ubangiense (Pellegrin, 1901)	-	-	-	-	-	X	-	-	X	-	X	Y
Raiamas buchholzi (Peters, 1876)	-	-	-	X	-	X	-	-	X	-	X	Y
Varicorhinus axelrodi (Getahun, Stiassny & Teugels, 2004)	-	-	-	-	-	-	-	-	X	-	-	Y
Varicorhinus steindachneri Boulenger, 1910	-	-	-	-	-	-	-	-	X	-	-	Y
Varicorhinus sandersi Boulenger, 1912	-	-	-	-	-	X	-	-	X	X	-	Y
SILURIFORMES												
Amphiliidae (5)												
Amphilius lamani Lönnberg & Rendahl, 1920	-	-	-	-	-	X	-	-	-	-	-	Y
Amphilius nigricaudatus Pellegrin, 1909	-	-	-	X	-	-	-	-	X	-	-	Y
Doumea typica Sauvage, 1879	-	-	-	X	-	X	-	-	X	X	-	Y
Paramphilius baudoni (Pellegrin, 1928)	-	-	-	-	-	-	-	-	-	X	-	Y
Phractura brevicauda Boulenger, 1911	X	X	-	-	-	X	-	-	X	X	-	Y
Ariidae (1)												
Arius latiscutatus Günther, 1864	-	-	-	-	-	X	-	-	X	X	X	
Claroteidae (6)												
Chrysichthys auratus (Geoffrey Saint-Hilaire, 1809)	-	X	-	X	-	X	-	-	X	-	-	Y
Chrysichthys dageti Risch 1992	-	-	-	-	-	-	-	-	X	-	X	Y
Chrysichthys cf. longibarbis (Boulenger, 1899)	-	-	-	-	-	X	-	-	-	-	-	Y
Chrysichthys nigrodigitatus (Lacepède, 1803)	X	X	-	-	-	X	-	-	X	-	-	Y
Chrysichthys thysi Risch, 1985	-	-	-	-	-	X	-	-	-	-	-	Y
Chrysichthys walkeri Günther, 1899	-	-	-	X	-	-	-	-	-	-	-	Y
Parauchenoglanis balayi (Sauvage, 1879)	-	-	-	X	-	X	-	-	X	X	X	Y
Clariidae (9)												
Channallabes apus (Günther, 1873)	-	-	X	X	X	X	-	-	X	-	-	Y
Clarias angolensis Steindachner, 1866	X	-	-	X	X	X	X	-	X	X	-	Y
Clarias buthupogon Sauvage, 1879	-	-	-	X	X	-	-	-	-	-	-	Y
Clarias camerunensis Lönnberg, 1895	-	-	-	X	-	X	-	-	X	X	-	Y
Clarias gabonensis Günther, 1867	-	X	X	-	-	X	X	-	X	X	-	Y
Clarias gariepinus (Burchell, 1822)	-	-	-	-	-	X	-	-	X	-	-	Y
Clarias pachynema Boulenger, 1903	-	-	X	-	-	-	-	-	-	-	-	Y
Clarias theodorae Weber, 1897	-	-	-	X	-	-	-	-	-	-	-	Y
Clarias submarginatus Peters, 1882	-	-	-	X	-	-	-	-	-	-	-	Y

Table 3. *Continued.*

TAXON	Walsh *et al.* (Present Study)			Daget & Stauch (1968)		Teugels *et al.* (1991)			Stiassny *et al.* (2007)			Primary Freshwater (Whitfield, 2005)
	K	N	CB	K	N	K	N	CB	K	N	CB	
Malapteruridae (2)												
Malapterurus beninensis Murray, 1855	-	-	-	-	-	-	-	-	X	X	-	Y
Malapterurus oguensis Sauvage, 1879	X	X	-	X	-	X	-	-	-	-	-	Y
Mochokidae (1)												
Synodontis batesii Boulenger, 1907	-	X	-	-	-	-	-	-	-	-	-	Y
Schilbeidae (3)												
Parailia occidentalis (Pellegrin, 1901)	-	-	-	-	-	X	-	-	X	-	-	Y
Pareutropius debauwi (Boulenger, 1900)	-	-	-	-	-	X	-	-	X	-	-	Y
Schilbe multitaeniatus (Pellegrin, 1913)	-	-	-	-	-	X	-	-	X	-	-	Y
CYPRINODONTIFORMES												
Nothobranchiidae (7)												
Aphyosemion australe (Rachow, 1921)	X	-	X	-	-	X	X	X	X	-	X	Y
Aphyosemion escherichi (Ahl, 1924)	-	-	-	X	-	-	-	-	X	-	X	Y
Aphyosemion louessense (Pellegrin, 1931)	-	-	-	X	X	-	-	-	-	-	-	Y
Epiplatys ansorgii (Boulenger, 1911)	X	X	X	-	-	-	-	-	-	X	X	Y
Epiplatys cf. multifasciatus (Boulenger, 1913)	-	-	-	-	-	X	-	-	-	-	-	Y
Epiplatys sexfasciatus Gill, 1862	-	-	-	X	X	-	-	-	-	-	-	Y
Epiplatys singa (Boulenger, 1899)	X	X	X	X	X	X	X	-	-	-	-	Y
Poeciliidae (3)												
Aplocheilichthys spilauchen (Duméril, 1861)	-	-	-	X	X	X	-	-	X	X	-	Y
Aplocheilichthys cf. *spilauchen* (Duméril, 1861)	X	-	-	-	-	-	-	-	-	-	-	Y
Plataplochilus cabindae (Boulenger, 1911)	X	X	-	X	X	X	-	-	X	-	-	Y
PERCIFORMES												
Anabantidae (3)												
Ctenopoma kingsleyae Günther, 1896	-	-	-	X	-	X	-	-	X	-	-	Y
Ctenopoma nigropannosum Reichenow, 1875	X	-	-	-	-	X	-	-	X	-	-	Y
Microctenopoma nanum (Günther, 1896)	-	X	X	X	X	X	X	-	X	X	-	Y
Carangidae (1)												
Caranx hippos (Linnaeus, 1766)	-	-	-	X	X	X	-	-	-	-	-	
Trachinotus ovatus (Linnaeus, 1758)	-	-	-	-	X	X	-	-	-	-	-	
Trachinotus teraia Cuvier, 1832	-	-	X	-	-	X	-	-	X	-	-	
Channidae (3)												
Parachanna sp.	X	-	-	-	-	-	-	-	-	-	-	Y
Parachanna insignis (Sauvage, 1884)	-	-	-	-	-	-	-	-	X	-	-	Y
Parachanna obscura (Günther, 1861)	-	-	-	-	-	-	-	-	X	X	-	Y
Cichlidae (16)												
Chilochromis duponti Boulenger, 1902	-	-	-	-	-	X	-	-	X	-	-	Y
Chromidotilapia kingsleyae Boulenger, 1898	-	X	-	X	-	X	-	-	-	-	-	Y
Chromidotilapia mamonekenei Lamboj, 1999	-	-	-	-	-	-	-	-	X	-	-	Y
Hemichromis elongatus (Guichenot, 1861)	X	X	X	-	-	X	X	-	X	-	-	Y
Hemichromis fasciatus Peters, 1857	-	-	-	X	X	-	-	-	-	-	-	Y
Oreochromis niloticus (Linnaeus, 1758), introduced	-	-	-	-	-	X	-	-	-	-	-	Y
Parananochromis sp.	-	-	X	-	-	-	-	-	-	-	-	Y
Oreochromis schwebischi (Sauvage, 1884)	-	-	X	X	-	X	-	-	X	-	X	Y
Pelvicachromis subocellatus (Günther, 1872)	-	X	X	X	X	X	-	-	X	-	-	Y
Sarotherodon galilaeus (Linnaeus, 1758)	-	-	-	-	-	X	-	-	-	-	-	Y
Sarotherodon nigripinnis dolloi (Boulenger, 1899)	-	-	X	X	-	X	-	-	X	-	-	Y
Thysochromis sp.	-	X	-	-	-	-	-	-	-	-	-	Y
Thysochromis ansorgii (Boulenger, 1901)	-	-	-	-	-	X	-	-	X	-	-	Y
Tilapia cabrae Boulenger, 1899	X	X	-	X	X	X	-	-	X	-	X	Y
Tilapia guineensis (Günther, 1862)	X	X	X	X	X	X	X	-	X	X	X	Y
Tilapia tholloni (Sauvage, 1884)	-	-	-	-	-	-	-	-	X	-	-	Y
Eleotridae (5)												
Bostrychus africanus (Steindachner, 1879)	-	-	-	-	-	X	-	-	X	-	-	
Dormitator lebretonis (Steindachner, 1870)	-	-	-	X	X	-	-	-	X	-	-	
Eleotris daganensis Steindachner, 1870	-	X	X	X	X	X	-	-	X	X	-	
Eleotris senegalensis Steindachner, 1870	X	-	-	X	-	X	-	-	X	-	-	
Eleotris vittata Duméril, 1861	-	-	-	X	X	X	-	-	X	-	-	
Gerreidae (1)												
Eucinostomus melanopterus (Bleeker 1863)	-	-	X	-	X	X	-	-	X	X	-	

Table 3. *Continued.*

TAXON	Walsh *et al.* (Present Study)			Daget & Stauch (1968)		Teugels *et al.* (1991)			Stiassny *et al.* (2007)			Primary Freshwater (Whitfield, 2005)
	K	N	CB	K	N	K	N	CB	K	N	CB	
Gobiidae (6)												
Awaous lateristriga (Duméril, 1861)	-	-	-	X	-	X	-	-	X	-	X	
Bathygobius soporator (Valenciennes, 1837)	X	-	-	-	X	-	-	-	X	X	-	
Nematogobius maindroni (Sauvage, 1880)	-	-	-	-	-	-	-	-	X	X	-	
Porogobius schlegelii (Günther, 1861)	-	-	-	-	-	X	-	-	X	-	-	
Periophthalmus barbarus (Linnaeus, 1766)	-	-	-	X	-	X	-	-	X	X	-	
Yongeichthys thomasi (Boulenger, 1916)	-	-	-	-	-	-	-	-	X	X	-	
Haemulidae (2)												
Pomadasys jubelini (Cuvier, 1830)	X	-	-	-	X	X	-	-	X	-	-	
Pomadasys perotaei (Cuvier, 1830)	-	-	-	-	X	X	-	-	-	-	-	
Lutjanidae (4)												
Lutjanus agennes Bleeker, 1863	-	-	-	-	X	-	-	-	X	-	-	
Lutjanus dentatus (Duméril, 1861)	-	-	-	-	X	-	-	-	X	-	-	
Lutjanus endecacanthus Bleeker, 1863	-	-	-	-	X	-	-	-	X	-	-	
Lutjanus goreensis (Valenciennes, 1830)	-	-	-	-	X	-	-	-	X	-	-	
Monodactylidae (1)												
Monodactylus sebae (Cuvier, 1829)	-	-	-	-	X	-	-	-	X	-	-	
Polynemidae (1)												
Polydactylus quadrifilis (Cuvier, 1829)	X	-	-	-	-	X	-	-	X	-	-	
Sphyraenidae (1)												
Sphyraena afra Peters, 1844	-	-	-	-	X	-	-	-	-	-	-	
Sciaenidae (3)												
Pseudotolithus brachygnathus Bleeker, 1863	-	-	-	-	-	X	-	-	-	-	-	
Pseudotolithus elongatus (Bowdich, 1825)	-	-	-	-	-	X	-	-	X	-	-	
Pseudotolithus senegalensis (Valenciennes, 1833)	-	-	-	-	X	X	-	-	-	-	-	
PLEURONECTIFORMES												
Citharidae (1)												
Citharus linguatula (Linnaeus, 1758)	-	-	-	-	-	X	-	-	-	-	-	
Cynoglossidae (1)												
Cynoglossus senegalensis (Kaup, 1858)	X	-	-	-	-	X	-	-	X	-	-	
Paralichthyidae (1)												
Citharichthys stampflii (Steindachner, 1894)	X	-	-	-	X	-	-	-	-	-	-	
SYNBRANCHIFORMES												
Mastacembelidae (2)												
Mastacembelus marchei Sauvage, 1879	-	X	-	-	-	-	-	-	X	-	-	Y
Mastacembelus niger Sauvage, 1879	-	-	-	X	-	X	-	-	-	-	-	Y
SYNGNATHIFORMES												
Syngnathidae (3)												
Enneacampus ansorgii (Boulenger, 1910)	-	-	-	-	-	X	-	-	X	-	-	
Enneacampus kaupi (Bleeker, 1863)	X	X	-	-	X	-	-	-	X	-	-	Y
Microphis aculeatus (Kaup, 1856)	-	-	-	X	-	X	-	-	X	-	-	
MUGILIFORMES												
Mugilidae (6)												
Liza dumerili (Steindachner, 1870).	-	-	-	-	-	X	-	-	X	-	-	
Liza falcipinnis (Valenciennes, 1836)	-	-	X	X	X	X	-	-	X	-	-	
Liza grandisquamis (Valenciennes, 1836)	X	-	-	-	-	X	-	-	X	-	-	
Mugil bananensis (Pellegrin, 1927)	-	-	-	-	-	-	-	-	X	-	-	
Mugil cephalus Linnaeus, 1758	-	-	-	-	-	-	-	-	X	-	-	
Mugil curema Valenciennes, 1836	-	-	-	-	X	X	-	-	X	-	-	
LEPIDOSIRENIFORMES												
Protopteridae (1)												
Protopterus dolloi Boulenger, 1900	X	-	-	-	X	X	-	-	X	X	X	Y
ELOPIFORMES												
Elopidae (1)												
Elops lacerta Valenciennes, 1847	-	-	-	-	-	X	-	-	X	-	-	
BELONIFORMES												
Hemiramphidae (1)												
Hyporhamphus picarti (Valenciennes, 1847)	-	-	-	-	X	-	-	-	X	-	-	
Belonidae (1)												
Strongylura senegalensis (Valenciennes, 1846)	-	-	-	-	X	X	-	-	X	-	-	

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