Verlag Dr. Friedrich Pfeil
ISSN 0936-9902

Excerpt from

Ichthyological Exploration of Freshwaters

An international journal for field-orientated ichthyology

Volume 28
Number 2

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Ichthyological Exploration of Freshwaters

An international journal for field-orientated ichthyology

Volume 28 · Number 2 · January 2018
pages 97–192, 40 figs., 14 tabs.

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Ichthyological Exploration of Freshwaters is published quarterly

Subscriptions should be addressed to the Publisher:

Verlag Dr. Friedrich Pfeil, Wolfratshauser Str. 27, 81379 München, Germany
PERSONAL SUBSCRIPTION: EURO 100 per Year/volume – 4 issues (includes surface mail shipping)
INSTITUTIONAL SUBSCRIPTION: EURO 180 per Year/volume – 4 issues (includes surface mail shipping)

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CIP-Titelaufnahme der Deutschen Bibliothek

Ichthyological exploration of freshwaters : an international journal for field-orientated ichthyology. – München : Pfeil.
Erscheint jährl. viermal. – Aufnahme nach Vol. 1, No. 1 (1990)
ISSN 0936-9902

Vol. 1, No. 1 (1990) –

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Printed by PBtisk a.s., Příbram I – Balonka

ISSN 0936–9902
Printed in the European Union

Verlag Dr. Friedrich Pfeil, Wolfratshauser Str. 27, 81379 München, Germany
Phone +49 89 5528600–0 · Fax +49 89 5528600–4 · E-mail: info@pfeil-verlag.de · www.pfeil-verlag.de

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Ichthyol. Explor. Freshwaters, Vol. 28, No. 2, pp. 135–156, 2 figs., 2 tabs., January 2018
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An updated checklist of the ichthyofauna of the Mono River basin (Benin and Togo: West Africa)

Djiman Lederoun*, ** Jos Snoeks*, ****, Philippe Lalèyè*, Pierre Vandewalle** and Emmanuel Vreven***, ****

In order to evaluate the impact of anthropogenic changes, such as the future construction of a dam at Adjarala, on the fish diversity of the Mono River basin, a list of the ichthyofauna of this basin has been compiled. This list was established based on data obtained from collections in natural history museums and from the literature, and updated following the most recent systematic revisions. A total of 60 native and one introduced species, belonging to 40 genera and 23 families, are reported. The families Cyprinidae and Cichlidae, with nine species each, are best represented in the list. Mormyridae, Alestidae and Clariidae account for six species each, while all other families contribute three species or less. Of the 60 native species recorded, three are typically marine, while five others are estuarine. Based on museum records, *Raiamas senegalensis* (Cyprinidae), previously not reported from the Mono basin, has been added. Earlier attributions of *Marcusenius brucii*, *M. cyprinoides*, *Petrocephalus simus* (Mormyridae), *Labeo coubie* (Cyprinidae), *Brycinus leuciscus* (Alestidae), *Phractura ansorgii* (Amphiliidae) and *Synodontis melanopterus* (Mochokidae) to the Mono basin proved to be based on misidentifications. The present study shows that the fish species diversity of the Lower Mono is most probably underestimated, due to inadequate sampling and the resulting lack of archived material from this portion of the basin.

Dans le but d'évaluer l'impact des activités anthropiques, telle que la construction prochaine d'un barrage à Adjarala, sur la diversité des poissons du bassin du fleuve Mono, une liste de l'ichthyofaune de ce bassin a été compilée. Cette liste a été établie à partir des collections des musées d'histoire naturelle et des données de la littérature. Elle a été actualisée en suivant les dernières révisions systématiques. Un total de 60 espèces natives et une espèce introduite, appartenant à 40 genres et 23 familles, sont rapportés. Les familles des Cyprinidae et des Cichlidae, avec neuf espèces chacune, sont les mieux représentées. Les Mormyridae, Alestidae et Clariidae comptent chacune six espèces alors que les autres familles contribuent avec trois espèces ou moins. Parmi les 60 espèces natives inventoriées, trois sont typiquement marines tandis que cinq autres sont estuariennes. Sur la base des collections des musées, *Raiamas senegalensis* (Cyprinidae), non signalé du bassin du Mono, a été ajouté. Les citations antérieures de *Marcusenius brucii*, *M. cyprinoides*, *Petrocephalus simus* (Mormyridae), *Labeo coubie* (Cyprinidae), *Brycinus leuciscus* (Alestidae), *Phractura ansorgii* (Amphiliidae) et *Synodontis melanopterus* (Mochokidae) du bassin du Mono, sont basées sur des identifications erronées. La présente étude a montré que la diversité des espèces de poissons du cours inférieur du Mono est probablement sous estimée, en raison d'un échantillonnage inadéquat et de l'absence de collection provenant de cette partie du bassin.

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Introduction

Western exploration and documentation of the ichthyofauna of the Mono basin started only quite recently. Indeed, Daget's (1950) paper on the freshwater fishes of the coastal regions of Togo and Dahomey (now Benin), contained the very first data on the Mono's ichthyofauna. Two cichlid species, *Tilapia zilli* (now *Coptodon zillii*; see Dunz & Schliewen, 2013) and *Tilapia heudeloti macrocephala* (now *Sarotherodon melanotheron melanotheron*; see Trewavas, 1983) were reported from the Grand-Popo Lagoon (Benin) by Daget (1950), although apparently no reference specimens were deposited in any natural history museum. The first major fish collections were made by the 'Laboratoire d'Hydrobiologie du Service des Eaux, Forêts et Chasses du Dahomey' in the 1950s during the colonial period (Gras, 1961; Lalèyè et al., 2004). Based on the study of these collections, which unfortunately have been lost, Gras (1961) reported five freshwater and four marine fish species from the lower reaches of the Mono basin in Benin. Five years later, Thys van den Audenaerde was the first to explore the ichthyofauna of the Upper Mono in Togo. His small collection from that basin, deposited at the Royal Museum for Central Africa (RMCA), contained 129 specimens belonging to nine widespread West African species, currently identified as: *Enteromius ablabes*, *Labeo parvus*, *Malapterurus beninensis*, *Clarias gariepinus*, *Heterobranchus longifilis*, *H. isopterus*, *Epiplatys togolensis*, *Hemichromis fasciatus* and *Coptodon guineensis*.

From 1969 to 1970, other important ichthyological expeditions were undertaken. These expeditions, such as those of Loiselle in 1969, Verheyen, Hulselmans and Puylaert in 1969, Stoffels in 1970 and Thys van den Audenaerde and Opdenbosch in 1970, were largely organized by the RMCA, and enabled further exploration of the Mono basin in Togo. In addition, members of the 1969 expeditions also made collections for the J. L. B. Smith Institute of Ichthyology [now the South African Institute for Aquatic Biodiversity (SAIAB)], and the United States National Museum (USNM). However, none of these collections has since been the subject of any particular publication.

Later collections from the Mono River basin, made in the period 1975 to 1986, were deposited in major natural history museums all over the world. In 1975, several specimens of *Enteromius callipterus* caught in the upper course of the Mono in Togo were deposited in the fish collection of the British Museum of Natural History (BMNH). Another expedition undertaken by Kulo and Kritsky in 1985–1986 around Kolokopé, i. e. the upper course of the Mono basin in Togo, resulted in the deposition of a small collection of fishes from the Mono River in the American Museum of Natural History (AMNH).

However, the most important collections, comprising more than 1000 specimens from 24 localities, were assembled between 1981 and 1986 by Lévêque, Paugy and Bénech in the Togolese part of the Mono basin. In the context of the Onchocerciasis Control Programme (OCP) they explored this section of the main river, as well as numerous tributaries. Their collections were all deposited at the Muséum National d'Histoire Naturelle (MNHN) in Paris. This sampling effort yielded much new data on the fish fauna of the Mono River basin, some of which was published in Paugy & Bénech (1989), including the first checklist of this river's ichthyofauna. These data were also incorporated into a guide to the fresh and brackish water fishes of West Africa (Lévêque et al., 1990, 1992). Nevertheless, the ichthyofauna of the Mono River basin remains underexplored.

Two ichthyological monitoring stations were set up in the middle section of the Mono basin to evaluate the effects of the insecticides used in the context of the OCP, one at Atchinédji and the other at Tététou (Paugy et al., 1988). The construction of the Nangbéto dam between the two monitoring stations in 1987, caused huge disruptions, including floods, in the natural flow regime. As a result, further sampling was abandoned. Thus, since 1987 no additional systematic sampling has been undertaken in the Mono basin. Nevertheless, after a short study visit to Benin in 1997, Vandewalle returned to the RMCA with a single specimen of *Labeo senegalensis* [previously reported and catalogued as *L. coubie* (see Lévêque, 2003)] from the Sazué River (Benin), a left-bank tributary of the Lower Mono. Finally, Musschoot & Lalèyè (2008), while studying the collections of *Synodontis schall* from the Mono and Ouémé basins, recognized and described a new species, *S. ouemeensis*, currently considered endemic to these two drainages and the Ogun basin (Nigeria).

In spite of the work briefly reviewed above, much remains to be learned about the ichthyofauna of the Mono River basin. Indeed, the identifications of many specimens housed in natural history collections were never subsequently reviewed, and are now outdated. In addition, since the con-

struction of the Nangbéto dam in 1987, no major ichthyological studies have been undertaken to complete and synthesize our current knowledge of the fish fauna of the Mono. Thus, we feel that an updated list of its ichthyofauna is not only desirable but important. Such a list will become even more significant if the planned construction of a second dam at Adjarala on the lower course of the Mono basin goes ahead.

Material and methods

Study area. With its lower reaches forming the border between Togo and Benin over a stretch of about 100 km, the Mono is a transnational coastal basin (Fig. 1). The river itself rises in the Koura Hills at Alédjo (≈9°21'N 01°27'E) in northwestern Benin. It is approximately 360 km long and drains a watershed of approximately 22 000 km² (Paugy & Bénech, 1989) between latitudes 6°10' and 9°00' North and longitudes 0°30' and 1°50' East. Close to the Atlantic Ocean, the river splits into two branches, one flowing towards the east and entering the Beninese lagoon system (the coastal lagoon of Grand-Popo and Lake Ahémé), and the smaller segment meandering to the west into the Togolese lagoon system (Lake Togo and the Vogan Lagoon) (Fig. 1).

Two main climatic regions can be distinguished within the Mono watershed: (1) the tropical zone, situated north of the 8th parallel and characterized by two seasons, a dry (November to March) and a rainy one (April to October) with an average total rainfall of between 1000 and 1300 mm/year; and (2) the sub-equatorial zone, situated south of the 8th parallel and characterized by four seasons, with two dry seasons (December to March and July to September) alternating with two rainy seasons (March to July and September to November), and an average annual rainfall of 900 to 1100 mm (Paugy & Bénech, 1989; Amoussou, 2010; Laïbi et al., 2012).

Currently, the Nangbéto hydroelectric dam, located approximately 180 km upstream of the mouth of the Mono, is the only major hydrological intervention within the watershed. Its reservoir, which became operational in 1987, covers an area of ≈180 km², has a maximum depth of ≈40 m and a water storage capacity of approximately $1715 \cdot 10^6$ m³. Prior to 1987, the Mono River at Athiémé (watershed ≈21 500 km²) (Fig. 1) was characterized by a significant flow from June to November, with a maximum flow rate in September (423.1 m³/s) and a flow close to zero from December to May (1.48 m³/s) (Amoussou, 2010). The installation of the Nangbéto dam markedly altered the flow regime; the flow is now permanent and floods are less intense (Oyédé, 1991). The flow rate still reaches its peak in September, albeit with a slight reduction of 3.2 % in the maximum flow (409.7 m³/s), while the minimum flow rate has increased by 97.2 % (to 52.6 m³/s) (Amoussou, 2010). The construction of a second hydroelectric dam began in 2016 at the Adjarala Rapids (Fig. 1), approximately 100 km downstream of Nangbéto (Anonymous, 1992, 1997).

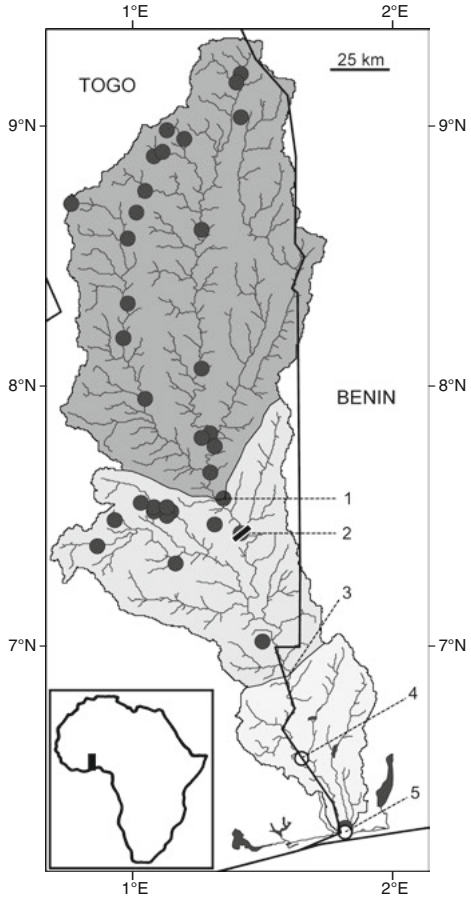

Fig. 1. Hydrographic map of the Mono basin: upper course (dark grey); middle course (light grey); lower course (very light grey). ●, sampling localities recorded for specimens housed in the MNHN and the RMCA; ○, sampling localities taken from the literature. Localities cited in the text: **1**, Atchinédji; **2,** Nangbéto dam; **3**, Adjarala; **4**, Athiémé; **5**, Grand-Popo Lagoon.

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Data and methods. Data were obtained from natural history museum collections and from relevant publications (Daget, 1950; Gras, 1961; Paugy & Bénech, 1989; Lévêque & Bigorne, 1985a–b; De Vos, 1995; Bigorne & Paugy, 1991; Lévêque et al., 1991; Paugy et al., 1994; Paugy et al., 2003a–b; Musschoot & Lalèyè, 2008). The compiled species list has been updated using the most recent systematic revisions. Specimens were mainly identified with the keys in Paugy et al. (2003a–b) except for those groups for which more recent revisions were available (Musschoot & Lalèyè, 2008; Decru et al., 2012, 2013).

All specimens originating from the Mono basin and housed at the RMCA were re-examined. Specimens held in other museums, in particular those from the Muséum National d'Histoire Naturelle (MNHN, Paris), were re-examined when their identification seemed doubtful, i.e. for those species for which their presence in the Mono basin is unlikely based on our current knowledge of their distribution. Species reported from the Mono basin by Daget (1950), Gras (1961) and Paugy & Bénech (1989) for which no collection records exist were retained in our list, since the published reports were actually based on collected specimens, most of which were identified by experts in the field (see Table 1). Of the species listed by Paugy et al. (1994), only those based on collection records were accepted and included while species whose provenance was inferred from distribution data only were disregarded.

To obtain a more informative picture of the distribution of its fish fauna, the Mono basin was first divided into three major sections (lower, middle and upper) according to its longitudinal profile reconstructed from data on elevation (Anonymous, 1962) and also into three other sections based on the location of the Nangbéto dam (see Fig. 1), i.e. (i) downstream of the dam, (ii) the section occupied by Lake Nangbéto itself, and (iii) upstream of the lake. Species lists for these two different subdivisions are given in Table 1. The sequence of families follows that of Nelson et al. (2016), while the genera and species are listed in alphabetical order.

The ecological character of the fish assemblages, i.e. freshwater, estuarine or marine species, was defined according to Albaret (1994).

All sampling localities within each section were mapped (see Fig. 1). When coordinates of the sampling localities were missing from the museum labels, the relevant gazetteers for Benin (USBGN, 1965) and Togo (USBGN, 1966) were used.

Two empirical models published by Daget & Iltis (1965) and Hugueny & Lévêque (2006) were used to predict the species richness of the Mono basin. This should enable us to evaluate if the estimates of species diversity obtained here are compatible with those expected for a basin with its surface area. In addition, the log-linear relationship between the surface areas of some West African river basins and their currently known species richness, as presented by Gourène et al. (1999), was also applied to the data for the Mono basin. The data on the species richness of the basins included are from Hugueny & Lévêque (2006).

Fish collection acronyms used are as follows: AMNH, American Museum of Natural History, New York; BMNH, The Natural History Museum, London; DPB, Direction des Pêches du Bénin, Cotonou; MNHN, Muséum National d'Histoire Naturelle, Paris; MRAC, Musée Royal de l'Afrique Centrale, Tervuren; SAIAB, South African Institute for Aquatic Biodiversity, Grahamstown; and USNM, National Museum of Natural History, Smithsonian Institution, Washington, DC. Other abbreviations employed are: HL, Head Length; $MRAC^{DL}$ = New collections deposited at MRAC by Djiman Lederoun; and SL, Standard length. All locality data have been translated into English.

Results

Sixty native and one introduced species, representing 40 genera and 23 families, have been found in the Mono basin (Table 1). With nine species each, Cyprinidae and Cichlidae are the most species-rich families, followed by Mormyridae (6), Alestidae (6), Clariidae (6). All the other families in our list are represented by three species or less (see Table 1). *Oreochromis niloticus* (Cichlidae) is the only introduced species. Three species, i.e. *Arius latiscutatus*, *Drepane africana* and *Pseudotolithus senegalensis*, are typically marine, while five others, i.e. *Aplocheilichthys spilauchen*, *Awaous lateristriga*, *Coptodon guineensis*, *Nematogobius maindroni* and *Sarotherodon melanotheron* are estuarine species according to Albaret's (1994) criteria.

The middle and upper courses of the Mono exhibit the highest species richness with 45 and 44 species, respectively (73 and 72 % of the total

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fish fauna); wheras the lower course harbors 29 species (47 %). However, these numbers may be biased due to the fact that the lower course has been poorly explored (Fig. 1). Sixteen species (26 % of the fish fauna), belonging to 13 genera and nine families, occur in all three parts of the basin. Nevertheless, each section also hosts a number of typical species. Thus, ten species (five marine or estuarine species and five freshwater species) are characteristic for the lower course, while four (one estuarine species i.e. *Awaous lateristriga* and three freshwater species) are only found in the middle course, and six (all freshwater species) in the upper course (Table 1).

Thirteen species (21 % of the fish fauna) were collected from the Mono River at Nangbéto prior to the construction of the dam and the creation of its lake (Table 1). These are all widespread species within the Mono basin. For the sections downstream and upstream of Lake Nangbéto itself, the species richness is respectively 53 (86 % of the fish fauna) and 50 (81 %) species. Forty-two species are common to downstream and upstream sections of the lake. Furthermore, eleven (five marine or estuarine and six freshwater species) are characteristic for the downstream section, while eight (all freshwater species) are restricted to the upstream section. All species reported in the present study were known from the Mono basin before the construction of the Nangbéto dam.

The mean maximum species richness predicted by the formula developed by Daget & Iltis (1965) is 61, while the Hugueny & Lévêque (2006) model yields a figure of 55 and the linear model of Gourène et al. (1999) results in 70 species (Table 2). Based on the average of the pooled means (62 species), it can be assumed that approximately 98 % of the estimated species richness is currently known. If one adopts the highest estimate (70 species), our current knowledge covers only 87 % of the species richness; however, the number of known species does fall within the lower bound predicted by that model (Table 2).

Based on our current knowledge of West African fish fauna, the taxonomic status of some species reported from the Mono basin is uncertain. In the following, we discuss some special issues: previous misidentifications, species cited for the first time from the Mono basin, and junior synonyms previously used in the literature.

Polypteridae. Only a single species of this family, *Polypterus senegalus*, was reported from the Lower Mono by Paugy & Bénech (1989), but unfortunately no specimen was preserved. However, several specimens of this species were sampled during our recent expeditions from 2011 to 2013 and have been deposited at the MRAC. All belong to the nominal subspecies *P. s. senegalus* known from West Africa, while the other subspecies, *P. s. meridionalis* is only known from the Congo River, specifically from the section extending from the Upper Lualaba River downstream to Yangambi (Banister & Bailey, 1979; Gosse, 1963, 1984, 1990).

Osteoglossidae. Lévêque et al. (1991) reported *Heterotis niloticus* from the Mono as an introduced species. A single specimen, collected in Lake Toho (Lower Mono) in 1986, is housed at the DPB. In addition, several specimens, which have been deposited at the RMCA, were collected in a number of small lakes located in the lower course and in the main course of the Mono downstream of the Nangbéto dam during our recent expeditions, indicating that the species is widespread in the basin. The first transfers of this species in Africa date from the 1950s when the species was introduced from Cameroon in to the Democratic Republic of the Congo and Gabon (see Welcomme, 1988). However, the species had already been reported from Benin (Daget, 1950; Gras, 1961) and Togo (Daget, 1950) on the basis of material collected during the colonial period in the 1940s and 1950s. That its presence in the area predates the initial period of introductions within Africa is further attested by a single specimen (MRAC 73190) collected at Lake Togo, Togoville in 1947. Therefore, *H. niloticus* is herein considered native to the area, and has already been reported as such by several authors in the past (see Daget & Iltis, 1965; Micha & Frank, 1976; Daget, 1984; Paugy, 2003a).

Mormyridae. Based on existing collections, six valid species are currently known from the Mono basin. Two of these, i.e. *Brienomyrus brachyistius* and *Mormyrus hasselquistii*, are apparently confined to the tributaries, while the remaining four species are present in both its main course and its tributaries.

The evidence adduced for the presence of *Marcusenius brucii*, *M. cyprinoides* and *Petrocephalus levequei* based on MNHN specimens and Bigorne (2003) can now be rejected, as detailed in the following. Two specimens (MNHN 1985-140

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Table 1. Annotated checklist of the fishes of the Mono River basin, together with their currently known distribution within the basin based on museum records and published literature reports. The list is arranged by (a) longitudinal profile and (b) relative to the position of the Nangbéto dam. **D**, downstream; **i**, introduced species; **LC**, Lower course; **mc**, main course; **MC**, Middle course; **Na**, Nangbéto; **t**, tributaries; **U**, Upstream; **UP**, Upper course; ●, species present; *, marine species; ○, estuarine species; **+**, species present but not reported by Paugy & Bénech (1989). Acronyms of museums are mentioned in Collections column, when relevant (see Data and methods). Major collections and bibliographical details are also given.

Family	Species	a					b		
		LC	mc MC	t MC	mc UP	t UP	DNa	Na	UNa
Polypteridae (1)	*Polypterus senegalus senegalus*	●	●				●		●
Osteoglossidae (1)	*Heterotis niloticus*	+					+		
Mormyridae (6)	*Brienomyrus brachyistius*			●			●		●
	Marcusenius senegalensis		+	+	+		+		+
	Mormyrops anguilloides		●	●	●		●		●
	Mormyrus hasselquistii					+			+
	Mormyrus rume		●	●	●	●	●		●
	Petrocephalus bovei		●		●	●	●		●
Cyprinidae (9)	*Enteromius ablabes*			●	●	●	●		●
	Enteromius callipterus		●	●	●	●	●		●
	Enteromius chlorotaenia		●	●	●	●	●		●
	Enteromius macrops					●			●
	Enteromius nigeriensis	+					+		
	Enteromius sublineatus			●		●	●		●
	Labeo parvus	●	●	●	●	●	●	●	●
	Labeo senegalensis		●	●	●		●		●
	Raiamas senegalensis				+				+
Distichodontidae (1)	*Distichodus rostratus*	●	●				●		●
Alestidae (6)	*Brycinus* cf. *imberi*	●	●	●	●	●	●	●	●
	Brycinus longipinnis	●	●	●	●	●	●		●
	Brycinus macrolepidotus	●	●	●	●	●	●	●	●
	Brycinus nurse		●	●	●		●		●
	Hydrocynus forskalii				●				●
	Rhabdalestes septentrionalis		●	●	●	●	●		●
Hepsetidae (1)	*Hepsetus odoe*	●	●	●	●	●	●	●	●
Amphiliidae (2)	*Amphilius atesuensis*			●	●	●	●		●
	Phractura clauseni			●			●		●
Mochokidae (2)	*Synodontis* cf. *obesus*		●		●	●	●		●
	Synodontis ouemeensis		●		●		●		●
Malapteruridae (1)	*Malapterurus beninensis*			●		●	●		●
Clariidae (6)	*Clarias* (*Clarioides*) *agboyiensis*			●	●	●	●		●
	Clarias (*Clarias*) *anguillaris*	●		●	●	●	●		●
	Clarias (*Clarioides*) *buthupogon*				●	●			●
	Clarias (*Clarias*) *gariepinus*	●	●	●	●	●	●	●	●

and MNHN 1991-0941) previously catalogued as *M. brucii* are herein identified as *M. senegalensis*. Both specimens have conical teeth and hence clearly differ from other West African *Marcusenius* species, such as *M. thomasi*, *M. mento*, *M. furcidens*, *M. ussheri*, *M. meronai* and *M. deboensi*, all of which have bicuspid teeth. We counted 12 scales around the caudal peduncle, indicating that they are not conspecific with *M. cyprinoides* or *M. abadii* either, as both of these species have 16 circumpeduncular scales. Therefore, the MNHN specimens might belong either to *M. senegalensis* or *M. brucii*, although the presence of the latter species in Mono basin is questionable, as Jégu & Lévêque (1984), who examined several specimens of *M. senegalensis* from the Mono River, did not report *M. brucii* from that basin. According to the key to the species of the genus *Marcusenius* published by Bigorne & Paugy (1990), *M. brucii* is only known from the Ogun and Oshun rivers in Nigeria. However, in the second edition of the guide to the fresh and brackish water fishes of West Africa, Bigorne (2003) reported both *M. brucii* and *M. senegalensis* from the Mono. We believe that this report of *M. brucii* was based on the two MNHN specimens referred to here, with which the diagnostic characters proposed by Bigorne (2003) show some overlap. Indeed, the body depth ranges from 3.1 to 4.6 times the SL in *M. senegalensis* (vs. 2.9 to 3.3 times in *M. brucii*) and the depth of the caudal peduncle varies from 2.0 to 3.6 times SL in *M. senegalensis* (vs. 1.9 to 2.0 times in *M. brucii*). For the two specimens from the Mono in the MNHN, the body depth ranges from 3.1 to 3.2 times SL and the depth of the caudal peduncle varies from 2.0 to 2.3 times in its length. While the specimen with a caudal peduncle depth of 2.3 can be attributed to *M. senegalensis*, this is not the case for the second. Indeed, both its values (3.1 and 2.0) lie within the ranges given for both nominal species, and we are therefore unable to assign this latter specimen to either *M. senegalensis* or *M. brucii* based on the diagnosis provided by Bigorne (2003). Paugy & Bénech (1989) had also mentioned that the taxonomic status of the two nominal species was unclear. Indeed, they specifically stated that it was also difficult to distinguish between the two species in the Ogun River, from which *M. brucii* was originally described. In addition, they speculated that *M. brucii* replaces *M. senegalensis* in the Mono basin. A revision of the status of both nominal species is underway, but preliminary results seem to indicate that *M. brucii* is a junior synonym of *M. senegalensis* (Boden, pers. comm.). Since we were unable to allocate the examined specimens to one of the two nominal species, we use the older name, i. e. *M. senegalensis*.

Collections	Literature
	Paugy & Bénech, 1989
MRAC[DL], DPB	
MNHN, MRAC	Paugy & Bénech, 1989; Bigorne, 2003
MNHN, MRAC	Bigorne, 2003
MNHN, MRAC, USNM	Paugy & Bénech, 1989; Bigorne, 2003
MNHN, MRAC	Bigorne, 2003
MNHN, MRAC	Paugy & Bénech, 1989; Bigorne, 2003
MNHN, USNM	Paugy & Bénech, 1989; Bigorne, 2003
MNHN, MRAC, USNM	Paugy & Bénech, 1989
BMNH, MNHN, USNM	Gras, 1961; Paugy & Bénech, 1989; Lévêque, 2003
MNHN, USNM	Paugy & Bénech, 1989; Lévêque, 2003
MNHN	Paugy & Bénech, 1989; Lévêque, 2003
MRAC[DL]	Gras, 1961
MNHN	Paugy & Bénech, 1989; Lévêque, 2003
MNHN, MRAC, USNM	Gras, 1961; Paugy & Bénech, 1989; Lévêque, 2003
MNHN	Paugy & Bénech, 1989
MRAC	
MNHN	Paugy & Bénech, 1989
MNHN, MRAC	Gras, 1961; Paugy & Bénech, 1989; Paugy, 2003c
AMNH, MNHN, MRAC, USNM	Paugy & Bénech, 1989
MNHN, MRAC, USNM	Paugy & Bénech, 1989; Paugy, 2003c
AMNH, MNHN, MRAC, USNM	Paugy & Bénech, 1989; Paugy, 2003c
MRAC	Paugy & Bénech, 1989; Paugy, 2003c
MNHN	Paugy & Bénech, 1989; Paugy, 2003c
MNHN, MRAC, USNM	Paugy & Bénech, 1989; Paugy, 2003b
MNHN, USNM	Paugy & Bénech ,1989; Skeleton et al., 2003
MNHN	Paugy & Bénech, 1989; Skeleton et al., 2003
MNHN	Paugy & Bénech, 1989; Paugy & Roberts, 2003
MNHN	Musschoot & Lalèyè, 2008
MRAC	Paugy & Bénech, 1989; Norris, 2003
MRAC	Paugy & Bénech, 1989; Teugels, 2003a
MRAC	Paugy & Bénech, 1989; Teugels, 2003a
MNHN	Paugy & Bénech, 1989; Teugels, 2003a
AMNH, MNHN, MRAC	Paugy & Bénech, 1989; Teugels, 2003a

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As regards *Marcusenius cyprinoides*, its presence in the Mono basin is attested by a single specimen (MNHN 2002-0799). However, according to Bigorne (2003), *M. cyprinoides* is only known from the Chad basin, the Benue and the Lower Niger. The specimen from the Mono has conical teeth and 12 circumpeduncular scales and is in fact conspecific with the two *M. senegalensis* specimens cited above.

The re-examined specimens of *Petrocephalus levequei* (MNHN 1985-0782: five out of 19: 62.5–76.5 mm SL) are identified here as *P. bovei*.

Table 1. (continued).

Family	Species	a					b		
		LC	mc MC	t MC	mc UP	t UP	DNa	Na	UNa
	Heterobranchus isopterus			●	●	●	●		●
	Heterobranchus longifilis		●		●	●			●
Claroteidae (2)	*Chrysichthys* (*Chrysichthys*) *auratus*	●	●	●	●	●	●	●	●
	Chrysichthys (*Melanodactylus*) *nigrodigitatus*	●	●		●		●	●	●
Ariidae (1)	*Arius latiscutatus*	+*					+*		
Schilbeidae (2)	*Schilbe intermedius*		●		●				●
	Schilbe mystus	●	●	●	●	●	●	●	●
Nothobranchiidae (2)	*Epiplatys togolensis*			○			○		
	Fundulopanchax (*Paludopanchax*) *filamentosus*	●					●		
Poeciliidae (1)	*Aplocheilichthys spilauchen*	○					○		
Centropomidae (1)	*Lates niloticus*	●	●		●		●		●
Sciaenidae (1)	*Pseudotolithus* (*Pseudotolithus*) *senegalensis*	+*					+*		
Drepaneidae (1)	*Drepane africana*	+*					+*		
Cichlidae (9)	*Chromidotilapia guntheri guntheri*	●	●	●	●	●	●	●	●
	Coptodon dageti				+				+
	Coptodon guineensis			○		○	○		○
	Coptodon zillii	●	●	●	●	●	●	●	●
	Hemichromis bimaculatus	●					●		
	Hemichromis fasciatus	●	●	●	●	●	●	●	●
	Oreochromis niloticus	i	i				i		i
	Sarotherodon galilaeus galilaeus	●	●	●	●	●	●	●	●
	Sarotherodon melanotheron melanotheron	○					○		
Gobiidae (2)	*Awaous lateristriga*			○			○		○
	Nematogobius maindroni		○		○	○	○	○	○
Anabantidae (1)	*Ctenopoma kingsleyae*	●		●	●	●	●		●
Channidae (1)	*Parachanna obscura*			●	●	●	●		●
Protopteridae (1)	*Protopterus annectens annectens*	●					●		
Total		**29**	**31**	**34**	**39**	**33**	**53**	**13**	**50**
			45		**44**				

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According to Bigorne (2003), *Petrocephalus* occurs in two distinct areas in West Africa: (1) the Sudano-Sahelian zone, which includes the Mono basin; and (2) the Guinean zone, which extends from the coastal basins of Guinea to the Ivory Coast. Given that *P. levequei* is known from the Guinean zone, it should not occur in the Mono basin. Seven species are known from the Sudano-Sahelian zone: *P. ansorgii*, *P. bane*, *P. bovei*, *P. pallidomaculatus*, *P. pellegrini*, *P. sauvagii*, and *P. soudanensis*. The specimens examined have a uniform silvery colour without the sub-dorsal spot usually found in *P. ansorgii*, *P. pallidomaculatus*, *P. sauvagii* and *P. soudanensis* (Bigorne, 2003). The specimens examined have 23–26 dorsal-fin rays and are therefore clearly different from *P. bane*, which has at least 29 (Bigorne, 2003). Therefore, the specimens might be conspecific with *P. bovei* or *P. pellegrini*. As the length of the anal-fin base varies from 3.5 to 3.6 times the SL (vs. 3.8–4.5 in *P. pellegrini*) and *P. pellegrini* is known only from the Niandan, a tributary of the Niger in Guinea (Bigorne, 2003), the MNHN specimens are herein identified as *P. bovei*, a species already known from the Mono basin (Bigorne, 2003).

Collections	Literature
MNHN, MRAC	Paugy & Bénech, 1989
MRAC	Paugy & Bénech, 1989; Teugels, 2003a
MNHN, MRAC, SAIAB	Paugy & Bénech, 1989; Risch, 2003
MRAC	Paugy & Bénech, 1989; Risch, 2003
DPB	Gras, 1961
AMNH, MRAC	Paugy & Bénech, 1989; DeVos, 2003
MNHN	Paugy & Bénech, 1989; DeVos, 2003
MNHN	Paugy & Bénech, 1989; Wildekamp & Van der Zee, 2003
	Paugy & Bénech, 1989; Wildekamp & Van der Zee, 2003
	Paugy & Bénech, 1989; Wildekamp & Van der Zee, 2003
MRAC[DL]	Paugy & Bénech, 1989; Paugy, 2003d
	Gras, 1961
	Gras, 1961
MNHN, MRAC, USNM	Paugy & Bénech, 1989; Teugels & Thys van den Audenaerde, 2003
MRAC, USNM	Teugels & Thys van den Audenaerde, 2003
MRAC	Paugy & Bénech, 1989; Teugels & Thys van den Audenaerde, 2003
MRAC	Daget, 1950; Paugy & Bénech, 1989; Teugels & Thys van den Audenaerde, 2003
MRAC[DL]	Paugy & Bénech, 1989; Teugels & Thys van den Audenaerde, 2003
MNHN, MRAC, USNM	Paugy & Bénech, 1989; Teugels & Thys van den Audenaerde, 2003
MRAC[DL]	Paugy & Bénech, 1989; Ahouansou Montcho & Lalèyè, 2008
MNHN, MRAC	Gras, 1961; Paugy & Bénech, 1989; Teugels & Thys van den Audenaerde, 2003
MRAC[DL]	Daget, 1950; Gras, 1961; Paugy & Bénech, 1989
MRAC, USNM	Paugy & Bénech, 1989; Harrison et al., 2003
MNHN	Paugy & Bénech, 1989; Harrison et al., 2003
MRAC[DL]	Paugy & Bénech, 1989
MNHN	Paugy & Bénech, 1989; Teugels, 2003b
MRAC[DL]	Paugy & Bénech, 1989

Cyprinidae. Together with the Cichlidae, Cyprinidae is the most species-rich family within the basin, with nine reported species; i. e. including six species of *Enteromius*. The genus *Barbus* sensu lato is known to be a paraphyletic assemblage with three different ploidy levels: diploid (2n = 48 or 50), tetraploid (2n = 100) and hexaploid (2n = 148–150) (Golubtsov & Krysanov, 1993; Guégan et al., 1995; Berrebi et al., 1990, 1996; Machordom & Doadrio, 2001). Currently, the name *Barbus* sensu stricto is only used for some tetraploid European species and some species endemic to the Maghreb and north-east Africa (Doadrio, 1990; Berrebi, 1998; Seegers et al., 2003). Nowadays, the West African *Barbus* s.l. are divided into two main groups: the large-sized hexaploid species and the small diploid species (Berrebi et al., 1990). While the former are assigned to the genus *Labeobarbus* (Berrebi, 1998; Skelton, 2001), the latter have long been referred to as *'Barbus'* (Berrebi et al., 1996).

Table 2. Species richness of the Mono basin as predicted by the different models used.

Model	Predicted species richness	Current species richness (N = 60) as % of predicted species richness
Daget & Iltis (1965)	61	98.4
Hugueny & Lévêque (1999)	55	109.1
Linear relationship	70	85.7

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However, the genus name *Enteromius*, being the oldest African generic-level name available, has recently been proposed to accommodate all African diploid *'Barbus'* species (Yang et al., 2015). Therefore, and although paraphyletic in its current delineation, this new nomenclature, as further motivated by Skelton (2015, 2016), has been followed throughout the present paper and is used here for all small-sized, diploid species found in the Mono basin.

Raiamas senegalensis is herein reported for the first time from the Upper Mono. Indeed, although not reported by Lévêque & Bigorne (1983) in their revision of the West African *Leptocypris* and *Raiamas*, a single lot is available (MRAC 73-11-P-674-684) registered as *Barilius macrostoma* (i. e. one of junior synonyms of *Raiamas senegalensis*). Paugy & Bénech (1989) reported the capture of a few specimens of *Labeo coubie* in the lower and middle reaches of the Mono basin. However, although these authors deposited their fish collections at the MNHN, no *L. coubie* specimens were found among this material. Nevertheless, a single specimen (MRAC 97-007-P-0001), collected at Houndjo-Houndji (≈06°18' N 01°50' E) on the lower course of the Mono was also identified as *L. coubie* (see Lévêque, 2003). The scale formula for this specimen is: 6.5/36/6.5; 4.5; 16. The upper lip is damaged, preventing the examination of its inner surface, but it is known to be smooth in *L. senegalensis* (vs. with transverse folds in *L. coubie*). However, the snout of this specimen lacks tubercles (vs. snout with small, starred, nuptial tubercles in *L. coubie*) (Lévêque, 2003). In addition, the specimen (196 mm SL) has 55 gill-rakers on the first gill arch [52–65 (size range 150–250 mm SL) for *L. senegalensis* vs. 37–47 (size range 150–250 mm) for *L. coubie*] (Lévêque, 2003). This feature clearly falls outside the range of *L. coubie*. Finally, the general appearance of the specimen is rather pale (as in *L. senegalensis*) while *L. coubie* is dark, with bluish-grey to purplish-black dorsum and lateral parts) (Lévêque, 2003). Although, both *L. coubie* and *L. senegalensis* are widespread in western Africa, the former has not been reported from the coastal basins between the Volta and the Niger, an area that includes the Mono basin. Taking all these criteria together, the MRAC specimen was identified as *L. senegalensis*, a species also collected in the lower course of the Mono during our recent expeditions (2011-2013). We therefore conclude that *L. coubie* is absent from the Mono basin.

Alestidae. Six valid species are recorded from the Mono. However, the taxonomy of one of them, *Brycinus imberi*, remains unclear. Preliminary results of a systematic revision of *B. imberi* have raised questions about the conspecificness of the Mono specimens with the syntypes originating from the Lower Zambezi River in Mozambique (Musschoot, pers. comm.). Both populations differ in the relative position of their fins and in body depth. As such, the specimens from the Mono are here referred to as *B.* cf. *imberi*.

Three specimens (MRAC 73-014-P-0086, MRAC 73-005-P-880, and MRAC 73-11-P-56) previously identified as *Brycinus leuciscus* are here re-identified as *B. nurse*. These specimens lack a parietal fontanel and have 8 teeth in the external premaxillary row (vs. fontanel present and 6 teeth on the external premaxillary row in *B. leuciscus*, *B. luteus*, *B. intermedius*, *B. longipinnis*, and *B. derhami*), and have 5.5 scales above the lateral line (vs. 4.5 in *B. carolinae*, *B. nigricauda*, *B. imberi*, *B. brevis*, and *B. macrolepidotus*). Lévêque et al. (1991) seem to have reported *B. leuciscus* from the Mono on the basis of these erroneous identifications. These re-identifications thus confirm the absence of the *B. leuciscus* in the area as reported by Paugy (1986).

Amphilidae. Two species, *Amphilius atesuensis* and *Phractura clauseni*, are present in the Mono River basin. An examination of five specimens (MNHN 1987-0715) captured in the Amou River at Amou oblo (≈07°23' N 00°52' E) and attributed to *P. ansorgii* by Paugy & Bénech (1989), concluded that they are conspecific with *Phractura* specimens from the Oulé River at Ezimé (≈07°29' N 00°56' E) (MNHN 1986-0242: 1 specimen) and the Amou River (MNHN 1986-0243: 1 specimen), identified as *P. clauseni* by Paugy & Bénech (1989). In all these re-examined MNHN specimens, the posterior tip of the pectoral fin does not reach the base of the ventral fin, which is considered diagnostic for *P. clauseni* (vs. the posterior tip of the pectoral fin does extend to the base of the ventral fin in *P. ansorgii*) (Skelton et al., 2003). Moreover, the anteriormost point of the pelvic-fin insertion is situated behind the level of a vertical line drawn through the base of the last dorsal-fin ray (vs. pelvic-fin insertion located at that level in *P. ansorgii*). Therefore, all examined specimens are here identified as *P. clauseni*.

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Mochokidae. One genus and two valid species of this family are currently found in the basin: *Synodontis* cf. *obesus* and *S. ouemeensis*. A specimen of *S. melanopterus* (MNHN 1981-0923) from the Mono River has been re-identified as *S.* cf. *obesus* during this study. It is characterized by the following combination of characters: gill slit not extending beyond pectoral-fin insertion (vs. gill slit extending ventrally beyond pectoral-fin insertion in *S. dekimpei*, *S. batensoda* and *S. membranaceus*); maxillary barbel unbranched (vs. maxillary barbel branched in *S. resupinatus*, *S. annectens* and *S. clarias*); humeral process lacking backwardly directed spines (vs. humeral process with backwardly directed spines in *S. budgetti* and *S. omias*); maxillary barbel longer than head (vs. maxillary barbel shorter than head in *S. vermiculatus*, *S. sorex*, *S. voltae*, *S. thysi*, *S. violaceus*, *S. macrophthalmus*, *S. courteti*, *S. xiphias*, *S. gobroni* and *S. guttatus*); maxillary barbel with a clearly visible, broad membrane (vs. maxillary barbel without membrane or with a barely visible rudiment at its base in *S. punctifer*, *S. ocellifer*, *S. tourei*, *S. koensis*, *S. arnoulti*, *S. schall*, *S. ouemeensis*, *S. kogonensis*, and *S. levequei*); lobes of the caudal-fin having no black edges (vs. caudal-fin lobes with black edges: *S. filamentosus* and *S. bastiani*); only the first dorsal-fin ray prolonged into a filament (vs. at least three dorsal-fin rays prolonged into filaments in *S. melanopterus*, *S. eupterus* and *S. velifer*); 34 mandibular teeth (vs. more than 48 mandibular teeth in *S. ansorgii* and *S. comoensis*); body covered with numerous small spots (vs. body with few large spots that are sometimes fused in *S. waterloti* and *S. robbianus*); interorbital distance 36.9 % of head width (vs. interorbital distance over 50 % of head width in *S. frontosus*); post-ocular length 36.8 % of HL and interorbital distance 77.9 % of snout length (vs. post-ocular length 39.6 up to 43.6 % of HL and interorbital distance 89.3 up to 103.2 % of snout length in *S. nigrita*).

It should be noted that, owing to their larger numbers of mandibular teeth [32–43 vs. 21–31 in *S. obesus* (De Weirdt, pers. comm.)], the identification of several MNHN specimens (MNHN 1981-0923; 1982-0990 and 1986-0321) as well as RMCA specimens (MRAC B1-026-P-0084-0087) from the Mono basin as *S. obesus* (Paugy & Bénech, 1989; Paugy & Roberts, 2003) remains uncertain. The status of these specimens is currently under further study (De Weirdt, pers. comm.) as they might represent a new species endemic to the Mono basin and possibly to the Ouémé basin as well. Pending the results of this study, the Mono specimens are here attributed to *S.* cf. *obesus*.

Musschoot & Lalèyè (2008) described two new West African *Synodontis* species, of which only *S. ouemeensis* is present in our study area. These authors concluded that, although *S. schall* is widespread in West Africa, it is replaced by *S. ouemeensis* in the Mono River. Hence, *S. ouemeensis* is currently regarded as being endemic to the Ogun, Mono and Ouémé rivers (Nigeria, Benin and Togo).

Malapteruridae. Only one representative, *Malapterurus beninensis*, is present in the Mono River. The family was only known from MRAC specimens previously identified as *M. electricus*, which was thought to be a widespread almost Panafrican species. Roberts (2000) revalidated *M. beninensis* which had been synonymized with *M. electricus* by Gosse (1986). This distinction was subsequently confirmed by Norris (2002). Apart from the Mono River, *M. beninensis* is known from the Lower Volta River in Ghana to the Chiloango River system in Cabinda (Angola) and the Congo, and from the island of Fernando Poo (Roberts, 2000; Norris, 2002).

Ariidae. One specimen identified as *Arius latiscutatus* and captured in Grand-Popo Lagoon (Fig. 1) in 1956, was examined in the collections of the DPB and its identification confirmed. The species has previously been reported from the basin by Gras (1961).

Schilbeidae. Two valid species are currently known from the Mono basin, i.e. *Schilbe mystus*, reported by Paugy & Bénech (1989) as its junior synonym *S. niloticus* (see De Vos, 1995), and *S. intermedius*. One specimen (MNHN 1981-0921) previously identified as *S. mystus* was re-identified as *S. intermedius* following De Vos (1995, 2003). This specimen lacks an adipose fin and is therefore not conspecific with *S. mystus*, nor with *S. micropogon*, *S. brevianalis* or *S. mandibularis* (see De Vos, 2003). The two remaining West African species to which this specimen might be attributed are *S. intermedius* and *S. uranoscopus*. As it has nine gill rakers on the lower limb of the first gill arch (8–13 in *S. intermedius* vs. 13–16 in *S. uranoscopus*), the MNHN specimen is identified here as *S. intermedius*.

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Nothobranchiidae. *Epiplatys togolensis* is currently the only species known from the Mono basin. Originally described as a subspecies of *E. sexfasciatus* and elevated to species rank by Wildekamp (1996), the only currently available specimen is MNHN 1987-1440.

Poeciliidae. Paugy & Bénech (1989) reported *Aplocheilichthys keilhacki* (as *Micropanchax keilhacki*) from the Mono basin. In addition, some specimens of *A. keilhacki* from the basin are housed at the RMCA (MRAC 91-52-P-4-7: 16.0–22.3 mm SL). However, the only valid species currently known from the basin is *Aplocheilichthys spilauchen*. Furthermore, in all four MRAC specimens the pectoral fins insert below the mid-lateral line (vs. pectoral fins on or above mid-lateral line in all other West African species of Poeciliidae, i. e. *Procatopus aberrans*, *P. similis*, *Poropanchax normani*, *P. rancureli*, *P. luxophthalmus*, *Rhexipanchax nimbaensis*, *R. lamberti*, *R. kabae*, *R. schioetzi*, *Micropanchax scheeli* [= *M. keilhacki* (see below)], *M. bracheti*, *M. ehrichi*, *M. kingie* and *M. pfaffi*). In addition, these specimens have 8 dorsal-fin rays, 11 or 12 anal-fin rays and 25–28 scales on the mid-lateral row, formulae that agree well with the description of *A. spilauchen* as provided by Wildekamp & Van der Zee (2003).

Moreover, *Micropanchax keilhacki* has been described based on two specimens from the Togo Lagoon near Djeta, southeastern Togo. However, the species does not appear in the overview of the West African species by Wildekamp & Van der Zee (2003) and the genus does not occur in the Mono (DL, unpublished data).

Sciaenidae. This family primarily consists of marine species and is represented by a single species in the Mono basin, i. e. *Pseudotolithus (Pseudotolithus) senegalensis*, which is known from the Grand-Popo Lagoon in Benin only. *Pseudotolithus senegalensis* has previously been reported from the Mono basin as *Otolithus brachygnathus* by Gras (1961). Although the species is widespread along the West African coast (Bauchot, 2003a), its presence in the Mono basin is currently not supported by any natural history museum specimen. In addition, Vreven & Snoeks (2007) reported that previous data on *Pseudotolithus* species in West and Central Africa should be treated with caution, as there has been much confusion between *P. senegallus*, *P. senegalensis* and *P. typus*. Here, we accept the report of *P. senegalensis* from the study area by Bauchot (2003a) pending the collection of fresh specimens. The species, however, is not represented among the material collected during our recent surveys (2011–2013) in the Grand-Popo Lagoon.

Drepanidae. The only species from this family reported from the Mono basin is *Drepane africana*. This species was erected for the subspecies *D. punctata africana*, known from Mauritania to Angola, while the subspecies *D. punctata punctata* (now *D. punctata*) occurs along the Indo-Pacific coast (Daget & Iltis, 1965). Gras (1961) was the first to report this species (as *D. punctata*) from the Grand-Popo Lagoon.

Although *Drepane africana* is well known and widespread along the West African coast (Bauchot, 2003b), its presence in the Mono basin is not supported by any museum specimen. Furthermore, the species was not found during our recent expeditions (2011–2013) to the Grand-Popo Lagoon.

Cichlidae. With nine valid species currently known from the Mono basin, this family is, together with the Cyprinidae, the most species-rich in the study area. We found MRAC specimens identified as *Tilapia galilaea multifasciata* [= *Sarotherodon galilaeus multifasciatus*] and as *T. g. galilaea* [= *S. g. galilaeus*], which would indicate that both subspecies are found sympatrically in the Mono. According to Trewavas (1983), these two subspecies differ from each other in the median number of dorsal spines: 15 in *S. g. multifasciatus* vs. 16 in *S. g. galilaeus*. Most of the specimens from the Mono basin have 16 dorsal spines. As such, they are considered as *S. g. galilaeus* and not *S. g. multifasciatus*, which conforms to the reported occurrence of the former in the area (see Trewavas, 1983; Teugels & Thys van den Audenaerde, 2003).

The brackish water subspecies *Sarotherodon melanotheron melanotheron* was reported from the Mono at the Grand-Popo Lagoon by Daget (1950) as its junior synonym *Tilapia heudeloti macrocephala* (see Trewavas, 1983). Paugy & Bénech (1989) and Paugy et al. (1994) reported the species from the Mono by referring to Daget's (1950) report. Although the species is lacking in the existing collections from the basin, several specimens were recently collected from the Lower Mono (small lakes and Grand-Popo Lagoon) and have been deposited at the RMCA.

Oreochromis niloticus was introduced into

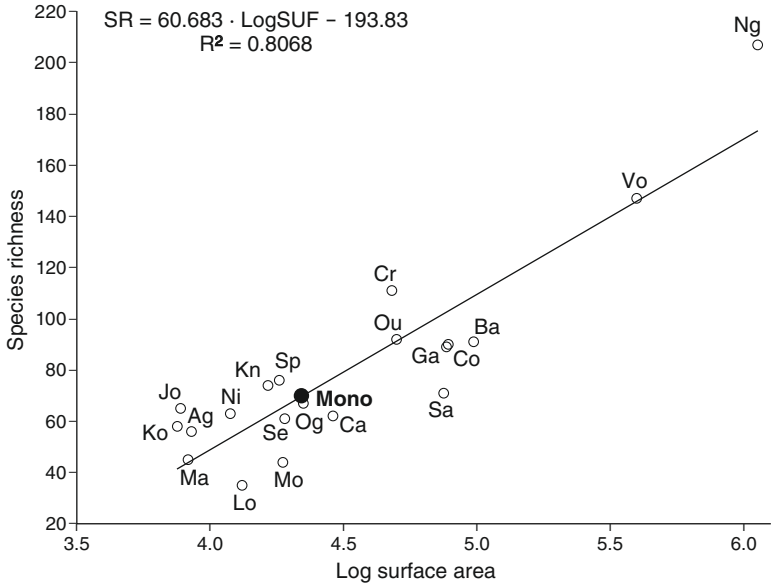

Fig. 2. Scatterplot of species richness (SR) against the logarithm of the surface area (LogSUF) of twenty West African coastal river basins. ○, basins used to obtain the regression line; ●, position of the Mono basin on the regression line based on its known surface area (22 000 km²) with an inferred species richness of 70 species; **Ag**, Agnébi; **Ba**, Bandama; **Ca**, Cavally; **Co**, Comoé; **Cr**, Cross; **Ga**, Gambie; **Jo**, Jong; **Kn**, Konkouré; **Ko**, Kolenté; **Lo**, Lofa; **Ma**, Mano; **Mo**, Moa; **Ni**, Nipoué; **Ng**, Niger; **Og**, Ogun; **Ou**, Ouémé; **Sa**, Sassandra; **Se**, Sewa; **SP**, St Paul; **Vo**, Volta.

Benin and Togo for the purposes of aquaculture in 1979 (Lazard, 1990). However, specimens of *O. niloticus* escaped from the hatcheries and quickly established themselves in the nearby ponds and streams (Lalèyè et al., 2004). The only specimen reported (but not preserved) from the main course of the Mono was collected at Atchinédji (≈07°34' N 01°21' E), upstream of the Nangbéto dam reservoir, by Paugy & Bénech (1989). Moreover, Ahouansou Montcho & Lalèyè (2008) reported the species from Lake Toho (≈06°37' N 01°46' E: Lower Mono basin). The Monseigneur Robert Sastre Aquaculture Station (≈06°37' N 01°46' E), from where *O. niloticus* specimens might have escaped, is situated in the neighbourhood of the lake.

Discussion

Paugy & Bénech (1989), based on both a literature review and a study of museum collections, reported a total of 61 native and one introduced species (*Oreochromis niloticus*) for the Mono basin. Lévêque et al. (1991) reported only 59 native species for the Mono basin, based on a survey of museum collections only. A compilation of the species occurrence information, as provided in the faunal guides to the fresh- and brackish water fishes of West Africa (Lévêque et al., 1990, 1992; Paugy et al., 2003a–b) for the Mono basin, gives a total of 52 native and one introduced species for the basin.

The present study reports a total of 60 native and one introduced species. Although this number differs very little from that obtained by Paugy & Bénech (1989), our list does not include ten of the species reported by those authors, while incorporating nine others. The species not included in our list are: *Marcusenius brucii*, *Petrocephalus* sp., *Pollimyrus isidori* (Mormyridae), *Labeo coubie* (Cyprinidae), *Phractura ansorgii* (Amphiliidae), *Clarias camerunensis* (Clariidae), *Epiplatys bifasciatus*, *Foerschichthys flavipinnis* (= *F. nigeriensis*), *Fundulosoma thierryi* (Nothobranchiidae) and *Aplocheilichthys keilhacki* (= *Micropanchax keilhacki*) (Poeciliidae). The species of Clariidae and Nothobranchiidae were omitted because the localities previously reported for them do not lie within the Mono basin. Indeed, although they are known

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from Togo [*C. camerunensis* from Missahohe (≈06°57' N 00°35' E) and Kousountou (≈06°56' N 00°37' E); *E. bifasciatus* from Agalopé (≈06°26' N 01°16' E); *F. nigeriensis* from Agalopé and from a tributary of the Lili River between Tsevié and Aguatopé (≈06°26' N 01°15' E); and *F. thierryi* from a pond at Assahoun near the railroad (≈06°27' N 00°55' E)], their presence in the Mono basin is not substantiated by any museum specimen.

Furthermore, only a single *Marcusenius* species, *M. senegalensis*, has been retained, as *M. brucii*, which was previously reported from the Mono basin, is most probably a junior synonym of *M. senegalensis* (Boden, pers. comm.). All *Petrocephalus* specimens examined belong to *P. bovei*, a species also reported by Paugy & Bénech (1989). The sole report of *Pollimyrus isidori* is based on misidentifications of *P. bovei* (see Paugy & Bénech, 1989). Similarly, the earlier reports of *Phractura ansorgii* and *Aplocheilichthys keilhacki* (= *Micropanchax keilhacki*) are shown here to rest on the misidentification of *P. clauseni* and *A. spilauchen*, respectively (see Results). The nine species added to our list (see Table 1) are either based on comparisons with museum specimens (six species) or on published records (three species).

Some reports of additional species, such as *Brycinus leuciscus*, *Marcusenius cyprinoides*, *Petrocephalus levequei* and *Synodontis melanopterus*, are based on misidentifications or mislocalizations (see Results). *Parailia pellucida*, previously reported for the Mono basin by De Vos (2003), was also removed from the list. That attribution was presumably based on De Vos' (1995) citation of Loiselle (1971), who reported the presence of *P. pellucida* in the Zio River at Toblekope (≈06°17' N 01°13' E: Togo). It is clear, however, that the Zio River belongs to the Lake Togo basin (see Paugy & Bénech, 1989). This explains why no specimens of this species from the Mono basin can be found in natural history collections. Similarly, *Hippopotamyrus pictus* was also not included in our list as the specimens examined by Lévêque & Bigorne (1985a) and Bigorne (2003) [MNHN 1981-736, MRAC 73-13-P-43-44 from the Oti River (≈10°40' N 00°47' E) and MNHN 1982-964 from the Kara River (≈10°01' N 00°25' E)] were actually collected from tributaries of the Volta River basin in northern Togo. Furthermore, the supposed presence of *Enteromius atakorensis* in the Mono basin mentioned by Lévêque et al. (1991) also seems to be in error. Indeed, to our knowledge, the only known specimen from Togo (AMNH 57314), also originates from the Kara River (≈10°01' N 00°25' E). Finally, two species names are replaced in our list: *Malapterurus beninensis* replaces *M. electricus* and *Synodontis ouemeensis* replaces *S. schall* in the Mono basin.

Species occurrences reported in this study were not compared to those cited in Paugy et al. (1994). These authors established a list of 73 native taxa by using the distribution maps of all West African species published by Lévêque et al. (1990, 1992), rather than point sampling, to infer the presence of species in particular catchment areas. If a species was reported to be present in the neighbouring basins to the left and the right, Paugy et al. (1994) considered it to be present in the intermediate basin, which is certainly not always the case (see Gourène et al., 1999). For example, recent studies have shown that *Enteromius atakorensis* (see Lévêque, 2003), *Pollimyrus adspersus* (see Bigorne, 2003), *Poropanchax normani*, *Epiplatys spilargyreius* (see Wildekamp & Van der Zee, 2003) and *Mastacembelus nigromarginatus* (see Vreven, 2003), reported from the Mono basin by Paugy et al. (1994), are in fact not present.

The number of species actually present in the basin almost certainly exceeds the total of 60 native species listed here. The lower course of the basin has so far been sampled only cursorily (Fig. 1) and there is reason to believe that further sampling campaigns in this area will significantly increase its currently known species richness. However, using a variety of predictive models, an average species richness of 62 ± 8 species was obtained for the whole basin. The overall mean therefore differs by only two species from our current estimate of the total species richness of the entire basin.

Welcomme (1985), Hugueny (1990), Oberdorff et al. (1993), Tito de Morais & Lauzanne (1994), Thiel et al. (1995), Koné et al. (2003) and Lalèyè et al. (2004) showed that the number of species increases as one proceeds downstream in the river. According to the present inventory, the upper and middle courses of the Mono each host more species than the lower part of the basin. This disparity is likely to be due to a sampling bias, and supports the hypothesis that particular attention to sampling in the lower course of the basin will reveal additional species. Indeed, Lévêque et al. (1990, 1992) and Da Costa et al. (2000) noted that the migration of marine and estuarine taxa into rivers enriches their fish communities, especially in their lower courses. Strikingly, such taxa are

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poorly represented (≈ 13 %) in our inventory, and additional marine and estuarine species, such as *Caranx* spp., *Eleotris* spp., *Cynoglossus senegalensis*, *Elops* spp., are to be expected within the extensive estuarine area. For example, these taxa represent ≈ 25 % of the fish fauna of Ouémé River (Lalèyè et al., 2004).

Although several species are characteristic for each of the different sectors of the basin, this finding is also likely to result, at least in part, from sampling biases. The available data on the ichthyofauna of the upper and middle courses are mainly based on the collections made by Lévêque, Paugy and Bénech (see Paugy & Bénech, 1989), who used multiple fishing techniques. However, our current knowledge of the ichthyofauna of the lower course is based on the catches from artisanal fisheries only.

The species richness of the Mono basin (60 species, 22 000 km^2) is broadly comparable to that of the well-known neighbouring coastal basins, such as the Ouémé basin to the east [122 species for 50 000 km^2 (Lalèyè et al. 2004)] and the Volta basin to the west [147 species for 398 371 km^2 (Hugueny & Lévêque, 2006)], taking into account the differences in surface area (see Fig. 2). However, 20 species reported from the Mono basin are not known from the Ouémé basin despite recent sampling undertaken by Lalèyè et al. (2004). The species missing in the Ouémé basin according to this list are: *Amphilius atesuensis*, *Aplocheilichthys spilauchen*, *Arius latiscutatus*, *Awaous lateristriga*, *Enteromius ablabes*, *E. nigeriensis*, *E. sublineatus*, *Brycinus* cf. *imberi*, *Clarias anguillaris*, *C. buthupogon*, *Drepane africana*, *Epiplatys togolensis*, *Fundulopanchax (Paludopanchax) filamentosus*, *Heterobranchus isopterus*, *Mormyrus hasselquistii*, *Nematogobius maindroni*, *Phractura clauseni*, *Pseudotolithus (P.) senegalensis*, *Coptodon dageti* and *Synodontis* cf. *obesus*. However, only five species, i. e. *A. lateristriga* (MNHN 1984-0503), *E. sublineatus* (MNHN 1982-1349, MNHN 1982-1164, MNHN 1982-1351, MNHN 1982-1352), *E. togolensis* (MRAC 73-5-P-3134-148), *F. filamentosus* (FB 2743415: not seen) and *H. isopterus* (MNHN 1982-0944), are represented by museum vouchers from the Ouémé River, while three more species, i. e. *A. spilauchen* (see Wildekamp & Van der Zee, 2003), *C. anguillaris* (see Teugels, 2003a) and *N. maindroni* (see Harrisson et al., 2003), are only listed in the literature, without preserved voucher specimens. The absence of the remaining 12 species (excluding the marine species *A. latiscutatus*, *D. africana*, and *P. senegalensis*), from the Ouémé is most likely due to limited sampling of the lagoon area. On the other hand, 80 species (46 marine or estuarine species and 34 freshwater species) reported from the Ouémé basin have not been found in the Mono basin. In the case of marine and estuarine species, this may be partly due to the undersampling of the lower regions of the Mono River (see also above).

Ten species, including the three aforementioned marine species, currently known from the Mono basin, i. e. *Arius latiscutatus*, *Brienomyrus brachyistius*, *Brycinus* cf. *imberi*, *Clarias buthupogon*, *Drepane africana*, *Epiplatys togolensis*, *Fundulopanchax filamentosus*, *Pseudotolithus senegalensis*, *Synodontis* cf. *obesus* and *S. ouemeensis*, are absent from the Volta basin. Conversely, 102 species (10 marine or estuarine species and 92 freshwater species) identified from the Volta basin are absent from the Mono. Based on these data, it seems that, despite its modest size, the Mono River harbors its own particular ichthyofauna, which is not just a depauperate version of the species diversity found in its larger neighbours, the Ouémé and the Volta. Therefore, further detailed documentation of these apparently complex patterns of species distribution might shed new light on the hydrographic history of the region.

In evaluating the decline and extinction of fishes, at least five causes are typically listed (Helfman, 2007; Tyus, 2011). Helfman (2007) refers to these as the HIPPO factors: (1) Habitat loss; (2) Introduced species; (3) Pollution; (4) (human) Population and consumption; and (5) Overexploitation. Montgomery (2003) had previously referred to history, i. e. our inability to learn from past mistakes, as yet another important cause. According to Helfman (2007), for freshwater fishes, the principal cause of decline and extinction is habitat degradation, including disruption of the bottom, removal of structure, water withdrawal, hydrological alterations (including impoundments) eutrophication, and sediment deposition. However, generally, a combination of several of these HIPPO factors together with aspects of the basin's history is usually at work (Helfman, 2007; Tyus, 2011). Overall, the importance of each factor in the erosion of fish diversity has already been quite well documented and discussed for other continents (see Miller et al., 1989) but is, with the exception of Southern African species (see Skelton, 1990) and the Lake Victoria cichlid species flock (Harrison & Stiassny, 1999), largely lacking in Africa as a whole. Indeed, in Southern

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Africa, the two major, direct causes of decline among freshwater fishes are habitat destruction (H) and introduced species (I) (see Skelton, 1990), whereas for Lake Victoria, the primary factors are usually habitat alteration (H), competition and predation by introduced species (*Lates niloticus*) (I), overfishing (O) and pollution (P) (see Harrison & Stiassny, 1999).

In the Mono River, all above-mentioned factors are present, although in different degrees. The dam built between 1984 and 1987 at the level of Nangbéto village in Togo resulted in the formation of a lake, which covers an area of 180 km^2. This changed the hydrological regime downstream (see above). *Oreochromis niloticus* was introduced into the newly created Lake Nangbéto in 1986 to support the fisheries (Paugy & Bénech, 1989). This man-made lake is now the main center of fishing activity for the entire basin (DL, unpublished data). The fish fauna of the small lakes in the lower basin, i.e. mainly cichlids such as *Sarotherodon galilaeus* and *S. melanotheron*, is currently subject to intense and largely uncontrolled exploitation (Lederoun et al., 2015, 2016). In addition, many cotton fields (intensively treated with pesticides) lie along the banks of the Mono, and their runoffs drain into this river. Finally, the use of pesticides and other toxic chemicals for fishing is a common practice in the Lower Mono basin during the low-water period, approximately between December to March (DL, unpublished data). The combination of all these anthropogenic changes has most probably impacted the fish fauna of the basin; hence the pressing need to continue monitoring and documenting its diversity.

In conclusion, it should be noted that, while the present paper provides an assessment of our current knowledge of the fish fauna of the Mono, it is obvious that the existing collections do not allow us to realistically evaluate the species richness of the river basin prior to the advent of the Nangbéto dam. Sampling campaigns carried out before dam construction did not cover the entire basin, and the area downstream of the dam, in particular, has been largely neglected. However, with 60 native species currently known for its watershed of about 22 000 km^2, the fish species diversity of the Mono basin is relatively similar to that found in other basins of the West African ichthyofaunal province. The list presented herein will undoubtedly be an indispensable asset in assessing the possible impacts of the Nangbéto dam on the fish diversity of the basin. In addition, it will supply baseline data for further exploration of the fish diversity of the basin. This is, among others, especially true for the Mono downstream of Adjarala rapids i.e. the lower course of the Mono and this before the construction of a future dam at this site.

Acknowledgements

We would like to thank Patrice Pruvost, Romain Causse, Gaby Zora and Claude Ferrara (MNHN) for the loan of specimens under their care; Tobias Musschoot (FishBase, RMCA) for the map of the study area; Gert Boden (FishBase, RMCA) for the digital copy of the MRAC holdings of the Mono and the surrounding region; Miguël Parrent (RMCA) for curatorial assistance; Rainer Sonnenberg (Zoologisches Forschungmuseum Alexander Koenig, Bonn, Germany) for confirming the identification of *Epiplatys togolensis*; and David De Weirdt for sharing his knowledge of *Synodontis*. This work is part of the Ph.D. dissertation of the first author at the University of Liège funded by a scholarship of the Agence Universitaire de la Francophonie (AUF) (2010-2013) and supplemented by a research grant of the International Foundation for Science (IFS, A/5327-1) (2013-2015).

Material examined. *Polypterus senegalus senegalus*. MRAC 2011-026-P-0060–0068, 9, 224.8–282.8 mm TL; Benin: Codjohoué, Mono River.

Heterotis niloticus. MRAC 2011-026-P-0052, 1, 262.6 mm SL; Bénin: Sazué River at Houndjo-Houndji, affluent of Mono River.

Brienomyrus brachyistius. MRAC 73-11-P-31–46, 16, 71.6–101.2 mm SL; Togo: Amoutchou River at Ebéva.

Marcusenius senegalensis. MNHN 1985-0140, 2, 130.1–133.1 mm SL; Togo: Amoutchou River at Ebeva. – MNHN 1991-0941, 1, 89.4 mm SL; Togo: Na River at Paratao. – MNHN 2002-0799, 1, 81.1 mm SL; Togo: Ogou at Tchamba. – MRAC 2013-004-P-0114-0123, 10, 110.5-142.9 mm SL; Benin: Togodo, Mono River.

Mormyrops anguilloides. MRAC 2012-021-P-0103–0110, 8, 166.3–235.5 mm SL; Benin: Togodo, Mono River.

Mormyrus hasselquistii. MRAC 73-11-P-52, 1, 247.1 mm SL; Benin: Alédjo, Mono River.

Mormyrus rume. MRAC 2012-021-P-0111–0113, 3, 160.2–277.9 mm SL; Benin: Togodo, Mono River.

Petrocephalus bovei. MNHN 1985-0755, 1, 82.5 mm SL; Benin: Atchinedji, Mono River. – MNHN 1985-0756, 1, 67.7 mm SL; Benin: Tététou, Mono River. – MRAC 2012-021-P-0098–0099, 2, 57.9–58.2 mm SL; Benin: Adjarala, Mono River.

Enteromius ablabes. MNHN 1988-1803, 2, 43.2–55.1 mm SL; Togo: Amou River at Oblo. – MRAC 73-5-P-2413–468, 50, 17.8–43.0 mm SL; Togo: Agbofon near Atakpamè, Mono River. – MRAC 76-32-P-4077–4078, 2, 19.0–30.3 mm SL; Togo: 5-10 miles for d'Atakpamé, Mono River.

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Enteromius callipterus. MNHN 1989-0540, 2, 46.2–53.9 mm SL; Togo: Amou River at Amou oblo. – MRAC 2013-004-P-0038–0062, 25, 40.6–43.3 mm SL; Benin: Lomon River at Hontomè.

Enteromius chlorotaenia. MNHN 1981-992, 2, 71.8–73 mm SL; Togo: Atakpame, Mono River.

Enteromius nigeriensis. MRAC 2012-021-P-0001–0016, 16, 36.8–49.0 mm SL; Benin: Djonnougui, Mono River. – MRAC 2013-004-P-0001–0032, 32, 33.9–48.8 mm SL; Benin: Djonnougui, Mono River.

Enteromius sublineatus. MNHN 1982-1353, 1, 69.7 mm SL; Togo: Tététou, Mono River. – MNHN 1982-1165, 1, 78.6 mm SL; Togo: Kpessi, Mono River. – MRAC 2013-004-P-0063–0089, 27, 14.0–45.9 mm SL; Benin: Paratago to the right of the bridge on the way to Aledjo, Mono River.

Labeo parvus. MRAC 73-5-P-1891, 1, 159.7 mm SL; Togo: Agbofon near Atakpamè, Mono River. – MRAC 73-14-P-229–234, 6, 100.5–143.7 mm SL; Togo: Agbofon near Atakpamè, Mono River. – MRAC 73-14-P-236–242, 7, 79.9–165.3 mm SL; Togo: Ogbone, Mono River. – MRAC 2013-004-P-0104–0108, 5, 84.9–239.4 mm SL; Benin, Togodo, Mono River.

Labeo senegalensis. MNHN 1981-0913, 1, 141.5 mm SL; Togo: Tététou, Mono River. – MRAC 97-007-P-0001, 1, 196 mm SL; Benin: Sazué River at Houndjo-Houndji, affluent of Mono River. – MRAC 2012-021-P-0045–0048, 4, 110.7–134.8 mm SL; Benin: Togodo, Mono River.

Raiamas senegalensis. MRAC 73-11-P-674–684, 11, 91.8–163.5 mm SL; Togo: Fazao, Mono River.

Distichodus rostratus. MNHN 1981-0888, 1, 152.3 mm SL; Togo: Tététou, Mono River. – MRAC 2012-021-P-0102, 1, 188.8 mm SL; Benin: Djossouhé, Mono River.

Brycinus cf. *imberi*. MRAC 73-11-P-0059, 1, 73.2 mm SL; Togo: Tététou, Mono River. – MRAC 2012-021-P-0022–0028, 7, 80.2–91.9 mm SL; Togo: Nangbéto dam at Atakè, Mono River.

Brycinus longipinnis. MRAC 73-014-P-0191–0228, 38, 61.0–70.0 mm SL; Togo: Dotékopé, Mono River. – MRAC 2012-021-P-0029–0041, 13, 50.6–58.0 mm SL; Togo: Nangbéto dam at Akodéseva, Mono River.

Brycinus macrolepidotus. MRAC 73-05-P-619–621, 3, 96.7–117.5 mm SL; Togo: Corrékopé, Mono River. – MRAC 73-14-P-55–59, 3, 92.7–114.5 mm SL; Togo: Kolékopé, Mono River. – MRAC 73-14-P-60–81, 22, 84.0–130.4 mm SL; Togo: Dotékopé, Mono River. – MRAC 2011-026-P-0015–0019, 5, 130.9–178.6 mm SL; Benin: Adjarala, Mono River.

Brycinus nurse. MRAC 73.005-P-880, 1, 149.2 mm SL; Togo: Corrokopé, Mono River. – MRAC 73-11-P-56; 1, 107.3 mm SL; Togo: Ebeva, Mono River. – MRAC 73-014-P-0086, 1, 86.0 mm SL; Dotékopé, Mono River. – MRAC 2011-026-P-0020–0021, 2, 140.5–142.5 mm SL; Togo: Nangbéto dam at the end of the dike, Mono River.

Hydrocynus forskalii. MRAC 73-14-P-53–54, 2, 143.5–208.5 mm SL; Togo: Ogbone, Mono River.

Rhabdalestes septentrionalis. MNHN 2000-0650, 2, 35.9–40.9 mm SL; Togo: Kpessi, Mono River. – MNHN 2000-0649, 2, 28.4–36.7 mm SL; Togo: Tététou, Mono River. – MRAC 2012-021-P-0049–0088, 40, 47.4–54.7 mm SL; Togo: Nangbéto dam at Akodéseva, Mono River.

Hepsetus odoe. MRAC 2012-021-P-0043–0044, 2, 160.5–166.5 mm SL; Benin: Togodo, Mono River.

Amphilius atesuensis. MNHN 1987-0711, 5, 49.1–64.8 mm SL; Togo: Amou River at Amou oblo.

Phractura clauseni. MNHN 1986-0242, 1, 68.8 mm SL; Togo: Oule River at Ezime. – MNHN 1986-0243; 1, 46,7 mm SL; Togo: Amou River at Amou oblo. – MNHN 1987-0715, 5, 39.5–61.4 mm SL; Togo: Amou River at Amou oblo. – MNHN 1987-716, 1, 64.6 mm SL; Togo: Oule River at Ezime.

Synodontis cf. *obesus*. MRAC 17-25-P-37–38, 2, 52.8–56.0 mm SL; Togo: Tchamba, Mono River. – MRAC 73-14-P-359–362, 4, 104.5–144.0 mm SL; Togo: Kolékopé, Mono River. – MRAC 73-14-P-363–368, 6, 89.5–159.5 mm SL; Togo: Ogbone, Mono River. – MNHN 1981-0923, 1, 133.3 mm SL; Togo: Tététou, Mono River. – MNHN 1982-0990, 1, 97.2 mm SL; Togo: Tététou, Mono River. – MNHN 1986-0321, 1, 114.3 mm SL; Togo: Atchinedji, Mono River.

Synodontis ouemeensis. MNHN 1981-927, 1, 104 mm SL; Togo: Atchinedji, Mono River. – MNHN 1981-928, 1, 149 mm SL; Togo: Tététou, Mono River. – MNHN 1982-995, 1, 55 mm SL; Kpessi, Mono River. – MNHN 2002-0783, 1, 107 mm SL; Togo: Atchinedji, Mono River.

Malapterurus beninensis. MRAC 73-11-P-797–807, 11, 61.5–168.0 mm SL; Togo: Ebeva, Mono River.

Clarias (*Clarioides*) *agboyiensis*. MRAC P-73072.0115, 1, 102.7 mm SL; Togo: Botike-Zogue, river between Aufouin and Atlekogou. – MNHN 2002-783, 2, 66.9–80.2 mm SL; Togo: Anié River at Sotouboua.

Clarias (*Clarias*) *anguillaris*. MRAC 2013-004-P-0109, 1, 203.0 mm SL; Benin: Grand-Popo Lagoon at Onkuhoué, Mono River.

Clarias (*Clarioides*) *buthupogon*. MNHN 1986-0404, 3, 63.7–65.7 mm SL; Togo: Aou losso, Mono River. – MNHN 1986-0406, 1, 78.5 mm SL; Togo: Kri-kri, Mono River.

Clarias (*Clarias*) *gariepinus*. MRAC 2013-004-P-0110, 1, 203.0 mm SL; Benin: Grand-Popo Lagoon at Houssoukoé, Mono River.

Heterobranchus isopterus. MRAC 73-05-P-3021–3022, 2, 83.3–103.3 mm SL; Togo: Dotékopé, Mono River. – MRAC 2013-004-P-0111-0112, 2, 133.0–155.7 mm SL; Benin: Lomon River at Hounssahoué.

Heterobranchus longifilis. MRAC 2011-026-P-0051, 1, 221.8 mm SL; Benin: Djonnougui, Mono River.

Chrysichthys (*Chrysichthys*) *auratus*. MRAC 2011-026-P-0035-0037, 3, 102.3–122.7 mm SL; Benin: Vodomey, Mono River.

Chrysichthys (*Melanodactylus*) *nigrodigitatus*. MRAC 2011-026-P-0034, 1, 105.6 mm SL; Togo: Nangbéto dam at Akodéséva, Mono River.

Schilbe intermedius. MNHN 1981-0921, 1, 181.3 mm SL; Togo: Tététou, Mono River. – MRAC 2011-026-P-0071–0073, 3, 129.5–171.8 mm SL; Benin: Adjarala, Mono River.

Schilbe mystus. MRAC 2011-026-P-0074–0083, 10, 143.5–259.8 mm SL; Benin: Adjarala, Mono River.

Epiplatys togolensis. MNHN 1987-1440, 1, 34.1 mm SL; Togo: Amou River at Amou oblo.

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Fundulopanchax (Paludopanchax) filamentosus. MRAC 73-72-P-201–218, 18, 14.0–27.9 mm SL; Togo: Aklakou-Molokou, Mono River.

Aplocheilichthys spilauchen. MRAC 91-52-P-4–7, 4, 16.0–22.3 mm SL; Togo: Agamè, Mono River.

Lates niloticus. MRAC 2011-026-P-0053–0054, 2, 202.7–232.7 mm SL; Togo: Nangbéto dam at Akodéseva, Mono River.

Chromidotilapia guntheri guntheri. MRAC 2011-026-P-0032–0033, 2, 82.5–83.6 mm SL; Togo: Nangbéto dam at Djatokopé, Mono River.

Coptodon dageti. MRAC 73-61-P-1–3, 3, 93.8–120.7 mm SL; Togo: 36 km E of Ayengré, Mono River.

Coptodon guineensis. MRAC 2011-026-P-0089, 1, 193.4 mm SL; Benin: Gbagan Lagoon at Zogbédji, Mono River.

Coptodon zillii. MRAC 73-14-P-448, 1, 149.5 mm SL; Togo: Kolékopé, Mono River. – MRAC 2011-026-P-0090, 1, 129.0 mm SL; Benin: Codjohoué, Mono River. – MRAC 2013-004-P-0132, 1, 79.9 mm SL; Benin: Lomon River at Hounssahoué under the bridge on the way to the Tohoun border.

Hemichromis bimaculatus. MRAC 2011-026-P-0039–0046, 8, 43.0–67.5 mm SL; Benin: Lac Loké at Agbodo, Mono River.

Hemichromis fasciatus. MRAC 2011-026-P-0047–0050, 4, 66.1–117.5 mm SL; Togo: Nangbéto dam at the end of the dike, Mono River.

Oreochromis niloticus. MRAC 2011-026-P-0055–0059, 5, 80.1–126.4 mm SL; Togo: Nangbéto dam at Akodéséva, Mono River.

Sarotherodon galilaeus galilaeus. MRAC 2012-021-P-0118, 1, 99.4 mm SL; Benin: Lake Doukon at Doukonta, Mono River.

Sarotherodon melanotheron melanotheron. MRAC 73-14-P-396–397, 2, 136.0–178.2 mm SL; Togo: Korékopé, Mono River. – MRAC 73-14-P-441–447, 7, 125.5–177.0 mm SL; Togo: Dotékopé, Mono River. – MRAC 73-14-P-449–472, 24, 41.5–58.7 mm SL; Togo: Dotékopé, Mono River. – MRAC 2011-026-P-0069–0070, 2, 118.9–129.3 mm SL; Benin: Lac Toho at Logbo, Mono River.

Awaous lateristriga. MRAC 73-14-P-498–500, 3, 102.0–106.2 mm SL; Togo: Kolékopé, Mono River. – MRAC 73-14-P-501–502, 2, 96.0–104.0 mm SL; Togo: Dotékopé, Mono River. – MRAC 2011-026-P-0001–0005, 5, 65.0–89.5 mm SL; Benin: Djonnougui, Mono River.

Nematogobius maindroni. MNHN 2000-0640, 1, 57.5 mm SL; Togo: Kpessi, Mono River. – MNHN 1988-0480, 2, 49.4-51.4 mm SL; Togo: Tététou, Mono River.

Ctenopoma kingsleyae. MRAC 2011-026-P-0038, 1, 95.0 mm SL; Benin: Togodo, Mono River. – MRAC 2012-021-P-0100–0101, 2, 89.7–100.0 mm SL; Benin: Lac Toho at Logbo, Mono River.

Parachanna obscura. MNHN 1988-0478, 1, 52.7 mm SL; Togo: Amou River at Amou oblo. – MRAC 2012-021-P-0114–0117, 4, 143.9–178.0 mm SL; Benin: Lake Toho at Logbo, Mono River.

Protopterus annectens annectens. MRAC 2013-004-P-0131, 1, 239.8 mm TL; Benin: Djonnougui, Mono River.

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Received 14 March 2017
Revised 16 November 2017
Accepted 6 December 2017

Ichthyological Exploration of Freshwaters

An international journal for field-orientated ichthyology

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Ichthyological Exploration of Freshwaters

An international journal for field-orientated ichthyology

Volume 28 · Number 2 · January 2018

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Cover photograph
Nothobranchius ditte Nagy (Photograph by Béla Nagy)
Béla Nagy
(this volume pp. 115–134)

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