

# General characteristics of ichthyological fauna



CHRISTIAN  
LÉVÊQUE

DIDIER  
PAUGY

**C**urrently, among nearly 11,000 fresh and brackish water fish species described in the world (Nelson, 1994; Froese & Pauly, 2016), 3,360 species have been described from Africa, belonging to 95 families (Lévêque *et al.*, 2008). Initially, these species were listed in the Check-List of the Freshwater Fishes of Africa or CLOFFA (Daget *et al.*, 1984, 1986a and b, 1991), but since its publication numerous species have been described or placed in synonymy following taxonomic revisions. These revisions also concerned the higher entities (genera, families). Thus, many families have been broken up into several others. For example the old family Bagridae has been divided into three families: Bagridae, Claroteidae and Austroglanididae (Mo, 1991). Conversely, some families who still retained an uncertain status could now be grouped. Thus, genetic studies have confirmed the monophyly of the Cromeriidae and Grasseichthyidae with the Kneriidae within the Gonorynchiformes (Lavoué *et al.*, 2005).

The discovery and description of new species of fish still constitute an important scientific activity in Africa. Rich faunas of cichlids endemic to the Great Lakes of East Africa have not yet delivered all their secrets. Similarly, still poorly-explored areas, such as Angola and some areas including parts of the Congo basin, should still reveal many other species.

In countries where the fish fauna is considered to be relatively well-known, the introduction of new fishing techniques (electro-fishing for example) can lead to the identification of species that had not been captured using traditional techniques alone. Similarly, using new taxonomic tools (*i.e.*, molecular techniques, specific parasitic markers, electrical signals, behaviour, etc.) has facilitated the revision of some taxonomic groups previously based solely on morphology.

For example, we can mention the striking species flock of *Brienomyrus* (Mormyridae) in Ogowe basin in Gabon (Sullivan *et al.*, 2002; Sullivan *et al.*, 2004). At least 41 different forms could be identified, while only five species are described (figure 4.1). However, the specific status of some of these forms remains uncertain. Thus, it is not possible to distinguish the two groups that have different electric waves using only morphological or genetic characters (Arnegard *et al.*, 2005) (figure 4.2).

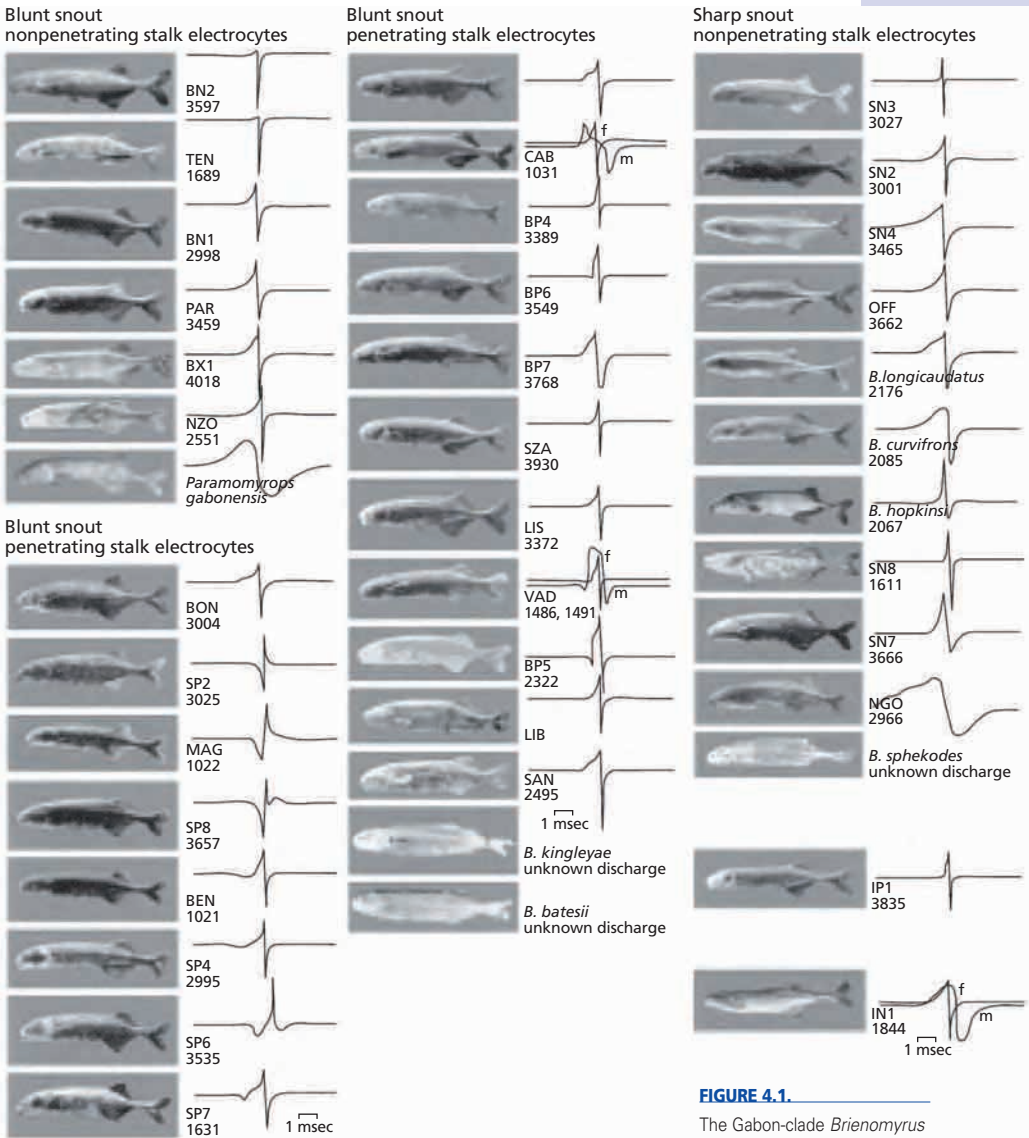


FIGURE 4.1.

The Gabon-clade *Brienomyrus* (from Sullivan et al., 2002).

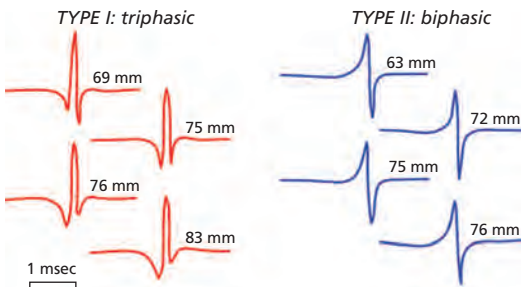


FIGURE 4.2.

Biphasic and triphasic electric organ discharges recorded from different *Brienomyrus* signal forms that cannot be discriminated through genetic and morphologic characters alone.

## Composition of the ichthyofauna

Cyprinidae, Alestidae, and a few Siluriformes families constitute the bulk of the riverine fish fauna with Cyprinodontiformes and Mormyridae (table 4.1). The Cichlidae are by far the most abundant with some 1,150 species (more than 2,000 estimated) and about 143 genera recorded, most of them endemic to East African lakes where many species still remain to be described.

Ichthyologists used to distinguish three major groups of fish according to their tolerance of salt water and their ability to disperse across the sea (Myers, 1951):

- the primary division comprises the “primary fish” which are strictly intolerant to salt water and are therefore limited exclusively to freshwaters. They are usually much longer established in continental waters than the other groups. For example, all Mormyrids belong to this group.
- the secondary division includes “secondary fish” rather strictly confined to fresh water but evidently capable of occasionally crossing narrow sea barriers. Many of them are salt-tolerant for short periods. Some species of Cichlidae and Cyprinodontiformes belong to this division.
- the “peripheral” division includes representatives of extant marine families which have colonized inland waters. An example is the genus *Lates* (Latidae), of marine origin, but now widespread in Africa where it has colonized most freshwater habitats. This group includes diadromous fish which are few in African freshwater contrary to what is observed in Europe.

In Africa, 28 out of 94 indigenous families (six families were introduced), are “primary” division fishes and represent about 55% of the recorded species. Another 32% belong to the 3 families of “secondary” division fishes, of which the cichlids alone represent around 30%. The remaining 12% belong to 57 families of the “peripheral” division (table 4.1).

The main feature of African fish fauna is the existence of a high proportion of endemic families (15 of the 28 families belong to the “primary” group) (figure 4.3). They are probably among the most ancient families of fish, given that the African continent has remained above sea level since the Precambrian, more than 600 million years ago. This long period of exundation may explain why Africa has a far more diverse fish fauna than South America, and an unparalleled assemblage of archaic families, such as Protopteridae, Arapaimidae, whose distribution extends far beyond Africa to Australia, Asia and South America, but that have evidently been there for a long time.

The African inland waters house elements of marine origin which either evolved in freshwaters, or moved seasonally or sporadically between the sea and freshwaters: Perciformes, Pleuronectiformes and Tetraodontiformes provide examples.

The number of inland waters fishes of Africa is a little lower than the number estimated for South America. Compared to African fish fauna, there are no Cyprinidae in the South American fauna which mostly consists of Siluriformes

TABLE 4.1.

African fish families with representative in fresh and brackish waters (in orange-brown: introduced families).

Class / subclass Orders Families	Division	Number of species at least peripheral	Number of genera in Africa	Number of species in Africa	Distribution beyond Africa
<b>Cephalaspidomorphi</b>					
<b>Petromyzontiformes</b>		41			
01 Petromyzontidae	peripheral		1	1	marine, temperate
<b>Elasmobranchii</b>					
<b>Carchariniformes</b>		8			
02 Carcharhinidae	peripheral		2	2	widespread
<b>Pristiformes</b>				5	
03 Pristidae	peripheral		2	5	widespread, tropical
<b>Rajiformes</b>				27	
04 Dasyatidae	peripheral		4	4	widespread, tropical
<b>Sarcopterygii</b>					
<b>Lepidosireniformes</b>		5			
05 Protopteridae	primary		1	5	South America
<b>Actinopterygii</b>					
<b>Polypteriformes</b>		10			
06 Polypteridae	primary		2	10	fossils in South America
<b>Acipenseriformes</b>				26	
07 Acipenseridae	peripheral		1	1	northern hemisphere, temperate
<b>Osteoglossiformes</b>		217			
08 Arapaimidae	primary		1	1	Asia, Australia, South America
09 Pantodontidae	primary		1	1	endemic to Africa
10 Notopteridae	primary		2	3	
11 Mormyridae	primary		19	203	endemic to Africa
12 Gymnarchidae	primary		1	1	endemic to Africa
<b>Elopiformes</b>		7			
13 Elopidae	peripheral		1	1	widespread
14 Megalopidae	peripheral		1	2	widespread, tropical
<b>Albuliformes</b>				1	
15 Albulidae	peripheral		1	1	widespread, tropical
<b>Anguilliformes</b>		26			
16 Anguillidae	peripheral		1	7	widespread
17 Muraenidae	peripheral		1	1	widespread
18 Ophichthidae	peripheral		3	5	widespread
19 Muraenesocidae	peripheral		1	1	widespread, tropical
<b>Clupeiformes</b>		80			
20 Denticipitidae	peripheral		1	1	endemic to West Africa
21 Clupeidae	peripheral		20	32	widespread
22 Pristigasteridae	peripheral		1	1	widespread, tropical
23 Engraulidae	peripheral		2	2	widespread
<b>Gonorynchiformes</b>		32			
24 Chanidae	peripheral		1	1	Indian Ocean, Western Pacific
25 Kneriidae	primary		4	30	endemic to Africa
26 Phractolaemidae	primary		1	1	endemic to Africa
<b>Cypriniformes</b>		2662			
27 Cyprinidae	primary		41	526	Eurasia
28 Cobitidae	primary		1	1	Eurasia
29 Balitoridae	primary		1	1	Eurasia

TABLE 4.1. (CONT.)

Class / subclass Orders Families	Division	Number of species at least peripheral	Number of genera in Africa	Number of species in Africa	Distribution beyond Africa
<i>Characiformes</i>		1343			
30 Hepsetidae	primary		1	1	endemic to Africa
31 Alestidae	primary		13	106	endemic to Africa
32 Citharinidae	primary		3	10	endemic to Africa
33 Distichodontidae	primary		17	92	endemic to Africa
<i>Siluriformes</i>		2287			
34 Ictaluridae	primary		1	1	North America
35 Siluridae	primary		1	1	Eurasia
36 Bagridae	secondary		1	10	Asia
37 Austroglanididae	primary		1	3	endemic to Africa
38 Claroteidae	primary		16	92	endemic to Africa
39 Schilbeidae	primary		5	32	Asia
40 Amphiliidae	primary		12	65	endemic to Africa
41 Clariidae	primary		13	76	Asia
42 Malapteruridae	primary		1	11	endemic to Africa
43 Ariidae	peripheral		3	12	tropical
44 Plotosidae	peripheral		1	2	Indian Ocean, Western Pacific
45 Mochokidae	primary		8	189	endemic to Africa
<i>Esociformes</i>		10			
46 Esocidae	primary		1	1	northern hemisphere, temperate
<i>Osmeriformes</i>		71			
47 Galaxiidae	peripheral		1	1	temperate
<i>Salmoniformes</i>		66			
48 Salmonidae	peripheral		4	6	northern hemisphere, temperate
<i>Atheriniformes</i>		171			
49 Bedotiidae	peripheral		2	11	Endemic to Madagascar
50 Atherinidae	peripheral		2	4	Pacific and Mediterranean
<i>Cyprinodontiformes</i>		805			
51 Aplocheilidae	primary		11	221	South Asia, South and Central America
52 Poeciliidae	secondary		14	83	North and South America
53 Cyprinodontidae	secondary		2	6	North and Central America; Anatolia
<i>Beloniformes</i>		56			
54 Hemiramphidae	peripheral		3	4	widespread
<i>Gasterosteiformes</i>		24			
55 Gasterosteidae	peripheral		1	1	Europe
<i>Syngnathiformes</i>		35			
56 Syngnathidae	peripheral		4	13	widespread
<i>Synbranchiformes</i>		87			
57 Synbranchidae	peripheral		2	2	widespread
58 Mastacembelidae	primary		2	50	Asia
<i>Perciformes</i>		2185			
59 Centropomidae	peripheral		1	7	widespread
60 Ambassidae	peripheral		1	7	Indo-Pacific; east coast of Africa
61 Moronidae	peripheral		2	2	North America; Europe
62 Terapontidae	peripheral		2	4	Indo-Pacific; east coast of Africa
63 Kuhliidae	peripheral		1	2	Indo-Pacific; east coast of Africa
64 Centrarchidae	primary		2	7	North America
65 Percidae	primary		2	2	northern hemisphere, temperate
66 Apogonidae	peripheral		2	3	widespread
67 Carangidae	peripheral		2	3	widespread, tropical

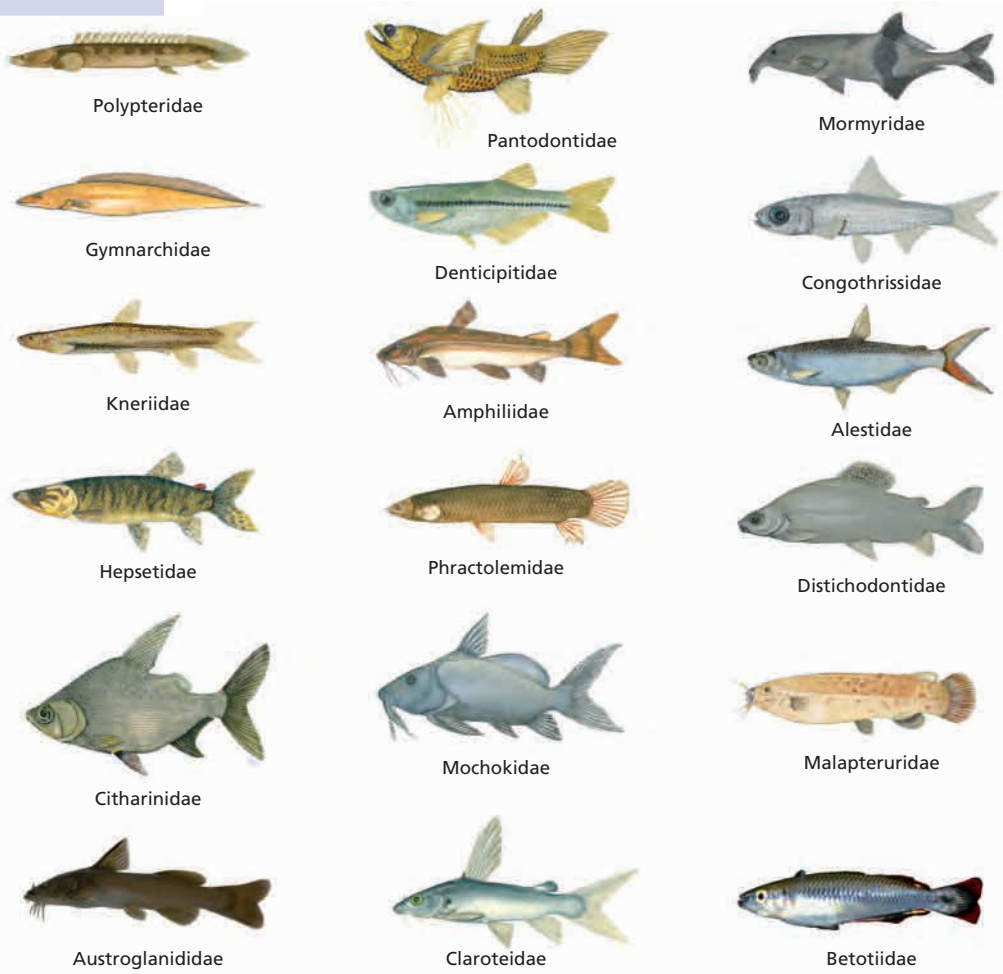
TABLE 4.I. (CONT.)

Class / subclass <i>Orders</i> Families	Division	Number of species at least peripheral	Number of genera in Africa	Number of species in Africa	Distribution beyond Africa
68 Leiognathidae	peripheral		2	2	Indo-Pacific; east coast of Africa
69 Lutjanidae	peripheral		1	6	widespread
70 Gerreidae	peripheral		2	3	widespread
71 Haemulidae	peripheral		2	3	widespread, tropical
72 Sparidae	peripheral		2	3	widespread
73 Sciaenidae	peripheral		4	4	widespread
74 Polynemidae	peripheral		1	1	widespread, tropical
75 Monodactylidae	peripheral		1	3	Indo-Pacific; east coast of Africa
76 Nandidae	primary		2	2	Asia; South America
77 Mugilidae	peripheral		6	21	widespread
78 Cichlidae	secondary		154	1047	Asia; South and Central America
79 Pomacentridae	peripheral		1	1	widespread, tropical
80 Clinidae	peripheral		1	1	widespread
81 Blenniidae	peripheral		3	5	widespread
82 Eleotridae	peripheral		11	32	widespread
83 Gobiidae	peripheral		31	59	widespread
84 Kraemeriidae	peripheral		1	1	Indo-Pacificque est
85 Microdesmidae	peripheral		1	1	widespread, tropical
86 Scatophagidae	peripheral		1	1	Indo-Pacific; east coast of Africa
87 Anabantidae	primary		3	34	Asia
88 Osphronemidae	primary		3	3	Asia
89 Channidae	primary		2	5	South Asia
<i>Pleuronectiformes</i>		20			
90 Paralichthyidae	peripheral		1	1	widespread
91 Pleuronectidae	peripheral		1	1	widespread
92 Soleidae	peripheral		4	4	widespread
93 Cynoglossidae	peripheral		1	1	widespread, tropical
<i>Tetraodontiformes</i>		12			
94 Tetraodontidae	peripheral		2	7	widespread
			533	3255	

and Characiformes (table 4.II). Conversely, in Asia Cyprinidae are dominant, the Siluridae (or Siluriformes) abundant, and there are many species of marine origin (table 4.II).

## Main sources of taxonomic information

Scientific knowledge of African fish fauna is relatively recent and remains a poorly-explored area. The 10th edition of Linnaeus's "Systema naturae", published in 1758, cited only 13 African freshwater fish species – the ones collected in Egypt by Hasselquist. He died near Smyrna on his way home but his collections reached home in safety, and five years after his death his notes were published by Linnaeus and translated into French, German and English as "Voyages and Travels in the Levant in the Years 1749-1752".



**FIGURE 4.3.**

Endemic families  
of Africa.

The true father of modern African ichthyology, Michel Adanson (1727-1806), was a Frenchman who lived in Senegal from 1749 to 1753. Although he published nothing on fishes during his lifetime, he built a large collection in the form of a "herbarium", part of which was given to the Cabinet du Roi in 1756. Another part was deposited at the Muséum de Paris, and the set was used by Cuvier and Valenciennes for their "Histoire naturelle des Poissons" whose 22 volumes were published between 1828 and 1849. About 130 to 140 species of African fresh and brackish water fishes were cited in the work. A third part of Adanson's collection, kept in the family château, was only rediscovered in the early 20th century and was given to the Muséum de Paris in 1939. After Adanson's death, part of his handwritten notes and field drawings were used for the "Cours d'Histoire naturelle" published in 1844-45 (Paugy, 2010a).



**TABLE 4.II.**

Compared composition of the fish fauna in four representative large basins of Africa (Niger), South America (Mamoré), North America (Mississippi) and Asia (Mekong).

Drainage area (km <sup>2</sup> )	Mamoré South America	Mekong Asia	Mississippi North America	Niger Africa
Length (km)	159,000 1,050	783,000 4,200	3,200,000 3,780	1,125,000 4,183
Agnathes			7	
Elasmobranches	4	2		1
Dipnoi	1			1
Chondrostei			6	4
Semionotiformes	4		4	
Amiiformes			1	
Osteoglossiformes		3	2	32
Anguilliformes			1	
Clupeiformes	4	2	4	6
Gonorynchiformes				1
Characiformes	138			35
Beloniformes	1			
Cypriniformes		168	81	35
Siluriformes	146	65		65
Gymnnotiformes	20			
Esociformes			2	
Atheriniformes	4		2	
Percopsiformes			1	
Cyprinodontiformes	3	1	1	23
Perciformes	21	17	63	33
of which Cichlidae	18			17
Gasterosteiformes		1		
Synbranchiformes	1	7		3
Scorpeniformes			2	
Pleuronectiformes	1	5		2
Tetraodontiformes		7		1
<b>TOTAL</b>	<b>350</b>	<b>278</b>	<b>177</b>	<b>242</b>

### Continental level

The only general fish fauna available on a pan-African scale is Boulenger's Catalogue (1909-1916) which is only of historical value at present. A major step forward was the publication of the Check-List of the Freshwater Fishes of Africa (CLOFFA) which provides a current list of brackish and freshwater fish species with full synonymies as well as a full bibliography (Daget *et al.*, 1984, 1986a and b, 1992). The CLOFFA is particularly useful for taxonomists as a major source of information for further taxonomic revisions.

### Regional level

For several decades, ichthyologists devoted their research to the inventory of the fish fauna of African continental waters, which allowed the description of many new species. In some cases, their work led to the publication of local or regional inventories and fauna lists. In other cases, regional taxonomic summaries were not yet made. A detailed bibliography of taxonomic publications on African fishes can be found in volumes 3 and 4 of CLOFFA (Daget *et al.*, 1986b, 1991). The websites FishBase ([www.fishbase.org](http://www.fishbase.org)) and Faunafri (<http://www.poissons-afrique.ird.fr/faunafri/>) are, of course, essential tools.

### Maghreb

Pellegrin (1921) remains an important reference for the Maghreb. Other works on the systematics and phylogeny of various groups, notably the Cyprinidae, have been published since, but a summary of these works would be welcome (Doadrio, 1994).

### Western Africa

Ichthyological inventories for West Africa began in the late 19th century. F. Steindachner from Austria (1870, 1895) as well as A. Günther from Britain, then H.E. Sauvage and J. Pellegrin from France and the Belgian-born British scientist G.A. Boulenger, described numerous species based on the collections that were brought back to them by travellers. A fauna of the freshwater fishes of West Africa written by Pellegrin (1923) summarized the state of knowledge at that time. Later, especially after the Second World War, inventories covered whole basins or regions. These included the following monographies by country or basin: Gambia (Svensson, 1933; Johnels, 1954), Ghana (Irvine, 1947), Upper Niger (Daget, 1954), Chad basin (Blache *et al.*, 1964), Côte d'Ivoire (Daget & Iltis, 1965), Volta (Roman, 1966), coastal rivers of Côte d'Ivoire, Ghana, Guinea, Sierra Leone, Liberia, and Togo (Schültz, 1942; Daget, 1962b; Teugels *et al.*, 1988; Lévêque *et al.*, 1989, 1991; Paugy *et al.*, 1989, 1994; Paugy & Bénech, 1989). The many inventories established later, most notably by teams from Orstom (later IRD) and the Tervuren Museum (Belgium) made it possible to publish an updated fauna of fresh and brackish water fishes of West Africa (Lévêque *et al.*, 1990, 1992; Paugy *et al.*, 2003a, 2003b) which provide the state of knowledge on the taxonomy and distribution of species.

### Nile Valley

By the late 18th century, European ichthyologists had begun studying Nile fishes. In 1789, Gmelin cited 17 Nile species based on the collections of Hasselquist (1722-1752) and Forskål (1736-1765). In 1799, Geoffroy Saint-Hilaire accompanied General Bonaparte during his Egyptian expedition and assembled large collections deposited with the Muséum d'Histoire naturelle de Paris. He published the description of *Polypterus* in 1802, and that of other species in 1809. The first overview of Nile fishes was published in 1907 by Boulenger and remains a useful reference.

Lake Tana was the focus of recent work that revealed the existence of a large *Barbus* species flock (Nagelkerke & Sibbing, 2000).

### Lower Guinea

The first collections from Cameroon were collected by the German scientist R. Buchholz in the region of Douala and deposited at the Zoologisches Museum der Humboldt Universität in Berlin where they were studied by W.C.H. Peters. Later, Lönnberg of Sweden published the results of collections carried out in the area of Mount Cameroon. Between 1903 and 1913, G.A. Boulenger wrote a summary of the collections made by the American scientist G.L. Bates deposited at the British Museum in London. The Austrian professor K. Haberer also carried out important collections from the Sanaga

River between 1907 and 1909, deposited at the Naturhistorisches Museum in Vienna but described only twenty years later by Holly. In 1930, he published a synopsis of the freshwater fishes of Cameroon. Later, E. Trewavas (1962) examined the crater lake fishes deposited in the British Museum's collections. They were collected in 1948 by the British scientist P.I.R. MacLaren from the southwestern part of the country.

The first specimens from the Ogowe River collected by R.B.N. Walker in 1866 were investigated by British scientist A. Günther of the British Museum. Later, the river was explored in 1874 by Savorgnan de Brazza, who deposited large collections at the Muséum d'histoire naturelle de Paris. Sauvage studied them and later published the first ichthyological inventory of the Ogowe River (Sauvage, 1880). Finally, Mrs Kingsley arrived on the banks of the Ogowe River in 1895 to study the civilizations of Gabon, but she also collected 65 fish species (of which 46 were then unknown). J. Pellegrin continued this work later.

The first collections from the coastal basins of the Congo were carried out in 1929 by French scientist Baudon and deposited at the Muséum de Paris, where they were also examined by J. Pellegrin.

For Lower Guinea (Cameroon, Gabon, Congo), partial contributions had to suffice for a long time: Amiet *et al.*, 1987; Daget, 1978, 1979; Daget & Depierre, 1980; Roman, 1971; Mbega & Teugels, 2003; Thys van den Audenaerde, 1966, 1967; Teugels *et al.*, 1992; Teugels & Guégan, 1994; Mamoneke & Teugels, 1993. But an inventory of N'Tem fauna was nonetheless published (Kandem Toham, 1998) and more recently, an overview of the fresh and brackish water fauna of Lower Guinea was also published (Stiassny *et al.*, 2007a and b).

### Congo

The situation is much less favourable for the Congo, for which Boulenger (1901) proposed an initial inventory. Major contributions from the first half of the 20th century came from Nichols & Griscom (1917), Fowler (1936) and Poll (1938). These were followed after the Second World War by major regional contributions such as those by Banister & Bailey (1979), De Kimpe (1964), Gosse (1963, 1966, 1968), Matthes (1964), Poll (1967, 1976), and Poll & Gosse (1963). There are numerous collections from the Congo basin, and it is urgent to summarize and update the available information (Teugels & Guégan, 1994) because this work was not yet realized for the largest African basin. Nevertheless, several recent local contributions (Wamuini Lunkayilakio *et al.*, 2010; Ibala Zamba, 2010) have improved our knowledge of the ichthyological fauna of the Congo basin, which most certainly contains the greatest species diversity.

### Angola

Despite Poll's work (1967) over a very limited area, Angola remains a poorly known region in which there remains much to be discovered.

### Eastern Africa

The fauna of the East African great lakes is composed in large part of endemic species (Lowe-McConnell *et al.*, 1994). For Lake Victoria, taxonomic data can be found in Barel *et al.* (1977), Greenwood (1980, 1981), Oijen (1991, 1996),

Oijen & Witte (1996), Witte & Oijen (1990), Fermon (1997). For Lake Tanganyika, the main sources are Brichard (1989), Coulter (1991), De Vos & Snoeks (1994) and Poll (1986).<sup>1</sup> References for Lake Malawi include Konings (1990), Eccles & Trewavas (1989) and Duponchelle & Ribbink, 2000); for Lake Kivu, Snoeks (1994); and for Lake Rukwa, Seegers (1996).

### Zambezi

The fauna of the Zambezi is relatively scarce and is rather well known with the work of Jubb, 1965, 1967; Bell-Cross, 1972, 1976; Gagher & Pott, 1972; Bruton & Kok, 1980; Skelton *et al.*, 1985; Jackson, 1986; Skelton, 1994; and Marshall, 2011.

### East Coast

An exhaustive list of the fish species of the Ethiopian Rift Valley was recently published by Golubtsov *et al.*, 2002. For the East Coast of Africa, Eccles (1992) published a summary of the current state of knowledge, and a detailed inventory was proposed by Skelton (1994).

### Southern Africa

In South Africa, the inventory of freshwater fishes began with Burchell's expedition (1811-1812), whose results were published in 1822. A. Smith, who was in charge of the Cape Town museum built in the 1820s, carried out missions inside the country between 1834 and 1836, and published the results of his collections between 1840 and 1845; they included several fish species. During this period, German scientist Wilhelm Peters went on an expedition in what is now Mozambique and described many species. In 1861, France's consul at Cape Town, F. Castelnau, described 21 fish species including some from the Okavango. Several other European scientists, including F. Steindachner of Austria, M. Weber of the Netherlands, and A. Günther and G. Boulenger of Britain, also made significant contributions in the late 19th and early 20th centuries. G.D.F. Gilchrist and W.W. Thompson of the South African Museum were the first resident scientists to work on freshwater fishes. They published an initial catalogue between 1913 and 1917. Their successor, K. Barnard (1943), then R. Jubb after the Second World War, pursued the inventory of species with Jubb's 1967 release of "Freshwater Fishes of Southern Africa". Skelton (2001) provides an updated summary of knowledge of this relatively poor fauna dominated by the Cyprinidae.

### Madagascar

Malagasy fauna mainly comprises species of marine origin (Pellegrin, 1933; Arnoult, 1959; Kiener, 1963; Stiassny & Raminosoa, 1994). If species that only penetrate fresh water occasionally are excluded, known species would number around sixty (de Rahm, 1996; Sparks & Stiassny, 2003).

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#### NOTE 1

The site <http://www.destin-tanganyika.com/> also provides a fully updated overview of the ichthyological fauna of Lake Tanganyika.

## Taxonomic revisions

Many taxonomic revisions of African fishes at the continent level have been published during past 30 years: Among the main works, we can list:

- **Mormyridae**: phylogeny of the family (Lavoué, 2001); phylogeny of the Gabon-clade *Brienomyrus* (from Sullivan *et al.*, 2002)
- **Alestidae**: *Alestes* and *Brycinus* (Paugy, 1986); *Hydrocynus* (Paugy & Guégan, 1989); Hubert *et al.*, 2005
- **Cyprinidae**: *Neobolines* (Howes, 1984), *Labeo* (Reid, 1985)
- **Bagridae**: in Africa, the Bagridae are now separated in three: Bagridae, Claroteidae and Austroglanididae (Mo, 1991)
- **Claroteidae**: *Chrysichthys* (Risch, 1986); *Auchenoglanis* and *Parauchenoglanis* (Teugels *et al.*, 1991)
- **Schilbeidae**: *Schilbe* (De Vos, 1984; 1995)
- **Mochokidae**: *Synodontis* (Poll, 1971); *Microsynodontis* (Ng, 2004); phylogeny of *Synodontis* (Pinton *et al.*, 2012)
- **Clariidae**: *Clarias* (Teugels, 1986; Hanssens, 2009) and *Heterobranchus* (Teugels *et al.*, 1990)
- **Malapteruridae**: *Malapterurus* description of 11 new species; a new genus *Paradoxoglanis* with 3 new species (Norris, 2002),
- **Cyprinodontiformes**: Poeciliidae (Huber, 1999; Ghedotti, 2000), Aplocheilidae (Murphy & Collier, 1997; Murphy *et al.*, 1999).
- **Cichlidae**: *Oreochromis* and *Sarotherodon* (Trewavas, 1983), *Tylochromis* (Stiassny, 1989)
- **Mastacembelidae**: *Aethiomastacembelus* and *Caecomastacembelus* grouped into a single genus *Mastacembelus* (Vreven, 2001; 2005)
- **Channidae**: *Parachanna* (Bonou & Teugels, 1985).

It is now possible to keep track of developments in the identification of fauna in real time by consulting reliable specialist sites.

Scientific editors

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# The Inland Water Fishes of Africa

*Diversity, Ecology and Human Use*



**Africa**  
TERVÜREN

KONINKLIJK MUSEUM  
VOOR MIDDEN-AFRIKA  
MUSÉE ROYAL  
DE L'AFRIQUE CENTRALE

**RD**  
Editions

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© IRD/C. Lévêque – Fish landing in Mopti, Mali.

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