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AN ANNOTATED CHECKLIST OF THE FISHES OF RWANDA (EAST CENTRAL AFRICA), WITH HISTORICAL DATA ON INTRODUCTIONS OF COMMERCIALY IMPORTANT SPECIES

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ABSTRACT

A checklist of the fishes of Rwanda is given. Currently 82 species belonging to 12 families are known from Rwandese waters. With at least 37 species, cichlids are by far the largest fish family in the country followed by Cyprinidae, Mormyridae and Mochokidae, respectively represented by 24, six and four species. The other eight families are represented by one or two species only. The presence of at least 12 species is the result of introductions by man. The list includes the general distribution of each species in Rwanda, common English names and local Kinyarwanda names, annotations referring to introductions, distribution and taxonomic status of the species, as well as to older records from literature. Historical data on introductions of various species are reported.

INTRODUCTION

Between 1979 and 1987 several fish surveys were undertaken in Rwanda as part of a collaborative research programme between the Rwandese National Research Institute INRS at Butare (presently called IRST, Institut de Recherche Scientifique et Technique) and the Royal Museum for Central Africa in Tervuren, Belgium (Thys van den Audenaerde *et al.*, 1982). As a result, the ichthyofaunal diversity of the Rwandese waters is now relatively well known. Several ichthyological notes were recently published (De Vos *et al.*, 1990; De Vos & Thys van den Audenaerde, 1990a, b; De Vos, 1993; Snoeks, 1994; Snoeks *et al.*, 1997).

The present checklist brings an overview of the fish diversity in the country as currently known. The species list includes the general distribution of each species in Rwanda, the

common English names as well as the local Kinyarwanda names. The list also gives some annotations referring to introductions, the distribution and the taxonomic status of the species, and to older records in literature.

HYDROGRAPHY OF RWANDA

The Republic of Rwanda is a small landlocked mountainous country in the centre of Africa; its surface area is 26,338 km². An important North-South mountain ridge near the western border of the country constitutes the Congo-Nile watershed, the eastern part belonging to the Akagera River system which drains to Lake Victoria and further to the Nile, the western part draining to Lake Kivu and its outlet the Rusizi River, hydrographically both belonging to the Congo system. Both major Rwandese hydrographic systems can be subdivided into some ichthyogeographic sub-units (figure 1).

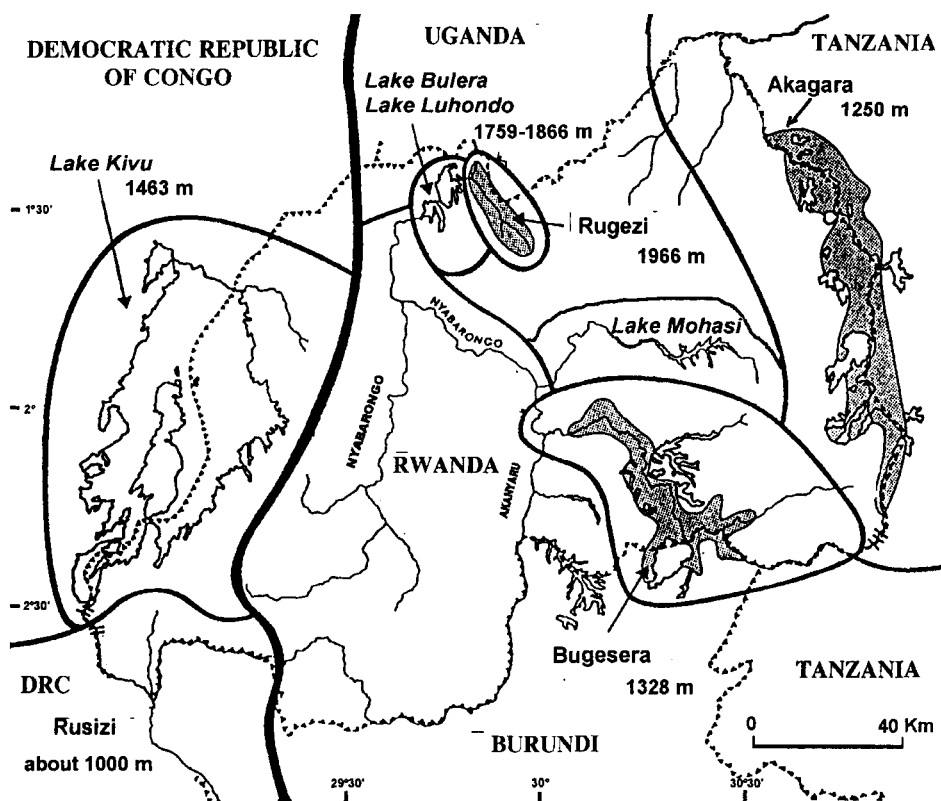


Figure 1. Hydrography of Rwanda.

The Akagera system

The Akagera system originates in the north of the country where it forms the Rugezi Swamps at ca. 1960 m altitude. The outlet of these swamps form the Rusumu Falls, which drain into Lake Bulera (1866 m), a complex of high altitude valleys barred in the north by the Virunga volcanic chain. Lake Bulera in its turn drains by some major falls into the similar Lake Luhondo (1760 m). Lake Luhondo drains into the Nyabarongo River coming from the south

via the Mukungwa, a short river stretch full of rapids and small falls. The Nyabarongo collects most waters from the eastern slopes of the Congo-Nile watershed, and first flows northward toward the Mukungwa. After meeting with the Mukungwa, the Nyabarongo runs south-east through steep valleys to south of Kigali where it receives its major tributary, the Akanyaru, draining the south-eastern part of the country. Some distance before this junction the Nyabarongo receives the Nyabugogo River which drains Lake Mohasi (1450 m), an inundated valley lake north-east of Kigali, and linked to its outlet by a very narrow ditch often fully blocked by mud or vegetation. Lake Mohasi, as well as Lakes Bulera and Luhondo, originally had very clear water with abundant submerged vegetation, but almost no fishes. None of these lakes supported any commercial fishery before fish introductions occurred (Damas, 1953). Soon after its junction with the Akanyaru, the Nyabarongo enters into a large depression with smooth slopes, the Bugesera-depression (1328 m) that extends from somewhat south of Kigali to the major Rusumo Falls on the Rwandese-Tanzanian border. Several shallow side lakes, such as Rweru, Bugesera, Bilira, Gaharwa, Cohoha, Sake and others, occur in this depression, all temporarily linked to or fenced off the Nyabarongo by important papyrus swamps. Downstream from the Rusumo Falls, the Nyabarongo now becomes the Akagera River, and enters a large swampy area forming the eastern border with Tanzania (Middle Akagera system, altitude 1250 m). In this area a dozen or so warm, shallow and relatively fertile lakes (*e.g.* Ihema, Mpanga, Hago, Kivumba, and Rwamyakizinga) are all also permanently or intermittently linked to or blocked off from the Akagera River. The Akagera abruptly changes its south-north direction near the Ugandese border where it drains its water eastward to Lake Victoria over Tanzanian territory, entering the lake in Ugandese waters of the lake. All sub-units of the Akagera system in Rwanda thus are separated by falls or long river stretches with many rapids, which make upward migrations of fishes very difficult, or in most cases even impossible.

At least 55 fish species are presently known from the Rwandese waters of the Akagera basin but the exact number of species is probably slightly higher. The number of species in each ichthyogeographic sub-unit is strongly linked to altitude and is low in the higher parts.

Lake Kivu

Lake Kivu, located at an altitude of 1463 m is an international water shared with the Democratic Republic of Congo. From the hydrographical viewpoint this lake belongs to the Congo system linked to it through the Rusizi River and Lake Tanganyika, but its geological history indicates that it originated as a volcanic dam on a river formerly draining northwards to Lake Edward but later overflowing southwards to Lake Tanganyika. The present ichthyofaunal composition of Lake Kivu is clearly of Edwardian-Victorian origin and includes it in the same ichthyofaunal Province as Lakes Victoria and Edward-George, namely, the East Coast ichthyofaunal Province (Snoeks *et al.*, 1997).

Currently, 28 fish species are known from Lake Kivu and its affluents, of which 19 are cichlids and 9 non-cichlids. The Rusizi river system, draining Lake Kivu into Lake Tanganyika shares very few ichthyofaunal elements with the Lake Kivu basin and its fish fauna is rather characterised by the presence of several old Central African elements and a few Congolese and Tanganyikan invaders. Currently 45 fish species are known from the Rusizi system, but so far only 17 species have been recorded from its upper courses or affluent rivulets in Rwanda.

THE RWANDESE ICHTHYOFAUNA

Appendix 1 reports 82 species belonging to 12 families, Protopteridae (figure 2), Clupeidae (figure 3), Mormyridae (figure 4a–e), Alestidae (figure 5), Cyprinidae (figure 6a–f), Schilbeidae (figure 7), Amphiliidae (figure 8), Clariidae (figure 9), Mochokidae (figure 10a–b), Aplocheilichthyidae (figure 11), Mastacembelidae (figure 12) and Cichlidae (figure 13a–h), currently known from Rwandese waters. At least 12 species are the result of introductions by man. With at least 37 species, Cichlidae are by far the largest fish family in the country followed by Cyprinidae, Mormyridae and Mochokidae, respectively represented by 24, six and four species. The other eight families are represented by one or two species only. This list is not conclusive since the taxonomic status of several Rwandese fishes is still unresolved and several species still await formal description. Besides, at present, some hydrographic sub-units are insufficiently explored.

Probably a dozen or so haplochromine species of the Middle and Upper Akagera currently remain undescribed. Several of these species have already been given working names in various reports and documents and their biology and fisheries potential has been studied (Belpaire, 1982; Plisnier *et al.*, 1988; Plisnier, 1989, 1990). Voucher specimens of these taxa are present in the Royal Museum for Central Africa, Tervuren. Additional taxonomic problems are still to be resolved within several cyprinids, particularly within the group *Varicorhinus-Barbus*.

Pending more in-depth studies of the haplochromines, we use the generic name “*Haplochromis*” for most species of this group. No annotations are given for the various haplochromine species of Lake Kivu (all endemics). For more details on this group we refer to the work of Snoeks (1994).

Several additional species, not mentioned in this list, might also occur in Rwandese waters. This is particularly applicable to some species known from the lower Rusizi in Burundi and Congo [e.g. *Labeo cylindricus* Peters, 1852, *Micralestes stormsi* Boulenger, 1902, *Bagrus docmak* (Forsskål, 1775), *Raiamas salmolucius* (Nichols & Griscom, 1917)] which might also occur in the upper courses of the river on Rwandese territory. More collection work is required to obtain a complete inventory of the fishes of the Upper Rusizi. In addition, a few fish species with a broad distribution in the Lake Victoria drainage, but so far not reported from Rwanda, also might occur in the Middle Akagera (part of the Lake Victoria system in Rwanda). Examples within this group are *Ctenopoma muriei* (Boulenger, 1906), a few small barbs and some clariid species.

Rather surprising is the presumed absence of the genus *Chiloglanis* Peters, 1868 in the entire Nyabarongo drainage above the Rusumo falls. More intensive collection work might reveal the presence of representatives of this reophilous group in this part of the system.

Several wrong recordings on fish from the Rwandese waters appear in the literature: Records of *Gnathonemus petersii* (Günther, 1862) from Gisenyi (Lake Kivu) and *Barbus pleuropholis* Boulenger, 1899 from Lake Mohasi by David & Poll (1937) are based on erroneous localities outside Rwanda. Consequently they are not listed. Paugy (1984) reported *Bryconaethiops microstoma* Günther, 1873 from Lake Kivu but this was based on an erroneous locality interpretation whereby the Kivu Province was mistaken for Lake Kivu. Records of *Brycinus macrolepidotus* Valenciennes, 1849 and *Polypterus senegalus senegalus* Cuvier, 1829 from Rwanda in FishBase (Froese & Pauly, 2000) as well as in previous versions of FishBase are unsubstantiated. Those species do not occur in Rwandese waters. Records of *Barbus jacksonii* Günther, 1889 from the Nyabarongo and Akagera systems and from Lake Mohasi by Mahy (1979a) and from Lake Ihema by Frank *et al.* (1984) are unsubstantiated and based on misidentifications. A record of *B. nummifer* Boulenger, 1904

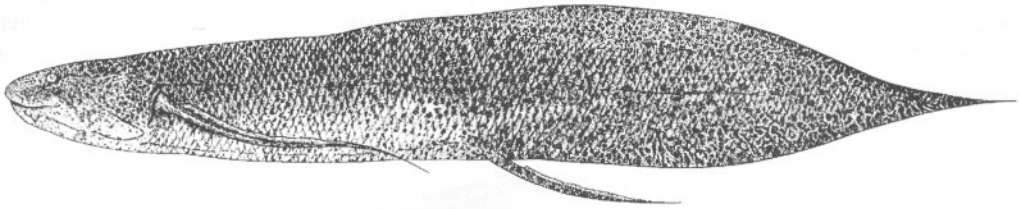


Figure 2. *Protopteridae*: *Protopterus aethiopicus aethiopicus*.

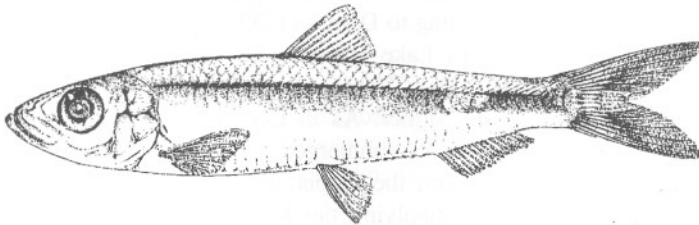


Figure 3. *Clupeidae*: *Limnothrissa miodon*.

(a junior synonym of *B. jacksonii*) from Lake Ihema by Frank *et al.* (1984) is also unsubstantiated. A record of the group *B. perince* Rüppell, 1835-*B. alberti* Poll, 1939 (considered as a junior synonym of *B. stigmatopygus* Boulenger, 1903 by Banister, 1987)-*B. innocens* Pfeffer, 1896 by Hulot (1956) is unsubstantiated. A record of *Barbus eutaenia* Boulenger, 1962 from Rwanda-Burundi by Greenwood (1962) refers to a misidentified sample from the Malagarasi River in Burundi. *Barbus eutaenia* does not occur in Rwandese waters.

A record of *Barbus longifilis* Pellegrin, 1935 (as *B. altianalis* var. *longifilis* by Pellegrin, 1935) from the Nya-Barongo River, Kivu region, refers to specimens originating from a river of the Congo basin in the Kivu region (Democratic Republic of Congo) and not to Lake Kivu system or to the Nyabarongo from the Upper Akagera in Rwanda.

Lévêque (1997) reported *Hydrocynus vittatus* (Castelnau, 1861) from Lake Kivu, which however is a *lapsus* for the endemic cichlid *Haplochromis vittatus* (Boulenger, 1901).

INTRODUCTIONS AND TRANSLOCATIONS OF FISHES IN RWANDESE WATERS

In the mid-thirties some Belgian farmers living near Lakes Luhondo and Bulera, obtained permission from the colonial authorities to introduce fishes from Uganda into these lakes. Small fishes, by then considered to be all juvenile tilapia, were transported between 1935 and 1938 by road from Lake Bunyoni to Lakes Luhondo and Bulera, but a successful fishery developed only in Lake Luhondo, the lowest of the two lakes. This lake thereby turned from clear water to rather turbid and without submerged vegetation, and the local *Barbus* species disappeared or became restricted to the small tributaries of the lake (De Vos *et al.*, 1990). The introduced cichlids turned out to be a mixture of a tilapia (a strain of *Oreochromis niloticus* (Linnaeus, 1758)) and of a *Haplochromis* species. This latter species, later named *H. erythromaculatus* De Vos, Snoeks & Thys van den Audenaerde, 1990 became by far the most common fish in the shallow zone.

In 1935 and 1936, tilapia were introduced into Lake Mohasi, which before then did not support any significant fisheries. According to Damas (1953), the tilapia (most likely a strain of *Oreochromis niloticus*) originated from Lake Edward. Damas (1953) also reported another possible introduction of tilapia (so called *Tilapia nigra* (Günther, 1894)) but this was not confirmed by the then District Commissioner. As in Lake Luhondo, the clear Lake Mohasi became turbid later on and lost most of its submerged vegetation. Here too, haplochromines might have been introduced together with the tilapia. Following this introduction of tilapia, commercial fisheries soon developed, supplying the Kigali market. But within a few years overfishing caused a sharp decline in the stocks and mass mortalities during 1951-52 apparently further contributed to this decline (Damas, 1953; De Bont, 1954). Consequently, only small fishes were captured and the commercial fisheries were abandoned for many years. It is not known if the tilapias and haplochromines introduced into Lake Luhondo, Bulera and Mohasi also spread downstream into the Bugesera and the Akagera lakes but the presence of an *O. niloticus* strain in several of these lakes suggests that this might have happened.

From 1948 on the Belgian colonial authorities in central Africa strongly encouraged the development of small scale fish farming. In each province of the Belgian Congo, as well as in Rwanda and Burundi, a 'Centre d'Alevinage Principal' (CAP, i.e. a main fry producing centre) was set up, to supply the whole territory with the necessary tilapia fry for local fish farming. For the former Kivu Province of the Belgian Congo, a province by then ranging from Lake Kivu in the east to the Lualaba River in the west, this CAP was created in 1948-49 at Nyakabera, 10 km north-east of Bukavu and only 2 km from Lake Kivu, in a small steep valley

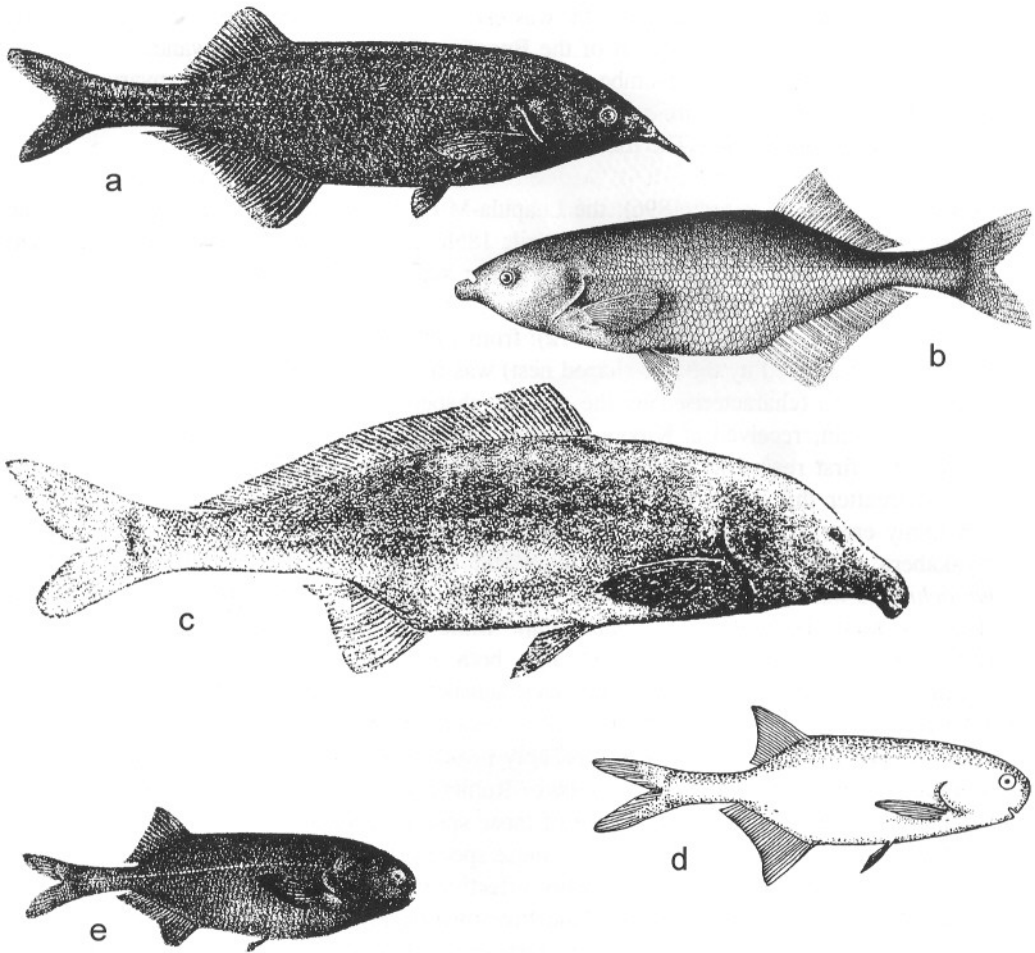


Figure 4. Mormyridae: a. *Gnathonemus longibarbis* (after Boulenger, 1909), b. *Marcusenius victoriae*, c. *Mormyrus kannume* (after Boulenger, 1909), d. *Petrocephalus catostoma catostoma* (after Greenwood, 1966), e. *Pollimyrus nigricans* (after Boulenger, 1909).

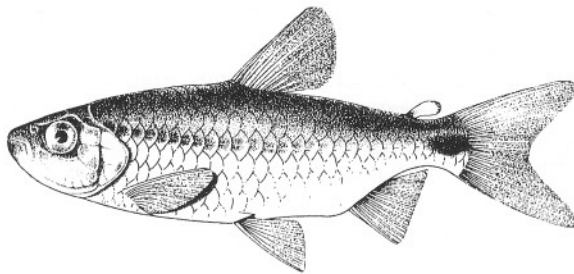


Figure 5. Alestidae: *Brycinus jacksonii*

draining into the lake. In Burundi the CAP was established also around 1950 at Karuzi, in the north-east of the country, in the south of the Bugesera drainage area. In Rwanda a CAP was constructed only in 1951-54 at Kigembe, in the south of the country, in the Akanyaru drainage area. All three CAP-stations were supplied several times with tilapia fry from the Kipopo fish ponds in Katanga (now Shaba). The following tilapia species were introduced:

- *Tilapia rendalli* (Boulenger, 1896): the Luapula-Mweru strain by then introduced under the incorrect name of *T. melanopleura* Duméril, 1858, the type-specimen of *T. melanopleura* coming from Senegal and actually being a junior synonym of *T. zillii* (Gervais, 1848) (see Thys van den Audenaerde, 1968).
- *Oreochromis macrochir* (Boulenger, 1912): from 1949 on, the Luapula-Mweru strain of this species (characterised by the star-shaped nest) was introduced into Rwanda. After 1952 also the Kafue strain (characterised by the volcano-shaped nest) was introduced. Specimens of this latter strain, received at Kipopo (Shaba) from Chilanga, Northern Zambia (De Bont, 1950) were first reared at Kipopo under the name of *Tilapia kafuensis* Boulenger, 1912. Soon thereafter this name was incorrectly changed to *T. andersonii* (Castelnau, 1861), a synonymy error. This Kafue strain was distributed to Kigembe-CAP and probably also to Nyakabera under the name of *T. andersonii*. Currently the two traditional strains of *Oreochromis macrochir* are considered specifically distinct (Schwanck, 1994). The Kafue strain is now indicated as *O. macrochir* while the Luapula-Mweru strain is called *O. mweruensis* Trewavas, 1983, although both species fully hybridize when brought together, and behave more as good allopatric subspecies (Thys van den Audenaerde, 1964).
- *Tilapia rendalli* and the both formerly called “*macrochir*-strains” were widely distributed in fish ponds in Rwanda, and escapees probably invaded the Akagera lakes from Karuzi, as it was decided already in 1952 to stock lakes Ruhinda and Rweru with *T. rendalli* fry from Karuzi (De Bont, 1954). The presence of those species in Lake Kivu is most probably the result of escapes from Nyakabera where these species were introduced already in 1949-50; however, they colonised Lake Kivu only effectively after 1954 as the intensive K.E.A.-survey (K.E.A. = Applied Research and Investigation Project on lakes Kivu, Edward and Albert) during 1952-54 and other fishery surveys in 1954 did not yet collect these species in the lake (Thys van den Audenaerde, pers. obs.). To what extent the very similar *O. macrochir* and *O. mweruensis* kept pure or eventually hybridised in the areas where they were introduced together, is not known.

Attempts in the early eighties to obtain pure *Oreochromis niloticus* broodstock from Lake Ihema for aquaculture purposes were not successful. It was apparent that much hybridisation with the other alien tilapia *O. macrochir* took place in the lake. Indeed, Plisnier (1984) reported that those hybrid specimens present distinctive characters from both species and have skewed sex ratio's matching aquaculture observations. Hybridisation between *O. macrochir* and *O. niloticus* is also observed in some small lakes of the Bugesera depression (De Vos, 2002). The few brooders captured alive from Lake Ihema were transferred to the Fish Station at Gitarama. In 1983 or 1984 between 100 and 200 *O. niloticus* fingerlings were transported from Auburn University Alabama to Rwasave Fish Station at Butare. The fish were selected from the Ivory Coast strain being held at Auburn because the PD/A CRSP (Pond Dynamics/Aquaculture, Collaborative Research Support Program, Oregon State University) wanted to “standardise” tilapia strains used in its research and Ivory Coast was the selected strain. Later in 1984 one hundred small, one year old brooders of Egypt strain were brought from Auburn by K. Veverica. Fifty of them were distributed in Rwasave Station, the others in Runyinya station

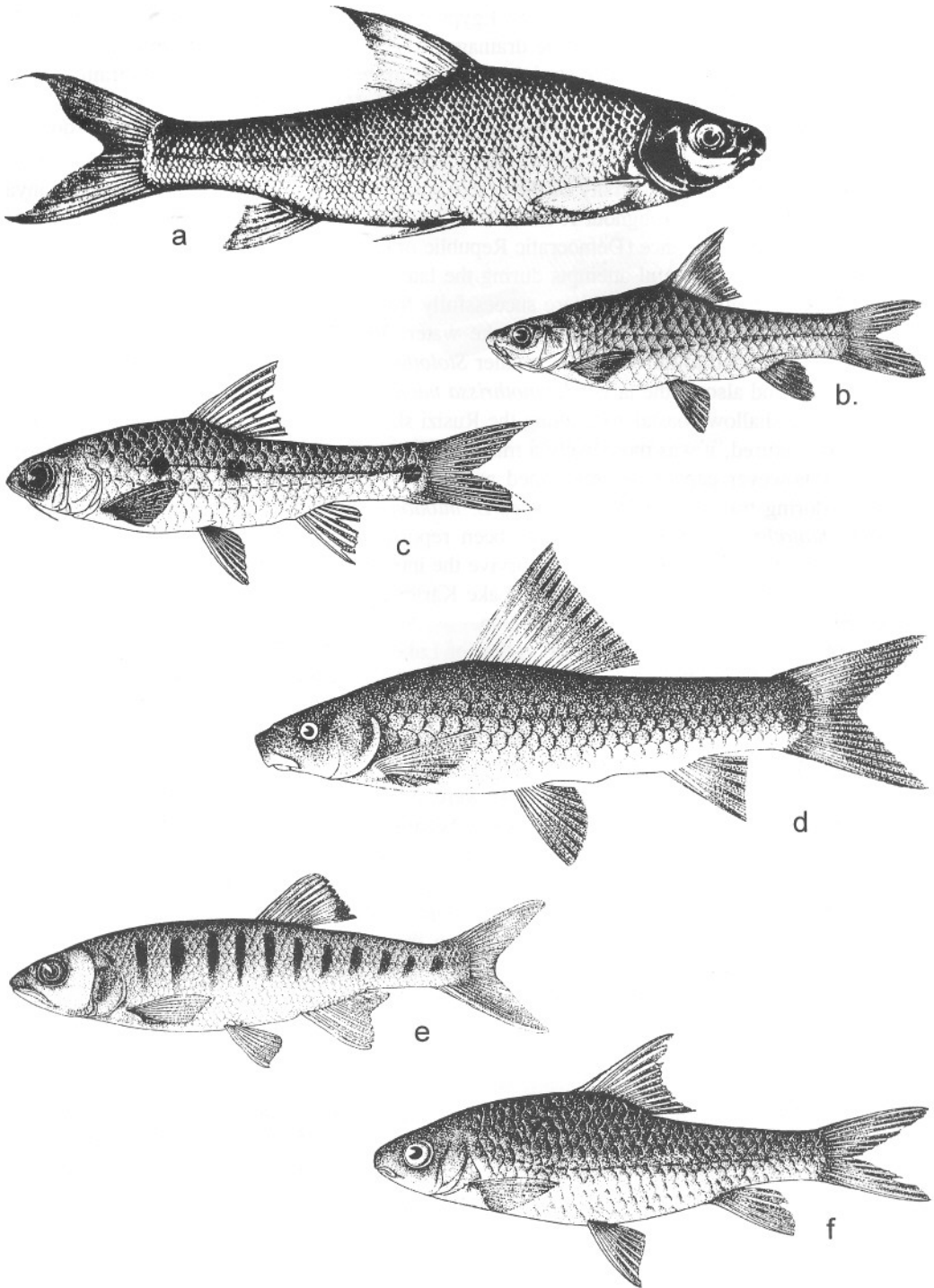


Figure 6. Cyprinidae: a. *Acapoeta tanganicae* (after Moore, 1903), b. *Barbus cercops* (after De Vos & Thys van den Audenaerde, 1990b), c. *Barbus claudinae* (after De Vos & Thys van den Audenaerde, 1990a), d. *Labeo victorianus*, e. *Raiamas moorei*, f. *Varicorhinus ruandae*.

situated about 17 km West of Butare. The Egypt strain was chosen because most of Rwanda aquaculture was taking place in the Nile drainage. Also, this strain was considered to be more cold tolerant than the other two strains available (Ghana and Ivory Coast strains). The *O. niloticus* at Rwasave Station are therefore a mixture of Ivory Coast and Egypt strains. Fish from Rwasave Station were distributed in different parts of Rwanda in the period 1990-1994, as part of on-farm trials. Apparently this strain was also introduced in Lake Mohasi and most likely modified the genetic diversity of the tilapia stock in the lake. Fingerlings from Runyinya Station were distributed throughout Rwanda in 1984. There were probably also some transfers of these fish to Kivu Province (Democratic Republic of Congo) and into Burundi.

After several unsuccessful attempts during the late fifties it was only in 1959 that juveniles or fry of the Tanganyika clupeids were successfully transported to Lake Kivu. Large numbers of very small fry were released into the lake waters near Bukavu and near Goma (Capart, 1959). It was intended to introduce the smaller *Stolothrissa tanganicae* Regan, 1917, but as fry of this species and also of the larger *Limnothrissa miodon* (Boulenger, 1906) often occur mixed together in the shallow coastal zone along the Rusizi shore of northern Lake Tanganyika where the fry was captured, it was most likely a mixture of both species that was introduced into Lake Kivu. This however cannot be ascertained as the fry could not be checked on identification before or during transport. In the seventies *L. miodon* became very important for Lake Kivu fisheries. *Stolothrissa* however has never been reported nor captured from Lake Kivu, and maybe was never introduced, or did not survive the introduction. It should be noticed that when Tanganyika clupeids were introduced into Lake Kariba, also only *Limnothrissa* apparently was introduced or at least survived the introduction.

In 1960, after a short scientific exploration of Lake Bugesera organised by the IRSAC (the former Central African Research Institute based in Uvira, Congo), it was stated that no pelagic plankton-feeding fish species, no carnivorous species feeding on haplochromines and no mollusc-eating fishes were present in this lake (Marlier, 1962). Therefore specimens of *Rastrineobola argentea* (Pellegrin, 1904), *Schilbe intermedius* Rüppell, 1832, and *Astatoreochromis alluaudi* (Pellegrin, 1904) were transported from Entebbe (Lake Victoria, Uganda) to Lake Bugesera, where the latter two became established. *Astatoreochromis alluaudi* apparently does not feed on molluscs in Bugesera, but it spread out to several other Bugesera lakes. *Schilbe intermedius* was probably already naturally present in Lake Ihema, but in Lake Bugesera the survivors of the introduced specimens (173 individuals) developed a local strain rarely exceeding 25 cm in length. From 1980 on this species also appeared in Lake Rweru (Ntakimazi, pers. comm.). Later in the eighties the fish was also found in other lakes of the Bugesera depression as well as in the Nyabarongo and Akanyaru Rivers, indicating that the species was expanding its range from Lake Bugesera.

According to Welcomme (1988) common carp (*Cyprinus carpio* Linnaeus, 1758) was introduced for aquaculture in 1960 from Israel. Possibly other carp specimens also came in from Uganda where common carp was already in use for aquaculture. The species is now found in the Upper Akagera system (e.g. Lake Rweru) and is common in Lake Karago (a small highland lake north-east of Gisenyi). A single catch of a common carp in Lake Ihema (Middle Akagera) in 1983 was reported by Plisnier *et al.* (1988), but this seems to be an isolated case and, as far as known, the species was never recorded again. Common carp were also present at Kigembe and Rwasave Stations but Rwasave got rid of carp in 1983. Some fish remained at Kigembe, but as of 1983 no fingerlings were distributed in the country.

Plisnier (1989) reported the introduction of *Caecomastacembelus frenatus* (Boulenger, 1901) into Lake Mohasi in the sixties by J. Hannotier. Most likely the fish was translocated from other parts of the Akagera system in Rwanda.

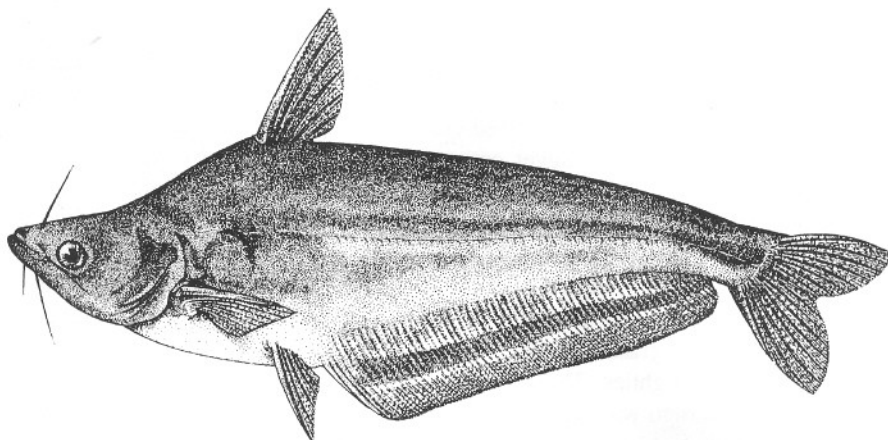


Figure 7. *Schilbeidae*: *Schilbe intermedius liocephalus* (after De Vos, 1995).

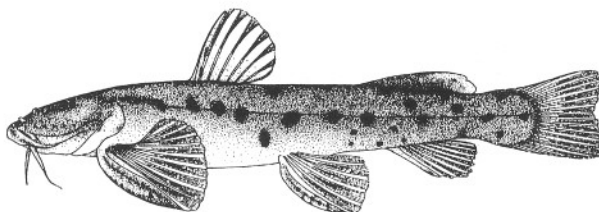


Figure 8. *Ampiliidae*: *Amphilius uranoscopus*.

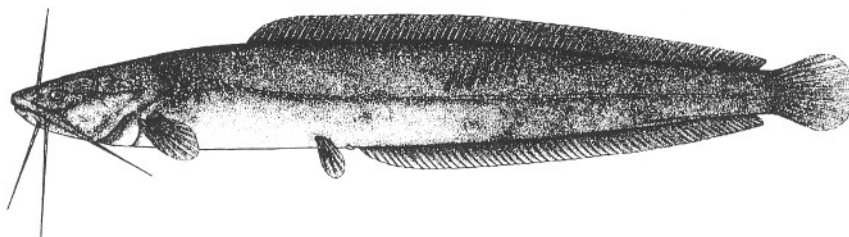


Figure 9. *Clariidae*: *Clarias liocephalus* (after Teugels, 1986).

In 1979 during a North Korean assistance programme, the Asian silver carp *Hypophthalmichthys molitrix* (Valenciennes in Cuvier & Valenciennes, 1844) and the grass carp *Ctenopharyngodon idellus* (Valenciennes in Cuvier & Valenciennes, 1844) were introduced from Korea for aquaculture and/or weed control (Welcomme, 1988) and were brought to fish ponds near Kigali. Apparently silver carp was also brought around that time from the Soviet Union against recommendation from the Fish Culture Office in Kigali. Some of these silver carp remained at Kigembe Station, others were transferred in farmers ponds nearby. It is unknown what happened later with these fish. The introduced grass carp was spawned and fingerling production was realised at the Kigali Fish Station in the early eighties. Fingerlings were transferred to Kigembe Station in 1983 or 1984 and to Rwasave Station around 1985-86. However, by 1988 all grass carp at Rwasave had died. A second transfer to Kigembe station was made in the late eighties. They were brought in to control *Azolla*, which became a failure. Apparently Lake Karago was also stocked with grass carp in the late eighties but it is unknown if the species established in this lake.

According to Plisnier (1989) the common carp, the grass carp and the Chinese or silver carp might have been introduced in Lake Mohasi in 1979. Although it appears that a few specimens were caught later, apparently these species did not establish in the lake.

In 1979 some *Clarias gariepinus* (Burchell, 1822) (of unknown origin to the authors) were introduced into the Kigembe fishponds. In Rwanda this species formerly only occurred naturally in Lake Kivu and in the Middle Akagera system, and was absent from the intermediate areas in Rwanda (Thys van den Audenaerde, 1987). From 1982 on, this species was also present and was fished for in the Bugesera part of the Nyabarongo River, below its confluence with the Akanyaru, apparently as an escape from the Kigembe fish ponds. In 1984 *C. gariepinus* was translocated from Lake Ihema into Lake Mohasi by the Rwandese Ministry of Agriculture (Plisnier, 1989). A first translocation apparently was made already in 1982 by some anglers. In order to improve the genetic diversity of the introduced stock, more *Clarias* specimens were translocated later in the eighties from Lake Ihema to Lake Mohasi by V. Frank.

Around 1988 V. Frank decided to introduce the lungfish *Protopterus aethiopicus* Heckel, 1851 from Lake Edward (ex Lake Idi Amin) into Lake Mohasi.

In the early nineties Rwandese authorities introduced *Labeo victorianus* Boulenger, 1901 into Lake Mohasi where currently it is abundant. Most likely the fish was translocated from other Rwandese waters in the Bugesera depressions.

In the seventies and later on several Tanganyika cichlids [e.g. *Haplochromis burtoni* (Günther, 1893)] were kept in aquariums by fish-hobbyists in Kigali. The spread of *H. burtoni* in the nearby rivers and lakes, especially in Lake Mohasi and the Bugesera lakes, is probably the result of introductions by these fish-keepers.

In 1983 the presence of *Oreochromis leucostictus* (Trewavas, 1933) was reported in Lake Ihema (Plisnier, 1984) and a few years later in 1986 also in Lake Kivu (Snoeks *et al.*, 1997), in both cases relying only on very few specimens. The presence of *O. leucostictus* in Lake Kivu has never been confirmed and seems doubtful. Currently the species is extremely abundant in many lakes of the Bugesera depression undoubtedly as a result of unrecorded introductions by man. In some small Bugesera lakes hybridisation with *O. macrochir* has been reported (De Vos, 2002).

Besides, some other introductions were reported, but no proof could be found. In the fifties it was sometimes pretended that the native tilapia strain of *Oreochromis niloticus* in Lake Kivu could be the result of an early introduction. The first specimens of this local strain were however already collected in 1898 by the famous explorer J.E.S. Moore, only two

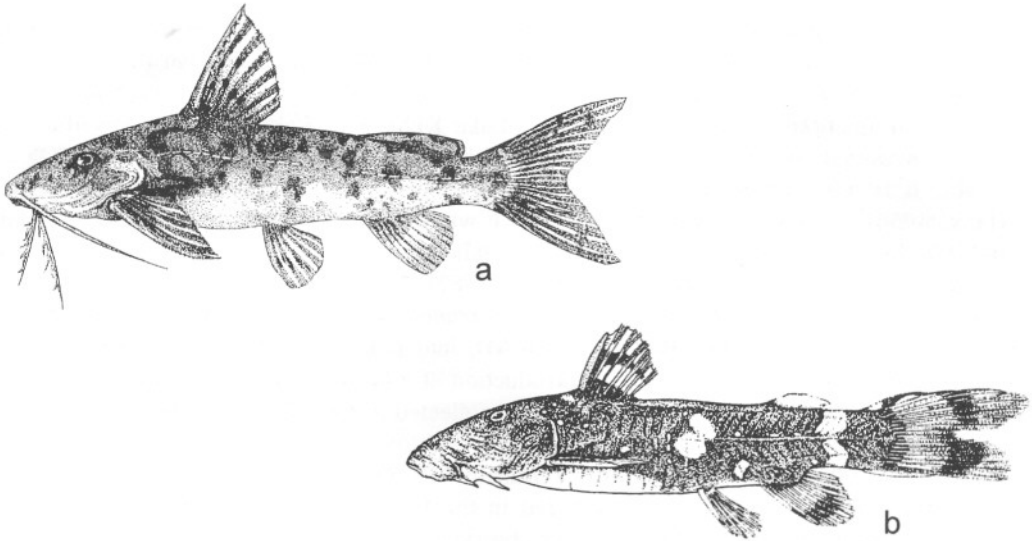


Figure 10. Mochokidae: a. *Synodontis ruandae*, b. *Chiloglanis asymetricaudalis* (after Poll, 1952 & 1953).

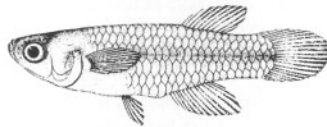


Figure 11. Aplocheilichthyidae: *Aplocheilichthys centralis* (this is a very small species).

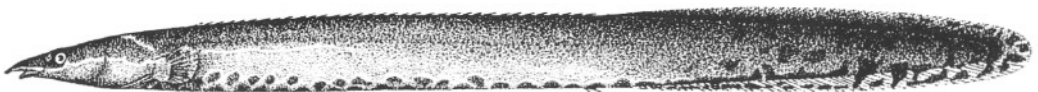


Figure 12. Mastacembelidae: *Mastacembelus frenatus*.

years after the discovery of this lake by G. Von Götzen. It is very improbable that fish were introduced before that time, thus *O. niloticus* must be natural in Lake Kivu (Thys van den Audenaerde, 1964).

The introduction of *Bagrus docmak* into Lake Kivu from Lake Edward soon after the K.E.A.-investigations during 1952 to 1954, has also sometimes been mentioned (Mahy, 1979b). It is true that some members of the K.E.A.-team recommended this introduction (Hulot, 1956), but there is no clear proof that it was ever attempted or successfully realised. And if it was, then this introduction apparently failed as this species has never been collected in Lake Kivu (Thys van den Audenaerde *et al.*, 1982).

Reizer (1975) reports the introduction of *Serranochromis "melanocephala"* (probably a *lapsus* for *S. macrocephalus* (Boulenger, 1899)), into Lake Luhondo in 1955 together with 2 tilapiine species and a barb. If this introduction of a *Serranochromis* was ever attempted, then it failed as *Serranochromis* has never been collected in Lake Luhondo afterwards.

The introduction of the two endemic Lake Victoria tilapias, *Oreochromis variabilis* (Boulenger, 1906) and *O. esculentus* (Graham, 1928) into the Akagera lakes is also sometimes reported and may have occurred in the fifties (Kiss, 1977; Welcomme, 1988). This statement is strongly weakened by our observation that most of the tilapia identifications by R. Kiss proved erroneous (Thys van den Audenaerde, pers. obs.). Furthermore, in those times, the whole Middle Akagera area, including all lakes on the Rwandese side of the river, were part of the National Park of the Kagera (the name in use before 1962 during the colonial period). By then roads inside the park were almost non-existent or poorly developed, no human activity or influence was allowed inside a national park, there was almost no tourism developed, and there was almost no fishing activity at all in these Akagera lakes. The whole fish supply to the Kigali market and for the central part of Rwanda entirely depended on the fluctuating Lake Mohasi fisheries and on fish imports from Bujumbura, Lake Tanganyika. Moreover, Kiss only began the first scientific collecting of fishes in the Akagera lakes in 1968 and no specimens of both Victoria tilapias could be found in these collections. It seems therefore very unlikely that these introductions ever took place, and the hypothesis that both species were eliminated in the competition with other (also introduced) tilapia species (Plisnier *et al.*, 1988) thus becomes highly improbable.

In 1985 V. Frank, as a private initiative, intended to introduce trout (probably rainbow trout) into cold headwater streams in Nyungwe forest in southern Rwanda where local fish are completely absent due to the low temperatures. It is unknown if this attempt succeeded or not.

During the last decades several fish species were imported in Rwanda for ornamental purposes (*e.g.* goldfish and various Lake Tanganyika species). As these species are not established in the natural waters of the country, they are not listed in Appendix I.

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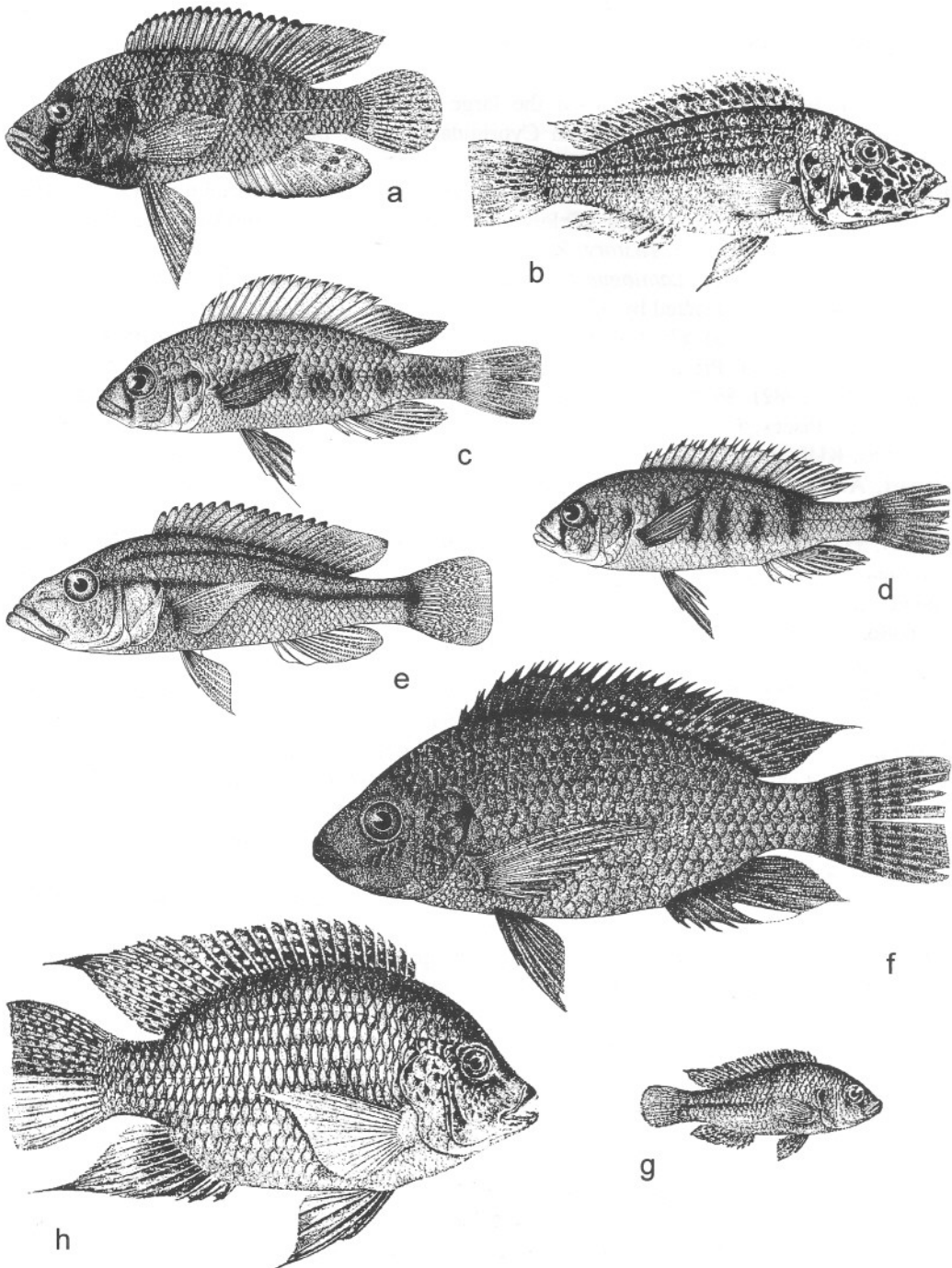


Figure 13. Cichlidae: a. *Astatoreochromis alluaudi* (after Boulenger, 1915), b. *Ctenochromis horei* (after Boulenger, 1915), c. *Haplochromis crebridens* (after Snoeks, 1994), d. *Haplochromis insidiae* (after Snoeks, 1994), e. *Haplochromis vittatus* (after Snoeks, 1994), f. *Oreochromis niloticus* (after De Vos et al., 1990), g. *Pseudocrenilabrus multicolor* (after Boulenger, 1915), h. *Tilapia rendalli* (after Boulenger, 1915).

LITERATURE CITED

- Banister, K.E. (1973). A revision of the large *Barbus* (Pisces, Cyprinidae) of East and Central Africa. Studies on African Cyprinidae Part II. *Bulletin of the British Museum (Natural History) Zoology* 26(1): 1–148.
- Banister, K.E. (1987). The *Barbus perince-Barbus neglectus* problem and a review of certain Nilotic small *Barbus* species (Teleostei, Cypriniformes, Cyprinidae). *Bulletin of the British Museum (Natural History) Zoology* 53(2): 115–138.
- Boulenger, G.A. (1909). *Catalogue of the fresh-water fishes of Africa in the British Museum (Natural History)*. Printed by order of the Trustees. London 1: 1–373.
- Boulenger, G.A. (1915). *Catalogue of the fresh-water fishes of Africa in the British Museum (Natural History)*. Printed by order of the Trustees. London 3: 1–526.
- Belpaire, C. (1982). Systematisch-morfologische studie van de *Haplochromis* en aanverwante soorten (Pisces, Cichlidae) uit het Ihemameer (Akagera, Rwanda). Unpublished M. Sc. thesis, KUL, Leuven.
- Capart, A. (1959). A propos de l'introduction du Ndakala (*Stolothrissa tanganyikae*) dans le lac Kivu. *Bulletin Agricole du Congo belge* 50(4): 1083–1088.
- Damas, H. (1953). Les lacs du Rwanda et leurs problèmes. *Annales de la Société Royale Zoologique de Belgique* 84(1): 17–38.
- David, L. & M. Poll (1937). Contribution à la faune ichthyologique du Congo Belge: collections du Dr. H. Schouteden (1924–1926) et d'autres récolteurs. *Annales du Musée du Congo* (1) 3(5): 189–294.
- De Bont, A.F. (1950). Rapport annuel 1947–1948 de la station de recherches piscicoles. *Bulletin Agricole du Congo belge* 41(2): 473–538.
- De Bont, A.F. (1954). Station de recherches piscicoles à Elisabethville. Rapports annuels nr. 4 (1951) et nr. 5 (1952–53). *Bulletin Agricole du Congo belge* 45(5): 1315–1348.
- De Vos, L. (1993). Le genre *Chiloglanis* (Siluriformes, Mochokidae) dans le bassin de la Ruzizi: description de deux nouvelles espèces. *Journal of African Zoology* 107: 153–168.
- De Vos, L. (1995). A systematic revision of the African Schilbeidae (Teleostei, Siluriformes). With an annotated bibliography. *Annales du Musée royal de l'Afrique Centrale, Sciences Zoologiques* 271: 1–450.
- De Vos, L. (2002). Projet DAB-RWA/022 (Développement Agricole du Bugesera, Rwanda): Rapport de mission de diagnostic rapide du volet « Pêche », RWA/922-DAB Bugesera II, Agence luxembourgeoise pour la Coopération au Développement.
- De Vos, L., J. Snoeks & D. Thys van den Audenaerde (1990). The effects of *Tilapia* introductions in Lake Luhondo, Rwanda. *Environmental Biology of Fishes* 27: 303–308.
- De Vos, L. & D. Thys van den Audenaerde (1990a). Description de *Barbus claudinae* sp.n. (Cyprinidae) avec synopsis des grandes espèces de *Barbus* du Rwanda. *Cybiurn* 14(1): 3–25.
- De Vos, L. & D. Thys van den Audenaerde (1990b). Petits *Barbus* (Pisces, Cyprinidae) du Rwanda. *Revue d'Hydrobiologie Tropicale* 23(2): 141–159.
- Frank, V., J.-C. Micha, A. Gillet & P.-D. Plisnier (1984). *Etude de la biologie des espèces de poissons exploités dans le lac Ihema (Bassin de l'Akagera) au Rwanda*. AGCD-CECODEL-UNECED (FNDP), Namur.
- Froese, R. & D. Pauly (eds.) (2000). *FishBase 2000: concepts, design and data sources*. ICLARM, Los Banos, Laguna, Philippines+ CD-rom.

- Greenwood, P. H. (1962). A revision of certain *Barbus* species (Pisces, Cyprinidae) from East, Central and South Africa. *Bulletin of the British Museum (Natural History) Zoology* 8(4): 151–208.
- Greenwood, P.H. (1966). *The Fishes of Uganda*. The Uganda Society, Kampala.
- Greenwood, P.H. (1979). Towards a phyletic classification of the 'genus' *Haplochromis* (Pisces, Cichlidae) and related taxa. Part I. *Bulletin of the British Museum (Natural History) Zoology* 35(4): 265–322.
- Hulot, A. (1956). Aperçu sur la question de la pêche industrielle aux lacs Kivu, Edouard et Albert. *Bulletin Agricole du Congo belge* 47(4): 815–888.
- Kiss, R. (1977). Les poissons et la pêche dans le lac Ihema (Rwanda, bassin moyen de l'Akagera). *Annales Hydrobiologiques* 8(2): 263–318.
- Lévêque, C. (1997). *Biodiversity dynamics and conservation: the freshwater fish of tropical Africa*. Cambridge University Press, Cambridge.
- Mahy, G. (1977). Bases scientifiques pour l'aménagement et l'exploitation rationnelle des ressources piscicoles du Rwanda. *Etudes Rwandaises* 11(1): 1–25.
- Mahy, G. (1979a). Contribution à la connaissance de la faune piscicole du Rwanda avec clés d'identification des espèces. II. Espèces nouvellement répertoriées dans les lacs de l'Akagera. *Etudes rwandaises* 12(2): 97–119.
- Mahy, G. (1979b). Biologie et écologie du lac Kivu. *Etudes Rwandaises* 12(3): 1–108.
- Marlier, G. (1962). Rapport sur la mission IRSAC au Mugesera Mars 1960 (unpublished report).
- Paugy, D. (1984). Characidae. In: J. Daget, J.-P. Gosse & D.F.E. Thys van den Audenaerde (eds.), *Check-list of the freshwater fishes of Africa*, Vol. 1, MRAC-ORSTOM, p. 140–183.
- Paugy, D. (1986). *Révision systématique des Alestes et Brycinus africains (Pisces, Characidae)*. Editions ORSTOM, Collection Etudes et Thèses.
- Pellegrin, J. (1935). Les variations buccales chez les barbeaux de la région du Kivu. *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences, Paris* 201: 848–850.
- Plisnier, P.-D. (1984). Etude de la biologie de *Tilapia (Sarotherodon) macrochir* BLGR et comparaison avec *Tilapia (Sarotherodon) nilotica* L. deux espèces commercialement exploitées dans le lac Ihema (Rwanda). *Mémoire Ingénieur Agronomie*. Université Catholique de Louvain-la-Neuve.
- Plisnier, P.-D. (1989). Etude hydrobiologique et développement de la pêche au lac Muhazi (Bassin de l'Akagera, Rwanda). Rapport Final (1986–1988). ACDST (ULG)-UNECED (FUNDP)-MINAGRI-AGCD.
- Plisnier, P.-D. (1990). Ecologie comparée et exploitation rationnelle de deux populations d'*Haplochromis* spp. (Teleostei, Cichlidae) des lacs Ihema et Muhazi (Rwanda). PhD thesis, UCL, Louvain-la-Neuve.
- Plisnier, P.-D., J.-C. Micha & V. Frank (1988). *Biologie et exploitation des poissons du lac Ihema (Bassin Akagera, Rwanda)*. ORTPN-AGCD-CECODEL (Ulg), UNECED, (FNDP), Presses Universitaires de Namur.
- Poll, M. (1952). Poissons de rivières de la région des lacs Tanganyika et Kivu recueillis par G. Marlier. *Revue Zoologique et Botanique Africaine* 46(3–4): 221–236.
- Poll, M. (1953). Poissons non Cichlidae. Exploration Hydrobiologique du Lac Tanganika (1946–1947). *Résultats Scientifiques de l'Exploration Hydrobiologique du Lac Tanganika* 3(5A): 1–251.
- Poll, M. & H. Damas (1939). Poissons. *Exploration du Parc National Albert, Mission H. Damas. Institut des Parcs Nationaux du Congo Belge* 6: 1–73.

- Reizer, C. (1975). Essai de définition d'une politique de production de protéines-poisson en République Rwandaise. Rapport PNUD/FAO RWA/68/04. Arlon, Belgique, pag. Var., (mimeo, 135 pp.).
- Riehl, R. & H.A. Baensch (1996). *Aquarien Atlas*, Band 1. 10th edition. Merlus Verlag, Melle, Germany.
- Seegers, L. (1996). The Fishes of the Lake Rukwa Drainage. *Annales du Musée Royal de l'Afrique Centrale, Sciences Zoologiques* 287: 1-407.
- Seegers, L. (1998). *Bemerkung zur Gattung Pseudocrenilabrus. Teil 1. Pseudocrenilabrus multicolor multicolor (Schoeller, 1903)*. Die Aquarien- und Terrarienzeitschrift (DATZ) 3: 167-172.
- Seegers, L. (1990). *Bemerkung zur Gattung Pseudocrenilabrus. Teil 2. Pseudocrenilabrus multicolor victoriae nov. subsp.*. Die Aquarien- und Terrarienzeitschrift (DATZ) 2: 99-103.
- Snoeks, J. (1994). The Haplochromines (Teleostei, Cichlidae) of Lake Kivu (East Africa). *Annales du Musée royal de l'Afrique Centrale, Sciences Zoologiques* 270: 1-221.
- Snoeks, J., L. De Vos & D. Thys van den Audenaerde. (1997). The Ichthyogeography of Lake Kivu. *South African Journal of Science* 93: 579-584.
- Schwanck, E. (1994). Behaviour and colour differences between *Oreochromis macrochir* and *O. mweruensis* (Teleostei: Cichlidae). *Ichthyological Exploration of Freshwaters* 5(3): 267-280.
- Teugels, G.G. (1986). A systematic revision of the African species of the genus *Clarias* (Pisces; Clariidae). *Annales du Musée Royal de l'Afrique Centrale, Sciences Zoologiques*, 247: 1-199.
- Thys van den Audenaerde, D.F.E. (1964). Révision systématique des espèces congolaises du genre *Tilapia* (Pisces, Cichlidae). *Annales du Musée Royal de l'Afrique Centrale, Sciences Zoologiques* 124: 1-155.
- Thys van den Audenaerde, D.F.E. (1968). Le statut taxonomique des espèces de *Tilapia* décrites par Aug. Duméril en 1859. *Revue Zoologique et Botanique Africaine* 78(3-4): 295-314.
- Thys van den Audenaerde, D. (1987). Programme ichtyologie: Recherches sur les Poissons. In D. Thys van den Audenaerde (Ed.). *Recherche scientifique au Rwanda par le Musée de Tervuren*. Musée Royale de l'Afrique Centrale, Tervuren. Pp. 103-114.
- Thys van den Audenaerde, D.F.E., E. Coenen, J. Robben & D. Vervoort (1982). Fisheries Research on Lake Kivu. Mimeo Musée Royale de l'Afrique Centrale, Tervuren.
- Verbeke, J. (1957). Le régime alimentaire des poissons du lac Kivu (Congo belge et Rwanda) et l'exploitation des ressources naturelles du lac. Exploration Hydrobiologique des Lacs Kivu, Edouard et Albert (1952-1954) 3(2): 1-24 (Bursse's Natural History Institute report).
- Welcomme, R. L. (1988). International introductions of inland aquatic species. *FAO Fisheries Technical Papers* 294: 1-318.
- Wildekamp, R. H. (1995). *A World of Killies. Atlas of the oviparous cyprinodontiform fishes of the world*. Vol. II. American Killifish Association.

Appendix 1. List of fish species currently known from Rwandese waters. The area "Upper Akagera" refers to the Nyabarongo-Akanyaru drainage and the associated lakes of the Bugesera depression above the Rusumo Falls, situated on the border between Tanzania and Rwanda. The area "Middle Akagera" refers to Rwandese waters of the Akagera system below those falls. SL: indicates standard length; TL indicates total length.

| Species, common and local names | Distribution, comments and maximum known sizes |
|--|--|
| PROTOPTERIDAE-African lungfishes (1 species) | |
| <i>Protopterus aethiopicus</i> Heckel, 1851 (Fig. 2) Marbled lungfish "Mamba" | Lake Mohasi, Upper Akagera system; introduced in Lake Mohasi around 1988-89 from Lake Edward. Since then dispersed from Lake Mohasi to other parts of the Upper Akagera system (e.g. Bugesera lakes); 2 m TL. |
| CLUPEIDAE-Herrings, Sardines (1 species) | |
| <i>Limnothrissa miodon</i> (Boulenger, 1906) (Fig. 3) Lake Tanganyika sardine "Isambaza", "Agahuza", "Indagara", "Karumba" | Lake Kivu; introduced from Lake Tanganyika in 1959 for fishery purposes; 17.5 cm TL |
| MORMYRIDAE-Elephant-snout fishes (6 species) | |
| <i>Gnathonemus longibarbis</i> (Hilgendorf, 1888) (Fig. 4a) Longnose stonebasher "Cyumbi", "Cyumi", "Mpumbi", "Imbaraga" | Middle Akagera system; 36 cm TL |
| <i>Hippopotamyrus grahami</i> (Norman, 1928) Graham's stonebasher "Cyumi", "Enkwekwe", "Imbaraga" | Middle Akagera system; 20 cm TL |
| <i>Marcusenius victoriae</i> (Worthington, 1929) (Fig. 4b) Victoria stonebasher "Imbaraga" | Middle Akagera system; a record of <i>Marcusenius cyprioides</i> (Linnaeus, 1758) from the Middle Akagera by Kiss (1977), quoted by Frank et al. (1984) and Plisnier et al. (1988), is a misidentification of <i>M. victoriae</i> ; 26 cm TL |
| <i>Mormyrus kannume</i> Forskal, 1775 (Fig. 4c) Elephant-snout fish, Bottlenose "Kasurabana", "ikimote", "Intama" | Middle Akagera system; 100 cm TL |
| <i>Petrocephalus catostoma</i> catostoma (Günther, 1866) (Fig. 4d) Churchill "Imbaraga" | Middle Akagera system; 15.2 cm TL |

| Species, common and local names | Distribution, comments and maximum sizes |
|---|---|
| <i>Pollimyrus nigricans</i> (Boulenger, 1906) (Fig. 4e) Dark stonebasher "Imbaraga", "Akagera", "Bunwa" | Upper and Middle Akagera; 10 cm SL |
| ALESTIDAE-African characids (2 species) | |
| <i>Brycinus jacksonii</i> (Boulenger, 1912) (Fig. 5) | Middle Akagera system; records of <i>Alestes nurse</i> (Rüppell, 1832) from the Middle Akagera by Kiss (1977), Frank <i>et al.</i> (1984) and Plisnier <i>et al.</i> (1988) and of <i>Brycinus imberii</i> (Peters, 1852) by Paugy (1986) and Plisnier <i>et al.</i> (1988) refer to <i>B. jacksonii</i> ; 27 cm TL |
| Victoria robber "Ikiraba", "Inshoga" | |
| <i>Brycinus sadleri</i> (Boulenger, 1906) | Middle Akagera system; 13.8 cm TL |
| Sadler's robber "Ikiraba", "Inshoga" | |
| CYPRINIDAE-Cyprinids (24 species) | |
| <i>Acapoeta tanganicae</i> (Boulenger, 1900) (Fig. 6a) | Rusizi basin; 61 cm TL |
| Mbaraga "Mbaraga" | |
| <i>Barbus acuticeps</i> Matthes, 1959 | Upper and Middle Akagera; 40.3 cm TL |
| Matthes' barb | |
| <i>Barbus altianalis</i> Boulenger, 1900 | Lake Kivu, Rusizi basin, Middle Akagera; a record by Verbeke (1957) of <i>Barbus cf. duchesni</i> Boulenger, 1902 (a junior synonym of <i>B. intermedius</i> Rüppell, 1836) from Lake Kivu refers to this species. Hulot (1956) reported the group <i>B. bynni</i> (Forsk., 1775) - <i>B. radcliffei</i> Boulenger 1903 - <i>B. altianalis</i> from Lake Kivu which refers in fact to the single <i>B. altianalis</i> . A record of <i>B. victoriae</i> Boulenger, 1908 (junior synonym of <i>B. marequensis</i> Smith, 1841) from the Middle Akagera by Mahy (1977) is a misidentification for one of the three large barbs occurring in this system; 90 cm TL |
| Ripon Falls barb "Umusege", "Isasi", "Ikinanga", "Inkwekwe" | |
| <i>Barbus apleurogramma</i> Boulenger, 1911 | Rusizi basin, Lake Kivu drainage, Upper and Middle Akagera, Lake Mohasi; 5.4 cm SL |
| East African redefined barb "Imisege", "Agahuza", "Isamweru", "Ikananga", "Inkwekwe" | |
| <i>Barbus cercops</i> Whitehead, 1960 (Fig. 6b) | Middle Akagera; 7 cm SL |
| Luambwa barb "Ikinanga", "Inkwekwe" | |

| Species, common and local names | Distribution, comments and maximum sizes |
|--|--|
| <i>Barbus claudinae</i> De Vos & Thys van den Audenaerde, 1990 (Fig. 6c) | Upper Akagera system; 23.4 cm SL / 30 cm TL |
| Claudine's barb "Ifurwe", "Mbinki", "Umujera" | |
| <i>Barbus kerstenii</i> Peters, 1868 | Middle Akagera, Lake Kivu drainage; a record of <i>Barbus serrifer</i> Boulenger, 1900 by Poll & Damas (1939) partly refers to this species; 9 cm SL |
| Redspot barb, Kersten's barb "Imisege", "Agahuza", "Isharangati", "Ikinanga", "Inkwekwe" | |
| <i>Barbus lineomaculatus</i> Boulenger, 1903 | Rusizi basin; 11 cm SL |
| Line-spotted barb "Ijembe" | |
| <i>Barbus microbarbis</i> David & Poll, 1937 | Lake Luhondo; uncertain status; known from only one specimen; according to Banister (1973) it could be a hybrid between a <i>Varicorhinus</i> species and a <i>Barbus</i> species; 27 cm TL |
| Short barbelled barb | |
| <i>Barbus neumayeri</i> Fischer, 1884 | Upper Akagera drainage, Lake Mohasi, Lakes Bulera and Luhondo, Mukungwa River, Rusizi system; a record of <i>Barbus oligogrammus</i> David, 1936 from Rwanda by Poll (1952) |
| Neumayer's barb "Ubuhenza", "Ingege", "Ishimbo", "Ikitamennye", "Ifurwe", "Agahuzi" | refers to <i>B. neumayeri</i> . <i>Barbus luhondo</i> Pappenheim & Boulenger and also <i>B. kerstenii luhondo</i> and <i>B. mohasicus</i> (partim) Pappenheim & Boulenger, 1914 are junior synonyms of <i>B. neumayeri</i> (see De Vos & Thys van den Audenaerde, 1990b); 11.8 cm SL |
| <i>Barbus nyanzae</i> Whitehead, 1960 | Middle Akagera system; 7 cm SL |
| Nyanza barb "Ikinanga", "Inkwekwe" | |
| <i>Barbus paludinosus</i> Peters, 1852 | Middle Akagera system; 11.5 cm SL |
| Straightfin barb "Ikinanga", "Inkwekwe" | |
| <i>Barbus pellegrini</i> Poll, 1939 | Rusizi basin, Lake Kivu drainage; records of <i>Barbus serrifer</i> Boulenger, 1900 by Pellegrin (1935) and by David & Poll (1937) refer to this species and a record of <i>B. serrifer</i> by Poll & Damas (1939) partly refers to this species; 9 cm SL |
| Pellegrin's barb "Imisege", "Agahuza" | |
| <i>Barbus ruasae</i> Pappenheim & Boulenger, 1914 | Mukungwa River; 43 cm SL / 49.5 cm TL |
| Rwasa barb Ishinja" | |

| Species, common and local names | Distribution, comments and maximum sizes |
|--|--|
| <i>Barbus somereni</i> Boulenger, 1911 Someren's barb "Ikinanga", "Inkwenwe", "ifurwe", "Urwozi" | Rusizi basin, Upper and Middle Akagera; 36 cm SL |
| <i>Ctenopharyngodon idellus</i> (Valenciennes in Cuvier & Valenciennes, 1844) ? Grass carp | Upper Akagera (?); introduced from Korea in 1979 for aquaculture and weed control (Welcomme, 1988). Most likely not established in the wild; 150 cm TL |
| <i>Cyprinus carpio</i> Linnaeus, 1758 Common carp "inkuyu" | Upper and Middle Akagera system, Lake Karago (a small highland lake in the north east of the country); introduced; 120 cm SL |
| <i>Garra dembeensis</i> (Rüppell, 1836) Dembea stone lapper | Mukungwa River; Probably more widely distributed in Rwandese waters; 11 cm SL / 14.6 cm TL |
| <i>Hypophthalmichthys molitrix</i> (Valenciennes in Cuvier & Valenciennes, 1844) ? Silver carp, Chinese carp | Upper Akagera (?); introduced in 1979 from Korea for aquaculture (Welcomme, 1988). Most likely not established in the wild; 100 cm TL |
| <i>Labeo victorinus</i> Boulenger, 1901 (Fig. 6d) Victoria labeo "Iningu", "Eningu", "Umuraba", "Impiryi", "Ikiraba" | Upper and Middle Akagera, Lake Mohasi; introduced in Lake Mohasi in the late 1980s or early 1990s; 41 cm TL |
| <i>Raiamas moorei</i> (Boulenger, 1900) (Fig. 6e) Moore's minnow "Umukenya" | Lake Kivu basin, Rusizi system; 22 cm TL |
| <i>Varicorhinus leleupanus</i> Matthes, 1959 Leleup's carp "Mbaraga" | Rusizi basin; 22 cm SL |
| <i>Varicorhinus platystoma</i> Pappenheim & Boulenger, 1914 Rwandese carp "Inshurezi" | Mukungwa River; taxonomic status uncertain; 21 cm TL |
| <i>Varicorhinus ruandae</i> Pappenheim & Boulenger, 1914 (Fig. 6f) Rwandese carp "Inshurezi" | Mukungwa River; taxonomic status uncertain; 26.2 cm SL |

| Species, common and local names | Distribution, comments and maximum sizes |
|---|---|
| SCHILBEIDAE -Glass catfishes (1 species) | |
| <i>Schilbe intermedius</i> Rüppell, 1832 (Fig. 7) | Upper and Middle Akagera; naturally distributed in Middle Akagera; introduced in the Upper Akagera system in 1962 from Jinja (Lake Victoria); also reported from Rwandese waters under the erroneous name <i>Schilbe mystus</i> (Linnaeus, 1762) which is in fact a Nilotic species; 60.5 cm TL |
| Silver catfish, Butter catfish | |
| "Injera", "Imputa", "Impiryi", "Nzeji" | |
| AMPHILIIDAE -Mountain catfishes (2 species) | |
| <i>Amphilius jacksonii</i> Boulenger, 1912 | Rusizi basin, Upper Akagera; most likely also present in the Middle Akagera; 15 cm TL |
| Marbled mountain catfish | |
| <i>Amphilius uranoscopus</i> (Pfeffer, 1889) (Fig. 8) | Rusizi basin, Upper Akagera, Lake Luhondo system, Lake Kivu system; most likely <i>Amphilius kivuensis</i> Pellegrin, 1933 is a junior synonym of this species; 19.5 cm TL |
| Stargazer mountain catfish | |
| "Ishonzi", "Iminya", "Ihijigi" | |
| CLARIIDAE -Airbreathing catfishes (2 species) | |
| <i>Clarias gariepinus</i> (Burchell, 1822) | Upper and Middle Akagera, Lake Mohasi, Lake Kivu system, Rusizi basin; naturally distributed in the Middle Akagera, Lake Kivu drainage and the Rusizi; elsewhere introduced; also reported from Rwandese waters under the name <i>Clarias mossambicus</i> (Peters, 1852), a junior synonym of <i>C. gariepinus</i> ; 150 cm SL |
| Sharptooth catfish, Mudfish | |
| "Ishonzi", "Inkuba", "Umihenzi", "Isombi", "Kamongo", "Kabambare" | |
| <i>Clarias iiocephalus</i> Boulenger, 1898 (Fig. 9) | Rugezi swamps, Lakes Bulera and Luhondo, Mukungwa River, Lake Mohasi, Upper and Middle Akagera, Lake Kivu System, Rusizi drainage; also reported as <i>Clarias carsonii</i> Boulenger, 1903, a junior synonym; formerly very common, this species has recently strongly declined in the Bugesera depression (Upper Akagera), most likely because of predation by and or competition with the introduced <i>Clarias gariepinus</i> and <i>Schilbe intermedius</i> (see De Vos, 2002); 35 cm TL |
| Smoothhead catfish | |
| "Isombe", "Ishonzi", "Ighoro", "Umugorora", "Umukubengeri" | |
| MOCHOKIDAE -Squeakers-Suckermouths (4 species) | |
| <i>Synodontis afrofisheri</i> Hilgendorf, 1888 | Middle Akagera system; 14 cm SL, 17.7 cm TL |
| Marbled Victoria squeaker | |
| "Inkoronko", "Kinkoronko" | |
| <i>Synodontis ruandae</i> Matthes, 1959 (Fig. 10a) | Upper and Middle Akagera; taxonomic status needs investigation; sometimes doubtfully distinct from the closely related <i>Synodontis victorinae</i> Boulenger, 1906 from Lake Victoria and the Malagarasi basin; 12.4 cm SL |
| Rwanda squeaker | |
| "Impahwa", "Inkero", "Nyiramacumu", "Igitera", "Impwashwa" | |

| Species, common and local names | Distribution, comments and maximum sizes |
|--|--|
| <i>Chiloglanis asymetricaudalis</i> De Vos, 1993 (Fig. 10b) Longtail suckermouth "Ikijagari" | Rusizi basin; 7.6 cm SL |
| <i>Chiloglanis ruziziensis</i> De Vos, 1993 Rusizi suckermouth Ikijagari" | Rusizi basin; 6.3 cm SL |
| APLOCHEILICHTHYIDAE-Lampeyes (1 species) <i>Aplocheilichthys centralis</i> Seegers, 1996 (Fig. 11) Central East African Lampeye | Middle Akagera system; in earlier literature (e.g. Kiss, 1977) this species was listed from the Middle Akagera as <i>Aplocheilichthys pumilus</i> Boulenger, 1906, a species restricted to the Lake Tanganyika drainage; Wildekamp (1995) reports that the species from the Akagera River and associated lakes in eastern Rwanda represents an undescribed species; Wildekamp (pers. comm.) attributes this species to <i>A. centralis</i> , recently described by Seegers (1996); 3.3 cm TL |
| MASTACEMBELIDAE-Spinyeels (1 species) <i>Mastacembelus frenatus</i> Boulenger, 1901 (Fig. 12) Longtail spinyeel "Urukungwe" | Rusizi basin, Upper and Middle Akagera, Lake Mohasi; also reported (e.g. Matier, 1962) as <i>Mastacembelus taeniatus</i> Boulenger, 1901, a junior synonym. Previously sometimes incorrectly included in <i>Caecomastacembelus</i> or <i>Afromastacembelus</i> (Vreven, work in progress); 40 cm SL |
| CICHLIDAE-Cichlids (38 species) <i>Astatoreochromis alluaudi</i> Pellegrin, 1904 (Fig. 13a) Alluaud's haplo "Ifuro", "Nyiramuhundi", "Ikaje", "Icyasamyi" <i>Ctenochromis horei</i> (Günther, 1893) (Fig. 13b) Hore's haplo <i>Haplochromis adolphifrederici</i> (Boulenger, 1914) Friedrich's Kivu haplo "Ifuro" <i>Haplochromis astatodon</i> Regan, 1921 Regan's Kivu haplo "Ifuro" | Upper and Middle Akagera; introduced in the early 1960s in the Bugesera system for mollusc control; dispersed afterwards; 19 cm SL Rusizi basin; also often indicated under the generic name <i>Haplochromis</i> ; current generic status uncertain; 20 cm SL Lake Kivu; 11.4 cm SL Lake Kivu; 10 cm SL |

| Species, common and local names | Distribution, comments and maximum sizes |
|--|--|
| <i>Haplochromis burtoni</i> (Günther, 1893) Burton's haplo "Ifuro" | Upper and Middle Akagera, Lake Mohasi; the distribution of <i>Haplochromis burtoni</i> has been reported as restricted to Lake Tanganyika and associated rivers (Greenwood, 1979); however we found that it is currently very common in various lakes in the Bugesera depression where it might be present due to introduction by man; we also collected this species from the Middle Akagera which indicates that it is dispersing in the Akagera system; although absent until the 1980s from lake Mohasi it is now also very abundant in this lake and, at least in the south of the lake, strongly outnumbered the autochthonous or previously introduced haplochromines; a record of <i>H. burtoni</i> from Lake Kivu (Riehl & Baensch, 1996 reported in Froese & Pauly, 2000) is doubtful: as far as known <i>H. burtoni</i> does not occur in Lake Kivu; 15 cm SL |
| <i>Haplochromis crebridens</i> Snoeks, De Vos, Coenen & Thys van den Audenaerde, 1990 (Fig. 13c) Sky-blue Kivu haplo "Ifuro" | Lake Kivu; 13.8 cm SL |
| <i>Haplochromis erythromaculatus</i> De Vos, Snoeks & Thys van den Audenaerde, 1990 Bulera haplo "Amahere" | Lakes Bulera and Luhondo, Upper Mukungwa River; a species which was probably introduced as juveniles together with young tilapia from Lake Bunyoni, Uganda or from Lakes Edward or George (De Vos <i>et al.</i> , 1990); 10.3 cm SL |
| <i>Haplochromis gracilior</i> Boulenger, 1914 Boulenger's Kivu haplo "Ifuro" | Lake Kivu; 10.3 cm SL |
| <i>Haplochromis graueri</i> Boulenger, 1914 Grauer's Kivu haplo "Ifuro" | Lake Kivu; 11.9 cm SL |
| <i>Haplochromis insidiae</i> Snoeks, 1994 (Fig. 13d) Snoeks' Kivu haplo "Ifuro" | Lake Kivu; 9.4 cm SL |
| <i>Haplochromis kamiranzovu</i> Snoeks, Coenen & Thys van den Audenaerde, 1990 Kamiranzovu haplo "Ifuro" | Lake Kivu; 9.4 cm SL |
| <i>Haplochromis microchrysomelas</i> Snoeks, 1994 Orange tail Kivu haplo "Ifuro" | Lake Kivu; 8.3 cm SL |

| Species, common and local names | Distribution, comments and maximum sizes |
|---|--|
| <i>Haplochromis nigroides</i> (Pellegrin, 1928) Pellegrin's Kivu haplo "Ifuro" | Lake Kivu; 7.2 cm SL |
| <i>Haplochromis occultioides</i> Snoeks, 1988 Paedophagous Kivu haplo "Ifuro" | Lake Kivu; 12.3 cm SL |
| <i>Haplochromis olivaceus</i> Snoeks, De Vos, Coenen & Thys van den Audenaerde, 1990 Olive Kivu haplo "Ifuro" | Lake Kivu; 8.9 cm SL |
| <i>Haplochromis paucidens</i> Regan, 1921 Trimorphic Kivu haplo "Ifuro" | Lake Kivu; 10.6 cm SL |
| <i>Haplochromis rubescens</i> Snoeks, 1994 Red Kivu haplo "Ifuro" | Lake Kivu; 11.4 cm SL |
| <i>Haplochromis scheffersi</i> Snoeks, De Vos & Thys van den Audenaerde, 1987 Scheffers' Kivu haplo "Ifuro" | Lake Kivu; 10.2 cm SL |
| <i>Haplochromis vittatus</i> (Boulenger, 1901) (Fig. 13e) Striped Kivu haplo "Ifuro" | Lake Kivu; 19.1 cm SL |
| <i>Haplochromis (Gaurochromis)</i> "Mohasi" "Ifuro" | Lake Mohasi; ecology and fisheries reported by Plisnier (1990); about 10 cm SL |
| <i>Haplochromis</i> spec. "Thicklip Mohasi" "Ifuro" | Lake Mohasi; about 15 cm SL |
| <i>Haplochromis</i> spec. "Small black Mohasi" "Ifuro" | Lake Mohasi; about 9 cm SL |

| Species, common and local names | Distribution, comments and maximum sizes |
|---|---|
| <i>Haplochromis</i> spec. | Bugesera lakes; about 10 cm SL |
| "Small red Bugesera" | |
| "Ifuro" | |
| <i>Haplochromis</i> spec. | Lake Karago (a small highland lake in the north east of the country); probably introduced into Lake Karago; about 11 cm SL |
| "Karago" | |
| "Ifuro" | |
| <i>Haplochromis (Gaurochromis)</i> spec. | Bugesera lakes; about 15 cm SL |
| "Bugesera" | |
| "Ifuro" | |
| <i>Haplochromis (Harpagochromis)</i> spec. | Bugesera lakes; carnivorous haplochromines from Lake Mugesera (Bugesera depression) were reported as <i>Haplochromis rubilus</i> (Boulenger, 1906) by Marlier (1962), a misidentification; about 18 cm SL |
| "Bugesera" | |
| "Ifuro" | |
| <i>Haplochromis (Paralabidochromis)</i> spec. | Bugesera lakes; about 14 cm SL |
| "Bugesera" | |
| "Ifuro" | |
| <i>Haplochromis (Gaurochromis)</i> spec. | Middle Akagera; ecology and fisheries reported by Plisnier (1990); about 14 cm SL |
| "Ihema" | |
| "Icyasamyi" | |
| <i>Haplochromis (Haplochromis)</i> spec. 1 | Middle Akagera; about 7 cm SL |
| "Ihema" | |
| "Icyasamyi" | |
| <i>Haplochromis (Haplochromis)</i> spec. 2 | Middle Akagera; about 9 cm SL |
| "Ihema" | |
| "Icyasamyi" | |
| <i>Haplochromis (Harpagochromis)</i> spec. | Middle Akagera; about 15 cm SL |
| "Ihema" | |
| "Icyasamyi" | |
| <i>Haplochromis (Paralabidochromis)</i> spec. | Middle Akagera; about 15 cm SL |
| "Ihema" | |
| "Icyasamyi" | |

| Species, common and local names | Distribution, comments, maximum sizes |
|---|--|
| <i>Oreochromis leucostictus</i> (Trewavas, 1933) | Upper and Middle Akagera; introduced; a record of Snoeks <i>et al.</i> (1997) from Lake Kivu needs confirmation; 32 cm TL |
| Blue spotted tilapia "Icyimanye cy'inyarufunzo n'inyamugera" | |
| <i>Oreochromis macrochir</i> (Boulenger, 1912) (Longfin tilapia) "Ighwati", "Ingege y'inyafurunzo" | Lake Kivu, Upper and Middle Akagera; previously <i>Oreochromis macrochir</i> and <i>O mweruensis</i> were considered as two distinct subspecies of <i>O. macrochir</i> but now considered to be distinct at specific level (Schwanck, 1994); introduced in the late 1940s and the early 1950s respectively from Zambia and Congo for aquaculture and stocking; both species fully hybridise and to what extent they kept pure or eventually hybridised in the areas where they were introduced together is not known; 27.1 cm SL |
| <i>Oreochromis mweruensis</i> Trewavas, 1983 (Mweru tilapia) "Ighwati", "Ingege y'inyafurunzo" | Lake Kivu, Upper and Middle Akagera (?); see annotation under <i>Oreochromis macrochir</i> , 23.8 cm SL |
| <i>Oreochromis niloticus</i> (Linnaeus, 1758) (Fig. 13f) Edward tilapia (Lake Kivu race) Nile tilapia "Ighonda" (females), "Isake" (males), "Ingege y'inyamugera" | Lake Kivu, Rusizi basin, Upper and Middle Akagera, Lakes Bulera and Luhondo, Lake Mohasi; naturally distributed in Lake Kivu and the Rusizi River [(subspecies <i>O. niloticus eduardianus</i> (Boulenger, 1912)]; elsewhere various strains were introduced for aquaculture, fisheries or stocking; introduced strains originated from Uganda, Ivory Coast and Egypt; 49 cm TL |
| <i>Pseudocrenilabrus multicolor</i> (Schoeller, 1903) (Fig. 13g) Dwarf Victoria mouthbrooder "Ifuro" | Middle Akagera system, affluents of Lake Bulera; Seegers (1990, 1998) distinguished two subspecies for this Victoria species; the subspecific status of the Rwandese populations is currently unresolved; the presence of <i>Pseudocrenilabrus multicolor</i> in affluents of Lake Bulera might be the result of an introduction but more likely the species naturally occurs in various areas of the Upper Akagera; 8 cm TL |
| <i>Tilapia rendalli</i> (Boulenger, 1896) (Fig. 13h) Redbreast tilapia "Induwe", "Ingege y'ighwati", "Impaga" | Lake Kivu, Rusizi basin, Upper and Middle Akagera, Lake Mohasi; introduced from Congo for stocking in various lakes (Thys van den Audenaerde, 1964, Wellcomme, 1988); contrary to a statement of Wellcomme (1988) the species has not disappeared from Lake Kivu; also reported as <i>Tilapia melanopleura</i> Duméril, 1858, a misidentification; 45 cm TL |