

Annotated checklist for fishes of the Main Nile Basin in the Sudan and Egypt based on recent specimen records (2006-2015)

by

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Received: 18 Aug. 2015
Accepted: 1 Dec. 2016
Editor: H. Persat

Key words

Nile fishes
Africa
Main Nile Basin
Subfossil fish bones
Checklist
Threatened species

Abstract. – The results of several short ichthyological surveys on the Nile Basin in Sudan between 2006 and 2015 are presented. In attempting to represent major type localities and recently observed variability, we complement known field records with records of a reference collection of recent fish bones collected during the 1980s and records of aberrant cichlids populations in Egypt observed at El Fayum and in lakes of the Nile Delta. From 133 native species in the Republic of the Sudan and Egypt, 107 out of 62 genera and 28 families have been confirmed so far. The Main Nile Basin, *i.e.* the Sudd and all affluents to the Nile in the South Sudan and the Republic of the Sudan (White and Blue Nile, Sobat and Atbara) and all satellite waterbodies in Egypt, currently harbours 150 species. This count includes 10 “abberant” populations putatively representing distinct species, namely *Garra cf. vinciguerrae*, *G. sp. nov.* “flathead”, *G. sp.* “Sennar”, *Haplochromis sp.* “Delta1”, *H. sp.* “Delta2” and *H. sp.* “Fayum”, *Hemichromis cf. letourneuxi* “Birkat Abu Jumas”, *Micropanchax cf. loati*, *Poropanchax cf. normani*, and *Chiloglanis sp.* “Sennar”. Two local populations, *Sarotherodon galilaeus* (Mariut) and *Labeo forskalii* (Sennar), seem different but are not included to the count of “abberant” populations because of the high overall variability in these two species in general and intermediate populations that have been observed along the Main Nile. *Andersonia leptura* reaches as far north as Taraq Island below the former fourth Nile cataract while the small species *Chiloglanis niloticus*, *Mochokus niloticus*, *Nannocharax niloticus* and *Kribia nana* are confirmed based on individual records since Boulenger (1907). Five introduced species are confirmed for the Delta region: the cyprinids *Ctenopharyngodon idella*, *Mylopharyngodon piceus* and *Pseudorasbora parva*, as well as the poeciliids *Gambusia affinis* and *Poecilia sp. (latipinna or velifera)*. The latter species is recorded for the first time in the studied area. Together with *Oreochromis mossambicus* and *Cyprinus carpio*, the Main Nile currently harbours seven introduced species.

Résumé. – Liste annotée des espèces de poissons du bassin du Nil, au Soudan et en Égypte, fondée sur des spécimens récemment collectés (2006-2015).

Cette liste est fondée sur les résultats de plusieurs courtes explorations ichthyologiques réalisées dans le bassin du Nil au Soudan entre 2006 et 2015. Nous avons tenté de représenter les principales localités types et la récente variabilité observée en complétant les données de terrain relevées durant ces expéditions par une collection de référence des os des poissons obtenue dans les années 80 et les restes des populations des cichlidés aberrants récoltés en Égypte, à El Fayum, ainsi que dans les lacs du delta du Nil. Sur les 133 espèces indigènes signalées en République du Soudan et en Égypte, 107 ont été confirmées et regroupées en 62 genres et 28 familles. Le bassin principal du Nil, à savoir le Sudd et tous les affluents du Nil au Soudan du Sud et en République du Soudan (Nil Blanc, Nil Bleu, Sobat et Atbara) et tous les plans d'eau satellites en Égypte, héberge actuellement 150 espèces. Ce nombre inclut dix populations “aberrantes”, qui sont probablement des espèces valides ou nouvelles, à savoir *Garra cf. vinciguerrae*, *G. sp. nov.* “flathead”, *G. sp.* “Sennar”, *Haplochromis sp.* “Delta1”, *H. sp.* “Delta2” et *H. sp.* “Fayum”, *Hemichromis cf. letourneuxi* “Birkat Abu Jumas”, *Micropanchax cf. loati*, *Poropanchax cf. normani*, et *Chiloglanis sp.* “Sennar”. Deux populations locales, *Sarotherodon galilaeus* (Mariout) et *Labeo forskalii* (Sennar), semblent différentes, mais ne sont pas incluses parmi les espèces “aberrantes” en raison de la grande variabilité de ces deux espèces et des populations intermédiaires qui ont été observées le long du Nil principal. *Andersonia leptura* a été trouvée aussi loin au nord que l'île de Taraq, en dessous de l'ancienne quatrième cataracte du Nil, tandis que les petites espèces *Chiloglanis niloticus*, *Mochokus niloticus*, *Nannocharax niloticus* et *Kribia nana* sont confirmées sur la base de quelques individus signalés par Boulenger (1907). Avec *Oreochromis mossambicus* et *Cyprinus carpio*, le Nil principal héberge actuellement sept espèces introduites.

At about 6,800 km long, the Nile is the longest river of the world (Dumont, 2009). Parts of its fish fauna have been depicted by the ancient Egyptians (Brewer and Friedman, 1989). A first survey to explore the Nile ichthyofauna was performed from 1798 to 1801 by scientists accompanying

Napoleon on his conquering expedition in Egypt (Geoffroy Saint-Hilaire, 1809).

Even though the Nile was probably one of the first African rivers scientifically investigated, the number of ichthyological studies on this river is limited.

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Besides the early studies of Rüppell (1829, 1832, 1835a, 1835b), Boulenger *Zoology of Egypt: the Fishes of the Nile* (1907) remains the most comprehensive work on Nile fishes. The publications of Pekkola (1918, 1919), Sandon (1950), Abu Gideiri (1984) and the surveys of Bailey (1994) complement Boulenger work, but are focussed on specific stretches or subbasins of the Nile. Lévêque *et al.* (1991), Bailey (1994) and Witte *et al.* (2009) are the most recent works on Nile fishes. However, these three publications differ markedly in coverage, respectively exclusion of subbasins inside the Nile drainage (an overview of included tributaries or lake basins is missing in the first two publications, for example Bailey excludes lakes Albert and Tana taxa, which are included in Lévêque *et al.*, 1991). Consequently, these three publications differ in the number of recognised species in the Nile (for example Lake Tana labeobarbs or small *Enteromius* barbs in the Sudd). This makes direct comparison of accounted species difficult, especially since Witte *et al.* (2009) gave detailed but rather generic insights on faunas of single subbasins, like Lake Tana and Lake Victoria, without offering an updated checklist for the complete Nile Basin.

By comparing results from known field studies with relevant literature, we strive to present a new checklist for fishes occurring in the Main Nile. The Nile system is a composite of three ecologically distinct subbasins, the Ugandan headwaters, the Ethiopian headwaters and the Main or Saharan Nile (Williams and Talbot, 2009). We follow Abell *et al.* (2008) and Witte *et al.* (2009) in recognizing a separate Ethiopian Highland ecoregion. This ecoregion is characterised by a high degree of endemism, which is not only reflected in Lake Tana labeobarbs, but also in the occurrence of the genus *Afronemacheilus* on the Ethiopian highland (Prokofiev and Golubtsov, 2013) or several endemic *Garra* species (Stiassny and Getahun, 2007). The Ethiopian Highland ecoregion includes the Lake Tana and the upper reaches of tributaries to the rivers Atbara, Blue Nile and Sobat in Ethiopia. The junction with the Sudd and the Sudanese lowland is marked by deeply incised valleys, in which the upper reaches of the Nile tributaries ascend from the Ethiopian plateau.

The White Nile above Lake No is subdivided into three sections: the White Nile with extensive papyrus-swamps until Bor and swampy vegetation until Juba, the canalised Bahr El Gebel (the river of rocks) that is incised into the Uganda escarpment, and the Albert Nile (Rzóska, 1976a). The narrow gorge at Nimule marks the transition to the Albert Nile into the Bahr El Gebel, where parallel NW-ward leading cataracts abruptly redirect the river northwards, from where the White Nile starts to descend to the Sudd (Rzóska, 1976a).

On the Sobat, the junction with the Ethiopian Highland is the confluence of Baro with the Pibor River (Sutcliffe, 2009) at the Ethiopian border, while the transition of the Atbara

and the Blue Nile to the Sudanese Lowlands is marked with the Rumela and Burdana dams on the Atbara and the Great Ethiopian Renaissance Dam on the Blue Nile today. The Dinder predominantly lies already in the Sudanese Lowland (Rzóska, 1976b), and even though it receives water from its highly seasonal affluents descending from the Ethiopian Plateau, these affluents are dry for much of the year (Sutcliffe, 2009).

The Main Nile Basin includes the Nile Delta (Nile below Cairo with Rosetta and Damietta branches and all delta lakes), the Egyptian Nile (also Lower Nile, including the Fayum lakes), the Sudanese Nile from Aswan to Khartoum, the Atbara and Blue Nile (including the Dinder and Rahad) in the Republic of the Sudan, the White Nile including the Sobat, Bahr El Gebel and the Sudd in the South Sudan (see Fig. 1 and Adamson and Williams, 1980, for definitions and further details on subbasins). This is consistent with the ecoregions 522 (Upper Nile), 523 (Lower Nile) and 524 (Nile Delta) in Abell *et al.* (2008), except for the exclusion of the Albert Nile above the Nimule cataracts to ecoregion 522.

Available IUCN (2015) data for the Sudan and Egypt, *i.e.* Nilotic species of the Northeast Africa region, apparently refers predominantly to economically valued species while occurrence, range and population trends of small species largely seem data deficient or have not been evaluated. Comparison with older literature, including recent regional (IUCN, 2015; Garcia *et al.*, 2010) and local (Bishai and Khalil, 1997) evaluation of Nile fishes suggests that several species reported to be common by Boulenger (1907), Pekkola (1918) or Sandon (1950) are apparently declining and becoming increasingly rare in the Nile today. Among endangered species in Egypt are supposedly common species such as *Leptocypris niloticus* (Joannis, 1835), *Chelaethiops bibie* (Joannis, 1835) or *Hemichromis letourneuxi* Sauvage, 1880 (referred to as "*Hemichromis bimaculatus*" in Garcia *et al.*, 2010: tab. 3.3). Bishai and Khalil (1997) consider only 22 species to be common in Egypt (see their continued table on pages 12-15).

However, data on recruitment, effective population size, migration and range of species inside the Nile are largely missing or fragmentary, for example small species are rarely recovered in commercial catches and thus their occurrence is often overlooked (Mishrigi, 1970). Therefore, data deficiency in smaller species is likely attributed to methodical reasons, or linked with lack of taxonomic expertise to identify juvenile and subadult fishes and small species. Our recent surveys aimed to recover information (1) that provides and supplements data on the range and occurrence of Nile fishes, including small species, (2) on species that are adapted to lotic environments, which suffer from increasingly lentic conditions and (3) on availability of species at type localities.

MATERIAL AND METHODS

Surveys in the Sudan (2006, 2007, 2008, 2014 and 2015) include all major affluents except the Dinder and Sobat Rivers. Attempts to reach Rank or Malakal already before the secession of the South Sudan failed. Recent and ongoing riots in the Upper Nile Province and the political insta-

bility in and along the borders of the South Sudan prevent investigation of the Dinder, Sobat and Sudd in near future. In 2006, sampling (T. Moritz and V. von Vietinghoff) was performed using a small seine of 2 × 1.2 m with 5 mm mesh size and small dip nets from aquaria trade at several localities on the Nile River (Khartoum, Atbara City, Sennar, Kosti, Jebel Aulia Reservoir). Weak electric fishes were localised using an electric fish detector (Moritz, 2015). In 2007 (D. Neumann, J. Peters, N. Pöllath and M.M. Wadelfaki), fishing was carried out using a battery driven electrofishing device (DEKA 3000), a 8 × 1.2 m beach seine, 10 mm gill nets and frame nets (2 mm mesh). Surveys in 2008 (T. Moritz, D. Neumann, N. Pöllath and M.M. Wadelfaki), additionally employed a small seine of 2 × 1.2 m and fish traps (10 and 5 mm mesh). During flood season in 2014 and 2015 (D. Neumann, A.A. Saadelnour Abdalla and Z.N. Mahmoud), surveys largely failed because of high water levels during rainy season; fishing gear used agrees with gear deployed in 2007. Additional specimens were obtained from the Central Souq el Samak in Khartoum and the Omdourman fish market, where catches from the Sudd (until secession of the Republic of South Sudan in 2011), White Nile, Jebel Aulia and Lake Nubia were traded. Collecting, tissueing and fixation follow Neumann (2010). The records presented herein are augmented by selected additional museum specimens and subfossil bones from the last decades. Alcohol specimens are deposited in the collections of the Zoologische Staatssammlung München (ZSM), the Deutsches Meeresmuseum in Stralsund (DMM), the Natural History Museum (BMNH) in London and at the Royal Museum for Central Africa (MRAC) in Tervuren. Specimens in the Staatssammlung für Anthropologie und Paläoanatomie München (SAPM, see Annexe 1) refer to the reference collection of fish bones collected and prepared mainly during the 1980s; subfossil findings (in Annexe 2) refer to records that have been documented during projects of the SAPM in Egypt or the Sudan. Numbers of specimens are indicated behind each collection number. Square brackets give the year, if voucher specimens have been recorded prior to the last decade or if based on observations only. If not remarked otherwise, nomenclature follows as cited in the online version of the Eschmeyer Catalog (2015).

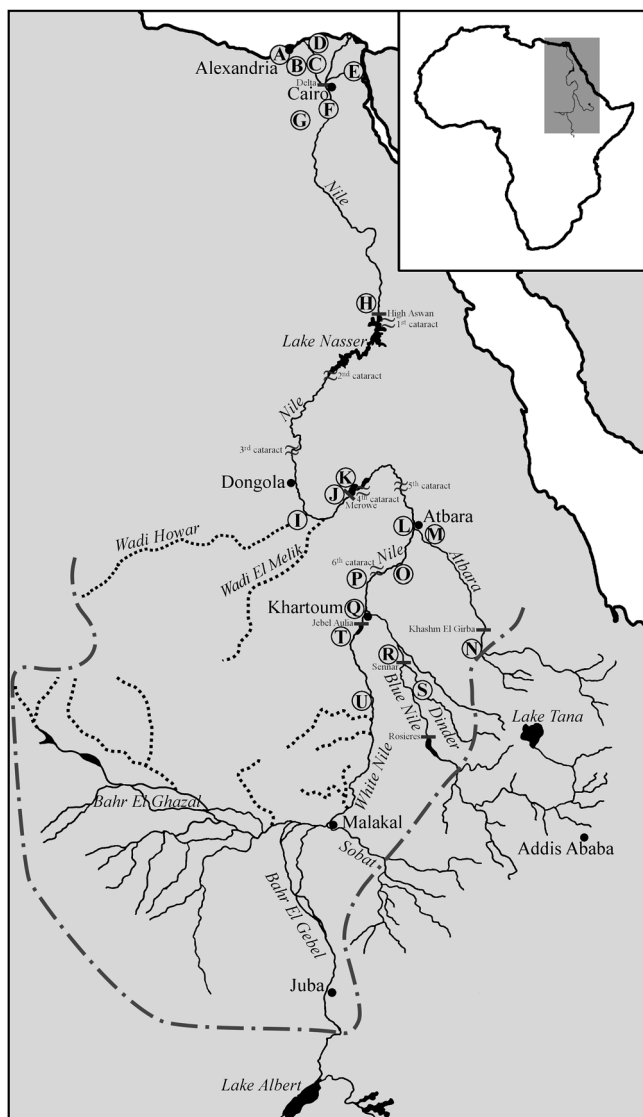


Figure 1. – Study sites and limits of Main Nile Basin (dashed grey line). **A:** Lake Mariut and Lake Bahig; **B:** Irrigation canal near Darih Efein; **C:** Irrigation canal in the area of El-Mahmoudeya; **D:** Irrigation canal in the area of Lake Burullus; **E:** Irrigation canals west of Ismailia and Lake Birkat-Abu-Jumas; **F:** Nile at El-Saf; **G:** irrigation canals in the area of El Fayum; **H:** Aswan and Lake Nasser; **I:** Lower Wadi Howar; **J:** Nile River at Taraq Island; **K:** Nile River upstream Merowe Dam; **L:** Nile River at Atbara; **M:** Atbara River at Atbara; **N:** Atbara River at Esh-Showak; **O:** Nile River at Shendi; **P:** Nile River at 6th cataract; **Q:** Nile River at Khartoum, Blue Nile at Khartoum and White Nile at Khartoum; **R:** Blue Nile at Sennar; **S:** Blue Nile at Es-Suki; **T:** White Nile upstream Jebel Aulia Dam; **U:** White Nile at Kosti.

Study area

The White Nile enters the Republic of the Sudan from the South Sudan about 110 river kilometres south of Kosti. In its course northward, it does not receive any permanent tributary for about 300 more kilometres before reaching the fan of the Blue Nile on the Gizera plain (Blue Nile below Sennar, locality R on figure 1). The Blue Nile originates at Lake Tana in Ethiopia and receives the river Dinder approximately 700 km downriver in the Sudan. In Khartoum, White and Blue Niles merge and form the Nile River. The Sudanese part of the Nile is roughly 2,500 km long, the Egyptian Nile com-

prises approximately 1,300 km; the total distance from the confluence in Khartoum to its mouth is about 3,800 km. In this section, the Nile River receives only one larger perennial tributary, the Atbara, which enters at Atbara City. Two other major western affluents that have been active throughout the early Holocene ceased their flow today: the Wadi El-Melik draining northwestern Kordofan and the Wadi Howar or Yellow Nile, draining the area east of the Ennedi and Jebel Marra Mountains (Dumont, 2009). Published data on subfossil fish remains from archaeological excavations suggest a diverse freshwater fish fauna in the Wadi Howar and Wadi El-Melik (Pöllath *et al.*, 2008; Pöllath, 2011) and the Al Fayum oasis (Linseele *et al.*, 2014) during the Holocene. Where appropriate and identified to species level, we added these data to include these affluents of the Main Nile, of which at least the upper Wadi Howar is still active, but unexplored.

Study sites

Lake Mariut (31°06'N-29°53'E) (see locality A on figure 1). – A brackish shallow lake (6‰) with satellite lakes and extensive swampy areas south of Alexandria surrounded by heavy industry plants. Maximum depth is ranging from 50-150 cm. The lake is highly eutrophic and carries high pesticide and high heavy metal residues (Hamza, 2009). Open sulphur deposits on the banks were observed during fieldwork in 2008 (DN). The ground is sandy to muddy and extensive reed vegetation provides shelter and spawning habitats for weed spawners; reed vegetation predominantly consists of *Typha domingensis* and *Phragmites australis* (El Hadidi, 1976).

Nile River at Taraq Island (18°34'N-31°57'E) (see locality J on figures 1, 2A). – Few kilometres below the Hamdab Dam near Merowe, the Nile River is braided and creates a highly diverse interlinked system of islands and canals. These canals vary in size and habitat condition, *e.g.* velocity (lentic, lotic or swift) and substrate (rocks, gravel, sand or mud), as well as vegetation coverage and density along riverbanks; where reeds are present, standings are dense. With reference to available post-closure satellite images, the locality seems to have largely kept these peculiar habitat structures even after closure of the Merowe Dam. Compared to 2008, habitats are anthropogenically influenced by water regime control, decreased discharge and obstruction of migration routes.

Nile River upstream Merowe Dam (18°50'N-32°04'E) (see locality K on figures 1, 2B, 2C). – Sampling in April 2008 was conducted two weeks after closure of the dam and fast rising water levels. The Dar El-Arab village was already abandoned, but fishermen were still active. Flow regime was already rather lentic with predominantly sandy substrates. The locality is submerged in Lake Merowe today.

Nile River at Atbara (17°14'N-33°58'E) (see locality L on figure 1). – Directly at the city of Atbara and north of the

seasonally active confluence of Atbara and Nile Rivers, the Nile is deeply incised into its riverbed. The eastern shore is steep with large rocks and boulders interspersed in the alluvial clay deposits. In the middle and western parts of the river stretch alluvial deposits form smaller clay islands.

Atbara River at Atbara (17°40'N-33°59'E) (see locality M on figures 1, 2D). – The lower Atbara River is highly seasonal and contributes only during flood season, roughly from June to November. During January 2006 it was inactive, with stagnant water bodies stretched along deeper parts of the riverbanks. Substrate included higher proportions of sand compared to alluvial clay deposits of the neighbouring Nile River.

Atbara River at Esh-Showak (14°23'N-35°52'E) (see locality N on figure 1). – Few kilometres below the confluence of the Tekeze and Atbara Rivers, the stretch is characterized by shallow water with long gravel and sand banks that were heavily frequented by camel and goat herds, and massively contaminated by animal droppings during the survey. The right riverbank has rocky outcrops in knee-deep water, high velocity and strong laminar current. Riverbed and banks were bare without major shelter except for few larger boulders inside the river. The sampling locality is located above the root of Khashim El-Girba Dam and below the new twin Rumela (Atbara) and Burdana (Tekeze) Dams before start of their construction in 2011. Dams are expected to be closed in 2016.

Nile River at Shendi (16°42'N-33°26'E) (see locality O on figure 1). – The river is vast and rather shallow with interspersed flat sandy islands and sand banks.

Nile River at 6th cataract (16°20'N-32°41'E) (see locality P on figure 1). – Main Nile immediately below the granite escarpment below Wad Ramli. The right riverbank is structured with granite outcrops and interspersed cobbles and boulders, which form the small cataract and cause turbulent water conditions. Immediately below the escarpment, the velocity is reduced along banks, which are sheltered with reed. The undercut slope of left bank opposite of the Nile Island is densely covered with reed standings. The current is strong and back eddies accumulate massive clay deposits in and along banks.

Nile at Khartoum (15°37'N-32°29'E) (see locality Q on figure 1). – Directly north of Khartoum and east of Omdurman, White Nile and Blue Nile merge to form the Main Nile. The confluence is characterised by the rather large Tuti Island, which acts as valve between both rivers depending on discharge of each of them. The banks on Tuti Island are either densely covered with reed or shrub and build up of several metres high and steeply sloping clay deposits, which are exposed only at the northernmost tip of the island.

Blue Nile at Khartoum (15°35'N-32°35'E, Fig. 2E) (also referred to as locality Q on figure 1 because of close proximity of localities above or below Tuti Island). – At the eastern



Figure 2. – Selected study sites. **A:** Front: small rapids at Taraq Island; background: riverbanks with fringing weeds and reduced velocity (13 Apr. 2008); **B:** Main river above Merowe Dam (11 Apr. 2008; now flooded and lotic lake habitat); **C:** Last picture of free flowing 4th cataract at Dar El Arab, next morning already in impounded condition (11 Apr. 2008); **D:** Atbara River close to Atbara city at low water (14 Jan. 2006); **E:** Blue Nile at Khartoum (11 Jan. 2006); **F:** White Nile at Khartoum during flood season (7 Aug. 2014); **G:** Irrigation channel close to Jebel Aulia (27 Jan. 2006); **H:** White Nile at Kosti (23 Jan. 2006).

flank, the Blue Nile in Khartoum deeply slopes to the river. The right riverbank is sandy with few irregular fringing reeds. The water level during sampling was shallow.

White Nile at Khartoum (15°36'N-32°29'E, Fig. 2F) (for same reasons again as locality Q on figure 1). – In Khartoum, immediately above the confluence with the Blue Nile at Tuti Island, the White Nile broadens and turns into a rather shallow lake with small islands and sand banks that are densely fringed with reeds. During high waters, the whole area and the Al Sunut Forest along the right riverbank are flooded and turn into an extensive riparian forest.

Blue Nile at Sennar Dam (13°33'N-33°38'E) (see locality R on figure 1). – In the lower stretch of the outlet canal of hydroelectric plant, which has large boulders and cobbles in the riverbed; turbulent and swift water conditions prevail. During sampling, the water level dropped by approximately one metre and left several fishes stranded between boulders, which were densely covered on the lower half with green filamentous algae. Bottom substrate consisted of coarse sand and pebbles. Above the dam, the river has lentic conditions, extensive *Eichhornia crassipes* cover and muddy substrate along shores.

Blue Nile at Es-Suki (13°19'N-33°52'E) (see locality S on figure 1). – Upstream of the root of Sennar Lake, the water conditions of the Blue Nile are rather stagnant with massive accumulations of *Eichhornia crassipes* and manifestation of blue green algae. In Es-Suki, habitat conditions are rather lentic, bottom substrate is muddy and banks are densely fringed with weeds.

White Nile between Khartoum, Jebel Aulia and above (15°25'N-32°26'E) (see locality T on figure 1). – The dam of Jebel Aulia is about 40 km south of Khartoum. We joined local fishermen during nocturnal gill net dragging in 2006 on the left bank, and exposed a 10 mm gill net on the right bank of the White Nile in 2015. Small irrigation canals branching above the dam were sampled during daytime (Fig. 2G). Canals and banks were clear except for occasional vegetation along the shore.

White Nile at Kosti (13°10'N 32°40'E, Fig. 2H) (see locality U on figure 1). – The White Nile at Kosti is slowly flowing, between 1.5 and 2 km wide and rather shallow. Various sand banks and islands subdivide the main river into several channels. It represents one of the rare collection sites with densely vegetated river banks, *i.e.* several meters wide reed standing bordered by occasionally massive aggregations of *Eichhornia crassipes*. High abundances of Nile oyster, *Etheria elliptica*, indicate increased water velocity and hard substrates on the riverbed. Rocky outcrops also prevail along the shores of islands north of Kosti, such as Aba Island.

Additional collection sites. - Lake at Bahig west of Alexandria (30°56'N-29°35'E) (refer to locality A on figure 1, Bahig is 30 km W of Mariut); irrigation canal near Darih Efein (30°45'N-29°59'E) (see locality B on figure 1); irriga-

tion canal in the area of El-Mahmoudeya (31°11'N-30°31'E) (see locality C on figure 1); irrigation canal in the area of Lake Burullus (31°25'N-30°36'E) (see locality D on figure 1); irrigation canal west of Ismailia (30°34'N-32°12'E) and Lake Birkat-Abu-Jumas 1.5 km W of Lake Timsah in Ismailia (30°33'N-32°16'E) (see locality E on figure 1); Nile River at El-Saf (29°33'N-31°17'E) (see locality F on figure 1); irrigation canals in the area of El Fayum (29°16'N-30°39'E; 29°06'N-30°40'E and 29°09'N -31°03'E) (see locality G on figure 1). Additional material originates from local fishermen and fish markets, mainly in Khartoum, Omdurman and Ismailia.

Interpretation of tables and plotted literature

Results summarised in annexe 2 refer only to species that have been positively recorded, which includes preserved specimens, known or proofed observations by thirds, for example on the basis of reliable photographs. Species or populations being either *abberant* or *introduced* are indicated with an “a” or “i” in annexe 2. Annexe 3 compares species records and taxa mentioned in the three main publications on Nile fishes, Boulenger (1907), Lévêque *et al.* (1991) and Bailey (1994). Witte *et al.* (2009) basically provide an overview on available fish families in the Nile but do not give a detailed account on species distribution in the Nile Basin, therefore we did not use Witte *et al.* (2009) for comparison in annexe 3. The records of *Enteromius* barbs in Boulenger (1907) have been matched with Banister (1987), Bailey (1994) and Lévêque *et al.* (1991) to the current taxonomy. Species which are not considered to occur in the Main Nile Basin or have not been confirmed are marked with “-” to identify species mismatches between these three publications. Species needing further investigation or confirmation are marked with “?” in annexe 3. Occurrences in the Sudd, White Nile, Blue Nile, Nile (including the Atbara) and Delta have been accounted if available from the three publications. Species that Bailey (1994) mentioned only briefly in the key or in his text without clear range are accounted as “unclear”. Published data are compared with known fieldwork data and information on range, abundance and conservation status available from Bishai and Khalil (1997), Garcia *et al.* (2010) and IUCN (2015). Names of species considered having been mentioned erroneously for the Main Nile appear in square brackets “[]” in annexe 3.

RESULTS

Our recent surveys confirm 107 taxa (Annexe 2) in 62 genera and 28 families, including five species introduced to the Delta region. The Main Nile Basin as defined above (Fig. 1) currently harbours 150 taxa (Annexe 3): 133 autochthonous, seven introduced species and additional 10 abberant

populations. *Chrysichthys rueppellii* is included in the count of native species, even though its status is not finally clarified (see species remarks below). Even though our records are rather patchy point samples, the on-going surveys have revealed three new species so far: *Labeo meroensis* Moritz, 2007, *Labeo* sp. nov. “redeye” (under description) and *Garra* sp. nov. “flathead” (under description). *Garra* cf. *vinciguerrae*, *G.* sp. “Sennar” and *Chiloglanis* sp. “Sennar” collected below the Sennar Dam need further investigation. Same applies to *Haplochromis* sp. “Delta1”, *H.* sp. “Delta2” and *H.* sp. “Fayum”, *Hemichromis* cf. *letourneuxi* “Birkat Abu Jumas” and *H.* cf. *letourneuxi* “Ismailia” (as two aberrant populations in annexe 2 and summarised as *H.* cf. *letourneuxi* in annexe 3), *Micropanchax* cf. *loati* and *Poropanchax* cf. *normani*. Further, *Sarotherodon galilaeus* “Mariut” and *Labeo forskalii* “Sennar”, differ from populations of the same species in the White and Blue Nile (see species remarks).

Specific remarks on families and selected species

Protopteridae

Protopterus aethiopicus Heckel, 1851 is widely distributed along the Nile and observed in high numbers in the fish market in Khartoum during the cold season, *i.e.* November to April. The species is rarely recorded during flood period, *e.g.* repeated visits in the Omdourman fish market revealed only a single specimen in August 2015 traded from El Jabalayn (also al-Gabalayn) approx. 65 km south of Kosti. The occurrence of *P. annectens* (Owen, 1839) inside the Main Nile is based on a single specimen purchased in the fish market in Khartoum in 1976 (BMNH 1976.11.12.200). The general appearance on a photo of this specimen is close to *P. aethiopicus*, but the scale counts and fin insertions are not characteristic and could also agree with *P. annectens*. The identity of this fish needs to be checked. Fieldwork of Ali Adam Saadelnour Abdalla and Arif Ibrahim Abulrahma in 2014 confirmed *P. annectens* only outside the Nile Basin in the Upper Wadi Kaja, a Chari-Chad affluent in West Dafur in the Sudan.

Polypteridae

Polypterus bichir Lacepède, 1803 seems so be the only species that occurs far north of Khartoum; it was formerly even recorded from the delta (Harrington, 1899), but it is threatened or already extirpated in the Egyptian Nile and Nile Delta (Bishai and Khalil, 1997). *Polypterus endlicherii* Heckel, 1847 is apparently rare north of Khartoum; it is not mentioned in Bishai and Khalil (1997) and might be restricted to the White Nile. Bailey (1994) gives a rather generic account only on family level without referring to the distribution of single species (Annexe 3).

Clupeidae

Boulenger (1907) mentioned that *Alosa fallax* (Lacepède, 1803) reached Aswan but the current southern limits of this species in the Egyptian Nile are unclear; Bishai and Khalil (1997) mention this species for the Delta only before the closure of the Aswan Dam.

Anguillidae

Historically, *Anguilla anguilla* (Linnaeus, 1758) reached Khartoum and was traded on the fish market (Boulenger, 1907; Pekkola, 1918). Nowadays the species still enters the Nile Delta and costal lagoons and is traded in the Cairo fish market (FAO, 2010) but is apparently regionally extinct above Lake Nasser (Bailey, 1994).

Notopteridae

Xenomystus nigri (Günther, 1868) is apparently restricted to the Sudd area, the expansion of this species into the White Nile below Malakal needs clarification.

Gymnarchidae

Large specimens are rare: one *Gymnarchus niloticus* Cuvier, 1829 above 150 cm TL was observed on the Central fish market in Khartoum in August 2014. Historically, the species occurred also north of Aswan (Boulenger, 1907); it seems increasingly restricted to Lake Nasser today and seems rare elsewhere in Egypt (Bishai and Khalil, 1997).

Mormyridae

Eleven of fifteen Nile mormyrids have been confirmed during our surveys, with *Pollimyrus isidori* (Valenciennes, 1847) being the most common one. Large *Mormyrus niloticus* (Bloch & Schneider, 1801), *Mormyrus kannume* Forsskål, 1775, *Mormyrops anguilloides* (Linnaeus, 1758) (> 600 mm TL) and *Hyperopisus bebe* (Lacepède, 1803) (> 400 mm TL) are common during flood season in fish markets in Khartoum. *Petrocephalus* species seem to be rare and are confirmed with only four individuals despite intensive search. Apparently, populations dropped significantly since Sandon (1950), who reports that *P. bane* (Lacepède, 1803) was the most common mormyrid species throughout the year in the Nile below Khartoum.

Pollimyrus isidori seems to vary remarkably in body shape and colouration: smaller specimens tend to be more elongated; larger specimens sometimes grow rather deep-bodied and nearly round if viewed laterally. The body colouration in Nile populations may range from a complete silver body without any spots, to a silver and intensively spotted body with intensive purple hue on the flanks, sometimes in combination with an intense bright steel blue back. Irregular dark blotches seem to vary individually and may densely cover almost the entire body. Observed variability in EODs of 62 Nile specimens largely concurs with the heterogeneity



Figure 3. – Live specimens of *Garra* from Lower Nile at Taraq Island (8/9 Apr. 2008). **A:** *Garra* cf. *vinciguerrae*; **B-C:** *Garra* sp. “Taraq-flathead”.

of signals in West African *P. isidori* (Moritz *et al.*, 2008) and currently does not allow further conclusions on the status of specific populations in the Nile.

Kneriidae

Cromeria nilotica Boulenger, 1901 seems to be more common in the Sudd region. The exact distribution limits of this species in the Upper White Nile are unclear and it may have been overlooked because of its small size; we could not confirm this species in Kosti so far. It has been collected in the Gambela River, an affluent of the Sobat, and might reach beyond Malakal into the White Nile.

Cyprinidae

For the following small *Enteromius* barbs (cf. Yang *et al.*, 2015) mentioned by Bailey (1994) the occurrence in the Sudd is unclear: *Enteromius* sp. nov. 1 & sp. nov. 2 (Bianco *in* Bailey, 1994), *E. cercops* (Whitehead, 1960) and *E. kerstenii* (Peters, 1868). The same applies for *E. yongei* (Whitehead, 1960) and *E. leonensis* (Boulenger, 1915). *Enteromi-*



Figure 4. – Stranded *Labeo forskalii* specimens of the Blue Nile below the dam of Sennar after water level fluctuation (17 Jan. 2007).

us wernerii Boulenger, 1905 is currently in synonymy with *Enteromius stigmatopygus* (Boulenger, 1903) (Lévêque, 1989; based on Banister, 1987), but a first comparison of the type material of *E. wernerii* suggests that this placement might be erroneous and should be carefully reevaluated



Figure 5. – *Nannocharax niloticus*, Sudan: White Nile at Khartoum (19 Jan. 2006).

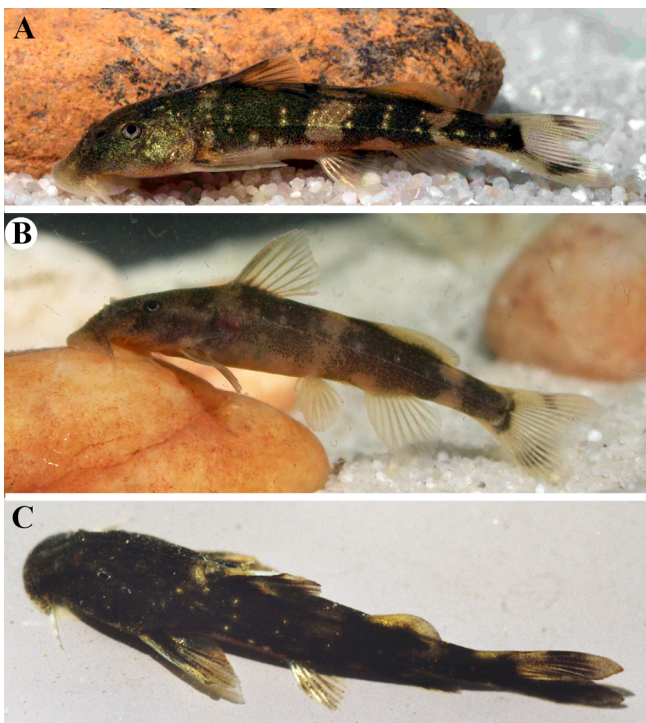


Figure 6. – Live specimens of *Chiloglanis* from the Nile. A: *C. niloticus*, Nile River at Taraq Island, ZSM 43646 (10 Apr. 2008); B: *C. niloticus*, White Nile at Khartoum, ZSM 43616 (18 Jan. 2006); C: *C. sp.* “Sennar”, Blue Nile at Sennar, ZSM 35280 (17 Jan. 2007).

to clarify the taxonomic status of this species. *Enteromius perince* (Rüppell, 1835) specimens from the Blue Nile tend to display only two instead of three or more flank spots. The Common carp, *Cyprinus carpio* Linnaeus, 1758, is intensively reared in the Delta region and seems to be restricted to aquaculture ponds in the Nile Delta (FAO, 2010). *Ctenopharyngodon idella* (Valenciennes, 1844) is still heavily stocked in the Delta region. Both carps account for 10% of landed catches in Egypt (FAO, 2010). *Pseudorasbora parva* (Temminck & Schlegel, 1846) was accidentally introduced to Lake Mariut and likely other Delta lakes together with stocked carps.

Shallow sand banks seem to serve as nursery sites for *Chelaethiops bibie* and *Leptocypris niloticus*; larvae and young-of-the-year are available in high abundance towards



Figure 7. – Males of *Micropanchax* species from the Nile. A-B: *Micropanchax* cf. or sp. aff. *loati*, Taraq Island, Lower Nile (9 Apr. 2008); C: *Poropanchax* cf. or sp. aff. *normani*., White Nile at Kosti (23 Jan. 2006).

the end of the flood season in the Blue Nile (Khartoum) and White Nile (Aba Island and Khartoum). Populations of *Chelaethiops bibie* seem to vary in lower jaw length (isognathous vs protruding lower jaws), eye diameter and lateral dimension of orbit, pectoral fin extension (in relation to pelvic fin insertion). The pigmentation on the body can vary from a vaguely dusky to a dark back in single specimens (in combination with an intensive lateral stripe) the unpaired fins in living specimens sometimes are coloured distinctly yellowish. High phenotypic variation is observed in *Labeo forskalii* Rüppell, 1835: at the 4th cataract, two morphotypes occur syntopically. One appears dark grey with a pronounced falciform dorsal fin, and has a slightly elongated caudal fin with black-rimmed scales on the caudal peduncle and the caudal fin base. In the second, body and tail appear more truncated, the dorsal fin distally less falciform, and the body colour is light grey while dark-rimmed scales only appear on to the caudal peduncle. In both forms the position of the eye is either below or in the lower third of the lateral line level. *Labeo forskalii* originating from the 6th cataract at Sabaloqa appear much more elongated, the eyes are situated in a more dorsolateral position and approximately on the same level as the lateral line, the anteriorly dark centred body scales shift gradually towards dark rimmed scales on the distal part of the tail. Specimens from the Blue Nile collected in the out-

let canal of Sennar Dam share the elongated appearance and dorsolateral eye position, but tend to have dark rimmed scales on the whole body in combination with a dark grey life colouration with a distinctive blue-green hue which is rarely shared by other *L. forskalii* populations in the Sudan. The diversity and variability of the African *Labeo* species seems still puzzling. Since Reid McGregor (1985), only selected species underwent further investigation (Tshibwabwa, 1997; Tshibwabwa *et al.*, 2006). A thorough revision especially of Sahelian *Labeo* or other enigmatic species-groups, such as “*Labeo parvus*”, is pending. We follow Kottelat (2013) and treat *L. niloticus* (Linnaeus, 1758) as a valid name. A new species *L. sp. nov.* “redeye” has been discovered during our surveys in the White Nile and is presently under description.

The Nile at Taraq Island below the Hamdab Dam at the former 4th cataract harbours two distinct *Garra* species (Fig. 3). The first is a round headed *Garra* which differs from *G. dembeensis* sensu Stiassny & Getahun (2007) but seems close to *G. vinciguerrae* as originally described by Boulenger (1901) from the 3rd cataract. It further differs from *G. blanfordii* (Boulenger, 1901) and *G. dembeensis* in a scaled post-pelvic area (vs. asquamate post-pelvic area). We identify this population tentatively as *G. cf. vinciguerrae* until the taxonomic status and the available valid name for this species is resolved (pers. comm. F. Wicker 03 Dec. 2015.)

The second Taraq-*Garra* is new to science (description in prep.) and characterized among other characters by its flat but wide head. A third aberrant *Garra* has been recorded from the Blue Nile below the Sennar Dam, but we currently have only three dried up specimens that got stranded (Fig. 4). However, to allow proper evaluation, more adequately preserved specimens are needed. *Raiamas senegalensis* (Steindachner, 1870) is assumed to be common, but has been observed in only one specimen in the Upper Atbara so far; the exact range and abundance in the Sudan and Egypt is unclear.

Distichodontidae and Citharinidae

Species of both families seem to be declining and have been rarely recorded during our surveys. According to Pekola (1918) and Sandon (1950), *Distichodus* and *Citharinus* were “common everywhere”, abundant on fish markets and reached considerable sizes (*e.g.* > 50 cm in *Distichodus nefasch* (Bonnaterre, 1788)). *Nannocharax niloticus* (Joannis, 1835) (Fig. 5) can be confirmed only based on a single specimen from the White Nile on Wad Dakeen Island immediately above the confluence with the Blue Nile in Khartoum.

Alestidae

Earlier publications recognised three species of *Hydrocynus* for the Nile Basin: *H. brevis* (Günther, 1864), *H. forskahlii* (Cuvier, 1819) and *H. vittatus* Castelnau, 1861 (Ann. 3). However, Goodier *et al.* (2011) suggest that *H. vittatus* sensu

lato seems to be restricted to the Congo and Zambezi basins, an assumption we tend to follow here in regarding that this species likely does not occur in the Main Nile. *Hydrocynus vittatus* specimens have not been recorded recently, but historic records should be investigated to confirm presence or absence of this species from the Nile Basin. Numerous earlier publications accounted *Micralestes acutidens* (Peters, 1852) for the Nile Basin. However, teeth characteristics of our specimens correspond to *M. elongatus* Daget, 1957 and not to *M. acutidens* (Paugy, 1990; Stiassny and Mamonekene, 2007); *M. acutidens* as originally described from the Zambezi seems to be limited to Central and South Africa.

Amphiliidae

Observations in Taraq Island suggest that local abundances of *Andersonia* can be high under suited habitat conditions, specimens were only found inside exposed flotsam assemblages or submerged twigs of bankside shrubs in swift and well-oxygenated water.

Claroteidae

The taxonomic identity of *Chrysichthys rueppellii* Boulenger, 1907 is unclear. The species was repeatedly synonymised with *C. auratus* (Geoffroy Saint-Hilaire, 1809). This is likely attributed to the strong sexual dimorphism in *Chrysichthys* in general and to the observed variability in *C. auratus* in particular. Comparison of two *Chrysichthys* specimens from the Lower Egyptian Nile (ZSM 38803, 2) share general features of *C. turkana* Hardman, 2008 (M. Hardman, pers. comm., Jan. 2014) and basically agree with photos of the syntypes of *C. rueppellii* (BMNH 1850.7.29.17, 1; 1907.12.2.2131-2132, 2) originating from Lake Menzaleh in the Nile Delta. Even though a detailed redescription of *C. rueppellii* is warranted to allow proper identification and taxonomic confirmation, we suppose the specimens in ZSM 38803 confirm an aberrant *Chrysichthys* population in the Nile Delta, which might be conspecific with *C. rueppellii*. Two additional SAPM specimens are labelled with *C. rueppellii*: Nile at Aswan (SAPM-PI-00195, 1 [1986]) and Rosetta branch in the western delta at Bani Salamah / Merimde-Beni Salame excavation site below Cairo (SAPM-PI-00196, 1 [1986]). These specimens, however, are prepared, disarticulated bones, thus it was not possible to confirm identifications.

Schilbeidae

The most abundant species encountered on fish markets are *Schilbe intermedius* Rüppell, 1832 and *S. mystus* (Linnaeus, 1758), while *S. uranoscopus* Rüppell, 1832 could be recovered only once after repeated visits during flood season in 2014. *Parailia pellucida* (Boulenger, 1901) is confirmed based only on a single specimen collected below Jebel Aulia in 2015.

Clariidae

Although formerly widely distributed, both species, *Heterobranchus bidorsalis* Geoffroy Saint-Hilaire, 1809 and *Heterobranchus longifilis* Valenciennes, 1840, seem to become increasingly restricted within the Nile below Khartoum today; our last records of *Heterobranchus* spp. date back to 1986.

Mochokidae

With supposedly 16 taxa, mochokids are among the most specious and economically valued Nile fishes. Especially *Synodontis schall* (Bloch & Schneider, 1801) is landed in huge numbers and probably the most abundant catfish in terms of biomass and landed individuals. *Synodontis frontosus* Vaillant, 1895 and *S. clarias* (Linnaeus, 1758) were encountered on fish markets in Khartoum only during flood season in 2015. *Synodontis khartoumensis* Abu Gideiri, 1967 is close to *S. schall* and *S. frontosus*. Abu Gideiri supposed that this species could be a hybrid of *schall* and *frontosus*, but it differs in colouration (black paired fins), deeply embedded serrae on the posterior side of the dorsal spine, no serration on the distal outer and proximal inner side of the pectoral spine and a distinct granulated surface of the humeral process from *S. schall* and *S. frontosus* (see also Poll, 1971: 204–207). The species seems to be more abundant in the White Nile and is rarely recorded from commercial catches at the type locality in Khartoum today. The occurrence of *S. batensoda* Rüppell, 1832 and *S. membranaceus* (Geoffroy Saint-Hilaire, 1809) seems to be highly seasonal – if both species are still available in the Sudanese Nile; our record of *S. batensoda* dates back to the 1980s, while *S. membranaceus* could not be confirmed despite intensive search and several visits to fish markets during different seasons of the year. Fragments of humeral bones from excavations on Elephantine Island in Aswan and from lower Wadi Howar suggest that *S. membranaceus* was once common in landed catches and reached 400 mm TL and more. Bailey (1994) mentions *S. clarias*, *S. serratus* Rüppell, 1829 and *S. sorex* Günther, 1864 in his key without indicating the range inside the Nile as he did for other *Synodontis* (Annexe 3). *Chiloglanis niloticus* Boulenger, 1900 is confirmed from Taraq Island and from a single specimen at Khartoum (Fig. 6B). This species might be more common but surely fails to be recorded due to methodical problems, e.g. limited recovery from the riverbed. A single emaciated and likely undescribed *Chiloglanis* was found at the outlet canal of the Sennar Dam on the Blue Nile (Fig. 6C); further material is needed to evaluate the status of this population, referred to as *Chiloglanis* sp. “Sennar” in Annexes 2, 3.

Nothobranchiidae

Two *Nothobranchius* species occur in the Nile Basin: *N. virgatus* Chambers, 1984 and *N. nubaensis* Valdesalici,

Bellemans, Kardashev & Golubtsov, 2009. Both seem to be restricted to seasonal pools along southern affluents of the Nuba Mountains. How far populations descend inside Khors and Wadis and reach the Sudd or the floodplains of the Upper White Nile is currently unclear. In 2010, aquarium hobbyists confirmed both species at different location in the area of El Fula (11°43'N-28°20'E) inside the watershed of Wadi Al Ghallah, *N. nubaensis* additionally 9 km southeast of Kadugli inside the Khor El Hafein (10°56'N-29°49'E).

Poeciliidae

Two alien species are recorded for Lake Mariut: *Gambusia affinis* (Baird & Girard, 1853) and *Poecilia latipinna* sensu lato. The mosquito fish was already introduced in 1929 (Welcomme, 1988) and has established stable populations in Egypt (Bishai and Khalil, 1997). When the sailfin molly was released is unknown and its taxonomic status remains doubtful: it might be *P. latipinna* (Lesueur, 1821), *P. velifera* (Regan, 1914) or a hybrid of both. The status of the autochthonous representatives of this family is unresolved: five species, *Micropanchax hutereaui* (Boulenger, 1913), *M. kingii* (Boulenger, 1913), *M. loati* (Boulenger, 1901), *M. macrophthalmus* (Meinken, 1932) and *Poropanchax normani* (Ahl, 1928), are mentioned for the Nile Basin. *Haplochilus schoelleri* (Boulenger, 1901), a lampeye from Lake Menzaleh, a western satellite of Lake Mariut in Alexandria, is currently in synonymy of *Micropanchax loati*. Specimens collected at Taraq Island and Kosti (7A, B) might represent a new species or the currently synonymised *H. schoelleri*: male Taraq-specimens exhibit ctenoid scales and thus a strong sexual dimorphism. They seem closer to *M. loatii* than to *M. kingii*, but the tubular cephalo-sensory system and slender body disagree with both species (pers. comm., J. van der Zee, 27 Feb. 2015). For the moment, we identify this population as *M. cf. loati* (Fig. 7A, B). Comparison with type material of other *Micropanchax*, especially *H. schoelleri*, is needed to evaluate the status of the Taraq-lampeyes. Same applies to the *Poropanchax* specimens collected in the White Nile at Kosti which disagree with *P. normani* (pers. comm., J. van der Zee, 27 Feb. 2015). Unless clarified, we identify the Kosti population as *Poropanchax cf. normani* (Fig. 7C). Moreover, we doubt that the ranges of *M. hutereaui* (Bailey, 1994) and *M. macrophthalmus* expand into Nile Basin (Lévêque *et al.*, 1991); the reference to these two species in the White Nile and Nile should be carefully checked and might refer (in part) to the aberrant *Micropanchax* and *Poropanchax* mentioned above.

Cyprinodontidae

The range and abundance of *Aphanius fasciatus* (Valenciennes, 1821) and *A. dispar* (Rüppell, 1829) in the Nile Delta is unclear; according to Bishai and Khalil (1997), *Aphanius* is rare in Egypt; our last records date back to the

1960s. *Aphanius fasciatus* was introduced to aquaculture pools at Jebel Aulia with salt from Port Sudan used for *Macrorbranchius* breeding. Status and abundance of this artificial population is unclear.

Latidae

Lates juveniles (< 1 cm) have been observed on the right bank of the White Nile immediately in front of the Fisheries Research Institute of Khartoum, at the end of July 2014 and 2015. Specimens were hiding in the cooler and well-oxygenated shallow water between aquatic plants and submerged weeds along the sandy shore, likely preying on copepods and *Micralestes* and *Leptocypriis* larvae sheltering in the few centimetre deep and warm pools on the banks.

Mugilidae

The records of *Mugil cephalus* Linnaeus, 1758 are tentatively confirmed on photographs taken in the fish market of Cairo in 2013. Subfossil bones of *Liza ramada* (Risso, 1827) from El Fayum (Linseele *et al.*, 2014) raise the question if this species was either traded preserved (*e.g.* salted) by ancient Egyptians or if this species originally reached this location by ascending the Nile.

Eleotridae

The data on the range and abundance of *Kribia nana* (Boulenger, 1901) inside the Nile is fragmentary: previously, the only known specimen from the Main Nile was one of the syntypes collected at Kermah at the Third Nile cataract in 1900 (Boulenger, 1907). All later records originate exclusively from the White Nile. Our specimen from Taraq Island seems to be the first record below Khartoum in more than a century and is the first for the area of the former Fourth Cataract.

Anabantidae

Lévêque *et al.* (1991) mention *Microctenopoma congicum* (Boulenger, 1887) for the Nile, referring to a single specimen questionably stored in the BMNH collection, but it was not possible to trace this specimen. This species was never confirmed for the Nile, we thus treat the record of *M. congicum* in Lévêque *et al.* (1991) for the Nile as erroneous. *Ctenopoma petherici* Günther, 1864 specimens collected in Kosti display an ocellus on the caudal peduncle, which is one of the key characteristics for *C. muriei* (Boulenger, 1906), while all other morphologic characters of the Kosti specimens agree with *C. petherici*.

Cichlidae

The taxonomy of cichlids in the Nile is convoluted and needs thorough revision. The Delta, El Fayum and White Nile (Kosti) populations of *Coptodon zillii* (Gervais, 1848) seem to differ from each other in morphology, coloura-

tion and body shape. However, until revised, we assign all *Coptodon* specimens to *C. zillii*. The identity of *Coptodon ismailiaensis* (Mekkawy, 1995) and *Oreochromis ismailiaensis* Mekkawy, 1995 remains questionable. It was not possible to confirm the presence of both species at their type locality. The specimens in the type series of *Coptodon ismailiaensis* seem to be comparatively slender. Except for the lack of light spots on the caudal fin, holotype and paratypes of *Coptodon ismailiaensis* largely agree with *C. zillii*. It is currently unclear if *C. ismailiaensis* is a distinct species, or if it is based on aberrant specimens used in aquaculture or hybrids of escaped aquaculture specimens with *C. zillii* from the Delta. The situation for *Oreochromis ismailiaensis* is similar: holotype and paratypes largely agree with medium sized *O. niloticus* (Linnaeus, 1758) lacking the strikingly striped caudal fin. Similar *Oreochromis* have been observed at Qantir, 20 km SE from Ismailiyah, but additional material is necessary to allow a thorough comparison. If more specimens are available, the status of *C. ismailiaensis* and *O. ismailiaensis* should be carefully evaluated.

A similar variability is observed in *Sarotherodon galilaeus* (Linnaeus, 1758) among populations from Lake Mariut, Kosti on the White Nile and Sennar on the Blue Nile. If the observed variation attributes to escaped aquaculture specimens or hybrids, interbreeding with autochthonous populations or to natural variation of autochthonous populations needs further investigation. Unless clarified, all recorded specimens are assigned to *S. galilaeus*. Inside Egypt, the status and range of introduced *O. mossambicus* (Peters, 1852) and *O. spilurus* (Günther, 1894) – if established – is currently unclear (FAO, 2010); neither of both has been observed in the Sudan so far.

Because of the unresolved taxonomy of the *Hemichromis fasciatus* Peters, 1857 group and the unclear type locality of *Hemichromis fasciatus* in West Africa, we refer to the Nile population as *Hemichromis cf. fasciatus*. The Nile Delta might harbour two deviant *H. letourneuxi* populations: one slender elongated and rather yellowish form in the isolated Lake Birkat-Abu-Jumas which is in direct vicinity of Lake Timsah in Ismailia, and one more deep bodied stout form collected in irrigation canals in Ismailia. Both seems to differ from fishes collected at the type locality Lake Mariut, but more material is needed to clarify their status. The observed variability between the two populations in the eastern delta could be linked to salinity levels in Ismailia; both locations are very close to the brackish Lake Timsah, but Birkat-Abu Jumas has no direct connection and seems isolated. We refer to both Ismailia populations as *H. cf. letourneuxi* in annexe 3 and mention them separately in annexe 2. Inside Lake Mariut, two *Haplochromis* seem to occur in sympatry, they apparently differ in several morphological characters, *e.g.* squamation on the chest and pectoral fin base, as well as in several scale counts and breeding behaviour. They seem

close to *H. wingatii* specimens from the Semliki and Lake Albert, but the western and eastern Delta likely harbour at least two distinct populations which are preliminary identified here as *Haplochromis* sp. “Delta1” and *Haplochromis* sp. “Delta2” (Schraml, pers. comm., 2016). Further, we refer to the aberrant *Haplochromis* observed by Schraml (pers. comm., 2016) in the El Fayum lakes here *Haplochromis* sp. “Fayum”, as they apparently differ from the *Haplochromis* in the Nile River. Because of the complexity of *Haplochromis* in general and unresolved taxonomy inside the Nile Basin in particular, we refrain from drawing any premature conclusions, but suppose Lower Nile *Haplochromis* are not conspecific with *H. wingatii* or *H. loati*.

Abundance and conservation

Comparison of available data of regional (Garcia *et al.*, 2010; IUCN, 2015) and local assessments (Bishai and Khalil, 1997) indicates that the knowledge on fish populations in Egypt and Sudan is limited. Inside in the Egyptian Nile, up to 68 species are considered threatened, endangered or already extirpated (Ann. 3). This constitutes more than one third of the fish species of the Main Nile Basin. The count includes 45 species that are threatened at their type locality. The species *Hyperopisus bebe*, *Mormyrus hasselquistii* Valenciennes, 1847, *Petrocephalus bovei* (Valenciennes, 1847), *Enteromius anema* (Boulenger, 1903), *Alestes baremoze* (Joannis, 1835), *Brycinus macrolepidotus* Valenciennes, 1850, *Distichodus rostratus* Günther, 1864, *Ichthyborus besse* (Joannis, 1835), *Clarotes laticeps* (Rüppell, 1829), *Synodontis batensoda* and *Synodontis membranaceus* are apparently extirpated at their type locality in Egypt, which seems also to be the case for the Nile endemics *Enteromius neglectus* (Boulenger, 1903), *Nannocharax niloticus* and *Mormyrus niloticus* (Garcia *et al.*, 2010). These species should be carefully reassessed with suited surveys to confirm their current status. Inside Egypt, 99 species lack proper occurrence data, including 30 Nile endemics and 19 species with unclear status at their type locality. Inside the Sudan (excluding the South Sudan), 80% or 123 species either have not been assessed or are data deficient. This includes 40 species at their type locality and 32 of 43 Nile endemics (Ann. 3). Three species seem to become increasingly rare, *i.e.* *Citharinus citharus* (Geoffroy Saint-Hilaire, 1809), *Polypterus bichir* and *P. endlicherii* (Ali Adam Saadelnour Abdalla, Mohammed Abakar Abdallah, pers. comm., 2015).

DISCUSSION

Fish diversity in the Main Nile Basin

Boulenger (1907) mentions 114 fish species for the Main Nile as defined above (Ann. 3). Lévêque *et al.* (1991) refer to 128 species for the Nile Basin, excluding marine spe-

cies invading the delta but including selected Lake Tana and Lake Albert endemics. If the latter are excluded, their species count drops to 117 species for the Main Nile Basin. This nearly meets the 122 species in Bailey (1994), but if compared at species level, Lévêque *et al.* (1991) and Bailey (1994) differ in recognition of 29 taxa, among them such common species as *Gambusia affinis*, *Hemichromis fasciatus* or *Pseudocrenilabrus multicolor* and 11 *Enteromius* barbs. Even though Bailey (1994) also excludes species invading the delta (except *Anguilla anguilla*), his species count for the Main Nile is still 12 species above that of Lévêque *et al.* (1991) (see Ann. 3).

Our current synopsis refers to 150 taxa for the Main Nile Basin. The species status for some taxa like *Coptodon ismailiensis* or *Oreochromis ismailiensis* is unclear and few of them might turn out as invalid for this count. For other species like *Oreochromis mossambicus* or *O. spilurus* it is still unclear if they are established in the Main Nile, or if (repeated?) observations refer individuals escaping from fish farms in the Delta. As mentioned in the results above, our findings are far from being complete to allow deeper assumptions on the occurrence and range of fish species in the Nile. However, our count is a good starting point for future taxonomic work and assessment towards a thorough revision of the diversity in the Main Nile. For the first time since Boulenger (1907) records from literature have been matched to species present in the Main Nile today, and have been compared with relevant publications on Nile Fishes.

The total number of species currently known to occur in the complete Nile Basin surely is well above 800 (Witte *et al.*, 2009). The identification of geologically definable subbasins (Adamson and Williams, 1980) helps to characterise these subunits and to compare it with closely related and interconnected subbasins and lakes or ecoregions inside the Nile Basin (see above). This not only supports to identify and to discuss observed overlap in the faunal composition of those subunits, but also helps to delineate further subunits if this seems justified. The faunal composition and range of species inside the Sudd and its northern and southern tributaries is largely unknown at the moment. However, the Sudd swamps cover a complex fracture zone (Adamson and Williams, 1980) and a further subdivision of “the Sudd” and recognition of local centres of endemism, especially *e.g.* on the Yirol Plateau is not unlikely. While the Sudd swamps are predominantly inhabited by species that are common in the White Nile, the affluents draining the surrounding escarpments of the Sudd harbour several endemic species, *e.g.* *Clarias engelseni* (Johnsen, 1926) or *Enteromius yeiensis* (Johnsen, 1926) on the southern Yirol Block, the two probably undescribed small *Enteromius* barbs mentioned by Bailey (1994) for the Bahr El Arab south of Nyala, and *Nothobranchius virgatus* and *N. nubaensis* on the southern slopes of the Nuba Mountains. Also the question if *Protop-*

terus annectens enters the Nile Basin, for example via seasonal affluents to the Bahr El Arab, remains open and the taxonomic identity and distribution of nothobranchiids and poeciliids in the Sudan is still puzzling.

Similar applies for the Nile Delta. The complex geological history of the Nile Basin (Adamson and Williams, 1980; Williams and Adamson, 1980; Williams and Talbot, 2009) could explain the observed variability. The number of aberrant cichlids observed suggests that the diversity inside the Delta might be higher than previously expected. Therefore, *Coptodon*, *Haplochromis*, *Pseudocrenilabrus* and *Sarotherodon* populations in Main Nile and the Delta as well as the validity and identity of *Chrysichthys rueppellii* should be critically compared.

Diversity of Nilotic fishes in the 21st century

Despite the fact that the Nile was one of the first African rivers systematically studied by scientists (see review by Paugy, 2010) and millions of people that depend on this river and the exploitation of its ichthyofauna, our knowledge on the fishes in the Main Nile remains sketchy. At the same time, nearly one third of species in the Egyptian Nile are considered to be threatened or to have already disappeared. Even though the number of 99 (Ann. 3) has to be understood as cumulative because of different regional (Garcia *et al.*, 2010) and local (Bishai and Khalil, 1997) categorizations, the general message from available data seems to be that approximately one third of species in Egypt is declining or disappearing and the rest is either data deficient or has not been evaluated at all (Ann. 3). The need of reliable data acquisition on fish populations is further emphasized by the fact that up to 94 in the Egyptian and 123 species in the Sudanese Nile are currently either not evaluated or are data deficient, which is a prerequisite to develop fishery management measurements that are suited support the local fish populations inside the Main Nile.

Recruitment, breeding and nursing sides as well as the ecology of most species, for example spawning migrations inside the Nile, are poorly understood. The available data on Nile fishes is, however, limited and often biased: the FAO Fishery Profile for the Republic of the Sudan (FAO, 2014) has a clear fisheries biology background, representing only the commercially exploited species. Species slipping through nets with a 40 mm mesh tend not to be recorded and escape attention (Mishrigi, 1970; Mohammed Abakar Abdallah and Ali Adam Saadelnour, pers. comm., 2014).

This makes assumptions on productivity of populations and factors (negatively) impacting fish populations and species inside the Egyptian and Sudanese Nile difficult. The seemingly dramatic decline of fish diversity in Egypt has been attributed largely to changes of the flow regime and over-fishing (Bishai and Khalil, 1997; Garcia *et al.*, 2010). Historically, the course of the Nile was obstructed by six

cataracts, but today the number and size of these rapids has diminished due to changed flow regimes, reduced discharge from the headwaters and irrigation losses and constructions of barrages. Man-made dams and resulting artificial lakes increase evaporation losses especially in the Bayuda and Nubian deserts and change habitat conditions from lotic to lentic environments. This impacts the dispersal and composition of fish communities, *e.g.* of zooplankton feeders and riverine species dependent on swift flowing water and oxygen rich environments (Abu Gideiri and Ali, 1975). It also affects species dependent on rocky and sandy habitats, if large stretches of the Nile riverbed are converted into muddy soft-bottom substrates with partly anoxic conditions. Such conversion of habitat conditions can for example be attributed to impoundment and increased siltation and intensified blooms of blue-green algae in the now much clearer water above dams (Entz, 1976), or to reservoir flushing *e.g.* if anoxic sediments are released to the small rocky stretches below dams, or to the clearing Papyrus swamps (Thompson, 1976). The anthropogenic impact on fish communities in the Lower Nile is manifold and not limited to overfishing, water extraction, obstructed migration routes and habitat modification (Entz, 1976), but includes pollution especially at Khartoum and Cairo megacities and increased loads of fertilizers and pesticides (El-Sheekh, 2009).

As a general trend, many species seem to be in decline. Besides fragmentation of populations, levelling and taming of the Nile, the dramatic decline of floodplains and erosion of islands in the Nile and thus loss of suited spawning and nursing sites due to discharge regulations should be a major concern. Sudden water level drops can negatively impact not only lotic species but also species along shallow shores as observed at Sennar (Fig. 4). Not only comparison of fish bone remains from archaeological excavations on Elephantine Island at Aswan (von den Driesch, 1986) suggests that single species grow noticeably smaller today. The size of *Synodontis* landed or traded in Khartoum suggests that majority of specimens are harvested in their first or second year – and are probably caught during spawning migration. *Synodontis schall* in age group III (> 30 cm TL) is hardly found in the fish markets in Khartoum or Omdourman today, while those specimens represented two third of specimens investigated by Bishai and Abu Gideiri (1965) five decades ago. A decrease in size and abundance will have socio-economic implications for the protein supply, not only in the rapidly growing megacities Khartoum and Cairo, but for Egypt and the Sudan in general and their dependence on the protein supply from the Nile.

Selected species like *Garra*, *Nannocharax* and *Chiloglanis* might serve as good indicator species to test for methodical problems: the available occurrence data largely dates back to Boulenger (1907). Our point sampling at natural and exposed structures from anthropogenically altered

habitats suggests that these species are able to adapt to altered habitat conditions and flow regimes and might be not that rare then previously considered. The decisive factor for their occurrence – the habitat conditions – might be similar on the surrounding river bed, but recording from hard substrates on the riverbed requires specific fishing techniques. Habitats should be carefully evaluated to allow conclusions if for example lotic species become increasingly isolated to very short stretches below dam sites or fast-flowing stretches at bridge pier foundations, or if they are still abundant but fail to be recorded because of methodological problems.

Even though conditions below dams seem to offer suitable habitats and could serve as local refuges, stability of these habitats in the long run has not been evaluated for the Nile.

For the future conservation of fish diversity and productivity of the river Nile, there is urgent need for (1) coordination/creation of cross-national monitoring programs including identification and protection of spawning and nursing sites; (2) preventive protection of specific habitats such as hard rock and lentic stretches; and (3) installation/utilisation of suitable and locally adapted fish passages and controlled non-fishing areas which bypass dams sites and impoundments to support spawning migrations. This has to include that ascending lotic fishes are not trapped in a stagnant lake situation immediately above such bypasses, where there are left disorientated in a sea of nowhere. Understanding movements and spawning of species in the Main Nile is vital to understand the recruitment of Nile fishes. In the light of the present decline, ichthyological field surveys and systematic studies need to be intensified to allow proper assessment of the fascinating fish diversity in the Nile.

Acknowledgements. – For help with the research permits we thank Ali Sharaf El-Din and Zuhair Nour El Dayem Mahmoud from the Sudan Institute of Natural Sciences (SIFNS), University of Khartoum for continuous support and cooperation with field work, research and export permits. We thank Richard Mayden for funding the field trip in 2006 in the frame of the “Cypriniformes Tree of Life” project, Joris Peters for funding the field trip in 2007, the Gesellschaft für Ichthyologie (GfI) for funding the field trip in 2008 and Antje Küpper (GAF ÄG Munich) for financial support for surveys in 2014 and 2015. The GAF office in Khartoum, namely Mahgoub Suliman Mohamedain, Arif Ibrahim Abulrahma, Majdi Gedom and Neil Munro for various support in 2014 and 2015. Further thanks to Zuhair Nur Eldayem Mahmoud (University of Khartoum), Ali Adam Saadelnour Abdalla (Fisheries Research Institute Khartoum), Mohammed Abakar Abdallah (Fisheries Research Station Kosti), Vivica von Vietinghoff, Nadja Pöllath, Chiori Kitagawa, Joris Peters (all three LMU Munich), Friedericke Jesse (Univ. Cologne), Erwin Schraml and Andreas Dunz for field assistance or help with additional material, Musa Mohamed Wadelfaki, Awatif Khindir Omer (both University of Khartoum) and Marcus Stüben for help in organizing field trips in 2006 or 2008. We are deeply indebted to Ali Eltahir Sharafeldeen (Sudan Institute of Natural Sciences), Zuhair Nur Eldayem Mahmoud, Mahgoub Suliman Mohamedain and Ali Adam Saadelnour Abdalla for repeated help to facilitate travel, collecting and export permits. We thank Jouke van der Zee and Michael Hardman for support with identifications,

Fabian Herder (ZFMK) for loan of material, and James McLaine for loan of material and providing high-resolution images of the syntypes of *G. vinciguerrae* and *Chrysichthys rueppellii* and the *Protopterus* BMNH 1976.11.12.200. The manuscript profited much from the comments of Emmanuel Vreven (RMCA), Uli Schliewen (ZSM) and Jonathan W. Armbruster (Auburn University) and two anonymous reviewers, for help with the French abstract. We wish to thank Kisekelwa Kisse, Frederic Schedel and Julian Carter, respectively, for proof reading.

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ANNEXE 1: MATERIAL STUDIED

Numbers after collection numbers indicate amount of specimens.

Protopteridae

Protopterus aethiopicus Heckel, 1851: fish market in Khartoum (DMM IE/6405, 3; SAPM-PI-00074, 1; SAPM-PI-00075, 1).

Polypteridae

Polypterus bichir Lacepède, 1803: Upper Nile in Egypt (ZSM 30583, 1); fish market at Omdurman (ZSM 34546, 1); fish market in Khartoum (SAPM-PI-00062, 1).

Polypterus endlicherii Heckel, 1847: White Nile at Kosti (ZSM 35162, 1); Jebel Aulia reservoir at Geteina (ZSM 39631, 2).

Polypterus senegalus Cuvier, 1829: White Nile at Kosti (DMM IE/6385, 1; DMM IE/6386, 1; DMM IE/6387, 2; DMM IE/6388, 3; DMM IE/9370, 5; DMM IE/9371, 3; DMM IE/9372, 2; ZSM 35216, 1; ZSM 35248, 1; ZSM 35188, 1; SAPM-PI-00070, 1); White Nile at Jebel Aulia (SAPM-PI-00071, 1); fish market in Khartoum (ZSM 38711, 1); fish market in Omdurman (ZSM 34545, 2; ZSM 35173, 5).

Arapaimidae

Heterotis niloticus (Cuvier, 1829): White Nile at Kosti (ZSM 35179, 1; SAPM-PI-00057, 1; SAPM-PI-00060, 1); fish market in Khartoum (DMM IE/6402, 1; DMM IE/6403, 1; 1 ex each, SAPM-PI-00054-00056 & SAPM-PI-00058-00059).

Clupeidae

Alosa fallax (Lacepède, 1803): Northwestern Nile delta, tentatively Rosetta branch, (SAPM-PI-00460, 1).

Anguillidae

Anguilla anguilla (Linnaeus, 1758): fish market in Cairo (1 ex each: SAPM-PI-00500 & 00501; SAPM-PI-00493).

Gymnarchidae

Gymnarchus niloticus Cuvier, 1829: White Nile at Kosti (SAPM-PI-00033, 1); fish market in Khartoum (SAPM-PI-00034).

Mormyridae

Brevimyrus niger (Günther, 1866): White Nile at Kosti (DMM IE/6396, 2; DMM IE/6440, 6); Nile River at Khartoum (ZSM 43223, 1).

Hyperopisus bebe (Lacepède, 1803): White Nile at Khartoum (DMM IE/6334, 2; all 1 ex each, SAPM-PI-00035-00039 & SAPM-PI-01404-01408; ZSM 43202, 2); White Nile at Kosti (ZSM 35229, 1); additional specimens were observed on fish markets in Wad Medani and Merowe.

Marcusenius cyprinoides (Linnaeus, 1758): Nile at Khartoum (DMM IE/6211, 1; ZSM 43214, 1; ZSM 43215, 2); Blue Nile at Es-Suki (ZSM 35176, 2); White Nile at Khartoum (DMM IE/6306, 3; DMM IE/6335, 4; DMM IE/6336, 4), White Nile at Jebel Aulia (ZSM 43216, 1); White Nile at Kosti (ZSM 35226, 2); fish market in Khartoum (ZSM 39810, 2; 1 ex each, SAPM-PI-00028-00030).

Mormyrops anguilloides (Linnaeus, 1758): White Nile at Kosti (SAPM-PI-00079, 1[1986]); Blue Nile at Wad Medani (SAPM-PI-00081, 1[2007]); Nile at Taraq Island (ZSM 38680, 1; ZSM 39811, 1); fish market in Khartoum (DMM IE/6404, 1; 1 ex each, SAPM-PI-00077-00078).

Mormyrus caschive Linnaeus, 1758: White Nile at Kosti (DMM IE/6391, 3; DMM IE/6441, 6; ZSM 35227, 1; SAPM-PI-00084, 1); Lake Nasser (1 ex each, SAPM-PI-00082-00083); fish market in Khartoum (SAPM-PI-00086, 1).

Mormyrus hasselquistii Valenciennes, 1847: White Nile at Kosti (SAPM-PI-00087, 1); fish market in Khartoum (SAPM-PI-00086, 1).

Mormyrus kannume Forsskål, 1775: White Nile at Khartoum (DMM IE/6307, 2; DMM IE/6333, 1); fish market in Khartoum (SAPM-PI-00047, 1); Lake Nasser at Aswan (1 ex each: SAPM-PI-00040-00044; SAPM-PI-00045-00046).

Mormyrus niloticus (Bloch & Schneider, 1801): White Nile at Kosti (DMM IE/6392, 1); fish market in Khartoum (ZSM 43213, 2; DMM 9992, 1).

Petrocephalus bane (Lacepède, 1803): fish market in Khartoum (1 ex each, SAPM-PI-00048-00050); Jebel Aulia reservoir (ZSM 26557, 1); Nile at Khartoum (ZSM 43222, 1).

Pollimyrus isidori (Valenciennes, 1847): Nile at Taraq Island (ZSM 39812, 1; ZSM 39813, 4); Nile at Shendi (DMM IE/6301, 4); Blue Nile at Khartoum (DMM IE/6281, 1; DMM IE/6282, 1; DMM IE/6283, 1; DMM IE/6322, 2); Blue Nile at Es-Suki (ZSM 35278, 1; ZSM 35279, 1; ZSM 35285, 1); fish market near Es-Suki (ZSM 35145, 1); White Nile at Khartoum (DMM IE/6308, 16; DMM IE/6315, 1; DMM IE/6316, 1; DMM IE/6317, 1; DMM IE/6318, 1; DMM IE/6329, 5; DMM IE/6330, 8; DMM IE/6331, 3); White Nile between Khartoum and Jebel Aulia (DMM IE/6414, 1; DMM IE/6415, 13); White Nile at Kosti (DMM IE/6389, 2; DMM IE/6442, 12; SAPM-PI-00051, 1 & 00052, 1).

Cyprinidae

Chelaethiops bibie (Johannis, 1835): Nile at Taraq Island (ZSM 39826, 1; ZSM 39830, 4; ZSM 39831, 2; ZSM 39832, 1; ZSM 39834, 13; ZSM 39835, 2; ZSM 39836, 1; ZSM 39837, 3; ZSM 39838, 3; ZSM 39839, 2); Nile upstream Merowe Dam (ZSM 39833, 2); Nile at Atbara (DMM IE/6254, 6); Nile at Shendi (DMM

IE/6296, 3; BMNH 2006.3.7.1, 1), at 6th cataract (ZSM 35140, 3; ZSM 35260, 7; ZSM 35259, 10); Nile at Khartoum (BMNH 2006.3.7.2, 1; DMM IE/6205, 1); Atbara River at Esh-Showak (ZSM 35130, 1; ZSM 35133, 1); Blue Nile at Khartoum (BMNH 2006.3.9.46-89, 44; BMNH 2006.3.9.90-93, 4; DMM IE/6236, 24; DMM IE/6284, 104; DMM IE/6285, 196; DMM IE/6286, 25; DMM IE/6438, 3; DMM IE/6444, 155; DMM IE/9124, 50; DMM IE/9305, 1); Blue Nile at Sennar at outlet of canal from Sennar Dam (BMNH 2006.3.9.31-45, 15; DMM IE/6363, 1; ZSM 35251, 1; ZSM 35253, 1; ZSM 35117, 23); White Nile at Khartoum (DMM IE/6220, 1; DMM IE/6228, 6; DMM IE/6313, 1; DMM IE/6345, 3); White Nile between Khartoum and Jebel Aulia (DMM IE/6276, 3; DMM IE/6426, 2), White Nile at Kosti (ZSM 35121, 2; ZSM 35122, 19; ZSM 35124, 20; ZSM 35126, 18; ZSM 35128, 1; ZSM 35132, 5; ZSM 35252, 17; ZSM 35257, 5; ZSM 35258, 15; ZSM 35290, 3).

Ctenopharyngodon idella (Valenciennes, 1844): from fishermen at Lake Mariut (ZSM 40005, 1).

Enteromius anema Boulenger, 1903: Nile at Khartoum (DMM IE/6203, 1); Blue Nile at Sennar (BMNH 2006.3.7.9, 1; BMNH 2006.3.9.214-222, 9; BMNH 2006.3.9.223-224, 2; DMM IE/6353, 1; DMM IE/9133, 15; DMM IE/9302, 1); juveniles likely belonging to this species from White Nile at Khartoum (DMM IE/6348, 21).

Enteromius neglectus (Boulenger, 1903): Nile at Atbara (DMM IE/6259, 6); Blue Nile at Khartoum (DMM IE/6251, 7); juveniles likely belonging to this species DMM IE/2947, 16).

Enteromius perince (Rüppell, 1835): Atbara River at Esh-Showak (ZSM 35266, 1); Blue Nile at Sennar (BMNH 2006.3.7.10, 1; BMNH 2006.3.9.225-233, 9; BMNH 2006.3.9.234, 1; DMM IE/6354, 11; DMM IE/9126, 15); White Nile between Khartoum and Jebel Aulia (DMM IE/6278, 2; DMM IE/6432, 2); Nile at 6th cataract (ZSM 35232, 4; ZSM 35289, 2); Lake Nasser at Aswan (1 ex each: SAPM-PI-00118-00120; SAPM-PI-00121).

Enteromius pumilus (Boulenger, 1901): Nile at Taraq Island (ZSM 39783, 12; ZSM 39784, 2; ZSM 39785, 5; ZSM 39786, 2; ZSM 39787, 1).

Enteromius stigmatopygus (Boulenger, 1903): Nile at El-Saf (ZSM 38795, 1); White Nile between Khartoum and Jebel Aulia (DMM IE/6279, 1; DMM IE/6433, 1).

Garra cf. vinciguerrae Boulenger, 1901: Nile at Taraq Island (ZSM 39823, 3; ZSM 39824, 4; ZSM 39828, 8; ZSM 39825, 1; ZSM 29827, 4; ZSM 39819, 1; ZSM 39822, 2); Nile upstream Merowe Dam (ZSM 39821, 2), Nile below Lake Nasser at Aswan (SAPM-PI-001131, 1); 3rd cataract (type material: BMNH 1907.12.2.1175-1179).

Garra sp. "flathead": Nile at Taraq Island (ZSM 39814, 3; ZSM 39820, 2; ZSM 39815, 6; ZSM 39816, 2; ZSM 39817, 5; ZSM 39818, 6).

Garra sp. "Sennar": Blue Nile at Sennar at outlet of canal from Sennar Dam (ZSM 35141, 3).

Labeo coubie Rüppell, 1832: Nile or Lake Nasser at Aswan (SAPM-PI-00127, 1 & -00128, 1, SAPM-PI-00129, 1); Lake Nubia, purchased on fish market in Khartoum (ZSM 43211, 1), fish market in Khartoum [without exact locality data] (SAPM-PI-00131, 1); White Nile at Kosti (SAPM-PI-00133, 1).

Labeo forskalii Rüppell, 1835: Nile or Lake Nasser at Aswan; SAPM-PI-00134, 1); Nile at Taraq Island (ZSM 39863, 2; ZSM 39870, 4; ZSM 39874, 3; ZSM 39857, 11; ZSM 39858, 8; ZSM 39869, 3; ZSM 39872, 9; ZSM 39873, 2; ZSM 39871, 16); 6th cataract (ZSM 35239, 4); fish market in Khartoum; Blue Nile at Sennar at outlet canal of Sennar Dam (ZSM 38843, 1; ZSM 35230, 11; ZSM 35235, 11; ZSM 35236, 8; ZSM 35237, 14; ZSM 35240, 7;

ZSM 35568, 14; ZSM 35586, 5; ZSM 35586, 13); Sudanese Nile [without exact locality data] (1 ex each, SAPM-PI-00135-00136).

Labeo horie Heckel, 1847: Nile or Lake Nasser at Aswan (1 ex each, SAPM-PI-00123-00141); Nile at Taraq Island (ZSM 39860, 1); Nile at 6th cataract (ZSM 35287, 1); fish market in Khartoum (1 ex each, SAPM-PI-00142-00143); Atbara River at Esh-Showak (ZSM 35217, 1); White Nile at Kosti (ZSM 35160, 1; 35180, 1); White Nile at Jebel Aulia (ZSM 43218, 1); fish market at Atbara (DMM IE/6267, 1); likely conspecific juvenile at Atbara River at Esh-Showak (ZSM 35585, 1).

Labeo meroensis Moritz, 2007: Nile at Taraq Island (ZSM 39862, 1; ZSM 39864, 2; ZSM 39865, 2; ZSM 39866, 1; ZSM 39867, 1); Nile at Atbara (BMNH 2006.11.9.11-13, 3); Nile at Shendi (BMNH 2006.11.9.1, 1; BMNH 2006.11.9.2-8, 7; BMNH 2006.11.9.9-10, 2 [C&S]; DMM IE/6300, 1; MRAC A6-46-P-1-3, 3).

Labeo niloticus (Linnaeus, 1758): Nile or Lake Nasser at Aswan (1 ex each, SAPM-PI-00144-00147); Nile at Taraq Island (ZSM 39856, 1; ZSM 39859, 3); Nile upstream Merowe Dam (ZSM 39855, 2); Atbara River at Esh-Showak (ZSM 35209, 1; ZSM 35218, 1); Nile at 6th cataract (ZSM 35220, 6; ZSM 35221, 1; ZSM 35288, 3, ZSM 43614, 1); White Nile between Khartoum and Jebel Aulia (DMM IE/6417, 1); White Nile above Jebel Aulia (ZSM 43219, 1); White Nile at Kosti (ZSM 35161, 1); fish market in Esh-Showak (ZSM 35178, 1); fish market in Khartoum (DMM IE/6408, 1; DMM IE/6409, 1).

Labeo sp. nov. "red eye": fish market in Khartoum (DMM IE/6433, 1; ZSM 43615, 1; ZSM 44626, 1).

Labeobarbus bynni (Forsskål, 1775): Atbara River, fish market at Esh-Showak (ZSM 35175, 2); Nile at Taraq Island (ZSM 39788, 1; ZSM 39789, 4; ZSM 39790, 5; ZSM 39791, 2; ZSM 39792, 3; ZSM 39793, 2; ZSM 39794, 3; ZSM 39795, 1); Nile at Khartoum (DMM IE/6204, 5); Lake Nasser at Aswan (1 ex each: SAPM-PI-00114 & SAPM-PI-00115); SAPM-PI-00116); fish market in Khartoum (BMNH 2006.3.13.1, 1; SAPM-PI-00117, 1); White Nile at Khartoum (DMM IE/6411, 1); White Nile between Khartoum and Jebel Aulia (DMM IE/6277, 4); fish market in Cairo (ZSM 38785, 1).

Leptocypris niloticus (Joannis, 1835): Nile at Taraq Island (ZSM 39841, 106; ZSM 39840, 1; ZSM 39842, 1; ZSM 39843, 3; ZSM 39844, 1); Nile upstream Merowe Dam (ZSM 39829, 1; ZSM 39845, 2); Nile at Shendi (DMM IE/6299, 18); Nile at 6th cataract (ZSM 35267, 11); Atbara River at Esh-Showak (ZSM 35268, 22); Atbara River at Atbara city (BMNH 2006.3.7.8, 1; BMNH 2006.3.9.108-159, 52; BMNH 2006.3.9.160-162, 3; DMM IE/9108, 8); Blue Nile at Khartoum (BMNH 2006.3.7.7, 1; DMM IE/6235, 2; DMM IE/6246, 3; DMM IE/6287, 24; DMM IE/6437, 10; ZSM 43201, 1); Blue Nile at Sennar at outlet of canal from Sennar Dam (BMNH 2006.3.7.6, 1; BMNH 2006.3.9.106-107, 2; BMNH 2006.3.13.4, 1; DMM IE/6364, 1; ZSM 35256, 1; ZSM 35118, 1); White Nile at Khartoum (DMM IE/6221, 1); White Nile between Khartoum and Jebel Aulia (DMM IE/6268, 17; DMM IE/6435, 1); White Nile at Kosti (DMM IE/6399, 20; ZSM 35119, 4; ZSM 35123, 8; ZSM 35139, 7; ZSM 35231, 11; ZSM 35233, 7; ZSM 35234, 12; ZSM 35238, 16).

Pseudorasbora parva (Temminck & Schlegel, 1846): Lake Mariut (ZSM 38804, 1); irrigation canal in the area of Lake Burulus (ZSM 38797, 1).

Raiamas senegalensis (Steindachner, 1870): Egyptian Nile without detailed locality data, tentatively around Aswan (SAPM-PI-00126, 1).

Distichodontidae

Distichodus nefasch (Bonnaterre, 1788): central fish market in Khartoum (SAPM-PI-00109, 1); White Nile at Kosti (1 ex each, SAPM-PI-00110-00111); Blue Nile at Khartoum (DMM IE/6323, 1); White Nile at Khartoum (DMM IE/6346, 1).

Distichodus rostratus Günther, 1864: Nile or White Nile at Khartoum, central fish market (DMM IE/6406, 1; DMM IE/6407, 1; SAPM-PI-00113, 1; ZSM 43207, 1); White Nile at Kosti (SAPM-PI-00112, 1).

Ichthyoborus besse (Joannis, 1835): White Nile at Kosti (1 ex each: ZSM 35276; ZSM 35277; ZSM 35587; SAPM-PI-00026-00027); fish market in Khartoum (DMM IE/6410, 1).

Nannocharax niloticus (Joannis, 1835): White Nile at Khartoum (DMM IE/9301, 1).

Citharinidae

Citharinus citharus (Geoffroy Saint-Hilaire, 1809): fish market in Khartoum (1 ex each, SAPM-PI-00018 & 00019); White Nile at Kosti (SAPM-PI-00020, 1).

Citharinus latus Müller & Troschel, 1844: fish market in Khartoum (SAPM-PI-00024, 1); White Nile at Kosti (1 ex each, SAPM-PI-00023 & 00025).

Alestidae

Alestes baremoze (Joannis, 1835): Nile at Taraq Island (ZSM 39798, 1); Nile upstream Merowe Dam (ZSM 39797, 21); Nile at Atbara (DMM IE/6257, 10); Nile at Shendi (DMM IE/6305, 4); Nile at 6th cataract (ZSM 35215, 2; ZSM 35570, 5); Nile at Khartoum (DMM IE/6212, 3); Atbara River at Esh-Showak (ZSM 35199, 7; ZSM 35210, 1); Blue Nile at Khartoum (DMM IE/6240, 6; DMM IE/6249, 4; DMM IE/6292, 4; DMM IE/6326, 2); White Nile at Kosti (DMM IE/6365, 2; ZSM 35205, 3; SAPM-PI-00001 & 00003, 1), Jebel Aulia (ZSM 43210, 1; SAPM-PI-00002, 1); White Nile below Jebel Aulia (DMM IE/6431, 2); White Nile at Khartoum (DMM IE/6217, 2); fish market in Atbara (DMM IE/2974, 1).

Alestes dentex (Linnaeus, 1758): Nile River upstream Merowe Dam (ZSM 39796, 11); Atbara River at Atbara (DMM IE/6439, 4); White Nile at Khartoum (DMM IE/6227, 1); White Nile between Khartoum and Jebel Aulia (DMM IE/6271, 1; DMM IE/6416, 1); Jebel Aulia (ZSM 43209, 1); White Nile at Kosti (1 ex each, SAPM-PI-00006 & 00007).

Brycinus macrolepidotus Valenciennes, 1850: Atbara River at Esh-Showak (ZSM 35255, 1); Blue Nile at Khartoum (DMM IE/6327, 2); White Nile at Khartoum (DMM IE/6338, 1).

Brycinus nurse (Rüppell, 1832): Nile at Taraq Island (ZSM 39800, 1; ZSM 390801, 2; ZSM 39802, 2; ZSM 39804, 7; ZSM 39805, 1); Nile upstream Merowe Dam (ZSM 39806, 71); Nile at Shendi (DMM IE/6304, 19); Nile at the 6th cataract (ZSM 35241, 21; ZSM 35244, 20; ZSM 35243, 28; ZSM 36001, 2); Nile at Khartoum (DMM IE/6208, 14; SAPM-PI-00015, 1 [1986]); at Atbara River (DMM IE/6255, 8); fish market in Atbara (DMM IE/6264, 1); fish market in Esh-Showak (ZSM 35137, 2; ZSM 35242, 32; ZSM 35273, 1); Blue Nile at Khartoum (DMM IE/2950, 5; DMM IE/6293, 8; DMM IE/6328, 1); Blue Nile at the outlet canal of the Sennar Dam (ZSM 35264, 1); White Nile at Khartoum (DMM IE/6218, 3; DMM IE/6225, 3; DMM IE/6310, 3); White Nile between Khartoum and Jebel Aulia (DMM IE/6275, 2; DMM IE/6424, 5; DMM IE/6430, 2); White Nile at Kosti (DMM IE/6368, 1; DMM IE/6376, 2; DMM IE/6397, 1; DMM IE/6401, 1; ZSM 35206, 3; ZSM 35262, 1; ZSM 35265, 2; ZSM 35271, 1; ZSM 35274, 1; SAPM-PI-00016, 1).

Hydrocynus brevis (Günther, 1864): fish market at Khartoum (ZSM 38741, 2; ZSM 38853, 6; SAPM-PI-00088, 1); White Nile at Kosti (SAPM-PI-00089, 1).

Hydrocynus forskahlii (Cuvier, 1819): Nile at Shendi (DMM IE/6303, 4); Nile at 6th cataract (ZSM 35182, 1); White Nile between Khartoum and Jebel Aulia (DMM IE/6412, 2; DMM IE/6418, 1); White Nile at Kosti (ZSM 35155, 1; ZSM 35228, 2; ZSM 35289, 1; ZSM 35275, 1).

Micralestes elongatus Daget, 1957: Nile at Taraq Island (ZSM 39799, 6; ZSM 39803, 2); Nile at Atbara (DMM IE/6252, 8); Nile at 6th cataract (ZSM 35575, 2); Nile at Khartoum (DMM IE/6207, 27; ZSM 43200, 3); fish market at Khartoum (1 ex each, SAPM-PI-00097 & 00098); Blue Nile at Khartoum (DMM IE/6237, 21; DMM IE/6247, 1; DMM IE/6288, 26; DMM IE/6291, 19; DMM IE/6445, 155; DMM IE/9177, 13; DMM IE/9200, 42); Blue Nile at Sennar (DMM IE/6355, 17; ZSM 35120, 5); White Nile at Khartoum (DMM IE/6222, 4; DMM IE/6226, 26; DMM IE/6309, 17); White Nile between Khartoum and Jebel Aulia (DMM IE/6425, 3); White Nile at Kosti (DMM IE/6369, 1; DMM IE/6373, 7; ZSM 35127, 5; ZSM 35254, 2; ZSM 35263, 1; ZSM 35572, 5; ZSM 35573, 1; ZSM 35574, 5).

Amphiliidae

Andersonia leptura Boulenger, 1900: Nile at Taraq Island (ZSM 39755, 4; ZSM 39756, 4; ZSM 39757, 5; ZSM 39758, 4; ZSM 39759, 1; ZSM 39861, 1).

Bagridae

Bagrus bajad (Forsskål, 1775): Nile at Atbara (DMM IE/6258, 1); White Nile at Khartoum (DMM IE/6319, 2; SAPM-PI-00174, 1; ZSM 43203, 1); White Nile at Kosti (ZSM 35174, 1); Faqus in Egypt (SAPM-PI-00170, 1); two additional specimens from the Egyptian Nile without detailed locality information (1 ex each: SAPM-PI-00171 & 00172).

Bagrus docmak (Forsskål, 1775): Rosetta branch in the western delta at Bani Salamah below Cairo (SAPM-PI-00179, 1 & 00180, 1); Nile River at Taraq Island (ZSM 39846, 1; ZSM 39847, 1); White Nile at Khartoum (DMM IE/6339, 2; SAPM-PI-00171, 1 [1986]); White Nile at Qarrasa 100 km south of Khartoum (ZSM 43204, 2); White Nile at Kosti (ZSM 35170, 1).

Claroteidae

Auchenoglanis biscutatus (Geoffroy Saint-Hilaire, 1809): central fish market in Khartoum (SAPM-PI-00153, 1); White Nile at Jebel Aulia (ZSM 43217, 1).

Auchenoglanis occidentalis (Valenciennes, 1840): Nile at Aswan (SAPM-PI-00160, 1); Nile Khartoum (DMM IE/6210, 1; 1 ex each, SAPM-PI-00162 & 000163); Atbara River at Esh-Showak (ZSM 35134, 1; ZSM 35211, 1); Blue Nile Khartoum (DMM IE/9306, 1); Blue Nile at Sennar (DMM IE/6358, 1); White Nile at Khartoum (DMM IE/6332, 1); White Nile at Kosti (DMM IE/6379, 2; ZSM 35186, 1; ZSM 35203, 1; ZSM 42937, 1; SAPM-PI-00161, 1).

Chrysichthys auratus (Geoffroy Saint-Hilaire, 1809): Nile at Aswan (SAPM-PI-00184, 1); Nile at Atbara (DMM IE/6253, 4); Nile at Shendi (DMM IE/6302, 2); Nile at the 6th cataract (ZSM 35129, 1; ZSM 36002, 1); fish market in Cairo (ZSM 38803, 2); Rosetta branch in the western delta at Bani Salamah below Cairo (SAPM-PI-00185, 1); Blue Nile at Khartoum (DMM IE/6232, 1); Nile at Sennar (DMM IE/6362, 1); Atbara River at Atbara (DMM IE/6261, 1); White Nile at Khartoum (DMM IE/6231, 2; DMM IE/6312, 1; DMM IE/6340, 1; DMM IE/6347, 4; SAPM-PI-00186,

1 & 00187, 1); White Nile at Kosti (DMM IE/6380, 2; DMM IE/6381, 3; ZSM 35225, 3; ZSM 35250, 5).

Clarotes laticeps (Rüppell, 1829): central fish market in Khartoum (1 ex each, SAPM-PI-00197 & 00199-00200); White Nile at Kosti (ZSM 35184, 1; SAPM-PI-00198, 1).

Schilbeidae

Schilbe intermedius Rüppell, 1832: Blue Nile at Khartoum (DMM IE/2952, 2; DMM IE/6325, 1); White Nile at Kosti (ZSM 35207, 1; ZSM 35208, 2; ZSM 35213, 3; ZSM 35214, 1; ZSM 35222, 1; ZSM 35224, 1; ZSM 35246, 1).

Schilbe mystus (Linnaeus, 1758): Nile at Taraq Island (ZSM 39853, 1); Nile upstream Merowe Dam (ZSM 39852, 6); White Nile between Khartoum and Jebel Aulia (DMM IE/6413, 2; SAPM-PI-02735, 1); Jebel Aulia (ZSM 43224, 1); White Nile at Kosti (ZSM 35181, 1; ZSM 35223, 1; ZSM 35245, 2); fish market in Khartoum (ZSM 39854, 1; ZSM 43206, 2; 1 ex each, both 1986: SAPM-PI-02732 & 02734).

Schilbe uranoscopus Rüppell, 1832: White Nile at Kosti (SAPM-PI-00208, 1 [1986]); Jebel Aulia (ZSM 43205, 3); Nile at Khartoum (DMM IE/6337, 1); fish market in Khartoum (1 ex each, SAPM-PI-00207 & 00209-00210).

Siluranodon auritus (Geoffroy Saint-Hilaire, 1809): White Nile above Jebel Aulia Dam (ZSM 43225, 1; ZSM 43226, 1); White Nile at Kosti (SAPM-PI-00211, 1; 00212, 1); Blue Nile at Khartoum (DMM IE/6242, 5; DMM IE/6294, 1); Blue Nile at Sennar (DMM IE/6350, 1; DMM IE/6357, 1; DMM IE/6436, 1).

Clariidae

Clarias anguillaris (Linnaeus, 1758): Nile at Khartoum (DMM IE/6213, 1); fish market in Khartoum (1 ex each, SAPM-PI-00213 - 00214); Jebel Aulia (ZSM 43212, 3).

Clarias gariepinus (Burchell, 1822): Rosetta branch in the western delta at Bani Salamah below Cairo (SAPM-PI-00217, 1 & 00220, 1); Egyptian Nile at Faqus (SAPM-PI-00218, 1; SAPM-PI-00219, 1; SAPM-PI-00221, 1); Egyptian Nile at Aswan (SAPM-PI-00223, 1); Nile at 6th cataract (ZSM 35183, 1); fish market in Khartoum (SAPM-PI-00225, 1 & 00226, 1); Atbara River at Esh-Showak (ZSM 35185, 1); White Nile at Khartoum (DMM IE/6320, 1); White Nile at Kosti (DMM IE/6390, 2; SAPM-PI-00224, 1).

Heterobranchus bidorsalis Geoffroy Saint-Hilaire, 1809: fish market in Khartoum (SAPM-PI-00230, 1 & 00231, 1).

Heterobranchus longifilis Valenciennes, 1840: Nile or Lake Nasser at Aswan (SAPM-PI-00234, 1).

Mochokidae

Chiloglanis niloticus Boulenger, 1900: Nile at Taraq Island (ZSM 43646, 2); White Nile at Khartoum (ZSM 43616, 1).

Chiloglanis sp. "Sennar": Blue Nile at Sennar at outlet of canal from Sennar Dam (ZSM 35280, 1).

Mochokus niloticus Joannis, 1835: White Nile at Khartoum (DMM IE/6344, 2; DMM IE/9298, 1; ZSM 43618, 1).

Synodontis batensoda Rüppell, 1832: fish market in Khartoum (SAPM-PI-00240, 1).

Synodontis caudovittatus Boulenger, 1901: Nile at Taraq Island (ZSM 39850, 1); White Nile at Kosti (SAPM-PI-00241, 1; 00242, 1 & 00243, 1).

Synodontis frontosus Vaillant, 1895: Nile at Aswan (SAPM-PI-00248, 1 & 00249, 1); Lake Nasser (SAPM-PI-7, 1); Nile at Khartoum (DMM IE/6216, 3; 1 ex each, SAPM-PI-00250-00251); Blue Nile at Khartoum (DMM IE/6250, 1); White Nile at Khartoum (DMM IE/6321, 6; DMM IE/6342, 4; DMM IE/6343, 5; DMM

IE/6349, 2); White Nile between Khartoum and Jebel Aulia (DMM IE/6423, 1); White Nile at Kosti (ZSM 35204, 3; ZSM 42946, 1).

Synodontis khartoumensis Abu Gideiri, 1967: Nile at Aswan (SAPM-PI-00270, 1); Blue Nile at Es-Suki (ZSM 35196, 1; ZSM 35201, 1); White Nile at Kosti (ZSM 35190, 2; ZSM 35191, 2; ZSM 35192, 1; ZSM 35194, 1); fish market in Atbara (DMM IE/6266, 2).

Synodontis nigrita Valenciennes, 1840: White Nile at Jebel Aulia (SAPM-PI-00262, 1; ZSM 43220, 1; ZSM 43221, 1); White Nile at Kosti (ZSM 35195, 1); fish market in Khartoum (SAPM-PI-00260, 1 & 00261, 1).

Synodontis schall (Bloch & Schneider, 1801): Nile at Aswan (SAPM-PI-00267, 1; SAPM-PI-00269, 1); Nile above Merowe Dam (ZSM 38709, 1; ZSM 39848, 4; ZSM 39849, 1); Nile Khartoum (ZSM 43228, 4); Blue Nile at Es-Suki (ZSM 35197, 1; ZSM 35200, 1; ZSM 35248, 2; ZSM 35249, 1; ZSM 35571, 1); White Nile at Khartoum (DMM IE/6448, 1; DMM IE/6654, 4; DMM IE/6655, 4; DMM IE 6656, 1; SAPM-PI-00272-00278, 1 ex each); White Nile at Kosti (ZSM 35151, 3; ZSM 35198, 1); fish market in Wad Medani (ZSM 35144, 1; ZSM 35168, 1); White Nile above Jebel Aulia Dam (ZSM 43230, 1; ZSM 43231, 2); White Nile at El Qutaynah (ZSM 43229, 2).

Synodontis serratus Rüppell, 1829: Nile or Lake Nasser at Aswan (1 ex each, SAPM-PI-00291-00292); Nile at 6th cataract (ZSM 35169, 1); Atbara River at Esh-Showak (ZSM 35282, 1; ZSM 35283, 1); White Nile at El Qutaynah (ZSM 43208, 2); White Nile at Khartoum (DMM IE/6657, 1); White Nile at Kosti (ZSM 35193, 1); fish market in Khartoum (SAPM-PI-00293, 1; 00294, 1; 00295, 1).

Synodontis sorex Günther, 1864: fish market in Khartoum (SAPM-PI-00303, 1).

Malapteruridae

Malapterurus electricus (Gmelin, 1789): Nile at Taraq Island (ZSM 38678, 1); Nile above Merowe Dam (ZSM 38677, 1; ZSM 38695, 1); Jebel Aulia (SAPM-PI-01669, 1); fish market in Khartoum (SAPM-PI-01668, 1).

Nothobranchiidae

Epiplatys bifasciatus (Steindachner, 1881): White Nile at Kosti (DMM IE/6394, 1; DMM TM-333).

Epiplatys spilargyreus (Duméril, 1861): White Nile at Kosti (DMM IE/6370, 9; DMM IE/6393, 3; ZSM 35286, 4; ZSM 35576, 4).

Poeciliidae

Gambusia affinis (Baird & Girard, 1853): Irrigation canal west of Ismailia (ZSM 38793, 2).

Micropanchax cf. *loati*: Nile River at Taraq Island (females: ZSM 39779,9; ZSM 39781,13; ZSM 39780,3; males: ZSM 39776, 11; ZSM 39777, 1; ZSM 39778, 3).

Poropanchax cf. *normani*: White Nile at Kosti (DMM TM-352, 1); additional juveniles likely belonging to this species from White Nile at Kosti (DMM IE/6400, 5).

Poecilia sp.: Lake Mariut (ZSM 43815, 2), adult male and female.

Cyprinodontidae

Aphanius fasciatus (Valenciennes, 1821) aquaculture ponds near Jebel Aulia (ZSM 43815, 3).

Latidae

Lates niloticus (Linnaeus, 1758): Nile or Lake Nubia at Aswan (SAPM-PI-01445, 1), Lake Nasser (SAPM-PI-01446, 1), Nile at Taraq Island (ZSM 39808, 1; ZSM 39809, 1); Nile above Merowe Dam (ZSM 39807, 1); Nile at Shendi (DMM IE/6295, 2); Nile at 6th cataract (ZSM 35261, 1; ZSM 35272, 1); Nile at Khartoum (DMM IE/6209, 2); Atbara River at Esh-Showak (ZSM 35138, 1); Blue Nile at Khartoum (DMM IE/6233, 1; DMM IE/6244, 1; DMM IE/6245, 2; DMM IE/6289, 1; DMM IE/6290, 1); Blue Nile at Sennar (DMM IE/6351, 1; DMM IE/6360, 1); White Nile at Khartoum (DMM IE/6224, 1; DMM IE/6311, 1); White Nile between Khartoum and Jebel Aulia (DMM IE/6296, 1; DMM IE/6273, 1; DMM IE/6421, 3; DMM IE/6422, 2); Jebel Aulia (SAPM-PI-01450, 1); White Nile at Kosti (DMM IE/6382, 2; ZSM 35187, 1); fish market in Atbara (DMM IE/6262, 1); fish market in Khartoum (1 ex each, SAPM-PI-01448–01449, SAPM-PI-01451–01452).

Mugilidae

Liza ramada (Risso, 1827): Nile Delta east of Damietta Branch at Faqus (SAPM-PI-01777, 1).

Eleotridae

Kribia nana (Boulenger, 1901): Nile at Taraq Island (ZSM 39782, 1); White Nile at Kosti. (DMM IE/9299, 1).

Anabantidae

Ctenopoma petherici Günther, 1864: White Nile at Kosti (DMM IE/6371, 1; DMM IE/6372, 2; DMM IE/6395, 1; DMM IE/9300, 1).

Channidae

Parachanna obscura (Günther, 1861): White Nile at Kosti (DMM IE/6383, 1); fish market in Khartoum (ZSM 38682, 1; SAPM-PI-00236, 1 & 00237, 1).

Cichlidae

Coptodon zillii (Gervais, 1848): Irrigation canal in the area of El Fayum (ZSM 40478, 1); Lake Mariut (ZSM 41421, 2); Lake at Bahig west of Alexandria (ZSM 38794, 1); Nile at Shendi (DMM IE/6297, 1); Nile at Khartoum (DMM IE/6214, 4); Blue Nile at Khartoum (DMM IE/6248, 2; DMM IE/6324, 2); White Nile at Khartoum (DMM IE/6230, 1; SAPM-PI-02826, 1); White Nile between Khartoum and Jebel Aulia (DMM IE/6428, 1); White Nile at Kosti (DMM IE/6378, 3; ZSM 35247, 2; ZSM 35281, 1; SAPM-PI-02825, 1).

Coptodon cf. zillii (Gervais, 1848): Lake Mariut (ZSM 40003, 1); Nile at Cairo (ZSM 38808, 7), irrigation canals the eastern delta in vicinity of Lake Burullus (ZSM 38790, 6); Irrigation canals in El Fayum area (ZSM 38784, 1); White Nile at Kosti (ZSM 35146, 2).

Haplochromis spp.: Lake Mariut (ZSM 38791, 4; ZSM 38800, 1; ZSM 38801, 12; ZSM 38805, 7; ZSM 38807, 11); irrigation canal in the area of El-Mahmoudeya (ZSM 38788, 1); irrigation canal west of Ismailia (ZSM 38789, 1); irrigation canals near Darh Efein (ZSM 38786, 3); irrigation canals at El Fayum (ZSM 38792, 1); Nile River at El-Saf (ZSM 38806, 9).

Hemichromis cf. fasciatus Peters, 1857: White Nile at Kosti (DMM IE/6366, 2; DMM IE/6375, 8); fish market at Khartoum (ZSM 39772, 1).

Hemichromis letourneuxi Sauvage, 1880: irrigation canal near Darh Efein (ZSM 40480, 1); irrigation canal west of Ismailia (ZSM 38787, 1); irrigation canal in the area of El Fayum (ZSM 38796, 1); Lake Mariut (ZSM 38809, 2); White Nile at Kosti (DMM IE/6367, 5; DMM IE/6374, 4).

Hemichromis cf. letourneuxi Sauvage, 1880: Lake Birkat-Abu-Jumas west of Ismailia (ZSM 38799, 2; ZSM 40784, 2).

Oreochromis aureus (Steindachner, 1864): Jebel Aulia (ZSM 43227, 1).

Oreochromis niloticus (Linnaeus, 1758): Western Nile delta, Rosetta branch at Bani Salamah below Cairo (SAPM-PI-01880, 1); irrigation canal at El Fayum (ZSM 38783, 1); Nile at Taraq Island (ZSM 39774, 1; ZSM 39775, 2); Nile above Merowe Dam (ZSM 39773, 2); Nile at Atbara (DMM IE/6263); Nile at Shendi (DMM IE/6298, 8); Nile at 6th cataract (ZSM 35135, 1; ZSM 36003, 1); Nile at Khartoum (DMM IE/6215, 2); Atbara River at Esh-Showak (ZSM 35136, 1; ZSM 35143, 1; ZSM 35270, 2); Blue Nile at Sennar (DMM IE/6352, 2; DMM IE/6361, 3); White Nile at Khartoum (DMM IE/6219, 4; DMM IE/6229, 1; DMM IE/6314, 1); White Nile between Khartoum and Jebel Aulia (DMM IE/6270, 2; DMM IE/6427, 1); White Nile at Kosti (DMM IE/6377, 2; ZSM 35125, 1; ZSM 35142, 3; ZSM 35202, 3; ZSM 35212, 4; ZSM 35269, 1; ZSM 36481, 2); fish market in Qantir [20 km southeast of Ismailia] (ZSM 36691, 2; ZSM 36692, 6); fish market in Atbara (DMM IE/6263, 1); fish market in Omdurman (ZSM 39922, 6; ZSM 39923, 6); fish market in Khartoum (SAPM-PI-01881-01882, 1).

Oreochromis sp. "botched": Blue Nile at Sennar (ZSM 35167, 3).

?*Oreochromis* sp.: Lake Mariut (ZSM 40004, 1).

Pseudocrenilabrus multicolor (Schöller, 1903): Lake Mariut (ZSM 40011, 2).

Sarotherodon galilaeus (Linnaeus, 1758): Western Nile delta, Rosetta branch at Bani Salamah below Cairo (SAPM-PI-02387, 1); Nile at El-Saf (ZSM 38802, 1); fish market in Cairo (ZSM 38810, 1); Blue Nile at Es-Suki (ZSM 35163, 6; ZSM 35164, 7; ZSM 35172, 1; ZSM 35219, 1); White Nile at Kosti (DMM IE/6384, 1; ZSM 35147, 3; ZSM 35152, 3; ZSM 35153, 2; ZSM 35348, 3; ZSM 34549, 4; ZSM 35350, 4; ZSM 35157, 1; ZSM 35158, 2; ZSM 35159, 3; ZSM 36460, 1); fish market in Omdurman (ZSM 34547, 4; ZSM 34548, 5; ZSM 34549, 4); fish market in Khartoum (SAPM-PI-02391-02392, 1); Blue Nile at Wad Medani (ZSM 35171, 3); Blue Nile at Sennar (ZSM 35165, 6; ZSM 35166, 5).

Sarotherodon cf. galilaeus (Linnaeus, 1758): Lake Mariut (ZSM 40000, 5; ZSM 40001, 12; ZSM 40002, 5).

Tetraodontidae

Tetraodon lineatus Linnaeus, 1758: Nile or Lake Nasser at Aswan (SAPM-PI-02764, 1); White Nile between Khartoum and Jebel Aulia (DMM IE/6280, 1; DMM IE/6419, 1); Jebel Aulia (SAPM-PI-02767, 1); White Nile at Kosti (DMM IE/6398, 1; ZSM 35154, 1; ZSM 35156, 1); fish market in Khartoum (SAPM-PI-02767-02768, 1 each).

Ismailia									
Lake Birkat-Abu-Jumas									
Nile delta, Damietta branch Faqus or Lake Menzalah									
Irrigation canal El-Mahmoudeya									
Nile Delta, Lake Burullus							•		
Nile delta, Rosetta branch									
Lake Mariout / greater Alexandria			•				•		
Lake at Bahig / W of Alexandria									
Cairo fish market							•		
Nile Cairo									
Nile at El-Saf			•						
Al Fayum							†		
Egyptian Nile									
Wadi Howar									
Nile at Aswan			•				†		
Lake Nasser							• • • • •		
Nile at Taraq Island (below Merowe Dam)			•	•	a	a	• • • • •		•
Nile at 4 th Cataract / Dar el-Arab									
Nile in Atbara (town)			•	•			• •		•
Atbara above confluence with Nile									
Atbara above Esh-Showak			•	•			• • • • •		•
Nile River in Shendi				•			• •		•
Nile at 6 th Cataract / Sabaloqa			•	•			• • • • •		•
Omdourman fish market								•	•
Khartoum fish market			•				• • • • •	• • •	• • •
Nile in Khartoum / below Tuti Island			• •	•			•		•
Blue Nile in Khartoum				•				•	•
Blue Nile, Wad Medani fish market									
Blue Nile below Sennar Dam			•	•		a	a		•
Blue Nile at Es-Suki									
White Nile in Khartoum / at Al Sunut Forest			•	•			•	•	
White Nile below Jebel Aulia			•	• •			• •	•	•
White Nile above Jebel Aulia							•		•
White Nile in Kosti				•			• • •	• • •	• • •
Species									
<i>Enteromius neglectus</i>									
<i>Enteromius perince</i>									
<i>Enteromius pumilus</i>									
<i>Enteromius stigmatopygus</i>									
<i>Chelaethiops bibie</i>									
<i>Ctenopharyngodon idella</i>									
<i>Garra cf. vinciguerrae</i>									
<i>Garra</i> sp. nov. "flathead"									
<i>Garra</i> sp. "Sennar"									
<i>Labeobarbus bynni</i>									
<i>Labeo coubie</i>									
<i>Labeo forskalii</i>									
<i>Labeo horie</i>									
<i>Labeo</i> sp. nov. "red eye"									
<i>Labeo meroensis</i>									
<i>Labeo niloticus</i>									
<i>Leptocypris niloticus</i>									
<i>Mylopharyngodon piceus</i>									
<i>Pseudorasbora parva</i>									
<i>Raibamas senegalensis</i>									
Distichodontidae									
<i>Distichodus nefusch</i>									
<i>Distichodus rostratus</i>									
<i>Ichthyoborus besse</i>									
<i>Nannocharax niloticus</i>									
Citharinidae									
<i>Citharinus citharus</i>									
<i>Citharinus latus</i>									
Alestidae									
<i>Alestes baremoze</i>									

Annexe 2. – Continued.

Ismailia									
Lake Birkat-Abu-Jumas									
Nile delta, Damietta branch Faqus or Lake Menzalah			•					•	
Irrigation canal El-Mahmoudeya									
Nile Delta, Lake Burullus									
Nile delta, Rosetta branch			•	•				•	
Lake Mariout / greater Alexandria									
Lake at Bahig / W of Alexandria									
Cairo fish market					•				
Nile Cairo						a			
Nile at El-Saf									
Al Fayum								†	
Egyptian Nile			•					•	
Wadi Howar							†		
Nile at Aswan		†		† †	• •			•	
Lake Nasser									
Nile at Taraq Island (below Merowe Dam)	•	•	•	• •			•		•
Nile at 4 th Cataract / Dar el-Arab	•	•					•		
Nile in Atbara (town)	•	•	•	•	•		•		
Atbara above confluence with Nile	•	•					•		
Atbara above Esh-Showak	•	•			•			•	
Nile River in Shendi	•	•	•				•		
Nile at 6 th Cataract / Sabaloqa	•	•	• •				•		•
Omdourman fish market		•		•	•		•		•
Khartoum fish market		•		•	• • •		• • •		• •
Nile in Khartoum / below Tuti Island		•	•	•	•		• •		•
Blue Nile in Khartoum	•	•	•		• •		•		•
Blue Nile, Wad Medani fish market									•
Blue Nile below Sennar Dam		•	•		• •		•		a
Blue Nile at Es-Suki									•
White Nile in Khartoum / at Al Sunut Forest	•	•	•	•	• • •				• • •
White Nile below Jebel Aulia	•	•	• •				• • •		
White Nile above Jebel Aulia	•	•		•	•		• • •	•	
White Nile in Kosti	•	•	• • •	•	• •	•	• • • •	•	
Species									
<i>Alestes dentex</i>									
<i>Brycinus macrolepidotus</i>									
<i>Brycinus nurse</i>									
<i>Hydrocynus brevis</i>									
<i>Hydrocynus forskahlii</i>									
<i>Micralestes elongatus</i>									
Amphiliidae									
<i>Andersonia leptura</i>									
Bagridae									
<i>Bagrus bojad</i>									
<i>Bagrus docmak</i>									
Claroteidae									
<i>Auchenoglanis biscutatus</i>									
<i>Auchenoglanis occidentalis</i>									
<i>Chrysichthys auratus</i>									
<i>Chrysichthys rueppelli</i>									
<i>Clarotes laticeps</i>									
Schilbeidae									
<i>Parailia pellucida</i>									
<i>Schilbe intermedius</i>									
<i>Schilbe mystus</i>									
<i>Schilbe uranoscopus</i>									
<i>Siluranodon auritus</i>									
Clariidae									
<i>Clarias anguillaris</i>									
<i>Clarias gariepinus</i>									
Mochokidae									
<i>Chiloglanis niloticus</i>									
<i>Chiloglanis</i> sp. "Sennar"									
<i>Mochokus niloticus</i>									

Annexe 2. – Continued.

Ismailia					i				
Lake Birkat-Abu-Jumas									
Nile delta, Damietta branch Faqus or Lake Menzalah						• •		•	
Irrigation canal El-Mahmoudeya									
Nile Delta, Lake Burullus									
Nile delta, Rosetta branch									
Lake Mariout / greater Alexandria						i			
Lake at Bahig / W of Alexandria									
Cairo fish market								?	
Nile Cairo									
Nile at El-Saf									
Al Fayum				†			†	†	
Egyptian Nile									
Wadi Howar				†	†	†		†	
Nile at Aswan		•		†	•	•	†	•	
Lake Nasser		•						•	
Nile at Taraq Island (below Merowe Dam)	•				•			•	•
Nile at 4 th Cataract / Dar el-Arab					•			•	
Nile in Atbara (town)			•					•	
Atbara above confluence with Nile									
Atbara above Esh-Showak					•			•	
Nile River in Shendi								•	
Nile at 6 th Cataract / Sabaloqa					•			•	
Omdourman fish market		• •		• • •	•			•	
Khartoum fish market	○			• • • •	•			•	
Nile in Khartoum / below Tuti Island		• •		• •			i	•	
Blue Nile in Khartoum		•						•	
Blue Nile, Wad Medani fish market				•					
Blue Nile below Sennar Dam								•	
Blue Nile at Es-Suki			•	•					
White Nile in Khartoum / at Al Sunut Forest		•		• •				•	
White Nile below Jebel Aulia		•						•	
White Nile above Jebel Aulia				• • •	•			•	
White Nile in Kosti	•	• •	• • •	• • •	• •	a		•	•

Annexe 2. – Continued.

Species									
<i>Synodontis batensoda</i>									
<i>Synodontis caudovittatus</i>									
<i>Synodontis clarias</i>									
<i>Synodontis frontosus</i>									
<i>Synodontis khartoumensis</i>									
<i>Synodontis membranaceus</i>									
<i>Synodontis nigrita</i>									
<i>Synodontis schall</i>									
<i>Synodontis serratus</i>									
<i>Synodontis sorex</i>									
Malapteruridae									
<i>Malapterurus electricus</i>									
Nothobranchiidae									
<i>Epiplatys bifasciatus</i>									
<i>Epiplatys spilargyzeus</i>									
Poeciliidae									
<i>Gambusia affinis</i>									
<i>Micropanchax cf. loati</i> ?									
<i>Poropanchax cf. normani</i> ?									
<i>Poecilia</i> sp. (<i>latipinna sensu lato</i>)									
Cyprinodontidae									
<i>Aphanius fasciatus</i>									
<i>Aphanius dispar</i>									
Latidae									
<i>Lates niloticus</i>									
Mugilidae									
<i>Mugil cephalus</i>									
Eleotridae									
<i>Kribia nana</i>									

Ismailia				a		a	•	
Lake Birkat-Abu-Jumas							a	
Nile delta, Damietta branch Faqus or Lake Menzalah								
Irrigation canal El-Mahmoudeya				a		•		
Nile Delta, Lake Burullus				•				
Nile delta, Rosetta branch							•	•
Lake Mariout / greater Alexandria				•	a	•		• a
Lake at Bahig / W of Alexandria				•				
Cairo fish market								
Nile Cairo				•			•	•
Nile at El-Saf					a			
Al Fayum				•		a	•	•
Egyptian Nile								
Wadi Howar								
Nile at Aswan							†	•
Lake Nasser								•
Nile at Taraq Island (below Merowe Dam)							•	
Nile at 4 th Cataract / Dar el-Arab							•	
Nile in Atbara (town)							•	
Atbara above confluence with Nile								
Atbara above Esh-Showak							•	•
Nile River in Shendi				•			•	•
Nile at 6 th Cataract / Sabaloqa							•	
Omdourman fish market			•	•			•	
Khartoum fish market			•	•	•		•	•
Nile in Khartoum / below Tuti Island				•			•	
Blue Nile in Khartoum				•				•
Blue Nile, Wad Medani fish market							•	
Blue Nile below Sennar Dam							•	
Blue Nile at Es-Suki							•	
White Nile in Khartoum / at Al Sunut Forest				•			•	•
White Nile below Jebel Aulia				•			•	•
White Nile above Jebel Aulia			•		•		•	•
White Nile in Kosti	•	•	•	•	•	•	•	•
Species								
Anabantidae								
<i>Ctenopoma petherici</i>								
Channidae								
<i>Parachanna obscura</i>								
Cichlidae								
<i>Coptodon zillii</i>								
<i>Haplochromis</i> sp. "Delta 1"								
<i>Haplochromis</i> sp. "Delta 2"								
<i>Haplochromis</i> sp. "Fayum"								
<i>Hemic-hromis</i> cf. <i>fasciatus</i>								
<i>Hemic-hromis letourneuxi</i>								
<i>Hemic-hromis</i> cf. <i>letourneuxi</i>								
<i>Oreochromis aureus</i>								
<i>Oreochromis niloticus</i>								
<i>Pseudocrenilabrus multicolor</i>								
<i>Sarotherodon galilaeus</i>								
Tetraodontidae								
<i>Tetraodon lineatus</i>								

Annexe 2. – Continued.

Annexe 3. – Distribution of fish species of the Main Nile and conservation status. Column with taxon names: (i) = introduced species; [square brackets] = occurring outside Main Nile. Columns with occurrence data: A = Lake Albert, B = Blue Nile, D = Delta, N = Main Nile below confluence in Khartoum, S = Sudd, T = Lake Tana, W = White Nile; ? = occurrence in respective subbasin currently unclear; ○ = unconfirmed occurrence based on literature source (e.g. Bishai and Khalil, 1997; IUCN 2015). Columns on conservation status reflect regional IUCN assessments (North Africa = Egyptian Nile and delta, Northeast Africa = Sudanese Nile and affluents inside the Republic of the Sudan or South Sudan) were applicable: NE* = Not Evaluated (range outside Main Nile), NE² = Not Evaluated (assessment pending for the Main Nile), DD = Data Deficient, VU = Vulnerable, EN = Endangered, CR = Critically Endangered, RE = Regionally Extinct; local conservation status in Egypt (Bishai and Khalil, 1997): thr. = threatened, dec. = declining, ext. = extirpated, van. = vanished. Bold print = type locality inside Egyptian or Sudanese Nile, ◆ = confirmed at type locality, ◇ = should be carefully requalified at type locality.

	Boulenger, 1907					Lévéque et al., 1991	Bailey 1994					Current synopsis					Conservation status in Egypt	Conservation status in the Rep. Sudan
Total number of recognised taxa in Main Nile	114					117	122					150						
Subbasin	S	W	B	N	D	–	S	W	B	N	D	S	W	B	N	D		
Protopteridae																		
<i>Protopterus aethiopicus</i>	●	●				N	●	●		●		●	◆		●		NE ² , thr.	NE²
[<i>Protopterus annectens</i>]		●				N			–					–			NE*	DD
Polypteridae																		
<i>Polypterus bichir</i>	●	●		●	●	N			unclear			●	●		●	?	NE², thr.	NE ²
<i>Polypterus endlicherii</i>	●	●				N			unclear			●	●				NE	DD
<i>Polypterus senegalus</i>	●	●				N			unclear			●	●				NE	LC
Clupeidae																		
<i>Alosa fallax</i>				●	●	N			–							●	LC, thr.	RE
Anguillidae																		
<i>Anguilla anguilla</i>				●	●	N			?	?						●	EN	RE
Arapaimidae																		
<i>Heterotis niloticus</i>	●	●		●		N	●	●				●	●		?		RE	DD
Notopteridae																		
<i>Xenomystus nigri</i>		●				N	●					●					DD	DD
Gymnarchidae																		
<i>Gymnarchus niloticus</i>	●		●			N	●	●		●		●	●		◆		DD, thr.	DD
Mormyridae																		
<i>Brevimyrus niger</i>	●					N	●					●	●				LC	LC
<i>Hippopotamyrus harringtoni</i> (endemic)	●					N	●		●	●		●	?				DD	DD
<i>Hippopotamyrus pictus</i>	●					N				●		?	?				DD	DD
<i>Hyperopisus bebe</i>	●		●			N	●	●	●	●		●	●	?	●		RE	DD
<i>Marcusenius cyprinoides</i>	●		●			N	●	●	●	●		●	●	●	●	○	VU	LC
<i>Mormyrops anguilloides</i>			●			N	●	●	●	●		●	●	●	●		LC, thr.	LC
<i>Mormyrus caschive</i> (endemic)	●		●			N	●	●	●	●		●	●	●	◆		VU	LC
<i>Mormyrus hasselquistii</i>	●		●			N	●	●				●	●		?		RE	LC
<i>Mormyrus kannume</i> (endemic)	●		●			N	●	●	●	●		●	●	●	●	○	VU	LC
<i>Mormyrus niloticus</i> (endemic)			●			N		●				●		●			RE	DD
<i>Petrocephalus bane</i>	●	●	●			N	●	●	●	●		●	●	●	●	?	VU	NE
<i>Petrocephalus bovei</i>			●			N	●	●				●	●	?	●		RE	NE
<i>Petrocephalus keatingii</i> (endemic)	●					N		●				●					DD	DD
<i>Pollimyrus isidori</i>	●	●		●		N	●	●	●	●		●	●	●	●	?	VU	NE
<i>Pollimyrus petherici</i> (endemic)	●	●				N	●	●	●			?	?	●			DD	DD
Kneriidae																		
<i>Cromeria nilotica</i> (endemic)	●					N	●					●	?				DD	DD
Cyprinidae																		
<i>Chelaethiops bibie</i>	●	●		●		N	●	●		●		●	●	●	●		EN	DD
(i) <i>Ctenopharyngodon idella</i>			–			–			–						●		introduced	
(i) <i>Cyprinus carpio</i>			–			–			–						●		introduced	

Annexe 3. – Continued.

	Boulenger, 1907					Léveque et al., 1991	Bailey 1994					Current synopsis					Conservation status in Egypt	Conservation status in the Rep. Sudan
Total number of recognised taxa in Main Nile	114					117	122					150						
Subbasin	S	W	B	N	D	–	S	W	B	N	D	S	W	B	N	D		
<i>Enteromius anema</i>	•	•		•		N	•	•	•	•		•	•	•	•		RE	DD
<i>Enteromius cercops</i>			–			–	•					?					NE*	NE ²
[<i>Enteromius humilis</i> (endemic)]			–			T			–					–			NE*	NE ²
<i>Enteromius kerstenii</i>			–			–	•					?					NE*	NE ²
<i>Enteromius leonensis</i>			–			–	•	•				?	?				DD	DD
<i>Enteromius neglectus</i> (endemic)			•	•		N				•				•	•	?	RE	CR
[<i>Enteromius neumayeri</i> (endemic)]			–			T			–					–			NE*	NE*
<i>Enteromius nigeriensis</i>			–			N	•					•					NE*	LC
<i>Enteromius perince</i>	•	•	•	•	•	N	•	•	•	•		•	•	•	•	◊	VU	DD
[<i>Enteromius pleurogramma</i> (endemic)]			–			T			–					–			DD	DD
<i>Enteromius pumilus</i>		•				N	•	•		•		•	♦		•		DD	DD
<i>Enteromius stigmatopygus</i>		•				N	•	•		•		•	•		•		DD	DD
<i>Enteromius tongaensis</i> (endemic)			–			N	•					•					DD	DD
[<i>Enteromius trispilopleura</i> (endemic)]			T			T			–					–			NE*	NE*
<i>Enteromius yeiensis</i> (endemic)			–			N	•					•					DD	DD
<i>Enteromius yongei</i>			–			–	•					?					NE*	NE ²
<i>Enteromius</i> sp. nov.1 Bianco, 1981 in Bailey			–			–	•					?					NE*	NE ²
<i>Enteromius</i> sp. nov.2 Bianco, 1981 in Bailey			–			–	•					?					NE*	NE ²
[<i>Garra dembeensis</i> (endemic, Tana)]			–			N		•						–			NE*, thr.	NE*
[<i>Garra quadrimaculatus</i> (Tana)]			–			N			–					–			NE*	NE*
<i>Garra</i> cf. <i>vinciguerrae</i> (endemic)		•		•		–			–				?		•		LC	LC
<i>Garra</i> sp. nov. “flathead” (endemic)			–			–			–						•		NE ²	NE ²
<i>Garra</i> sp. “Sennar” (endemic)			–			–			–					•			NE ²	NE ²
<i>Labeobarbus bynni</i> (endemic)	•	•	•	•		N	•	•	•	•		•	•	•	•	◊	VU	LC
[<i>Labeobarbus intermedius</i> (endemic)]			–			T			–					–			NE*	NE*
<i>Labeo coubie</i>	•	•	•	•		N	•	•	•	•		•	•	•	•	◊	EN	DD
<i>Labeo forskalii</i> (endemic)			•	•		N		•	•	•		?	•	•	◊		DD, thr.	DD
<i>Labeo horie</i> (endemic)	•	•	•	•		N	•	•	•	•		•	•	•	•	◊	NE, thr.	NE
<i>Labeo</i> sp. nov. “red eye” (endemic)			–			–			–			?	•				NE ²	NE ²
<i>Labeo meroensis</i> (endemic)			–			–			–					•			NE	NE ²
<i>Labeo niloticus</i> (endemic)	•	•	•	•		N	•	•	•	•		•	•	•	•	◊	LC	LC
[<i>Mesobola bredori</i> (endemic)]			–			A			–					–			NE*	NE*
<i>Leptocypris niloticus</i>	•	•	•	•		N		•	•	•		?	•	•	•		EN	DD
(i) <i>Mylopharyngodon piceus</i>			–			–			–							•	introduced	
(i) <i>Pseudorasbora parva</i>			–			–			–							•	introduced	
<i>Raiamas senegalensis</i>	•		•	•		N		•	•	•		?	•	•	•		EN	LC
[<i>Varicorhinus beso</i> (endemic)]			–			T			–					–			NE*	NE*
Nemacheilidae																		
[<i>Afronemacheilus abyssinicus</i> (endemic, Tana)]			T			N			–					–			NE*	NE*
[<i>Afronemacheilus kaffa</i> (endemic, Turkana)]			–			–			–					–			NE*	NE*
Distichodontidae																		
<i>Distichodus brevipinnis</i>		•				N		•	•				•	?			DD	DD
<i>Distichodus engycephalus</i>	•	•	•	•		N		•	•	•		•	•	?	•		RE	LC
<i>Distichodus nefasch</i> (endemic)		•		•		N	•	•	•	•		•	•	?	•	◊	LC, thr.	LC
<i>Distichodus rostratus</i>	•	•		•		N	•	•	•	•		•	•	?	•	?	RE	LC

Annexe 3. – Continued.

	Boulenger, 1907					Léveque et al., 1991	Bailey 1994					Current synopsis					Conservation status in Egypt	Conservation status in the Rep. Sudan
Total number of recognised taxa in Main Nile	114					117	122					150						
Subbasin	S	W	B	N	D	–	S	W	B	N	D	S	W	B	N	D		
<i>Ichthyborus besse</i>		•		•		N	•	•				•	•		?		RE	NE
<i>Nannocharax niloticus</i> (endemic)	•	•	•			N	•	•	•	•		•	•	?	?		RE	DD
<i>Neolebias trewavasae</i>	•	•				N	•					•	•				NE*	NE*
Citharinidae																		
<i>Citharinus citharus</i>		•	•	•		N	•	•	•	•		•	•	•	•		NE², thr.	NE ² , dec.
<i>Citharinus latus</i>		•		•		N	•	•		•		•	•		•		VU	DD
Alestidae																		
<i>Alestes baremoze</i>	•	•	•	•		N	•	•	•	•		•	•	•	•		RE	LC
<i>Alestes dentex</i>	•	•		•		N	•	•	•	•		•	•	?	♦	?	VU	LC
<i>Brycinus macrolepidotus</i>	•	•	•	•		N	•	•	•	•		•	•	•	•	◊	RE	LC
<i>Brycinus nurse</i>	•	•	•	•		N	•	•	•	•		•	•	•	•	?	DD	DD
<i>Hydrocynus brevis</i>		•		•		N	•	•	•	•		•	•	•	♦		RE	LC
<i>Hydrocynus forskahlii</i> [<i>Hydrocynus vittatus</i>]	•	•	•	•		N	•	•	•	•		•	•	•	•	◊	VU	LC
<i>Micralestes elongatus</i>	•	•		•		N	•	•	•	•					unclear		LC	LC
Amphiliidae																		
<i>Andersonia leptura</i>	•			•		N		•				•	•		•		DD	DD
Bagridae																		
<i>Bagrus bajad</i>	•	•	•	•	•	N	•	•	•	•		•	•	•	•	◊	LC	DD
<i>Bagrus docmak</i>	•	•	•	•	•	N	•	•	•	•		•	•	•	•	◊	LC	LC
Claroteidae																		
<i>Auchenoglanis biscutatus</i>	•	•		•		N	•	•		•		•	•		•	◊	VU	DD
<i>Auchenoglanis occidentalis</i>	•	•	•	•		N	•	•	•	•		•	•	•	•	◊	VU	DD
<i>Chrysichthys auratus</i>	•	•		•	•	N	•	•	?	•		•	•	•	♦	•	LC	LC
<i>Chrysichthys rüppeli</i> (endemic)				•	•	–				•	•				?	?	NE², thr.	NE ²
<i>Clarotes laticeps</i>	•	•	•	•		N	•	•	•	•		•	•	•	•	◊	RE	DD
Schilbeidae																		
<i>Parailia pellucida</i>		•				N		•				•		•			DD	DD
<i>Schilbe intermedius</i>	•	•	•	•	•	N	•	•	•	•		•	•	•	•	◊	LC, thr.	LC
<i>Schilbe mystus</i>	•	•	•	•		N	•	•	•	•		•	•	•	♦	◊	LC	LC
<i>Schilbe uranoscopus</i>	•	•	•	•		N	•	•	•	•		•	•	•	•	?	VU	LC
<i>Siluranodon auritus</i>	•	•	•			N	•	•				•	•	•	?	?	DD, thr.	DD
Clariidae																		
<i>Clarias anguillaris</i>		•		•	•	N	•	•		•		•	•	?	•	?	DD, thr.	DD
<i>Clarias engelseni</i> (endemic)			–			N	•					•					DD	DD
<i>Clarias gariepinus</i> [<i>Clarias hilli</i>]	•	•	•	•		N	•	•	•	•		•	•	•	•	◊	LC	LC
<i>Clarias wernerii</i> (endemic)			–			A			–					–			NE*	NE*
<i>Heterobranchus bidorsalis</i>		•		•		N		•		•		•		•			VU	DD
<i>Heterobranchus longifilis</i>		•		•		N	•	•		•		•	•		•		VU	LC
Mochokidae																		
<i>Chiloglanis niloticus</i> (endemic)				•		N				•				?	•		DD, thr.	DD
<i>Chiloglanis</i> sp. “Sennar” (endemic)			–			–			–						•		NE²	NE²
<i>Mochokus brevis</i>		•				N	•	•				•	♦				DD	DD
<i>Mochokus niloticus</i>	•	•		•		N	•	•		•		•	•		•		VU	DD
<i>Synodontis batensoda</i>	•	•		•		N	•	•	•	•		•	?	?	?		RE	DD
<i>Synodontis caudovittatus</i> (endemic)	•	•				N	•	•				•	♦		•		DD	DD

Annexe 3. – Continued.

	Boulenger, 1907					Léveque et al., 1991	Bailey 1994					Current synopsis					Conservation status in Egypt	Conservation status in the Rep. Sudan
Total number of recognised taxa in Main Nile	114					117	122					150						
Subbasin	S	W	B	N	D	–	S	W	B	N	D	S	W	B	N	D		
<i>Synodontis clarias</i>	•	•	•			N	unclear					•	?	♦	○		VU	LC
<i>Synodontis eupterus</i>	•					N	•	•				•	?				DD	DD
<i>Synodontis filamentosus</i>	•					N	•	•				•	♦				DD	DD
<i>Synodontis frontosus</i> (endemic)	•	•				N	•	•				•	♦				DD	DD
<i>Synodontis khartoumensis</i> (endemic)			–			N	•		•			•	?	♦			DD	DD
<i>Synodontis membranaceus</i>		•		•		N	•	•				?	?	?			RE	DD
<i>Synodontis nigrita</i>	•	•				N	•	•				•	•				DD	DD
<i>Synodontis schall</i>	•	•	•	•	•	N	•	•	•	•		•	♦	•	•	•	LC	LC
<i>Synodontis serratus</i> (endemic)		•		•		N	unclear					•		•	○		VU	LC
<i>Synodontis sorex</i>	•	•				N	unclear					•	?	♦			DD	DD
Malapteruridae																		
<i>Malapterurus electricus</i>	•	•	•	•		N	•	•	•	•		•	•	•	•	○	VU	LC
Nothobranchiidae																		
<i>Epiplatys bifasciatus</i>	•	•				N	•	•				•	♦				DD	DD
<i>Epiplatys spilargyreus</i>	•	•				N	•	•				•	•				NE ²	NE ²
<i>Nothobranchius virgatus</i> (endemic)			–			–	Nuba					Nuba (E)					NE*	DD
<i>Nothobranchius nubaensis</i> (endemic)			–			–	–					Nuba (E)					NE*	NE ²
Poeciliidae																		
(i) <i>Gambusia affinis</i>			–			–		•					?		•		introduced	
<i>Micropanchax hutereaui</i>			–			N	•						?				NE*	DD
<i>Micropanchax kingii</i> (endemic)			–			N	•					?	•				NE	NE
<i>Micropanchax loati</i> (endemic)	•	•				N	•					?	•				RE	LC
<i>Micropanchax</i> cf. <i>loati</i> (likely endemic)				•	•	–		–						•			NE ²	NE ²
[<i>Micropanchax macrophthalmus</i>]			–			N		–						–			NE*	NE*
<i>Poropanchax normani</i>			–			N	•					?	•				NE*	NE ²
<i>Poropanchax</i> cf. <i>normani</i> (likely endemic)			–			–		–				?	•				NE*	NE ²
(i) <i>Poecilia</i> sp. (<i>latipinna sensu lato</i>)			–			–		–							•		introduced	
Cyprinodontidae																		
<i>Aphanius fasciatus</i>					•	–		–						•	•		LC, thr.	NE*
<i>Aphanius dispar</i>					?	–		–						•			LC	NE*
Latidae																		
[<i>Lates macrophthalmus</i>]			–			A		–						–			NE*	NE*
<i>Lates niloticus</i>	•	•	•	•		N	•	•	•	•		•	•	•	•	○	DD	DD
Mugilidae																		
<i>Mugil cephalus</i>				•	•	–		–							•		LC	NE*
<i>Liza aurata</i>				•	•	–		–							•		LC	NE*
<i>Liza ramada</i>				•	•	–		–							•		LC	NE*
Atherinidae																		
<i>Atherina boyeri</i>					•	–		–							•		LC	NE*
Eleotridae																		
<i>Kribia nana</i>	•		•			N	•						♦		•		DD, ext.	DD
Anabantidae																		
[<i>Microctenopoma congicus</i>]			–			N [?]		–						–				
<i>Ctenopoma muriei</i>	•	•				N	•	•				•	♦				LC	LC
<i>Ctenopoma petherici</i>	•	•				N	•	•				•	♦		•		DD	DD
Channidae																		
<i>Parachanna obscura</i>	•	•				N	•	•				•	•				NE	NE

Annexe 3. – Continued.

	Boulenger, 1907					Léveque et al., 1991					Bailey 1994					Current synopsis					Conservation status in Egypt	Conservation status in the Rep. Sudan			
	S	W	B	N	D	S	W	B	N	D	S	W	B	N	D	S	W	B	N	D					
Total number of recognised taxa in Main Nile	114					117					122					150									
Subbasin	S	W	B	N	D	–	S	W	B	N	D	S	W	B	N	D	S	W	B	N	D				
Moronidae																									
<i>Dicentrarchus labrax</i>				•	•	–														?	•	LC, thr.	NE*		
<i>Dicentrarchus punctatus</i>					•	–															•	LC, thr.	NE*		
Cichlidae																									
<i>Coptodon zillii</i>	•	•		•	•	N	•	•				•	•	•	•							NE	NE		
<i>Coptodon ismailiaensis</i> (endemic)			–			–															?	NE ²	NE ²		
[<i>Haplochromis albertianus</i> (endemic)]			–			A															–	NE*	NE*		
[<i>Haplochromis avium</i> (endemic)]			–			A															–	NE*	NE*		
<i>Haplochromis loati</i> (endemic)			–			N	•					•										DD	DD		
[<i>Haplochromis mahagiensis</i> (endemic)]			–			A															–	NE*	NE*		
<i>Haplochromis wingatii</i> (endemic)			–			N	•					•										DD	DD		
<i>Haplochromis</i> sp. “Delta1” (endemic)			–			–															•	•	NE², thr.	NE ²	
<i>Haplochromis</i> sp. “Delta2” (endemic)			–			–															?	•	?	NE², thr.	NE ²
<i>Haplochromis</i> sp. “Fayum” (endemic)			–			–															?	•	?	NE², thr.	NE ²
<i>Hemichromis</i> cf. <i>fasciatus</i>			–			–	•					•	•									DD	DD		
<i>Hemichromis letourneuxi</i>	•	•	•		•	N	•	•		•		•	•		•							EN	DD		
<i>Hemichromis</i> cf. <i>letourneuxi</i>			–			–																EN			
<i>Oreochromis ismailiaensis</i> (endemic)			–			–																?	NE ²		
<i>Oreochromis aureus</i>			–			N				•	•				•	•						NE	NE		
(i) <i>Oreochromis mossambicus</i>			–			–																?	introduced		
<i>Oreochromis niloticus</i>	•	•	•	•	•	N	•	•	•	•		•	•	•	•							NE	NE		
<i>Pseudocrenilabrus multicolor</i> (endemic)	•	•			•	–	•					•	?									DD	DD		
<i>Sarotherodon galilaeus</i>			•	•	•	N	•	•	•	•		•	•	•	•							NE	NE		
Tetraodontidae																									
<i>Tetraodon lineatus</i>	•	•		•	•	N	•	•		•		•	•		•							DD, thr.	DD		
<i>Summary on conservation status (Main Nile species only)</i>																									
Regionally extirpated or threatened (total number, RE, CR, EN, VU & threatened or extirpated)												68	3												
Regionally extirpated or threatened at type locality (RE, EN, VU or threatened, bold print)												45	–												
Nile endemics extirpated or threatened at type locality (RE, CR, EN, VU & thr. or ext.)												13	–												
Regionally not evaluated or data deficient (total number, only NE, NE ² or DD)												94	123												
Regionally not evaluated or data deficient at type locality (NE, NE ² or DD in bold print)												19	40												
Data deficient (NE, NE ² or DD) Nile endemics (excluding Albert, Tana and Turkana)												30	32												