Oreochromis niloticus (Linnaeus, 1758)

Tarangire National Park, Tanzania. © M.L.J. Stiassny.

Synonyms
Perca nilotica Linnaeus, 1758
Tilapia crassispina Arambourg, 1948
Oreochromis niloticus niloticus (Linnaeus, 1758)
Tilapia nilotica nilotica (Linnaeus, 1758)
Chromis guentheri Steindachner, 1864
Tilapia eduardiana Boulenger, 1912
Tilapia cancellata Nichols, 1923
Tilapia calciati Gianferrari, 1924
Tilapia regani Poll, 1932
Tilapia inducta Trewavas, 1933
Tilapia vulcani Trewavas, 1933
Oreochromis niloticus baringoensis Trewavas, 1983
Oreochromis niloticus filoa Trewavas, 1983
Oreochromis cancellatus filoa Trewavas, 1983
Oreochromis niloticus sugutae Trewavas, 1983
Oreochromis niloticus tana Seyoum & Kornfield, 1992

FAO names
Nile tilapia
Tilapia del Nilo
Tilapia du Nil
Тилапия нильская

Local names
Adangme: Logokpa (Ghana)
Alur: Zogora (Uganda)
Amharic: Koroso (Ethiopia)
Arabic: Bulti (Sudan)
Creole, French : Petit lapia (Madagascar, Mauritius, Réunion), Tilapia (Madagascar, Mauritius, Réunion)
English: Baringo tilapia (Kenya), Cichlid (Ghana), Edward tilapia (Rwanda), Mango fish (Ghana), Nile tilapia (official FAO name, official AFS name, Kenya, Rwanda, Tanzania, Zambia)

Ewe: Akpafiatsi (Ghana), Gbolonu (Ghana), Logokpa (Ghana)
Fang: Ekouni (Gabon)
French: Carpe (Gabon), Tilapia du Nil (official FAO name, Madagascar, Mauritius, Réunion)
Ga: Didee (Ghana)
Hausa: Bugu (Nigeria), Falga (Nigeria), Garagaza (Nigeria), Gargaza (Nigeria), Karfasa (Nigeria)
Igbo: Ifunu (Nigeria), Mpupa (Nigeria)
Ijo: Tome (Nigeria), Ukuobu (Nigeria)
Jula: Tɛbɛnfin (Burkina Faso)
Kanuri: Karwa (Nigeria)
Kim: Biering-pill (Chad), Peng-pill (Chad), Sale (Chad)
Luo: Ngege (Kenya), Nyamami (Kenya)
Mòoré : Tegr-pere (Burkina Faso)
Nupe: Tsokungi (Nigeria)
Nyankore : Mahere (Uganda)
Nyoro : Ngege (Uganda)
Oromo: Qoroosoo (Ethiopia)
Kinyarwanda: Igihonda (Rwanda), Ingege y'inyamugera (Rwanda), Isake (Rwanda)
Swahili: Ngege (Kenya, Uganda, Tanzania), Perege (Tanzania), Sato (Tanzania)
Tigrigna: Gmnit (Ethiopia)
Wolof: Wass (Senegal)
Yoruba: Epia (Nigeria)
Zande: Kpakaru (Sudan)

Geographical distribution
Naturally occurring in coastal rivers of Israel (Trewavas & Teugels 1991), the Nile basin including lakes Albert, Edward, Turkana, Baringo and Tana, various smaller Ethiopian lakes, and the river systems of the Jebel Marra, Awash, Omo and Suguta (Trewavas 1983). Also present in lakes Kivu and Tanganyika. In West Africa, its natural distribution covers the basins of the Senegal, Gambia, Volta, Niger, Benue and Chad, with introduced specimens reported from various coastal basins (Teugels & Thys van den Audenaerde 2003). Widely introduced for aquaculture, with many existing strains. Several countries report adverse ecological impact after introduction.

Habitat and Biology
Occurs in a wide variety of freshwater habitats like rivers, lakes, sewage canals and irrigation channels (Bailey 1994). Does not do well in pure salt water, but is able to survive in brackish water (Lamboj 2004). Mainly diurnal. Feeds mainly on phytoplankton or benthic algae. Additionally, insect larvae are of some importance, as are aufwuchs and detritus; juveniles tend to be more omnivorous than adults (Lamboj 2004). A maternal mouthbrooder (Trewavas 1983; Lamboj 2004; Genner et al 2018). Nest a simple pit in shallow water dug by the male (Genner et al 2018). Globally, the most important tilapia species in fish farming and supports major capture fisheries where established; generally highly invasive and known to hybridise with many other *Oreochromis* species. For this reason further stocking has been banned in a number of countries, e.g. South Africa, Malawi and Zambia (Genner et al 2018). Extended temperature range 8-42 °C, natural temperature range 13.5-33 °C (Philippart & Ruwet 1982). IUCN red list status least concern (Diallo et al 2023).

Key features
A large, deep-bodied tilapia, with a relatively small head (Genner et al 2018). Jaws of mature male not greatly enlarged, length of lower jaw 29-37% of head length; genital papilla of breeding male not tassellated (Trewavas 1983). Most distinguishing characteristic is presence of regular vertical stripes on caudal fin (Eccles 1992; Teugels & Thys van den Audenaerde 2003) at all life stages. Males bluish

pink, sometimes with a dark throat, belly, anal and pelvic fins; females usually brownish, silvery/white beneath with around 10 thin vertical bars (Genner et al 2018).

Interest to fisheries

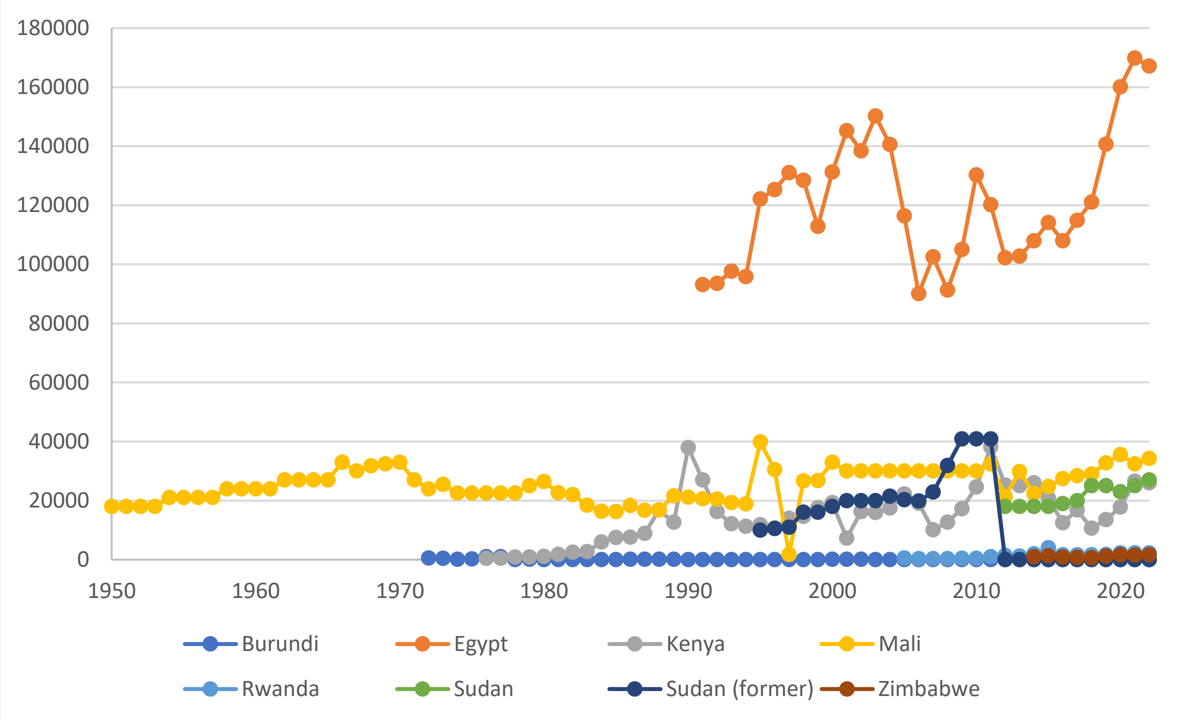

Figure 1: Catches (in tonnes) of Oreochromis niloticus *as available from FAO (April 2024).*

Nile tilapia is a major fisheries species within its native range in northern and western Africa and the southwestern part of the Middle East, and is widely introduced elsewhere. It is one of the world's most important food fishes, and the fourth most important species in global aquaculture production by weight, accounting for 9% of the total global aquaculture production in 2016 (FAO 2022). *Oreochromis niloticus* has become invasive in many waters and wetland systems as a result of intentional introductions or escapes from aquaculture facilities (Gupta et al 2004). The establishment of feral populations of Nile tilapia in an ecosystem is almost impossible to control and the only way to reduce the impact of this species is to prevent its entry into new freshwater habitats (Wise et al 2007). Nevertheless, many studies report declining catches and the need to take regulatory actions for sustainable fisheries management.

In the Nile, the populations of Lake Manzala (Mehanna et al 2020) and the El-Salam canal (El-Bokhty & Fetouli 2023) were reported to be overexploited. In the Rosetta Branch of the lower Nile, El-Bokhty & El-Far (2014) observed a decrease in tilapia catches by 1100 tons per year during the period 2002-2009, attributed to fishing pressure and the use of small mesh sizes. In Lake Nasser, reports of growth overfishing (1966-1992; Mekkawy 1998) and overexploitation (1980-2005; Mehanna 2007) date back a long time, and although recommendations were formulated (e.g. El-Far et al 2018), catches continue to decline. The contribution of tilapias in the catches from Lake Nasser decreased from 89% in the 1980s to 54% in 2017 (Mehanna et al 2021). Of the four species identified, Nile tilapia contributes 39% to the total catch and 81% to the tilapia catch. A serious decline in Nile tilapia Catch Per Unit Effort (CPUE) was noticed during the last seven years (2011 to 2017) of the study (Figure 2; Mehanna et al 2021). In the statistics from Egypt as presented by FAO (2024), a sharp decline of about 40% is obvious (from about 150.000 tons down to 90.000) in the period 2003-2008, but catches have increased since and exceeded 160.000 tons in 2020 (Figure 1).

In Ethiopian lakes, fisheries are predominantly focussed on Nile tilapia (e.g. Abebe & Getachew 1992; Bjoerkli 2004; Hailu 2014).

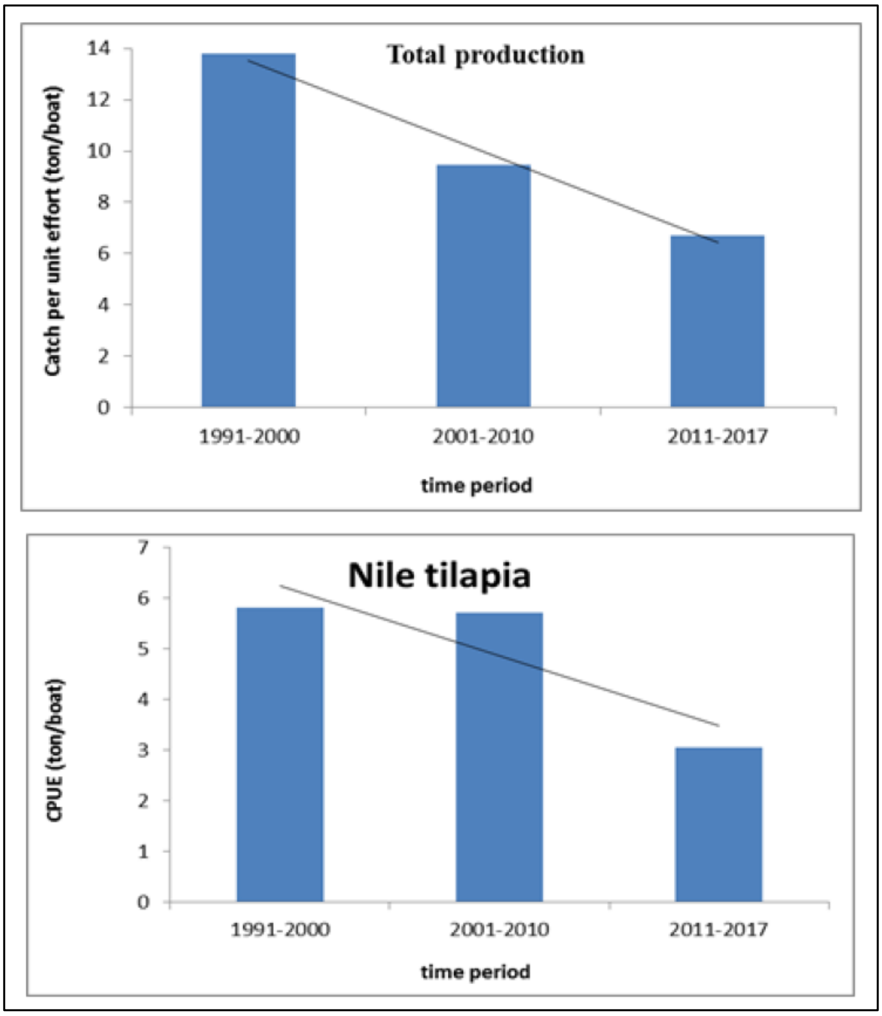

Figure 2: Catch Per Unit Effort (ton/boat) from Lake Nasser for the total fishery production and for Nile tilapia, from 1991 to 2017 (image for Mehanna et al 2021).

Length at first maturity, with maturation at a relative small size, i.e. 'dwarfing', considered to be an adaptation to high fisheries mortality at the adult size, varies greatly in different populations of Nile tilapia within the Rift Valley Lakes (Bjoerkli 2004). In Lakes Awassa and Ziway, females matured at a small size (ca. 14 cm) indicating overfishing, whereas size at fist maturity in Lake Chamo was much larger at about 42.0 cm, indicating that overfishing is unlikely (Abebe & Getachew 1992; Reyntjes & Wudneh 1998; Teferi & Admassu 2002; Bjoerkli 2004). However, more recently Mereke & Mulugeta (2016) considered Lake Chamo to be one of the most overexploited lakes in the country. Shija et al (2019) reported that 93.1% of the Nile tilapia catch was below size at maturity, a case of growth overfishing with reduced mesh sizes. Nile tilapia contributed about 85% to the annual catch of the lake (Tesfaye & Wolff, 2014). Current catches are however only half of what was reported by the Lake Fisheries Development Project in 1997, while the number of fishermen has doubled and the number of nets has even increased seven-fold, up to two times the estimated optimum level of fishing effort (Tesfaye et al 2021). In the Amerti Reservoir, the mean length at maturity was estimated at 21.5 cm for males and 18.9 cm for females, with over 1/3 of the catch below that size (Hailu 2014). In Lake Langano, Nile tilapia is the most important fish stock contributing more than 90% by weight to the total landings (Temesgen 2018; Tesfaye et al 2022). The size at first capture was estimated at 14.0 cm which is much lower than the size at first maturity of 16.6 cm, while catch size above size at first maturity was only 38%. The mean size of the catch (16.0 cm TL) recorded in this study is much lower than the mean size of the catch recorded (21.6 cm TL) by the Lake Fisheries Development Project (1997) in the same lake, with also the estimated exploitation rate indicating overfishing (Tesfaye et al 2022). Overfishing of tilapia was probably also taking place in Lakes Abaya and Langano (Reyntjes & Wudneh 1998). Exploitation of immature *O. niloticus* was also reported in Lake Hawassa (Muluye et al 2016; Tekle-Giorgis 2018).

Nile tilapia is commercially important in the Lake Tana fishery and contributes up to 65% of the total annual catch (Tewabe 2013; Degsera et al 2021). Analysis of the Lake Tana fishery from commercial catch data showed that *O. niloticus* catches boomed between 2003 and 2007, due to increased fishing on spawning grounds (Tewabe 2013). The catch subsequently declined (Figure 3), associated with the illegal use of undersized monofilament gillnets and the harmful increase in targeting spawning aggregations in littoral areas (Degsera et al 2021). In particular, the commercial catch of large specimens of *O. niloticus* greater than 20 cm was significantly reduced (de Graaf et al 2006), and large-sized specimens are only rarely recorded (Tefera et al 2019). The CPUE of *O. niloticus* in Lake Tana sharply declined from 75 kg per trip in 2001 to 24 kg per trip in 2016/2017. Mean length at first maturity of *O. niloticus* in Lake Tana is approximately 20.5 cm (2016-2017) (Tefera et al. 2019). Based on the total annual catch composition recorded, Degsera et al (2021) calculated that approximately 37% of the catch was below mean length at first maturity. Hence, it is highly recommended to increase the mesh size of nets used by the fishers. A similar pattern of exploitation of immature *O. niloticus* has been reported in Lake Hawassa (Muluye et al 2016; Tekle-Giorgis 2018).

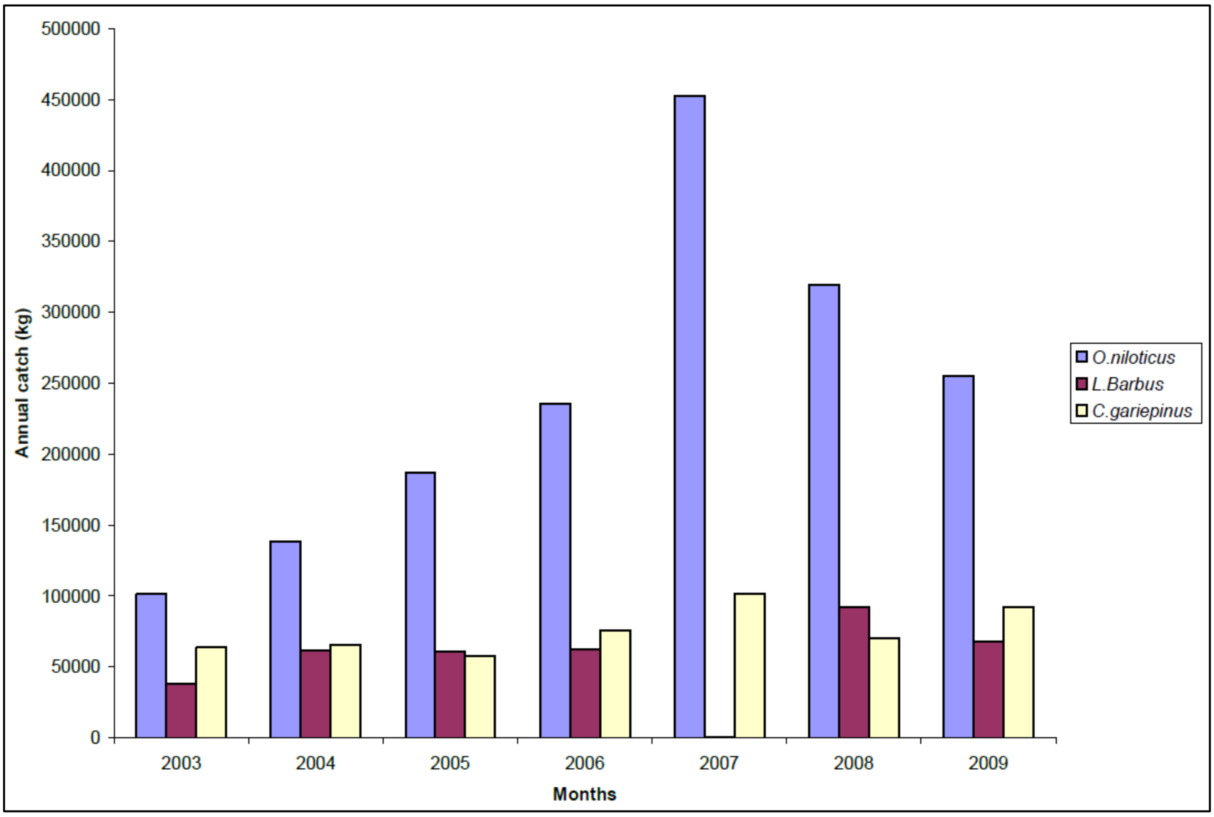

Figure 3: Annual catch by weight from 2003 to 2009 by fishers of Bahir-Dar number One fishers cooperative, Lake Tana (image from Tewabe 2013).

In Lake Turkana, Lowe-McConnell (1982) attributed the reduction in the median maturation size of *O. niloticus*, from 28 cm to 18 cm over a period of 20 years, to the effects of intensive fishing.

In Lake Baringo, catches of *O. niloticus* (endemic subspecies *baringoensis*) decreased from above 600 tons per year in the 1960s and a peak of 712 t in 1970 to less than 12 ton in 2004-2006, despite a two-year period of closure in 2002 and 2003 (Mlewa & Green 2006; Britton et al 2008). Catch contribution decreased from around 80% in the 1980s to around 20% in the mid-2000s (Britton et al 2008) and dropping to only 1% by 2020 (Nyakeya et al 2020). Despite the obvious decrease in the last decades, the changes in catch and relative abundance were considered independent of exploitation in the fishery but significantly correlated with lake level (Britton et al 2008; Walumona et al 2021). Britton et al (2008) calculated a length at maturity below 130 mm. With fishery regulations prohibiting the catch of specimens below 180 mm, a relatively large proportion of mature fish was below exploitation size each year (19 to 44%); in most years the proportion of fish available for exploitation was less than 10%. By the late 2010s, *O. niloticus* in Lake Baringo exhibited stunted growth, with a mean length at maturity of only 8 cm (Tsuma et al 2017; Nyakeya et al 2020). The unpredictable and unstable environment, influencing abundance and life history traits, should also be considered in management plans (Britton et al 2008).

In West Africa, Dialla et al (2016) reported 14.6% juveniles in the Nile tilapia catches from the Sourou (Burkina Faso), where over 50% of fishing gear included illegal mesh sizes. In Lake Oguta (Nigeria), Sanda et al (2017) reported a reduction in the size of specimens between 1991 and 2002, with average weight declining from 0.56 kg to 0.24 kg.

The two commercially important tilapia species of the Lake Edward system are *O. niloticus* and the smaller-sized *O. leucostictus* (Decru et al 2019). Although *O. niloticus* used to be the dominant species on landing sites around the lake, its numbers have declined over recent decades (Balole-Bwami et al 2017). Previously the most important commercial fish species, its relative importance has declined due to overexploitation and Nile tilapia is now the third most important in Lake Edward after semutundu (*Bagrus docmak*) and marbled lungfish (P*rotopterus aethiopicus*) (Musinguzi et al 2020). The Nile tilapia stock was assessed by Musinguzi et al (2020) as recruitment impaired or collapsed in Lake Edward, and collapsed in Lake George and the Kazinga Channel.

A study of the fishery of Lake Wamala in Uganda, northwest of Lake Victoria (Okaronon 1995), where it was stocked in 1956, has shown a decline of the total fish catches from a maximum of 7100 tonnes in 1967 to less than 500 tonnes by the 1990s, a decrease in catch rates from about 8 kg in the 1960s to less than 1 kg per net per night by 1975, a decrease in the contribution of *O. niloticus* from 67% to 45.1% by the 1990s, a maximum size decrease from 32 cm TL in 1975/78 to 22 cm in 1988/92 and a decrease in size at first maturity from about 21 cm to 14 cm. This has been concurrent with a shift in the mesh size of gillnets used, from 127 mm in the 1960s to 64 mm by the 1990s, and environmental changes, especially in lake level in 1980.

Nile tilapia was introduced into Lake Victoria in the 1950s to enhance the declining tilapia fishery (Outa et al 2020). It currently forms the third commercially important species after the introduced Nile perch *Lates niloticus* and the native *Rastrineobola argentea*, whereas other tilapias are extinct or only occasionally caught in the lake (Yongo et al 2021). The introduction of Nile tilapia completely eliminated *Oreochromis esculentus* within a period of 30 years (Goudswaard et al 2002; Wise et al 2007). Catches of Nile tilapia have declined to less than 25% of their peak in the early 1990s (**Error! Reference source not found.**; Natugonza et al 2022). Nile tilapia catches originally rose when larger meshed gillnets were used for Nile perch, but signs of overexploitation were reported already in the early 2000s (Lake Victoria Fisheries Research Project 2001; Goudswaard et al 2002). The size at first maturity of female *O. niloticus* in Lake Victoria has declined from 35.0 cm TL (early 1990s) to 31.0 cm TL (1998) and further down to 26.0 cm TL (2015) (Yongo et al 2021). The Lake Victoria fishery is open access, and an increase in fishing boats, fishers, gears and the use of illegal gears have led to overexploitation (Cowx et al 2003; Njiru et al 2008).

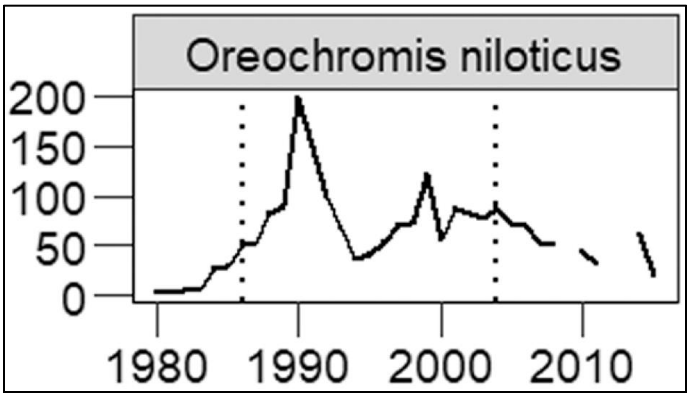

Figure 4: Total annual catches (thousand tonnes) of Oreochromis niloticus *in Lake Victoria over time. Image from Natugonza et al 2022.*

The impacts of *O. niloticus* introductions are well documented in southern Africa, including extensive hybridization and introgression with native *O. mossambicus* in the Limpopo River system, South Africa (D'Amato et al 2007; Firmat et al 2013), replacing the native Kariba bream *O. mortimeri* in Lake Kariba (Figure 5; Chifamba 1998, 2006, 2019; Zengeya & Marshall 2008; Tweddle 2010) and hybridizing with the three-spotted tilapia *O. andersonii* in the Kafue River in Zambia (Deines et al 2014). Tweddle et al (2015) reported that the fishery of the Kafue Flats floodplain (Zambia) is under great threat from the introduction of Nile tilapia (escaped from local fish farms) that now dominates the catch. Fishermen in the Kafue floodplains have reported a decrease in catch-per-effort of both *O. macrochir* and *O. andersonii* since the introduction of *O. niloticus* (Bbole et al 2014). Introduced *O. niloticus* is the most common fish species in Zimbabwe, constituting the dominant tilapia species caught by artisanal and commercial fishermen. In Lake Chivero (Zimbabwe), it replaced another introduced species (*O. macrochir*) and accounts for about 95% of the catches from that lake (Marshall 1999; Tiki 2011). Following the introduction of Nile tilapia, it is highly likely that native cichlids in the Chitsuwa Reservoir (Zimbabwe) are at risk of extirpation or will be localized in isolated habitats because of the robustness of *O. niloticus* (Madzivanzira et al 2020).

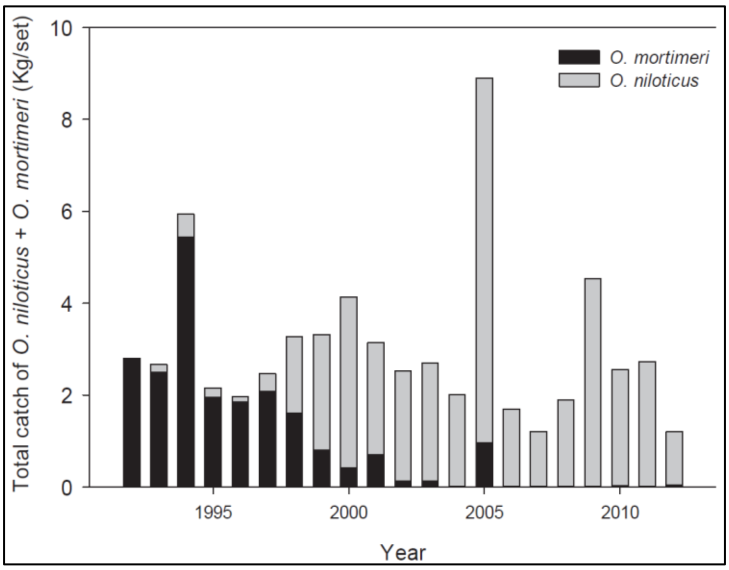

Figure 5: Combined catches of Oreochromis niloticus *and* O. mortimeri *per set of gill nets per night from 1992 to 2012 (image from Chifamba 2019).*

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