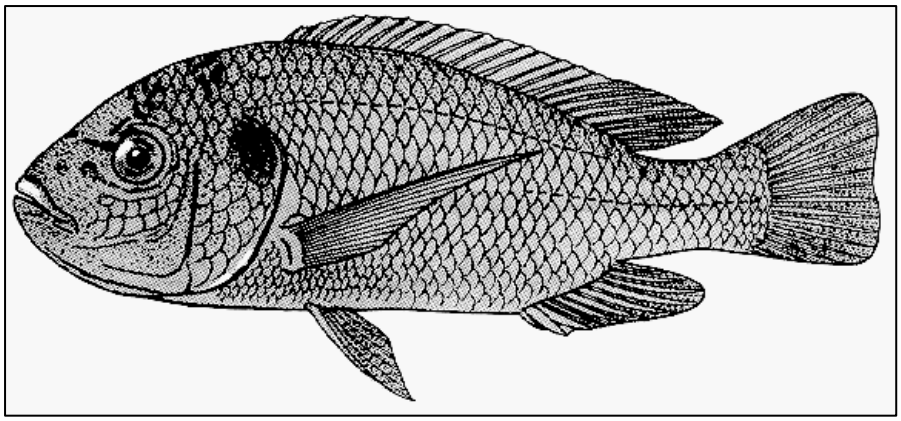
Oreochromis lidole (Trewavas, 1941)



Synonyms
Tilapia lidole Trewavas, 1941

FAO names
None

Local names
Nyanja: Chambo chachimuna (Malawi)
Nyanja (Chichewa): Chambo (Malawi)
Nyanja (Chinyanja): Galamula (Malawi), Lidole (Malawi), Lolo (Malawi)
Swahili: Dole (Tanzania)
Tonga: Chambo (Malawi), Chambo cha blue (Malawi), Chambo chachimuna (Malawi), Chambu (Malawi)
Tumbuka: Chambo (Malawi), Chambo cha blue (Malawi), Chambo chachimuna (Malawi)
Yao (Chiyao): Galamula (Malawi), Lidole (Malawi), Muhadjiri (Malawi)

Geographical distribution
Lake Malawi (Trewavas 1983; Trewavas & Teugels 1991; Schechonge et al 2018). Reports from Lake Chungruru and Lake Kingiri (Trewavas 1976, 1983) are misidentifications of *Oreochromis chungruruensis* and juvenile *O. squamipinnis* respectively (Genner et al 2018).

Habitat and Biology
Occurs in all kinds of habitats but is mainly found in open water away from the coast (Konings 1990). The most pelagic of the Lake Malawi *Oreochromis* species (Jackson 1961; Jackson et al 1963; Lowe-McConnell 1982; Trewavas 1983; Eccles 1992). Forms schools (Lowe 1952; Trewavas 1983). Feeds on phytoplankton (Ricardo Bertram et al 1941; Lowe-McConnell 1982; Trewavas 1983; Konings 1990; Robinson et al 1995). Female mouthbrooder (Trewavas 1983). *Oreochromis lidole* is now probably globally extinct, as it has not been recorded since 2007 (Genner et al 2018). IUCN red list status critically endangered (Konings 2018).

Key features
Length of head 34.4-42.4% SL; length of lower jaw 31.3-40.0% head length (Trewavas 1983). Teeth of jaw in 3-4, rarely 5 rows (Trewavas 1983; Turner & Mwanyama 1992). Lower pharyngeal bone with restricted toothed area; median length of bone 33.0-40.7 % length of head and 1.3-1.5 times its own

width; blade 1.9-3.9 times median length of toothed area; dorsal fin with 14-17 spines and 10-11 soft rays; anal fin with 3 spines and 8-10 soft rays; 30-32 vertebrae; breeding male black (Trewavas 1983).

Interest to fisheries

Due to their difficult identification, published catch data usually do not distinguish between the three different species of *Oreochromis* collectively called chambo (*O. karongae, O. lidole* and *O. squammipinnis*). FAO (2024) does not hold catch statistics for *O. lidole* or chambo.

The main fishing grounds for chambo in Malawi are the southern parts of Lake Malawi, especially the Southeast Arm (SEA) where the fishery is well established in the productive shallow waters, and the smaller Lake Malombe; fishing in the northern part of Lake Malawi is not as intensive (FAO 1993; Banda et al 2005; Kapute et al 2008; Tweddle et al 2015). Chambo in the SEA of Lake Malawi is intensively exploited by both artisanal (traditional) and commercial fishers (FAO 1993; Weyl 2001; Weyl et al 2004a; Banda et al 2005).

Traditionally exploited by artisanal gillnet and beach seine fishers (Turner et al 1995), chambo were considered fully exploited soon after the initiation of industrial purse seining in 1942 (Lowe 1952). Effort has exceeded the level that allows Maximum Sustainable Yield (MSY) for chambo since 1976 (Bell et al 2012). Of the formerly important fishing grounds only the SEA still retained a viable fishery in 1986 which appeared to be fully exploited (Lowe McConnell 2003). In 1992, In 1992, Seisay et al reported that the MSY of *O. lidole* in the SEA was below the then applied effort level. Combined MSY and maximum sustainable economic yield estimates for all *Oreochromis* sp. in the SEA of Lake Malawi were at 70% of the then applied effort, with *O. squamipinnis* being harder hit than *O. karongae* and *O. lidole*, and no increase in effort could be accommodated. To achieve both the MSY and maximum sustainable economic yield for *O.lidole* in the SEA, a reduction in effort of at least 30% was suggested.

Fisheries assessments in the 1960s demonstrated that haplochromine cichlids were underexploited, and a trawl fishery was subsequently developed (Tarbit 1972). This fishery rapidly depleted larger, slower growing, late maturing species (Turner 1977; Banda et al 1996) and began to fish in shallower waters where chambo were a common bycatch (Weyl et al 2005b). As the fishing effort increased, and catches of larger species decreased, the artisanal fishery changed from targeting primarily large cyprinids and tilapia to fishing for small haplochromine cichlids (Weyl et al 2005b). The resultant gear modifications, such as the use of small-meshed gillnets and light attraction, increased the harvest pressure on immature chambo, particularly in southern Lake Malawi where the 1+ year-class chambo, previously relatively unexploited, contributed heavily to the catch in the light attraction kauni fishery (Weyl et al 2004a, 2005a,b). Weyl (2001) already reported that, in some parts of the SEA of Lake Malawi, the spawner biomass-per-recruit for chambo had decreased to 37% of pristine levels, considered to be too low to sustain the chambo stock. Excessive fishing pressure in the SEA likely also caused the decrease in length at which 50% of the fish are mature, from 275mm TL in 1985 (Lewis 1990) to around 222 mm TL for various populations studied in 2008 (Kapute et al 2008). It was most likely this additional pressure on the juvenile stock which caused the crash of the chambo fishery and the dramatic decline of the catches (Banda et al 2005; Weyl et al 2010; Tweddle et al 2015), despite the large increases in fishing effort (Hara & Njaya 2016), although environmental variability such as fluctuating lake levels may also have played a role (e.g. Tweddle & Magasa 1989). According to Breuil & Grima (2014), the estimated fish production in Malawi increased in the early 2000s mainly due to the promotion of offshore deep-water fishing in Lake Malawi and the intensification of recording. These authors did not observe any loss of fish biodiversity since the late 1990s, which neglects the likely disappearance of *Oreochromis lidole*, which has not been recorded since 2007 (Genner et al 2018), and attribute the changed fish composition to overfishing and environmental degradation. During the late 1970s, production of chambo was about 9000 tonnes annually but landings have since severely declined, with current estimates of about 4000 tonnes (Chavula et al 2023). In southern Lake Malawi catches decreased from 5000 tonnes per year in 1992

to less than 2000 tonnes per year by 1999 (Weyl et al 2010; Hara & Njaya 2016) (Figure 1). Prior to 1986 chambo dominated the Lake Malawi fisheries (Lowe-McConnell 2003), but catch contributions decreased to 17% by 1994 (Turner 1994), further dropping to 11.7% by 2002 (Irvine 2002).

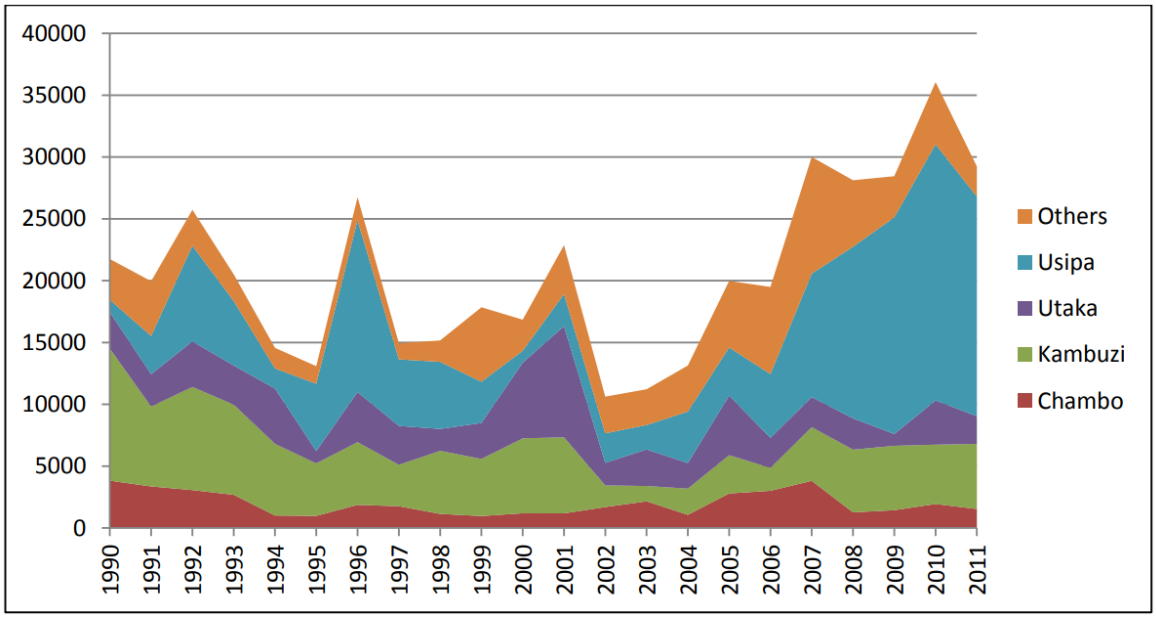


Figure 1: Estimated total production from the South East Arm and South West Arm of Lake Malawi for the years 1990 to 2011. Image from Hara & Njaya 2016.

Lake Malombe is a prime example of the loss of economic value resulting from the depletion of a high-value species in an African fishery. This highly productive lake consistently yielded about 4000 tonnes per year of chambo until the 1970s (Figure 2) (Tweddle et al 2015). Chambo were harvested using mostly large-meshed gillnets. The introduction of a small-meshed purse seine (nkacha net) in the mid-1980s in combination with continued fishing on adults initially increased chambo catches, to about 8000 tonnes per year by 1982, as the small immature fish were now also being caught. By the early 1990s however, recruitment in Lake Malombe was very low due to a severely depleted parent stock and continuous exploitation of juveniles and spawners, which resulted in severe recruitment and growth overfishing and a crash of the chambo catch to less than 200 tonnes per year in 1992 (Figure 2) (Van Zalinge et al 1991; Seisay et al 1992; Turner 1995; Tweddle et al 1995, 2015; Banda et al 2005; Weyl et al 2010).

The 2001 mean beach price for chambo was US$ 1.04 per kg while the mean for other fishes was US$ 0.36 per kg (Department of Fisheries, unpublished data). Consequently the value of the overall catch decreased from more than US$ 9.4 million per year to less than US$ 2 million per year. For the about 2200 fishers the decreases in catch rate and value have resulted in a reduction of the overall value of the catch from US$ 4000 per fisher per year to only US$ 720 per fisher per year after the collapse (Tweddle et al 2015). The lack of alternative livelihoods for small scale fishers means that they have had no choice but to stay in the fishery (Allison & Ellis 2001), resulting in a relatively stable number of fishermen despite dwindling economic returns (Tweddle et al 2015).

The low fecundity of chambo, typically <1000 eggs per female annually (Trewavas 1983), poses a potential problem for producing a sufficient number of juveniles for large-scale cage culture (Banda et al 2005).

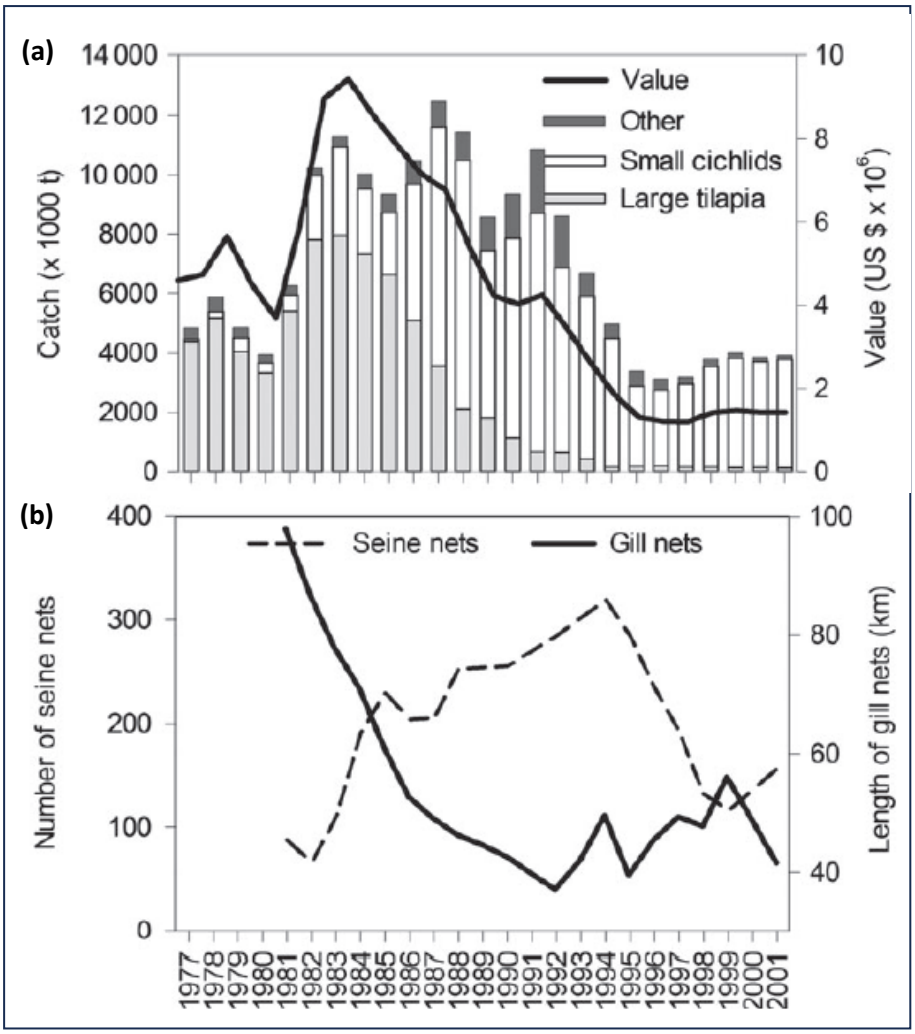


Figure 2: Demise of the fishery for large tilapias in Lake Malombe, Malawi. (a) Catch of large tilapias vs small haplochromine cichlids and corresponding catch value calculated using the fish price from 2000; (b) replacement of the gillnet fishery by a small-meshed seine net fishery (Source data Malawi Department of Fisheries; image from Tweddle et al 2015).

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