

## *Stolothrissa tanganicae* Regan, 1917



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### **Synonyms**

None

### **FAO names**

Lake Tanganyika sprat

### **Local names**

Bemba: Chilwe (Zambia), Kapenta (Zambia)

Chilungu: Chilwe (Zambia), Kapenta (Zambia), Nsembe (Zambia)

English: Lake Tanganyika sprat (official FAO name), Lake Tanganyika sardine (Tanzania)

Bwari: Kalumba (Congo Dem Rp)

Kirundi: Ndagala (Burundi)

Swahili: Ndagala (Congo Dem Rp, Rwanda, Tanzania), Ndakala (Congo Dem Rp, Tanzania), Daga (Tanzania)

### **Geographical distribution**

Lake Tanganyika (Poll et al 1984; Whitehead 1985; Gourène & Teugels 1994), including the outflowing Lukuga River downstream to the Kisimba-Kilia Falls (Kullander & Roberts 2012). Introduced in Lake Kivu between 1958 and 1960 (Collart 1960) but unsuccessfully.

### **Key features**

Body slender, its depth about 17-22% SL; 13-14 pre-pelvic and 8-9 post-pelvic scutes, with pre-pelvic scutes not strongly keeled, beginning behind base of last pectoral fin ray, but post-pelvic scutes with sharp spines; maxilla blade about 2.25 times as long as its shaft, but not continued forward to hind tip of pre-maxilla; posterior supra-maxilla diamond-shaped or more or less rhomboidal, approximately symmetrical; 36-42 lower gill rakers, long and slender; 15-16 dorsal soft rays, 16-17 anal soft rays; 44 vertebrae; a distinct silver stripe along flanks, broadest over tips of pelvic fins (Poll 1974; Whitehead 1985). Resembles *Limnothrissa miodon* of Lake Tanganyika, which is slightly deeper-bodied, has a larger eye which is about equal to head length behind eye, and a maxilla blade continued forward to posterior tip of pre-maxilla (Whitehead 1985).

### **Habitat and Biology**

A pelagic, lacustrine species, forming very large schools (Poll 1950, 1953; Whitehead 1985). Juveniles tend to stay closer to the shore than individuals of 5 cm SL or more (Whitehead 1985). Spends daylight hours at a depth of 70-95 m, rising up to 8-15 m at night, especially on dark nights (Poll 1953; Whitehead 1985). These migrations also reflect the migration of plankton (Poll 1953) on which it feeds (Poll 1950, 1953; Kawabata 1975; Bernacsek 1980), including prawns, shrimps, copepods, chironomids, diatoms and algae (Whitehead 1985). Breeds at about 6 cm SL, with ripe individuals present almost throughout the year, but major spawning in May-June and again in December-

January, the adults moving inshore to breed; the eggs sink slowly (Whitehead 1985). IUCN red list status least concern (Ntakimazi 2006).

**Interest to fisheries**

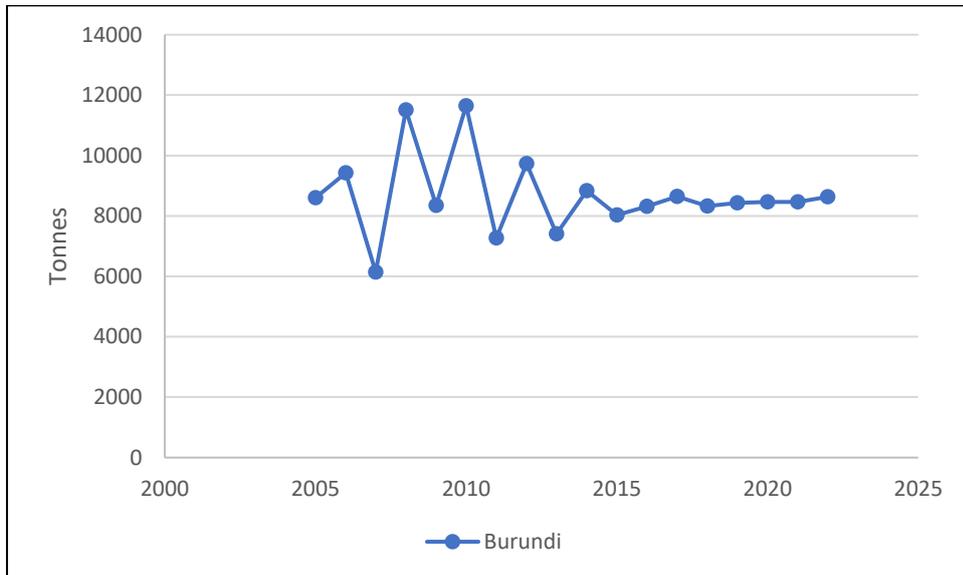


Figure 1: Catches (in tonnes) of *Stolothrissa tanganicae* as available from FAO (April 2024).

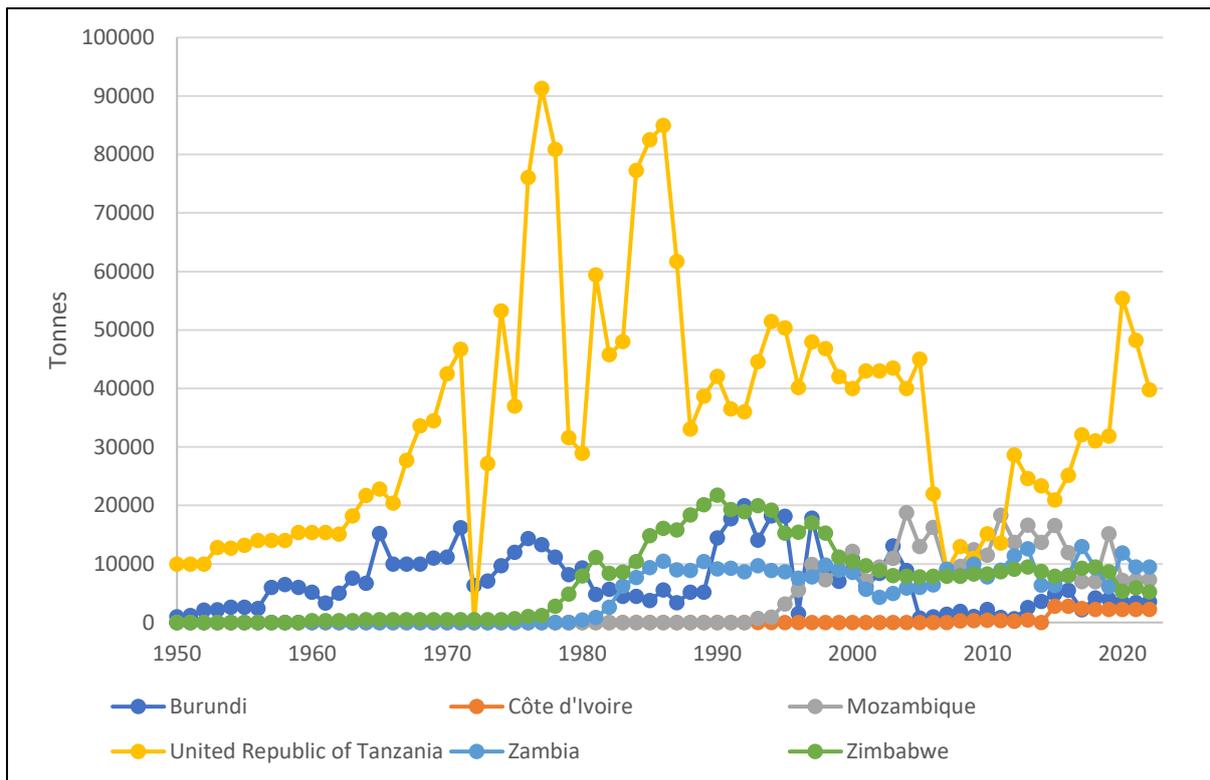


Figure 2: Catches (in tonnes) of “*Stolothrissa, Limnothrissa spp.*” as available from FAO (April 2024).

Very oddly, FAO (2024) statistics contain data from Cote d’Ivoire of *Stolothrissa* or *Limnothrissa*. Both genera are currently monospecific and do not occur in West Africa. The data for Mozambique and Zimbabwe are not relevant for *S. tanganicae*, as only *Limnothrissa* has been introduced in these countries. In Tanzania, Zambia and the DRC both *L. miodon* and *S. tanganicae* occur, but species level data are not available from FAO (2024).

Burundi reports species level data for both *L. miodon* and *S. tanganyicae*, although reported catches for the former are surprisingly low. In addition, the added data for the two species do not correspond at all to the data reported at the combined generic level (Figure 2). At present, it is unclear what the Burundian data, at both the species and generic level, represent.

In general, even though the major commercial pelagic stocks are distributed throughout all sectors of Lake Tanganyika, its northern half is dominated by a clupeid-based fishery, whilst the southern areas feature a *Lates stappersii*-based fishery (Mannini 1998). Catch frequency and Catch Per Unit Effort (CPUE) distribution showed that the *S. tanganyicae* stock is very unevenly distributed in the lake, being mostly found in the northern part, from the Kalemie (DRC) latitude northwards and only at very low density in the southern half (Mannini 1998; Mannini et al 1999; Szczucka 1998). A clear horizontal migration occurs with post-larval juveniles concentrating offshore. Young *S. tanganyicae* move towards shallow water from the length of 30-40 mm (at about the age of 2-3 months). They are recruited first to the industrial fishery and then to the lift-net fishery. Fishing grounds of the former are normally more distant from the coast than those of the artisanal fishery. The *S. tanganyicae* fishery is supported mostly by a single major cohort which is recruited during the dry season and makes the exploitable stock during the successive wet season. The availability of *S. tanganyicae* resources in the local fishing grounds is very irregular due to the high mobility of the schools. These migrations, both horizontal and vertical, are primarily determined by predation avoidance towards *L. stappersii* and by prey preference on copepod mesozooplankton (Mannini et al 1999).

In Lake Tanganyika, most of the catch derives from the artisanal fishery in which the clupeids *Stolothrissa* and *Limnothrissa* compose about 65% (Langenberg 2008). The clupeids are caught in the pelagic area by artisanal fishers using lift-nets of 6-8 mm mesh sizes and artificial light during dark nights (Mulimbwa et al 2022).

The fishing pressure has steeply increased during the last decades (Mölsä et al 1999; Sarvala et al 2006; Van der Knaap et al 2014). Presently, overfishing is threatening the recruitment, and therefore also the fishery of the indigenous clupeid fish in Lake Tanganyika (Mulimbwa 2006; Mulimbwa et al 2014a, 2014b, 2019, 2022; Van der Knaap et al 2014; De Keyzer et al 2020). The *S. tanganyicae* stock is heavily exploited by liftnets in the northern part of the lake and the exploitation is more moderate in the central and southern parts (Aro & Mannini 1995). Although Aro & Mannini (1995) reported that beach seines are not used for *Stolothrissa* fishery in the north, Van der Knaap et al (2014) reported their use in the DRC, exploiting large quantities of immature clupeid fish, which will eventually affect the commercial pelagic fishery. In the south, where beach seines are common, the main body of the catches consist of young immature specimens and in the Mpulungu area (Zambia), about 70% of the catch is less than 50 mm in length (Aro & Mannini 1995). Offshore purse seine fishery in the Kigoma region (Tanzania) exploits the mature part of the stock, and the number of immatures in catches increases from Kigoma to Mpulungu (Aro & Mannini 1995). The *Stolothrissa* areal exploitation pattern shows that in all areas, catches are strongly based on the immature part of the stock.

The kapenta seine fishery in Zambia mainly catches *L. miodon* (65%) and *S. tanganyicae* (25%) (Plisnier 1995). The lift nets and chiromilla nets surveyed caught exclusively clupeids, with 69% *L. miodon* and 31% *S. tanganyicae* for the lift nets and respectively 50% and 49% for the chiromilla nets (Plisnier 1995). The artisanal fishery represented 73% of all catches in Zambia, dominated by *L. miodon* (42% of the total artisanal catches) followed by *S. tanganyicae* (22%). The clupeid catch represented 63% of the total artisanal catches (Plisnier 1995). This is lower than previously reported, 78% in 1992 and 73% in 1980 (Lupikisha 1993). Only 67 tonnes of clupeids were caught by the industrial fishery in 1994 (2% of the industrial catch), with *S. tanganyicae* contributing much less than *L. miodon*. The fishing companies of Mpulungu (Zambia) do not target clupeids since their abundance is generally low in Zambian pelagic waters (Plisnier 1995).

Signs of excess fishing pressure on *S. tanganyicae* stocks (high juvenile content and smaller mean length in catches) and a decrease in catch-rates (the catch by weight per effort spent fishing) exist

since the early 2000s for the northern end of the lake (Mölsä et al 1999; Mulimbwa 2006; Sarvala et al 2006; Mushagalusa et al 2015). In Zambia the pelagic fish stocks were reported to decline in abundance in the mid-2000s (FAO 2006). The decreasing catches are characterized by daily, seasonal and long-term fluctuations that are partly due to natural causes such as predator-prey relationships existing between clupeids and *Lates stappersii*, food availability or an environment favourable to reproduction, and local over-exploitation (Roest 1988; Bayona et al 1992; Plisnier 1995; Mölsä et al 2002; O'Reilly et al 2003; Chitamwebwa & Kimirei 2005; Mulimbwa 2006; Sarvala et al 2006; Kolding & van Zwieten 2012). Also climate change may be playing an important role (Plisnier 1997). It is notable that *S. tanganyicae* was the dominant target species of the purse seine fishery in the Zambian waters of the lake during the 1980s. Although the *S. tanganyicae* decline coincides with the expansion of purse seining in Zambia, the stock in northern waters, at least until recently, seems to have withstood decades of high fishing pressure in fairly confined areas. This strongly suggests that environmental factors have played a role in hastening the southern stock's decline. A succession of poor recruitment periods brought on by environmental perturbations can rapidly reduce the size of short-lived clupeid stocks (Mannini 1998; Mölsä et al 1999). Nonetheless, the effect of fishing pressure resulting into local overfishing cannot be neglected since the fishing pressure has steeply increased during the last decades and remains high (Mölsä et al 1999; Chitamwebwa and Kimirei 2005; Sarvala et al 2006; Van der Knaap et al 2014), arousing concerns about the sustainability of the fishery (De Keyzer et al 2020; Mulimbwa et al 2022). However, efforts to document the total catch and CPUE have been sporadic and inconsistent (Plisnier et al 2018), making assessment of catches and fisheries potential speculative (Kolding et al 2019; De Keyzer et al 2020). The clupeids (including *S. tanganyicae*) live for about one year; have high P/B ratio, are highly fecund and consequently have a high turnover rate, features that help them to withstand high exploitation pressure. A recovery in the highly fished areas of Zambia, Burundi and Congo has not been realized (Kimirei et al 2008).

## Bibliography

- Aro, E. and P. Mannini (1995). Results of Fish Population Biology Studies on Lake Tanganyika during July 1993-June 1994. FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika. GCP/RAF/271/FIN-TD/38 (En): 104p.
- Bayona, J.D.R., S.G. Ndaró and B.P. Ngatunga (1992). Industrial fisheries in the Tanzanian sector of Lake Tanganyika: a case of local over-fishing in Kigoma. TAFIRI Research Bulletin 3: 33-43.
- Bernacsek, G.M. (1980). Introduction to the freshwater fishes of Tanzania. University of Dar-es-Salaam, Department of Zoology, Dar-es-Salaam, Tanzania. 78 p.
- Chitamwebwa, D.B.R. and I.A. Kimirei (2005). Present fish catch trends at Kigoma, Tanzania. Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie 29(1): 373-376.
- Collart, A. (1960). L'introduction du *Stolothrissa tanganyicae* (ndagala) au lac Kivu. Bulletin Agricole du Congo Belge 51(4): 975-985.
- De Keyzer, E.L.R., P. Masilya Mulungula, G. Alunga Lufungula, C. Amisi Manala, A. Andema Muniali, P. Bashengezi Cibuhira, A. Bashonga Bishobibiri, A. Bashonga Rafiki, B. Hyangya Lwkitcha, J. Hugé, C. Itulamy, C.E.T. Huyghe, C. Itulamy Kitungano, L. Janssens de Bisthoven, J. Kakogozo Bombi, S. Kamakune Sabiti, I. Kiriza Katagata, D. Kwibe Assani, P. Lubunga Dunia, V. Lumami Kapepula, F. Lwacha, J. Mazambi Lutete, F. Shema Muhemura, L.J.M. Milec, H. Milenge Kamalebo, T. Mulimbwa N'Sibula, A. Mushagalusa Mulega, F. Muterezi Bukinga, D. Muzumani Risasi, D. Mwenyemali Banamwezi, J. Kahindo N'djungu, N. Nabintu Bugabanda, J.-P. Ntakobajira Karani, J.A.M. Raeymaekers, J. Riziki Walumona, R. Safari Rukahusa, M.P.M. Vanhove, F.A.M. Volckaert, O. Wembo Ndeo and M. Van Steenberge (2020). Local perceptions on the state of the pelagic fisheries and fisheries management in Uvira, Lake Tanganyika, DR Congo. Journal of Great Lakes Research 46(6): 1740-1753.

- FAO (2006). Report of the eleventh session of the sub-committee for Lake Tanganyika. FAO Fisheries Report 801, 41p.
- FAO (2024). FishStat: Global capture production 1950-2022. [Accessed on 29 March 2024]. In: FishStatJ. Available at [www.fao.org/fishery/en/statistics/software/fishstatj](http://www.fao.org/fishery/en/statistics/software/fishstatj). Licence: CC-BY-4.0.
- Gourène, G. and G.G. Teugels (1994). Synopsis de la classification et phylogénie des Pellonulinae de l'Afrique Occidentale et Centrale (Teleostei; Clupeidae). *Journal of African Zoology* 108(1): 77-91.
- Kawabata, M. (1975). Fish community near Mukuyu, the east coast of Lake Tanganyika. *Kyoto University African studies* 9: 21-31.
- Kimirei, I.A., Y.D. Mgaya and A.I. Chande (2008). Changes in species composition and abundance of commercially important pelagic fish species in Kigoma area, Lake Tanganyika, Tanzania. *Aquatic Ecosystem Health and Management* 11(1): 29-35.
- Kolding, J. and P.A.M van Zwieten (2012). Relative lake level fluctuations and their influence on productivity and resilience in tropical lakes and reservoirs. *Fisheries Research* 115: 99-109.
- Kolding, J., P.A.M. van Zwieten, F. Marttin, S. Funge-Smith and F. Poulain (2019). Freshwater small pelagic fish and their fisheries in major African lakes and reservoirs in relation to food security and nutrition. FAO Fisheries and Aquaculture Technical Paper 642. 110p.
- Kullander, S.O. and T.R. Roberts (2012). Out of Lake Tanganyika: endemic lake fishes inhabit rapids of the Lukuga River. *Ichthyological Exploration of Freshwaters* 22(4): 355-376.
- Langenberg, V.T. (2008). On the limnology of Lake Tanganyika. PhD Thesis, Wageningen University, 212p.
- Lupikisha, J.M. (1993). The fisheries statistics data collection system in Zambia and fisheries statistics of Lake Tanganyika. p. 143-163. In: Coenen E.J. (1993). Report on the first workshop on the coordination and standardization of fisheries statistics for Tanganyika (Bujumbura, 26—30 July 1993). FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika. GCP/RAF/271/FIN-TD/11 (En), 176p.
- Mannini, P. (1998). Geographical distribution patterns of pelagic fish and macrozooplankton in Lake Tanganyika. FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika. GCP/RAF/271/FIN-TD/83 (En): 125 pp.
- Mannini, P., J. Sarvala, E. Aro, I. Katonda, B. Kissaka, C. Mambona, G. Milindi, L. Kuusipalo, P. Paffen and P. Verburg (1999). Chapter 6 Fish Biology. p. 57-63. In: O.V. Lindqvist, H. Mölsä and J. Sarvala (ed.). *Lake Tanganyika Research: summary of the scientific programme 1992-98*. FAO/FINNIDA Research for the Management of the Fisheries of Lake Tanganyika. GCP/RAF/271/FIN-TD/94(En): 102p.
- Mölsä, H., J. Sarvala, S. Badende, D. Chitamwebwa, R. Kanyaru, N. Mulimbwa and L. Mwape (2002). Ecosystem monitoring in the development of sustainable fisheries in Lake Tanganyika. *Aquatic Ecosystem Health and Management* 5: 267-281.
- Mölsä, H., J.E. Reynolds, E.J. Coenen and O.V. Lindqvist (1999). Fisheries research towards resource management on Lake Tanganyika. *Hydrobiologia* 47: 1-24.
- Mulimbwa, N. (2006). Assessment of the commercial artisanal fishing impact on three endemic pelagic fish stocks, *Stolothrissa tanganyicae*, *Limnothrissa miodon* and *Lates stappersi*, in Bujumbura and Kigoma sub-basins of the Lake Tanganyika. *Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie* 29: 1189-1193.
- Mulimbwa, N., J. Sarvala and J.A.M. Raeymaekers (2014b). Reproductive activities of two zooplanktivorous clupeid fish in relation to the seasonal abundance of copepod prey in the northern end of Lake Tanganyika. *Belgian Journal of Zoology* 144: 77-92.

- Mulimbwa, N., J.A.M. Raeymaekers and J. Sarvala (2014a). Seasonal changes in the pelagic catch of two clupeid zooplanktivores in relation to the abundance of copepod zooplankton in the northern end of Lake Tanganyika. *Aquatic Ecosystem Health and Management* 17: 25-33.
- Mulimbwa, N., J. Sarvala J. and J.C. Micha (2019). The larval fishery on *Limnothrissa miodon* in the Congolese waters of Lake Tanganyika: impact on exploitable biomass and the value of the fishery. *Fisheries Management and Ecology* 26: 444-450.
- Mulimbwa, N.T., L.J.M. Milec, J.A.M. Raeymaekers, J. Sarvala, P.-D. Plisnier, B. Marwa and J.-C. Micha (2022). Spatial and seasonal variation in reproductive indices of the clupeids *Limnothrissa miodon* and *Stolothrissa tanganyicae* in the Congolese waters of northern Lake Tanganyika. *Belgian Journal of Zoology* 152:13-31.
- Mushagalusha, D., J.-C. Micha, G. Ntakimazi and N. Muderhwa (2015). Brief evaluation of the current state of fish stocks landed by artisanal fishing units from the extreme northwest part of Lake Tanganyika. *International Journal of Fisheries and Aquatic Studies* 2(4): 41-48.
- Ntakimazi, G. (2006). *Stolothrissa tanganyicae*. The IUCN Red List of Threatened Species 2006: e.T60752A12405999. <https://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T60752A12405999.en>. Accessed on 13 August 2024.
- O'Reilly, C.M, S.R. Alin, P.D. Plisnier, A.S. Cohen and B.A. McKee (2003). Climate change decreases aquatic productivity in Lake Tanganyika, Africa. *Nature* 424: 766-768.
- Plisnier, P.-D. (1995). Catch assessment survey in Zambian waters of Lake Tanganyika in 1994. FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika. GCP/RAF/271/FIN-TD/41 (En) 18p.
- Plisnier, P.-D. (1997). Climate, limnology and fisheries changes of Lake Tanganyika. FAO/FINNIDA Research for the Management of Fisheries on Lake Tanganyika GCP/RAF/271/FINTD/72. 38p.
- Plisnier, P.-D., M. Nshombo, H. Mgana and G. Ntakimazi (2018). Monitoring climate change and anthropogenic pressure at Lake Tanganyika. *Journal of Great Lakes research*. 44: 1194-1208.
- Poll, M. (1950). Histoire du peuplement et origine des espèces de la faune ichthyologique du lac Tanganika. *Annales de la Société royale zoologique de Belgique* 81: 111-140.
- Poll, M. (1953). Exploration hydrobiologique du lac Tanganika (1946-1947). Résultats scientifiques. Volume III, fascicule 5A. Poissons non Cichlidae. Institut Royal des Sciences Naturelles de Belgique, Bruxelles. 251 pp.
- Poll, M. (1974). Synopsis et distribution géographique des Clupeidae d'eau douce africains, descriptions de trois espèces nouvelles. *Bulletin de la classe des sciences de l'Académie royale de Belgique*, 5e Série, 60(2): 141-161.
- Poll, M., G.G. Teugels and P.J.P. Whitehead (1984). Clupeidae. p. 41-55. In: J. Daget, J.-P. Gosse and D.F.E. Thys van den Audenaerde (eds.) Check-list of the freshwater fishes of Africa (CLOFFA). ORSTOM, Paris and MRAC, Tervuren. Vol. 1.
- Roest, F.C. (1988). Predator-prey relationships in northern Lake Tanganyika and fluctuations in the pelagic fish stocks. *CIFA Occasional Paper* 15: 104-129.
- Sarvala, J., V.T. Langenberg, K. Salonen, D. Chitamwebwa, G.W. Coulter, T. Huttula, R. Kanyaru, P. Kotilainen, L. Makasa, N. Mulimbwa and H. Mölsä (2006). Fish catches from Lake Tanganyika mainly reflect changes in fishery practices, not climate. *Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie* 29: 1182-1188.
- Szczucka, J. (1998). Acoustic estimation of fish abundance and their spatial distributions in Lake Tanganyika. FA/FINNIDA Research for the Management of the Fisheries of Lake Tanganyika. GCP/RAF/271/FIN-TD/84. 63 pp.
- Van der Knaap, M., D. Manara Kamitenga, L. Ngoie Many, A. Esube Tambwe and G. J. De Graaf (2014). Lake Tanganyika fisheries in post-conflict Democratic Republic of Congo. *Aquatic Ecosystem Health and Management*, 17(1): 34-40.

Whitehead, P.J.P. (1985). FAO Species Catalogue. Vol. 7. Clupeoid fishes of the world (suborder Clupeoidei). An annotated and illustrated catalogue of the herrings, sardines, pilchards, sprats, shads, anchovies and wolf-herrings. FAO Fisheries Synopses 125(7/1):1-303. Rome: FAO.