School of Doctoral Studies in Biological Sciences

University of South Bohemia in České Budějovice
Faculty of Science

SPATIAL DISTRIBUTION OF FISH IN LAKE TURKANA, KENYA

RNDr. Thesis

Mgr. Milan Muška

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Annotation

The knowledge of fish spatial distribution is essential for fish stock assessments and management. The aim of this study was to describe the fish spatial distribution in the vertical and horizontal point of view, estimate parameters of pelagic fish assemblage and compare this results with historical data.

Declaration [in Czech]

Prohlašuji, že svoji rigorózní práci jsem vypracoval samostatně pouze s použitím pramenů a literatury uvedených v seznamu citované literatury.

Prohlašuji, že v souladu s § 47b zákona č. 111/1998 Sb. v platném znění souhlasím se zveřejněním své rigorózní práce, a to v úpravě vzniklé vypuštěním vyznačených částí archivovaných Přírodovědeckou fakultou elektronickou cestou ve veřejně přístupné části databáze STAG provozované Jihočeskou univerzitou v Českých Budějovicích na jejích internetových stránkách, a to se zachováním mého autorského práva k odevzdanému textu této kvalifikační práce. Souhlasím dále s tím, aby toutéž elektronickou cestou byly v souladu s uvedeným ustanovením zákona č. 111/1998 Sb. zveřejněny posudky školitele a oponentů práce i záznam o průběhu a výsledku obhajoby kvalifikační práce. Rovněž souhlasím s porovnáním textu mé kvalifikační práce s databází kvalifikačních prací Theses.cz provozovanou Národním registrem vysokoškolských kvalifikačních prací a systémem na odhalování plagiátů.

In České Budějovice, 25. September 2013   Mgr. Milan Muška

Co-author´s agreement

We hereby declare that Milan Muška had a major contribution to the following paper:

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Milan Muška was responsible for sampling arrangement, hydroacoustic survey, data processing, statistical analysis and writing the manuscript.

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The last snapshot of natural pelagic fish assemblage in Lake Turkana, Kenya: A hydroacoustic study

Milan Muška [a,b,*], Mojmír Vašek [a,1], David Modrý [c,d,2], Miloslav Jirků [d,3], William O. Ojwang [e,4], John O. Malala [f,5], Jan Kubečka [a,6]

[a] Biology Centre, Academy of Sciences of the Czech Republic, Institute of Hydrobiology, Na Sádkách 7, 370 05 České Budějovice, Czech Republic
[b] University of South Bohemia, Faculty of Science, Branišovská 31, 370 05 České Budějovice, Czech Republic
[c] University of Veterinary and Pharmaceutical Sciences Brno, Faculty of Veterinary Medicine, Palackého 1/3, 612 42 Brno, Czech Republic
[d] Biology Centre, Academy of Sciences of the Czech Republic, Institute of Parasitology, Branišovská 31, České Budějovice, Czech Republic
[e] Kenya Marine and Fisheries Research Institute, Kisumu Research Center, P.O Box 1881, Kisumu, Kenya
[f] Kenya Marine and Fisheries Research Institute, Lake Turkana Station, P.O. Box 205, 30500 Lodvar, Kenya

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ABSTRACT

A hydroacoustic survey and supplementary gillnet investigation were carried out in the open water of the central part of Lake Turkana in September 2009. Overall acoustic fish density and biomass were assessed as 1381 ind./ha and 30 kg/ha, respectively. The fish density estimate was lower than the results from two previous investigations in the 1970s and 1980s (long-term average 3739 ind./ha), but the biomass remained relatively unchanged (long-term average 25.4 kg/ha). A decreasing gradient in pelagic fish density from the western to eastern shore of the lake was observed. Fish were distributed unevenly within the water column. During the day, a majority of fish aggregated in the mid-water layers (10–12 m below the water surface), creating on echograms the so-called Midwater Scattering Layer. This feature dissipated completely during dusk and the majority of fish occurred in the surface layers at night. These diel vertical fish migrations influenced day and night hydroacoustic estimates of the total fish abundance. *Synodontis* spp., *Lates* spp. and *Schilbe uranoscopus* dominated the catch of both mid-water and bottom gillnets installed in open water areas. *Hydrocynus forskalii* and *Brycinus* spp. contributed significantly to the catch of mid-water gillnets while *Bagrus bayad* and the endemic *Haplochromis macconneli* occurred only in the catch of the bottom gillnets.

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Introduction

Pelagic fish play important role in the ecosystem of all African Great Lakes. The extensive open water areas of African Great Lakes host rich pelagic communities dominated by small species like *Rastrineobola argentea* (Pellegriin) in Lake Victoria, *Stolothrissa tanganicae* Regan and *Limnothrissa miodon* (Boulenger) in Lake Tanganyika, *Engraulicypris sardella* (Günther) together with diverse cichlids in Lake Malawi and *Brycinus minutus* (Hopson & Hopson) plus *Brycinus ferox* (Hopson & Hopson) in Lake Turkana. These small planktivores are responsible for

the relatively efficient transfer of secondary production to the higher trophic levels, as they represent an important prey to piscivorous species like native or introduced *Lates niloticus* (L.) and others (Beadle, 1974). Both small pelagic planktivores and their predators usually represent an important part of commercial fish yield in African Great Lakes. The knowledge of fish stock parameters is essential for the determination of appropriate fisheries management and definition of sustainable fish yield.

Lake Turkana is situated in the arid region of northwestern Kenya, in the eastern branch of the Great Rift Valley. With its 240 km length and 14–50 km width, it is the world's largest desert lake and also the fourth largest African lake by area (Ferguson and Harbott, 1982; Herdendorf, 1982). Since Lake Turkana was first discovered for the scientific community at the end of 19th century (von Höhnel, 1894), as the last of the African Great Lakes, only little attention was given to its environment and fish populations. The first scientific observations of Lake Turkana central sector were made by Cambridge expeditions to the East African lakes in 1930–31 (Beadle, 1932; Worthington, 1936). Later, in the 1970s, a three-year survey program (1972–75) summarized by Hopson (1982) laid the foundations of knowledge of the Lake Turkana environment. This extensive