Species composition and relative abundance of zooplanktivorous haplochromines in the northern portion of Lake Victoria (Uganda)

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Abstract: Recent surveys have indicated an increase in haplochromine biomass recorded from the bottom trawl and in the beam trawl. The haplochromines recovering in the offshore waters belong to three species in the zooplanktivorous trophic group: *Yssichromis laparogramma* (Greenwood and Gee), *Yssichromis fusiformis* (Greenwood and Gee) and *Astatotilapia lacrimosa* (Boulenger). In this paper, the species composition and relative abundance of the zooplanktivorous haplochromines recorded from the bottom and frame trawl surveys in the various parts of the Ugandan waters of Lake Victoria are discussed.

Introduction

Research in Lake Victoria in the early 1970s using bottom trawl surveys found that 83% of the demersal ichthyomass consisted of haplochromine cichlids (Kudhongania & Cordone 1974). This group consisted of over 250 species (van Oijen, Witte & Witte-Mass 1981) with a wide ecological diversity. Up to 40 different species, varying in composition according to area and depth, could be caught in one haul. Following the upsurge of the Nile perch, *Lates niloticus* (L.), in Lake Victoria at the beginning of the 1980s, the haplochromine stock and its fishery virtually disappeared (Witte & van Oijen 1990). Experimental trawl surveys in the northern portion of L. Victoria (Uganda) in the early 1980s indicated that the contribution of haplochromine cichlids to the catch by weight had declined from 91% in 1981 to almost zero by 1985 (Okaronon & Kamanyi 1986), and by the early 1990s haplochromine cichlids contributed only 0.2% to the ichthyomass (Okaronon 1994). There was a difference in the rate of decline within and between trophic groups. Zooplanktivores were present for longer in the catches (Witte, Goldschmidt, Ligvoet, van Oijen and Wanink 1992). The mainly pelagic zooplanktivores have a narrower habitat overlap with the Nile perch than the demersal detritivores and this would have enabled them to escape the predatory impact of Nile perch. Their pelagic habitat and the relatively small size may explain why they were not caught in large numbers in the commercial catches.

Nile perch catches peaked between 1985 and 1990 and are now declining (Fisheries Department Statistics), while fishing effort is still increasing (Pitcher & Bundy 1994; Reidmiller 1994). Witte and Witte-Mass (1987) predicted that the high densities of the Nile perch may be temporary, and a decrease might allow a resurgence of certain haplochromines. In Lake Kyoga, where Nile perch catches have declined following heavy fishing pressure, the haplochromines have increased in abundance (Ogutu-Ohwayo 1994). A study in the Mwanza Gulf indicated that zooplanktivores survived best in the presence of Nile perch (Goldschmidt & Witte 1990) and recent trawl surveys in the open waters of Lake Victoria have indicated increased abundance of *Yssichromis* species (Tumwebaze 1997). This study examines the species composition and relative abundance of the zooplanktivorous haplochromines in the open waters of Lake Victoria.

Materials and methods

Samples of haplochromine species were obtained from offshore waters of Lake Victoria during bottom trawl surveys using MV IBIS. Most hauls were of 30 minutes duration but shorter hauls were common and catches from these were adjusted to 30-min catch rate equivalents. Trawling was carried out during daytime. The haplochromine specimens were sorted into taxonomic groups to genus, or species level where possible. Identification was based on coloration, size and prominent body markings such as bands spots or bars using keys (Greenwood 1981). A sample of haplochromines was preserved in 4% formalin and brought to laboratory for food analysis. A similar sampling exercise was carried out using a mid-water frame trawl (3 x 3 m mouth) at two sites (Buuma and Bugaia).

Results

Overall, haplochromines contributed 2.2% of the mean catch per bottom trawl haul (Table 1). The highest proportion of the catch was found in areas where the lake was between 10 and 19 m deep, but this may be an artifact of sampling efficiency; the bottom trawl being less efficient in waters less than 10 m deep. The greatest catch per 30-min haul was also found in waters 10-19 m deep, but there was a marked reduction in catch of haplochromines in waters deeper than 30 m.

Haplochromines contributed 86.7% of the catch in frame trawl in the Buvuma channel and 23% in Bugaia waters; the other species were juvenile Nile perch and *Rastrineobola argentea* (Pellegrin).

The haplochromines from the bottom trawl belonged to three main species, namely *Yssichromis laparogramma* (Greenwood and Gee), *Yssichromis fusiformis* (Greenwood and Gee) and *Astatotilapia lacrimosa* (Greenwood)(Table 2). Overall *A. lacrimosa* was the most dominant species. By contrast, *Y. fusiformis* was the most abundant species in the frame trawl catches followed by *Y. laparogramma*, while *A. lacrimosa* was rarely caught (Table 3).

Discussion

Haplochromines contributed 2.2% to the mean catch by weight using the bottom trawl net, as compared to 0.2% recorded in the 1993-1995 surveys. This suggests that, although Nile perch is still the dominant fish species, there is an increase in the contribution of haplochromines to bottom trawl catches, especially of *A. lacrimosa*. By contrast, catches by the mid-water frame trawl were dominated by haplochromines of the genus *Yssichromis*. These data suggest that *A. lacrimosa* is a benthic species and *Yssichromis* occupy the pelagic zone. In the present study only three species of haplochromines were recorded from the catch as compared to over 300 species recorded before the upsurge of Nile perch (Witte *et al.* 1992). Although there is an apparent resurgence of haplochromines in the lake, it is only based only a few species, mainly in offshore waters.

This development of the mid-water species abundance, contrasts with previous studies, which showed that the majority of surviving haplochromines inhabit shallow inshore areas particularly those covered with macrophytes and areas with rock outcrops (Witte *et al.* 1992; Kaufman & Ochumba 1993). Ogutu-Ohwayo (1994) noted that many surviving species especially haplochromines in Lake Nabugabo were confined to macrophyte habitats along the lake margin. In the offshore waters however, the pelagic zone seems to be an important refugium for the open water haplochromine cichlids. It is possible these haplochromine species are now exploiting a niche left by the disappearance of the original species flock. The high abundance in midwater is possibly because they are less vulnerable to Nile perch in this zone.

Whether the resurgence is an artifact of the declining stock of Nile perch is unclear, especially because the recent surveys were carried out with a new, more efficient trawl. Irrespective, further studies are required to examine the role of the haplochromines in the food web of the lake. Furthermore, new studies need initiating to identify whether the increased contribution of haplochromines is real in terms of standing stock. Consequently, no action should be taken to exploit these fishes in the midwater zone as the by-catch of Nile perch taken by any gear used is likely to be detrimental to the stock recruitment dynamics of the latter species.

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Table 1. Percentage contribution of haplochromines to the mean catch at various depths

Depth (m)	Mean catch (kg)	Haplochromine weight (kg)	% Haplochromine
0-9	377.7	4.8	1.3
10-19	113.4	6.0	5.3
20-29	157.3	4.2	2.6
30-39	99.6	1.3	1.4
40-49	9.3	0.4	4.3
Overall	757.3	16.7	2.2

Table 2. **Catch composition and relative abundance of haplochromines in the bottom trawl catches**

Area	% *Y. laparograma*	% *Y. fusiformis*	% *A. lacrimosa*
Kisima	24.1	16.1	59.8
Lutoboka	25.0	0.7	74.3
Bumangi Bay	12.3	7.7	80.0
Buve-Zinga	38.7	34.4	26.9
Goru-Luyo	50.0	23.1	26.9
Total	31.7	24.2	44.1

Table 3. Species composition and relative abundance of haplochromines in the frame trawl catches

Area	% *Y. fusiformis*	% *Y. laparograma*	% *A. lacrimosa*
Buvuma	78.3	20.0	1.6
Bugaia	81.0	19.0	0
Total	78.5	20	1.5