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A Survey of the Ichthyofauna of Lake Kanyoboli and other small Water Bodies: Alternative Refugia for Endangered Fish Species

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ABSTRACT

In 1988 the World conservation Union Red Book of endangered species listed the hundreds of endemic fishes of Lake Victoria under a single heading: "Endangered". Most of the endemic native food fishes are either endangered or extinct. A survey of the fauna of Lake Kanyaboli, however, revealed that remnants of some of these native fishes actually do thrive. These include several unidentified *Haplochromis spp., Oreochromis esculentus* and *Oreochromis variabilis.* Other species whose existence here drew great interest included *Haplochromis phytophagous. Haplochromis maxillarias, Haplochromis maridade, Haplochromis nubilus* and *Aplocheilichthys putilus.* The existence of these species in this lake therefore, placed the lake and other small water bodies in a very important and pivotal position as conservation refugia.

INTRODUCTION

The recent history of the fishes of Lake Victoria exemplifies a pace and magnitude of change that is alarming. The fishery of the lake, that once drew on hundreds of species mostly endemic, now rests on a native pelagic minnow called Omena *(Rastrineobola argentea),* the introduced Nile perch *(Lates niloticus)* and, the other introduced Nile tilapia *Oreochromis niloticus* (KAUFMAN, 1989). The cannibalistic Nile perch now threatens to destroy not only itself but also the entire lake ecosystem. An attempt should be made to rehabilitate Lake Victoria.

Table 1. Shows the list of fish species that are endangered in Lake Victoria.

SPECIES
Haplochromine spp.
Oreochromis esculentus
Oreochromis variabilis
Astatoreochromis alluaudi
Clarias spp.
Ctenopoma murei
Barbus spp.

"Endangered" means species rarely appears or does not appear at all in the catches all year round.

Native food fishes if kept from extinction, can certainly be restored to the market place through aquaculture (OGUTU-OHWAYO, 1990; KAUFMAN, 1992; GOLDSCHMIDT, 1980). In an effort to establish separate management areas for the conservation of the native fishes the present research programme became necessary. The study began in 1990 when emergency fauna surveys of Lake Victoria using remote-operated vehicles were carried out. The surveys centered on the remnants of endemic fish communities in L. Victoria. On the recommendations of the survey team it has become necessary for both scientists and conservationists to bring to light the richness and ecological significance of some of the small little-known lakes and dams. These may serve as conservation parks for the endangered fauna. Thus far, those of interest include (1) Lake Kanyaboli (2) Lake Nyabayo (3) Lake Sare (4) Tinga dam (5) Futro dam (6) Uthiya dam (7) Masawa dam and Upper Yala river and accompanying flood plains.

STUDY AREA

The area sampled in this study is shown in Fig. 1.

(A) Identification of water bodies

(B) Parameters investigated

(i) Fish species

(ii) Limnology

(iii) Fish parasites

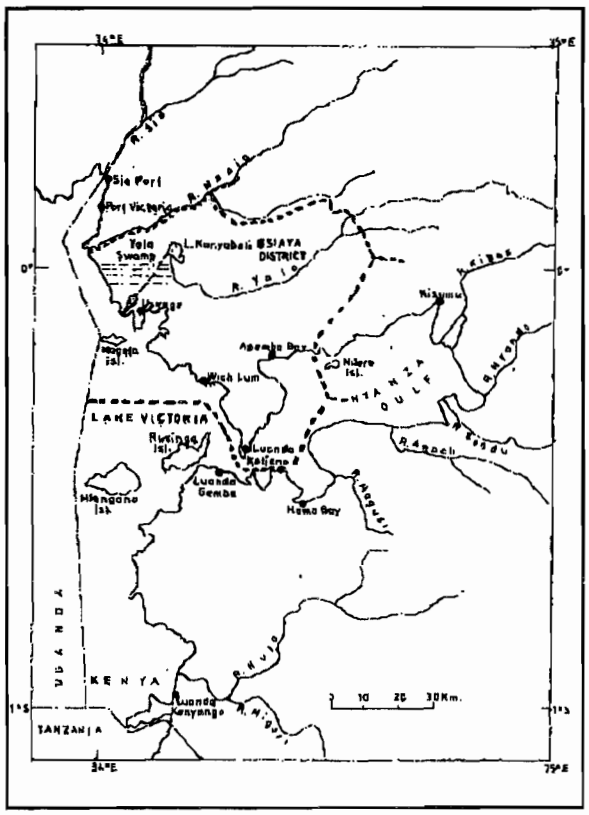

Fig. 1 – Map of Lake Victoria – Kenya showing sampled areas of study.

MATERIALS AND METHODS

(C) Sampling.

A rubber dingy with a mounted outboard engine was used to survey the lakes. Fish samples were obtained using trawlnets, handnets and beach seines. Fish were identified and measured on a fish measuring board. Transparency and water depth were measured using a Secchi disc (30 cm diameter) a weight and graduated rope. A digital leitwert-messgerat meter was used to measure conductivity. Dissolved oxygen (DO) and pH were measured using a digital pH/MV (redox) messgerat meter. A tetratest Laborett kit was also used to determine pH, total hardness and carbonate values. Total hardness is given here as the amount of dissolved calcium and magnesium while carbonate hardness is given as the amount of carbonate/bicarbonate present in solution. Fish parasites were obtained from fresh specimens and identified under a microscope.

RESULTS

Water bodies surveyed so far include L. Kanyaboli, L. Nyabayo, L. Sare and dams-Tinga, Masawa, Uthinya and Futru dams. Fish species identified are shown in Table 2.

Water chemistry parameters are shown in Table 3: Extremely variable conductivity values were recorded in the water bodies during the survey.

Secchi disc transparency in Lake Kanyaboli varied between 25-30 cm. Temperature and pH values in the water bodies were recorded as 20.5 - 33.2°C and 6.2 - 8.0 respectively. Oxygen levels

Table 2: The Ichthyofauna of Lake Kanyaboli and other water bodies sampled by Lake Victoria Species Survival Survey team.

WATER BODY (AREA)	IDENTIFIED FISH SPECIES
Lake Kanyaboli (10.5km²)	*Oreochromis esculentus, O. niloticus, Haplochromis phytophagous, H. maxillaris, Protopterus aethiopicus, Clarias gariepinus, Astatoreochromis alluaudi, Aplocheilichthys pumilus, Haplochromis maridadi*
Lake Nyabayo	*Oreochromis esculentus, O. leucostictus, Haplochromis spp. Haplochromis nubilus, Astatoreochromis alluaudi*
Tinga dam (2000 x 100 m)	*Oreochromis esculentus, O. variabilis, O leucostictus, Astatoreochromis alluaudi*
Masawa dam (70 x 70m)	*Clarias gariepinus, Oreochromis leucostictus, Tilapia zilli*
Yala River and accompanying flood plains (173Km³)	*Ctenopoma murei, Mormyrus kannume, Protopterus aethiopicus, Tilapia zilli, Clarias gariepinus, Synodontis victoriae, Aplocheilichthys pumilus, Astatoreochromis alluaudi, Barbus sp., Haplochromis maridadi, Bagrus radiatus, Haplochromis sp.*
Uthinya dam (50 x 50m²)	*Barbus jacksonii, Barbus apleurogramma, Oreochromis leucostictus*
Futru dam (100 x 50m)	*Oreochromis leucostictus, O. niloticus*

Table 3. Some physico-chemical parameters noted during the survey (surface waters) for the small water bodies. Ranges of physico-chemical parameters of L. Victoria are also given for comparison.

Water Body	*pH*	*Temp (°C)*	*Dissolved Oxygen (mg/L)*	*Secchi disc Transparency*	*Conductivity (uScm) (cm)*	*Total Hardness (mg/L as*
Lake Kanyaboli	7.7	21-28	10.2-11.0	25-30	349	107.4
L. Nyabayo	0.2	22	9.7	-	62	53 7
Tinga Dam	7.6	26	-	-	670	125 3
Yala River & Flood plains	6.8-7.2	28-33.2	0.04	-	95	5.8-53.7
Masawa Dam	7.3	26.5	-	-	153	71.6
Uthiya Dam	7.5	23	-	-	-	716
Futru Dam	8	20.5	-	-	-	161 1
L. Victoria	7-9	24-29	5-9.5	15-225	70-180	20-70

were varied while carbonate hardness and total hardness values fluctuated between 35.8 and 161.1mg/L(AS cAcco3). Large macrophytes that fringed most water bodies included *Typha, Cyperus, Potamegaton* species and occasional incidences of *Eichhornia crassipes.* Incidences of parasitic infection were observed in *Protopterus aethiopicus, Haplochromis phytophagous* and *Oreochromis esculentus.* Parasite groups identified were species of *Argulus* and Nematodes.

DISCUSSION AND CONCLUSION

This survey has revealed that most species currently thought extinct or endangered are abundant in Lake Kanyaboli. These include numerous haplochromines most of which could not be identified until a DNA analysis is completed. Lake Kanyaboli is the only water body in Kenya with an abundant population of *Oreochromis esculentus*. The endangered mollusc crusher *Astatoreochromis alluaudi* occurred commonly in the catches and was present virtually in all water bodies inhabited by haplochromines. This relationship was attributed to food chain links.

Oreochromis variabilis, feared extinct by fishermen could be found in Tinga Dam. This is the first time that most of these water bodies are sampled since they were built in the early 1950s. It is not possible, therefore, to exhaustively examine changes that have occurred to influence their ecology and limnology. Despite the observed high conductivity values these waters still support fish communities that have almost completely disappeared from the larger Lake Victoria. A management strategy should therefore be designed to improve their water chemistry and community richness.

The fauna presently found in these waters has in the past featured prominently in the study of vertebrate evolution, speciation, ecological plasticity and tropical community structure (GOLDSCHMIDT, 1986; FRYER and ILES, 1972. GOLDSCHMID and WITTE, 1992). It is therefore necessary that these water bodies should serve as natural living museums for conserving endangered fishes of Lake Victoria. The small size of these water bodies makes management of such conservation programmes feasible. Todate. only preliminary surveys and captive breeding work is being conducted by Kenya Marine Fisheries Research Institute, Sangoro Research Centre, as an *in situ* conservation effort.

Currently a study of their water chemistry and ecology is being carried out by Kenya Marine Fisheries Research Institute and the New England Aquarium. A report on the biodiversity and ecosystem modelling of the waters is expected soon.

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