SECTION 8: THE LAKES

Weaver at nest in Papyrus swamp. A.J.Plumptre, WCS

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8.1 SUMMARY

The lakes of the Albertine Rift are some of the richest in the world for freshwater fish species. The data on species richness for some of the Rift lakes is poor as they have not been thoroughly surveyed. New species can still be found, and many remain undescribed. The high rate of speciation of the cichlid family has contributed to the high species numbers and endemism. Lake Tanganyika contains the highest number of known species of fishes of the five large lakes of the Albertine Rift (Albert, George, Edward, Kivu and Tanganyika) with around 325 species of which 250 are cichlids. Lake Edward and George (connected by the Kazinga Channel) rank second with 81 species known to date and 60 cichlids. The percentage of endemic cichlids to each lake in four of the five large lakes is high (greater than 90%) except for Lake Albert (36%). Lake Tanganyika has 289 endemic fish species, while lakes Edward and George with a combined total of 56 endemic species (Snoeks, 2000). At least 366 species are known from these lakes that are endemic to the Albertine rift but this will be a minimum estimate for the Rift region as it only totals the numbers of species known to be endemic to each lake, and does not take into account the minor lakes, wetlands and rivers in the region. In addition, there are many species yet to be described. There is also high endemism and diversity of other groups in these lakes, particularly mollusks, crabs and ostracods.

Les Lacs du Rift Albertin sont parmi les plus riches du Monde pour les espèces de poissons d'eaux douces. Les données sur la richesse en espèces de tous les lacs sont pauvres parce que les lacs n'ont pas été largement étudiés et de nouvelles espèces peuvent être découvertes à tout moment. Le taux d'évolution d'espèces des Cichlidés a contribué de trop pour ce qui est du nombre et de l'endémisme des espèces. Le Lac Tanganyika contient le nombre le plus élevé d'espèces de poissons connues des cinq lacs avec environs 325 espèces dont 250 Cichlidés. Le Lac Edouard et Georges occupent la deuxième place avec 81 espèces connues aujourd'hui et 60 Cichlidés. Le pourcentage des Cichlidés

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endémiques à chaque lac, parmi les quatre des cinq larges, est élevé (plus de 90%) sauf pour le Lac Albert (36%). Le Lac Tanganyika a 289 espèces de poissons endémiques (à ce lac) et les Lacs Albert et Georges, avec un total combiné, ont 56 espèces endémiques. Au moins 366 espèces connues de ces lacs sont endémiques au Rift Albertin mais ceci est une estimation minimum vu que les résultats ne donnent seulement que le nombre des espèces endémiques pour chaque lac.

8.2 INTRODUCTION

The large lakes in the Albertine Rift (Albert, George, Edward, Kivu and Tanganyika) are known to be important for speciation in fish as well as other groups of aquatic organisms including mollusks, crabs and ostracods. For this report it was not possible to pull together existing lists for these species in the lakes because of the lack of time and manpower available. However, these five lakes are important sites for endemic species and should be included as part of any analysis of the biodiversity of the Albertine Rift. Instead figures for species richness and endemism were compiled from existing literature and reviews of these lakes.

8.3 TAXONOMY OF FISHES AND THE RADIATION OF CICHLID FISHES

Much of the richness of the fish fauna of these lakes is due to the radiation of the cichlids (Cichlidae). Since the lakes were formed this group has evolved rapidly to fill many of the vacant niches in the lakes. Consequently this group has probably been better studied than some fish taxa (Patterson and Makin, 1998). However, the cichlids are being revised (Snoeks, 2000); many new species are being described, and many existing species could be split as a result of genetic analyses. In addition, there are key areas in the region that remain relatively unexplored, in particular Lake Edward. Lake George is better known, although the extensive wetland around the lake remains nearly unexplored. The Lake Edward-George system is very exciting biogeographically because it represents the confluence of the Albertine and Victoriine faunas. Preliminary excursions to Lake Edward in the past 10 years have yielded many new species of cichlids; and these fishes radically alter our understanding of the biogeography and evolution of the region.

8.4 BIODIVERSITY OF THE LAKES IN THE ALBERTINE RIFT

Despite the problems with taxonomy and the low sampling effort for some of these lakes there have been attempts to predict their total species richness (Snoeks, 2000). Lake Tanganyika contains the largest diversity of fishes of the five large lakes in the Albertine Rift. This is in part due to its size (32,000 km^2) and its age since any major geological process such as volcanic eruptions affected it. The other lakes have all been affected by volcanic eruptions or changes in water flow that could have influenced the fish fauna in the lakes (Beadle, 1974, Kaufman, Chapman and Chapman, 1996, Snoeks, 2000). Tanganyika is the second deepest lake in the world and the volume of water it contains and diversity of habitats also contributes to its high species richness (Kaufman, Chapman and Chapman, 1996). As a result of these factors it also has the largest number of endemic species (Table 8.1).

Tanganyika has been more isolated than the other lakes through geological time, and the level of the lake has fluctuated with changing geological and climatic patterns. Its long period of isolation is reflected in very high endemism (98% of the cichlids, and 89% of all fishes in the lake). It has an extraordinary richness of endemic cichlids (an estimated 250 species); it also has by far the richest non-cichlid lacustrine fish assemblage in East Africa (Lowe-McConnell 1993, Snoeks 2000, Table 8.1).

Table 8.1 The estimated age since major changes in geology affected the lake, species richness of fish and endemism of the major lakes in the Albertine Rift (adapted from Snoeks, 2000).

Lake	Age since last major change	Total fish species	% of total = cichlids	No. endemic fish species	% Cichlids that are endemic	% of all fish species endemic
Albert	12-14,000	48	23	6	36	13
Edward-George	8-10,000	81	74	56	92	69
Kivu	11-14,000	23	70	15	94	65
Tanganyika	10 million	325	77	289	98	89

There are fewer surveys of other taxa in these lakes but Lake Tanganyika has some detailed information (Patterson and Makin, 1998) that shows a high percentage endemism in invertebrate groups (Table 8.2). Although not as high as the endemic cichlids and fish the levels of endemism in these invertebrate groups is still higher than that in the other vertebrate groups (see chapters 2-5) in the region.

Table 8.2 Diversity and endemism of other groups in Lake Tanganyika (Patterson and Makin, 1998)

Taxa	Number of species	Number endemic	Percentage endemic
Copepoda	68	33	49
Ostracoda	85	74	87
Mollusks	75	46	61

8.5 ECONOMIC IMPORTANCE OF THE LAKES

The five large lakes in the rift and their associated fish fauna are all highly important sources of revenue for local fishing communities. The fisheries that lake Edward and George sustain are some of the most productive in the world and of great importance to the economies of the people that live on the shores of the lakes. Introduced species such as the Nile Perch, which were introduced to boost the economy of the fisheries, have had a major impact on the biodiversity of these lakes by reducing species richness through predation. However, recent over fishing has led to the reduction in size of Nile Perch and some of the endemic cichlids that were thought to be extinct are reappearing. It is probable that they have survived in the wetlands that border these lakes.

Management of these fisheries therefore has to take into account the impacts on biodiversity as well as the livelihoods of the local people. Some degree of over fishing of Nile Perch seems desirable provided the stocks are not drastically reduced so that the off take of fish is too low. All the lakes in the Rift cross international boundaries which provides an additional challenge for the management of the fisheries.

8.6 Discussion

The number of endemic fish species listed in Table 8.1 greatly exceeds the number of endemic mammal, bird, reptile, and amphibian species of the region. Often the Albertine Rift is referred to as a region of high biodiversity and endemism, but this reference is made primarily to the montane and submontane forests. The lakes and their very high levels of fish species should be included when considering the Albertine Rift because they are in fact richer in endemic species than the terrestrial vertebrates. Only the plants have a greater number of endemic species (chapter 7).

There is still a need to undertake more surveys of the aquatic fauna in these lakes. In particular, Lake Edward is poorly known and many more species are probably awaiting discovery in this lake.