

Systematic Inventory of the Population of the Coastal Birds in the North-Western Part of Lake Tanganyika, Uvira Territory, South Kivu, DRC

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Abstract:- The systematic inventory of the avifauna of the littoral of Lake Tanganyika was investigated by direct observation, counting on transects, on points of account and using Japanese nets, from the mouthpiece of the small Ruzizi to the east, to the mouthpiece of the Kakumba river westward, during the months of February to May 2016. The objective was to document the bird species that inhabit the coast of Lake Tanganyika in Uvira. For the identification and listing of birds we refer to the field guides of Zimmerman et al., (1999) and of Stevenson and Fanshawe (2002). The numbers of species, genera, families, orders as well as the specific richness of the sites were calculated. 34 species of birds grouped into 25 genera, belonging to 14 families and to 7 orders were counted. The site of the mouthpiece of little Ruzizi was richer in species with 25, while the mouthpiece of the Kakumba River had 17 species.

Keywords:- Birds, Counts, Coastal Area and Lake Tanganyika.

I. INTRODUCTION

Biological inventories show that the greatest number of species of fish, birds, plants and aquatic insects inhabit the coastal area of the lake and even pelagic fish frequent and use the coastal area for reproduction, shelter from predators and growth of juveniles (Ntakimazi, 1995; SaâdHanene and al., 2005).

The coastal area is of great importance for the survival of the biodiversity of the lake where it extends into the so-called buffer zone of varying size along the shores. This buffer zone and all of the activities taking place there are very important in maintaining the aquatic life of the living organisms inhabiting the lake. It is often characterized by the type of vegetation that grows there and which plays an important role in the dynamics of trophic and exchange relationships between the watershed and the lake (Boudol, 2002). These areas are very important for hosting the poultry fauna that depends on the lake.

Indeed, birds play an important role in various lake ecosystems such as Lake Tanganyika. They first serve as food for other species; they disperse seeds, control insects, pollinate plants and modify the habitat (Marie-Eve, 2013). Birds are good indicators of ecosystem health, so their disappearance in a territory is more than worrying and

reflects the seriousness of the general state of health of the environment (Eamer and al., 2010).

In the aquatic environment, the coastal area also shelters a great diversity of migratory birds and freshwater birds which use the riparian vegetation to rest, feed and reproduce (Ntakimazi, 1995).

There are 29 orders of birds recognized in the wild; DR Congo alone has 22 orders. The most represented order is that of Passeriformes with 602 species, and the least represented order is that of Procellariiformes with only one species. DR Congo is the first country in Africa in terms of the number of bird species (Upoki, 2001)

The Albertine Rift contains 1061 species (Murhabale, 2008), that is 50% of the bird species of the African continent of which 41 are endemic and 25 threatened with extinction. It is an ecological region and particularly an endemic region of birds which unfortunately is affected by anthropogenic threats which remain intense in DR Congo (Magadju and al., 2015; Plumtre et al., 2003).

Although we have some information on the avifauna of the Albertine Rift in general, the western part, more precisely the eastern part of the Democratic Republic of the Congo, is still poorly known as various of these habitats including the coastline of Lake Tanganyika have not been the subject of adequate scientific investigations with regard to coastal avifauna (Murhabale, 2008).

The littoral zone of Lake Tanganyika is currently experiencing great anthropic pressure: anarchic constructions, deforestation, fishermen's and lucrative beaches, exploitation of materials (sand, pebble, and gravel), markets, stations and so many other activities. This anthropic pressure thus constitutes a constant threat to this kind of biotope; while its ornithological biodiversity is still poorly understood on the Congolese coast and yet this area can be considered as an important area for the conservation of birds (ZICO). In the Congolese part to the north of Lake Tanganyika in general and in the territory of Uvira in particular with high demography and human activities, the coastal area of the lake seems to be unaffected by these threats and previous studies on its current state of affairs are absent. All along the shores of the lake in the territory of Uvira and the perimeter of the coastal area or protection zone there are several human activities.

It should be noted that most of the studies on the biodiversity of the littoral zone of Lake Tanganyika in DR Congo are carried out only in the field of fish, aquatic vertebrates, zooplankton, phytoplankton, etc. A small number of studies with unpublished data on the water birds of the Ruzizi plain are carried out; and among these studies, we cite by way of example: The inventory of water birds of the locality of Ndunda in the plain of Ruzizi, by Pascal Akonkwa (2010); and Bashonga B. (2012), inventoried all the birds of the Ruzizi plain.

The problems mentioned above prompt us to ask ourselves a few questions that deserve answers throughout this study:

What are the bird species commonly encountered in the coastal area of Lake Tanganyika?

Are they sedentary or migratory?

Thus, to better understand the richness of bird biodiversity on the shore of Lake Tanganyika in DR Congo, we proposed to conduct a systematic study of the coastal avifauna in the north-western part of Lake Tanganyika, in order to contribute to the knowledge of the biodiversity of this environment. For this, the following objectives are reformulated:

- The overall objective of this work is to inventory and identify all the coastal birds of the north-western part of Lake Tanganyika.
- Specific objectives:
 - Determine the systematic position of each inventoried species,
 - Determine the numbers of species, Genres, families and orders
 - Compare the specific richness of these species from various sites under study,
 - Determine the status of each species,
 - Determine the catch effort.

II. MATERIAL AND METHODS

➤ Description of the Study Environment and Choice of Sites

The territory of Uvira is one of the 8 territories of South Kivu in DR Congo. It is bounded to the north by the territory of Walungu, to the west by the territory of Mwenga, to the south by the territory of Fizi and to the east by Lake Tanganyika and the Ruzizi River which separate it from Burundi. It covers 3,146 km². In 2016, the size of the population of Uvira is estimated at 1,181,207 inhabitants against 452,360 inhabitants in 2008 (Annual report of the Administration of the Territory of Uvira, 2016).

In total, 2 sampling sites were chosen on the coastal axis of Lake Tanganyika from the mouthpiece of the little Ruzizi (north towards the Congolese-Burundian border) to the Kakumba river in Kigongo. This is the site of: Ruzizi Small Mouthpiece and Kakumba Mouthpiece. These sites are chosen on the basis of their accessibility, but also and above all according to their representativeness (movement of birds, presence of aquatic macrophytes, mouths of rivers, etc.).



Fig 1:- Map showing the sampling sites on the coastal axis of Lake Tanganyika in the territory of Uvira.

➤ Data Collection and Processing

Data was collected in the field during the months of February, March and May 2016. We have 2 sampling sites on the shore of Lake Tanganyika. Out of a total of six outings, 4 outings were made to the Ruzizi little Mouthpiece, and 2 to the Kakumba Mouthpiece.

The geographic coordinates of each site chosen along the shores of Lake Tanganyika are taken using a GARMIN / GPS MAP 76CX brand GPS and entered into a database for the preparation of a map.

At each observation and / or sampling site, the different bird species have been observed and / or captured. Bird sightings were carried out with the naked eye and using a pair of NIKON 8x-16x40 binoculars and an Opticron PICCOLO MK II Japan 22 x telescopes. The birds were photographed by a Canon 30x OPTICAL camera. We chose in a given habitat a quiet "point" of parking and observe all the birds in motion or perched on the macrophytes, stones, sands and other substrates by the lake. For the capture, three Japanese nets were used. We stretched them out between 4 sticks 12m apart in the aquatic macrophytes. Each net was 12m in length, 5 longitudinal divisions which were spread over a height of 3.5m in width and 37mm of mesh. These nets are installed in quiet places and monitoring was done every 30 minutes.

Each individual bird captured is counted and identified. The identification of birds was carried out using bird identification guides (Zimmerman, DA, and al., 1999 and Terry., And al., 2002) which contain the color plates of the different species of birds in the middle. We compared the salient morphological characters: the coloration of the plumage; the shape, size, color of the beak; the color of the leg and the color of the iris with the color plates contained in the field guides.

On captured birds, various measurements were taken using a graduated slat. These are the total length of the body, the length of the tail, the length of the beak, the length of the legs and the length of the span. After these measurements, the bird is released into its capture environment while avoiding injury to the species.

The data is saved and processed in Excel on a computer. QGIS software is used to report sampling or

observation sites on the map of Lake Tanganyika in the territory of Uvira.

The catch effort (density of birds per net hour) was calculated by taking the total number of birds caught divided by the total number of hours of catch (Kizungu, 1996):

Day 1: 3 fillets exposed for 7 hours = 21 hours
 Day 2: 3 fillets exposed for 8 hours = 24 hours
 Day 3: 3 fillets exposed for 7 hours = 21 hours
 Day 4: 3 fillets exposed for 8 hours = 24 hours
 Day 5: 3 fillets exposed for 8 hours = 24 hours
 Day 6: 3 fillets exposed for 8 hours = 24 hours
 Total: 138 hours

III. RESULTS

➤ Coastal bird species identified in the north-western part of Lake Tanganyika

The birds inventoried are represented in table 1 with the places of inventory as well as their status. A total of 34 bird species have been identified on the coast of Lake Tanganyika; 11 of which are aquatic and 23 others non-aquatic. 12 species are common, 6 non-common, 3 common resident, 6 locally common, 1 abundant, 2 locally non-common and 1 migratory. Among these 34 species, 25 have been identified towards the small mouth of Ruzizi and 17 towards the mouth of Kakumba.

Species	inventoried at		Status
	Ruzizi small mouthpiece	Kakumba mouthpiece	
<i>Euplectes orix</i>	+	+	Common, highly gregarious
<i>Ploceus castanops</i>	-	+	Not common
<i>Ploceus pelzeni</i>	+	-	Common resident
<i>Ploceus ocularis</i>	+	-	Common
<i>Quelea quelea</i>	+	+	Locally common, nomadic
<i>Ploceus xanthops</i>	+	+	Locally common
<i>Ploceus jacksoni</i>	+	-	Locally common
<i>Ploceus reichardi</i>	+	-	-
<i>Ploceus melanocephalus</i>	+	-	Locally common
<i>Pycnonotus barbatus</i>	-	-	Abundant
<i>Phylloscopus trochilus</i>	+	-	-
<i>Cisticola natalensis</i>	+	-	Not common
<i>Camaroptera superciliaris</i>	-	+	-
<i>Passer domesticus</i>	+	-	Locally common
<i>Motacilla aguimp</i>	+	+	Common
<i>Motacilla capensis</i>	-	+	Not common
<i>Estrilda quartinia</i>	-	+	Common resident
<i>Lonchura cucullata</i>	+	+	Common
<i>Acrocephalus gracilirostris</i>	+	-	Common
<i>Acrocephalus rufesens</i>	+	-	Locally common
<i>Vidua macroura</i>	-	+	Common
<i>Actitis hypoleucos*</i>	+	+	Common
<i>Philomachus pugnax*</i>	+	+	Common
<i>Charadrius dubius*</i>	+	-	Not common
<i>Charadrius asiaticus*</i>	+	-	Migratory
<i>Turtur afer</i>	-	+	Common
<i>Circus ranivorus</i>	-	+	Locally common
<i>Phalacrocorax africanus*</i>	+	+	Common
<i>Phalacrocorax carbo*</i>	+	-	Locally common
<i>Ixobrychus minutus*</i>	+	-	Not common
<i>Egretta garzetta*</i>	+	-	Common
<i>Ispidina picta*</i>	-	+	Not common
<i>Alcedo cristata*</i>	+	-	Common resident
<i>Ceryle rudis*</i>	+	-	Common

Table 1:- List of Inventoried Species

Legend: the cross (+) shows the presence of a species in a site, the line (-) shows the absence of a species in a site and the Asterix (*) shows the aquatic species.

➤ *Systematic composition of species*

Several individuals of birds have been counted (527 birds). This count made it possible to identify 34 species grouped into 25 genera belonging to 14 families and 7 orders. Out of the total of 527 birds counted, 442 birds were observed and 85 others were captured.

Order	Family	Species
Passeriformes	Ploceidae	<i>Euplectesorix</i>
		<i>Quelea quelea</i>
		<i>Ploceuscastanops</i>
		<i>Ploceuspelzeni</i>
		<i>Ploceusocularis</i>
		<i>Ploceusxanthops</i>
		<i>Ploceusjacksoni</i>
		<i>Ploceusreichardi</i>
		<i>Ploceusmelanocephalus</i>
	Pycnonotidae	<i>Pycnonotusbarbatus</i>
	Sylviidae	<i>Philoscopusstrochilus</i>
		<i>Cisticolanatalensis</i>
		<i>Camaropterasuperciliaris</i>
	Passeridae	<i>Passer domesticus</i>
Motacillidae	<i>Motacilla capensis</i>	
	<i>Motacillaaguimp</i>	
Estrildidae	<i>Estrildaquartinia</i>	
	<i>Lonchuracucullata</i>	
Acrocephalidae	<i>Acrocephalusgracilirostris</i>	
	<i>Acrocephalusrufesens</i>	
Viduidae	<i>Viduamacroura</i>	
Charadriiformes	Charadriidae	<i>Actitishypoleucos</i>
		<i>Philomachuspugnax</i>
		<i>Charadriusdubius</i>
		<i>Charadriusasiaticus</i>
Columbiformes	Columbidae	<i>Turturafer</i>
Accipitriformes	Accipitridae	<i>Circusranivorus</i>
Pélécaniformes	Phalacrocoracidae	<i>Phalacrocoraxafricanus</i>
		<i>Phalacrocoraxcarbo</i>
Ciconiiformes	Ardeidae	<i>Ixobrychusminutus</i>
		<i>Egrettagarzetta</i>
Coraciiformes	Alcedinidae	<i>Ispidina picta</i>
		<i>Alcedocristata</i>
		<i>Cerylerudis</i>
TOTAL : 7	14	34

Table 2:- Composition of Inventoried Species

➤ *Specific wealth of families and orders*

Figure 1 shows that among these 14 families observed, the Ploceidae family was the most diverse in number of species with 9 out of a total of 32 obtained. It is followed by the family of Charadriidae with 4 species, the families of Sylviidae and Alcedinidae occupy the third position each with 3 species, the families of Motacillidae, Phalacrocoracidae, Ardeidae, Estrildidae and Acrocephalidae each occupy the fourth position and in order other families occupy the last position each 1 single species.

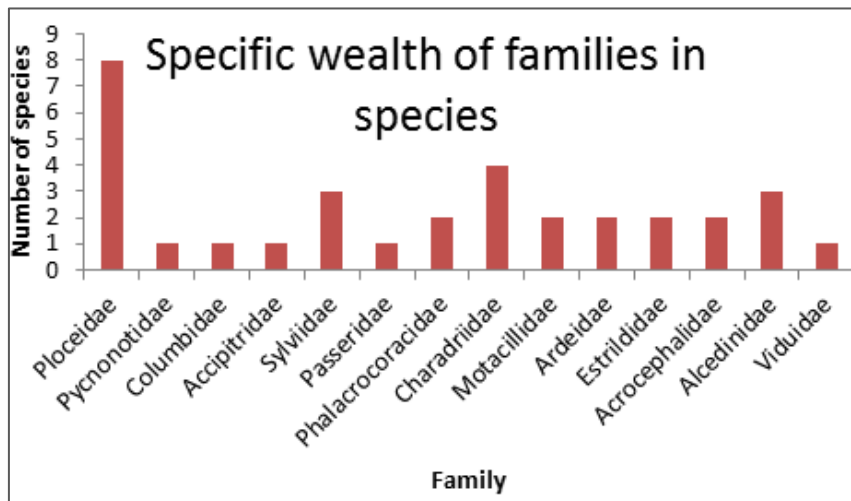


Fig 1:- Specific wealth of families in species

➤ Family wealth in gender

In terms of the wealth of families in gender; the families of Ploceidae, Sylviidae, Charadriidae and Alcedinidae occupy the first position each with 3 genera followed by the families of Ardeidae and Estrildidae each with 2 genera. The other families occupy the last position each with 1 gender (Figure 2).

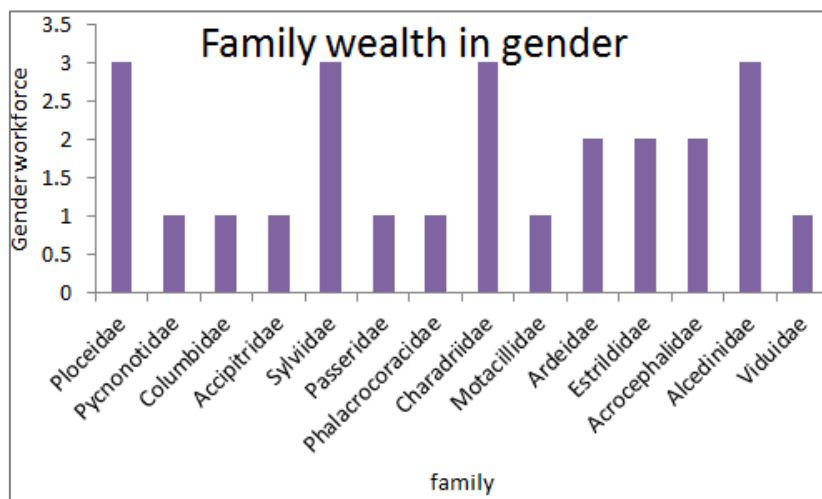


Fig 2:- Family wealth in gender

➤ Wealth of family orders

The Passeriformes order occupies the first position with 8 families out of 14 inventoried, or 57.14%.

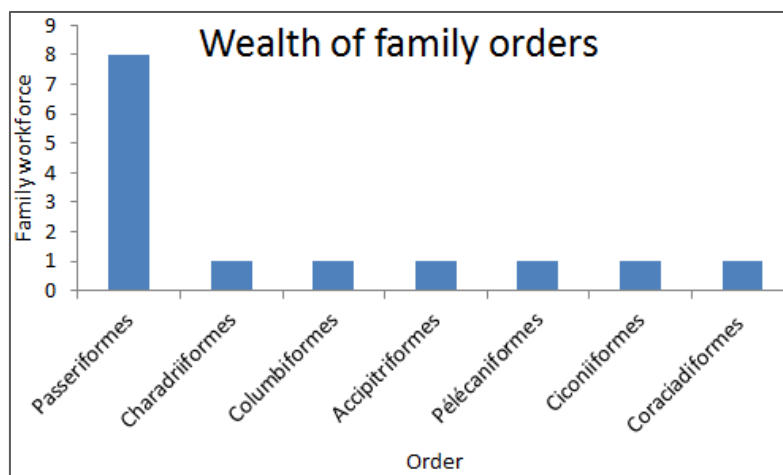


Fig 3:- Wealth of family orders

➤ *The specific richness of these species from various sites*

The Ruzizi Small Mouthpiece is the richest in species with 25 species, or 60%, and the Kakumba Mouthpiece with 17 species, or 40%. 17 species were found only in the site of the Little Ruzizi Mouthpiece, 9 in the Kakumba Mouthpiece and 8 having been found in all the sites.

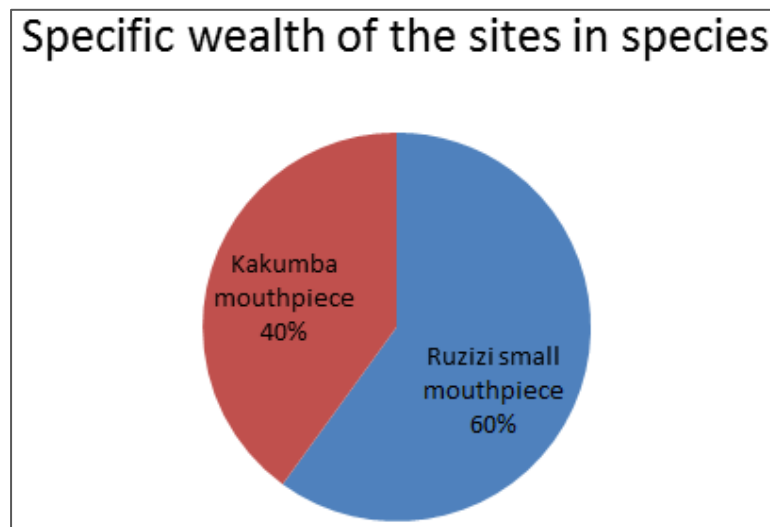


Fig 4:- Distribution of species in the two sites

IV. DISCUSSION

The results of our investigations carried out on the coast of Lake Tanganyika (Congolese side) for three months reveal that 34 species grouped into 25 genera belonging to 14 families and 7 orders have been inventoried.

Among this 14 families inventoried in Lake Tanganyika, 8 families were reported at the natural pond of Nyangara in Uvira territory: Accipitridae, Alcedinidae, Ardeidae, Charadriidae, Estrildidae, Phalacrocoracidae, Ploceidae and Passeridae (Cikwanine K., et al. , 2008). In Lake Kivu, 8 families have been inventoried: Ardeidae, Phalacrocoracidae, Alcedinidae, Sylvidae, Pycnonotidae, Ploceidae, (Bertin M., 2008; Papy L., 2010); Acrocephalidae and Estrildidae (Papy L., 2010; Magadju, 2015) and 5 families have been reported in the north-eastern part of Algeria: Phalacrocoracidae, Ardeidae, Accipitridae, Charadriidae, Alcedinidae (S. Metalaoui and M. Houhamdi, 2010).

Two sites were visited on the shoreline of the lake for data collection (Little Ruzizi Mouthpiece and Kakumba Mouthpiece). The distribution of bird species in these sites is as follows: 25 species at the small Ruzizi mouthpiece and 17 others at the Kakumba mouthpiece. It is therefore the site of the Ruzizi Small Mouthpiece which is richer in species. This richness in species could be justified by the number of visits to this site (4 exits) and by the fact that this site seems to be the least disturbed because there is still a cover of macrophytes serving as shelter and nesting place for the birds.

Consequently, the low numbers of birds found in the other site would be due to the various disturbances which weigh on these sites such as the presence of fields,

activities of the population, presence of Beach which was created by deforestation, etc. Let us also add that it is because of constructions on the 10 meters from the shores which are also the cause of deforestation of the coast.

Our study shows that the Passeriformes order is the richest family order in this ecosystem, it contains more than half of the families obtained with 8 out of 14 families distributed in the other orders. This could be true because, Jacques BERLIOZ, 1946; UPOKI, 2001; Bertin M., 2008 and Papy L., 2010; in their studies, they have shown the consideration of the order Passeriformes of all avian orders as it contains more than half of all known species of birds in the world today.

Out of the total of 34 species of birds inventoried on the coast of Lake Tanganyika, 11 species are aquatic (Actitishypoleucos, Philomachus pugnax, Charadrius dubius, Charadrius asiaticus, Phalacrocorax africanus, Phalacrocorax carbo, Ixobrychus minutus, Egretta garzardar, etc.) Based on G. W. Coulter, 1991; water birds are birds that depend on the aquatic environment for reproduction or food. The presence of these bird species on the shore of Lake Tanganyika is due to the search for food. Generally Lake Tanganyika is poor in aquatic birds and this could be explained by the fact that the coastal environment of this lake is disturbed by anthropogenic activities. 23 others are non-aquatic. The presence of non-aquatic bird species in this ecosystem could be justified by the presence of fields where corn and other seed crops are grown, since some of this group are granivores and others are insectivores.

Some of these species have been reported as pests of agronomy in South Kivu (Kizungu, 1996).

V. CONCLUSION

The inventory made of the coastal birds of Lake Tanganyika in Uvira territory during February, March and May; at two sites (the Ruzizi Small Mouthpiece and the Kakumba Mouthpiece), 527 birds distributed among 34 species, 25 genera, 14 families and 7 orders were counted. 11 species were aquatic birds and 23 others were non-aquatic.

Among these 527 birds inventoried on the shore of Lake Tanganyika, 442 were observed using a pair of binoculars near the lake or flying over the waters of the lake, in full flight, on stones, on sand, in the bush on the banks of the lake and 85 others were captured using 3 Japanese nets installed in calm places stretched between 4 distant sticks 12m long in aquatic macrophytes.

The Ploceidae family is rich in number of species, it alone includes 9; followed by Charadriidae with 4 species. The families of Sylviidae and Alcedinidae are in third position each with 3 species, the families of Motacillidae, Phalacrocoracidae, Ardeidae, Estrildidae and Acrocephalidae each take fourth position with 2 species. The other families occupy the last position, each with a single species. The Passeriformes order includes more than half of the families obtained, or 57.14%.

In the context of this work, the density of birds per net hour is $85/138 = 0.61$ bird per net hour.

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