

Bird Conservation in the Ruzizi Delta, Northern End of Lake Tanganyika in Burundi and the Democratic Republic of Congo

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ABSTRACT

The investigation of bird conservation in the Ruzizi Delta was carried out within the framework of a global doctoral research on the ecology, conservation and management of birds of the Ruzizi Delta by interviews with the help of a questionnaire, direct observation and real and virtual bibliography via the Internet. The questionnaire was intended for users of wetlands in the Ruzizi Congolese Delta, with a view to creating a community wetland reserve for the conservation of birds and biodiversity and for the well-being of local populations. 87.5% were in favour, 7.5% were against and 5% abstained. Direct observation has identified the existence and mapping of wetlands that can be classified in accordance with environmental and wetland protection laws. The literature has led us to identify what is known and where there is still a shade area with regard to the conservation of birds by the protection of their ecosystems. The protection of the wetlands of the Ruzizi Congolese Delta will also contribute to the stabilization of the conservation efforts of the Ruzizi Burundian Delta which is a Ramsar site and of the northern end of Lake Tanganyika which already is inscribed on the UNESCO heritage list. By extending the list and extent of protected areas, this community reserve will also be favorable to the fight against natural disasters, epidemics and global warming and to the achievement of sustainable development objectives.

Keywords: Bird conservation, Protection of wetlands, Community reserve, Northern end of Lake Tanganyika, Biodiversity stronghold

INTRODUCTION

Located between the two arms of the Ruzizi River, the Grande Rusizi and the Small Ruzizi, the Ruzizi Delta is 85% a mosaic of wetlands. It includes streams, ponds, marshes and lagoons, especially during the rainy season. The wetlands are among the most productive ecosystems, they harbour very rich bio-diversity, and birds are at the apex of the food-chain in wetland ecosystems (Narayanan & Sreekumar, 2012). The Ruzizi Delta is thus the bastion of biodiversity, comprising micro-organisms, macro invertebrates, plants and animals, mostly endemics. Wetlands are known as “biological supermarkets” because of the extensive food chain and rich biodiversity they support providing unique habitats for a wide range of fauna and flora (Mitsch & Gossilink, 2000).

The Burundian Ruzizi Delta has about 193 identified plant species, distributed in 55 families of which the Poaceae, Fabaceae, Malvaceae and Convolvulaceae are the richest

with more than 10 species each (Ntakimazi, Nzigidahera, Nicayenzi, & West, 2000). In addition, 6 species distributed in 5 families of Great Mammals, 12 species distributed in four families, 120 bird species distributed in 39 families, 12 species distributed in nine families, 17 species of Amphibians distributed in five families, 11 species of fishes, and 10 species of Molluscs are told in the Ruzizi Burundian Delta (Ntakimazi, Nzigidahera, Nicayenzi, & West, 2000).

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This chapter for bird conservation in the Ruzizi Delta aims investigate stakeholder’s opinions for the protection of the Ruzizi Congolese wetlands of the Ruzizi Congolese Delta as community reserves, private or public ones for bird and biodiversity conservation. The Ruzizi Congolese Delta has free access and birds are threatened by wetlands overexploitation. Some measures must be taken for wetland bird species to survive in Ruzizi Delta, both in of DRC (BirdLife International 2015; (Seyler, Thomas, Mwanza, & Mpoy, 2010); (Demey & Louette, 2001)and in Burundi (BirdLife, 2020); (USAID, 2010); (Nkezabahizi & Bizimana, 2008).

MATERIALS AND METHODS

Materials

A questionnaire on the place name, the presence of birds in the area, most known birds and their opinions to protect wetlands for bird and biodiversity conservation was formulated.

Methods

In each sampled site, we taught the importance of crocs and hippos in a river, a pond or a lagoon and then we submitted a questionnaire to ten people, including the local chef, two farmers, two fishermen, two cow keepers, two fish sellers and one people security keeping.

RESULTS

The results that we present mainly concern: (1) One hundred respondents randomly chosen at the rate of 25 per site: their sex (gender), their age, their location, their functions, their seniority in the function, their marital status, people in charge; (2) Knowledge of birds by respondents; (3) The usefulness or otherwise of birds; (4) The gradual increase or decrease in birds over the past five years; (5) Why are birds gradually declining over the past five years? (6) What to do for the sustainable conservation of birds and biodiversity in the Ruzizi Congolese Delta? Appendix 1 presents the survey questionnaire for the below results.

The respondents

Sex of respondents

Figure-1 presents the diagram of sex of respondents. 31 (78%) respondents were female and only nine (23%) of them were male. The difference between sex of respondents was highly significant ($\chi^1=30.25$; $df=1$; $p< 0.05$).

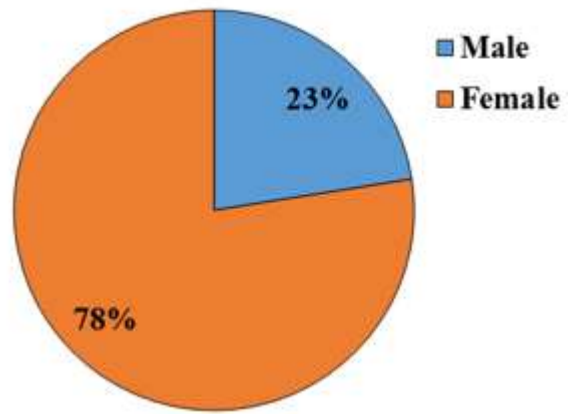


Figure-1. Gender of respondents (Source: Our fieldwork of 2019-2021)

Slices of age respondents

Nine more young respondents (26%) had an age between 18-35, 25 adults (63%) had a 36-65 age and six older respondents (15%) had a bigger age than 66 years old (Figure 2). The difference between slices of age of respondents was highly significant ($\chi^2=39.125$; $df=2$; $p< 0.05$).

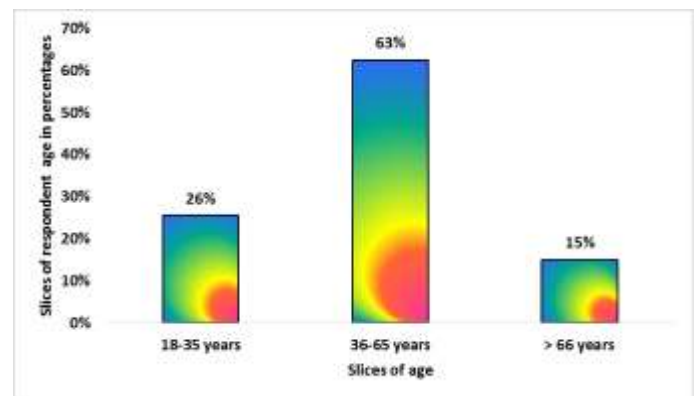


Figure-2. Slices of age of respondents (Source: Our fieldwork of 2019-2021)

Location of respondents

Figure-3 presents the distribution of respondents per site. Most of them (27.5%) reside near around the site of Kavimvira Border Office Ponds (KBOP), and then 25% of them reside in the site of Kyamvubu (Kya) and in the site of Kahorohoro (Kah). Finally, 22.5% of respondents reside in the site of Vugizo. The difference among the distribution of respondents per site was not significant ($\chi= 0.50$; $df= 3$; $p> 0.05$).

Our respondents were distributed into the following activities, that we call functions (Figure 4). : 25% of them were fish sellers (FS); 22% were farmers (Fa); 20% were fishermen (Fi); 17.5% were cow breeders (CB); and 15% of

^{1,2} Chi Squarred Test

them were security keepers (SK). There is no significant difference between the distribution of respondents among different functions ($\chi= 3,125$; $df= 4$; $p> 0.05$).

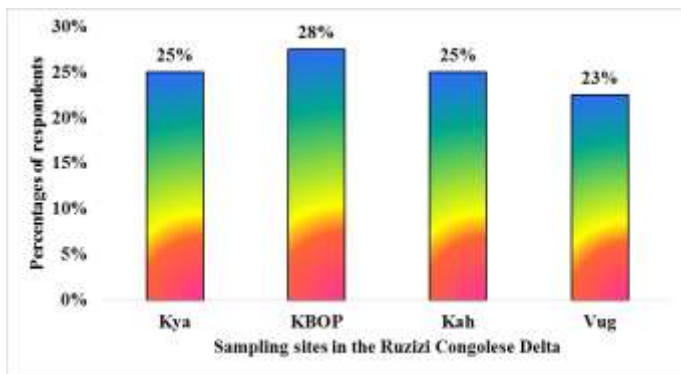


Figure-3. Distribution of respondents per sampled sites
 Legend: *Kya*, Kyamvubu site; *KBOP*, Kavimvira Border Office Ponds; *Kah*, Kahorohoro site; *Vug*, Vugizo site. *Source:* Our fieldwork of 2019-2021

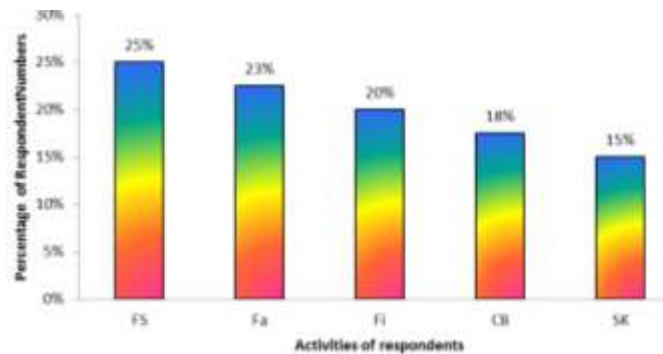


Figure 4 Functions of respondents
 Legend: *FS*, Fish sellers; *Fa*, Farmers; *Fi*, Fishermen; *CB*, Cow breeders; *SK*, Security keepers. *Source:* Our surveys of 2019-2021

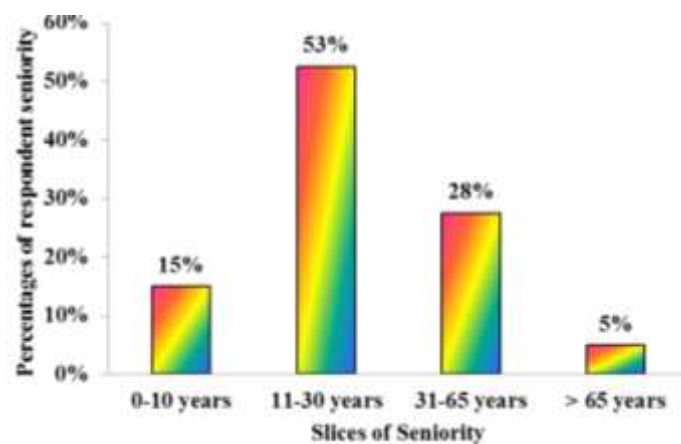


Figure 5 Slices of seniority of respondents
Source: Our surveys of 2019-2021

Slices of seniority of respondents

The seniority of respondents includes the following slices: 0-10 years, 15% of respondents; 11-30 years, 53% of respondents; 31-65 years, 28% of respondents; and above 65 years, 5% of respondents. There was a highly significant difference between the slices of respondents ($\chi^3=50.5$; $df= 3$; $p< 0.05$).

Civil status of respondents

Figure-6 presents the civil statuses of respondents. Most of them were married (70%), others were widow (15%), divorced (10%) and single (5%). There is a highly significant difference between the statuses of respondents ($\chi^4=110$; $df=3$; $p< 0.05$).

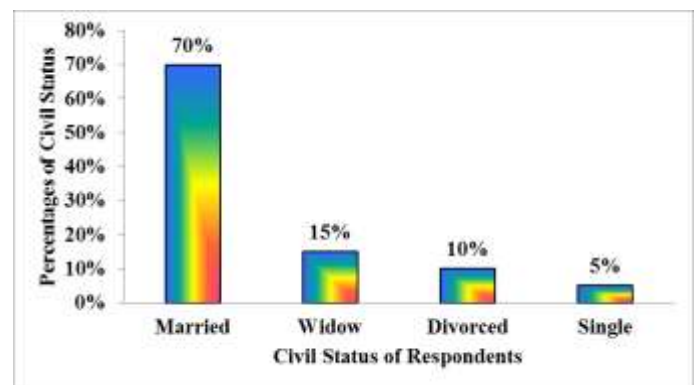


Figure 6 Civil statuses of respondents
Source: Our surveys of 2019-2021

Slices of people in charge of Respondents

Figure-7 presents the slices of people in charge of respondents. Most respondents have 6-10 people (53%); others have 11-15 people (28%); 0-5 people (15%) and more than 16 people (5%). The difference is highly significant among slices of people in charge of respondents ($\chi=50.5$; $df=3$; $p< 0.05$).

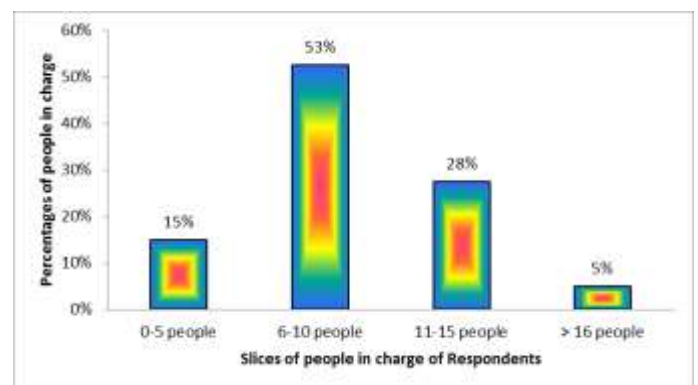


Figure 7 Slices of people in charge of respondents
Source: Our surveys of 2019-2021

³ Chi Squarred Test

⁴ Chi Squarred Test

Bird knowledge

The bird species most known in the Ruzizi Congolese Delta are: *Motacilla aguimp* (16%); *Corvus albus* (15%); *Pycnonotus barbatus* (14%); *Bubulcus ibis* (12%); *Ceryle rudis* (11%); *Ploceus Baglafecht* (10%); *Anastomus lamelligerinus* (9%); *Ardea purpurea* (6%); *Pelecanus oncorotalus* (4%); and *Pelecanus rufescens* (2%). There is a significant difference of bird knowledge in the Ruzizi Congolese Delta ($\chi^2= 20,933$; $df= 9$; $p< 0.05$).

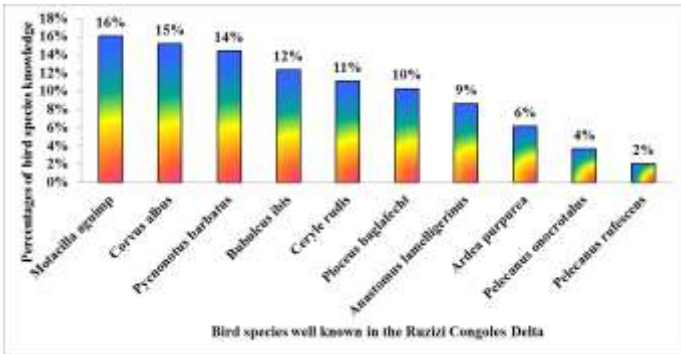


Figure 8 Bird knowledge of respondents in the Ruzizi Congolese Delta

Source: Our surveys of 2019-2021

Bird Usefulness

Figure-9 presents bird usefulness in the Ruzizi Congolese Delta. 78% of our respondents told that birds are useful; 15% said that birds are useless; and 8% told they don't know (abstention). There is a highly significant difference among options of bird usefulness in the Ruzizi Congolese Delta ($\chi=88,625$; $df= 2$; $p< 0.05$).

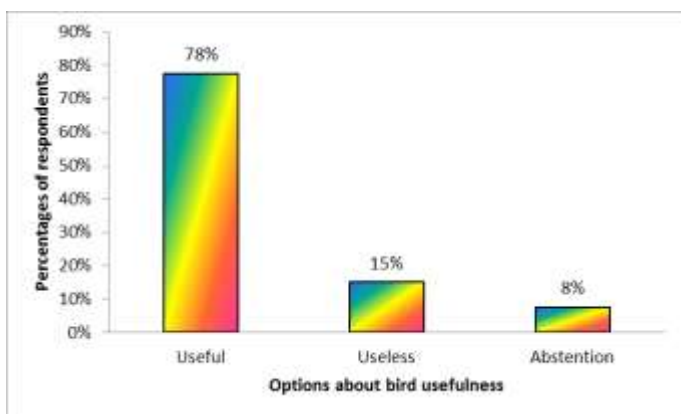


Figure 9 Bird usefulness in the Ruzizi Congolese Delta

Source: Our surveys of 2019-2021

Are birds increasing or decreasing during the last five years?

Figure-10 presents responses on the question: «Are birds decreasing or increasing in the Ruzizi Congolese Delta the last five years»? Most respondent told birds are decreasing

(68%), 25% told birds are increasing, and 8% told they don't know (abstention). There is a significant difference among options of decreasing and increasing of birds in the Ruzizi Congolese Delta ($\chi=57,125$; $DF=2$; $p<0.05$).

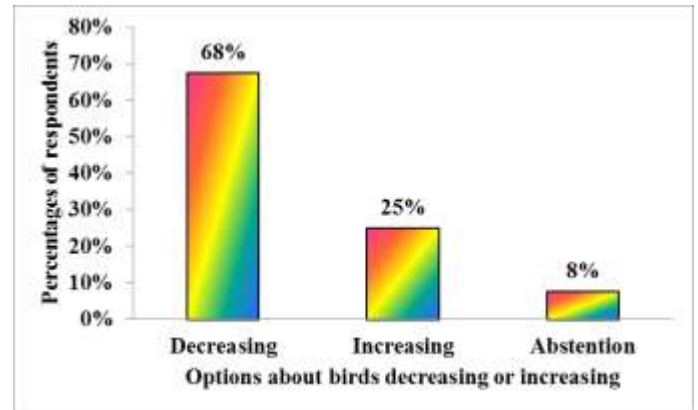


Figure 10 Are birds increasing or decreasing in the Ruzizi Congolese Delta during the last five years?

Source: Our surveys of 2019-2021

Reasons for bird decreasing in Ruzizi Delta during the last five years

Figure-11 presents the reasons told by our respondents for bird decreasing in the Ruzizi Congolese Delta during the last five years. These are: Wetlands destruction (78%); Non respect of environmental law (13%); and bird capturing (10%). There is a highly significant difference among options of bird decrease and increase in the Ruzizi Congolese Delta ($\chi=87,875$; $df= 2$; $p< 0.05$).

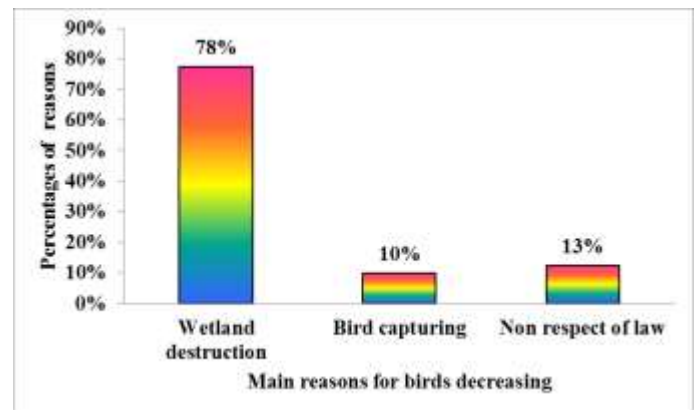


Figure 11 Reasons for bird decreasing in the Ruzizi Delta during the last five years

Source: Our surveys of 2019-2021

Suggestions to improve bird increase

Figure-12 presents the suggestions of respondents to improve bird increase in the Ruzizi Congolese Delta. These are: Public sensitization (38%); Wetlands protection (35%); and Environmental Law respect (28%). There is no

⁵ Chi Squarred Test

significant difference among the suggestions to improve bird increase and conservation in the Ruzizi Congolese Delta ($\chi=1,625$; $df= 2$; $p> 0.05$).

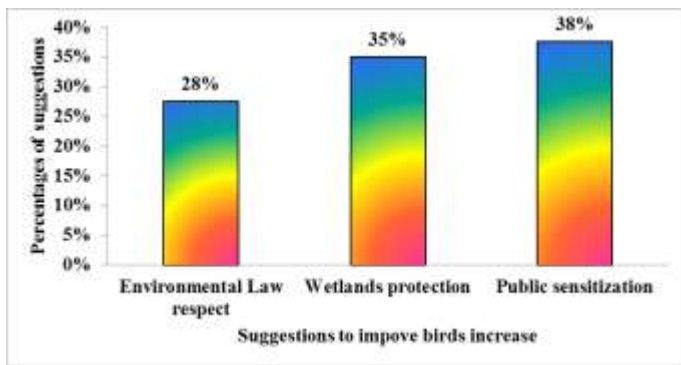


Figure 12 Suggestions of respondents to improve bird increase

Source: Our surveys of 2019-2021

Existence of Environmental Law in DRC

Figure-13 presents the responses for the question: «Does environmental Law exist in DRC»? These are: Yes, 58%; No, 28%; and I don't know, 15%. There is a significant difference between the responses on the existence of environmental law in DRC ($\chi=28,625$; $df=2$; $p< 0.05$).

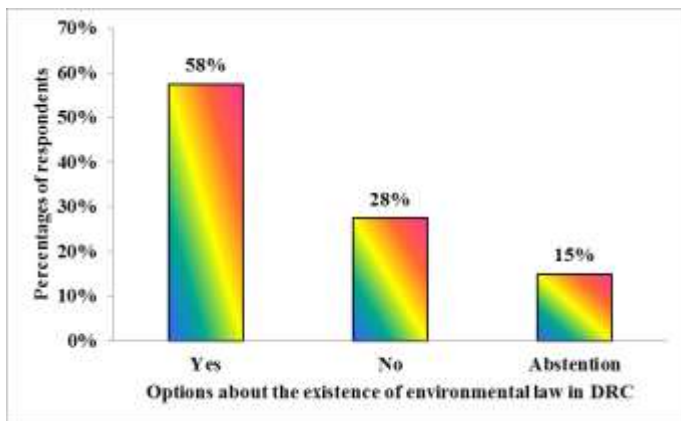


Figure 13 Existence of environmental law in DRC

Source: Our surveys of 2019-2021

Statements of environmental Law in DRC

Figure-14 presents major statements of environmental law of DRC for bird and biodiversity conservation in the Ruzizi Congolese Delta. These are: 100m free from the Lake Tanganyika shoreline, rivers and ponds (25%); protect wetlands (23%); Protect some bird species (20%); Protect visible and invisible biodiversity (15%); Protect crocodiles (10%); Protect hippopotamuses (8%). There is a significant difference among the statements of environmental law in DRC ($\chi^6=14.750$; $df=5$; $p< 0.05$).

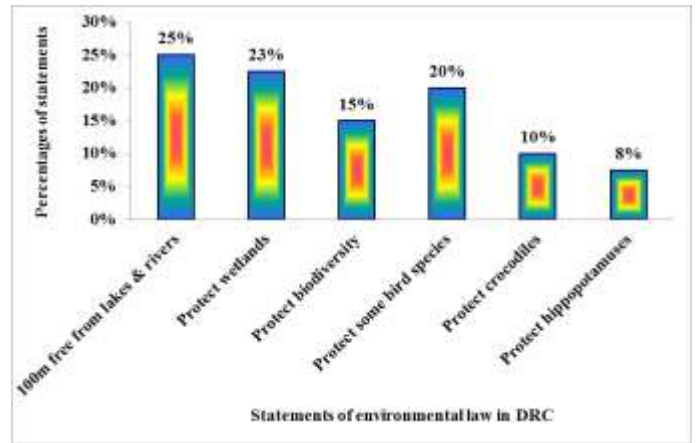


Figure 14 Statements of environmental law in DRC

Source: Our Survey of 2019-2021

Public opinion about the Ruzizi Congolese Delta wetlands protection

Figure-15 presents the following opinions of respondents regarding the full protection of the Ruzizi Congolese Delta: Yes, 88%; abstention, 5%; and no, 8%. The difference is highly significant between the public options to protect the Ruzizi Delta for bird and biodiversity conservation ($\chi=132,125$; $df=2$; $p< 0.05$).

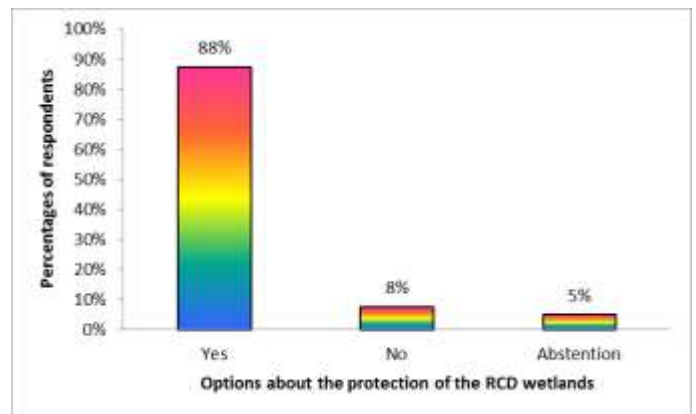


Figure 15 Public options about the protection of Ruzizi Delta for bird's conservation

Source: Our Survey of 2019-2021.

Benefits of protection for stakeholders

Figure 16 presents the benefits from wetlands protection to stakeholders in the Ruzizi Congolese Delta. Among the multiple benefits our respondents told about agriculture productivity firstly (18%), followed by cow breeding productivity (15%), fish productivity (13%), Ramsar birds

⁶ Chi Squarred Test

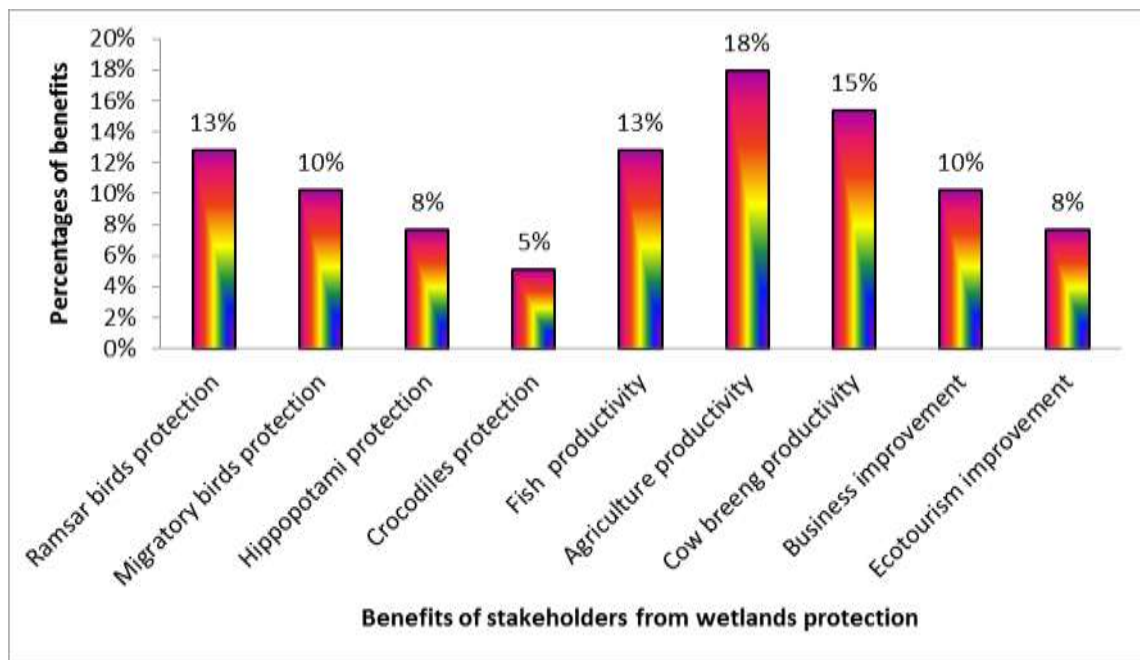


Figure 16 Benefits from wetlands protection to stakeholders

Source: Our Survey of 2019-2021

protection (13%), migratory birds protection (10%), business improvement (10%), Hippos protection (8%), ecotourism improvement (8%), and finally Crocodile protection (5%). The difference among the benefits from wetlands protection to stakeholder was significant ($\chi^2=11,834$; $df=8$; $p<0.05$).

DISCUSSION

The respondents

Saxe, slices of age, civil status and seniority of respondents

In the Ruzizi Delta ladies are mainly implied in farming, selling fish, security keeping and even fishing activities which are low-wage jobs. For that reason, 78% of our respondents were female and 23% were male. Women are more frequently found in insecure, low-wage jobs while men are concentrated in higher income jobs with more security and benefits (Badru, 2020). Most respondent have a slice age of 36-65 years (62.5%), which represents the active population followed by young people of 18-35 years, while oldest people with more than 65 years represent only 15%. To reduce inequality, we have to promote inclusive growth, by creating economies where every citizen, regardless of income, wealth, gender, race or origin is empowered to succeed (Keeley, 2015).

There was no significant difference between the respondent distributions per sites of Kyamvubu, Kavimvira Border Office Ponds, Kahorohoro, and Vugizo.

The arrangement of members of a population within a habitat is referred to as dispersion or the distribution or pattern of a population (Brower, Zar, & Ende, 1997). The pattern of our respondents was uniform for the validity of their opinions to protect the Ruzizi Congolese Delta. They were fish sellers, farmers, fishermen, cow breeders and security keepers and there were no significant difference so that their opinions were representative for all the four sites of the studied area. There was a significant difference between the slices of seniority of respondents of which the highest was 11-30 years, young and most active population, then 31-65 years adult and active people, 0-10 years and the lowest was above 65 years, the oldest people (Brower, Zar, & Ende, 1997).

The approach of (Keeley, 2015) to reduce inequality promotes inclusive growth, creating economies where every citizen, regardless of income, wealth, gender, race or origin is empowered to succeed by means of four main pillars: (1) Overcome gender inequalities; (2) Labour market policies need to address working conditions as well as wages and their distribution; (3) A focus on education in early years is essential to give all children the best start in life; (4) Governments should not hesitate to use taxes and transfers to moderate differences in income and wealth.

Slices of people in charge of respondents and development

Most respondents were married, others were widow, divorced, and least of them were single. It is recommended that rural development planners must take

⁷ Chi Squarred Test

into account the special circumstances of the rural people especially their age, sex, occupation, educational level and marital status if they are to participate meaningfully in development (Itari, Bullem, & Okeme, 2015). Most respondents had the slice of 6-10 people in charge, others had 11-15 people, 0-5 people and least of them had more than 16 people in charge (Itari, Bullem, & Okeme, 2015). The members of rural households which are engaged in subsistence farming are less likely to work on a permanent basis in non-agricultural sectors, particularly because jobs and income opportunities in the non-agricultural sectors are insecure and perceived to be risky (Kang & Dannet, 2013).

Bird knowledge, usefulness, and decreasing

Bird knowledge

In nature, the most known birds in the Ruzizi Congolese Delta are *Motacilla aguimp*, *Corvus albus*, *Pycnonotus barbatus*, *Bubulcus ibis*, *Ceryle rudis*, *Ploceus baglafaecht*, *Anastomus lamelligerinus*, *Ardea purpurea*, *Pelecanus oncotatus*, and *Pelecanus rufecens*. Among this list, important birds for conservation are water birds like *Bubulcus ibis*, *Ceryle rudis*, *Anastomus lamelligerinus*, *Ardea purpurea*, *Pelecanus oncotatus*, and *Pelecanus rufecens* and the migrant bird species, *Anastomus lamelligerinus* (Stevenson & Fanshawe, 2002). About the usefulness of birds most of respondents told that birds are useful, others said birds are useless and some others told they do not know (abstention). Birds are indicators of the environmental health: this means environmental changes can be detected by changes in the natural behaviour of bird species (BirdLife, 2018). For examples: In some parts of Africa, the presence of birds like Abdim's stork *Ciconia abdimii* is associated with rain. Also, some bird species help identify priority areas where anthropogenic activities need to be carefully managed (BirdLife, 2018).

Bird decreasing challenges

Most respondent told birds are decreasing, few others told birds are increasing, and very few of them told they don't know (abstention). An important planning issue of key importance to bird conservation in Africa is incorporating ecology into conservation strategy (Cowling *et al.*, 1999). One obvious ecological process that has yet to be satisfactorily addressed is migration (Nicholls, 1998) despite the high profile of the; 200 bird species that breed in Europe and winter in Africa (Moreau, 1972) some of them are found the Ruzizi Delta. The great majority of migrants are insectivores: birds that are unlikely to be able to sustain themselves during the Palaearctic winter. Quails *Coturnix coturnix*, Turtle Doves *Streptopelia turtur*, Ruffs *Philomachus pugnax*, recorded in the Ruzizi Delta, and Bimaculated Larks *Melanocorypha bimaculata* are amongst the few granivores that migrate to Africa (Fry, 1983). In the Ruzizi Delta, the bird decreasing challenges

raised three main reasons, wetland destruction, non-respect of environmental law and free bird capturing. Various criteria have been used for prioritising areas for conservation and these are: diversity, abundance, rarity, conservation status and multiple criteria indices (William, 2001).

Challenges of wetlands destruction

Traditional and modern agricultural expansions, continuous land degradations, urbanizations and industrializations, lack of policies and institutional arrangements, lack of capacities, natural and ecological problems are the most dominant challenging factors of wetlands (Bekele & Getahun, 2020). Conservation of wetlands is a relatively recent priority, and it has seen more recent shifts from protection of remaining wetlands initially as a static biodiversity resource towards a focus on the many, formerly largely undervalued beneficial functions that these ecosystems provide to society (Bekele & Getahun, 2020).

Wetlands are defined as areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters (Ramade & Roche, 2006). Sustainable livelihoods based on wetland resources have proven to be very delicate and so as a wetland ecosystem degraded, the livelihoods of most rural poor people deteriorate (Zinhiva, *et al.*, 2014).

Maintaining wetlands health is as important as maintaining wetland acreage and the various functions provided by wetlands; wildlife habitat, water quality improvement, flood water retention, recreation opportunities, etc., are often directly related to wetland health (Stelk & Christie, 2016). Wetland conservation is a young science and its management largely depends on adaptive management approaches and other challenges include inadequate funding of wetland conservation initiatives, inadequate community participation, variability of climatic conditions, lack of political goodwill and lack of wetland management plans to guide towards wise use of wetlands (Obiero, *et al.*, 2012). Wetlands are often considered as nature based solutions that can provide a multitude of services of great social, economic and environmental value to human kind. Changes inland-use, water-use and climate can all impact wetland functions and services (Thorslund, *et al.*, 2017).

Fight against bird decreasing

To fight against bird decreasing, the respondents gave three ways with the same weight: Environmental law respect, wetlands protection and public sensitization. The African continent's rapid development had brought with it different changes and needs. These include high demand for space, road and rail networks, electricity and

industrialization, more broadly (BirdLife, 2020). Africa has a great need for infrastructure to spur development, whose role out should maximise the benefits of a rightly planned development (BirdLife, 2020). For example, the growing need for power and electricity to match Africa's rate of development leads to increase in electricity power lines and wind farms (inspired by green energy).

However, if these are not sited properly, they can cause harm to several African and migrant bird species through collision challenges (BirdLife, 2020). While there are benefits of having roads, ports or windmills constructed, the location of such infrastructure should be carefully put into consideration (BirdLife, 2020). Another growing concern is hunting and trapping of birds for traditional medicine, belief-based reasons (African vulture species in particular), domestic pets (for example African Grey Parrots) or game. These threats are pertinent across the continent. Poverty and inadequate appreciation of nature have also been cited as underlying challenges facing conservation in Africa. Many disenfranchised communities and the majority of the development sector are directly dependent on ecosystem services such as wood, water and arable land (BirdLife, 2020).

This thesis intends to put the spotlight on, and emphasize the need to conserve Congolese, Burundian and Africa's biodiversity and ecosystem services by providing information needed for the creation of protected wetland areas in the Ruzizi Congolese Delta. The nature sector is the fastest-growing of the competing industries, growing its revenues at 5-6% per year, compared less than 1% for agriculture and a contraction (revenue decline) in fisheries (Waldron, et al., 2020). So, wetland protection in the Ruzizi Delta is the best economic business to landowners' people compared to farming and cow breeding in irregularly inundated areas.

Conservation areas also generate economic benefits (e.g. revenue from nature tourism and ecosystem services), making Protected Areas/ Nature and economic sector in their own right and if some economic sectors benefit but others experience a loss, high-level policy makers need to know the net impact on the wider economy, as well as on individual sectors (Waldron, et al., 2020).

Existence of Environmental Law in the DR of Congo

Concerning the existence of Environmental Law in DRC, 57.50% of respondents told «Yes», 27.50% told «No» and 15% told they don't know (abstention). There is a significant difference between their responses, confirming that there is an Environmental Law in DRC which must be applied at the national, provincial, local and international levels (Cabinet & DRC, 2014); (Cabinet & DRC, 2011).

Adoption of Environmental Laws in DRC at national, provincial and local levels

The Ministry of the Environment has set up an Environmental and Social Management Framework (ESMF) and established the Support Project for Forest Dependent Communities (FDC) that the Congolese Government intends to implement with the support from the World Bank (Cabinet & DRC, 2002). This framework aims to establish guidelines to ensure that the selection, appraisal and approval of micro-projects and their implementation comply with both national socio-environmental policies, laws and regulations to the World Bank's environmental protection policies (MENTC, 2015). On February 11, 2014, the DRC promulgated Law No. 14/003 of February 11, 2014 relating to the conservation of nature (Cabinet & DRC, 2014).

Under the aegis of IUCN and UNEP, the DRC adopted since 2009, the comparative legal analysis of draft framework laws on the environment in the Democratic Republic of the Congo which was considered as an effective and comprehensive environmental legislation in that time (IUCN & UNEP, 2009). On July 16, 2011, the DRC promulgated Law n°11/009 of July 9, 2011 on fundamental principles relating to the protection of the environment, Environmental Law, Organic Texts, Ministries, Public Establishments (Cabinet & DRC, 2011). On August 29, 2002, the DRC promulgated Law No. 011/2002 of August 29, 2002 on the DRC's forest code which also defines the legal rules applicable to forestry, forest research, processing and trade in forest products and the sustainable conservation of biodiversity and its ecosystems (Cabinet & DRC, 2002). On December 31, 2015, the Presidency of the Republic of the DRC promulgated the law relating to water and the protection of ecosystems adjacent to water such as the shores of lakes, rivers, natural ponds and wetlands in general (President & DRC, 2016).

In 2017, the DRC adopted the FPP (Forest Peoples Program) initiated by the English and Netherlands NGDO, presented as the Congolese Environmental Community Paralegal Guide in 12 themes, among which: (1) the code of good conduct paralegals; (2) the right to self-determination of indigenous peoples and local communities; (3) the right to a healthy environment; (4) good governance of natural resources; (5) the right of local communities and indigenous peoples to the "CLIP"; (6) rights of access to natural resources; (7) notions of sustainable development; (8) notions of codes in environmental matters; (9) on the family code; (10) on the concepts of REDD + (REDD means the reduction of emissions linked to deforestation and forest degradation); (11) notions on fishery resources in the DRC; and (12) notions on sexual violence (Olga, Bobia, & Kipalu, 2017).

"CLIP" is recognized in international and regional African law, in particular under the following legal instruments: (1) The United Nations Declaration on the Rights of Indigenous Peoples; (2) Convention 169 of the International Labour Organization (ILO) concerning Indigenous and Tribal Peoples in Independent Countries;

(3) The International Covenant on Civil and Political Rights; (4) The International Covenant on Economic, Social and Cultural Rights; (5) The Convention on the Elimination of All Forms of Racial Discrimination; (6) The Convention on Biological Diversity; and (7) The African Charter on Human and Peoples' Rights (Olga, Bobia, & Kipalu, 2017).

In November 2012, the Council of Ministers adopted the National REDD+ Framework Strategy, which aims to stabilize the forest cover at 63.5% of the national territory from 2030, and to maintain it thereafter. This strategy, which aligns with national development plans and frameworks, as well as with the international agreements of the United Nations Framework Convention on Climate Change (UNFCCC), promotes policies and measures to promote sustainable development and integrated.

It makes REDD+ a lever capable of supporting the efforts to be carried out in terms of national governance, political reforms, improvement of the standard of living of the Congolese population and poverty reduction (IMF, 2013).

International conventions signed or ratified by the DR of Congo

The Democratic Republic of Congo (DRC) has acceded to around 46 international conventions on the protection of the environment and the sustainable management of renewable natural resources (forests, water and biodiversity), some of which are of direct or indirect interest to the Ruzizi Delta (RDC & MECNT, 2013) such as⁸: (1) African Convention for the Conservation of Nature and Natural Resources (ACCNNR), adopted in Alger (Algeria) on September 15, 1968, ratified on October 9, 1969 by the ICCN (Congolese Institute for the Conservation of Nature) and updated on November 13, 1976 by the DCN (Direction de la Conservation de la Nature); (2) International Convention for the Protection of Plants (ICPP), adopted in Rome (Italy) on December 6, 1951 and ratified on September 16, 1972 by the DEHPE (Department of Human Settlements and Environmental Protection); (3) Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), adopted in Washington (United States) on March 3, 1973 and ratified on October 18, 1976 by the DCN (Direction de la Conservation de la Nature); (4) Convention on the Prohibition of the use of techniques for Modifying the Environment for Military Purposes or any other hostile purposes (CPMEMP), adopted in Geneva (Switzerland) on February 28, 1978 and ratified on February 28, 1978 by the DEHPE (Directorate of Human Settlements and Environmental Protection); (5) Convention on the

conservation of Migratory Species belonging to Wild Fauna (CCMSWF), adopted in Bonn (Germany) on June 23, 1979 and ratified on September 01, 1990 by the ICCN (Congolese Institute for the Conservation of Nature); (6) Convention for the Protection of the Ozone Layer (CPOL), adopted in Vienna (Austria) on March 22, 1985 and ratified on September 15, 1990 by the DEHPE (Directorate of Human Settlements and Environmental Protection); (7) Convention on Wetlands of International Importance Particularly as Waterfowl Habitat or "Ramsar", adopted in Ramsar (Iran) on February 2, 1971 and ratified on September 15, 1994 by the DRE (Department of Water Resources); (8) Convention on Biological Diversity (CBD), adopted in Rio de Janeiro (Brazil) on June 4, 1992 and ratified on December 8, 1994 by the DDD (Department of Sustainable Development); (9) United Nations Framework Convention on Climate Change (UNFCCC), adopted in Rio de Janeiro (Brazil) on June 4, 1992 and ratified on December 8, 1994 by the DDD (Department of Sustainable Development); (10) Phytosanitary Convention for Africa (PCA), adopted in Kinshasa (DRC) on September 13, 1967, and ratified on September 13, 1975 by the DGF (Directorate General of Forests); (11) International Union for the Conservation of Nature (IUCN), adopted in 1992 and ratified in 2005 by ICCN (Institut Congolais pour la Conservation de la Nature); (12) Agreements on Migratory Waterbirds of Africa Eurasia (AEWA), not yet adopted and not yet ratified but whose information is available at the ICCN level; (13) Convention on Desertification and Drought Control (CDDC), adopted on September 12, 1997 but not yet ratified by the DRC; (14) Protocol on climate change (PCC) adopted in Kyoto (Japan) on February 16, 2005 by the DDD but not yet ratified by the DRC; (15) Global Environment Fund (GEF) not yet adopted and not yet ratified by the DRC but whose information is available at the level of the DDD (Sustainable Development Department); (16) United Nations Programme for the Environment (UNEP) under discussion by the DEHPE (Directorate of Human Settlements and Environmental Protection) but not yet adopted or ratified by the DRC; (17) Convention on Pollution Control and Biodiversity Protection of Lake Tanganyika under analysis at the level of DEHPE (Directorate of Human Settlements and Environmental Protection) but not yet adopted or ratified by the DRC; (18) Protocol on Biotechnological Risk Prevention (PBRP), adopted in Cartagena (Tunisia) by the DDD (Sustainable Development Department) but not yet ratified by the DRC; (19) Regional Environmental Information Management Programme (REIMP), whose the information is available at the CNIE (National Centre for Environmental Information) but not yet adopted nor ratified by the DRC; (20) International Agency for the

⁸ (RDC & MECNT, 2013) Ministry of the Environment, Nature Conservation and Tourism, General Secretariat for the Environment and Nature Conservation, National Environment, Forests, Water and Biodiversity Program "PNEFEB", 2nd Generation. General Secretariat for the Environment and Nature

Conservation, 103p. www.observatoire-comifac.net, page 92-93.

Development of Environmental Information (IADEI) under discussion by the NCEI (National Centre for Environmental Information), but not yet adopted nor ratified by the DRC; (21) SADC Regional Environmental Education Program (sixteen countries in Southern Africa and the Indian Ocean, including the DRC) (SADC/REEP), information available from the NCEI, but not yet adopted or ratified by the DRC; and finally information available on (22) the Central African Protected Areas Network (CAPAN) at ICCN level but not yet adopted nor ratified by the DRC (RDC & MECNT, 2013).

The environmental conventions which mobilize the international community the most at the moment are those which emerged directly from the Rio summit, such as the convention on climate change and the convention on biological diversity (Fishpool & Evans, 2001). In addition to these two major conventions, there is the convention on combating desertification in countries seriously affected by drought, the pre-Rio conventions on wetlands (Ramsar, 2013), international trade in species of flora and fauna endangered wildlife (CITES, 1973), the protection of the world cultural and natural heritage (UNESCO P. , 1972), the conservation of European wildlife and natural environment (UNESCO B. , 1979).

Public opinion about the Ruzizi Congolese wetlands delta protection

Most respondents were favorable for the Ruzizi Congolese wetlands protection particularly the Ruzizi Congolese Delta, only a few proportion were against, some small proportion of respondents said they don't know (abstention).

Why protect the Ruzizi Congolese wetlands in the Ruzizi Delta?

We first point out, the traditional "Luhongolo" agriculture, deforestation of the hills overlooking the Congolese plain of Ruzizi following the population explosion without a substantial development plan since the wars of 1994-2003. In addition, extreme poverty means that the population falls back on natural resources, particularly plant-based, for their basic needs. Also, the erosive nature of the soil on the sometimes steep, even very steep slopes under the Mitumba Mountains is subject to recurrent landslides and landslides that sediment in rivers and streams carrying houses, livestock and sometimes causing death men.

In addition, an unplanned and uncontrolled extensive grazing herd decimates the vegetation around ponds, rivers and along the shoreline of Lake Tanganyika, resulting in bare soil ready to sediment in ponds, rivers and finish their run in Lake Tanganyika. Likewise, uncontrolled and unregulated fishing depletes the fish stock and ichthyologic diversity and causes, among other

things, the scarcity and rising prices of fish on the markets. All of this is contributing to the worsening effects of global warming in Uvira and the Ruzizi Delta. Protecting the wetlands of the Ruzizi Congolese Delta at the local, national, regional and even international level is proving to be the only sustainable way to fight against the effects of global warming in the city and territory of Uvira for an estimated population to 1,211,521 inhabitants⁹ including 241,724 men, 286,587 women, 314,078 boys and 369,132 girls.

At the local level, the population is being sensitized on the need to protect ecosystems rich in biodiversity such as ponds, rivers and the coast of Lake Tanganyika. At the provincial and national level, it will be necessary to use the results of this doctorate to erect a nature reserve in the Ruzizi Congolese Delta for a sustainable cross-border conservation of biodiversity with the sister Republic of Burundi. Similarly, the ICCN (Congolese Institute for Nature Conservation), will erect the Ruzizi Congolese Delta national reserve into a national park, which will be submitted to the Ramsar Secretariat for its designation as a Ramsar site for the sustainable conservation of the 139 bird species most important for conservation, of which 73 migratory bird species, and 97 bird species fulfilling the criteria A1 (2 species), A2 (2 species), A3 (13 species) and A4i 112 species of water birds (Bashonga B. , 2013).

Which areas to protect and how to protect them in the Ruzizi Congolese Delta?

We investigated four sites representative of the wetlands of the Ruzizi Congolese Delta. These are: (1) the site of the coast of Lake Tanganyika from Kilomoni II S 03° 20 '52.5 " / E 029° 11' 47 " Altitude 778m to the mouth of the little Ruzizi S 03° 21 '15.5 " / E 029° 12 '44.5 " 775m; (2) the site of the Ponds of the Border Offices of Kavimvira S 03° 20 '24.5 " / E 029° 12' 45.4 " Altitude 779m; (3) the site of Kahorohoro S 03° 19 '50.8 " / E 029° 12' 11.2 " Altitude 774m and (4) the site of Vugizo S 03° 16 '08.5 " / E 029° 14' 27.1 " Altitude 781m.

The area available for protection before the floods of April 16-17 is 500m from the Kilomoni II shore to the mouth of the Small Ruzizi River, over a length of 3km, i.e. 500mx3000m = 1,500,000m² (1.5km²) and 500m on the west bank of the Small Ruzizi River to Vugizo, over a length of 7 km, or 1m2x500x7000 = 3,500,000m² (3.5km²), making a total of 5km² area. After the floods of April 16-17, 2021 the entire area between the mouth of the Small Ruzizi River on 3km length of the west bank of the Small Ruzizi River up to Vugizo (7km), becomes available for protection as a wetland for biodiversity conservation making 1km2x3x7 = 21km² area.

⁹ Annual report of the administration of the Uvira Territory for 2018

History of the creation of a Community Reserve in the RCD

The history of studies and events on the creation of a Community Reserve in the Ruzizi Congolese Delta (RCD) includes the following key circumstances:

3.5.6.1 Training courses in biodiversity inventory techniques by PBEATRA

PBEATRA¹⁰ stood for the Albertine Rift Aquatic and Terrestrial Biodiversity Program. This program funded by the Macarthur Foundation / Chicago USA, was jointly executed by the Centre for Research in Natural Sciences (CRSN) of Lwiro, the Centre for Research in Hydrobiology (CRH) of Uvira, the Congolese Institute for Nature Conservation (ICCN) in the DRC and the Field Museum of Natural History (FMNH) from Chicago USA, during 2000-2005. During this program, we were trained for the trapping, identification and counting birds in the Kahuzi-Biega National Park, Mugeru Nature Reserve (Katana) and Idjwi Island at Washiha and Nyamusisi forests. We then carried out investigations on aquatic birds of the Ruzizi plain and the coast of Lake Tanganyika and submitted scientific reports to Professor John Bates of the FMNH of Chicago USA, which allowed us to be selected for the study trip to Belgium in 2008 and for the master's scholarship at Makerere University Kampala in 2009.

Acquisition of documentation and material for ornithological studies

Ornithological studies were introduced to CRH-Uvira through material donated by Mr. Charles Kahindo Muzusangabo on April 23, 2001 while he was doing his Master's degree at Makerere University Kampala in Uganda, with a binocular for bird watching investigations. These are the books (1) Olivier Girard 1998. «*Echassiers, Canards et Limicoles de l'Ouest Africain*. Castel Editions ZAC du Pas de Bois, Le Château d'Olonne, 136p» and (2) the collection of publications compiled by «Tim Dodman, Hilaire Yaokokoré Béibro, Edith Hubert and Emmanuel Williams (Eds), 1998. African Waterbird Census 1998 Les Dénombrements d'Oiseaux d'Eau en Afrique, 1998. Wetlands International, The Netherlands (Pays Bas), 292p». As CRH-Uvira is a hydrobiology research centre, this documentation was the basis of the inventory of aquatic birds on the coast of Lake Tanganyika at Uvira and the wetlands of the Ruzizi plains in Rwanda, Burundi and Democratic Republic of Congo (DRC).

In 2002, the researcher Kizungu Byamana Robert of CRSN-Lwiro offered us the two volumes of the book «Guggisberg, C. A. W. 1986. Birds of East Africa. Supra Safari Guide No 6 Volume II, Mount Kenya Sundries, Nairobi Kenya 196p», and «Guggisberg, C. A. W. 1988.

Birds of East Africa. Supra Safari Guide No 6 Volume I, Mount Kenya Sundries, Nairobi Kenya 168p». In 2003, the American Joe Catron gave us the book «Zimmerman D. A., Turner D.A. & Pearson D.J. 1999. *Birds of Kenya and Northern Tanzania*. Christopher Helm, A. & C. Black. London, 576 pages», was following investigations of the Nyanza project in Kigoma, Tanzania. In 2005, Professor John Bates of FMNH Chicago USA gave us the book Stevenson T. & Fanshawe J. 2002. Field Guide to the Birds of East Africa: Kenya, Tanzania, Uganda, Rwanda, Burundi. T. & A.D. Poyser, London, 604 pages. These books allowed us ornithological research for the bird conservation for their habitats protection in the Ruzizi Congolese plain, focussing on the Ruzizi Delta in DRC and in Burundi.

The Royal Museum of Central Africa (RMCA) in Tervuren Belgium

The project to create a Community Reserve in the Ruzizi Congolese plain, with a particular focus on the Community Reserve of the Ruzizi Congolese Delta (RCD) was accepted for a study trip between October 5 and December 5, 2008 at the Royal Museum for Central Africa (RMCA) of Tervuren in Belgium. The investigations focused on the taxonomy of birds of the Ruzizi plains in Rwanda, Burundi and the DRC, with a particular focus on the Ruzizi Congolese Delta as the bottleneck site for migratory birds. This ornithological training course was carried out under the direction of Professor Louette Michel in his ornithological laboratory and in the vicinity of the RMCA. At the end of this study trip, I was awarded a scholarship from the Belgian Technical Cooperation (BTC) in Kinshasa for a master's degree at Makerere University in Kampala, Uganda.

Master's Degree Program at Makerere University Kampala in Uganda

The investigations on the creation of a Community Reserve in the Ruzizi Congolese Delta (RCD) continued with the program of our Master's degree in Environmental Sciences and Natural Resources (MINER)¹¹ at the University of Makerere Kampala in Uganda in 2009-2013 under the direction of Professors Eric Sande and Derek Pomeroy. During our investigations we identified 252 species of birds in the Ruzizi Congolese plain among which 179 species of resident birds, 143 species of water birds (among which 108 species specializing in wetlands and 35 visiting species known as wetland generalists).

Regarding the Ramsar criteria, the Ruzizi Congolese Plain according to this study fulfils six of the seven Ramsar criteria on the conservation of water birds. These are the Ramsar Criteria A1, two species (Black-winged Pratincole *Glareola nordmanni*) & Great Snipe, *Gallinago media*); A2,

¹⁰ Programme Biodiversité des Ecosystèmes Aquatiques et Terrestres du Rift Albertin, 2000-2005.

¹¹ MIENR, Makerere Institute of Environment and Natural Resources

two species (Sharpe's Akalat *Sheppardia sharpei* & Tanzania Masked Weaver *Ploceus reichardi*); A3, 16 species (Spot-breasted Ibis *Bostrychia rara*, African Skimmer *Rynchops flavirostris*, White-headed Mousebird *Colius leucocephalus*, Fischer's Sparrow Lark *Eremopterix leucopareia*, White-headed Saw-wing *Psalidoprocne albiceps*, Yellow Wagtail *Motacilla flava*, Sharpe's Akalat *Sheppardia sharpei*, Grey-capped Warbler *Eminia lepida*, Cassin's Grey Flycatcher *Muscapa cassini*, Red-chested Sunbird *Cinnyris erythrocerca*, Long-tailed Fiscal *Lanius cabanisi*, Tanzania Masked Weaver *Ploceus reichardi*, Baglafaecht Weaver *Ploceus Baglafaecht*, Cardinal Quelea *Quelea cardinalis*, Zanzibar Red Bishop *Euplectes nigroventris*, African Citril *Serinus citrinelloides*); A4i, 101 species; A4ii, three species (European Bee-eater *Merops apiaster*, Barn Swallow *Hirundo rustica* & Yellow Wagtail *Motacilla flava*); and finally, the Ramsar criterion A4iv, Five Species (Great White Pelecan *Pelecanus onocrotalus*, White Stork *Ciconia ciconia*, Black Kite *Milvus migrans*, White-headed Vulture *Trigonoceps occipitalis* and Common Kestrel *Falco tinnunculus*) (Bashonga B., 2013).

The CSG (Crocodile Specialists Group) Programmes

The Crocodile Specialists group funded investigations on crocodiles in the Ruzizi plains of Rwanda, Burundi and DRC in 2011-2012 and in 2019-2020 with two scientific field reports. The first was defended in Abidjan in Côte d'Ivoire during the 8-10 December 2015 workshops. The second was submitted to the workshops of Argentina in 2019. The population of the coast of Lake Tanganyika in Uvira and of the Ruzizi Congolese Plain has been made aware of the ecological interest of crocodiles and their economic, social and cultural utility. It was thus able to adhere to the opinion of protecting the wetlands of the Ruzizi Congolese Plain and of the Ruzizi Congolese Delta for a sustainable conservation of biodiversity (fish, birds, crocodiles and hippopotami). Now the final CSG on crocodiles of the Ruzizi Delta in DRC and in Burundi has been sent for editing and publishing in one of the journals of the CSG in the case of chapter five of this doctoral thesis.

The CEBioS/ IRSNB MRV projects of 2015-2021

The MRV (Measuring, Reporting and Valuing biodiversity) Project from the IRSNB (Belgian Institute for Natural Sciences) in the case of CEBioS 2015-2017 provided access to the identification of threats to crocodiles and hippopotami of the Ruzizi plain and the coast of Lake Tanganyika in Uvira. The MRV CEBioS 2017-2019 project dealt with raising public awareness on the reduction of threats to crocodiles and hippopotami of the Ruzizi Congolese plain and the lakeshore at Uvira, northern end of Lake Tanganyika (Alexis Bashonga

Bishobibiri 2019 French & English). Finally, the MRV CEBioS 2019-2021 project on degrading acts done to animals in the Ruzizi Congolese plain and on the lakeshore at Uvira, northern end of Lake Tanganyika, allows us to raise awareness among the population on peaceful cohabitation by respecting the texts on the respect for the environment and the culture of peace through respect for animals and human beings.

The floods of April 16-17, 2020

On the night of April 16-17, 2020 the city and territory of Uvira experienced natural disasters characterized by deadly floods that swept away homes, livestock and left around 50 people dead¹². In the city of Uvira, it was especially the Mulongwe and Kavimvira rivers that particularly overflowed their beds and carried the most sediment into Lake Tanganyika that day. Before these floods, it was difficult to delimit the wetlands of the Ruzizi Delta to protect in Burundi as in the DRC. From these floods, the areas still flooded until now, barely a year after the deadly disasters will now remain unsuitable for human habitation, and therefore, will have to be classified for the sustainable conservation of biodiversity: birds, fish, crocodiles, hippopotami, macroinvertebrates and microinvertebrates (Kiza, 2020).

Expected benefits from the Ruzizi Congolese wetlands delta protection

Stakeholders of the Ruzizi Congolese Delta were stated about the benefits they expected from the Ruzizi Congolese wetlands protection including agriculture productivity firstly, breeding productivity, fish productivity, Ramsar birds' protection, migratory birds' protection, business improvement, Hippopotami protection, ecotourism improvement, and Crocodile protection.

The establishment of protected areas is a subject that, in all cases, exhibits multiple objectives and involves stakeholders with diverse interests (Premachandra & Mardle, 2005). A stakeholder analysis appears to be a prerequisite for any development or research intervention on wetland management, as emphasised by the Ramsar Convention (Darradi, Grelot, & Morardet, 2005). As well, local community members mainly consider the wetland as an agricultural resource for their livelihoods while stakeholders from outside focus more on its hydrological importance (Darradi, Grelot, & Morardet, 2005). The wider socioeconomic and cultural values of natural ecosystems are increasingly being recognised by protecting areas, as are the important ecosystem services they provide (Stolton, et al., 2015).

¹² Kiza Muhato, 2020. Detailed report following the flood and disaster caused by the violent wind and torrential rain from April 16 to 17, 2020 in the City of Uvira, 7p signed on 05/05/2020 by the Mayor of the City.

Effective management, means understanding the full spectrum of measures and actions necessary to sustain the site, and has to place the site positively within the community context and be able to respond to any potentially threatening development that may take place in the surrounding area (Chatterjee, Phillips, & Stroud, 2008). Hydrologic performance criteria are difficult to develop for protecting an area however, they should be adaptive, achievable, self-sustaining and should reflect trends in climatic and hydrologic variability (Asmus, et al., 2002).

While protected area designation has been used as one of the primary methods to achieve biodiversity or conservation objectives, they have as well contributed to the alleviation of rural poverty, have aided in achieving food security, and have helped to mitigate the impacts stemming from climate instability (Esau, 2017); (Dudley, Stolton, & Kettunen, 2013). The establishment of protected areas has proven to be a socially just and cost-effective way to deliver ecosystem services, while at the same time protecting the unique cultural and spiritual heritage of local communities (Stolton, et al., 2015).

Stakeholder engagement emerge as an important principle in water governance and a decisive factor in the ability of government to successfully address and overcome challenges in the supply and management of water as a range of formal and informal stakeholder engagement mechanisms exist, and should be tailored to specific contexts, stakeholder categories, policy goals and local needs (OECD, 2015)¹³. The thesis argues that decision makers who take a systematic, inclusive approach are likely to get a better return on the time and resources they invest. Stakeholders will as well be better equipped to handle their issues and risks effectively to create the necessary conditions for outcome-oriented, fit-for-target, anticipatory and adaptive stakeholder engagement for the Ruzizi Congolese wetland Delta protection.

Constraints of the Study

Constraints to bird's conservation in the Ruzizi Congolese Delta are mainly due to the poor land distribution policy and non-compliance with laws on wetlands and biodiversity. These are given from the following extract of law no 011/2002 (Kabila, 2003).

Extract from the Congolese forest code (Joseph Kabila, 2003. Forest Code, Law no 011/2002 of August 29, 2002. Official Journal of the Democratic Republic of Congo, 39 pages)

Among the five innovations, the law on the forest code introduces the following innovation: Three categories of

forests are now provided for by this law, namely: classified forests, protected forests and permanent production forests. These are withdrawn from the protected forests following a public inquiry with a view to their concession. The Ruzizi Congolese Plain and the Ruzizi Congolese Delta are part of the category of classified forests under Articles 3 and 13 below (Kabila, 2003).

6.1 **Article 3** paragraph 3 Title 1 of the Forest Code stipulates: The Forest Code also contributes to the enhancement of biodiversity, the protection of the natural habitat of wildlife and tourism.

6.2 **Article 13**, title 2, chapter 1 stipulates: Are further classified, the drills necessary for:

(a) protection of slopes against erosion; (b) the protection of springs and watercourses; (c) conservation of biological diversity; (d) soil conservation; (e) public health and improvement of the living environment; (f) protection of the human environment; (g) in general, any other purpose deemed useful by the administration in charge of forests.

6.3 **Article 39** Title 3 Chapter 2, stipulates: In classified forests, the rights of use are limited: (a) the collection of dead wood and straw; (b) picking fruits, food or medicinal plants; (c) the harvesting of gums, resins or honey; (d) the collection of caterpillars, snails or frogs; (e) the removal of wood intended for the construction of dwellings and for artisanal use.

6.4 **Article 45** paragraph 2 Title 4 chapter one, stipulates: Any act of deforestation of areas exposed to the risk of erosion and flooding is particularly prohibited.

6.5 **Article 48** Title 4 Chapter one stipulates: Any deforestation over a distance of 50 meters on either side of water courses and within a radius of 100 meters around their sources is prohibited.

6.6 **Article 51** Title 4 Chapter 1, stipulates: In order to protect forest biological diversity, the administration in charge of forests may, even in concession forest areas, reserve certain species or enact any restrictions it deems useful. ;

6.7 **Article 59** Title 4 in Chapter 4, stipulates: Any fire caused is to be controlled by its author who is liable for damages resulting from his act in accordance with article 258 of the civil code of obligations. No one has never been punished while bush fires are always observed.

6.8 **Article 146** Title 9 Chapter 2, stipulates: Shall be punished with a penal servitude of six months to five years and a fine of 20,000 to 500,000 constant francs or one of the penalties only whoever: (a) degrades a forest

¹³ **OECD**, Organisation for Economic Co-operation and Development, France

ecosystem or deforests an area exposed to the risk of erosion or flooding; (b) in a classified forest, prunes or limbs trees or practices clearing cultivation; (c) clears the forest over a distance of 50 meters on either side of watercourses or within a radius of 100 meters around their source; (d) without being authorized to do so, cuts, pulls out, removes, mutilates or damages trees or plants of protected forest species. Nobody has never been punished using this article in Uvira City and Uvira Territory; (e) removes, moves or damages boundary markers, marks or fences used to delimit forests or forest concessions (Kabila, 2003); (FAO & UKAID, 2015).



Figure-17. Public awareness on the Ruzizi Delta wetlands protection in Kilomoni 2 (Ruzizi Congolese Delta) (Source: Our fieldwork of 2019-2021)



Figure-18. Fieldwork in the great River Congolese Mouth (Rusizisizeional Park); (Source: our field work of 2019-2021).

These regulations are not applied, among other reasons, because land is distributed among individuals and that is origin of community conflicts and law non respect (Cabinet & DRC, 2011); (Cabinet & DRC, 2014) (Gurrapu et al, 2016). We are debating so that these regulations in

force are applied on the one hand and on the other hand so that the wetlands on the Ruzizi Congolese River bank and the Ruzizi Congolese Delta are protected and erected in bamboo forests for the security of birds, crocodiles, hippos and biodiversity of the northern end of Lake Tanganyika. Lake Tanganyika is an ecosystem of world interest already inscribed on the UNESCO heritage list (Bank, 2018).

Previous studies

Bird conservation strategies in the Ruzizi Congolese Delta begun in 2001, with the support of John Bates from the Chicago RMNH (Field Museum of Natural History) USA, and then continued with the trip I did at the Royal Museum of Central African of Tervuren Belgium from October 5th to December 5th 2008 in the ornithological Laboratory led by Professor Louette Michel. Then followed my Master's fieldwork from 2010 to 2011 and finally my doctoral research of which fieldwork were conducted from 2019 to 2021 (Figures-17, 18). The vision of the doctoral research was the whole Ruzizi Congolese Plain, almost 67 kilometres length, but by luck of scholarship I focussed on the Ruzizi Delta in the DR of Congo and Burundi. Bird migration conservation strategies are needed both in the Ruzizi Congolese Delta and the Rusizi Burundian Delta.

The creation on the Congolese part of a protected area as a natural reserve of national and regional interest, or a national park fulfilling the Ramsar criteria (potential Ramsar Site) is the strategy recommended by this publication as a way of sustainable conservation strategy of birds and biodiversity of the Ruzizi Delta in DR Congo as in Burundi.

Meanwhile, bird conservation strategies for the Lake Tanganyika Shore Areas in the DR of Congo almost 677 kilometres have not yet been investigated. There may be new bird species there, and non-investigated migrant bird species. Bird checklist of the area is important for their conservation strategies and management.

Conclusion

This chapter on bird conservation in the Ruzizi Delta provides us with information on the opinions of land users in favour of protecting the wetlands of the Ruzizi Congolese Delta for the conservation of the multiple species of resident, migratory, aquatic and even rare birds that meet Ramsar criteria A1, A2, and A3.

The protection opinion being mostly accepted, we still have to specify the immediate and long-term management methods as a community reserve first, and later as a Ramsar site before moving on to recommendations.

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Conflicts of Interest

Authors declare that there is no conflict of interests regarding the publication of this paper.

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