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A Preliminary Survey of the Amphibian Fauna of Kisangani Ecoregion, Democratic Republic of the Congo

BG Badjedjea¹, BJ Akuboy², MF Masudi², JA Asimonyio², KP Museu³, Koto-te-Nyiwa Ngbolua⁴

¹ Department of Ecology and Aquatic Biodiversity Resources, Biodiversity Monitoring Centre, University of Kisangani, P.O. Box 2012 Kisangani, Democratic Republic of the Congo.

² Department of Ecology and Terrestrial Biodiversity Resources, Biodiversity Monitoring Centre, University of Kisangani, P.O. Box 2012 Kisangani, Democratic Republic of the Congo.

³ Geological and Mining Research Centre (CRGM), Kinshasa, Democratic Republic of the Congo

⁴ Department of Biology, Faculty of Science, University of Kinshasa, P.O. Box 190 Kinshasa XI, Democratic Republic of the Congo

*Corresponding author: Prof. Dr. Koto-te-NyiwaNgbolua, Tel: +243 81 68 79 527, E-mail: jpngbolua@unikin.ac.cd

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ABSTRACT

A preliminary study on amphibians was conducted in three selected sites of Kisangani region and surroundings in the Orientale Province (Democratic Republic of the Congo). In this part of the country, data on herpetological diversity are scarce; therefore, knowledge of the biodiversity of amphibians in the Kisangani region and its surroundings is still incomplete. A survey was conducted in three protected areas in the Orientale Province of Democratic Republic of the Congo, namely Tshuapa–Lomami–Lualaba Conservation Landscape, Hunting Reserve of Rubi-Télé, and Uma forest with the aim of identifying amphibian fauna biodiversity of such regions. 29 amphibian species were identified. Most of the species were collected in the forest habitats especially primary forest and secondary forest. Few species were collected in the farm bush or in fallow lands. The most noteworthy species are: *Hyperolius bolifambae*, *Hyperolius kuligae*, *Cardioglossa gracilis*, *Cardioglossa leucomystax*, *Leptopelis millsoni*, *Leptopelis notatus*, *Nectophryne batesi*, *Amietophrynus tuberosus*. The amphibians constitute bio-indicators of relevance in evaluating the ecosystem integrity because their presence or absence informs about the degree of ecosystem degradation. It is thus desirable that this study is extended to other sites in order to evaluate the impact of the human activities on the forest ecosystems of the Democratic Republic of Congo.

Key words: Bio-monitoring, Amphibians, Protected areas, Democratic Republic of the Congo

INTRODUCTION

Rain forests currently cover about 7% of the Africa continent, and represent slightly more than one fifth of the total remaining tropical forest all over the world. In the Democratic Republic of the Congo (DRC), forests cover 62% of national territory and boast a wide arrange of biological resources of which many are endemic [1]. Even with the monitoring effort of research scientists' for zoological biodiversity of DRC, the amphibian fauna especially those of Kisangani eco-region remain poorly studied. Some findings indicated that 224 species of Amphibians are currently known in the Democratic Republic of the Congo, among which 48 are endemic [2]. The Oriental Province is located in the heart of the Central basin of the Guinea-Congolean region and contains many characteristic and endemic species. It is a strategic area for biodiversity conservation because it extends over 503,239 km² and straddles' the equator. The Oriental Province hosts 97 species of amphibians and is second to Kivu Province (111 species) in amphibian species diversity. Despite the fact that this province hosts a diversity of habitats (forests, savannahs, lakes, mountains, islands, rivers and wetlands) that are home to flora and fauna, the quantitative data to support this assertion are lacking [3]. These habitats meet the ecological requirements of amphibians and likely host high amphibian species diversity

[4]. Literature on amphibian fauna of the Oriental Province is still scarce and limited to few areas, meaning the vast territories, especially forests, are unexplored. Historical studies on the amphibian fauna were conducted in Kisangani during the colonial era [5]; in Buta and Eala [6]. Apart from the first inventory in Masako Forest Reserve [7], [8] and on Kungulu Island [9], the only recent herpeto-faunal survey was conducted by a Belgian founded expedition in 2010. The number of amphibian species and genera in the Kisangani region are thus no well known. The present study was undertaken with the aim of conducting a survey of the amphibian fauna of the Kisangani region. This area consists of forest blocks that are, diverse ecological gradients included: fallow and, secondary forest, primary forest, ponds, and meadows. We hypothesized that the composition and diversity of amphibian fauna varies across this diversity of habitat types.

MATERIALS AND METHODS

A survey on amphibian fauna of Kisangani eco-region was conducted from February 2012 to April 2014, in three different sites during "Boyekoli Congo scientific field works/missions" funded by VLIR-UOS Project. The first mission was conducted in the Lomami National Park (TL2) from 25 January to 12 February 2013, the second in Rubi-Télé Hunting Reserve from

16 to 26 August 2013 (Mission II), and the third in the lower altitude forest of Uma from 9 to 16 April 2014. In the Lomami Lualaba National Park (TL2), we camped at Obenge (E025° 53'44, 6'; S 01° 03, 865'; 409m) and at Lusekola. In Rubi-Télé Hunting Reserve, we camped at Sukisa (N02°19,121'; E024°58,611'; 441m), and in the forest of Uma, the camp was based at Basukwambula village (N00°33,486'; E 025°55,846'; 454m) (figure 1).

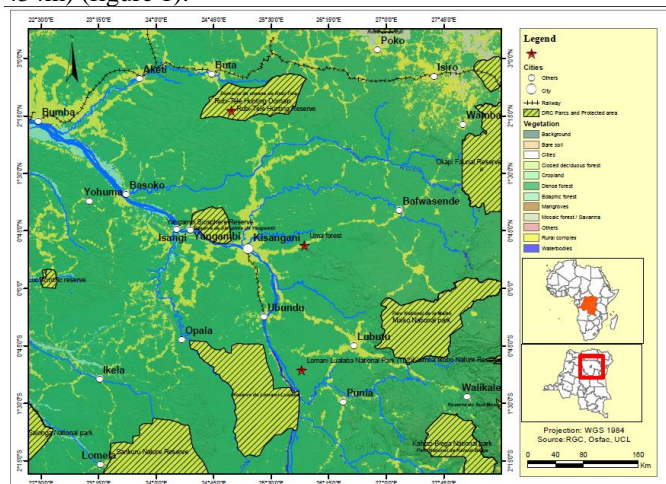


Figure 1 : Study area

Surveys were conducted at night and we collected amphibians by hand in the marshy banks, open water, rivers of the forest, stagnant water and along paths leading to these places. In the Lomami National Park (TL2), we collected a few species (*Amietophrynus*, *Xenopus* and *Arthroleptis*) in a pitfall trap installed to capture Soricomorphes. In Rubi-Télé Hunting Reserve (RBTL) and the forest of Uma, some specimens of

Amietophrynus were also captured by pitfall. During the day, we looked for amphibians in ponds, vegetation along rivers, and under rocks. We also purchased some specimens from local people. The pictures of the living specimens were taken before we euthanized them. Tissue samples were taken for molecular genetic studies. Carcasses of specimens were preserved in 70% alcohol, and sent to the Royal Institute of Natural Sciences, Belgium (ISNB), and/or kept in the “Centre de Surveillance de la Biodiversité (CSB)” of the University of Kisangani.

RESULTS AND DISCUSSION

Samples collected during various capture missions consisted of 301 amphibian specimens distributed in 11 genera, 7 families and 25 identified species. Among 301 specimens of amphibians, 51 specimens were collected in the Lomami National Park (TL2), 162 specimens in Rubi-Télé Hunting Reserve and 88 in the Uma forest. In the three prospected sites, Uma forest is most diversified site with 23 species, followed by Rubi-Télé (15 species) and TL2 (14 species) respectively. Other individuals have been identified at the genus level only, which increases specific richness to 29 species. At the generic level, *Hyperolius* were the most species rich with seven species, followed by *Amietophrynus* and *Leptopelis* (five species each) *Arthroleptis*, *Phrynobatrachus* and *Cardioglossa*, (two species each) and finally *Afrixalus*, *Hylarana*, *Nectophryne*, *Ptychadena* and *Xenopus* (one species each). During our survey/inventory, it was difficult for us to identify many *Amietophrynus ssp*, *Hyperolius ssp*, *Arthroleptis ssp* at the species level, based only on their external morphological characters. The list of recorded species is given in the table 1.

Table 1: List of recorded species

Amphibian species	Surveyed site		
	TL2	RBTL	Uma
Arthroleptidae family			
<i>Arthroleptis cf. sylvaticus</i>	+	+	+
<i>Arthroleptis sp2</i>	+	+	+
<i>Cardioglossa leucomystax</i> Boulenger, 1903	-	+	+
<i>Cardioglossa gracilis</i> Boulenger, 1900	-	+	+
<i>Leptopelis calcaratus</i> Boulenger, 1906	-	-	+
<i>Leptopelis millsoni</i> Boulenger, 1895	-	-	+
<i>Leptopelis cf. nordequatorialis</i> Perret, 1966	+	-	-
<i>Leptopelis notatus</i> Buchholz et Peters, 1875	-	-	+
<i>Leptopelis sp</i>	-	-	+
Bufonidae family			
<i>Amietophrynus cf. funereus</i> Bocage, 1866	+	+	-
<i>Amietophrynus cf. latifrons</i> Boulenger, 1900	+	+	+
<i>Amietophrynus maculatus</i> Hallowell, 1855	-	-	+
<i>Amietophrynus tuberosus</i> Gunther, 1859	-	+	+
<i>Nectophryne batesii</i> Boulenger, 1913	-	-	+
Hyperoliidae family			
<i>Hyperolius bolifambae</i> Mertens, 1938	-	+	+
<i>Hyperolius cinnamomeoventris</i> Bocage, 1866	+	+	+
<i>Hyperolius kuligae</i> Mertens, 1940	-	-	+
<i>Hyperolius sp1</i>	-	+	-
<i>Hyperolius sp2</i>	-	-	+
<i>Afrixalus osorioi</i> Ferreira, 1906	-	-	+

<i>Hyperolius ocellatus</i> Günther, 1859	+	+	+
<i>Hyperolius tuberculatus</i> Mocquard, 1897	+	+	+
Phrynobatrachidae family			
<i>Phrynobatrachus auritus</i> Boulenger, 1900	+	-	-
<i>Phrynobatrachus cf. latifrons</i>	+	+	+
Ptychadenidae family			
<i>Ptychadena mascareniensis</i> Diménil et Bibron, 1841	+	+	+
<i>Ptychadena cf. christyi</i>	-	-	+
Pipidae family			
<i>Xenopus laevis</i>	+	-	-
<i>Xenopus cf. pygmaeus</i>	+	-	-
Ranidae family			
<i>Hylarana albolabris</i> Hallowell, 1856	+	+	+
Total	14	15	23

(Legend: + presence of cited frog; - absence of cited frog in the study site)

Figures 2, 3, 4 and 5 give the pictures of some reported frogs.



Figure 2 : *Leptopelis millsoni* (Uma forest)



Figure 3 : *Hyperolius bolifambae* (Rubi-Télé Hunting Reserve)



Figure 4 : *Hyperolius sp2* (Uma forest)



Figure 5: *Hyperolius ocellatus* (Rubi-Télé Hunting Reserve)

The present study is preliminary but provides essential information on the amphibian species richness of the sampling sites. There are very few or almost no herpetological surveys published on the region of Kisangani and its neighboring areas. Thus, our ability to compare our results with those of other studies in the region and its surroundings is limited. The results presented in this work should be considered as the minimum number of species present in each site, considering the scope covered by our inventory/survey. The results clearly show that Rubi-Télé Hunting Reserve, Lualaba Tshuapa Lomami National Park and Uma forest contain a large species richness of amphibians (29 species and 11 genera). This species richness varies from one site to another, and each site has unique diversity compared to others. *Leptopelis millsoni*, *Leptopelis notatus*, *Afrixa luxosorioi*, *Cardioglossa leucomystax* and *C. gracilis*, *Nectophryne batesii*, *Amietophrynus tuberosus*, *Hyperolius kuligae*, *Hyperolius sp2* were captured in the forest of Uma, *Hyperolius bolifambae*, *Phrynobatrachus cf. latifrons*, *Hyperolius sp1* were captured at Rubi-Télé. *Xenopus cf. laevis*, *Arthroleptis cf. sylvaticus*, *Arthroleptis sp* and *Leptopelis cf. nordequatorialis* were collected in the Lomami National Park. This study contributes to the knowledge of the amphibian distribution in the region of Kisangani.

The diversity of amphibians present at each site are similar to the amphibian diversity surveyed at Wildlife National Parks of Comoé (Ivory Coast) or Pendjari (Benin) that are home to over 30 species of amphibians [10], and to the assessment of the

amphibians of the Fouta Djallon, Guinea, West Africa, where 25 frog species were recorded [11]. The National Park Nouable-Ndoki in Congo [12] presented an annotated list of 20 species of amphibians. While they detected fewer species overall, some species such as *Amietophrynus regularis*, *A. maculatus*, *A. funereus*, *Hyperolius cinnamomeoventris* and *Leptopeli snotatus* are present in both our studies. In the Bas-Congo Province on contrary [13], 20 species of amphibians were identified of which some are complex. In this study, we report the presence of primitive species of the family *Arthroleptidae* (genus *Cardioglossa*) that retain a larval stage [14]. During the Belgian colonial period, scientific missions by researchers such as [15], and [16] in 1891 had reported the presence of *Cardioglossa cf. leucomystax* in the locality of Buta, Gamangi and Medje and in the Western part of Virunga National Park. The *Cardioglossa gracilis* species was also reported by [15] in the city of Buta [17] thus, indicating that this species has a very large distribution area from Nigeria, Cameroon, Gabon and Zaïre (Democratic Republic of the Congo). These two species have been recorded only at Uma [18] specifying that *Hyperolius bolifambae* is a typical case of fallow land. Its males sing on herbs and shrubs, particularly in clearings that run along the tracks. At Rubi-Télé, it was captured in the old secondary forest. In Congo, it is common to the following locations: Medjé (Christy Collection 1912-1914), Lisala (Collection Dehyen 1937), *Hyperolius kiligae* is a well documented species in Cameroon by [19], *Hyperolius cinnamomeoventris* is a species that colonizes several habitats in Africa: wet savannah, bush, clearings and degraded forests [20], there are also several morphs and is assumed to be composed of several cryptic species [21], [22]. *Amietophrynus tuberosus* Günther, 1859 was found in Lomani in the region of Kisangani (Laurent Collection 1946); *Nectophryne batesi* Boulenger, 1913 is found in Hombo, Mwana, Teturi and Kisangani [23]. *Amietophrynus regularis* Reuss, 1833 is often considered as a savannah species, but often penetrates forests along logging roads and colonizes degraded habitats [24]. This observation was made during our inventory on both species *Amietophrynus regularis* and *A. maculatus* that were caught only in degraded environments and around human dwellings. *Amietophrynus cf. funereus*, *Amietophrynus cf. latifrons* especially *Amietophrynus tuberosus* seem typically forest species, as [25] emphasizes that it is a rain forest habitat that cannot be risen with a jump, so it merges with the soil and plant fragments.

At night, there are several species of frogs of the family *Hyperoliidae* and *Arthroleptidae* on vegetation along rivers, and swamps. Among the frogs in the family *Bufo*idae, *Nectophryne batesii* is often captured on vegetation, while *A. regularis*, *A. maculatus*, *A. funereus*, *A. latifrons* are often captured on the land. Finally, *Phrynobatrachus auritus* is often captured on vegetation and rarely in water. The family *Hyperoliidae* is the most represented with six species. It is also one of the most species rich families in Africa with 32 species in East Africa [10], and 47 species in West Africa [26].

In summary, most of the species inventoried in our study sites are present across all sites and frequently encountered (*Hyperolius cinnamomeoventris*, *Hyperolius ocellatus*, *Hylarana albolabris*, *Ptychadena mascariensis*, *Amietophrynus regularis*, *Amietophrynus maculatus*,

Amietophrynus cf. funereus, *Amietophrynus cf. latifrons*, *Leptopelis calcaratus*). They are often collected during our capture missions, regardless of their abundance. Other species (*Arthroleptis cf. sylvaticus*, *Arthrolepti ssp.*, *Cardioglossa gracilis*, *Cardioglossa leucomystax*, *Amietophrynus tuberosus*, *Hyperolius bolifambae*, *Hyperolius kuligae*, Common forest tree frog, *Leptopelis millsoni*, *Afrivalus osorioi* and *Hyperolius sp1 and sp2*) are rare.

This result indicates that the composition and diversity of amphibian fauna varies across the diversity of habitat types in Kisangani eco-region.

CONCLUSION

The amphibians constitute bio-indicators of relevance in the evaluation of the ecosystem integrity because their presence or absence informs about the degree of ecosystem degradation. The aim of this study was to make an inventory of these animals in the ecological area of Kisangani. The results of this study indicate that 301 specimens collected in the three sampling sites are grouped in 7 families, 11 genera and 29 species. The family of *Arthroleptidae* is the most diversified (9 species), *Ranidae* family is less represented. Among the prospected sites of capture, Uma forest is the most diversified (23 species), followed by RBTL (15 species) and TL2 (14 species). It is thus desirable that this study is extended to other sites in order to evaluate the impact of the human activities on the forest ecosystems of the Democratic Republic of Congo.

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