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ARTICLE

Comparative Diversity of Snakes around Kisangani, Tshopo Province, Democratic Republic of the Congo

Diversité Comparée des Serpents autour de Kisangani, Capitale de la Province de la Tshopo, République Démocratique du Congo

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Summary – The specific richness of snakes is included in several publications in the Democratic Republic of the Congo, but without presenting a comparative study on the elements of serpentine diversity. In this study, we compare snake diversity and species detection frequency across three sites in Kisangani city (Campus Valley of Kisangani University, Dehon Fathers Concession, and Kisangani Zoological Garden). We sampled at each site over 24 days by walking and inspecting potential snake shelters, such as the undersides of tree bark and inside litter and humus. A total of 104 snakes were collected, day and night, grouped into 17 species and six families. The Colubridae family was the most diverse. The three sites have a similar serpentine fauna composition, with the Dehon Fathers Concession being the most diverse. This study shows that serpentine communities in some green sites in low-altitude tropical urban areas should be preserved because they remain highly diverse.

Keywords – Democratic Republic of the Congo, Diversity, Snake, Visual Encounter Survey

Résumé – La richesse spécifique des serpents est incluse dans plusieurs publications en République Démocratique du Congo, sans toutefois présenter d'étude comparative sur les éléments de la diversité serpentine. Dans la présente étude, nous comparons la diversité des serpents et la fréquence de détection des espèces sur trois sites situés dans la ville de Kisangani (la Vallée du Campus de l'Université de Kisangani, la Concession des Pères Déhon et le Jardin Zoologique de Kisangani). Nous avons échantillonné sur chaque site pendant 24 jours en marchant et en inspectant des lieux potentiels de refuge pour serpents, comme les dessous des écorces d'arbres, ainsi que l'intérieur de la litière et de l'humus. Au total, 104 serpents ont été collectés, jour et nuit, regroupés en 17 espèces et six familles. La famille des Colubridae était la plus diversifiée. Les trois sites présentent une composition de faune serpentine presque identique, le site de la Concession des Pères Déhon étant le plus diversifié. Cette étude démontre que les communautés serpentines situées sur certains sites verts dans des zones urbaines tropicales de basse altitude sont à conserver, car elles peuvent encore être très diversifiées.

Mots-clés – Diversité, Enquête des Rencontres Visuelles, République Démocratique du Congo, Serpent

INTRODUCTION

Reptiles are under global threat, particularly those inhabiting forests, as evidenced by declines reported for snakes in tropical Africa (e.g., Akani *et al.* 2013, Cox *et al.* 2022). This also concerns the basin of the Democratic Republic of the Congo (DRC), a huge terrestrial biome very rich in both floristic and faunal diversity, including the world's second-largest tropical forest and nationwide 177 species of snakes (Asimonyio *et al.* 2015, Akuboy *et al.* 2016, Uetz *et al.* 2025 accessed 16th August 2025). While some great and large compilations on reptilian accounts have been published in the last 100 years that include tropical forests of the Congolese countries (Schmidt 1923, Chippaux &

Jackson 2019, Trape 2023), the distribution and limits of snake species in DRC, however, remain largely unknown (Nagy *et al.* 2013).

Our study focuses on the heavily populated Kisangani City, the capital of Tshopo Province, and the surrounding region, where forests have long experienced uncontrolled deforestation, following urbanisation, itinerant burning agriculture, logging, and mineral extraction, leading to a general disappearance of biological diversity (Bamba 2010). However, there are no studies on the snake fauna of Kisangani and its surrounding region to generate basic information for further threat assessment, despite the potentially negative effects on snake diversity that could be expected from widespread human-made habitat degradation. This situation provides the pretext for this study, which compares snake diversity across three semi-natural sites in greater Kisangani.

MATERIAL AND METHODS

The city of Kisangani is located in the northern third of the DRC with an average elevation of ca. 400 meters. It is surrounded by agricultural fields, plantations, fish farms, scattered tree stands, and some remnants of the original Congolese rainforest. We selected three sites in the greater suburban area of Kisangani (Fig. 1): **Site 1**, the Campus Valley of Kisangani University (0.513°N, 25.178°E; 393 m a.s.l.; 15.5 ha), a depression within the University of Kisangani mainly with fish farms and scattered trees. **Site 2**, the Dehon Fathers Concession, (0.543°N, 25.214°E; 425 m a.s.l.; 83 ha), a mosaic of man-made grassland, agricultural patches, fish farms, clusters of small forests bordering wetland and suburban housing blocs. **Site 3**, the Kisangani Zoological Garden (0.543°N, 25.189°E; 422 m a.s.l.; 80 ha), is a primarily wooded area with some flat green fields, bounded by the Tshopo River.

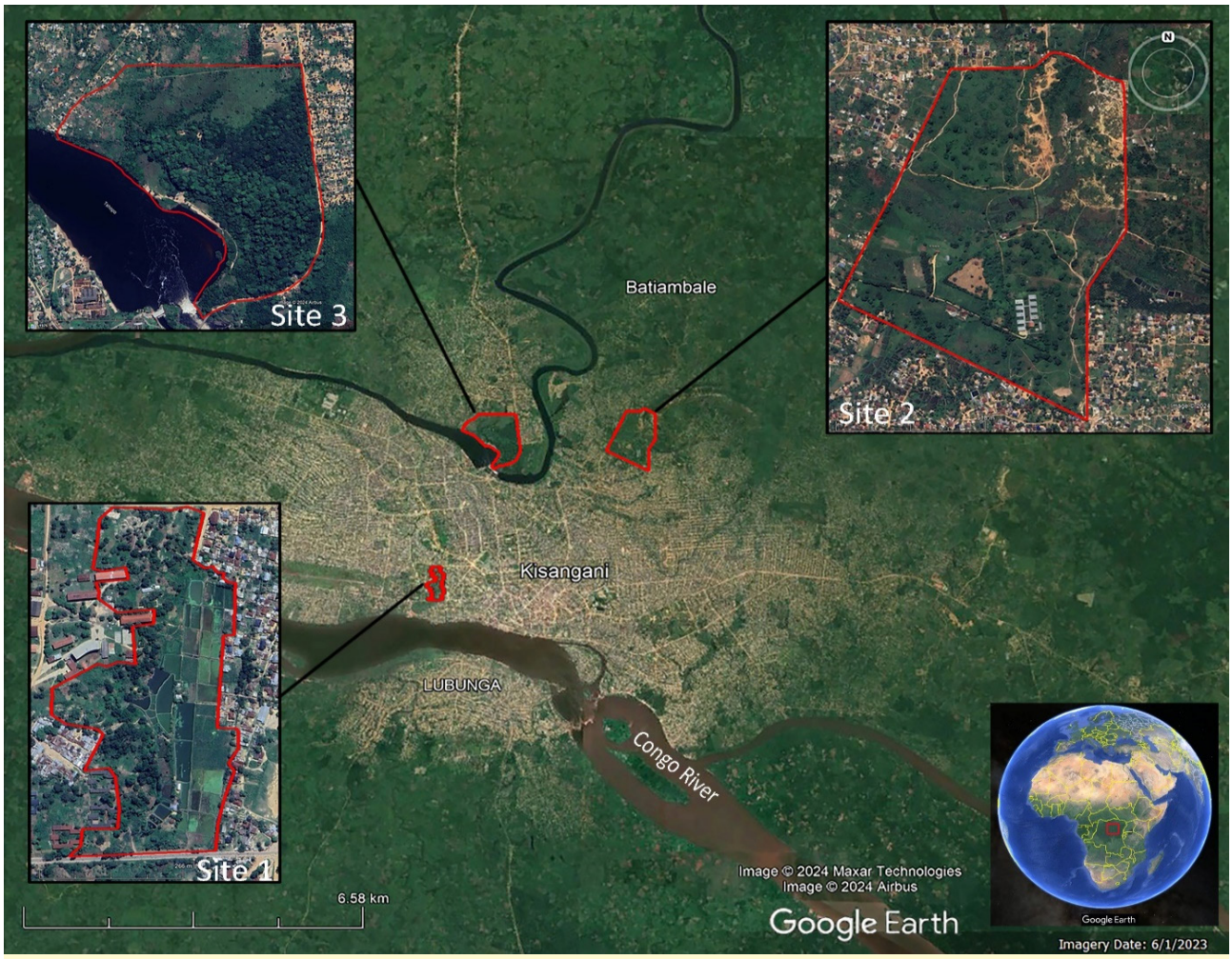

Figure 1 - Sampling sites in municipal Kisangani. For close-up maps and descriptive details of each site.

Figure 1 - Sites d'échantillonnage dans la ville de Kisangani. Cartes agrandies et détails descriptifs pour chaque site.

Equipped with headlamps and field hooks, five persons searched each site simply by VES (Visual Encounter Survey), but also directly inspected potential snake refuges, such as the underside of loose bark, inside leaf litter and humus, as recommended by Vanzolini & Papavero (1967). Each site was visited during 24 days in March, June, September and October in 2021 and 2022 for 6 days of collection in each site by month, twice during the day (9 am to 3 pm) and once at night (7 pm to 3 am) for a total of 72 days of collection in all with a total sampling effort of 14 hours for 5 persons.

The collected snakes were preserved in 70% ethanol and deposited in the collection room of the Department of Ecology and Biodiversity of Terrestrial Resources of the Biodiversity Monitoring Center of the Kisangani University (CSB). All snakes were photographed post-preservation, whereas photos of conspecifics from equivalent sites on the right bank of the Congo River within the Tshopo Province, north and east of Kisangani, are displayed below to maintain recognition value (Figs. 2 and 3).

We used three biodiversity indices to estimate the composition of snake species at the three sites: Shannon Diversity Index H' (Shannon 1948) for site-proportional abundances/species; Simpson 1-D Diversity Index (Simpson 1949, Krebs 1989) to quantify how evenly the individuals at a site are distributed among different species; and evenness (Shannon Equitability Index) compares the relative abundances of different species at a site. The similarities of the composition of snake species and their abundance for all sites together is estimated by the Jaccard Similarity Index and the Steinhaus Distance Index (Steinhaus 1957).

RESULTS

We collected a total of 104 snake specimens of 17 species from all three sites in Kisangani City (Campus Valley of Kisangani University, Dehon Fathers Concession and Kisangani Zoological Garden). The abundance of snake species/site, their total and relative numbers across all sites, and the relative abundance of snake species of all are presented (Tab. 1). It shows that despite the large anthropization of the city, the species richness of snakes is still very high in Kisangani and its surroundings.

The Colubridae is the most diversified (12 genera and 12 species) and most abundant (87 specimens representing 83.62%) group of snakes in municipal Kisangani, followed by the Viperidae family (two genera and two species) with 10 specimens representing 9.61% (Tab. 1). The other families, Typhlopidae, Elapidae and Atractaspididae, produced marginal numbers of ≤ five specimens and < 5% proportions. The Western Forest Centipede-Eater *Aparallactus modestus* was the most abundant snake (30 specimens and 28.84%), followed by the Olive House Snake *Boaedon olivaceus* and Shadow African Water snake *Grayia obscura* with 21 or 15 specimens and 20.19% or 14.42%, respectively. All other species were represented by ≤ eight specimens (Tab. 1). With 53 specimens, the Dehon Fathers Concession yielded the highest abundance of snakes and a richness of 12 snake species (Tab. 1), with *Aparallactus modestus* being the most abundant (16 specimens) and *Boaedon olivaceus* the second (12 specimens), but also *Grayia obscura* being quite abundant, in all reflecting the overall diversity of snakes from the entire Kisangani region. The abundance and richness were similar at the Kisangani Zoological Garden, with 31 specimens across 12 species, and the same order for the two most common species. That order was slightly different among the 20 snakes captured at Campus Valley, where again *Aparallactus modestus* was the most common species (six specimens), but the second most common snake was *Philothamnus carinatus* (four specimens), a different species than at the other sites.

All three sites have a similarly diverse snake fauna with little differences in the composition of snake species (Tab. 2). The relative abundances of individuals per species are quite similarly distributed across the three sites: Shannon Diversity Index H (0.48–0.60), Simpson 1-D Diversity Index (0.30–0.41), and for evenness (0.69–0.86). This means that a few species account for most of the individuals, while the others contribute none or very few. Low values of around 40% of the Jaccard similarity show the largest difference of species composition between Dehon Fathers Concession and the Zoological Garden (> 50% of species recorded in only one of the sites: Tab. 3), whereas Dehon Fathers Concession and Campus Valley were the most similar sites (species sharing ca. 70%). However, the two sites also yield the highest Steinhaus distance values (close to 60%), which results from the vastly different abundance.

Figure 2 - Snake species observed at semi-natural sites in the Kisangani suburban surroundings. Photos show life specimens primarily from right-side areas of Congo River outside Kisangani, Tshopo Province, DRC : A) Green Bush Viper *Atheris squamigera* (coordinates below); B) Spotted Night Adder *Causus maculatus*; C) Shadow African Water Snake *Grayia obscura*; D) 13-scaled Green Snake *Philothamnus carinatus*; E + inset) Yellow Forest Snake *Hormonotus modestus*; F) Olive House Snake *Boaedon olivaceus*; G) Red-Black Striped Snake *Bothrophthalmus lineatus*; H) Rough-scaled Blackbelly Snake *Hydraethiops melanogaster*. Locations: A) Longala, Tshopo Province, DRC, 1.526°N, 25.296°E; B and G) Kisangani, Tshopo Province, DRC, 0.519°N, 25.260°E; C and D) Uma, Tshopo Province, DRC, 0.539°N, 25.902°E; E) Budongo Forest, Murchison Falls National Park, Uganda, 1.787°N, 31.577°E; and inset head from Nzérékoré, Guinea, 7.706°N, -8.836°E; F) Bamakembe, Tshopo Province, DRC, -0.216°N, 25.803°E; H) Kondi, Equator Province, DRC, -1.167°N, 18.867°E. Photographs: A–D, F, G by Konrad Mebert; E is © Bernd-J. Seitz CC BY-NC with the inset and Figure H by Jean-François Trape.

Figure 2 - Espèces de serpents observées sur des sites semi-naturels dans les environs de la banlieue de Kisangani. Les photos montrent des spécimens vivants principalement dans les zones situées du côté droit du fleuve Congo, en dehors de Kisangani, Province de la Tshopo, RDC : A) Vipère buissonnière verte *Atheris squamigera* (coordonnées ci dessous) ; B) Aidre de nuit tachetée *Causus maculatus* ; C) Couleuvre aquatique africaine sombre *Grayia obscura* ; D) Couleuvre verte à 13 écailles *Philothamnus carinatus* ; E + insertion) Couleuvre forestière jaune *Hormonotus modestus* ; F) Couleuvre domestique olive *Boaedon olivaceus* ; G) Couleuvre rayée rouge et noire *Bothrophthalmus lineatus* ; H) Couleuvre à ventre noir à écailles rugueuses *Hydraethiops melanogaster*. Localités : A) Longala, Province de la Tshopo, RDC, 1.526°N, 25.296°E ; B et G) Kisangani, Province de la Tshopo, RDC, 0.519°N, 25.260°E ; C et D) Uma, Province de la Tshopo, RDC, 0.539°N, 25.902°E ; E) Forêt de Budongo, Parc national de Murchison Falls, Ouganda, 1.787°N, 31.577°E ; et insertion de la tête provenant de Nzérékoré, Guinée, 7.706°N, - 8.836°E ; F) Bamakembe, Province de la Tshopo, RDC, - 0.216°N, 25.803°E ; H) Kondi, Province de l'Équateur, RDC, -1.167°N, 18.867°E. Photographies : A–D, F, G par Konrad Mebert ; E © Bernd J. Seitz CC BY NC avec l'insertion et la Figure H par Jean François Trape.

Figure 3 - Snake species observed in the Kisangani suburban surroundings. Photos show life specimens primarily from right-side areas of the Congo River outside Kisangani, Tshopo Province, DRC : A) Forest File Snake *Gonionotophis poensis*; B) Spotted Dagger-tooth Tree Snake *Thrasops batesii*; C) Emerald Snake *Hapsidophrys smaragdina*; D) Laurent's Tree Snake *Dipsadoboa viridis gracilis*; E) Forest Egg-eating Snake *Dasypeltis fasciata*; F) Western Forest Centipede-Eater *Aparallactus modestus*; G and H) Jameson's Mamba *Dendroaspis jamesonii*; I) Reticulate Mole Viper or Stiletto Snake *Atractaspis reticulata*; J) Spotted Blind Snake *Afrotyphlops lineolatus*. Locations: A, D, F) Bamakembe, Tshopo Province, DRC, -0.216°N, 25.803°E; B) Moukalaba-Doudou National Park, Gabon, -2.497°N, 10.349°E; C) Kisangani, Tshopo Province, DRC, 0.519°N, 25.260°E; E and J) Longala, Tshopo Province, DRC, 1.526°N, 25.296°E; G) Yoko Forest Reserve, Kisangani, Tshopo Province, DRC, 0.310°N, 25.303°E; H) Kinshasa, DRC, -4.362°N, 15.417°E: I) Luki, Equator Province, DRC, -5.650°N, 13.066°E. Photographs A, C–F, I by Konrad Mebert; B by Niels Rahola; G by Jeannot B. Akuboy; H and I by Jean-François Trape.

Figure 3 - Espèces de serpents observées dans la banlieue de Kisangani. Les photos montrent des spécimens vivants principalement des zones situées sur la rive droite du fleuve Congo en dehors de Kisangani, Province de la Tshopo, RDC : A) Couleuvre des files forestières *Gonionotophis poensis* ; B) Couleuvre arboricole à crocs pointus tachetée *Thrasops batesii* ; C) Couleuvre émeraude *Hapsidophrys smaragdina* ; D) Couleuvre arboricole de Laurent *Dipsadoboa viridis gracilis* ; E) Couleuvre forestière mangeuse d'œufs *Dasypeltis fasciata* ; F) Mangeuse de mille-pattes forestière occidentale *Aparallactus modestus* ; G et H) Mamba de Jameson *Dendroaspis jamesonii* ; I) Vipère-mole réticulée ou serpent-poignard *Atractaspis reticulata* ; J) Serpent aveugle tacheté *Afrotyphlops lineolatus*. Localisations : A, D, F) Bamakembe, Province de la Tshopo, RDC, -0.216°N, 25.803°E ; B) Parc national de Moukalaba - Doudou, Gabon, -2.497°N, 10.349°E ; C) Kisangani, Province de la Tshopo, RDC, 0.519°N, 25.260°E ; E et J) Longala, Province de la Tshopo, RDC, 1.526°N, 25.296°E ; G) Réserve forestière de Yoko, Kisangani, Province de la Tshopo, RDC, 0.310°N, 25.303°E ; H) Kinshasa, RDC, -4.362°N, 15.417°E ; I) Luki, Province de l'Équateur, RDC, -5.650°N, 13.066°E. Photographies A, C–F, I par Konrad Mebert ; B par Niels Rahola ; G par Jeannot B. Akuboy ; H et I par Jean-François Trape.

Table 1 – Qualitative and quantitative comparison of species among the three sampled sites in Kisangani; the Campus Valley of the Kisangani University, the Dehon Fathers Concession, and the Kisangani Zoological Garden. Ni (number of snakes per species and site); Tot Ni (of all sites combined, respectively); %Tot Ni (relative abundance of snake species across all three sites).

Tableau 1 – Comparaison qualitative et quantitative des espèces parmi les trois sites échantillonnés à Kisangani : la Vallée du Campus de l'Université de Kisangani, la Concession des Pères Déhon et le Jardin Zoologique de Kisangani. Ni (nombre de serpents par espèce et par site) ; Tot Ni (nombre total pour l'ensemble des sites) ; %Tot Ni (abondance relative des espèces de serpents sur les trois sites).

Species	**Campus Valley of Kisangani University**	**Dehon Fathers Concession**	**Kisangani Zoological Garden**	**Sites combined**	**overall rel. frq.**
	Ni	Ni	Ni	Tot Ni	%Tot Ni
Atheris squamigera	0	2	0	2	1.92
Causus maculatus	2	4	2	8	7.69
Grayia obscura	2	9	4	15	14.42
Philothamnus carinatus	4	2	2	8	7.69
Hormonotus modestus	0	0	1	1	0.96
Boaedon olivaceus	3	12	6	21	20.19
Bothrophthalmus lineatus	1	1	0	2	1.92
Hydraethiops melanogaster	0	0	1	1	0.96
Gonionotophis poensis	1	2	1	4	3.84
Thrasops batesii	0	1	0	1	0.96
Hapsidophrys smaragdina	0	0	2	2	1.92
Dipsadoboa viridis gracilis	0	1	0	1	0.96
Dasypeltis fasciata	0	0	1	1	0.96
Aparallactus modestus	6	16	8	30	28.84
Dendroaspis jamesonii	0	0	1	1	0.96
Atractaspis reticulata	0	1	0	1	0.96
Afrotyphlops lineolatus	1	02	2	5	4.80
Taxa (s)	**8**	**12**	**12**	**12**	**100**
Effectif (Ni	**20**	**53**	**31**	**104**	

Table 2 – Results of biodiversity calculations.

Tableau 2 – Résultats des calculs de biodiversité.

	Campus Valley of Kisangani University	**Dehon Fathers Concession**	**Kisangani Zoological Garden**
Species Richness S	8	12	12
Nr. Individuals	20	53	31
Simpson 1-D	0.4082	0.3011	0.4024
Shannon H	0.5983	0.4783	0.5921
Eveness E	0.8631	0.6901	0.8542

Table 3 – Values of Jaccard similarity/Steinhaus distance indexes of snake species composition and abundance among three sites of Kisangani's suburban area, DRC.

Tableau 3 – Valeurs des indices de similarité de Jaccard et de distance de Steinhaus pour la composition et l'abondance des espèces de serpents parmi les trois sites de la zone de banlieue de Kisangani, RDC

Jaccard/Steinhaus	**Kisangani Zoological Garden**	**Campus Valley of Kisangani University**
Dehon Fathers Concession	0.41/0.39	0.67/0.57
Kisangani Zoological Garden		0.54/0.33

The species appearance curve (Fig. 4) suggests that the number of species and individuals will increase over time if inventories continue, with very high numbers in Dehon Fathers Concession, followed by the Kisangani Zoological Garden, and finally in the Campus Valley of Kisangani University. The number of individuals is very high in Dehon Fathers Concession, followed by Kisangani Zoological Garden, and finally in the Campus Valley of Kisangani University, with the most frequently collected taxa. The Campus Valley of Kisangani University shows a more homogeneous distribution and a relative impoverishment of abundance, whereas the Dehon Fathers Concession and the Kisangani Zoological Garden show a more or less heterogeneous and diversified distribution.

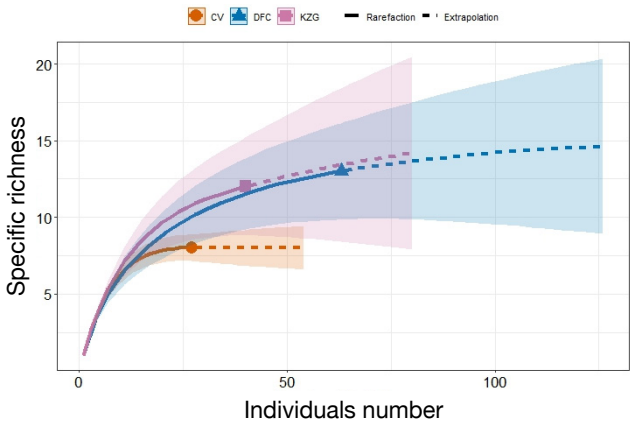

Figure 4 - The species appearance curves for the three sites (CV: Campus Valley of Kisangani University; DFC: Dehon Fathers Concession; KZG: Kisangani Zoological Garden).

Figure 4 - Les courbes d'apparitions des espèces pour les trois sites (CV : Vallée du Campus de l'Université de Kisangani ; DFC : Concession des Pères déhon ; KZG : Jardin Zoologique de Kisangani).

Figure 5 on the dendrogram of species grouping in the three sites of Kisangani and Table 4 on the presence or absence of species in the variabilities shows the formation of four species groups formed according to the sites, including: the first grouping consists of the species such as *Atheris squamigera, Thrasops batesii, Dipsadoboa viridis gracilis* and *Atractaspis reticulata*, which are present in the Dehon Fathers Concession but are absent in the Campus Valley of Kisangani University and in the Kisangani Zoological Garden. The second grouping consists of the species such as *Causus maculatus, Grayia obscura, Philothamnus carinatus, Boaedon olivaceus, Gonionotophis poensis, Aparallactus modestus* and *Afrotyphlops angolensis* are present in all three sites. The third grouping consists of species such as *Grayia obscura, Hormonotus modestus, Hydraethiops melanogaster, Hapsidophrys smaragdina, Dasypeltis fasciata*, and *Dendroaspis jamesonii*, which are present in the Kisangani Zoological Garden but absent in the Dehon Fathers Concession and the Campus Valley of Kisangani University. The fourth grouping consists of species such as *Philothamnus carinatus* and *Bothrophthalmus lineatus*, which are present in the Campus Valley of Kisangani University and in the Dehon Fathers Concession but are absent from the Kisangani Zoological Garden.

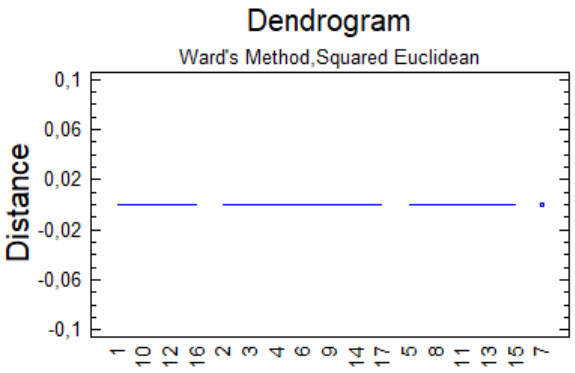

Figure 5 - Dendrogram of species grouping in the three sites of Kisangani.

Figure 5 - Dendrogramme de regroupement des espèces dans les trois sites de Kisangani.

Table 4 – Presence or absence of species in the variabilities.

Tableau 4 – Présence ou absence des espèces dans les variabilités.

Classes	Campus Valley of Kisangani University	Dehon Fathers Concession	Kisangani Zoological Garden
1	0	1	0
2	1	1	1
3	0	0	1
4	1	1	0

DISCUSSION

The richness and diversity of snakes have been compared among three sites within Kisangani City and its surroundings. The number of species ranged from eight to 12 per site, with a similar species composition and individual abundance per species. These results might be expected, since all three sites are only 2–3 km apart, experience the same tropical climate, and are deeply modified original rainforests, mostly replaced by comparable post-cultivation vegetation. However, they are separated by dense urban housing structures and exhibit distinct proportions of physical biotic structure: one dominated by fish pools, one by woodland, and one by a mosaic of grassland, agricultural patches, and tree stands. Nonetheless, the species richness of the Kisangani study sites is surpassed by several other study sites in tropical Central Africa (Tab. 5). For example, Trape (1985) observed 45 species at Dimonika in the Republic of the Congo-Brazzaville. In contrast, the high snake diversity in Dimonika appears to be linked to the region's increased topographic complexity, with small, deep, and steep-sided valleys, ravened slopes, and narrow ridgelines, which again increase the diversity of habitat niches and ultimately more species (Trape 1985). The study with high species numbers along mountain slopes in Cameroon, including the known 'biodiversity hotspot' Mount Nlonako, spans a much greater altitudinal range and bio zones (Hermann *et al.* 2005); reflecting a higher structural elevation and climatic complexity, leading to a greater biodiversity and species richness of snakes compared to our study sites in flat, tropical forests of Kisangani. Furthermore, the methods applied (Visual Encounter Survey and Targeted Search) had their limits, particularly in terms of low detection probabilities for canopy and small fossorial species, which were compensated for by increased sampling duration, area, and method variation in the aforementioned studies with higher species richness.

As no large-scale environmentally destructive event has been observed in the Kisangani region aside from severe logging, the largest threat to the diversity of snake fauna around Kisangani is increased anthropogenic demographic pressure, which results in further habitat loss and/or degradation. Nonetheless, the three semi-natural sites in the Kisangani suburban area reveal a surprisingly high snake richness, given their small size and the suburban character or proximity of the sites. Indeed, the comparable site at Yoko, 32 km south of Kisangani, DRC, yields about twice as many snake species; however, sampling was conducted over an area up to 20 times larger (Akuboy 2017). In summary, the snake species richness at the three semi-natural urban sites of Kisangani represents about 30% of the snake diversity in the greater Kisangani region (Chippaux & Jackson 2019, Trape 2023), despite its limited topographic and altitudinal range and reduced macro- and microhabitat complexity.

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Table 5 – Comparison of our results with those of other studies carried out in African Forests. In sampling methods: DI = direct inventory or VES (Visual Encounter Survey, TS = Targeted Search, PT = Pitfall Trap, GT = Glue Trap, and QD = Quadrature. In Habitats: PF = Primary Forest; SF = Secondary Forest; MF = Mountain Forest; SwF = Swamp Forest; Fa = Fallow land; Mg = Mangrove; Pl = Plantation; Sa = Savannah and SdF = Semi-deciduous Forest. Ni = Number of individuals, NS = Number of species, and Fam = Number of families.

Tableau 5 – Comparaison de nos résultats avec ceux d'autres études menées dans les forêts Africaines. Pour les méthodes d'échantillonnage : DI = inventaire direct ou VES (Enquête des relevés visuels), TS = recherche ciblée, PT = Piège à fosse, GT = Piège à colle et QD = Quadrature. Pour les habitats : PF = Forêt Primaire, SF = Forêt Secondaire, MF = Forêt de Montagne, SwF = Forêt Marécageuse, Fa = Jachère, Mg = Mangrove, Pl = Plantation, Sa = Savane et SdF = Forêt Semi-décidue. Ni = Nombre d'individus, NS = Nombre d'espèces, Fam = Familles.

Country	Locality	Site elevation (m a.s.l)	Duration of the study (day)	Sampling methods	Habitats	Ni	NS	Fam	References
DR Congo	Kisangani	425	120	TS	SF, SWF	104	17	6	This study
DR Congo	Yoko	435	60	DI, TS	PF, SF, FA	172	32	7	Akuboy *et al.* 2017
Angola	Malanje	1000	120	DI, TS	PF, SF	154	12	5	Ceríaco *et al.* 2016
Cameroon	Mont Nlonako	1100	2190	PT, DI, GT, QD	PF, SF, MF	118	63	5	Herrmann *et al.* 2005
Congo Braz	Dimonika	930	730	DI, TS	SWF, PF, SF	351	45	5	Trape 1985

AUTHORS CONTRIBUTION

JBA and KM have carried out the specimen collection in the field. KM carry out morphological identification, and KM, ALL, and GTG have contributed to the writing improvement

ETHICS

We had obtained the ethics document authorisation from the Biodiversity Monitoring Centre of Kisangani University. The research permits numbers are: CSB/UNIKIS N° 09 of March 04, 2021; CSB/UNIKIS N° 23 of June 10, 2021; CSB/UNIKIS N° 16 of September 03, 2022 and CSB/UNIKIS N° 13 of October 02, 2022, authorising us to collect snake specimens in the three sites around Kisangani. This document on ethics and deontology regarding the manipulation and well-being of animals was established by the researchers' team at the Biodiversity Monitoring Centre of Kisangani University.

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