

Diversity of Snakes at the University of Dodoma Campus, Tanzania

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Abstract Background: Tanzania is internationally recognized as a key country for the conservation of African biological diversity. This country's rich biodiversity is a reflection of its unique geographical position and climatic variations. The herpetofauna in Tanzania has a wide range of vertical and horizontal distribution. However, the field of herpetology has always received less priority in Tanzania. **Methods:** Visual encounter survey method was employed for snake collection. The study area was visited almost regularly and all snake species observed were recorded / collected. During regular surveys, searching was conducted in all possible microhabitats such as in shade, under boulder and logs, alongside of streams, agricultural field, forest, bushes and human settlements during day time. The killed snake species were collected and preserved in 10% formalin for further study. **Result:** A total of 16 snake species belonging to 12 genera and 7 families were documented at the campus of the University of Dodoma from February 2009 to April 2014. Out of all the species, 5 belong to family Colubridae, 6 to Lamprophiidae and one species each belong to family Elapidae, Viperidae, Atractaspididae, Boidae, and Pythonidae. Among the recorded species 3 are deadly venomous, 7 are mild venomous and the remaining 6 are non-venomous. **Conclusions:** Although the most common snake at the campus is a highly venomous snake, the puff adder, no fatalities associated with snake bites were recorded at the university during the study period. For the conservation of snakes in Tanzania, public awareness regarding the importance of snake to keep the ecosystem in balanced condition is essential. The snake biodiversity of Tanzania is unparalleled on mainland Africa, and nowhere is this more apparent than in its forest herpetofauna. Though, the endemics for which the nation is so renowned are seriously threatened by habitat loss and overexploitation for the wildlife trade.

Keywords: snakes diversity, venomous snakes, University of Dodoma, Tanzania

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1. Background

Tanzania is internationally recognized as a key country for the conservation of African biological diversity. It is unique geographically, culturally as well as in terms of floral and faunal diversity. This country's rich biodiversity is a reflection of its unique geographical position and climatic variations.

The herpetofauna in Tanzania has a wide range of vertical and horizontal distribution. However, the field of herpetology has always received less priority in Tanzania. Scientific investigations concerning the herpetofauna of Tanzania has been sporadic and so the information related to the subject is scanty.

The first zoogeographical analysis of East African herpetofauna was done by Parker, Laurent, Loveridge and Rand [1,2,3,4,5], which laid a good basis for further studies. A paper about the most common snakes in Tanzania was posthumously published in 1975 by Desmond Foster Vesey-FitzGerald, the Scientific Officer of Tanzania National Parks [6]. There are very few published accounts that include collections of snakes from

the other regions of Tanzania. Broadley & Howell (1991) arranged the Tanzanian reptiles according to White's (1983) classification in order to understand biogeographical and macro-ecological relationships of the east African herpetofauna. However, no detailed survey of the snake fauna of the country has been carried out so far [7,8].

The recent publication of a book, "A Field Guide to the Reptiles of East Africa" by Spawls *et al.*, has made an immense advance in East African herpetology [9]. However, further local faunal studies are still important to gather knowledge on species distribution and diversity. This kind of basic research is crucial to conservation programmes for the region's changing ecology that results from human transformations of local environments.

The present report is based on observations of snakes collected / observed during working in the University of Dodoma (Tanzania) from August 2009 to April 2014. Most observations were made around the university campus and adjacent villages.

1.1. Description of Study Areas

The University of Dodoma (UDOM) is a public university in central Tanzania located in Dodoma town,

the country's capital. It was formally established in March 2007 following the signing of the Charter by the President of the United Republic of Tanzania. The university is

located on a 6,000 hectare site in the Chimwaga area, about 8 kilometers (5.0 mi) east of downtown Dodoma.

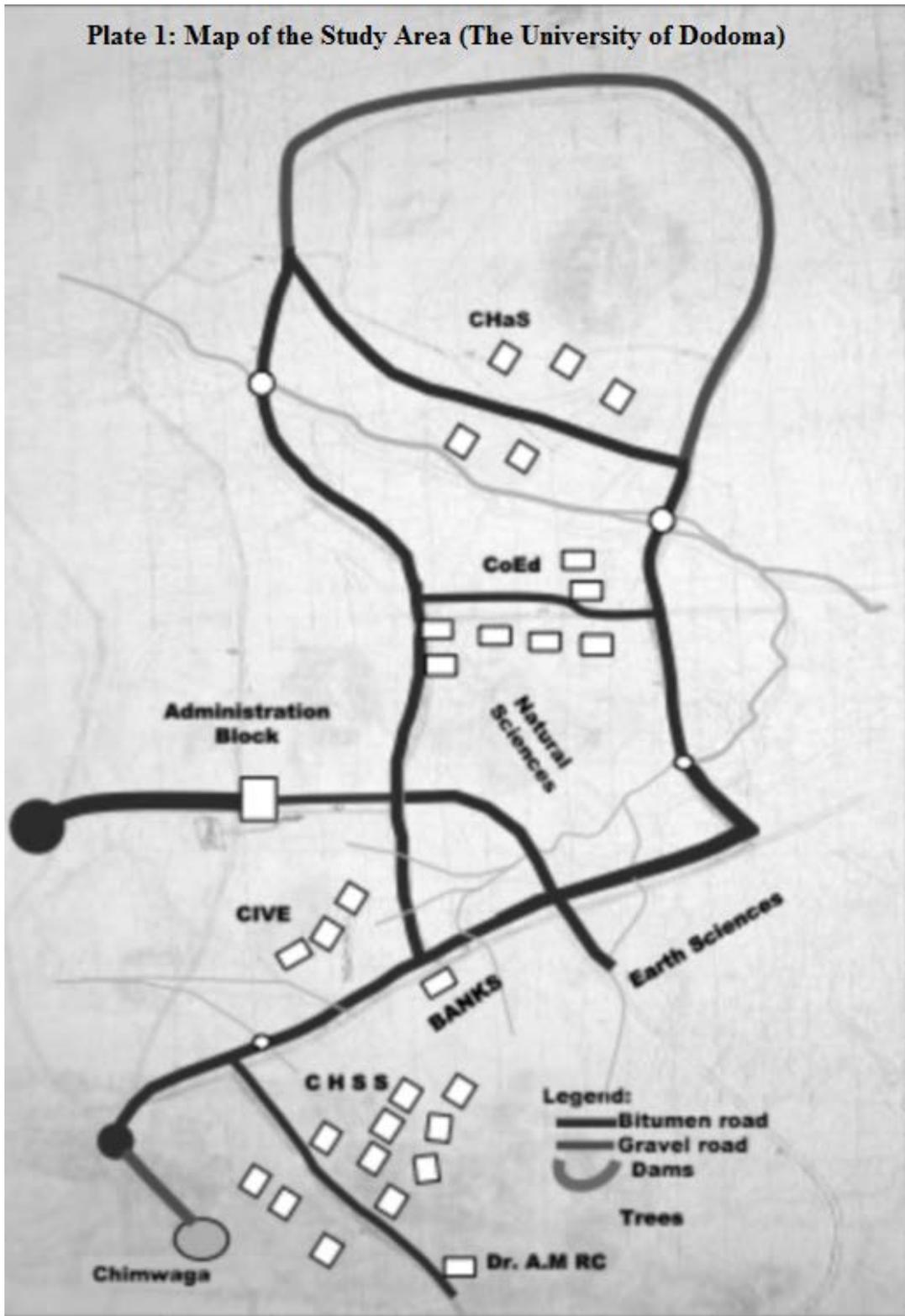


Plate 1. Map of the Study Area (The University of Dodoma)

In Chimwaga area there is a small reserved forest having lots of small wild animals. The unbuilt areas of the university campus consist of bushy grasslands and scattered rocky hills which is a home to many wild animals including various species of insects, amphibians, reptiles, birds and small mammals. Observation and collection of snake species from different locations in the

campus viz., Chimwaga area, College of Social Sciences, College of Education area, Central Administration area and College of Earth Science area as well as in villages adjacent to the University from February 2009 to April 2014 is reported in the present study. View of the university is shown in Plate 1.

1.2. Climate

Dodoma is located at 6°10'23"S35°44'31"E in the center of the country. The town is 486 kilometers (302 mi) west of the former capital at Dar es Salaam and 441 kilometers (274 mi) south of Arusha, the headquarters of the East African Community. Dodoma features a semi-arid climate with relatively warm temperature throughout the year. While average highs are somewhat consistent throughout the year, average lows dip to 13°C (55.4°F) in July. Dodoma receives an average of 570 mm of precipitation per year, the bulk of which occurs during its wet season between November and April. The rest of the year comprises the city's dry season.

2. Materials and Methods

Visual encounter survey method was employed for snake collection. The study area was visited almost regularly and all snake species observed were recorded / collected. During regular surveys, searching was conducted in all possible microhabitats such as in shade, under boulder and logs, alongside of streams, agricultural

field, forest, bushes and human settlements during day time. Opportunistic observations of snakes killed on the road by people or trucks were also useful in data collection. Students, teachers and local people were encouraged to preserve killed snakes in 10% formalin or to give a call as soon as possible or to take photographs of any type of snake species found with digital camera or with the help of mobile camera. The killed snake species were collected and preserved in 10% formalin for further study. The collected snake specimens were identified by the standard books of (1999) Spawls *et al.*, and McDiarmid *et al* [9,10,11].

3. Results

Altogether 16 snake species were recorded (Table 1, Plate 1), these species belonged to 12 genera and 7 families and they represented six non-venomous, seven mild venomous and three deadly venomous snakes. Out of the 16 species, five were of Colubridae family, six were of Lamprophiidae, and one each belonged to Elapidae, Viperidae, Atractaspididae, Boidae and Pythonidae family.

Table 1. List of snake species recorded at the campus of the University of Dodoma, Tanzania from February 2009 to April 2014

S.No.	Scientific Name	Common / Kiswahili Name	Family	Venomous / Non-Venomous
1	<i>Atractaspis bibronii</i> (Smith, 1849)	Bibrons' burrowing asp	Atractaspididae	Venomous
2	<i>Bitis arietans</i> (Merrem, 1820)	Puff adder/ (Kifutu / Moma)	Viperidae	Venomous
3	<i>Naja nigricollis</i> (Hallowell, 1857)	Black-necked Spiting cobra / Swila	Elapidae	Venomous
4	<i>Eryx colubrinus</i> (Daudin, 1803)	Kenya Sand boa	Boidae	Non-venomous
5	<i>Dasypeltis scabra</i> (Linnaeus, 1758)	Common Egg eater	Colubridae	Non-venomous
6	<i>Dasypeltis medici</i> (Bianconi, 1859)	Rufous Egg eater	Colubridae	Non-venomous
7	<i>Meizodon semiornatus</i> (Peters, 1854)	Semi-ornate snake	Colubridae	Non-venomous
8	<i>Ramphiophis rostratus</i> (Peters, 1854)	Rufous-beaked snake	Colubridae	Mildly venomous
9	<i>Telescopus semiannulatus</i> Smith, 1849)	Tiger snake	Colubridae	Mildly venomous
10	<i>Lycophidion capense</i> (Boulenger, 1893)	Cape Wolf snake	Lamprophiidae	Non-venomous
11	<i>Hemirhagerrhis kelleri</i> (Boettger, 1893)	Kellers' bark snake	Lamprophiidae	Mildly venomous
12	<i>Psammophis sudanensis</i> (Werner, 1919)	Striped sand snake / Nyokamwale	Lamprophiidae	Mildly venomous
13	<i>Psammophis mossambicus</i> (Peters, 1882)	Olive sand snake	Lamprophiidae	Mildly venomous
14	<i>Psammophis sibilans</i> (Linnaeus, 1758)	Hissing Sand-snake	Lamprophiidae	Mildly venomous
15	<i>Psammophis tanganicus</i> (Loveridge, 1940)	Tanganyika Sand snake	Lamprophiidae	Mildly venomous
16	<i>Python natalensis</i> (Smith, 1833)	South African rock python / Chatu	Pythonidae	Non-venomous

The Colubrids included the common egg-eater (*Dasypeltis scabra*), the rufous egg-eater (*Dasypeltis medici*), the rufous beaked snake (*Ramphiophis rostratus*), the semi-ornate snake (*Meizodon semiornatus*), and tiger snake (*Telescopus semiannulatus*), whereas the Lamprophiids included the Kellers' bark snake (*Hemirhagerrhis kelleri*), striped sand snake (*Psammophis sudanensis*), Olive sand snake (*Psammophis mossambicus*), Tanganyika sand snake (*Psammophis tanganicus*), the hissing sand snake (*Psammophis sibilans*) and the Cape wolf snake (*Lycophidion capense*).

The Atractaspidid recorded was the Bibrons' burrowing asp (*Atractaspis bibronii*), while the Elapid and Viperid was the black-necked spiting cobra (*Naja nigricollis*) and puff adder (*Bitis arietans*), respectively. Other species recorded were the Kenya sand boa (*Eryx colubrinus*) and the Southern Africa rock python (*Python natalensis*) which belong to family Boidae and Pythonidae respectively.

Of the 16 snake species recorded at the university campus, three were highly venomous, seven were mild venomous and the remaining six were non-venomous.

Snakes of the family Colubridae, Lamprophiidae, Boidae and Pythonidae are mild venomous or non-venomous [9]. Bibron's burrowing asp, puff adder and black-necked spitting cobra are the highly venomous snakes found at the Campus of the University of Dodoma. Of these snakes, the puff adder is the most common snake encountered at

the campus. However, from 2009 to May 2014 there were no fatalities cases associated with snake bites recorded at the University campus. Detailed information of the 16 documented species is provided in Table 1 and photographs of the snake species are shown in Plate 2.



1. *Atractaspis bibronii*



2. *Bitis arietans*



3. *Naja nigricollis*



4. *Eryx colubrinus*



5. *Dasypeltis scabra*



6. *Dasypeltis medici*



7. *Meizodon semiornatus*



8. *Ramphiophis rostratus*



9. *Ramphiophis rostratus*



10. *Lycophidion capense*



11. *Hemirhagerrhis kelleri*



12. *Psammophis sudanensis*



13. *Psammophis mossambicus*



14. *Psammophis sibilans*



15. *Psammophis tanganicus*



16. *Python natalensis*

Plate 2. Photographs of snake species from the University of Dodoma Campus, Tanzania

4. Discussion and Conclusions

Snakes are an integral part of many ecosystems. Currently, nearly about 3500 species of snakes found in the world, out of which 375 species (10.71%) are poisonous [12]. It is not known exactly how many different species of snake occur in Tanzania, but it is currently estimated that at least 275 reptilian species are highly likely to be found in Tanzania and most of them are strictly endemic [13].

The present study recorded altogether 16snake species belonging to 12 genera and 7 families around the campus of the University of Dodoma. The seven families are Atractaspididae, Colubridae, Elapidae, Viperidae, Lamprophiidae, Boidae and Pythonidae. While forest habitats must be conserved to preserve biodiversity, the diverse environment of the cultivated landscape can provide a rich environment for herpetofauna. Agricultural fields, permanent ponds, gardens, houses and refuse heaps all provide a variety of habitats for frogs and their ophidian predators. Social and various other human activities also increase the rodent population and possibly the lizard population which in turn are regular prey items for many snakes. In general, people cannot distinguish the poisonous and non-poisonous snakes. They think every snake is poisonous. So, they kill snakes whenever they meet them. Thus, the snake species are decreasing day by day. For the conservation of snakes in Tanzania, public awareness regarding the importance of snake to keep the ecosystem in balanced condition is essential. As the university of Dodoma campus is covers a large area and harbors many snake species, raising awareness among the students and staff about the snakes found at the campus is quite essential for protection of the students and staff against potential risks of venomous snake bites and to help protect the snakes especially the non-venomous ones which might be killed in fear that they are dangerous.

In Africa, damage attributed to rodents in Tanzania causes an estimated annual maize (corn) yield loss of 5–15%, which corresponds to about 45 million dollars and food for about 2 million people [14]. Maize is the main crop in Tanzania including Dodoma. Snakes are a major predator of rodents in Africa, including the Dodoma, Tanzania [9].

The snake biodiversity of Tanzania is unparalleled on mainland Africa, and nowhere is this more apparent than in its forest herpetofauna. Though, the endemics for which the nation is so renowned are seriously threatened by habitat loss and overexploitation for the wildlife trade. The latter is largely unmanaged, often illegal and increasingly pervasive. Assemblage from the wild is mostly unsustainable and has reached a level whereby it represents perhaps the biggest threat to Tanzania's reptiles. And yet with political will, a scientifically-derived quota system and trade that focuses on captive breeding rather than wild capture, the threat could be twisted into a conservation opportunity. Unfortunately however, that scenario is for the future and in the meantime great care is

needed to avoid the loss of many of Tanzania's rarest and most fascinating reptilians.

Competing interests

The authors declare that they do not have any financial and non-financial competing interests.

Authors' contributions

All authors had significant intellectual contribution towards the design of the field study, data collection, data analysis and write-up of the manuscript. All authors read and approved the final manuscript.

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