Review Article

Diversity of Amphibians and Reptiles at Chiremera Locality, Vanduzi - Mozambique

Abstract

Diversity of amphibians and reptiles was studied at Chiremera locality in Manica Province, Mozambique. To the best of our knowledge, no herpetofauna study has been done at the Chiremera locality. Globally the herpetofauna of Mozambique remains poorly documented compared to other areas of southern Africa (Pietersen D.W., 2014). The study aims to assess the diversity of amphibians and reptiles at Chiremera locality. The data was collected using two techniques: Visual Search and Intercept and pit fall traps. The data was collected in two habitat types: wild areas and human altered areas. We recorded on the wild areas 91 individual of amphibians (18 species, 10 genera and 9 families). The human altered areas had a total of 27 individual amphibians, (4 species, 4 genera and 4 families). *Hemisus marmoratus* (marbled snout-burrower) was the most abundant species in the two habitats, accounting for 26.3% of all individuals identified. The Shannon winner of amphibians was higher at the wild areas (H '= 2, 1) and lower in the human altered area (H' = 1, 2). A total of 24 individual reptiles were recorded on the wild areas (7 species, 7 genera and 5 families). In contrast to human altered areas we recorded (5 species, 3 Genera, and 3 families). *Bitis arietans* (puff adder) was the most abundant reptile accounting for 26% of all individuals identified. The Shannon wiener of reptiles was (H'=1, 6) at the wild areas and (H'=1, 5) at the human altered areas. Four rare species namely *Hyperolius acuticeps* (sharp-headed long reed frog), *Hyperolius benguellensis* (Benguella long reed frog), *Ptychadena subpunctata* (spotted ridged frog) all amphibians and *Naja mossambic*a

(Mozambique spitting cobra) - reptile were detected during our study. The result of the current study revealed that effect of human altered areas on the richness and abundance of amphibians and reptiles.

Key- Words: *Amphibian, Reptiles, Diversity, Chiremera-Manica, Mozambique.*

INTRODUTION

Biodiversity is an attribute of an area and specifically refers to the variety within and among living organisms, assemblages of living organisms, biotic communities, and biotic processes, whether naturally occurring or modified by humans. Biodiversity can be measured in terms of genetic diversity and the identity and number of different types of species, assemblages of species, biotic communities, and biotic processes, and the amount (e.g., abundance, biomass, cover, rate) and structure of each (Ian R. Swingland, 2001). Biological diversity can be considered as the number of species and individuals found in a single location or type of habitat as well as the change in species composition between sites, habitats or environmental gradients (MELO et al., 2009, WHITTAKER, 1960). One of the ways of quantifying it is by counting the species present in the samples. According to Pielou (1975), the variation of species existing between communities can be represented and quantified in several ways. The most common of these is through diversity indexes. This characteristic of varying the number of species in the communities is denominated diversity.

Herpetologically of Mozambique remains unexplored (PIETERSEN, D.W. 2014). Little extensive fieldwork was subsequently conducted, with major works which incorporated Mozambique herpetofauna such as FitzSimons (1962), Channing (2001) and Du Preez and

Carruthers (2009), based on incidentally collected specimens housed in various museums. More recently Broadley (1990a, 1992) surveyed the herpetofauna of the islands off the Mozambican coast, describing a number of additional taxa, particularly insular forms. Other recent contributions include Downs and Wirminghaus (1997), Branch et al. (2005), Bates and Maguire (2009), Branch and Tolley (2010), Jacobsen et al. (2010), Bates and Broadley (2012) and Pietersen et al. (2013), (PIETERSEN, D.W. 2014).

The reptile fauna of Mozambique consists of at least 294 species (Branch, Rödel & Marais 2005a,b; Schneider *et al*. 2005; Branch & Bayliss 2009; Jacobsen, Pietersen & Pietersen 2010; Bates & Broadley 2012; Portik *et al*. 2013a,b; Bates 2014; Branch, Bayliss & Tolley 2014; Reissig 2014; Conradie *et al*. 2016; Branch *et al*. 2017). Although numerous records are available for some parts of the country, many areas, especially in the north, remain poorly surveyed (Michael F. Bates, 2019), actually are known 82 species of amphibians (Michael F. Schneider et al., 2005). Conradie, W. et al.: (2016) carried out study of reptiles and amphibians in northern Mozambique (Mount Mabu, Mount Namuli, and Mount Ribáuè), and recorded a total of 56 species, 22 amphibians and 34 reptiles.

A known place of high diversity of herpetofauna is the Zambezi basin, where 200 species of reptile and 90 species of amphibians have been identified (Timberlake, 2000). In Maputaland Centre of Endemism 21 species of frog were identified in permanent and seasonal pans. This number corresponds to 16.28% of the total species occurring in southern Africa (SABONET, 2001). Threats to herpetofauna include collection for food, skin and medicinal purposes, pet trade and habitat destruction, although quantitative data on this is unknown. Due to perceived

danger to man and livestock, snakes and cobras are more frequently killed (Ministry for the Coordination of Environmental Affairs, 2009)

Mozambique adopted the Convention for Biological Biodiversity (CBD), and ractified in 1995, envisages a conservation of biodiversity, sustainable utilization of its components benefit sharing arising from utilization of genetic resources, effective managent of protected areas as well as ex-situ conservation of biodiversity (Ministry for the Coordination of Environmental Affairs, 2009). The present study aim to evaluate the diversity of amphibians and reptiles comparing wild areas and human altered areas.

MATERIALS AND METHODS

Study area

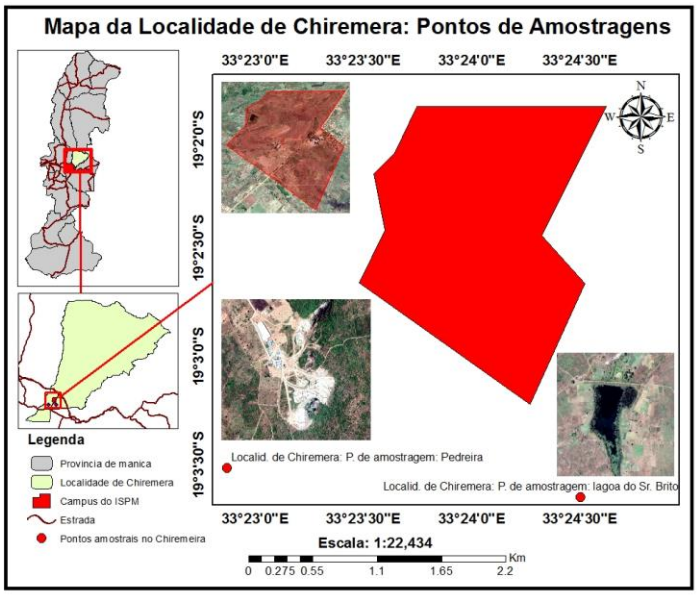

Fig. 1 Map of Study area

The present study was conducted at Chiremera locality in Manica Province-Mozambique. The climate according to the classification of Köppen (Ferro and Bouman, 1987), is of the humid temperate type (Cw). The mountainous region of Manica registers the annual levels in the order of 1000 and 1020 mm of rain. In general, the distribution of rainfall is uneven throughout the year, observing the existence of two distinct seasons, a rainy season and drought. The rainy season starts in November and ends in April. Evapotranspiration is an annual measure of 1220 1290, which is higher than the average value of annual abstraction.Annual annual average of 21.2 ° C (Statistical Yearbook, Province of Manica, 2017).

The Manica region is drained by the Revue river and its tributaries, which in turn drains its waters into the river Buzi which is the main watershed. The soils of Manica district show a close relationship with the geology and climate of the region, and are locally modified by topography

and water regime, in general, they are basically deep, well-drained red or reddish red or brown clay soils. In addition to amphibians and reptiles, the fauna comprises small mammals (Rattus rattus, Lepus saxatilis, Paraxerus palliatus, Heliosciurus mutabilis), and birds. The vegetation consists mainly of grasses and plants such as (Pennisetum purpureum, Panicum maximum, Cynodon dactylon, Hyparrhenia rufa, Mangifera indica, Acacia ataxacantha, Lantana camara, Acacia nigrescens, Eucalyptus camaldulensis, Kigelia africana and Acacia burkey.

Sampling Locations and

Two sampling areas were selected the wild areas and human altered areas. The wild areas are characterized by the presence of sandy loamy soils and vegetation consisting essentially of grasses.

Data Collection Techniques

Visual Search with direct observation was the main method used in this research. Surveys were conducted during the day and night (morning from 8Am - 11Am, and night from 6Pm - 9Pm) a day, in two 100m and 4m wide transects. Specimens were collected by hand (amphibians and lizard) and tongs (snakes). The collection duration in the sampling areas was 22 days, with a sampling effort of 66 hours per Man, totalizing 1518 hours.

The intercept and fall traps with drift fence were arranged in three distant lines, with twelve 12-liter buckets, buried at ground level, 8 meters apart.

Data analysis

Data were analyzed using Microsoft Excel, species richness and abundance by sampling site was determined by counting (Magurran, 1988). Shannon Wiener and Simpson indices were used to determine the variation of anuran, reptiles and amphibian diversity between sampling sites.

RESULTS

Richness and Abundance of Amphibians

We recorded on the wild areas 91 individual of amphibians (18 species, 10 genera and 9 families). In contrast, the human altered areas had a total of 27 individual amphibians, (4 species, 4 genera and 4 families). *Hemisus marmoratus* is the most abundant species in both habitats with (26.3%) of all identified individuals. The species *Hyperolius acuticeps*; *Hyperolius benguellensis* and *Ptychadena subpunctata* were represented by one individual (0.8%) and the occurrence of these species was observed only on the lakeshore.

Fig. 2 *Afrixalus fornasini* *Phlyctimantis maculatus*

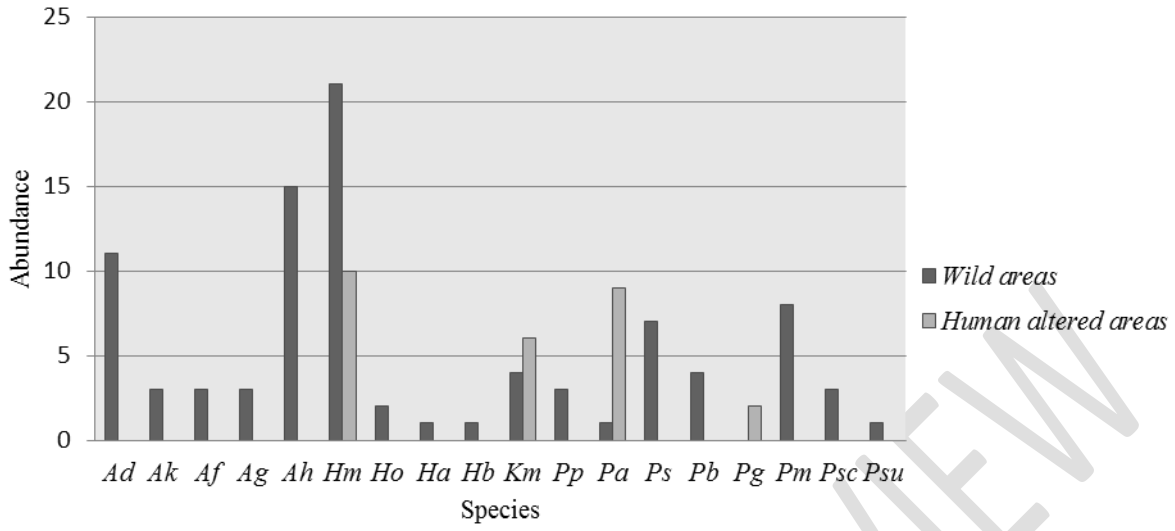

Fig. 3 Richness and Abundance of Amphibians recorded at Chiremera locality: *Af =Afrixalus delicatus; Ak=Afrixalus knysnae; Af= Afrixalus fornasinii; Ag= Amietophrynus gutturalis; Ah= Anhydrophryne hewitti; Hm= Hemisus marmoratus; Ho= Hildebrandtia ornate; Ha= Hyperolius acuticeps; Hb= Hyperolius benguellensis; Km=Kassina maculate; Pp= Phrnobatrachus parvulus; Pa= Phrynobatrachus acridoides; Ps= Phrynobatrachus spp; Pb= Phrynomantis bifasciatus; Pg= Ptychadena guibei; Pm= Ptychadena mapacha; Psc= Ptychadena schillukorum; Psu= Ptychadena subpunctata.*

Richness and abundance of reptile species

A total of 24 individual reptiles were recorded on the wild areas (7 species, 7 genera and 5 families) and 15 (5 species, 5 Genera, and 3 families) in the human altered areas.

Bitis arietans was the most abundant species with (26%) of all identified individuals.

Fig 4. *Trachylepis striata* *Trachylepis margaritiferus*

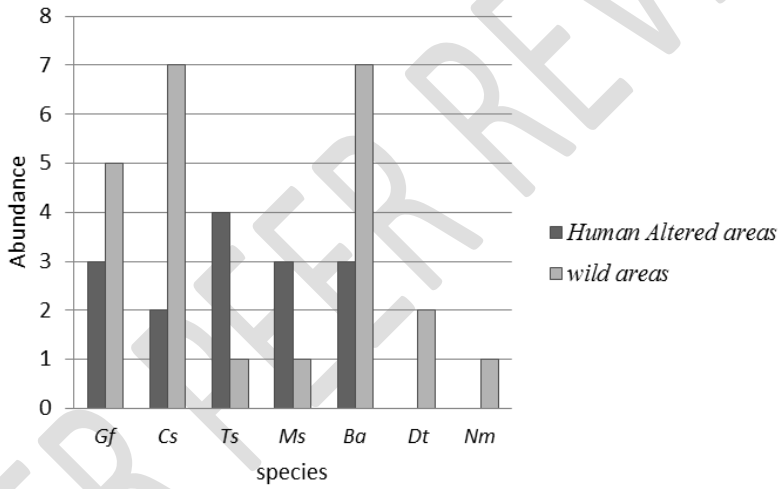

Fig. 5 Richness and Abundance of Reptiles recorded at Chiremera locality:

Gf= Gerrhosaurus flavigularis; Cs= Cordylosaurus subtessellatus;Ts= Trachylepis striata; Ms= Mochlus sundevallii, Ba= Bitis arietans; Dt=Dispholidus typus; Nm=Naja mossambica

DISCUSSION

Diversity of amphibians and reptiles at Chimera locality vary according to the habitat type. We recorded a total of 18 species of amphibians and 7 of reptiles. The Shannon winner of amphibians was higher (H'=2.1) in the wild areas than human altered areas (H'=1.2). The Shannon winner of Reptiles was (H'=1.6) in the wild areas and (H'=1.5) in the human altered areas. The lower species diversity found in the human altered areas may be related to anthropic action, as their effect reduces natural habitats and causes changes in the structure of communities (HEINEN, 1992; CARO, 2001; MORAES et al., 2007) due, not only to alteration of the physiognomy of natural environments (GIBBS, 1998) and the edge effect (MURCIA, 1995), but because it causes disturbances in the ecological relationships of predation, competition and spatial and temporal sharing of resources previously established between species (MORIN, 1986; ALFORD, 1989; ETEROVICK and BARATA, 2006). Intensity and frequency of anthropogenic pressure and the vegetation adjacent to the fragment may be the factors that most influence the number of species that can coexist in the environment (TOCHER et al., 1997; BROOKS et al., 2002).

CONCLUSIONS

Human activities most often generate a series of changes in the environment resulting in the partial or complete elimination of specific substrates, creating a homogenizing effect, which leads to a decrease in environmental complexity and consequently species richness.

Water is the most important factor in amphibian habitat due to its highly permeable skin and the need for breeding water for most species. Therefore, its distribution is determined by the distribution of water in the landscape, associated with the temperature factor. In the present

study, it was found that the greater richness and abundance of amphibians occurs in the vicinity of water bodies, specifically in the wild areas than in altered areas. The two areas studied showed low similarity. The growth of Chiremera has been gradually decreasing the habitats, which are transformed into fields of production, breeding or construction of new infrastructures, resulting in a decrease in the richness and abundance of these species.

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