



ISSN 2347-2677

IJFBS 2019; 6(6): 20-25

Received: 11-09-2019

Accepted: 15-10-2019

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Diversity and distribution of lizard fauna in tehsil Samar Bagh, Dir lower, khyber Pakhtunkhwa, Pakistan

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Abstract

Reptiles are one of the most ancient and diverse group of animals present on the earth for more than 230 million years. Pakistan has a very fertile biodiversity due to the presence of all types of habitats consisting of about 197 taxa of reptiles including lizards, snakes, turtles, tortoises, crocodiles and gavels. Reptiles have a key part in maintaining of the world's ecosystem. Lizards are diverse group of squamate reptiles having roughly 6000 species, present all over the world with the exception of Antarctica. The present research work was carried out on the diversity and distribution of lizard fauna in Tehsil Samar Bagh, District Dir (Lower), Khyber Pakhtunkhwa, Pakistan during April 2014 to August 2016. For collection of maximum information regarding the distribution and occurrence of different lizards, local people were interviewed. Various methods were used for trapping and catching the lizards like seething traps, noose traps and hand collection. In the present study, a total of 62 specimens of reptiles belonged to 4 families and 5 genera were collected. The % age of collected specimens for each family in descending order was: Agamidae (46.77%) > Gekkonidae (29.03%) > Eublepharidae (17%) and Varanidae (8.5%). During the present study, 6 species of lizards *Laudakia agrorensis*, *Calotes versicolor*, *Eublepharis macularius*, *Hemidactylus frenatus*, *Hemidactylus flaviviridis* and *Varanus bengalensis* were identified. The present study was a pioneer work on the diversity of reptiles in Tehsil Samarbagh, Dir Lower and will provide a baseline for future work on reptile fauna.

Keywords: Reptiles, lizard s, *Varanus* sp., *Calotes* sp. samarbagh, dir lower

Introduction

Reptiles are cosmopolitan animals having existed in a wide range of forms for more than 230 million years. In spite of the fact that the evolutionary process has greatly changed their species number, there are still more than 7,500 types of reptiles found all over the world. Reptiles have a key part in the proper functioning of the world's ecosystem, for the most part being regular carnivores help take out various bugs, crabs and different pests, which may harm crops and other food substances. Skins of reptiles have been used for making leather goods and to keep it as a pet are very important in economic point of view for the local economies. Pakistan has a very remarkable biodiversity because of tremendous natural and altitudinal inclinations, prompting complex zoogeographic designs. This abundance is especially high for reptiles, with around 197 taxa including reptiles, snakes, turtles, tortoise, crocodiles and gavels are recorded (Rahman and Ifat, 1997) ^[30].

Lizards are diverse group of squamate reptiles having roughly 6000 species, present all through the world with the exception of Antarctica, and also exhibit most of the oceanic islands.

In Pakistan many groups of lizards are found, yet lizards having a place with (Suborder Sauria) are the expressed group (Khan, 1980) ^[19]. The predominant groups of lizards found in Pakistan belong to family Agamidae, Chamaeleonidae,

Eublepharidae, Gekkonidae, Lacertidae, Scincidae, Uromastycidae and Varanidae. The number of species has consistently expanded from 65 species, to 101 species since 1966 (Khan, 2012) ^[16]. Family agamidae have six genera, twenty-three species, and twenty-six forms family chamelonidae have one class, one specie, and one form; family eublipharidae have one genus, one specie and one form; family gekkonidae have thirteen genera, thirty-seven species, and thirty-nine forms; lacertidae have four genera, twelve species and twelve forms; family scincidae have eight genera, sixteen species and sixteen forms; family uromastycidae

have one genus, two species and two forms, and family varinadae have one genus, three species and four forms (Khan, 2012) ^[16]. Reptiles are the second most dominant group of the herpeto fauna in margalla slopes National Park, represented by thirteen species which belong to twelve genera (Masroor, 2011) ^[27].

Food and feeding habits have been studied in many species of lizards (Zari, 1998) ^[34]. Food selection in reptiles is most commonly known by indirect methods, but it has been studied directly in several studies (AL Anzy, 1996; Zari, 1998) ^[2, 34]. Several agents change the food and feeding habits of lizards such as time of day, season, rainfall, food availability and quantity (Al Anzy, 1996; Zari, 1998) ^[2, 34]. The utilization of reptiles is a moderately normal practice in parts of Brazilian north east semiarid region, particularly in long dry spell, when the population is compelled to seek alternative food resources (Sianto *et al.*, 2012) ^[32].

The Tegus (Tupinambisteguixin) found in Eastern Paraguay, South America is likewise accepted to have therapeutic use, its fat or oil is accepted to cure an extensive variety of diseases, it is successful in curing skin wounds that are slow to heal and additionally it cures the skin disturbances, for example, pimples, pustules and boils and it is likewise accepted to cure measles, eye contaminations, ear aches, rheumatism and inflammation (Subramanian and Reddy, 2012) ^[33].

Creatures of land and water from time to time feed upon lizards and snakes (Duellman and Trueb, 1986) ^[5]. A few reptiles nourish as often as possible on lizards and snakes, including many instances of specialization. The best known cases are some varanids that are lizard's specialist and many snakes that are either lizard or snake experts (Greene, 1982, 1988) ^[9, 10]. Birds are surely essential predators of lizards and snakes. A few cases of fowls going after snakes and lizards from everywhere throughout the world were checked on by Greene (1988) ^[10]. Aside from this mammal also prey frequently on lizards (Greene, 1988) ^[10]. Be that as it may, some flesh eating species might be moderately vital predators of lizards and snakes (Martins, 1994) ^[26].

Materials and Methods

Selection of Localities

The lizards were collected from six union councils of Tehsil Samarbagh during April (2014) to October (2016). The six union councils consisted upon Sadberkaly, Mayar, Meskenay, Drangal, Samarbagh and Kambat.

All sorts of cress and trough in each locality such as grass, shrubs, nurseries stones, pond embankment, crevices, leaf debris and rotten logs were selected.

Sample collection

The collection of lizards was carried out from April (2014) to October (2016). For collecting maximum information regarding the distribution and occurrence of different lizards, local people were interviewed.

Lizards are active from late April to early October, mating in May–June and producing a single clutch in July (Salvador *et al.* 2008) ^[31]. Various methods were used for trapping and catching of lizards. Some methods are used for small lizard's trapping while other is used for large lizards. The most likely are setting a trap for the lizards. Similarly, for some lizards we also use hands for its trapping. However, larger species, such as monitor lizards were captured with noose traps or

other appropriate techniques.

Observations and collections were made at night and during the day to maximize the documentation of the lizard's species. Active searching was carried out at all study sites with a focus on suitable microhabitats for both diurnal and nocturnal species.

Most winter surveys were restricted to the period before dusk, as low night time temperatures limit the activities of reptiles. Night surveys within the study sites were conducted using hand lamps and powerful torches to avoid dangerous snakes. Passive signs of the presence of and reptiles, such as body impressions, tail drags or footprints, faecal pellets, tracks, dens, hiding places or egg laying excavations, were also utilized to determine the local distribution and rough population density of lizard fauna.

Field investigations were carried out at morning time, noon time sunset time and at night time. It was due to the reason because every species has a specific timing to come out for searching of food. Diurnal species were photographed in the field while the nocturnal species were brought to home and photographed on the subsequent day. All the specimens were photographed dorsally as well as ventrally. Collected specimens were killed, and preserved by injecting 10% formalin solution into belly, neck, legs and tail and preserved in 50 % formalin. Each specimen was tagged with necessary field information and then preserved in Pakistan museum of natural history Islamabad.

Identification

For identification of species different Keys were used unknown specimens. Most of the identification tricks were taken from Muhammad Sharif Khan keys. Online help from the group —Field Herpetology was also taken for this purpose.

Results

During the recent research work total of 180 species were observed in which 62 specimens were collected from six selected localities of tehsil Samarbagh, Dir Lower. Out of 62 collected specimens six species under five genera were identified. Among 62 specimens 15 individuals were belonged to *Laudakia agorensis*, 14 individuals were *Calotes versicolor*, were followed by *Eublepharis macularius* with 10 specimens, 10 were *Hemidactylus frenatus* and 8 individuals belong to *Hemidactylus flaviviridis*, While remaining were *Varanus bengalensis* with 5 specimens.

Taxonomic sources were provided for the identified species and validation of the specimen were made with their diagnostic characters i.e. body length, scales, limbs, fingers, colors, head shape, snout, naris etc. The relative percentage abundance of all the collected families of Tehsil Samarbagh, Dir Lower is shown in table.1.

1. *Calotes versicolor* (Daudin, 1802)

Diagnostic characters: Body length 6.6-8cm. Trunk color was blackish, brownish or grayish, ventral side is dim white, head wased similar to the body color and triangular, snout short and pointed, crest on neck, nictitating membrane is moveable. Tympanum behind the eyes. Claws pointed, tail long, whip and tapering. Epidermal keeled scale was present.

Remarks

This is the first record of this species from Tehsil Samarbagh,

Dir Lower. A total of 14 specimens were collected from six localities during the present study. Previously, it was reported

Distribution in Indian Subcontinent

India (Kar and Chandola-Saklani, 1985)^[14, 15]. (Gupta and Thapliyal, 1985)^[11]. Pakistan, (Khan, 2004)^[18]. (Khan and Fatima, 2002)^[23]. (Khan, 1991)^[21]. Bangladesh (Mahony and Reza, 2008)^[25]. Bhutan (COUNT, 2014)^[4]. Maldives (Hasen Didi, 1993)^[12]. Sri Lanka (Erdelen, 1986)^[6]. Nepal (Zug and Mitchell, 1995)^[35].

2. *Laudakia Agrorensis* (Stoliczka, 1872)

Synonym

Stellio agrorensis Agama *agrorensis* — BOULENGER 1885; *Agama agrorensis*^[36]; *Agama agrorensis* — WERMUTH 1967; *Laudakiaagrorensis*^[37]; *Laudakiaagrorensis* — SINDACO & JEREMČENKO 2008.

Diagnostic characters

Body length 5.4-7.8cm. Head scales were strongly carinated, tail twice or more than SV, 8-10 rows of strongly keeled vertebral scales; Body color was black with white spots, head was red,

Remarks

This is the recent study from Tehsil Samarbagh Dir Lower. A total of 15 specimens were collected from six localities during the present study. Previously, from Pakistan (Khan, 2004; 2002; 1999)^[18, 23]. (Masroor, 2011)^[27]. Chitral (Khisroon *et al.*, 2012).

Distribution in Indian Subcontinent

Pakistan (Khan, 2004; 2002; 1999)^[18, 23]. (Masroor, 2011)^[27]. (Khisroon *et al.*, 2012), India (Aengals *et al.*, 2011)^[1].

3. *Eublepharis macularius* (Blyth, 1854)

Diagnostic characters: Body length 8-10 cm. Body color is brightly yellow with prominent spots and strips were present. Eyelids were moveable, tail swollen, skin were tuberculated. Totally nocturnal. Skin durable and having bumps on dorsal side. Texture of dorsal is rough while ventral side is transparent and smooth.

Remarks

This species is reported first time from Tehsil Samarbagh Dir Lower. A total of 10 individuals were collected from four localities during the present study. Previously, it was reported from Pakistan by (Khan, 1999, 2002, 2004, 2016)^[18, 23]. (Masroor, 2011, 2012)^[27, 28]. (Goldberg *et al.*, 2003)^[7].

Distribution in Indian Subcontinent

India^[38]; (Aengals *et al.*, 2011)^[1].^[39], Pakistan by (Khan, 1999, 2002, 2004, 2016)^[18, 23]. (Masroor, 2011, 2012)^[27, 28]. (Goldberg *et al.*, 2003)^[7]. Sri Lanka (Vyas, 2000).

4. *Hemidactylus frenatus* (Schlegel, 1836)

Diagnostic characters: Body length 6.8 cm. Scales uniform. Tail distinct scale in form of bands. Color light brown and belly looking greenish. Pupil vertical and digits dilated. Tubercles are present on dorsal side. Come out at dusk time.

Remarks

Hemidactylus frenatus first record from Tehsil Samarbagh Dir

Lower. A total of 10 specimens were collected from four locations during the study. Previously, it was reported from (Khan, 1999, 2002, 2004, 2016)^[23, 18]. (Masroor, 2011, 2012); (Goldberg *et al.*, 2003)^[7].

Distribution in Indian Subcontinent

India (Kar and Chandola-Saklani, 1985)^[14, 15] (Gupta and Thapliyal, 1985)^[11]. Pakistan (Khan, 1999, 2002, 2004, 2016)^[23, 18]. (Masroor, 2011, 2012)^[27, 28]. (Goldberg *et al.*, 2003)^[7]. (Khan, 1999), Bangladesh (Mahony and Reza, 2008)^[25]. (Reza, 2007), Bhutan (COUNT, 2014)^[4]. Maldives (Hasen Didi, 1993)^[12]. Sri Lanka (Erdelen, 1986)^[6]. Nepal (Zug and Mitchell, 1995)^[35].

5. *Hemidactylus flaviviridis* (Rüppell, 1835)

Diagnostic characters

Body length 6.6-7.5 cm. Dorso-ventrally flattened. Dorsal parts covered with small, granular, smooth scales. Ventral scales imbricate and much larger than dorsal. Tail with clear regular segments, most with a transverse row of 4-6 small tubercles, dorsally; and a longitudinal row of wide subcaudal scales, ventrally. Digital pads strongly expanded. There is an average of 13 lamellae under fourth toe.

Remarks

This is the first record of this species from Tehsil Samarbagh Dir Lower. A total of 8 specimens were collected from six localities during the present study. Previously, it was reported from Pakistan by (Bibi, 1984; Dhuyo, 1986; Rahoo *et al.*, 1985) Mariyam (2012) reported it from Gilgit-Baltistan.

Distribution in Indian Subcontinent

From India (Mahendra, B. C. 1941, May), from Pakistan, (Bibi, 1984; Dhuyo, 1986; Rahoo *et al.*, 1985) Mariyam (2012) reported it from Gilgit-Baltistan. From Sri Lanka, (wijesekara, 2001).

6. *Varanus bengalensis* (Daudin, 1802)

Diagnostic characters

Body length 50-60 cm young is brightly colored white spots on dorsal side and tail is banded with white and black colors transversely. Adult is brown dusty or grey, and dark spots give them a speckled appearance, the belly is white. Male lizards, have external nostril positions between the eye and the tip of the snout. Scales rough and tongue protrude snakes like.

Remarks

This is the first record of this species from Tehsil Samarbagh Dir Lower. A total of 8 specimens were collected from six localities during the present study. Previously, it was reported from Pakistan by^[40]

Distribution in Indian Subcontinent

From India (Ishwar, N. M., Chellam, R., & Kumar, A. 2001)^[41]. (Purkayastha, J., Das, M., & Sengupta, S. 2011)^[29]. from Pakistan, (Khan, M. S. 1999)^[40]. (Khan, M. S., & Mirza, M. R. 1977)^[22]. From Sri Lanka. Karunaratna, D. M. S. S., Amarasinghe, A. T., & De Vos, A. S. H. A. (2008).

Discussion

The present research was carried out on the biodiversity and distribution of lizard fauna of Tehsil Samarbagh, Khyber Pakhtunkhwa, Pakistan during April 2014-September 2016.

This was the first research work from this area. The study area was divided in 6 quadrats (union councils). Active searching was carried out at all study sites with a focus on both diurnal and nocturnal species. Each zone was actively surveyed for suitable microhabitats of lizards i.e. (stones, pond embankment, crevices, leaf debris, and rotten logs).

There are reported 7 species of the genus *Hemidactylus* in Pakistan: *H. brookii*, *H. flaviviridis*, *H. frenatus*, *H. leschenaultii*, *H. persicus*, *H. triedrus* and *H. turcicus*. Recent studies through DNA barcoding validated *H. robustus* Heyden 1927 - long confused with *H. brookii* and *H. triedrus* in Iran and Pakistan, thus adding an 8th *Hemidactylus* to the fauna of Pakistan. However, in the present study six species of genus *Laudakia*, *Calotis*, *Eublepharus*, *Hemidactylus*, *Varanus* and *C. versicolor*, *L. agorensis*, *E. macularis*, *H. Frenatus*, *H. flaviviridis* and *V. bengalensis* were collected. Only two species *H. Frenatus*, *H. flaviviridis* were found same. So the present work conforms to the cited work.

Varanus flavescens was studied by Ghimire and Shah (2014) in Kanchanpur (Nepal). They estimated the distribution, threats, and habitat characteristics of lizard *V. flavescens*, and its habitat separation from the Bengal Monitor, *Varanus bengalensis*, using field observations and collecting information from native people. They found that *Varanus flavescens* was present in whole of the study area. Whereas in the present research work six species of lizards were identified in which family Varinadae was the less common in distribution. Both studies are more or less similar. The dissimilarity may be due to climate change, temperature and vegetation.

Masroor (2011) [27]. made a comprehensive work on the herpetofauna of margalla hills from 2003 to 2009. Due to his work large number of lizard species were recorded from the studied area. He explained the presence of 41 species in the park, in which amphibians were nine species and 32 species of reptiles. Out of these 32 species of reptiles three species of lizards were present namely, *Laudakia agorensis*, *Asymblepharus himalayanus*, and *Ophisops jerdonii* are listed for the first time in the park. While in present study, 15 specimens of *Laudakia agorensis* were recorded only and rest of the species were not found. The difference may be due to the difference in the climatic conditions and vegetation.

In the whole study of selected area, 6 genera were identified containing a total of 11 species of lizards. Whereas in present surveys was carried out from 2014 to 2016. A total of 6 species of lizard belonging to 5 genera and three families were recorded. Both studies were nearly same to each other.

Khan *et al* (2012) [16]. with the help of WWF Pakistan managed social, economic and ecological survey for the first time in the Shimshal-Pamir Lakes area in July 2009. The objective of the study was to investigate potentials and chance for future cooperative safety of some endangered species, their niche and to save ecosystems present at the height in the border area between China and Pakistan. The duration of the survey was two-week in the Shimshal Pamir area of Khunjerab National Park (KNP) along Pakistan-China border was a compulsory part of the research, was done solely to explore reptilian fauna with a special stress on investigating their occurrence, distribution and status in the study area. Field study is done during daytime when it was sufficient hot season and reptiles were active, basking or feeding. A total of 15 specimens belonging to four families of the Agamidae family were captured. Moreover 4 species were observed in

the said area in which one species i.e. *L. pakistanica* among the 4 species was endemic to Pakistan, *L. tuberculata* and *L. badakhshana* are new records from Shimshal, Pakistan. While in the present work total 6 species were recorded from tehsil Samarbagh, 2 species belonging to family Agamidae.

Bayless and Luiselli (2000) [3]. explained the environmental division of monitor lizards (Varanidae) in Nigeria. The environmental division of three varanid lizards (*Varanus exanthematicus*, *K. niloticusniloticus*, and *V. niloticusornatus*) in Nigeria was found in both literature records and also in detailed field work research. *V. exanthematicus* is present only in central and northern Nigeria, where its appearance is in very large scale is recorded. *V. n. ornatus* is restricted only to the south of the country. The division of *V. n. niloticus* always debatable. It is wide spread in the Sudan savanna and in the Guinea savanna, but seems just very few in the derived savanna and moist lowland forest vegetation zones. While in present study 1 species were identified from varanidae family which is *V. bangalensis*, which show great differences as both areas of the study have no resemblance for the reason of extensive deforestation for the purpose of agriculture and the use of excessive pesticides on the crops to remove the pests, which destroyed the lizard fauna on a large scale.

Hashmi and Khan (2013) [13]. examined basking movement in Monitor Lizard (*Varanus bengalensis*) from Thatta of Sindh (Pakistan). Monitor Lizard *Varanus bengalensis* is a group of lizards which come out during day time and are cold blooded. They come out during day time to get heat from sun is the evidence that they are cold blooded. Laying to the sun in *Varanus bengalensis* was noted from 1-15 June 2013 at Thatta District of Sindh. A stony sort living space was watched for *Varanus bengalensis*. The *Varanus bengalensis* come out to sun light from the morning to the late noon and sometime indicate two times from the beginning of the day and the evening. After sunbath *V. bengalensis* observed quickly moveable and catches their preys rapidly. In recent study one species *Varanus bengalensis* is recorded from research area. There is great dissimilarities in both study areas.

The present study was a pioneer work on lizard fauna of Tehsil Samar bagh, Dir Lower and will be helpful in the future taxonomic work of lizards and reptiles.

Conclusion

During the present study, a total of 62 specimens of lizards were collected from 6 quadrates of Tehsil Samar bagh and 6 species of lizards were identified belonging to 5 genera and 4 families. Family Agamidae was the most abundant family followed by Geckonidae then by Eublepharidae and the least abundant family was Varanidae. The six identified species were: *L. agorensis*, *C. versicolor*, *H. frenatus*, *H. flaviviridis*, *E. macularis* and *V. bengalensis*.

The present work shows the diversity of lizard fauna of Tehsil Samarbagh. This was a pioneer work of its kind and will help herpetologists and taxonomists in future taxonomic studies on lizards.

Acknowledgement

This paper is based on M. Phil research of the first author. The authors are grateful to the Department of Zoology, Shaheed Benazir Bhutto University, Main Campus, Sheringal, Dir Upper, Khyber Pakhtunkhwa, Pakistan for providing laboratory facilities.

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