

OCCURRENCE OF RUSSELL'S CHAIN VIPER *DABOIA RUSSELLII RUSSELLII* IN DEVA VATALA NATIONAL PARK, AZAD JAMMU AND KASHMIR

Umer Hafeez GOURSI^{1*}, Muhammad KABIR², Abid MEHMOOD^{1,3,4}

¹Department of Wildlife Management, PMAS-Arid Agriculture University Rawalpindi, Pakistan

²Department of Forestry and Wildlife Management, University of Haripur, Pakistan

³Department of Animals Science and Food Processing, Faculty of Tropical Agri Sciences,
Czech University of Life Sciences, Prague

⁴Department of Wildlife Management, Barari Forest Management, UAE

Abstract

The Russell's chain viper is being reported for the first time from Deva Vatala National Park, Azad Jammu and Kashmir (AJ&K) during surveys conducted from August 2011 to March 2012. The study area falls under dry sub-tropical region. The species is distributed in all the four selected sites of National Park over an area of about 7.2 km². Distribution was determined through direct observations as also used indirect evidences (crawling signs, molted skin, burrow surveys etc.) in its habitat using sign survey. Occurrence and terrain examined which revealed that Vipers' prefers gradual slopes (70%), as compared to steep slopes (12%) and flat areas (18%). The data on morphometric measurements were also recorded from two collected live specimens of Russell's chain viper along with photographs. There is a ruthless killing of this snake by local people mainly out of fear (39%) which is the major threat to its population as compared to others i.e., illegal trade for their fine skin (10%), venom collection for medicinal purposes (5%), roadside killings (11%), habitat degradation including encroachment, developments and segmentation (22%) and lack of awareness (13%). The present study during 2011-2012 not only confirms the presence of Russell's chain viper presence in Deva Vatala National Park but also highlighted the threats to study species.

Keywords: Distribution; Threats; Fauna of DVNP; Reptiles; Russell's chain viper; Dry sub-tropical region

Introduction

The monotypic genus *Daboia* contains only a single species, *Daboia russelii*, and is found in Pakistan, India, Southern China, Sri Lanka, Bangladesh, Nepal, Myanmar, Thailand, Cambodia, and Indonesia [1]. In Pakistan Russell's chain viper has been reported from Pakistan except arid Balochistan Plateau and northern Pakistan at low altitudes [2-11].

This snake is mostly found in open, grassy or bushy areas, but may also be found in forests and farmlands. They also distributed in plains, coastal lowlands, and hills of suitable habitat. Russell's chain viper has been reported with distribution between 2300–3000m elevation [9, 12]. This species is often found in highly urbanized areas and settlements in the

* Corresponding author: umar_goursi@hotmail.com

countryside, the attraction being the commensal rodents [1]. However, it does not associate as closely with human habitation as *Naja* and *Bungarus* [12].

Daboia r. russelii is listed as Not Evaluated by the International Union for the Conservation of Nature and Natural Resources [6]. On the other hand, Russell's viper is listed in schedule 2 under Wildlife Protection Act (1972) [4].

In Azad Jammu and Kashmir, herpetology is the least studied field, and present study did cover the current distribution range of the studied species. The results present data on general habitat, distribution, sighting records and threats for the first time from the area, which could serve as the basis for detailed studies in the future.

Materials and methods

Deva Vatala National Park (32°51.59N to 74°16.85E) is situated at an elevation from 267 to 536 m above sea level in a dry subtropical ecological zone comprising an area of 2993 ha in district Bhimber, Azad Jammu and Kashmir (Fig. 1). The National Park area has sloped, hilly and plain topography. The temperature of the area ranges between 8-42°C while maximum rainfall occurs from July to September [3]. The Park has significant population of wild animals including Nilgai (*Boselaphus tragocamelus*), Barking deer (*Muntiacus muntjak*), Jackals (*Canis aureus*), Indian hare (*Lepus nigricollis*), Indian crested porcupine (*Hystrix indicus*), Grey partridge (*Francolinus pondicerianus*), Black partridge (*Francolinus francolinus*), Indian rock python (*Python m. molurus*), Red jungle fowl (*Gallus galus murghi*), Indian peacock (*Pavo cristatus*) along with Northern shovellers (*Anas clypeata*), Coots (*Fulica atra*) and Mallards (*Anas platyrhynchos*) [3].



Fig. 1. Map of District Bhimber showing the study sites for the study of Russell Viper

The study area was subdivided into four study sites based on their topography i.e. Deva, Vatala, Chumb and Barmala for the extensive survey of Russell's chain viper (Fig. 1, Table.1). A reconnaissance survey was conducted to select study sites where Russell vipers were sighted during the past few years by local people and forest/wildlife officials. On the basis of reconnaissance survey and initial information six field surveys were conducted to collect the information about presence/absence of species during August, 2011 to March, 2012 using transect walk method and Visual Encounter Survey [3, 13].

To assess the distribution of the animal in the selected sites of study area transect walks were made covering an area of about 7.2 km² divided into 9 transects of varied length (Table 2). In addition, a detailed questionnaire was also developed to collect the information regarding Russell viper's presence, distribution in adjacent villages.

Table 1. Characteristics of selected study sites in DVNP

S. No.	Study Sites	Topography	Dominant vegetation of the sites
1	Chumb	Sloped and open plains	<i>Launea coromendaliana</i> , <i>Zanthoxylum armatum</i> , <i>Acacia nilotica</i> , <i>Butea monosperma</i> , <i>Mangifera indica</i> , <i>Cassia ocoidental</i> , <i>Dalbergia sissoo</i> , <i>Calotropis procera</i> , <i>Lantana camara</i> , <i>Ziziphus jujuba</i> , <i>Saccharum spontaneum</i> and <i>Trichodesmaindica</i> .
2	Deva	Sloped and open plains	<i>Saccharum spontaneum</i> , <i>Trichodesma indica</i> , <i>Dalbergia sissoo</i> , <i>Butea monosperma</i> , <i>Mangifera indica</i> , <i>Acacia nilotica</i> , <i>Aesculus indica</i> , <i>Acacia modesta</i> , <i>Lantana camara</i> , <i>Ziziphus jujuba</i> .
3	Barmala	Hilly area	<i>Saccharum spontaneum</i> , <i>Dodonea viscosa</i> , <i>Lantana camara</i> , <i>Dalbergia sissoo</i> .
4	Vatala	Hilly area	<i>Dodonea viscosa</i> , <i>Lantana camara</i> , <i>Dalbergia sissoo</i> , <i>Mangifera indica</i>

Table 2. Detail of transect walks and distribution of Russell's chain viper at different localities in the study area

Track code	Distance covered during random walk	Tracking area
VP ₁	4km	Barnali-ala-kass, Vatala
VP ₂	4km	Khacharaan-ala-paira, Red-ala-nala, Upper vatala, Gojaan-ala-nala, Thaakrichapperi, Malikaan-ala- nala, Tokaan-ala-nala
VP ₃	4km	Kali-ala-kass, Charakkhi, Rakwalchapper
CP ₁	5km	Chadaraan-ala-nakka, Martaraan-ala-nala, Bootii-ala-nakka, Chapperi
CP ₂	5km	Central mandiala, Mandiala
BP ₁	3 km	Barmala post, Joro-wala-nala
BP ₂	3 km	Tali post, Hussain-ala-kass
DP ₁	4 km	Tube- wala- nala
DP ₂	4 km	Khalabut

Transect area was calculated by multiplying length of transect by 0.2km (site specific possible visibility area along the both sides of transect) [3]. General habitat type with dominant vegetation, topography, land use information, water availability and other associated animals were also recorded. Impact of human activities and threats to Russell viper in the area were assessed and evaluated through direct evidence of disturbance and through information acquired by interviewing local inhabitants, hunters, government officials and biologists.

Identification of the Russell's Chain viper

Photographs of Russell's chain viper were taken in the field (Fig.2). Photographs taken from the field were compared with the reference photographs to confirm the species using identification guides; a guide to the snakes of Pakistan [7] and Snakes of India [14].

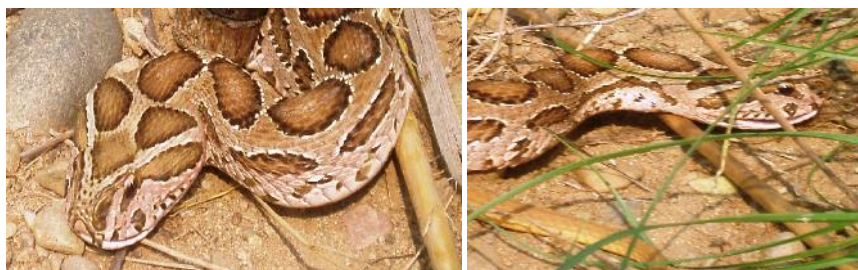


Fig. 2. Dorsal and lateral view of Russell's chain viper at Chumb locality

Results

Morphometric measurements were taken using a non-digital vernier caliper. The specimens in the Deva Vatala National Park were assigned to *Daboia russelii russelii* by the combination of characters (Table 3). The two alive specimens collected and measured were from the chumb and deva locality.

Table 3. Data of *Daboia r. russelii* measurements and scale counts of specimen at Chumb and Deva locality

S. No.	Characteristics	Measurements	
		Chumb Specimen-1 (Alive)	Deva Specimen-2 (Alive)
1.	Snout to vent length	1036 mm	1038 mm
2.	Tail length	218 mm	219 mm
3.	Ventral scales	164 scales	164 scales
4.	Sub-caudal scales	46 scales	47 scales
5.	Infra-labial scales	14 scales	14 scales
6.	Supra-labial scales	11 scales	12 scales

Morphology of collected specimens and photographed individuals from the field were recorded and verified through amphibians and reptiles of Pakistan [8] and a guide to the snakes of Pakistan [7]. The species found in the study area have dorsum light yellowish brown color with chestnut blotches bordered with dark brown narrowly edged with a rim of cream color arranged longitudinally mostly fused with each other and form a mid-dorsal chain. The lateral side of the specimen has the same but smaller dark spots. The head has a pair of distinct dark patches, one on each temple. A light brownish V-shaped pattern that forms an apex towards the snout is present on head. Behind the eye, there is a dark streak, outlined in white. Labials are brown. The ventral side is pinkish white with an irregular scattering of curved dark spots.

Distribution

Based on direct and indirect evidences Russell’s chain viper was found distributed in selected four localities of the study area between 299-536 m elevations. Viper distribution was observed in three sub-localities of Vatala, four sub-localities of Chumb, two sub-localities of Barmala and two sub-localities of Deva (Fig. 1, Table 2). Its active burrows based on fresh crawling trails, rock crevices were observed during transect walk at all these localities along with the direct observation. The crawling trails of Russell’s chain viper were distinguished from the others by using field guide books and reference photographs.

Sighting Records

Vipers have been sighted by the local peoples at about 24 different places during the 2011-2012. In addition to these sighting reports, vipers were sighted during the study at Chumb, Deva, Vatala and Barmala. During the study total seven (four dead and three alive) specimens were observed. Out of total seven heads, two dead and one alive specimen of Russell’s chain viper were directly observed at Chumb locality whereas, one alive specimen were directly observed at Deva locality followed by one dead specimen at Barmala and one dead and one alive at Vatala locality. Furthermore crawling trails along with molted skin and used holes were observed at the Chumb, Deva, Barmala and Vatala locality (Table 5 and 6).

Table 5. Sighting record of Russell’s Chain viper during study 2011-2012

Description	Chumb	Deva	Barmala	Vatala
Area surveyed (km ²)	2	1.6	1.2	2.4
Crawling trail observed	18	14	10	12
Viper trails	11	9	6	7
No. of holes observed	21	18	13	17
No. of active holes (with molted skin)	10	7	4	6

Table 6. Sighting record of Russell's Chain viper during study 2011-2012

Locality	Area of Transect		Direct	Number of vipers observed		Status	
	Length	Width (R+L)		Indirect Sign	Dead	Alive	
Chumb	3 km	200m	3	Crawling trails/molting skin/holes		2	1
Deva	2km	200m	1	Crawling trails/molting skin/holes		-	1
Barmala	2km	200m	1	Crawling trails/molting skin/holes		1	-
Vatala	3km	200m	2	Crawling trails/molting skin/holes		1	1

Habitat of Russell's chain viper

In Deva Vatala National Park, Russell chain viper prefers the area comprising the most dominant vegetation including, *Butea monosperma*, *Dalbergia sissoo*, *Acacia nilotica*, *Mangifera indica*, *Trichodesma indica*, *Saccharum spontaneum*, *Cyperus spp.*, *Lantana camara*, *Ziziphus jujuba*, *Dodonea viscosa* and *Carissa opaca* (Fig. 3).



Fig. 3. Overview of Russell's chain viper habitat in Deva Vatala National Park

Topographically and according to local inhabitants most of the vipers' sighting (70%) were observed on gradual slopes, 12% were on steep slopes and 18% were in the flat area during 2011-2012 (Fig.4).

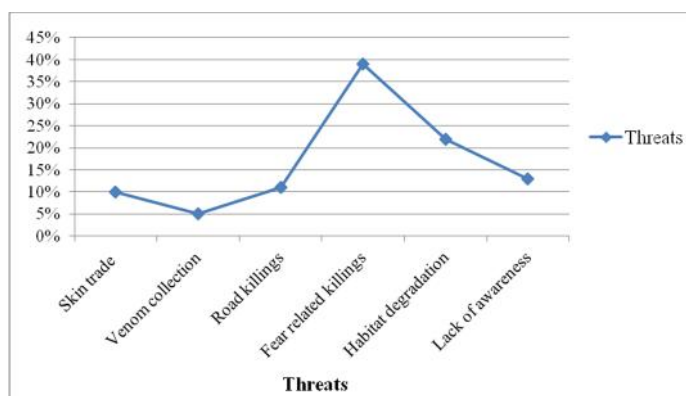


Fig. 4. Threats to Russell's chain viper in the study area during 2011-2012

Among other animals, Indian Peacock (*Pavo cristatus*), Jackal (*Canis aureus*), Black Partridge (*Francolinus francolinus*), Red Jungle Fowl (*Gallus gallus murghi*), Kalij Pheasant

(*Lophura leucomelanos*) while the amphibians and reptiles include Indian Monitor lizard (*Varanus bengalensis*), Indian Garden Lizard (*Calotes Versicolor*), Rat snake (*Ptyas mucosus*), Yellow bellied house gecko (*Hemidactylus flaviviridis*), Spotted barn gecko (*Hemidactylus brookii*), Alpine cricket frog (*Fejervarya limnocharis*) were also observed occupying the same habitat with vipers.

Threats to Russell's chain viper in the study area:

Around 80 people from the local community were interviewed to collect the information about the occupation of the local community and major threats to Russell's chain viper in the study area. The occupation of the local inhabitants in these study sites varied, 68% shepherds, 24% farmers, 6% shopkeepers, 1% drivers and 1% laborers. Data collected revealed that major threats to these snakes include; illegal trade for their fine skin (10%), venom collection for medicinal purposes (5%), road-side killings (11%), fear-related killings in study area (39%), habitat degradation including encroachment, developments and segmentation (22%) and lack of awareness (13%) (Fig. 5).



Fig. 5. Road-side killings found at Deva locality

Perception of the local community

Local perception about Russell's chain viper was also recorded in which 87% people were against the viper, whereas, 13% were in the favor of the viper.

Russell's chain viper is a venomous snake and causes snakebite fatalities in the area. According to the local community, 6 cases of vipers bite occurred during the study resulted in the death of 4 people. Such cases lead to a negative attitude of the local community towards Russell's viper existence and conservation. About 87% People believe vipers to be one of the factors of economic and life loss as these snakes kill their livestock and people. Mostly local community depends on their livestock by selling them or their milk. On the other hand, 13% people were also in the favor of Russell's chain viper as it consumes other small snakes and the rodents that damage their crops.

Discussion

The distribution of this viper (*Daboia russelii*) was not well known in the study area. Chain vipers have reported at scattered localities in the eastern Sind and the river valleys of the Punjab at low elevations. The Russell's chain viper is not a rare snake in parts of Thatta District but seems to be absent from or very rare in the Karachi District [8, 15].

Maximum viper sightings along with indirect evidences were observed in the Chumb locality. The maximum sighting is due to the increase human interference and decrease prey species that compelled vipers to counter with local inhabitants. Topographically Russell's chain viper prefers plain areas and gradual slopes which increase the chances of their occurrence in Chumb locality. Similar observations have been reported for Russell's chain viper habitat preferences with gradual slopes [16]. Low sightings were recorded in Barmala during 2011-2012; because of reduce entrance by local community due to entrance restrictions by Pakistan

Army and unfavorable habitat conditions. The Russell's chain viper hibernates in the winter when mating takes place from April to July while gravid females collected in September also, thus the chances of sighting in hibernating months were minimum [15, 17].

In Deva Vatala National Park, Russells' chain viper seems to prefer the subtropical area and used burrows/holes of other animals as reported in India and other previous studies [2, 18].

Maximum people killed viper due to the fear in the Deva Vatala National Park, Azad Jammu and Kashmir. The Russell's viper snakes were not found near the town or in the high mountains but were rather common in a valley about 6 miles below the town [15].

Road kill mortality, exploited for skin, illegal trade and killing due to its venom potency and aggression on encounter with humans on the field are most commonly known threats [19].

Maximum people in the study area were against Russell's chain viper. As it is a venomous snake and the attack of Russell's chain viper on the livestock leads towards the great economic loss to local community as they mostly depend on them. Some people were also in the favor of the viper as it eats the rodents and it's a part of the natural ecosystem. They thought that these snakes maintain the natural system as they eat the rodents that damage their crops and thus vipers should not be removed from the park. Besides these snakes feed mainly on small mammals, birds, lizards and frogs which help to keep ecosystem balance thus their existence is important to keep ecosystem stable.

The present study confirmed the presence of Russell's chain viper and its extend distribution range in Deva Vatala National Park of Azad Jammu and Kashmir. This is a preliminary study and further detailed research in this regard would be helpful to develop sound strategies and integrated management interventions. Government and NGOs should involve in the conservation of Russell's chain viper in Deva Vatala National Park. Currently, the park is not properly managed by the government. Park management must be initiated and improved to protect the wildlife in their natural habitat. This protected area network can be very helpful in future conservation strategies and programs.

Conclusions and Recommendations

According to our study on the Russell's chain viper (*Daboia russelii russelii*) in Deva Vatala National Park, Azad Jammu and Kashmir, we can state the following:

- Park management must be instigated to protect the potential habitat of viper by eliminating disturbances which resulted in the human-viper conflicts reduction.
- Increased enforcement is needed to reduce illegal trade and ruthless killing of vipers in the study area.
- Promote community awareness and education regarding significance of Russell's chain viper existence in study area.

▪ This study shows that this species has a new extended distribution range than previous. Further detailed research studies should be conducted to assess population, habitat, and ecology of the vipers and to develop sound conservation strategies and integrated management interventions. This will also help to fill out the knowledge gaps regarding the distribution of many other reptiles occurring in this region.

Acknowledgement

We owe a deep gratitude to Prof. Dr. Maqsood Anwar, Chairman Department of Wildlife Management, PMAS-Arid Agriculture University, Rawalpindi, Pakistan and Rafaqat Masroor, Pakistan Museum of Natural History, Islamabad, for reviewing the manuscript. We also thank Muhammad Siddique Awan, Associate Professor Department of Zoology, University of Azad Jammu and Kashmir, Muzaffarabad for their guidance during field surveys.

References

- [1] * * *, **ZipcodeZoo, Daboia russelii**, http://ZipcodeZoo.com/index.php/Daboia_russelii. ZipcodeZoo, the free nature encyclopedia, [Accessed on June 30, 2016].
- [2] J.C. Daniels, **Book of Indian Reptiles and Amphibians**, USA, Oxford University Press, 2002, p. 252.
- [3] R.L. Ditmars, **Reptiles of the World, the Crocodylians, Lizards, Snakes, Turtles and Tortoises of the Eastern and Western Hemispheres**, The McMillan Company, 1937, p. 321.
- [4] U.H. Goursi, M.S. Awan, R.A. Minhas, U. Ali, M. Kabir, N.I. Dar, *Status and Conservation of Indian Rock Python (Python molurus molurus) in Deva Vatala National Park, Azad Jammu and Kashmir, Pakistan*, **Pakistan Journal of Zoology**, **44**(6), 2012, pp. 1507-1514.
- [5] * * *, **Indian Biodiversity Portal, Daboia Russelii**, 2014, Available at : <http://indiabiodiversity.org/biodiv/species/show/238674> [Accessed on May 2, 2016].
- [6] * * *, **International Union for Conservation of Nature, Red List of threatened species**, version 3.1, 2015, <http://www.redlist.org> [Accessed on 13th February, 2016].
- [7] M.S. Khan, **A Guide to the Snakes of Pakistan**, Edition Chimaira BuchhandelsgesellschaftmbH., Andreas S. Brahm, 2002, p. 265.
- [8] M.S. Khan, **Amphibians and Reptiles of Pakistan**, Kreiger Publishing, Melbourne, Florida, USA, 2006, p. 311.
- [9] A.R. Krochmal, G.S. Bakken, T.J. LaDuc, *Heat in evolution's kitchen, evolutionary perspectives on the functions and origin of the facial pit of pit vipers (Viperidae: Crotalinae)*, **Journal of Biology**, **207**(24), 2004, pp. 4231–4238.
- [10] R. Masroor, *An annotated checklist of amphibians and reptiles of Margalla Hills National Park, Pakistan*. **Pakistan Journal of Zoology**, **43**(6), 2011, pp. 1041-1048.
- [11] R. Masroor, **A Contribution to the Herpetology of Northern Pakistan, The Amphibians and Reptiles of Margalla Hills National Park and Surrounding Regions**, Society for the Study of Amphibians and Reptiles (SSAR), USA in cooperation with Chimaira Buchhandels gesellschaft mbH, Germany, 2012, p. 217.
- [12] D. Mallow, D. Ludwig, G. Nilson, **True Vipers, Natural History and Toxinology of Old World Vipers**, Krieger Publishing Company, 2003, p. 359.
- [13] M.L. Crump, N.J. Scott, **Visual Encounter Surveys, Measuring and Monitoring Biological Diversity, Standard Methods for Amphibians**, Smithsonian Institution Press, Washington, 1994.
- [14] R. Whitaker, A. Captain, **Snakes of India, The Field Guide**, Draco Books, Chennai, India. 2004, p. 495.
- [15] S.A. Minton, *A Contribution to the Herpetology of West Pakistan*, **Bulletin of the American Museum of Natural History**, **134**(2), 1966, pp. 31-184.
- [16] W. Wüster, *The genus Daboia, Serpentes: Viperidae, Russell's Viper*, **Hamadryad**, **23**(1), 1998, pp. 33-40.
- [17] M. O'Shea, A. De Silva, S.A.M. Kularatne, *Daboia russelii russelii (Sri Lankan Russell's Viper). Large prey. Natural History Notes*, **Herpetological Review**, **35**(1), 2004, p. 64.
- [18] C. Srinivasulu, I. Das, *The Herpetofauna of Nallamala Hills, Eastern Ghats, India, An Annotated Checklist, With Remarks on Nomenclature, Taxonomy, Habitat Use, Adaptive Types and Biogeography*, **Asiatic Herpetological Research**, **11**, 2008, pp.110–131.
- [19] Y. Sawai, *Venomous Snakes and Snakebite treatment in Asia*, **Russian Journal of Herpetology**, **5**(2), 1998, pp. 103-112.

Received: June 30, 2016

Accepted: May 28, 2017