Status and Conservation of Indian Rock Python *(Python molurus molurus)* in Deva Vatala National Park, Azad Jammu and Kashmir, Pakistan

Umer Hafeez Goursi,[1] Muhammad Siddique Awan,[1] Riaz Aziz Minhas,[1]* Usman Ali,[2] Muhammad Kabir[3] and Naeem Iftikhar Dar[4]

[1]*Department of Zoology, University of Azad Jammu and Kashmir, Muzaffarabad*

[2]*Department of Zoology, Mirpur University of Science and Technology, Mirpur, Azad Jammu and Kashmir*

[3]*Pakistan Museum of Natural history, Islamabad*

[4]*Department of Wildlife and Fisheries, Government of Azad Jammu and Kashmir*

Abstract.- Population of Indian Rock Python *(Python molurus molurus)* was studied in Deva Vatala National Park, by visual encounter survey method and taking into account past sighting recorded by interviewing the local community, from April to September 2009. The python was randomly distributed in all localities of the study area with an overall population density of 3.06/km^2. Most sightings records were in July (26%) and August (15%), in day time, mostly near water sources in the forest areas. Python appears to prefer sub-tropical part of the park. A total of 91 python attacks were reported resulting in 74 livestock deaths and 17 injured. Herding practices of local cattle have increased habitat disturbance and declined the natural prey species of python which in turn has increased livestock losses, causing negative perception for python in local community. Habitat destruction due to the forest cutting, overgrazing, fodder and fuel wood collection and illegal python trade are found to be the major threats to this species.

Key words: *Python molurus molurus,* human-python conflict, Deva Vatala National Park, Azad Jammu and Kashmir

INTRODUCTION

Indian rock python (*Python molurus molurus*) is the largest snake species found in tropical and sub-tropical areas of Southern Asia (ITIS, 2009), distributed in forested areas in Pakistan, India, Sri Lanka, Southern Nepal, Bangladesh, Myanmar, Southern China, Thailand, Laos, Vietnam, Cambodia, Peninsula, Malaysia and Indonesia (McDiarmid *et al., 1999*).

Pythons inhabit a wide range of habitats including wetlands, open forest, scrublands, harsh desert, rainforests, woodlands, grassy marshes, river valleys, rocky slopes, and savanna (Murphy and Henderson, 1997; Woodland Park Zoo, 2000). They live in hollows of trees, mangrove thickets, mammal burrows and dense water reeds (Whitaker, 1987); in caves and unattended ruins of old buildings with clumps of vegetation around, and is reluctant to move away from its established territory (Khan, 2006).

P. molurus molurus is listed as Lower Risk/Near Threatened by International Union for the Conservation of Nature and Natural Resources (IUCN) (IUCN, 1994, 1996), enlisted in U.S. ESA (United States Endangered Species Act) as endangered throughout its range (Coborn, 1991; De Vosjoli, 1991; Jurgen *et al.,* 1988; Murphy and Henderson, 1997).

Mostly pythons are killed for their skin (used in fashion industry) and for flesh by locals communities (IUCN, 1996; Jurgen *et al.,* 1988), so are of high commercial value in international market, one of the main causes of alarmingly declining natural populations (Mukherjee, 1982; Tikader, 1983; Groomridge and Wright, 1982; Murthy, 1979).

In Pakistan most of the python inhabiting areas are being converted into agriculture lands, restricting it now in the Southern Sindh, Indus Valley and its tributaries where its numbers are fast diminishing. Only a few pythons have been reported in district Sanghar in Sindh and are on the verge of extinction (Khan, 2006). In Azad Jammu and Kashmir, because python population has never been

studied before, so no pertinent data is available.

Keeping in view conservation importance of this species, present work was taken up in Deva Vatala National Park focusing on its present distribution, population estimation and general habitat utilization in reference to human-python conflicts and conservation status of Indian rock python.

MATERIALS AND METHODS

Study area

Deva Vatala National Park (32°51.592-55.327 NL to 74°16.854-24.550 E) is situated at an elevation of 267–536m above sea level in District Bhimber, Azad Jammu and Kashmir (Fig. 1). The area was declared as game reserve in 1982, having 500 ha. area which was upgraded as National Park in 2007 with increased area covering 2993 ha. The dominant trees of the park are *Launea coromandaliana, Zanthoxylum armatum, Acacia nilotica, Butea monosperma, Mangifera indica, Cassia occidentalis, Dalbergia sissoo. Calotropis procera, Aesculus indica* and *Acacia modesta.* Shrubs include *Lantana camara, Ziziphus jujuba* and *Dodonaea viscosa,* where as *Saccharum spontaneum* and *Trichodesma indica* are the dominant herb species.

The park has significant populations of important wild animals including Nilgai *(Boselaphus tragocamelus)*, barking deer *(Muntiacus muntjak)*, jackals *(Canis aureus)*, Indian hare *(Lepus nigricollis)* and Indian crested porcupine *(Hystrix indica)*, Grey partridge *(Francolinus pondicerianus)*, black partridge *(Francolinus francolinus)*, red jungle fowl *(Gallus gallus murghi)*, Indian peacock *(Pavo cristatus)* along with water birds, shoveler *(Anas clypeata)*, coots *(Fulica atra)* and mallards *(Anas platyrhynchos)*.

Methods

The study area was divided into four localities (Deva, Vatala, Chumb and Barmala) on topographic basis (Fig. 1). Initially, a thorough field survey was conducted throughout the study area for the selection of potential areas of Indian rock python distribution where their signs were present or

sighted by local inhabitants. Specific vintage points were identified with the help of shepherds, hunters and livestock depredation spots. On the basis of the initial survey and information, six detailed field surveys were conducted in study area to look into Den, population estimation, sighting and livestock depredation.

Fig. 1. Map of Deva Vatala National Park (study area).

Transect walks were made to assess the density of the animal in the study area. Transect walks were named referring to the locality as VP (Vatala Python), CP (Chumb Python), DP (Deva Python) and BP (Barmala Python). A detail questionnaire was developed to collect the information regarding past sighting and livestock depredation and solicited to the people living in adjacent villages. To assess the population status of the Indian rock python, Visual Encounter Survey of dens and Direct Sighting Method were used following Crump and Scott (1994).

Transect area was calculated by multiplying length of transect by 0.4 km (possible visibility area along the both sides of transect). Besides collecting

the above mentioned information, macro habitat used by the Indian rock python was also assessed. 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 (conservation status) to Indian rock pythons in the area were assessed and evaluated by the direct evidences of disturbance and through information acquired by interviewing local inhabitants, hunters, government officials and biologists.

RESULTS

Distribution

Indian rock python was distributed over about 2993 ha area in all four localities of the study area. And sub localities. Python was found in eleven sub localities of Vatala, six sub localities of Chumb, four sub localities of Barmala and two sub localities of Deva (Fig. 2). Its active dens were observed during transect walk at all these localities. All the active dens observed from different localities (study sites) in the National Park were plotted on the GIS based map (Fig. 2).

Sighting records

Pythons have been sighted by the local peoples, wildlife and forest department's field staff at about 76 different places during the last five years (2005 to 2009). In addition to these sighting reports, python was sighted during the study at Chumb and Deva.

Maximum sightings have been reported during 2008 (n=29) and 2009 (n=28) while in 2005, 2006 and seven a total of 2, 9 and 8 sightings were reported respectively at different places. The rate of sighting was higher in Chumb 32% (n=24) than the Vatala 28% (n=21), Barmala 22% (n=17) and Deva 18% (n=14). The numbers of sightings were higher in the months of July i.e., 20 (26%) and August i.e., 12 (15%) as compared to the rest of the months.

Habitat utilization

In Deva Vatala National Park, Indian rock python usually preferred the subtropical area comprising the most dominant vegetation including herbs (*Saccharum spontaneum*), shrubs *(Lantana camara, Dodonaea viscosa, Carissa opaca, Ziziphus jujuba)* and trees *(Mangifera indica, Dalbergia sissoo, Lacunae coromandaliana, Zanthoxylum armatum, Butea monosperma* and *Acacia nilotica).*

About 91% dens used by the Indian rock pythons were originally the holes of other animals while about 9% python were found inhabiting in the rock crevices and human made caves. About 16% (n=13) active dens of Indian rock python were found at distance of 0-100 m from the water source, 47% (n=38) were between 100-500 m while 10% (n=8) dens were at 500-800 m away from the water sources. Among other animals, Peacock, Jackal, Black Partridge, Red Jungle Fowl, Kaleej Pheasant and Russell viper were also observed occupying the same habitat with pythons.

Population

A total of 27 pythons were estimated in Deva Vatala National Park during 2009 with the overall population density of 3.06/km^2. The population density was higher at Deva (4.37/km^2) and Chumb (3.75/km^2), as compared to Barmala (2.5/km^2) and Vatala (2.18/km^2) (Table I). During the 9 transect walks covering 8.8 km^2 area, 119 python used dens were observed out of which only 27 dens were estimated to be currently utilized by the pythons (Table I).

Table I.- Population density of Indian rock python during 2009 in Deva Vatala National Park.

	Vatala	Chumb	Barmala	Deva	Total
Elevation range (m)	309-536	267-313	404-511	339-415	
Area surveyed during walk (km^2)	3.2	2.4	1.6	1.6	8.8
No. of den observed	51	38	13	17	119
Number of active den	7	9	4	7	27
Estimated adult population	4	9	4	7	27
Population density (No. of individuals/km^2)	2.18	3.75	2.5	4.37	3.06

Human-python conflicts

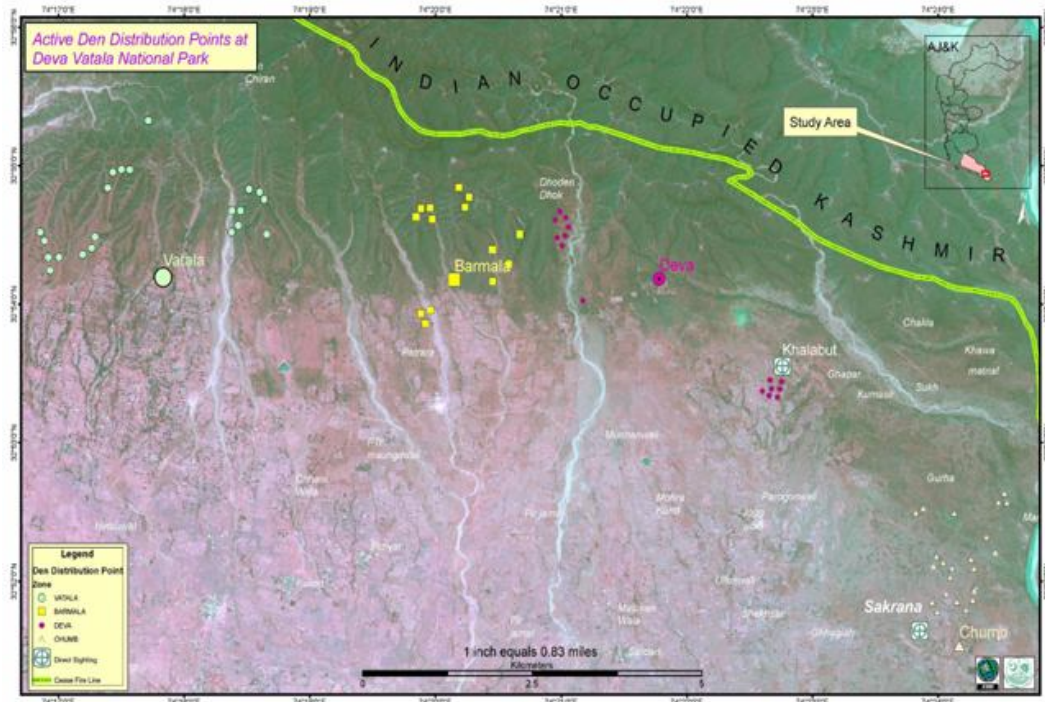Local people in the study area are shepherds

Fig. 2. Satellite image based map showing the distribution of Indian rock python on the basis of active dens in Deva Vatala National Park during 2009.
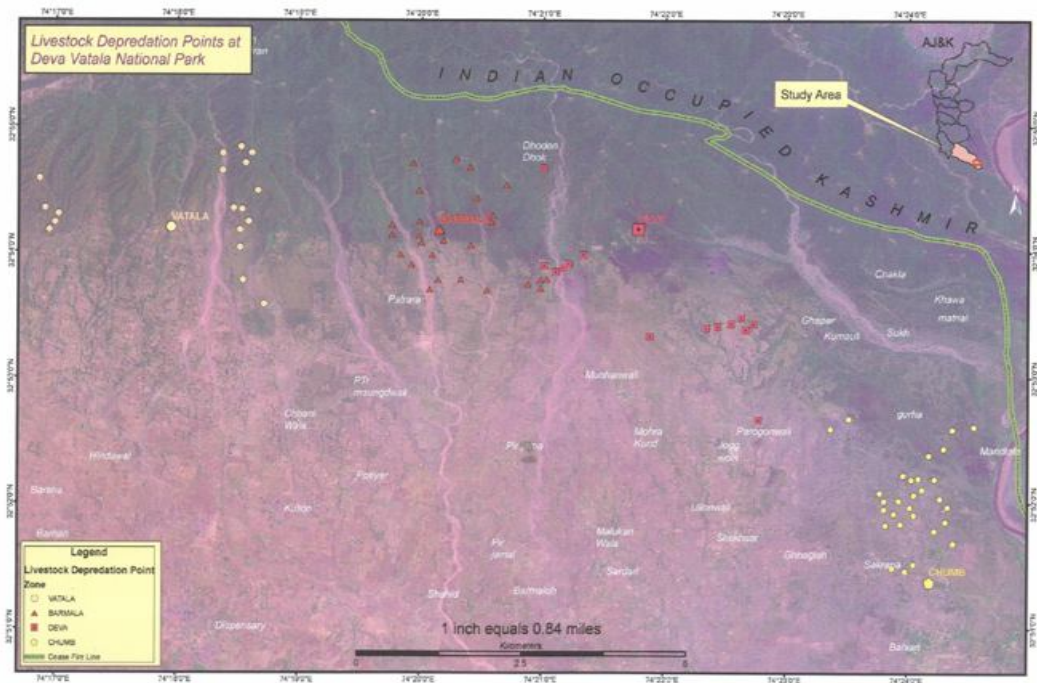

Fig. 3. Satellite image based map showing the livestock depredation points by Indian rock python during 2005-09 in Deva Vatala National Park.

(68%), farmers (24%), shopkeepers (6%), drivers (1%) and laborers (1%). Most of these people rear livestock to meet their daily life requirements along with other activities. Major livestock included goats (47%), cows (38%), buffalos (15%) and poultry (3%). The average number of livestock per family was 15.
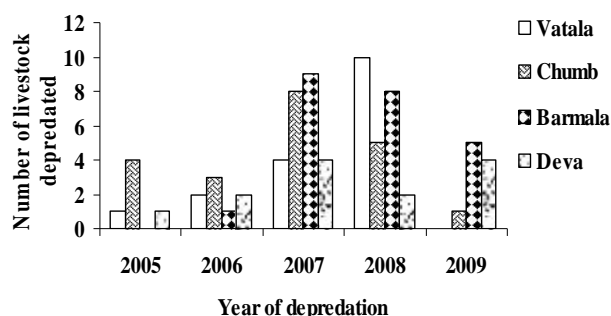

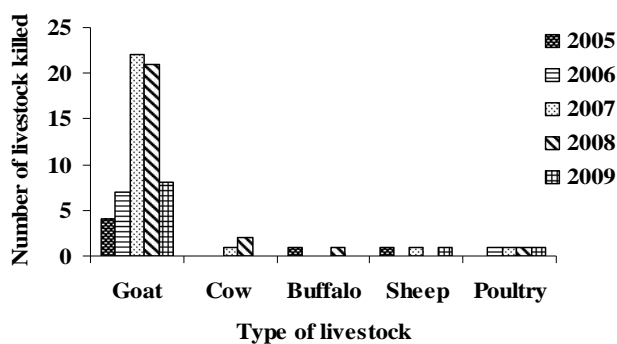Fig. 4. Livestock depredation during 2005-2009.

Fig. 5. Types of livestock killed by Indian rock python during 2005-2009

Livestock depredation

A total number of 91 python attacks were reported on livestock during 2005-2009, resulting into 74 livestock killings while other 17 were injured. Maximum number of livestock were killed in Barmala (31%) followed by Chumb (28%), Vatala (23%) and Deva (18%) during the last five years (Figs. 3, 4). Goat killings was highest (84%), followed by the poultry (5%), sheep (4%), cows (4%) and buffalos (3%) (Fig. 5). Most of the livestock killings occurred during the months of July (n=16), August (n=14) and September (n=11) in the day time (n=40) followed by the morning

(n=15) and evening (n=14) (Fig. 6, Fig. 7). These killings were observed in forest area (n=62) and pasture lands (n=8). As a result most (92%) of the attacker pythons were killed by shepherds and other local people. In about 7% cases, the people chased the python and captured it while in 1% cases they were injured but escaped. There was a significant correlation (r=0.9714, p=0.05) between goat depredation and number of python killing. During the time of attack, 86% of livestock herds were guarded by the human, 10% herds were without guardian while in about 4% livestock depredation cases, the herds were guarded by both shepherds and dogs. A significant (r=0.9562, p=0.05) relationship was observed between plain attacking sites and livestock guardianship when shepherd and dogs both were guardian on livestock.
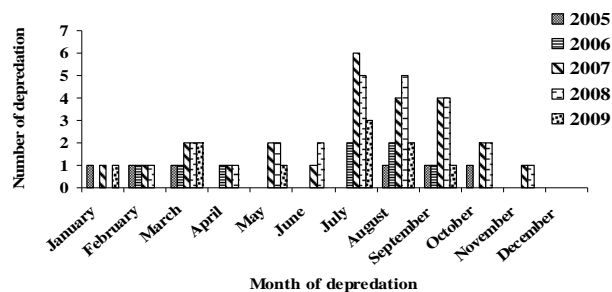

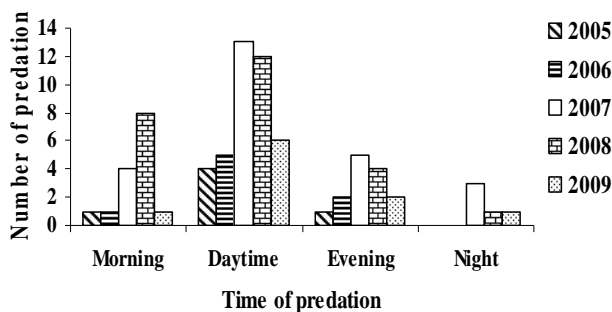Fig. 6. Month wise Livestock depredation during 2005-2009

Fig. 7. Time of livestock Predation by Indian rock python during 2005-2009

Action taken against the python and the local perception

Most of the pythons (92%) were killed by the local community when they attacked on their livestock. These python were killed using axes, woods and heavy stones. In about 7% cases reported

by the community, the people chased the python and captured it while in 1% cases they were injured. There was a significant (r=0.9675, p=0.05) correlation between number of killed python and the negative perception of the community about the python presence in the area. Local perception about the Indian rock python showed that 85% people were against the Indian python, whereas, 15% were in the favor of the python.

DISCUSSION

Python molurus molurus was distributed over about 2993 ha area in all four localities of the study area. According to Azam *et al.* (2007), the distribution of this python *(P. molurus molurus)* is not well known in other areas of the country. Minton (1966) has reported it at scattered localities in the Indus delta and the lower valley and north word up to Nawab Shah District. However, literature supported its occurrence in Punjab is inadequate.

Sighting records

Maximum python sightings were reported in summer season of 2008 and 2009. The Indian rock python hibernates in the winter, when mating takes place and eggs are laid during March to June. Thus due to its continuous presence inside den for their egg protection and incubation, the chances of sighting in hibernating months were minimum. Breen and John (1974) have recorded the similar observations during the breeding season of the Indian rock python. Sightings were high during morning and daytime probably due to herd movement towards the forest (for their animal grazing). Morning and daytime showed high encounter rate as compared to evening or night. View point is supported by Carr (1963), however, Khan (2006) also reported sightings in evening and night.

Low sightings were recorded during 2005 to 2007, because of reduced entrance of the local community in to the forest due to entrance restrictions by the Pakistan Army and declaration of the area as National Park. Increase in the sighting rate could be due to the decrease in the prey species that compelled the pythons to enter into the villages,

in and outside the forest area. Another worth mentioning factor is increase in human population and higher level of interference in the python habitat. The python habitat is being used consistently by the local for their fuel wood, fodder collection and grazing. Due to this constant interaction, the pythons have lost their shyness from the human beings, and hence have been seen frequently in the study area.

Habitat utilization

In Deva Vatala National Park, Indian rock python seem to prefer the subtropical area and used burrows of other animals as its den often shared sometime with porcupines and other animals near the water sources as reported by Carr (1963) and Gow (1976). Avadhani (2005) and Boulenger (1890, 1896) have stated that pythons live in a wide range of habitats and depend on a permanent source of water.

Population

The population density of pythons was low Vatala and Barmala could be due to presence of maximum number of a shrub (*Lantana camara*) around the den habitat. The backwardly curved spikes of these shrubs injured the python when it moved through and these injuries followed by the infections and attack of insect such as ants, which ultimately resulted into death of the animal. Disturbance by local community and the Army resulted in increased human-python conflict and could also be the reason for lower density of python in Vatala and Barmala localities. Furthermore, most of the area was under the army control, and a reasonable numbers of pythons were killed due to mine blasts.

Human-python conflict

The livestock depredation noted high in Chumb and Barmala intensified human python conflict. Absence of python's natural prey species forced it to adapt alternate food sources and abundant livestock could be a good choice. Vatala and Deva localities are comparatively less disturbed probably because of enough cover of *Lantana camara* that hinder free movement of livestock.

Goats, sheep, cows, buffalos and poultry were

depredated by the python in the study area. Jerry (1998) has reported that Indian rock python feed on mammals, birds and reptiles indiscriminately, but seem to prefer mammals. Free grazing goats were more common in study area as compared to the other livestock, hence, resulted into higher rate of their killings. Most of the depredations occurred in the forests because people preferred to graze their livestock deep into the forest pastures because of fresh and plentiful forage. Grazing practices proved in favor of python that caused significant livestock loss. On the other hand, high rate of livestock depredation also showed the scarcity of the natural python prey species.

Maximum livestock killings were at day time and morning time, as it is the time of livestock grazing. In evening and night, the killings were low because during these hours the livestock were back in homes. Some time python in search of food move towards villages and killed livestock during night times in their unsecure places. But this happens rarely as python moves towards the populated areas only when food is scarce or when threatened (Murphy and Henderson, 1997).

The attack of Indian rock python on the livestock leads towards the great economic loss to the local community as they mostly depend upon them. Some people were also in the favor of the python as it eats the other poisonous snakes and is a non-poisonous species. They thought that the pythons was not dangerous to humans and should not be removed from the park.

CONCLUSIONS AND RECOMMENDATIONS

The concluded findings of the study are as follows:
(i) The Indian rock python was randomly distributed in Deva Vatala National Park including all study localities between 267-536m elevations.
(ii) Indirect evidences and sighting records showed the python distribution at 76 different places the Park. Comparatively low sighting records were reported in 2005, 2006, 2007 whereas in 2008 and 2009, it was high due to the increase disturbance in the python habitat and decrease in its natural prey population in the forest.
(iii) Variation in population density in different localities of the study area could be due to habitat conditions, prey and water availability and anthropogenic activities. Deva and Chumb localities were the potential habitats of the python.
(iv) Python occupied sub-tropical zone with thick vegetation including *Saccharum spontaneum, Lantana camara, Dodonaea viscosa, Carissa opaca, Ziziphus jujuba, Mangifera indica, Dalbergia sissoo, Launaea coromandaliana, Zanthoxylum armatum, Butea monosperma* and *Acacia nilotica.*
(v) Livestock depredation was low during 2005, 2006 and 2009 as compared to the 2007 and 2008. Depredation of livestock resulted into the maximum human-python conflicts. Livestock depredation was high at Chumb followed by Barmala, Deva and Vatala.
(vi) Maximum livestock depredation was reported in the months of July, August and September. Goats were killed at higher rate during daytime. Due to the livestock depredation, most of the people are considering Indian rock python as their enemy, hence killed it in their first priority if encountered.
(vii) It is recommended that government and NGOs should involve in conservation of Indian rock python in Deva Vatala National Park. Human-python conflict could be overcome through better management programs and compensation schemes for the affected community. 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 will increase the natural prey population for python, minimizing the livestock depredation and human-python conflict.

REFERENCES

AVADHANI, R., 2005. Snakes of India. *Reptilia* (GB), **41**: 32-37.

AZAM, M. M., HUSSAIN, R., ALI, M. AND ABBAS, N., 2007. *Some observations about the biodiversity of Deva Vatala Game reserve Distr. Bhimber.* Zoological Survey Department, Ministry of Environment, Islamabad, pp. 20.

BOULENGER, G.A., 1890. *The Fauna of British India, Including Ceylon and Burma. Reptilia and Batrachia.* Taylor and Francis, London, pp. 541.

BOULENGER, G.A., 1896. *Catalogue of the snakes in the British Museum*, Vol. **3**. Taylor and Francis, London, pp. 727.

BREEN, J.F. AND JOHN, 1974. *Encyclopedia of reptiles and amphibians*. T.F.H. Publications, Ltd., Hong Kong, pp. 576.

CARR, A., 1963. *The reptiles*. Life Nature Library. Time-Life Books, New York, pp. 192.

COBORN, J., 1991. *The atlas of snakes of the world*. T.F.H. Publications, NJ.

CRUMP, M. L. AND SCOTT, N.J., 1994. Visual encounter surveys. In: *Measuring and monitoring biological diversity: standard methods for amphibians.* (eds. W.R. Heyer, M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster). Smithsonian Institution Press, Washington.

De VOSJOLI, P., 1991. *The care and maintenance of Burmese pythons*. Vivarium Systems, CA.

GOW, G. F., 1976. *Snakes of Australia*. Angus and Robertson, Sydney.

GROOMRIDGE, B. AND WRIGHT, L., 1982. *The IUCN amphibia, reptilia red data book. Part II. Testudines, Crocodylia, Rhynchocephalia.* IUCN. Glan, Switzerland, pp. 426.

ITIS, 2009. *Python molurus* (TSN 202187). *Integrated taxonomic information system.* Retrieved on 13 September 2009.

IUCN, 1994. Categories and criteria (version 2.3) the IUCN Red List. http://www.redlist.org. Accessed 13 September, 2009.

IUCN, 1996. *IUCN Red list of threatened species* (version 2.3) the IUCN red list. http://www.redlist.org. Accessed 13 September, 2009.

JERRY, G.W., 1998. *The living pythons*. T. F. H. Publications, pp. 131-142. ISBN 0-7938-0467-1.

JURGEN, O.F., RICHTER, K. AND JACOB, U., 1988. *The completely illustrated atlas of reptiles and amphibians*. T.F.H. Publications, NJ.

KHAN, M.S., 2006. *Amphibians and reptiles of Pakistan*. Krieger Publishing, Florida, USA.

McDIARMID, R. W., CAMPBELL, J.A. AND TOURÉ, T., 1999. *Snake species of the world: A taxonomic and geographic reference*, Vol. 1. Herpetologists' League, pp. 511.

MINTON, S.A., 1966. A contribution to the herpetology of West Pakistan. *Bull. Am. Mus. Nat. Hist.,* **134**: 117-118.

MUKHERJEE, A.K., 1982. *Endangered animals of India*. Zoological Survey of India, Calcutta.

MURPHY, J.R. AND HENDERSON, R.W., 1997. *Tales of giant snakes: A natural historical history of anacondas and pythons*. Krieger Publishing Co. FL.

MURTHY, T.S.N., 1979. Endangered reptiles of India. *Zoologiana,* **1** (1978): 24-28.

TIKADER, B. K., 1983. *Threatened animals of India*. Zoological Survey of India, Calcutta, pp. 166.

WHITAKER, R., 1987. *Common Indian snakes – A field guide*. The Macmillan Company of India Limited, pp. 6-9. SBN 33390-198-3.

WOODLAND PARK ZOO., 2000. *Indian python* (On-line). http://www.zoo.org/educate/fact_sheets/python/python.htm. Accessed Feb. 19. 2009.