NEW DISTRIBUTION RECORDS AND CHALLENGES TO THE CONSERVATION OF INDIAN ROCK PYTHON IN AZAD JAMMU AND KASHMIR, PAKISTAN

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Abstract

The aim of the study was to document the new distribution record and challenges to the conservation of Indian rock python (Python molurus molurus) in and around District Mirpur and Bhimer, Azad Jammu and Kashmir. The data on sighting records, distribution, and threats to Indian rock python were collected through a consecutive sampling method using questionnaire during July 2014 to October 2015. During the recent study, a total of 30 new distribution locations were recorded for Indian rock python in and around Deva Vatala National Park. Major threats faced by Indian rock python in and around the park were mainly fear of local communities (42.3%) followed by roadside killings (16.2%), habitat degradation (15.4%), illegal trade for their fine skin (14.6%), and lack of awareness (11.5%). Majority of local people (41%) believed that they see Indian rock python less frequently as compared to past whereas, (35%) believe that its sighting has been increased during past few years while (24%) had no idea about increase or decrease of sightings. Maximum adult male (66%) sightings were reported by locals in the open area (68.75 %), and during the month of August (34.37 %). Shepherds were major group responsible for causing threats to Indian rock python (43.8%) followed by hunters (20.8%), farmers (16.2%), drivers (10.8%), and shopkeepers (8.5%). According to our findings (68%), people did not like Indian rock python whereas, (21%) people liked Indian rock python, while a little proportion of people (11%) neither like or dislike it. Majority of people (50%) thought that Indian pythons should not be conserved whereas, (42.3%) believed that it should be conserved but there should be compensation scheme to cover for livestock losses, while (7.7%) did not supported either conservation or exploitation. The results of this study will be helpful in national action planning as well as global action planning for the conservation of Indian rock python.

Keywords: *Indian Rock Python, New distribution, Threats, Conservation, 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 [1]. It is spread in forested ranges of Pakistan, India, Sri Lanka, Southern Nepal, Bangladesh, Myanmar, Southern China, Thailand, Laos, Vietnam, Cambodia, Peninsula, Malaysia, and Indonesia [2]. *P. molurus* ranges through the

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lower half of the Asian region. *P. m. molurus* is native to India, Pakistan, Sri Lanka, and Nepal. Inadequate information is available on Indian rock python distribution in Pakistan and Azad Jammu and Kashmir. In Pakistan, most of the python habitats are being converted into agriculture lands, restricting its natural distribution in the Southern Sindh, Indus Valley and its tributaries drastically reducing its population. Only a limited number of pythons have been documented in district Sanghar in Sindh and are on the verge of extinction [3]. Indian rock python is only known to exist in Deva Vatala National Park (DVNP) of Azad Jammu and Kashmir (AJ&K), Pakistan [4].

P. m. molurus inhabit wetlands, open forest, scrublands, harsh desert, rainforests, woodlands, grassy marshes, river valleys, and rocky slopes. They live in hollows of trees, mangrove thickets, mammal burrows, and dense water reeds; in caves and abandoned wrecks of timeworn buildings with batches of shrubbery around, and is unenthusiastic to move away from its established territory [3-5].

P. m. molurus is scheduled as Lower Risk/Near Threatened, by International Union for the Conservation of Nature and Natural Resources (IUCN) [6, 7]. It is also registered in U.S. ESA (the United States Endangered Species Act) as endangered throughout its range [4, 5]. Indian python is listed as protected under the schedule III in the AJ&K, Wildlife (Protection, Preservation, Conservation, and Management) Ordinance, 2011 (AJ&K Wildlife Act, 2014) [8]. Mostly pythons are slain for their skin (used in the fashion industry) and for flesh by locals communities [6]. It makes them of high commercial value in the international market, one of the leading causes of alarmingly declining natural populations [9, 10].

There is a paucity of information on distribution and threats faced by the species in AJ&K. Therefore, this study was designed to document distribution and threats to Indian rock python in Azad Jammu and Kashmir, Pakistan.

Materials and methods

Study Area

The current study was conducted in protected and non-protected areas of two out of ten districts in AJ&K i.e. Mirpur (33°6'3.87N and 73°46'16.75E) and Bhimber (32° 58' 60N and 74° 04' 0E). The study area is mainly mountainous with some plains including flat and undulating terrain. It has been categorized as a hot and dry area, covered by mixed natural vegetation. The study site Mirpur is surrounded by a large water reservoir named as Mangla Dam. In the east of Bhimber is the Deva Vatala National Park (DVNP) (32° 53' 33.30-54'15.17N and 74°18'11. 42-20' 15.97E), which is one of the seven national parks in AJ&K, covers an area of 2993ha, while the elevation ranges from 267 to 536m above the sea level. River Tuvi surrounds the study site Bhimber in the east. The presence of rocks in the soil makes study area hot spot for stone querying which poses a threat to the biodiversity of the area [11, 12].

Methodology

A reconnaissance survey was conducted in the study area to select potential sites where pythons were sighted during the past few years by local people and forest/wildlife officials. To identify species distribution and challenges the study area was divided into two study sites i.e. Mirpur and Bhimber. On the basis of reconnaissance survey and initial information, sixteen field surveys were conducted to collect the information about presence/absence of species during July 2014 to October 2015 using transect walk method, and Visual Encounter Survey (VES) [4, 13]. The species gender was also determined based on visual characteristics, as females are larger and longer and have comparatively longer jaws relative to the size of the body [14]. To assess the distribution of the animal in different sites of the study area transect walks were made covering an area of about 12km^2 divided into 19 transects of varied length (Table 1). Transect area was calculated by multiplying the length of transect by 0.2km (site

specific possible visibility area along both sides of transect). All the distribution geographical coordinates recorded from sites having an occurrence of animal species were plotted on the GIS-based map (Fig. 1).
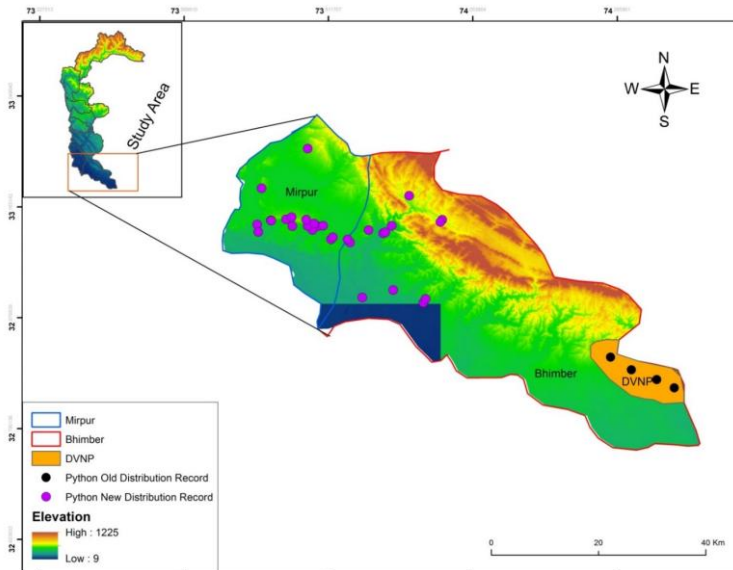

Fig. 1. Present and past distribution points of Indian rock python in the study area

Table 1. Detail of transect walks and distribution of Indian rock python
at different localities in the study area during 2014-2015

Tracking code	Distance covered during a random walk	Tracking area
MP1	8km	New City Chowk, New Mirpur City, Khaliqabad Road, Chungi, Jarri Kass
MP2	3km	Khaliqabad
MP3	4km	Jarri kass, Ali Baig
MP4	2km	Chitterpari
MP5	1km	Chitter Pari Rd.
MP6	2km	Sector-D4
MP7	3km	Sector-F2, Sector-F1, Hall Road
MP8	1km	Ban Khurma
MP9	2km	Kharak
MP10	2km	Chaksawari
MP11	4km	Dheari Choudhrian, Kakra Town
MP12	4km	Kasgumma
BP1	3km	Panjeri
BP2	3km	Sokasan
BP3	3km	Sokasan
BP4	4km	Poona
BP5	4km	Nakka Rajgan
BP6	4km	Jandala
BP7	3km	Jandala

Legends: MP (Mirpur Python), BP (Bhimber Python)

Data on sighting records, the impact of human activities, and threats to Indian rock python in the area were assessed and evaluated through direct evidence of disturbance and through information acquired by using questionnaire and interviewing local inhabitants, hunters, government officials, shepherds, school going children and biologists. Respondents

from the local community were selected using consecutive sampling method [15]. Information on community demographics and socio-economic factors including; sex, age, level of formal education, occupation and livestock holding was obtained. Respondents were interviewed about 15-20 minutes to gather the data. Before data collection, the questionnaire developed was tested and modified, through a pilot study of 30 respondents in the study area. Respondents were taken in confidence and reported information was re-confirmed. 130 community members were interviewed to collect the data. Respondents were asked series of closed-end questions about the threats faced by Indian rock python during the recent year in the study area. The questions asked of respondents included information about: a direct encounter with the species, indirect signs, the frequency of sighting in the past and at present, age of python sighted, type of threats faced by python, reason for killing python, group involved in killing of python, local perception, and python conservation. The data were also collected on members of the community involved in the killing of python. The data were analyzed using QED Statistics version 1.5.1.456. The data were also analyzed using G-Test and Chi-Squared Test.

Results

Distribution

In Azad Jammu and Kashmir, Indian rock python was only recorded by *Goursi et al.* [4], over about 2993 ha area in four localities of Deva Vatala National Park named as Chumb, Deva, Vatala, and Barmala. During the recent study based on direct and indirect evidence, python was found distributed at about 30 new locations of the study area including six localities of Bhimber and twenty-four localities of Mirpur (Fig. 1). Its active dens based on fresh crawling trails, molted skin, depredated animal signs were observed during transect walk at all these localities along with the direct observation. The crawling trails of Indian rock python were distinguished from the others by using field guide books and reference photographs.

Sighting records

A total of 32 Pythons have been sighted by the local peoples at about 30 different places during the 2014-2015 (Table 2). During the study, total twelve (eight dead and four alive) specimens were directly observed including five dead and two alive at Mirpur whereas, two alive and three dead specimens were directly observed at Bhimber. Furthermore crawling trails along with molted skin and used dens were observed at different localities of the Mirpur and Bhimber (Fig. 1).

During the study 68.75 % of the total sightings were from the open areas; followed by 25 % in cultivated and only 6.25 % in forested areas (Fig. 2).
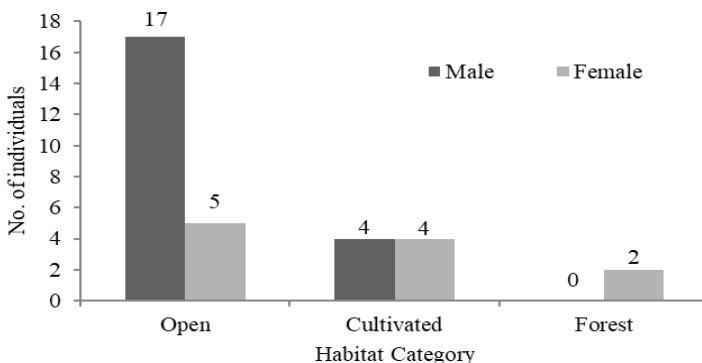

Fig. 2. Distribution of Indian rock python in different types of habitats during 2014-2015

The statistical analysis of species distribution among three categories of habitats showed a significant difference in the preference of habitat by the Indian rock python (G = 20.5536, DF = 2, P < 0.05).

Table 2. New Distribution record of Indian rock python during 2014-2015

Track code	Location	Land used	Month	Year	Sex	Age
MP1	New City Chowk-P1	Open	July	2015	1M	A
MP1	Chitter Pari Rd.-P1	Open	July	2015	1M+1F	A
MP1	New Mirpur City-P1	Open	August	2014	1F	A
MP1	Khaliqabad-P1	Open	September	2014	1M+1F	A
MP1	Sector D-4-P1	Open	August	2015	1M	A
MP1	Sector D-4-P2	Open	September	2015	1M	A
MP1	Chungi-P1	Open	October	2014	1M	A
MP1	Jarri Kass-P2	Open	July	2014	1M	A
MP3	Ali Baig-P1	Cultivated	August	2014	1F	A
MP1	New Mirpur City-P2	Open	August	2015	1F	A
MP1	Ban Khurma-P1	Open	August	2014	1M	A
MP1	Kharak-P1	Open	November	2014	1M	A
MP3	Chaksawari-P1	Cultivated	April	2014	1M	A
MP3	Chitterpari-P1	Cultivated	July	2015	1F	A
MP1	Sector-F2-P1	Open	August	2015	1M	A
MP1	Dheari Choudhrian-P1	Open	June	2014	1F	A
MP1	Kakra Town-P1	Open	September	2014	1M	A
MP3	Kasgumma-P1	Cultivated	March	2015	1M	A
MP3	Kasgumma-P2	Cultivated	July	2014	1M	A
MP3	Jarikass-P1	Cultivated	July	2015	1F	A
MP1	Sector F1-P1	Open	July	2014	1M	A
MP1	Hall Road-P1	Open	July	2014	1M	A
MP2	Khaliqabad-P2	Forested	August	2015	1F	A
BP1	Panjeri-P1	Open	August	2014	1M	A
BP2	Sokasan-P2	Forested	July	2014	1F	A
BP1	Jandala-P1	Open	August	2014	1M	A
BP3	Sokasan-P1	Cultivated	October	2014	1F	A
BP1	Nakka Rajgan-P1	Open	September	2014	1M	A
BP3	Poona-P1	Cultivated	August	2015	1M	A
BP1	Jandala-P2	Open	August	2015	1M	A

P1 = Python First sighting, P2 = Python second sighting; referring to different individuals

The analysis of animal demography revealed that all the individuals sighted were adults; comprising of 66 % sightings of adult male and 34 % adult females. Maximum sightings (81.25 %) of individuals were recorded from July until September (hot, humid, monsoon season) with a peak in August (34.37 %) and July (31.25%) as compared to the rest of month (Fig. 3).
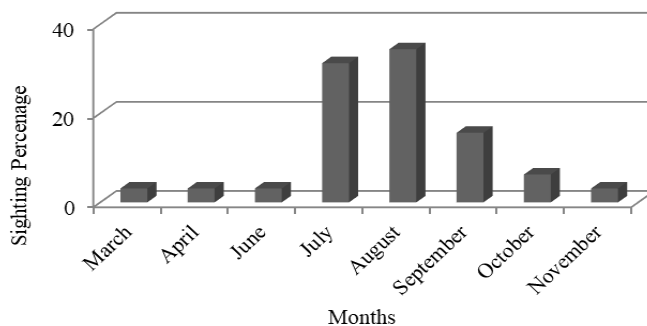

Fig. 3. Percentages of sightings in various months and seasons of the year 2014-2015

The statistical analysis showed significant difference in the sightings in various months/seasons of the year 2014-2015 (G = 28.9495, DF = 7, P < 0.05). The statistical analysis of population comparison over the study period supported a significant decline in the population from 2014 till 2015 (Chi-Squared = 6.07738, DF = 1, P < 0.05). There was a decline in sightings from 59 % in 2014 to 41 % in 2015, with 19 % fewer sightings during the study period.

Threats to Indian rock python

The data collected showed several factors affecting Indian rock python population in the study area. The statistical analysis of the threats exhibited a significant difference in the threat factors (G = 34.531, DF = 4, P < 0.05). The data analysis also revealed the statistically significant difference in threats between the three types of habitats (G = 22.085, DF = 2, P = <0.05). With 42.3% threat percentage, the highest killings were due to fear from snakes, followed by 16.2% from vehicles on the roadsides, 15.4% from habitat degradation, 14.6% as a result of illegal trade for its beautiful skin, and 11.5% from lack of awareness about the importance of the species (Fig. 4). The comparison of the level of threats in the three habitat types exposed that the open habitat types faced the most threats (52%) followed by cultivated habitats with 29% and forested areas with 19 % threat percentages (Fig. 5).
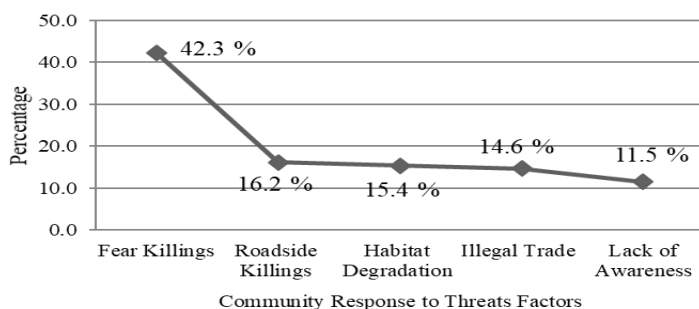

Fig. 4. Threats to the population of Indian rock python in study area during 2014-2015
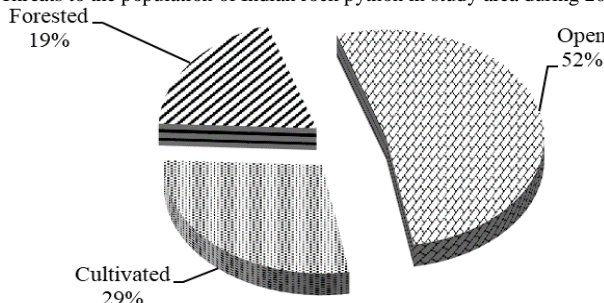

Fig. 5. Level of threats to Indian rock python in the three studied habitat types during 2014-2015

The data collected on the present and past sighting frequency of Indian rock python showed a significant difference in the frequency of sighting (G = 6.0734, DF = 2, P < 0.05). About 41% respondents suggested a decrease in the frequency of sightings over the recent period, whereas, 35% suggested an increase in the sightings and 24% had no idea about an increase or decrease in sightings (Fig. 6). 44.7% respondents had directly seen Indian rock python, 55.21% had seen indirect signs like fresh signs of crawling tracks, moulted skins, injured and depredated animal with regurgitate signs.

There was a statistically significant difference among the community members about the need for the conservation of Indian rock python in its range (G = 49.6089, DF = 2, P = <0.05). The majority (50%) were against the efforts for the conservation of Indian rock python in their

area. Whereas 42.3% of community members supported the ideology of conservation of the study species, and 7.7 % were unaware of what effects conservation interventions could impart (Fig. 7).
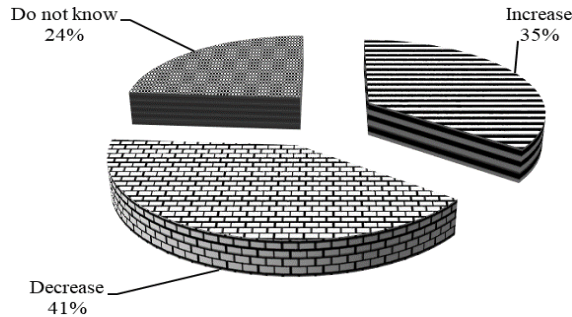

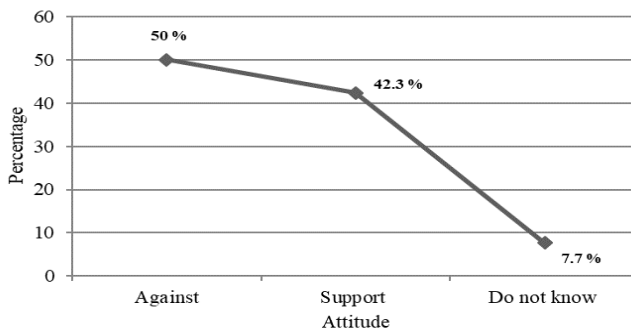**Fig. 6.** The frequency of present and past sightings of Indian rock python in the study area

Fig. 7. Community perception for the conservation of Indian rock python in the study area

The results also depicted the same story about the perception of the local community about the species itself. There was a statistically significant difference in the liking of the species among the community (G = 67.3082, DF = 2, P = <0.05). We noted maximum 68% of the community disliked Indian rock python but did not mention any reason for disliking, whereas 21% liked and 11% did not express liking or disliking for the species (Fig. 8). The response about the people who are actively involved in the killings of Indian rock python nominated five significant occupations. The analysis of the data revealed a significant difference in the occupations responsible for killing the study species (G = 46.2952, DF = 4, P = <0.05). Shepherds were the top nominee for actively killing pythons (43.8%) followed by hunters (20.8%) and farmers (16.2%) (Figs. 9, 10 and 11).
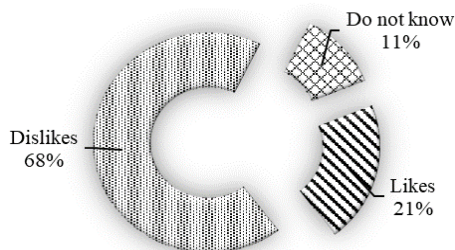

Fig. 8. Community perception about Indian rock python in the study area during 2014-2015
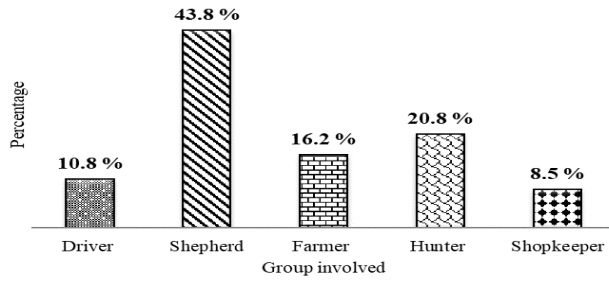
Fig. 9. The contribution of different occupations to the threats faced by\
Indian rock python in the study area during 2014-2015

Fig. 10. Killed Indian rock python, by local community during 2014-2015

Fig. 11. Stilled Indian rock python after devouring goat; captured by the local community in Bhimber

Discussion

There was no previous study on the distribution and presence of python in the study area, and the sites were unexplored. However Indian rock python was only recorded by *Goursi et al.* [4], distributed over about 2993 ha area in four localities of the DVNP, including eleven sub-localities of Vatala, six sub-localities of Chumb, four sub-localities of Barmala and two sub-localities of Deva. Therefore, the present study was conducted to record extensive distribution and threats to the population of python. According to *Azam et al.* [16], the distribution of python (*P. m. molurus*) is not well known in other areas of the country. *Minton* [17] has reported it at scattered localities in the Indus delta and the lower valley and north word up to Nawab Shah District. The recent sightings revealed higher population in open areas. According to *Murphy and Henderson* [5], pythons occur in a wide range of habitat types including; wetlands, savanna, and forests that support the finding of the current study. The new sighting records could be because of the factor that these study sites were unexplored. Another worth mentioning factor is an increase in human population and a higher level of interference in the python habitat for fuelwood, fodder collection, and grazing, which could force the species to move in new sites and habitats. All the individuals sighted, were adults with a higher percentage of males. According to *Harvey et al.* [18], female pythons make few long distance movements throughout the year, while males roam widely in search of females and suitable home, thus the probability of male python sighting increases. The recent data supports the higher sighting percentage from July until September. Similar observations were reported by *Goursi et al.* [4].

The comparison of the population sightings from 2014-2015 revealed that the population has substantially decreased over the course of time. The results were also supported by the response of the community that confirmed the decrease in the sightings of the species compared to its sighting frequency in the past. This decline could be attributed to the threats reported in the current study to this majestic species faces in the study area. Open habitats faced more threats to the population compared to the other studied habitat types. It could be associated with a higher number of individuals preferring open habitat, the vulnerability of the species in open areas or higher human pressure in these areas. These findings were also supported by the fact that significant occupational threat was the presence of shepherds in the habitat of the python. Not only the shepherds and their livestock disturbed the core habitat of python. Moreover, they killed it to protect their goats and other livestock which was predated by the python occasionally. *Goursi et al.* [4] in Deva Vatala National Park, AJ&K., made similar observations. Habitat encroachment and killing by farmers was also an essential factor in the population decline of the species. Moreover, habitat loss is another reason because this species prefers moist surrounding or long time stable water bodies for its activities. Due to destruction and filling of medium and large water bodies, the habitat of python remains no more natural, and it has to migrate from the area [19].

The comprehension of the results revealed that almost half of the reported killings were only due to fear and lack of awareness about the species. These results were reinforced by the responses from the community about their perception of Indian rock python. Where 68% of the community did not like to see a python in their area. In addition to it, the majority (50%) was even against any intervention for its conservation and protection. Some respondents (42.3%) were in favour of the python conservation as it eats the other poisonous snakes and is a non-poisonous species. A small portion of its diet consists of Aves, Amphibia and Reptilia [5, 20]. People who were positively predisposed towards python believed that the pythons were not dangerous to humans and should not be removed from the park.

Roadside killings were another significant threat that was revealed by the results of the current study. Roads, tracks and other passages are favourite basking sites for most of the amphibians and reptiles [21] and thus cause a higher number of mortalities due to reckless

driving and lack of awareness. Illegal trade and killing of pythons due to its charismatic skin contributed as one of the significant threats to trade by hunters.

Modification and demolition of habitats by humans can have a drastic effect on the Indian rock python population. Our findings emphasise that there is an urgent need for conservation as well as awareness among local people to turn their attitude from killing to the conservation of Indian rock python and other wildlife in the study area. Government and NGOs should involve in developing comprehensive Species Action Plan that will guide conservation efforts aiming to secure the future of the study species.

Conclusion

Indirect and direct evidences confirm 30 new python distribution sites in around the study area. This study has found out the result of distribution extension and aggregation sites of *Python molurus molurus* around the previously studied area of DVNP. Indian rock python although IUCN red-listed species and also categorized a protected species by the state wildlife act but pythons are killed either in conflict with human or for some python skin. These killings occur both in protected areas and outside protected areas like in the present study areas. Wildlife protection staffs do not have the capacity in handling conflicts and protecting pythons, additionally department also short of resources to protect pythons outside protected areas. The current study provides valuable information on the distribution range, threats, and level of human python conflicts along with some suggestion to help minimize these conflicts. There is an urgent need of the hour to educate the local community in order to save its population in Azad Jammu and Kashmir, Pakistan. Based on the information provided, the wildlife department could develop conservation strategies to help protect the species and its habitat from further degradation which is very important and need of the time.

Recommendation

The following recommendations are given for the proper conservation of Indian rock python in Azad Jammu and Kashmir: i) Implement and monitor the strong rules and regulations to stop python habitat degradation, killings and illegal trade by the local community: ii) Seminars, training workshops should be organized at the community level to create awareness in people about Indian rock python role in maintaining the natural ecosystem; iii) Detailed research studies and conservation projects should be launched both by the public and private sectors for the conservation, management, and improvement of the species in and around the study area; iv) The human-python conflict could be overcome through better management programs and compensation schemes for the affected community; v) Species and habitat 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 conflicts.

Acknowledgments

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