Fate of Snakes in an Urban Landscape - A report from Durgapur, Paschim Bardhaman, West Bengal, India

Figure showing road kill of *Daboia russelli*

Snakes, a well-known carnivorous creature, form an important part of the ecosystem by occupying a particular position in the trophic level to influence the nutrient flow (Pradhan et al 2014). Additionally, they maintain the number of the rodent pests (Fitch 1949; Gibbons 1988). The global diversity of snakes is about 3709 species (Uetz & Hošek 2018) and more than 297 species of snakes are found in the Indian Subcontinent (Aengals et al 2018), out of which West Bengal harbours about 112 species (Saha & Nandi 2005). Extinction of species is a major concern around the globe and snakes are no exception in this regard. Researchers from different parts of the world have contributed with their observations on snake diversity, making the subject, 'herpetology' more popular (Platt 1989; Vyas 2013; Fellows 2014; Nameer et al 2015; Sirsat et al 2016; Rout et al 2016; Tambre & Chavan 2016). However, most unfortunately studies have indicated the decline of snake populations due to various anthropogenic interventions both directly and indirectly andareof serious concern because ithas the potentialto affect the ecosystem adversely (Sahu et al 2014).

It has been observed in many places of the world that human settlements overlapping the habitats of snakes have caused the snakes to enter in the human occupied

habitats (Nonga & Haruna 2015). Most of the snakes come in the vicinity of human settlement for preys. Various serpent species have evolved to adapt themselves to live amidst human occupied settlements. However, the fate of snakes like other household pests has been most unfortunate where they are killed out of fear. Alternatively, they are sometimes rescued by some novice snake enthusiasts without proper knowledge of snake handling and often lead to snake bite. Additionally, rescued snakes are translocated to a distance of 25 - 35 km far from its home range (Vyas 2013; Barve et al 2013). In urban areas with surplus vehicle load, road kill is another major concern (Duttaet al 2016; Heiglet al 2017). In India, about half a million people are bitten by snakes every year with about 46,000 annual deaths due to snake bite. (Mohapatra et al 2011)

Durgapur city was built based on a definite plan almost 60 years ago. Areas with human settlements are well interspersed with greenery. Though expansion of the city has engulfed most of the forested areas still there remains enough refuge for biota to thrive. In a previous study on the herpetofauna during 2009 - 2011, different seasonal activity patterns were observed from the present study location (Pal et al 2012). In earlier Gayen et al (2017) reported 23 different snake species from Durgapur eco-region. This was the primary motivation to carry out the present study to comment on the snake-human conflict, its outcome and probable management and conservation strategies from Durgapur eco-region.

Materials and Methods

Study Site: The present study was carried out in Durgapur, also known as 'steel city' of West Bengal, India. The city covers an area of 154 km^2 and is situated at the transition zone between Chotanagpur plateau and Gangetic plains (23.48^{0}N, 87.32^{0}E, elevation 65 m MSL). The region is represented by dry deciduous forest of *Shorea robusta* (Champion & Seth 1968), scrubland and a few agricultural lands of poor laterite soil. Presently the landscape has been changed by various human activities and has a large number of small and heavy industries which includes the Durgapur Steel Plant, Alloy Steel Plant, Durgapur Thermal Power Station and Durgapur Projects Limited. A large dam and various reserves have been constructed for water supply and flood control for the inhabitants of Durgapur and its surrounding regions. The city is both interspersed and surrounded by several forest patches (Nayak & Roy 2016).

Data Collection: The present study is the outcome of a survey where information regarding snake-human conflict was gathered primarily from the snake rescue groups.

During the entire study period i.e. from January to December 2016, authors met the rescue personals once in every month to collect data on rescue operations for that particular month. Care was taken to note down the number of a particular species rescued during that month. This data was then plotted graphically for better understanding and visualization of yearlong rescue operation. Other methods like opportunistic sighting, personal observation and road-kill were also taken into account for better understanding and commenting on the more lucid scenario of the snake-human conflict from the present location during the study period. Snakes were identified with help of suitable literatures (Daniel 2002; Das 2002; Whittaker & Captain 2008).

Results and Discussion

Diversity of snakes in the city is notable (Pal et al 2012; Gayen et al 2017) and it matches the diverse habitat types present in this unique eco-region. Snakes are shy in nature and generally avoid direct interaction with humans. However, due to their food habit and habitat utilization pattern they invariably come in contact with human and we may term it as snake-human conflict. Total seven species of snakes belongs to four families recorded during the present study, including *Ptyas mucosa*, *Lycodon aulicus*, *Daboia russelii*, *Naja naja*, *Amphiesma stolatum*, *Xenochrophis piscator* and *Bungarus caerulus* were found to occur in vicinity of human settlements. Snakes rescued from human settlements during one-year study have been depicted. Most of the times outcome of such conflicts were adverse where both venomous and non-venomous snakes had been

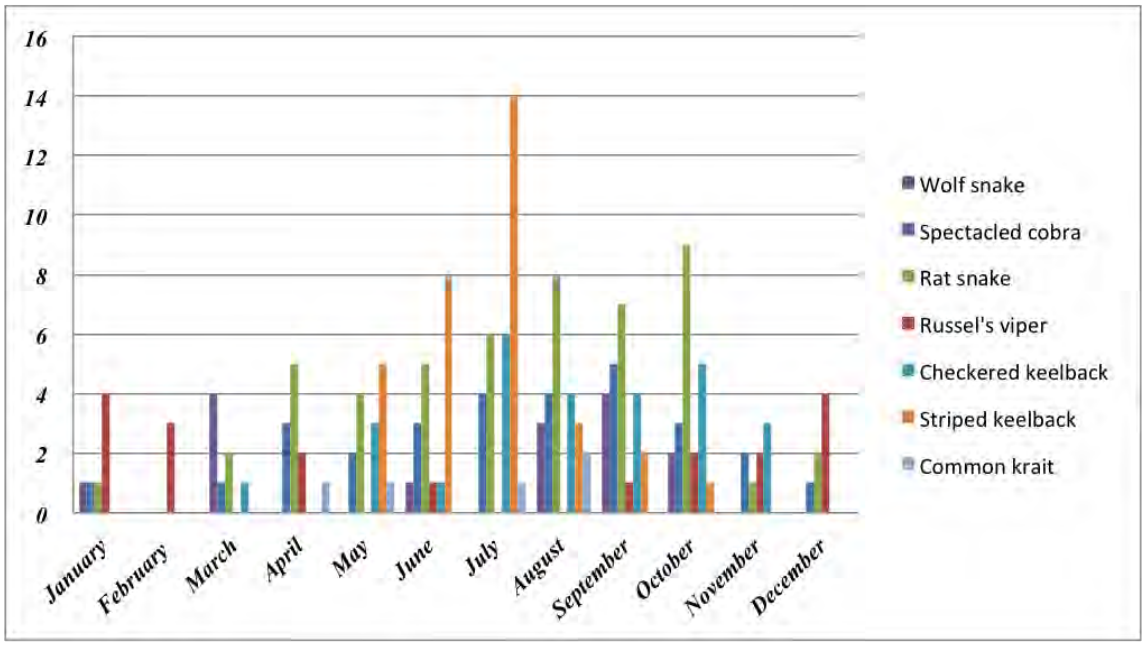

Chart showing the monthly variation of seven commonly rescued snake species from human settlements of Durgapur, West Bengal, India

Naja naja (Photo credit: Amit Kumar Dey)

found to be beaten to death out of fear and ignorance. Exact data of these snake killings are not presently available from Durgapur and needs future investigations. Various nature lover organisations of Durgapur along with the Forest Department are doing awareness programme to stop the killing of snakes. It has also been found that the cornered snake may get agitated and frightened to bite humans. Additionally, snake bites were found to occur from accidental encounters where the snake sensed any danger or may get stamped on in the darkness of night. Interestingly these incidents were more prevalent in the rainy season and this may be attributed to the fact that monsoon months are recorded to harbour highest snake diversity. During the present study, the highest numbers of snakes were rescued between monsoons and post monsoon months (July – October). The number of snakes rescued was lowest in the peak winter (December – January) and peak summer (March – May) when temperature was maximum or minimum and rainfall was minimum. In Durgapur, snakes entering into the houses were found to be rescued by snake rescue group. Snakes rescued from human settlements however, are released to distant forest patches as releasing them nearer to human settlements were strongly opposed by local inhabitants. Unfortunately, like most other parts of the world translocation tragedy for these rescued snakes from Durgapur are yet to be evaluated. Additionally, with numerous metalled road and heavy vehicle load, road kill is a major concern for Durgapur. A large number of snake species were killed every day on the road. In a previous study on road kill from Durgapur, it has been found that about 18 reptilian species were killed every day from a road span of 3.5km for a time of 3 months (Dutta et al 2016). During the present

Daboia russelii (Photo credit: Amit Kumar Dey)

Xenochrophis piscator (Photo credit: SagarAdhurya)

investigation on snake-human conflict similar findings were made and needs further extensive studies which will surely enrich us with more knowledge.

Conclusion

From the present study it is evident that snake-human conflict for urban industrial city like Durgapur with sufficient greenery and handsome snake diversity is mostly inevitable. However, with proper management and conservation strategies we may look forward to minimize, albeit totally eliminate these conflicts. Mass awareness to educate people about the importance of snakes with proper knowledge of venomous and non-venomous snakes will surely benefit the conservation of snake population, hence the ecosystem and in the long run human society. The age-old practice of "live and let live" must be implemented without any prejudice if we wish to survive longer in a healthy nature.

Figure showing *Bungarus caerulus* killed by local inhabitants (Photo credit- Arghaya Mondal)

References

Aengals, R., V.M.S. Kumar, M.J. Palot & S.R. Ganesh (2018). A Checklist of Reptiles of India. Version 1.0. Online publication is available at www.zsi.gov.in (Last update: March 2018)

Barve, S., D. Bhaisare, A. Giri, P.G. Shankar, R. Whitaker & M. Goode (2013). A preliminary study on translocation of "rescued" King Cobras (*Ophiophagus hannah*). *Hamadryad* 36(2): 80-86.

Champion, H.S. & S.K. Seth (1968). *A Revised Survey of Forest Types of India*. Manager of Publications, Delhi, Dehradun.

Daniel, J.C. (2002). *The Book of Indian Reptiles and Amphibians*. 1st Ed., Oxford University Press, Bombay. pp. 252.

Das, I. (2002). *A Photographic Guide to the Snakes and Other Reptiles of India.* 1st Ed., New Holland Publication, U.K. pp. 246.

Dutta, S., H.P. Jana, S. Saha & S.K. Mukhopadhyay (2016). The cause and consequences of Road Mortality of Herpetofauna in Durgapur, West Bengal, India. *Russian Journal of Ecology* 47(1): 88–95.

Fellows, S. (2014). Species diversity of Snakes in Pachmarhi Biosphere Reserve. *Entomol Ornithol Herpetol* 4: 136.

Fitch, H. (1949). Study of Snake Populations in Central California. *American Midland Naturalist* 41: 513-579.

Gayen, D., S. Dey & U.S. Roy (2017). Diversity of snakes in and around Durgapur city, West Bengal, India. *Reptile Rap*# 176 In: *Zoo's Print* 32(9): 17-22.
Gibbons, J. (1988). The management of reptiles, amphibians and small mammals in North America: the need for an environmental attitude adjustment, U.S. Department of Agriculture, Forest Service, GTRRM-166.
Heigl, F., K. Horvath, G. Laaha & J.G. Zaller (2017). Amphibian and reptilian road-kills on tertiary roads in relation to landscape structure: using a citizen science approach with open-access land cover data. *BMC Ecol* 17: 24.
Mohapatra, B., D.A. Warrell, W. Suraweera, P. Bhatia, N. Dhingra & R.M. Jotkar (2011). Snakebite Mortality in India: A Nationally Representative Mortality Survey. *PLoSNegl Trop Dis* 5(4): e1018.
Nameer, P.O., J. Praveen, A. Bijukumar, M.J. Palot, S. Das & R. Raghavan (2015). A checklist of the vertebrates of Kerala State, India. *Journal of Threatened Taxa* 7(13): 7961-7970.
Nayak, A.K. & U.S. Roy (2016). An observation on the Odonata fauna of the Asansol-Durgapur Industrial Area, Burdwan, West Bengal, India. *Journal of Threatened Taxa* 8(2): 8503-8517.
Nonga, H.E. & A. Haruna (2015). Assessment of human-snake interactionand its outcomes in Monduli District, northern Tanzania. *Tanzanian Journal of Health Research* 17(1): 1-12.
Pal, A., S. Dey & U.S. Roy (2012). Seasonal diversity and abundance of herpetofauna in and around an industrial city of West Bengal, India. *Journal of Applied Sciences in Environmental Sanitation* 7(4): 281-286.
Platt, D.R. (1989). Seasonal Activity of Snakes on a Sand Prairie. Proceedings of the eleventh North American Prairie Conference: 251-253.
Pradhan, S., D. Mishra & K.R. Sahu (2014). An inventory and assessment of snake diversity of Gandhamardan hills range of western Orissa, India. *International Journal of Pure and Applied Zoology* 2(3): 241-245.
Rout, S., B. Baruah, N. Mishra & T. Panda (2016). Diversity of herpetofaunal community in Kuldiha wildlife sanctuary, Odisha, India. *Current Life Sciences* 2(1): 9-14.
Saha, B.K. & N.C. Nandi (2005). A checklist of ophidian fauna of West Bengal, India along with their status, distribution and conservation. *Journal of Environment & Sociobiology* 2(1&2): 49-60.
Sahu, K.R., D. Mishra & S. Pradhan (2014). An inventory of Amphibian fauna of Gandhamardan hills range of western Orissa, India. *International Journal of Research in Zoology* 4(1): 6-9.
Sirsat, C.V., M.U. Patil & V. Ujiwal (2016). Analysis of data on snakes diversity and ecological status from Aurangabad district, (MS) India. *Bioscience Discovery* 7(2): 162-165.
Tambre, G.N. & S.P. Chavan (2016). Snake species diversity of Swami Ramanand Teerth Marathwada University, Nanded, Maharashtra State, India. *International Journal of Current Research and Academic Review* 4(6): 104-115.
Uetz, P. & J. Hošek (eds.) (2018). The Reptile Database. http://www.reptile-database.org/db-info/SpeciesStat.html. Accessed on 1stAugust 2018.
Vyas, R. (2013). Snake diversity and voluntary rescue practice in the cites of Gujarat State, India: An evaluation. *Reptile Rap* 15: 27-39.
Whitaker, R. & A. Captain (2008). *Snakes of India.The Field Guide*. Draco Books, Chengalpattu, Tamil Nadu, xiv+479pp.

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