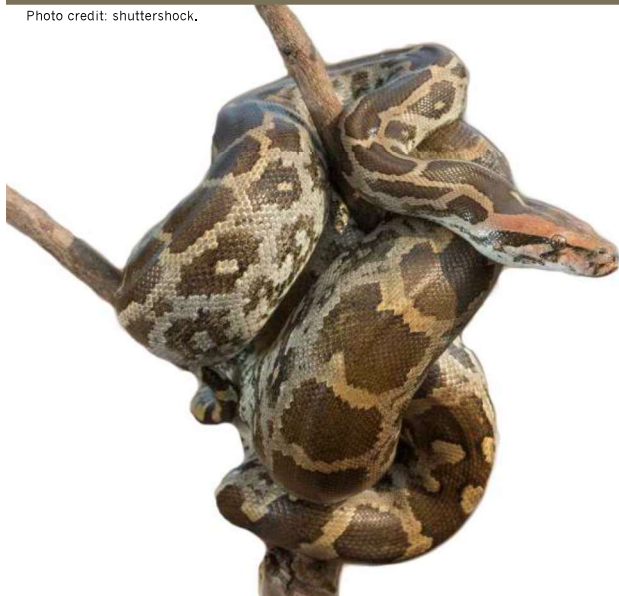




Boa & Python SPECIALIST GROUP Newsletter

SERPENS

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Indian python

Python molurus

A very large (>6 m) species of python found in diverse habitats in the Indian subcontinent and Southeast Asia, including grasslands, swamps, marshes, rocky outcrops, woodlands, rainforests and river valleys. Often confused with the Burmese python (*Python bivittatus*), it is generally lighter colored overall with more orange colouration on the head. The Indian python is oviparous with clutch size dependent on the size of the female, but is usually between 10 to 107 eggs. These snakes prey on mammals, birds, and reptiles. The Indian python is classified as lower risk / near threatened on the IUCN Red List of Threatened Species

+ THIS ISSUE

INVASION BY BOAS & PYTHONS

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TRACKING PYTHONS: INVESTIGATION ON THE SPATIO-TEMPORAL AND
THERMAL ECOLOGY OF INDIAN PYTHON (*PYTHON MOLURUS MOLURUS*, LINN.
1758) IN MOYAR RIVER VALLEY, TAMIL NADU, INDIA

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TRACKING PYTHONS: INVESTIGATION ON THE SPATIO-TEMPORAL AND THERMAL ECOLOGY OF INDIAN PYTHON (PYTHON MOLURUS MOLURUS, LINN. 1758) IN MOYAR RIVER VALLEY, TAMIL NADU, INDIA

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Indian pythons are large, heavy-bodied, ambush predators. Their movement is largely associated with age, sex and season. They are non-venomous snakes with an average adult snout-vent length of six to eight meters (Bhupathy 1990). They occupy the most diverse habitats in Indian sub-continent and found in dry, wetland areas, forests and rainforests (Kamalakkannan 2009). Further, they are semi-arboreal and prey upon a variety of small to medium-sized mammals, birds and lizards (Bhupathy et al. 2014). Their activity pattern is unimodal during winter and bimodal in spring and summer in semi-arid condition (Bhatt and Choudhury 1993). Three species of pythons are known from Indian region, namely Reticulated python *P. reticulatus* and Indian python *P. molurus* and Burmese Python *Python bivittatus*. Despite the wide distribution of pythons in India and South-east Asia, their ecology is poorly known. Information on its ecology such as sloughing, basking and breeding are largely based on observations in captivity (Vyas 1996, 1995; Dattatri 1990). Barring descriptions in a few compilations on giant snakes, information on the free ranging Indian pythons is scanty (Ramesh 2012; Reed and Rodda 2009; Henderson and Powell 2007). Indian Python distributed through out the Indian subcontinent except Indian Terai and Northeast India. Its range extending from Sind and Punjab in Pakistan to Bengal in India to the North, and southward throughout the entire Indian peninsula and Sri Lanka. It occupies a wide range of habitats from dry and rocky scrub to moist forests. The non-availability of information makes species management and conservation decisions difficult. The Indian python has been listed in Schedule I of the Indian Wildlife (Protection) Act 1972, and it is listed under CITES subsequent to severe habitat loss and abuse by the skin, pet, and meat trade. So far, only one PhD study on Indian python (2008 – 2012) is available from its native range (Ramesh 2012). Due to the Pythons cryptic behaviour, ability to hide inside bushes, burrows and caves in longer duration makes it difficult to monitor individuals in field condition. Hence, radio-telemetry tool is probably the only option to understand the python's biology, ecology and behaviour under natural environment. Till date telemetry study on Indian python is not conducted, So first time in its distribution range, we have initiated a telemetry study on this threatened species.

Spatio-temporal and Thermal Ecology

Understanding the spatial ecology that includes movement pattern and habitat usage of endangered species is essential for their conservation and to mitigate human-wildlife conflicts. Lack of understanding on how organisms move in relation to landscape structure and resource availability is a major constrain to maintain wild populations and leading to population decline and local extinctions. We plan to generate high-resolution data on spatio-

temporal movement pattern of *P. molurus molurus* in Moyar River Valley, Tamil Nadu by using radio-telemetry technique. Our main objective is to quantitatively determine home ranges across sex and season, as well as to explore correlations of python movements with environmental parameters. To compensate the constraints in current methods, we will combine telemetry and mark-recapture data to reveal the home range and movement patterns of this endangered reptile. We planned to radio-track 20 wild pythons, with VHF tags between 2018 and 2020. In addition to telemetry python ranging will be determined by using dorsal-natural marking and mark-recapture technique. Data on activity of pythons with respect to space, time and environmental factors will help us to understand the importance and usage of habitats. Beside movement ecology the study will also generate information on difference in dispersal capacity between various life stages in the species and site fidelity. Tendency of snake to move between subpopulations depends on habitat quality, seasonality and accessibility. The success of dispersing individuals (thus connectivity) contributes to population persistence. There are two basic components to connectivity- structural and functional. Structural connectivity is the spatial connection of habitat types; whereas, functional connectivity describes the utility of the habitat for dispersal across the landscape. The study will also address, whether pythons occur as patchy-populations (panmictic populations that are spread over multiple habitat patches) or as source-sink dynamics (spatially discrete populations connected by dispersal) as metapopulations. We also intend to study the activity pattern, survival rate and homing instinct of relocated pythons, which will help us to reduce human-snake negative interaction. Thermoregulatory mechanism is one of the core scientific components with respect to research in ectotherms. The thermoregulatory mechanism in snakes is hitherto poorly known in India. I-buttons implanted in pythons can be helpful to generate information thermal biology of foraging, digesting and breeding pythons and compare thermal dynamics of different python populations. This study also would provide information regarding people perceptions towards snakes in general. Further, we will outline the major threats and potential conservation strategies to the Python in the study area. Expected outcome of the study would be useful to improve the present status of Ophiology in the country.

Study Area

The study is being carried out in Moyar River valley and adjacent Sigur Plateau (11.701280N–76.587060E and 11.472440N–77.1476080E) in the Nilgiri Biosphere Reserve, which is transition zone between Western and Eastern Ghats. It is a wide south-east facing valley located at the junction of four plateaus: the Sigur in the northwest, the Nilgiri in the west, the Mysore in the north and the Thalamalai Plateau in the northeast. The valley is within the borders of the Satyamangalam Tiger Reserve and the Mudumalai Tiger Reserve in Tamil Nadu, and Bandipur Tiger Reserve in Karnataka State. A deep gorge, the Moyar gorge in the northern boundary of the Nilgiri District separates the Sigur and Mysore plateaus. The terrain is hilly and the altitude of the study area ranges from 300–950 m; the main ridge of the Nilgiri Plateau is above 2,000m. The study area receives rain from both the northeast and southwest monsoons, with more rain coming during the former from September to December.

Capture of pythons

Study species located by looking for tracks, shed skins, at rat holes, termite mounds and dense hedge rows. Snakes rescued from the human settlement/agriculture areas and by following radio-telemetered animals during the mating season until to find the new individuals. We would hand captured pythons and will be temporarily restrained each individual in a snake bag within a large plastic storage container. We usually record capture locations using a handheld GPS unit. Each python is measured, taking mass in kilograms and standard lengths (SVL, TL & girth, in centimeters). Further, each python will be identified/marked based on blotch pattern method (Bupathy 1990).

Surgical technique

Captured python will be implanted intraperitoneally (in the body cavity) with radio 4 transmitters (Reinert and Cundall 1982; Weatherhead and Anderka 1984; Dorcas and Willson 2011). Transmitter Implantation As mentioned earlier total 20 Indian pythons are planned to track with use of telemetry. So far, in eight pythons transmitters are implanted successfully and their movement pattern is being monitored under natural environment by the python research team. Transmitter weights won't be exceeding 0.3% of each snake's body mass. Equal ratio of male, female, sub-adult and adult would be tracked to generate the ecological information. Each snake anesthetized before implantation using isoflurane administered with an anesthesia machine; the surgery is planned to complete between 30 and 60 minutes for each snake as suggested by Ujvari and Korsos (2000). After surgery, we would keep python under observation for at least 24 hours before release. Prior to release, we will visually inspected each python to assess its health and alertness, as well as any problems related to implantation. If surgical implantation is proper generally, they do not show any problems related to transmitter implantation. Snakes will be tracked to the extent the battery life would allow, until they needed to be re-implanted with new transmitters. Time, date of capture, activity and GPS-location will be recorded for each animal. Size, SVL, weight, sex and female reproductive status (gravid or non-gravid) will be determined. All snakes shall be re-captured at the end of the study for removal of transmitters. All surgeries performed by a veterinarian, based on using the technique described in Ujvari & Korsos (2000). Animals will be kept in captivity to provide with adequate heating for healing of surgical wound and post-surgery conditions will be monitored. After the wound healing, the snake will be released at their capture site/predetermined experimental site.

Expected output and outcome of the study

1. This Study results can help us identify drivers that determine “movement ecology” of an Indian python for the first time. High-resolution information of movement pattern will help us estimate buffer zone across various python habitats needed for population persistence and potential genetic connectivity between local populations. **2.** The study will reveal information on habitat selection of python at the spatial scale of the geographic range, at the home range scale and selection of microhabitats. **3.** Hitherto unknown ecological information generated from this study would add new dimension in “impact assessment” studies. This study can provide a basis for further advanced research such as mechanism of thermoregulation and evolution of endothermy. **4.** The study will generate first ever information on movement pattern, home range size, habitat preference, and activity period of Indian python. This Information will help to instruct farmers to how to avoid inviting snakes from their living space and a way to reduce

conflict. Information on movement and activity pattern of snakes will also help managers to be prepared for rescue operation. It will be helpful to make efforts to community education and promoting sensible activity and awareness of snake movement and habits among farmers and their families. Study results also help to develop protocol for monitoring the snakes throughout the state and similar geographical area of other parts of the country, which is currently unavailable.

Acknowledgements

This Indian Python research project (EMR/2016/003963) sponsored by the Science and Engineering Research Board – Department of Science and Technology, Government of India. We would like to acknowledge the Indian Python Research Team members – Dr Gautam Taluktar, Dr Abhijit Das, Mr Vishnu Nair, Mr Thirumurugan, Mr Sathish for their constant involvement and coordination. Our heartfelt thanks to Dr Robert N. Reed, USGS for partial support of Telemetry equipment's including i-buttons, Supports and guidance. Dr. Daniel Natusch and Dr. Tomas Waller helped us to find appropriate telemetry equipment for the study. We also thank the Principal Chief Conservator of Forests and Chief Wildlife Warden, Tamil Nadu. Field Directors and Dy Field Directors of Sathyamangalam Tiger Reserve, Mudumalai Tiger Reserve and Forest Veterinary Unit members, for permission and support in the field. We are grateful to the Research Coordinator, Dean and the Director at Wildlife Institute of India for their support. We also thank Dr Frank Ridgley, Dr H.S. Prayag, and Dr M. Amarnath, for encouragement and support during the study.

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RECENT PUBLICATIONS

Natusch DJD, Lyons JA, Riyanto A, Mumpuni, Khadiejahd S, Shine R (2019) **Detailed biological data are informative, but robust trends are needed for informing sustainability of wildlife harvesting: A case study of reptile offtake in Southeast Asia.** *Biological Conservation* 233: 83-92. doi: <https://doi.org/10.1016/j.biocon.2019.02.016>

Conservation biologists often use sophisticated models of population functioning to predict the levels at which harvesting of wild populations will be sustainable. We argue that this approach is not useful for species that, although abundant, are near impossible to survey cost-effectively with enough precision to gather key data to input as model parameters. Our examination of >7000 Reticulated Pythons (*Malayopython reticulatus*), collected for the commercial skin industry, provides extensive information on life-history traits, population size structure, sex ratio and diets across sites in Kalimantan, Sumatra and Peninsular Malaysia. Our data reveal many interesting divergences between populations from north vs south of the equator (e.g., in body sizes, reproductive frequencies, seasonal timing of reproduction), and a trend for snakes to be smaller from more intensively harvested sites. In combination with earlier analyses, >10,000 individuals of *M. reticulatus* have been dissected for information on ecological attributes (more than for any other snake species worldwide). Nonetheless, in the absence of demographic data (e.g., on underlying abundances and rates of survival and growth of free-ranging snakes), the most robust estimate of sustainability of the harvest comes from long-term trends in mean body sizes, life history traits, and offtake rates. Because mathematical models depend upon accurate estimation of abundance and demography, parameters unobtainable for these secretive, well-camouflaged reptiles, managers should prioritise gathering long term data on harvest trends instead.

Hanslowe EB, Duquesnel JG, Snow RW, Falk BG, Adams AAY, Metzger EF, Collier MAM, Reed RN (2018) **Exotic predators may threaten another island ecosystem: A comprehensive assessment of python and boa reports from the Florida Keys.** *Management of Biological Invasions* 9(3): 369-377. doi: <https://doi.org/10.3391/mbi.2018.9.3.18>

Summarizing historical records of potentially invasive species increases understanding of propagule pressure, spatiotemporal trends, and establishment risk of these species. We compiled records of non-native pythons and boas from the Florida Keys, cross-referenced them to eliminate duplicates, and categorized each record's credibility. We report on 159 observations of six python and boa species in the Florida Keys over the past 17 years. Burmese pythons (*Python bivittatus*), boa constrictors (*Boa constrictor*), and ball pythons (*Python regius*) are the most frequently reported species, but credible records of three additional species were also reported. Among the most notable records, we report on three hatchling and multiple reproductive Burmese pythons captured on North Key Largo since 2016, indicating that the species is now established on that island.

Eskandarzadeh N, Rastegar-Pouyani N, Rastegar-Pouyani E, Todehdehghan F, Rajabizadeh M (2018) **Sexual Dimorphism in the Javelin Sand Boa, *Eryx jaculus* (Linnaeus, 1758) (Serpentes: Erycidae), from Western Iran.** *Current Herpetology* 37(1): 88-92. doi: <https://doi.org/10.5358/hsj.37.88>

The Javelin sand boa, *Eryx jaculus*, is one of the erycid snakes occurring in Iran. In order to investigate sexual dimorphism in this species, 12 morphological characters were examined in 22 adult specimens (10 males and 12 females) from different localities in western Iran. Results showed that the number of sub-caudal scales, the relative tail length, and snout-vent length are different between sexes. Brief comparison of sexual dimorphism among species of *Eryx* was presented.

Reynolds RG, Henderson RW (2018) **Boas of the World (Superfamily Booidae): A Checklist With Systematic, Taxonomic, and Conservation Assessments.** *Bulletin of the Museum of Comparative Zoology*, 162(1): 1-58. doi: <https://doi.org/10.3099/MCZ48.1>

The booid snakes (superfamily Booidae) are a near-circumglobally distributed group of macrostoman alethinophidian squamates, and several lineages are of significant conservation concern. A number of taxonomic changes have occurred among the superfamily Booidae over the last decade, including the resurrection and description of new families, elevation of a genus, elevation of 13 species, and the discovery of a new species. Here, we aim to synthesize existing knowledge of booid diversity, systematics, and conservation status. We provide a comprehensive checklist of all 66 species and 33 subspecies of booid snakes recognized herein, distributed among 14 genera and six families. For each species and subspecies, we evaluate taxonomy, distribution, type specimens, and conservation status.

Alexander GJ (2019) **Reproductive biology and maternal care of neonates in southern African python (*Python natalensis*).** *Journal of Zoology* 305(3): 141-148. doi: <https://doi.org/10.1111/jzo.12554>

Reproductive strategies such as parental care have been pivotal in evolutionary innovations such as endothermy in birds and mammals. The diversity of reproductive biology across the squamates provides a unique opportunity for elucidating the selective forces responsible for the evolution of various reproductive strategies. Here, I report on the reproductive biology of the southern African python (*Python natalensis*), based on a 7-year study of free-ranging pythons, revealing a behavioural complexity not usually expected for snakes. Mating occurred in the austral winter, with individual males following females for more than 2 months.

Ramesh C, Nehru P, Vishnu SN, Karthy S, Murugan VT, Das A, Taluktar G (2019) **Indian Rock Python: Mating behaviour of *Python molurus molurus* (Linnaeus, 1758) in Moyar River Valley, Tamil Nadu, India.** *Zoos Print* 34(2): 10-14. doi: <https://doi.org/10.1111/jzo.12554>

This is the first report of the mating of free-ranging Indian Rock Pythons from southern India and is based on the observation in Moyar River Valley (11.5640 N & 76.9680 E; 352m), in Sathyamangalam Tiger Reserve, Tamil Nadu, India.