

Cannibalism in the Oriental Ratsnake, *Ptyas mucosa* (Linnaeus, 1758), in Mumbai, Maharashtra, India

Pranav Joshi^{1,*}, Shubham Soni², and Alex Figueroa³

In snakes, ophiophagy (feeding on snakes) is generally ascribed to a few genera or species considered as specialised snake feeders, such as members of the genera *Clelia*, *Cylindrophis*, *Dryomarchon*, *Lampropeltis*, *Micrurus*, *Naja*, and *Ophiophagus* (Greene, 1997; Maritz et al., 2018; Weiss and Kalki, 2023). However, Colston et al. (2010) approximated that over 20% of all alethinophidians displayed some degree of ophiophagy in their diets, but it appears that this is mostly limited to singular events (e.g., McKelvy et al., 2013; Coelho-Lima et al., 2020; Figueroa and McCleary, 2021) as obtaining direct observations of snake feeding in the wild is challenging given their secretive nature and infrequent need to feed. Indubitably, ophiophagous feeding in snakes may also involve cannibalism, whereby species feed on conspecifics (Polis and Myers, 1985; Coelho-Lima et al., 2021). Ophiophagy and consumption of other elongate prey is advantageous to snakes because individuals stand to gain greater energetic value by consuming prey with high mass relative to cross-sectional size compared to other prey (Cundall and Greene, 2000; Maritz et al., 2018). No clear explanation exists as to why snakes exercise cannibalism (Polis and Myers, 1985), but it may simply be a matter of energetics. Herein, we report on an observation of cannibalistic behaviour in the Oriental Ratsnake, *Ptyas mucosa* (Linnaeus, 1758).

Ptyas mucosa is a large, diurnal, and terrestrial non-venomous snake inhabiting diverse habitats encompassing a wide geographic range that includes parts

of Turkmenistan and Iran in the west and ranges across most of South and Southeast Asia into Taiwan and the Indonesian Archipelago (Wallach et al., 2014). The diet of *P. mucosa* can be described as broad and with a diverse selection of prey, but as large, powerful constrictors, these snakes are believed to typically feed on rodents (Captain and Whitaker, 2004; de Lang, 2017). Nonetheless, amphibians ostensibly form a large part of their diet (de Lang, 2017; Chaudhuri et al., 2018; Ghosh et al., 2020) constituting 34.5% of 86 feeding events examined (Weiss and Kalki, 2023). Weiss and Kalki (2023) also ascertained that snakes comprised the second most abundant prey item at 21.4%, whereas mammals only accounted for 19%, followed by lizards (14.3%) and birds (10.7%). The proximity with which *P. mucosa* is found near human settlements has also led to some bizarre observations of individuals ingesting inorganic objects such as a discarded male contraceptive, cloth, socks, a polythene roll, and even one seen ingesting an entire onion and then dying 3 min later (Sharma et al., 2016). Another snake regurgitated five dead rat pups together with five plastic bottles containing pills (Parmar and Patel, 2022).

In their report, Weiss and Kalki (2023) reported 31 different prey species in the diet of *P. mucosa*. Snake species included *Chrysopelea ornata* (Shaw, 1802), *Fowlea piscator* (Schneider, 1799), *Naja naja* (Linnaeus, 1758), *Oligodon taeniolatus* (Jerdon, 1853), *Psammophis condanarus* (Merrem, 1820), *Rhabdophis plumbicolor* (Cantor, 1839), an unidentified uropeltid, and conspecifics (Weiss and Kalki, 2023). Prior to their recent study, ophiophagy, concomitantly with cannibalism, has only been reported once in *Ptyas*. More recently, the first report of ophiophagy in *P. korros* (Schlegel, 1837) was reported when one was observed feeding on a *Psammodynastes pulverulentus* (Boie, 1827) in India (Bohra et al., 2023). Saha and Chaudhary (2017) first reported cannibalism in *P. mucosa* when they watched a large adult consume a still-living smaller conspecific in about 15 min. Weiss and Kalki (2023) discovered that ophiophagy in *P. mucosa* predominately involved cannibalistic events (seven of 18 snakes).

¹ Ecological Neuroscience Group, School of Natural Sciences, Macquarie University, Sydney, New South Wales 2109, Australia.

² Department of Ecology and Environmental Sciences, Pondicherry University, Puducherry 605014, India; and Centre for Ecological Sciences, Indian Institute of Science, Bengaluru, Karnataka 560012, India.

³ Independent researcher, Singapore.

* Corresponding author: joshipranav59@gmail.com



Figure 1. (A) An adult *Ptyas mucosa* ingesting a smaller conspecific from the tail at Sanjay Gandhi National Park, Goregaon, Mumbai, India. (B) Injuries sustained by the prey individual.

At 15:21 h on 31 October 2022 at the Conservation Education Centre located within Sanjay Gandhi National Park in Goregaon, Mumbai, Maharashtra, India (19.1636°N, 72.8920°E), a large *P. mucosa* was seen capturing a smaller conspecific, which it began ingesting from the tail (Fig. 1A). Due to the disturbance caused by a crowd at the scene, the snake regurgitated its prey and escaped into a nearby water drainage. Inspection of the regurgitated snake revealed a large open wound along its ventrolateral side with exposed internal organs (Fig. 1B). After a period of about 20 min, the larger snake returned to once again feed on the smaller conspecific, this time ingesting it from the head. After ingesting almost half of its meal, the larger snake escaped once more into the same water drainage with the snake in its mouth. The observations described here suggest that cannibalism in *P. mucosa* may not merely be opportunistic (Polis and Myers, 1985) but targeted, as evidenced by the return of the larger snake to its intended prey.

Acknowledgments. We would like to thank Roshan Shinde (Sanjay Gandhi National Park) for letting us enter the park to photograph the snakes. We also thank Krishna Pawar (CEC Security) for helping us with the documentation. Lastly, we thank Hinrich Kaiser (Victor Valley College) for comments on the manuscript.

References

- Bohra, S., Swargiary, P., Roy, R., Purkayastha, J. (2023): Observation of an Indo-Chinese Rat Snake (*Ptyas korros*) preying on a Mock Viper (*Psamodynastes pulverulentus*). *Reptiles & Amphibians* **30**(1): e18679.
- Chaudhuri, A., Sardar, A., Chowdhury, S., Dutta, A. (2018): Natural history notes. *Ptyas mucosa* (Indian Ratsnake). *Diet and Behavior. Herpetological Review* **49**: 352–353.
- Coelho Lima, A.D., Oliveira Ramos, G., Martins, R.B.X., Castro Meira, L.P.D. (2020): First record of ophiophagy in the false coral snake *Oxyrhopus trigeminus* Duméril, Bibron & Duméril, 1854. *Cuadernos de Herpetología* **34**(1): 89–91.
- Coelho-Lima, A.D., Cardoso, D.T., Passos, D.C. (2021): The short life of a juvenile neotropical snake: a record of cannibalism in *Philodryas nattereri* (Steindachner, 1870). *Herpetology Notes* **14**: 843–846.
- Colston, T.J., Costa, G.C., Vitt, L.J. (2010): Snake diets and the deep history hypothesis. *Biological Journal of the Linnean Society* **101**(2): 476–486.
- Cundall, D., Greene, H.W. (2000): Feeding in snakes. In: *Feeding: Form, Function, and Evolution in Tetrapod Vertebrates*, p. 293–333. Schwenk, K., Ed., San Diego, California, USA, Academic Press.
- de Lang, R. (2017): *The Snakes of Java, Bali and Surrounding Islands*. Frankfurt am Main, Germany, Edition Chimaira.
- Figueroa, A., McCleary, R.J. (2021): Descending from the trees onto the mud to feed: observation of ophiophagy by *Trimeresurus purpureomaculatus* (Gray, 1832) on *Fordonia leucobalia* (Schlegel, 1837). *Herpetology Notes* **14**: 1281–1285.
- Ghosh, A., Madgulkar, S., Banerjee, K. (2020): Opportunistic nocturnal predation by a diurnal snake: an Indian Ratsnake, *Ptyas mucosa* (Linnaeus 1758), preying on Marbled Balloon Frogs (*Uperodon systoma*). *Reptiles & Amphibians* **27**: 245–246.
- Greene, H.W. (1997): *Snakes: the Evolution of Mystery in Nature*. Berkeley, California, USA, University of California Press.
- Maritz, B., Alexander, G.J., Maritz, R.A. (2019): The underappreciated extent of cannibalism and ophiophagy in African cobras. *Ecology* **100**(2): 1–4.
- McKelvy, A.D., Figueroa, A., Lewis, T.R. (2013): First record of ophiophagy in the widely distributed snake *Leptodeira septentrionalis* (Kennicott, 1859) (Ophidia, Colubridae). *Herpetology Notes* **6**: 177–178.
- Parmar, D.S., Patel, V.D. (2022): Plastic ingestion by the Indian snakes *Ptyas mucosa* and *Coelognathus helena helena* (Serpentes: Colubridae). *Phyllomedusa* **21**(1): 91–94.

- Polis, G.A., Myers, C.A. (1985): A survey of intraspecific predation among reptiles and amphibians. *Journal of Herpetology* **19**(1): 99–107.
- Saha, A., Chaudhuri, A. (2017): Natural history notes. *Ptyas mucosa* (Indian Rat Snake). Diet/cannibalism. *Herpetological Review* **48**: 681.
- Sharma, V., Sayyed, A., Bhandari, R. (2016): Herbivory and inanimate objects in the diet of the Oriental Ratsnake, *Ptyas mucosa* (Linnaeus 1758). *Reptiles & Amphibians* **23**: 102–103.
- Wallach V., Williams, K.L., Boundy, J. (2014): *Snakes of the World: a Catalogue of Living and Extinct Species*. Boca Raton, Florida, USA, CRC Press.
- Weiss, M., Kalki, Y. (2023): Trophic niche partitioning between sympatric *Naja naja* and *Ptyas mucosa*: crowdsourced data in application to community ecology. *Journal of Herpetology* **57**(1): 107–115.
- Whitaker, R., Captain, A. (2004): *Snakes of India: the Field Guide*. Chennai, Tamil Nadu, India, Draco Books.