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Rescue records of Leith's Sandsnake, *Psammophis leithii* Günther, 1869, from Surat, Gujarat, India with some additional insights on pholidosis and natural history

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Leith's Sandsnake (*Psammophis leithii*) is a species of colubrid snake native to the Indian Subcontinent that ranges through a series of states in central and northwestern India (Himachal Pradesh, Gujarat, Rajasthan, Uttar Pradesh, Punjab, Jammu, Kashmir, Madhya Pradesh, Maharashtra, and Andhra Pradesh) and into neighbouring Pakistan and Afghanistan (Smith, 1943; Baig et al., 2008; Whitaker and Captain, 2008; Wagner et al., 2016; Desai, 2017; Vyas et al., 2021). Even though some photos and comments exist in brief surveys (e.g., Khandal, 2009; Ingle and Sarsavan, 2013; Solanki et al., 2015; Patel and Vyas, 2019; Dhawal et al., 2021), more comprehensive studies of this snake's morphology and natural history are scarce. While the species is listed in the IUCN Least Concern category, the data underpinning this assessment are minimal and additional data are crucial to establishing a baseline knowledge so that effective conservation measures may be put in place in the regions it inhabits.

Psammophis leithii exhibits intriguing ecological adaptations, thriving in arid and semi-arid landscapes characterized by sparse vegetation and sandy substrates (Whitaker and Captain, 2008). Its distinctive, exceptionally thin morphology and relative rarity in terms of the number of observations make it an enigmatic subject for scientific inquiry. Despite its habitat limitations, the species appears to play a vital role in its ecosystem as an apex predator, contributing to the regulation of prey populations (Sharma, 2004). We here present four records obtained via snake rescue operations in Surat District, Gujarat, India, one of which allows us to provide some more comprehensive detail about the species' morphology and natural history.

Over an 18-year period of snake rescue operations (2006–2024), our team rescued four *P. leithii*, all from Olpad Taluka[4] in northwestern Surat District (Fig. 1, Table 1). All rescued individuals were subsequently released into their natural habitat. Whereas the first three snakes were released without detailed examination, we carefully examined the most recently obtained animal (Fig. 2). Ventral scales were counted following Dowling (1951) and sex was determined using the method of Gregory (1983). While this method is not completely accurate to identify females because a lack of hemipenis eversion is not positive evidence for female sex, our sex determination is corroborated by a low subcaudal count. This individual was a female that displayed the following characteristics: snout–vent length 490 mm + tail length 210 mm = total length 700 mm, tail length 30% of total length; 160 ventrals, 92 paired subcaudals; 17-17-11 dorsal scale rows counted one head length behind the head, at midbody, and one head length anterior to the cloaca; cloacal plate entire; eight supralabials (SL), SL4 and SL5 touching the eye (Fig. 3A, B); ten infralabials (IL), IL6 the largest, five ILs in contact with anterior genials; three lateral gulars[5] (LG), the first LG in contact with IL6 and IL7 (Fig. 3C); one preocular, two postoculars, 2+2 temporals on the left side (Fig. 3A) and 1+3 temporals on the right side (Fig. 3B); one loreal, in contact with SL2 and SL3, a postnasal, a preocular, and a prefrontal.

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[4] A taluka is an administrative unit below the district level, in which several villages are organized. This division is generally established for revenue purposes.

[5] This is the number of gular scales running along the posteriormost infralabials, counted beginning with the lateral gular that touches the posterior genial. These scales have also been called sublabials (e.g., Vogel and van Rooijen, 2011, 2012) but given the potential confusion with the use of this term for infralabials (Peters, 1964; Thorpe, 1975), we prefer our terminology.

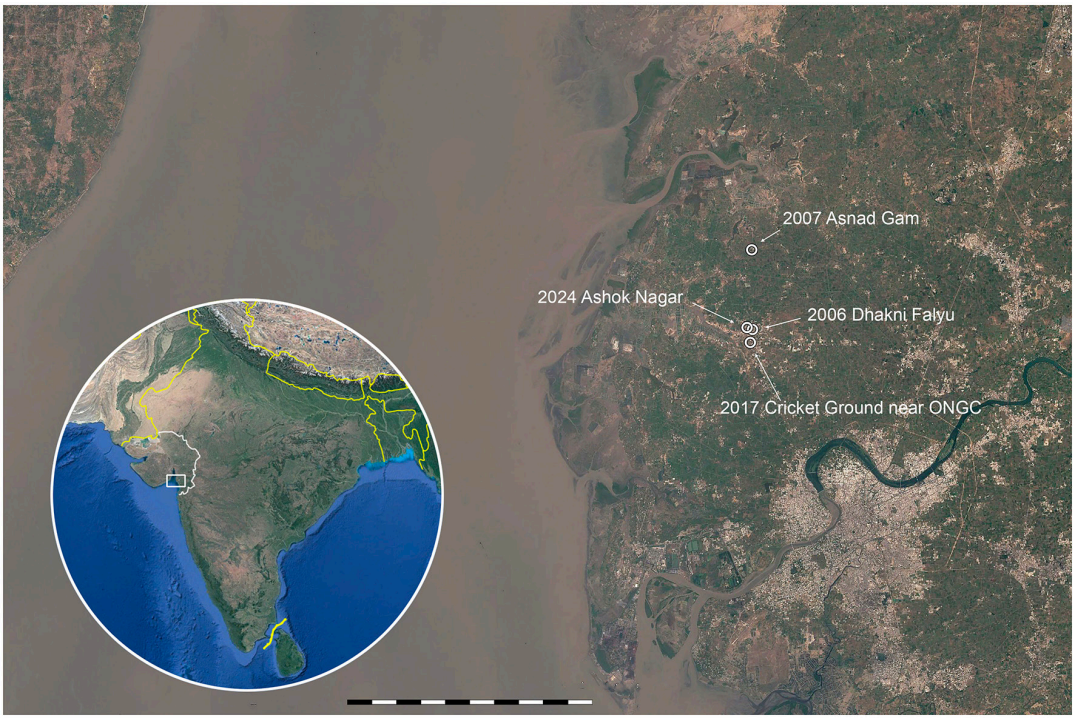

Figure 1. Satellite map depicting the apparently restricted distribution of *Psammophis leithii* in Surat District, Gujarat State, India, where these snakes have only been found in Olpad Taluka at the four indicated localities (see Table 1). The white rectangle in the inset shows the location of the main map in Gujarat (white border). Map created by Mark O'Shea using Google Earth images (Landsat/Copernicus, TerraMetrics 2024). Scale = 20 km.

Figure 2. An adult female *Psammophis leithii*, rescued from Olpad Taluka, Surat District, Gujarat, India. Photo by Mehul Thakur.

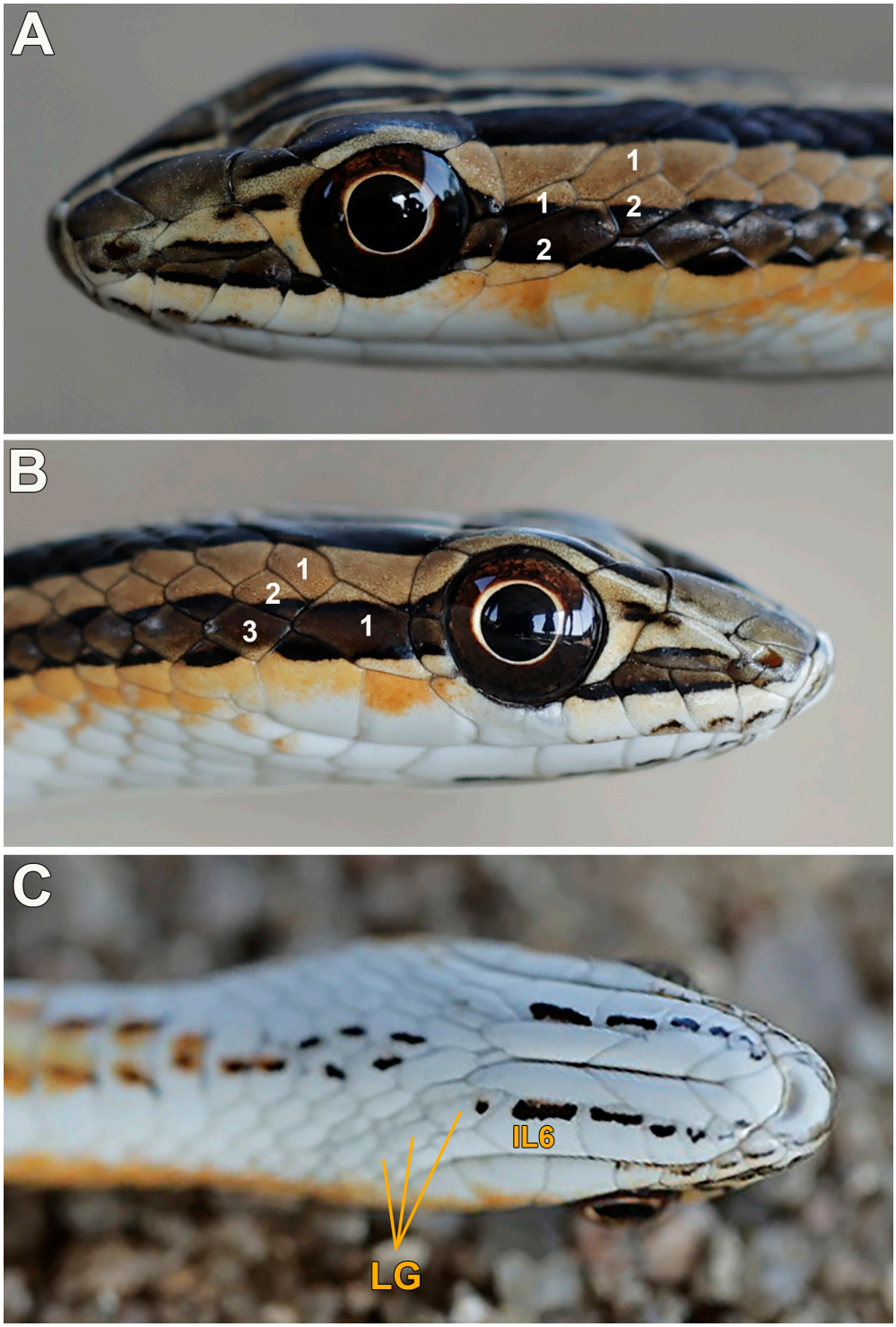

Figure 3. Head scalation of an adult female *Psammophis leithii* with some unusual patterns. (A) The left side of the head shows 2+2 temporals. (B) The right side shows 1+3 temporals. (C) The ventral view shows that five infralabials are in contact with the anterior genials, with the first lateral gular (LG) in contact with infralabials (IL) 6 and 7. Photos by Mehul Thakur.

Table 1. Snake rescue data for *Psammophis leithii* in Surat District, Gujarat, India for the period 2006–2024. The 2017 site is a cricket field near the local Oil and Natural Gas Corporation (ONGC).

Year	Location	Latitude (°S)	Longitude (°E)
2006	Dhakni Falyu	21.3379	72.7498
2007	Asnad Gam	21.3966	72.7492
2017	Cricket Ground near ONGC	21.3283	72.7481
2024	Ashok Nagar	21.3393	72.7455

This particular individual presented with two unusual scale characteristics. (1) The number of dorsal scale rows reduced to 11 instead of the expected 13 or 15 (Whitaker and Captain, 2008). We believe that the count of 17-17-16 reported by Ingle and Sarsavan (2013) for an individual from Sheopur District, Madhya Pradesh, may be a miscount, since in these types of snakes the number of dorsal scale row is usually an odd number barring earlier injury or unusual circumstances. (2) The number of temporal scales on this snake had an irregular pattern of 2+2 on the left and 1+3 on the right side of the head, in contrast to the 1+2 pattern reported by Whitaker and Captain (2008).

Deoras (1965) documented that there were five infralabials in contact with the anterior genials, a finding we were able to corroborate in our observations. However, Ingle and Sarsavan (2013) appeared to report a total of five infralabials (half of the normal number), and we believe that this is likely a misprint for the number of infralabials in contact with anterior genials. Additionally, Whitaker and Captain (2008) reported sexual dimorphism with minimal overlap in the numbers of ventral and subcaudal scales, noting the number of ventrals as 159–175 in males and 170–187 in females, and of subcaudals as 104–109 in males and 92–104 in females (no sample sizes were provided). Our female had only 160 ventrals, which increases the overlap with the purported male range by 10 ventral scales and may negate the idea of sexual dimorphism in that character. While we acknowledge that this single individual may be an outlier for this character, it certainly expands the known variation for the number of ventral scales in *P. leithii* females. The number of subcaudals in this female was 92, equalling the lowest count reported by Whitaker and Captain (2008). Further investigation is warranted to establish the precise range of scalation and variations, and until then, the validity of sexual dimorphism based on belly scales remains questionable.

The four rescued *P. leithii* were found in semi-arid environments, usually dominated by the invasive *Neltuma juliflora* (Fig. 4). This shrub or small tree can reach heights of up to 12 m and is native to Mexico, South America, and the Caribbean. It has become invasive in regions such as Africa, Asia, Australia, and beyond (Pasiecznik and Smith, 2003; Gunasekera, 2009). It appears as if *P. leithii* has adapted to presence of *N. juliflora*, utilizing it for shelter, dwelling, and shading in Surat District. In Ahmedabad District of Gujarat, the second author observed the snake on the native karira (*Capparis decidua*). Whichever tree species *P. leithii* might utilise, the extensive deforestation for construction activities poses a threat to this species and others with similar microhabitat requirements, emphasizing the necessity for habitat restoration to ensure the continued existence of this rarely encountered species.

Figure 4. The photographs highlight concerns regarding habitat fragmentation by the encroaching human population, where vegetation is being replaced by buildings. (A) View from one side of the house where a female *Psammophis leithii* was rescued in 2024. (B) The view of the urban jungle on the other side of the house. The available habitat suitable for snakes has been affected by deforestation, with only a few trees remaining in the area. Restoration efforts are vital to address this situation and preserve the species in its present habitat. Photos by Dikansh S. Parmar.

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References

Baig, K.J., Masroor, R., Arshad, M. (2008): Biodiversity and ecology of the herpetofauna of Cholistan Desert, Pakistan. Russian Journal of Herpetology **15**(3): 193–205.

Deoras, P.J. (1965): Snakes of India. New Delhi, India, National Book Trust.

Desai, A. (2017): Sarp Sandarbh: Information about the Snakes of Gujarat. Dahod, India, Prakruti Mitra Mandal.

Dhawal, O., Ganguly, S., Bhandari, S., Sharam, V., Chouhan, U., Ray, P. (2021): Sighting of Leith's sand snake, *Psammophis leithii* (Gunther, 1896) [sic] with first photographic evidence at Jawai Bandh, District Pali, Rajasthan, India. International Journal of Fauna and Biological Studies **8**(6): 7–9.

Dowling, H.G. (1951): A proposed standard system of counting ventrals in snakes. British Journal of Herpetology **1**: 97–99.

Gregory, P.T. (1983): Identification of the sex of small snakes in the field. Herpetological Review **14**: 42–43.

Gunasekera, L. (2009): Invasive Plants: a Guide to the Identification of the Most Invasive Plants of Sri Lanka. Colombo, Sri Lanka, Print Graphics Limited.

Ingle, M., Sarsavan, A. (2013): First record of Leith's Sand Snake (*Psammophis leithii*, Gunther, 1869) [sic] from Sheopur District, Madhya Pradesh, India. International Journal of Environment & Animal Conservation **2**(1): 1–4.

Khandal, D. (2009): Ecology and behaviour of psammophid snakes in Rajasthan, India. Cobra **3**: 25–32.

Pasiecznik, N.M., Harris, P.J.C., Smith, S.J. (2003): Identifying Tropical *Prosopis* Species – a Field Guide. Coventry, UK, Henry Doubleday Research Association.

Patel, H., Vyas, R. (2019): Reptiles of Gujarat, India: updated checklist, distribution, and conservation status. Herpetology Notes **12**: 765–777.

Smith, M.A. (1943): The Fauna of British India, Ceylon, and Burma. London, UK, Taylor & Francis.

Sharma, R.C. (2004): Handbook: Indian Snakes. Kolkata, India, Zoological Survey of India.

Solanki, R., Pande, A., Vasava, A., Singh, A., Bipin, C.M. (2015): Contributions to herpetofauna of Jaisalmer District – some photographic records. Reptile Rap **17**: 50–55.

Thorpe, R.S. (1975): Quantitative handling of characters useful in snake systematics with particular reference to intraspecific variation in the ringed snake *Natrix natrix* (L.). Biological Journal of the Linnean Society **7**(1): 27–43.

Vogel, G., van Rooijen, J. (2011): Description of a new species of the genus *Dendrelaphis* Boulenger, 1890 from Myanmar (Squamata: Serpentes: Colubridae). Bonn Zoological Bulletin **60**(1): 17–24.

Vogel, G., van Rooijen, J. (2012): A new species of *Dendrelaphis* (Serpentes: Colubridae) from the Western Ghats, India. Taprobanica **3**(2): 77–85.

Vyas, R., Srinivasulu, C., Thakur, S., Srinivasulu, B., Mohapatra, P., Kulkarni, N.U., Papenfuss, T. (2021): *Psammophis leithii*. The IUCN Red List of Threatened Species 2021: e.T172587A1347114.

Wagner, P., Bauer, A.M., Leviton, A., Wilms, T.M., Böhme, W. (2016): A checklist of the amphibians and reptiles of Afghanistan - exploring herpetodiversity using biodiversity archives. Proceedings of the California Academy of Sciences, Series 4 **63**(13): 457–565.

Whitaker, R., Captain, A. (2008): Snakes of India, the Field Guide. Chennai, India, Draco Books.

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