

Morphologically, they are hairy black and yellow whose size ranges from 1.88 to 3.75 cm, similar to carpenter bee. However, bumble bees have fuzzy abdomen, whereas carpenter bees have a smooth abdomen. There are about 200 different types of bumble bees in the world. They are social bees like the honey bee. Long and branched setae cover their entire body giving a fuzzy appearance. Female bee hind legs are modified to corbicula, which is a shiny concave surface that is bare, but surrounded by a fringe of hairs used to transport pollen. They are able to work in cold climate as long hair coats help them stay warm⁸⁻¹⁰. *B. breviceps* nest in the ground. Soil characteristics, where the nesting is found, such as composition, texture, compaction, slope and exposure are important factors for bee habitat maintenance.

A literature survey reveals that, *B. haemarrhoidalis* has been recorded as the sole pollinator of large cardamom. However, the present study reveals *B. breviceps* as the pollinator of large cardamom, especially during early flowering season at different altitudes of cultivation.

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Recent records of the endemic Kerala mud snake, *Enhydris dussumierii* (Duméril, Bibron & Duméril, 1854) from India

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A rare, little known and endangered species of mud snake, *Enhydris dussumierii* (Duméril, Bibron & Duméril, 1854), has been reported from Vellayani Lake, Kerala, India. Some taxonomic characters are redescribed, with notes on its colour pattern, diet and occurrence.

Keywords: Diet, homalopsidae, *Enhydris dussumierii*, taxonomic characters, Vellayani Lake.

THE genus *Enhydris* Sonnini and Latreille, 1802 is a highly diverse, enigmatic clade of homalopsid snakes with 23 species. The genus is represented in India by four species – the Kerala mud snake *Enhydris dussumierii* (Duméril, Bibron & Duméril, 1854), the Rainbow mud snake *Enhydris enhydris* (Schneider, 1799), Boie's mud snake *Enhydris plumbea* (Boie, 1827) and Siebold's mud snake *Enhydris sieboldii* (Schlegel, 1837)¹. The homalopsids are one of the five basal caenophidian clades that form the sister clade to all of the Colubroidae in the phylogeny proposed by Vidal *et al.*². Little is known about snakes of the family Homalopsidae, despite the fact that they are widespread and abundant in some habitats³, using both lotic and lentic aquatic ecosystems.

E. dussumierii is named after Jean-Jacques Dussumier (1792–1883), a French nobleman, mariner and naturalist, who collected fish and other vertebrate specimens from many parts of Asia. The two syntypes (MNHN 3751 and MNHN 3752) are located in the Museum National d'Histoire Natural (MNHN), Paris. The species was first described by Duméril *et al.*⁴ as *E. dussumieri* [sic]. Till date, two museum specimens exist, fide Gyi^{3,5}. A possible third specimen (*Hypsirhina malabarica*) in the Hamburg Museum was destroyed during World War II. Though Smith⁶ synonymized *H. malabarica* with *E. dussumierii*, Murphy³ doubts the synonymy based on differing tail/snout-vent length ratios, and the number of scale rows at the midbody, suggesting another species may be present. *E. dussumierii* is endemic to Kerala, and there are only a few published reports on its occurrence, distribution and biology^{3-5,7-9}. The first photograph of this species in life, taken by Ingrid Simpson in Kerala, was published by Murphy³.

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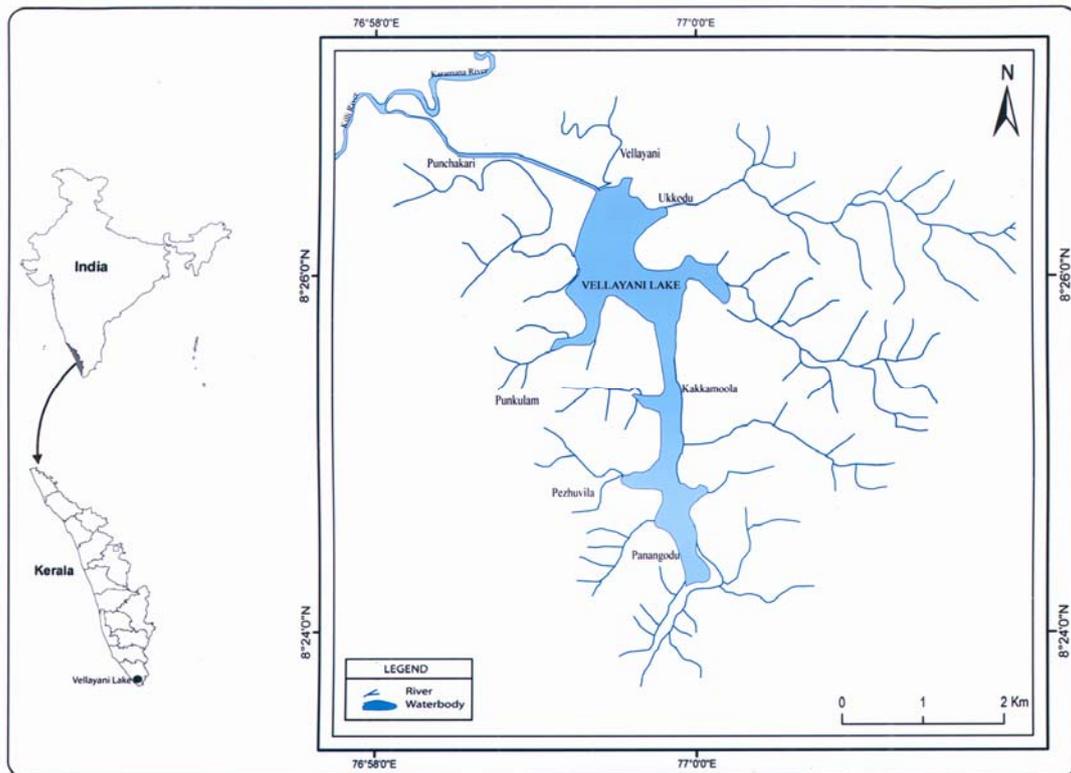


Figure 1. Map of India showing Kerala, Vellayani Lake and drainage basin.

Table 1. Scalation data for three specimens of *Enhydryis dussumierii* from Vellayani Lake, Kerala, India

Character	BNHS 3469	REP MS 1	Live specimen (released later)
Dorsal scale rows	27 : 27 : 23	27 : 27 : 23	27 at midbody
Ventrals	148	147	150
Anals	2	2	2
Subcaudals	38	36	36
Snout-vent length (mm)	555	565	Not recorded
Tail	85	90	Not recorded

The type locality is often erroneously stated as ‘Bengal’^{5,6}, which is probably the result of an error in translation. Murphy³ states, ‘Based upon my translation, Duméril appear to be thanking the Dussumier [sic] family of “Bengale” for their support and specimens and there is no type locality in the description’. Subsequent reports by Smith⁶ recorded the presence of this species only in Kerala – Cochin, Malabar coast; Ian Simpson added new localities Angamaly, Aluva, Chalakkudy and Olavipe (in Ernakulam District of central Kerala) for this species in a personal communication to Murphy³.

Three specimens of *E. dussumierii* were collected from Vellayani (freshwater) Lake (8°24’90”–8°26’30”N lat., and 76°59’68”–76°59’47”E long.), Thiruvananthapuram District, Kerala, India, during a biodiversity survey of the lake (Figure 1). *E. dussumierii* is locally known in

Kerala, where it was collected by us as ‘cheli kutta’ (mud snake) and ‘kanda pampu’ (paddy-field snake); both names are apt as it inhabits these localities. Murphy³ also mentions ‘thadikkipottan’, ‘pulavan’ and ‘Neerkoli’ as local names for this species, though these names are used for all freshwater snakes in Kerala. In Vellayani, this species was found at the muddy edges of the lake. One specimen collected by the first author was deposited at Bombay Natural History Society (BNHS 3469), and another is in the museum of the Department of Aquatic Biology and Fisheries, University of Kerala (REP MS 1). The stomach of this specimen contained a partially digested climbing perch (*Anabas testudineus*; Figure 2). The third specimen was kept alive at the wet laboratory of University of Kerala for photography and for studying behaviour. It was subsequently released back in the lake. In captivity, it moulted and ate fish (*Puntius* spp.) offered to it.

The specimens were identified using keys and descriptions available in the literature^{3,5,6}. Scalation data of the three specimens recorded during the study are given in Table 1. Characters common to all three specimens: supralabials 8 (4th touching ocular, 8th divided horizontally^b); nasals partially divided, nasal cleft extends to loreal^c; preocular 1; loreal 1; ‘internasals’^d 2, not in contact with loreal; postoculars 2; temporals 1 + 2.

^aGyi⁵, ‘The dorsal scales are in 27 rows and reduce to 23 or 21 rows just before the vent’; Murphy³, ‘ON THE

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BODY [sic] dorsal scales are in 27–27–22 or 29–27–24 rows'. We recorded 27:27:23 in two preserved specimens.

^bGyi⁵, p. 71, in his key states, '... upper labials posterior to eye *not divided*...'. Murphy³ on p. 86 writes 'none'. Later, while depicting MNHN 5752 he mentions 'rear upper labials, *note last one is horizontally divided*'. Then he states, 'Upper labials number eight; the sixth upper labial is the largest; and the last upper labial *may be horizontally divided*' (plate 14, figure c)³. Murphy has used the phrase 'may be horizontally divided' and at least one of the syntypes (MNHN 5752) has an undivided 8th supralabial scale. All *E. dussumierii* examined by us had the 7th or 8th supralabial horizontally divided (Figure 3). Though the first part of Gyi's key actually fails, '... upper labials posterior to eye *not divided*...', we have matched other characters of his key as well as his description of this species and are confident that the snakes examined by us are *E. dussumierii*. We have also used keys and descriptions in Smith⁶ and Murphy³ to corroborate our identification.



Figure 2. Specimen of *Enhydris dussumierii* REP MS 1. Ventral view showing stripes. Also seen are partially digested prey *Anabas testudineus* (above) and part of alimentary canal (below).



Figure 3. Specimen of *E. dussumierii* BNHS 3469. Dorsal view of head. Red line points to one of the 'internasals' which could more precisely be called 'postnasals'.

^cGyi⁵ (p. 74) in his key states, 'Nasal cleft extending to first upper labial... 18...'. which leads to *E. dussumierii*. Later, during the diagnosis of this species, he contradicts his previous statement with, 'Nasal cleft extending from nostril to internasal' (p. 121). Murphy³ mentions, 'The nasals are semi-divided with the nasal cleft touching the loreal (plate 14, figure a)'. All three specimens examined by us had nasal cleft extending to the loreal (Figure 4). At least one of the syntypes (MNHN 5752) has the nasal cleft extending to the first supralabial.

^dThough in this case the 'internasals' are not actually internasals *sensu stricto*, most authors^{3,5,6} have referred to the two adjacent (paired) scales immediately posterior to, and in contact with the nasal scales as 'internasals' (Figure 3). A scale/scales that lies/lie between, and is/are in contact with the nasals is/are an internasal/internasals (inter = between). Scales posterior to the nasals, anterior to the prefrontal/s and in contact with both (nasal/s and prefrontal/s) should actually be termed as 'postnasals' – a more precise term for these scales. However, to avoid confusion when comparing *E. dussumierii* with other homalopsines (where these scales arguably lie between



Figure 4. Specimen of *E. dussumierii* BNHS 3469. Close-up of left lateral view of head. Red line points to the nasal cleft extending to the loreal.



Figure 5. Live specimen of *E. dussumierii*.

the nasals), we have been conservative and retained the term ‘internasals’.

While going through the literature we noticed some inconsistencies with specimen numbers and the terminology used for them. As pointed out earlier, both Gyi⁵ and Murphy³ agree that there are only two specimens. Gyi⁵ states that he had examined two specimens: the holotype MNHN c3458 and MNHN 5751 (p. 122). Murphy³ also examined two specimens, and refers to both the specimens – MNHN 3751 and MNHN 5751, as paratypes (p. 109). He refers to the two as MNHN 5753 (3572) and MNHN 3751 (p. 111). MNHN 3751 (type) and MNHN 5752 (3572) (p. 113) and finally he states MNHN c3458 is the type specimen (pp. 232–233). As both MNHN 3571 and MNHN 3752 were included in the original description, they are both syntypes.

Smith's⁶ book is still the last word on snakes of the Indian subcontinent, while Gyi⁵ and Murphy³ are definitive works on Homalopsines and will always remain essential references for researchers (including us). Anomalies have been listed here, not with the intention of belittling these seminal works, but rather to quell confusion amongst future workers on this enigmatic group of snakes.

Colour and pattern in life (based on three individuals): Basically, brown above with three black stripes; white below with three black stripes (Figures 2 and 5). Dorsum: ground colour of top of head, body and tail – reddish-brown, tan or pale olivaceous brown, scales iridescent blue in sun or artificial light. Usually three distinct, dark, black, iridescent stripes present – one mid-dorsal the other two dorso-lateral. Dorso-lateral stripes indistinct in one individual. The mid-dorsal stripe, if starting from posterior edge of frontal is very faint, then well-defined from 2 to 3 scales after the parietals to the tail tip. This stripe is one to two scales wide; if the latter, it is on the uppermost dorsal body scale row and approximately half of each adjacent scale row. Lateral aspect of head and

body – rostral and scales above supralabials – also reddish-brown, or pale olivaceous brown. Lower postocular and supralabials similarly coloured, but paler, infused with cream. Infralabials cream, tinted with pale coral (orange), most are margined with black. This colouration is confluent with the similarly coloured lateral body region on the lowest five dorsal body scale rows below the black dorso-lateral body stripe on scale rows 6 and 7 of each side (Figure 5).

Eye: Pupil vertically elliptical, black; iris dull orange-red, the upper and lower divided horizontally by a blotchy black line. An extremely faint pre-ocular streak when present, joins the aforementioned line and continues to form a narrow post-ocular stripe, which in turn continues to form a well-defined dorso-lateral body stripe – more or less on scale rows 6 and 7, and part of 8th row on each side. All four margins of third dorsal body scale row also marked with black to form two closely spaced zigzag stripes opposite one another (Figure 6). Dorsal scale rows 4 and 5 are most heavily tinted with pale orange-cream.

Venter: Ground colour of ventrals and subcaudals enamel-white, tinted with pale orange. The middle of each ventral scale has a black, backward-pointing, triangular marking that occupies the entire height of the scale. These triangular markings unite to form a median ventral stripe, which is serrated on each side. The stripe continues onto the midline of subcaudals. Outer edges of ventrals and subcaudals have black margins, which unite to form a zigzag stripe on each side.

Though Murphy³ depicts an image of a live individual which is dark grey above (plate 36), in the description of this species he describes the colour as tan, dark and light brown. It is unclear whether the dark grey is an artifact of printing, or some individuals are actually so.

Colour and pattern of preserved specimens (REP MS 1 and BNHS 3469): Dorsum: top of head, body and tail dark iridescent greyish-black. Dorsal dark-grey stripes



Figure 6. Close-up of lateral body of *E. dussumierii* in life showing black margins at outer edges of ventrals and black margins of third dorsal body scale row, which form two closely spaced, opposed zigzag stripes.



Figure 7. Specimen of *Enhydris dussumierii* BNHS 3469. Left lateral view of head showing supralabials 7 and 8. Red line points to the upper scale of a divided supralabial; either 7 or 8.

visible in life, barely discernible from ground colour of dorsum after preservation. Lateral aspect of head, rostral and scales above supralabials – dark greyish-black. Lower postocular and supralabials pale brownish-cream mottled with greyish-black, lower portions less so (Figure 7). Eye pupil off-white, iris bluish-black. Sixth dorsal body scale row and above, iridescent black. Venter: colour/pattern as in life, except the pale orange tint seen in life is absent.

Fishermen usually come across specimens of *E. dussumierii* in the lake while excavating mud in the marginal areas of the lake as well as its flood plains, including the marshes, for catching fish (*Channa* spp.). The snakes are also found buried in the mud and when agitated, take shelter among the grasses and *Ipomoea aquatica* along the margins. Unlike some enhydrines, the live snake we kept briefly was inoffensive and cooperative (placid) during the process of photography and scale counting. However, according to Ian Simpson (pers. commun.) and a few fishermen, some individuals bite in defence. It is mildly venomous and fishermen reported the bite as painful.

This species has been listed as endangered in the CAMP Workshop⁷. Murphy³ considers the distribution of the species as drainage systems of the Western Ghats, southwest coast of India. The current record shows its presence towards the southern part of Kerala in fresh-water lakes and swamps, suggesting its extended distribution in lowland wetlands as well.

For *E. dussumierii* we prefer the common name used by Murphy³, ‘Kerala mud snake’, rather than that cited by Whitaker and Captain¹, ‘Dussumier’s smooth-scaled water snake’, as the former name describes the snake better. To a lay-person, inclusion of ‘mud snake’ in the common name, a reference to its habitat, is easier to understand than ‘smooth-scaled’ (a character which though valid, is hard to see, except when the snake is observed closely). Scientific nomenclature is that used by Whitaker and

Captain¹ – *Enhydris dussumierii*, instead of *Enhydris dussumieri* as listed by and Murphy³, Gyi⁵ and Smith⁶.

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