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Research Paper

New record of Camel Spider *Galeodes indicus* Pocock, 1900 (Arachnida: Solifugae: Galeodidae) from Chhatarpur, Madhya Pradesh and additional records from Jaisalmer, Rajasthan (India), with systematic account, distribution and other aspects

Akhlaq Husain[1*], Ashwani Kumar Dubey[2] and Meena, S. S.[3]
[1](Zoological Survey of India), 41, Hari Vihar, Vijay Park, Chakrata Road, Dehra Dun, Uttarakhand, India.
[2]Department of Zoology, Shri Rajiv Gandhi Government College, Banda, District Sagar, Madhya Pradesh, India.
[3]S. B. K. Government Post Graduate College, Jaisalmer, Rajasthan, India.
*Corresponding author Email: drakhlaqhusain@gmail.com

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Abstract: The present communication deals with the new and additional records of *Galeodes indicus* Pocock, 1900, the Camel Spider, under class Arachnida, order Solifugae and family Galeodidae, from Madhya Pradesh and Rajasthan (India), with systematic account, distribution, habitat, food and feeding, life cycle, life-span, threats, non-venomous nature, potential pest control benefits.

Keywords: New and additional records, *Galeodes indicus*, Madhya Pradesh and Rajasthan.

Introduction:

The little known Solifugae (Arachnida) fauna of India has been studied by some workers during the past (Pocock, 1895,1900; Tikader, 1973; Bastawade, 2004, 2005a, b, 2006; Gajbe, 2005, 2009; Ghosh and Sen, 2005; Thulsi Rao et al., 2005; Chandra et al., 2007; Pande et al., 2007; Pravalikha et al., 2014; Pandram and Sharma, 2015; Bano and Roy, 2016; Sayyed, 2016; Siva et al., 2019; Parmar, 2020) but still much to be explored. Ghosh and Sen (2024) listed 21 species under 6 genera and 3 families from India, out of which 3 species from Madhya Pradesh and 2 from Rajasthan but didn't mention their identity in these states. Gajbe (2005) recorded as *Galeodes* sp. from Seoni district of Madhya Pradesh.

Recently some good examples of *Galeodes indicus* Pocock, 1900, belonging to family Galeodidae, have been sighted and photographed from Chhatarpur and Jaisalmer districts of Madhya Pradesh and Rajasthan respectively. The record from Chhattarpur is new for the district but from Jaisalmer is the additional record from other

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localities after its first record from Chandan village in 2016 by Bano and Roy (2016).

The Solifugids are a small group of arachnids occur mainly in arid or semi-arid ecosystems and are unique in having secretion-aided suctorial organs or adhesive pads between terminal claws of their leg-like pedipalps and legs (except in 1st pair) (Cloudsley-Thompson, 1954; Savory, 1977) which help to aid in prey capture and scaling smooth vertical surfaces, including glass sheets; also having racket organs on ventral side of coxa-trochanter joint of 4th pair of legs for detecting vibrations by any nearby threat/predator (Cloudsley-Thompson, 1954; Savory, 1977; Cushing et al., 2005; Willemart et al., 2011; Spagna and Peattie, 2012).

STUDY SITES:

Chhatarpur district, Madhya Pradesh, India

Location: Chhatarpur is located in the northern part of Madhya Pradesh state, bounded in the north by the state of Uttar Pradesh, east by Panna, south by Damoh and west by Sagar and Tikamgarh districts of the state itself.

Climate: Humid subtropical, with hot summers (max. 47°C in June), cool winters (min. 1°C in January), somewhat cooler monsoon season and heavy rainfall occurs in the monsoon season from June to September (av. precipitation 400 mm; av. humidity 86% in August).

Flora: Anacardiaceae- Magnifera indica (Mango or *Aam*), Fabaceae- Temarindus indica (Tamarind or *Imli*), Lythraceae- Punica granatum (Pomgranate or *Anar*), Meliaceae- Azadirachta indica (*Neem*), Moraceae- *Ficus benghalensis* (*Bargad*), Myrtaceae- *Psidium guajava* (Guava or *Amrood*), Rutaceae- *Citrus* x *Limon* (Lemon or *Nibu*), Salicaceae- *Casearia graveolens* (*Chilla*), Sapotaceae- *Manilkara hexandra* (*Khirni*),

Jaisalmer district, Rajasthan, India

Location: Jaisalmer (26°55'3.47' N, 70°54'13.93' E) town lies in the heart of Thar Desert (Great Indian Desert) and the district is bounded by Pakistan on north-west, Barmer on south, Jodhpur and Bikaner districts on east.

Climate: Arid, extreme in summer as well as in winter, maximum temperature in summer rises up to 50°C which falls down to 4-2°C in winter; rainfall scarce with average being 100-150 mm annually during monsoon season.

Flora: Vegetation of the area mainly consists of xerophytic thorny trees, shrubs, herbs and grasses.

Lasiurus scindicus, sewan grass (Poaceae), a bushy and multi branched perennial desert grass with thin leaf blades and woody rhizome of extremely arid parts (sandy plains, low dunes and hummocks) of Barmer, Bikaner and Jaisalmer districts of western Rajasthan in Indian Thar desert. It thrives well under moisture stress, covering most of Jaisalmer district. The specimens were mostly sighted from these sewan grasslands.

Systematic account, Distribution and Other aspects

Galeodes indicus Pocock, 1900

Galeodes indicus Pocock, 1900. *Faun. Brit. India*, Arachmida: 142-143, figs. 49a-c (type-locality: Bilaspur); Simon, 1905. *Annales de la Societe Entomologique de France*, 74: 162; Hirst, 1908. *Rec. Indian Mus.*, 2: 243; Fischer, 1910. *J. Bombay nat. Hist. Soc.*, 20: 886-887; Gravely, 1915. *Rec. Indian Mus.*, 11: 532; Roewer, 1934. *Akademische Verlagsgesellschaft M.B.H., Leipzig*, 5 (IV) (4) (4-5): 527-528; Whittick, 1939. *Annals and Magazine of Natural*

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History, (11) 4: 446-447; Zilch, 1946. *Senckenbergiana*, 27: 145; Harvey, 2003. *Catalogue of the smaller arachnid orders of the world*: Amblypygi, Uropygi, Schizomida, Palpigradi, Ricinulei and Solifugae: 264; Bastawade, 2004. Scorpionida, Araneae and Solifugi. In: Fauna of Pench National Park (Maharashtra). *Fauna of Conservation Series*, 20: 285, 310-311; Bastawade, 2005. Arachnida: Scorpionida and Solifugae. In: Fauna of Melghat Tiger Reserve. *Conservation Area Series* 24: 411, 418-419; Thulsi Rao et al., 2005. *Rec. zool. Surv. India*, Occ. Paper No. 239: 3, 10-11; Bastawade, 2006. Scorpionida, Araneae and Solifugae. In: Fauna of Tadoba-Andhari Tiger Reserve (Maharashtra). *Conservation Area Series* 25: 285, 307-308; Chandra et al., 2006. Faunal resources of National Parks of Madhya Pradesh and Chhattisgarh. *Conservation Area Series*, 30: 12; Pande et al., 2007. *Journal of Paper Research*, 41 (1): 26-34; Gajbe, 2009. Soligugae. In: Fauna of Pachmarhi Biosphere Reserve. *Conservation Area Series* 39: 185; Pravalikha et al., 2014. *Species*, 10 (26): 101-103, fig. 1; Bano & Roy, 2016. *Journal of Threatened Taxa*, 8 (3): 8623-8625, figs. 1-3; Siva et al. 2019. *Journal of Threatened Taxa*, 11 (5): 13549; Parmar, 2020. The first record of *Galeodes indicus* Pocock, 1900 (Solifugae: Galeodidae) from Gujarat, India. Volume No. Online & Print 127: 46-51; Ghosh and Sen., 2024. Arthropoda: Arachnida: Solifugae: 4. In: *Fauna of India Checklist*. Version 1.0. Zoological Survey of India. *Galeodes* cf. *indicus*, Sayyed, 2016. *Journal of Threatened Taxa*, 8 (13): 9556.

Galeodes indicus obscurior Pocock, 1900. *Faun. Brit. India*, Arachmida: 143 (type-locality: Pimpalner, East Khandesh, Maharshtra) (synonymised by Whittick, 1939: 447; as also mentioned by Pravalikha et al., 2014 and Bano and Roy, 2016); Tikader, 1973. *Bulletin of the Indian National Science Academy*, 45: 264 (synonymised by Whittick, 1939: 447; as also mentioned by Pravalikha et al., 2014 and Bano and Roy, 2016).

Common Names: Camel spider, False Spider, Scorpion Carrier, Sun Scorpion, Sun spider, Wind scorpion or Wind Spider.

Vernacular Name: *Surya Koli* (Pench National Park, Maharashtra).

Classification: Phylum Arthropoda Gravenhorst, 1843, subphylum Chelicerata Heymons, 1901, class Arachnida Lamarck, 1801, order Solifugae Sundevall, 1833, family Galeodidae Sundevall, 1833, genus *Galeodes* Olivier, 1791.

Sightings:

1 example; Pahra Purwa village, near river Ken, Rajnagar tehsil, Chhatarpur district, Madhya Pradesh, India; 14.v.2024; by 2nd author (AKD).

1 example; Amar Sagar area, Jaisalmer, Rajasthan, India; 3. v. 2020; by 3rd author (SSM); 1 example; Amar Sagar area, Jaisalmer, Rajasthan, India; 9. ix. 2022; by 3rd author (SSM); 1 example; Parvati Mangal, A-147, Amar Shahid Sagarmal Gopa Colony, Jaisalmer, Rajasthan, India; 25. v. 2024; by 3rd author (SSM).

Diagnosis: Tarsus of palp narrow at base, freely articulating with tibia, stalks of claws hairy; reddish bristles on posterior border of 5th abdominal sternum (generic character) (Pravalikha et al., 2014; Parmar, 2020); tarsi thickly clothed below with thin hairs; tibia of palp without a pair of short spines; no posterior basal spine on tarsus of 2nd and 3rd legs (key, Pocock, 1900).

Description: Prosoma (Cephalothorax): Covered by carapace (prosomal dorsal shield or peltidium), truncated anteriorly, darkened with fuscous/brownish tinge; chelicerae yellowish with brownish spines,

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exceptionally very large, curved, robust, strong, powerful pincer-like and multi-dentate with large and small teeth (upper jaw with eight minor and nine major teeth; lower jaw with three minor and two major teeth); pedipalps, yellowish- brown (patella and tibia dark brown), very long, leg-like with six segments each (coxa, trochanter, femur, patella, tibia and tarsus), clothed variously with bristles, hairs or spines, tips bearing membranous suctorial organs or smooth adhesive pads which help in capturing prey and bringing water to mouth-parts for drinking and climbing smooth surfaces, even on glass; patella and basal half of tibia of palp and femur at maximal darken with fuscous; eyes a pair, large and centrally located, lateral vestigial eyes remain into pits under cuticle; legs yellowish-brown/fuscous, usual four pairs, each one having 7 segments (coxa, trochanter, femur, patella, tibia, metatarsus and tarsus) with secretion-aided smooth adhesive pads between claws, 1st pair smaller and thinner than then rest of 3 pairs, micro-setae or hairs on tarsal claws of legs 2nd through 4th, tarsi of 2nd and 3rd legs armed with short and stout spines, tarsus of 4th leg spined and bearing claws; a pair of spiracle or stigma between 2nd and 3rd legs; patella of 4th leg also maximal darken with fuscous like that of palp; malleoli (fan-shaped or racket sensory organs for detecting vibrations by any nearby threat) present on underside of coxa-trochanter joint of 4th pair of legs, blade of external malleolus slightly extending/surpassing ocular tubercle; a pair of spiracle or stigma between 2nd and 3rd legs; number of spines on pedipalps and legs may vary (Harmer et al., 1895; Barnes, 1982; Pocock, 1900; Filmer, 1997; Punzo, 1998; Holm and Dippenaar-Schoeman, 2010; Cushing and Castro, 2012; Spagma and Peattie, 2012; Pravalikha et al., 2014; Pandram and Sharma, 2015; Parmar, 2020).

Camel spiders are also characterized by a prosomal dorsal shield composed of three distinct elements, viz. pro-, meso- and metapeltidium which are associated with prosomal appendages and a sejugal furrow separating coxae of 1st and 2nd legs from those of 3rd and 4th by a distinct membranous region (Dunlop et al., 2012, fig. 1)

Opisthosoma (Abdomen): Leathery, infuscate (darkened with brownish tinge) above and 10 segmented; 1st sternite modified into genital organ, comprise nine tergites above and same numbered sternites below with anal segment flattened, exceeding up to upper edge with opening on rear tip.

Ctenidia are generally sexually dimorphic, being present in males and either absent or highly reduced in females (Maury 1984; Muma 1951; Wharton 1981),

Males: With a pair of long flagella, note quite straight, its blade distinctly longer than handle, one on each chelicera, near tip and as they paraxially moveable and bend back over chelicera, called horns and believed to have some sexual function but clearly known (Holm and Dippenaar-Schoeman, 2010); pedipalps very long (as compared to that in female), tibia studded below with tubercles bearing bristles which rarely extend to its apex; tarsus of 4th leg covered below with a pad of black or brown setae, not extending to apical segment; posterior margin of 5th sternite with ctenidia, the tubular reddish hairs or bristles (a respiratory organ); blade of external malleolus less than half of head width (Pocock, 1900: 142-43).

Females: Pedipalps comparatively shorter than those of males, tarsus of 2nd and 3rd legs without basal spine, distal tarsal segment of

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4th leg spined; lack flagella; ctenidia if present, vestigial as mentioned by (Maury 1984; Muma 1951; Wharton 1981).

Size (Measurements): by various workers as under:

Female total length 30.0 mm, head width 7.5 mm, palp length 38 mm, patella of palp length 12 mm, tibia and tarsus of palp length 12 mm, 1st leg 24 mm, 4th leg 48 mm; male total length 28 mm, head width7 mm, palp length 54 mm, patella of palp length 18.5 mm, tibia and tarsus of palp length 16.5 mm, 1st leg 37 mm, 4th leg 62 mm (as *Galeodes indicus*, Pocock, 1900: 143).

Length up to 41 mm, head width 11.5 mm and palp length 45 mm (as syn. *G. indicus obscurior* Pocock, 1900) (Pocock, 1900: 143).

Female 28-32 mm (Thulsi Rao et al., 2005). Male total length 30.62, head width 6.46, mandible length 9.10, palp (fe+pa+tib+ta) 14.88+12.76+10.57+2.42= 40.63, leg I (fe+pa+tib+ta) 10.27+9.29+6.03+2.57= 28.16, leg III (fe+pa+tib+ta) 8.21+8.42+7.20+3.14= 26.97, leg IV (fe+pa+tib+ta) 12.07+12.35+9.30+6.30= 40.02 mm (Pravalikha et al., 2014).

Female total length 10 mm, head width 2 mm, mandible length 2 mm, palpus length 12 mm, 1st leg 8 mm, 2nd leg 7 mm, 3rd leg 9 mm and 4th leg 15 mm (Bano and Roy, 2016).

Male: Chelicerae length 8.93, width 5.92; propeltidium length 5.33, width 6.43; abdomen length 15.23, width 5.47; palp-tarsus 5.93, metatarsus 10.12, tibia 16.51, femur 12.22= total 44.78 mm; leg I- tarsus 3.94, metatarsus 6.42, tibia 13.91, femur 15.06= total 39.33 mm; leg II- tarsus 3.22, metatarsus 5.44, tibia 6.15, femur 15.19= total 30.00 mm; leg III- tarsus 3.27, metatarsus 6.69, tibia 9.32, femur 12.00= total 31.28 mm; leg IV- tarsus 3.59, metatarsus 8.66, tibia 9.24, femur 11.28= total 32.45 mm; (Parmar, 2020).

Sex not ascertained: Body length with head 56 mm (M.P. specimen as measured by 2nd author, AKD).

Distribution:

India:

Madhya Pradesh: Gwalior (Pocock, 1900); Satpura Tiger reserve/Satpura National Park, Narmadapuram district (Chandra et al., 2006); Bori Sanctuary, Bhimkund, Hoshangabad (Gajbe, 2009); Pahra Purwa village, near river Ken, Rajnagar tehsil, Chhatarpur district (present new record).

Rajasthan: Chandan village, Jaisalmer (Bano and Roy, 2016); Amar Sagar and Amar Pachmari; Shahid Sagar Mal Gopa Colony, Jaisalmer (present additional records).

Rest of India: Andhra Pradesh (Srisailam and Sundipenta, Nallamalai Hills, Eastern Ghats, Kurnool dis trict), Bihar (Gaya), Chhattisgarh (Bilaspur-type-locality), Gujarat (Chotila Hill, near Chamunda Mata Temple, Chotiala, Surendranagar district, 209 m above sea level), Karnataka, Maharashtra (Kirangisala, Pench Tiger Reserve, Nagpur district; Pimpalner village, Sakri taluka, Dhule district; Jalgaon district/East Khandesh; hill nr. Kusumbhat on Dhakna-Dhami rd., Melghat Tiger Reserve, Amravati district; Kirangisala, Pench National Park, Nashik, Pune, Satara, Thane and Todaba (FRH, nr. Tadoba tank, Tadoba-Andhari Tiger Reserve) districts), Tamil Nadu (Cape Comorin/Kanyakumari; Chennai/Madras; Tiruchirappalli district), Telangana (Uyyalavada, near Nagarkurnool, Mahbubnagar district), Uttar Pradesh and West Bengal (Pocock, 1900; Tikader, 1973 (as syn. *Galeodes indicus obscurior*); Bastawade, 2004, 2005a, b, 2006; Thulsi Rao et al., 2005; Ramakrishna et al., 2006; Pande et al., 2007; Gajbe, 2009; Pravalikha et al., 2014; Bano and Roy, 2016; Sayyed,

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2016 (as *G.* cf. *indicus*); Siva et al., 2019; Parmar, 2020).

Elsewhere: Desert ecosystem regions of the world in general, with the exception of Australia (museum.wa.gov.au).

Habitat: Mainly desert biomes (arid, semi-arid, scrub-lands) and also grassland and forest areas (Muma, 1966; Cloudsley-Thompson, 1977; Wharton, 1987; Punzo, 1998).

Food & Feeding: Carnivorous, aggressive hunters and voracious feeders, feeding on termites, darkling beetles, silverfish, wasps, spiders, scorpions, other solifugids etc. and even small lizards, snakes, birds (owls and owlets) and rodents, locating the prey with their long pedipalps, kill and cut into pieces by strong chelicerae which are capable of shearing hair or feathers from vertebrate prey or carrion and cutting through skin and thin bones in small birds, liquify and ingest ; being nocturnal, mostly come out from their relatively permanent burrows for feeding at night; larvae and first nymphs do not feed and apparently survive on residual egg nutrition and then switch to termites etc. (Muma, 1966; Punzo, 1998; Bastawade, 2006; Holm and Dippenaar-Schoeman, 2010).

Life-cycle: Male uses its pedipalps during copulation, staying in contact with female throught the process; After mating female lays about 50 to 200 eggs in a burrow dig by her before and guard them until hatching, before undergoing 9-10 nymphal instar stages and adults (Punzo,1998; Mullen, 2009; Paula and Patrick, 2012).

Life-span: About a year in wild, may live longer in captivity.

Threats/Enemies: Various predators, like frogs & toads, lizards and birds.

Non-venomous: As no venom glands, however their powerful chelicerae may inflict a painful nip but nothing medically significant to humans (Schimdt, 1993).

Potential Pest Controllers: As feeding on various arthropod pests (ref. food and feeding).

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Figure 1. *Galeodes indicus*, full dorsal view (Chhatarpur, Madhya Pradesh)

Figure 2a. *Galeodes indicus*, dorsal closeup (Jaisalmer, Rajasthan)

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Figure 2b. *Galeodes indicus*, dorsal full view (Jaisalmer, Rajasthan)

Figure 2d. *Galeodes indicus*, front closeup view (Jaisalmer, Rajasthan)

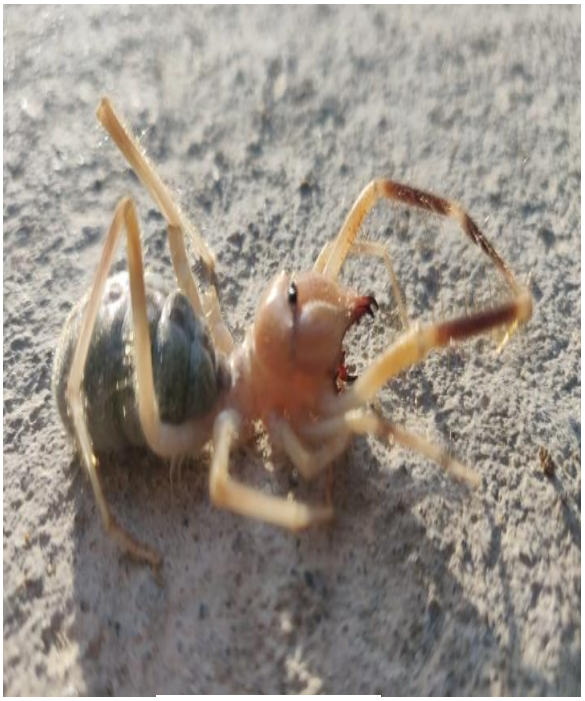

Figure 2c. *Galeodes indicus*, dorso-lateral view (Jaisalmer, Rajasthan)

Figure 2e. *Galeodes indicus*, antero-lateral prosoma view (Jaisalmer, Rajasthan)

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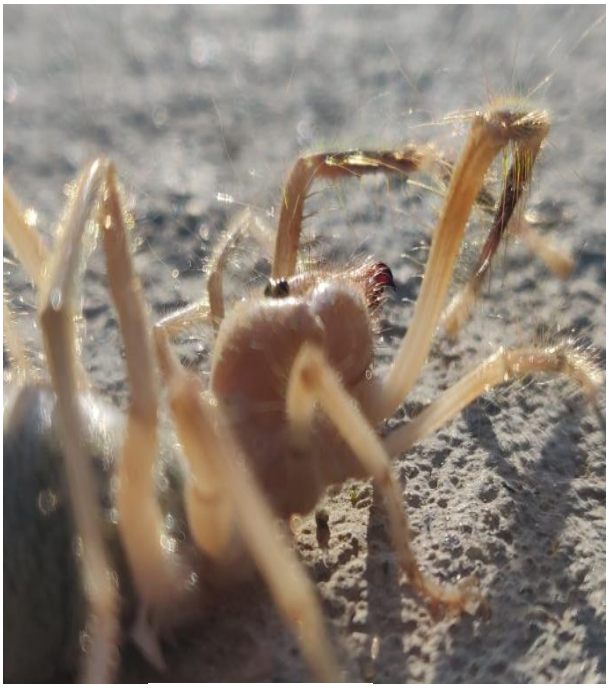

Figure 2f. *Galeodes indicus*, antero-lateral view (Jaisalmer, Rajasthan)

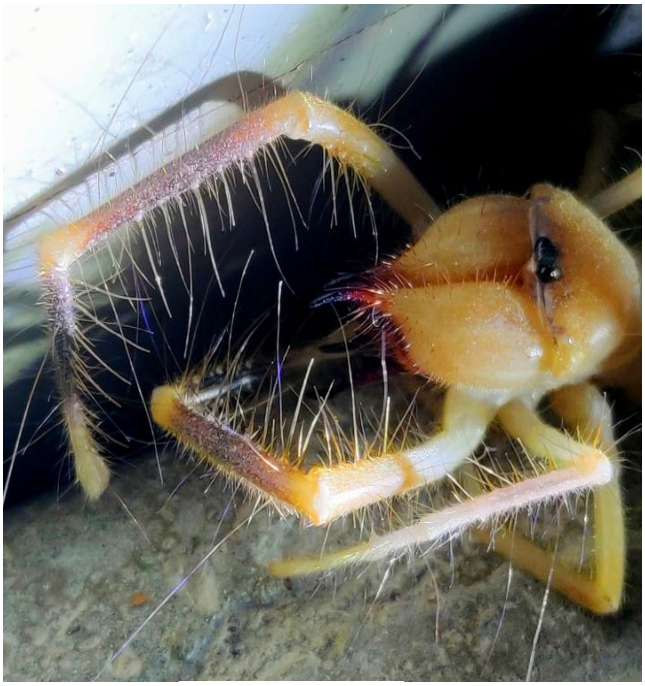

Figure 2g. *Galeodes indicus*, pedipalps closeup (Jaisalmer, Rajasthan)

Figure 2h. *Galeodes indicus*, antero-lateral view (Jaisalmer, Rajasthan)