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Description of a new species of the genus *Fessonia* (Acari: Trombidiformes: Smarididae) from Kerala, India

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Abstract

A new species of the genus *Fessonia* (family: Smarididae) viz., *Fessonia indica* sp. nov. has been collected from rice from Kerala state, South India, which is described and illustrated. So far, two species of the genus *Fessonia* have been reported in India. Descriptions are based on the morphology of post larval instar. A key to the Indian species is also provided.

Keywords: Morphology, New Record, Predatory Mite, Smaridid Mite, Taxonomy

Introduction

The superfamily Erythraeoidea is one of the largest superfamilies under the cohort Parasitengona (Acari: Trombidiformes). Erythraeoidea comprises two families *viz*., Smarididae and Erythraeidae. Smaridids represent a distinctive cohort of mites, distinguished by an extensible gnathosoma carrying the mouthparts during postlarval instars. These mites typically exhibit an oval idiosoma, and elongated legs, and possess either one or two pairs of eyes, as illustrated by Meyer and Ryke in 1959. The legs and idiosoma are commonly adorned with dense, occasionally cactus-like hairs. Dorsally, these mites feature a pair of sensillary areas that may be interconnected or remain discrete, delineated by a narrow furrow referred to as the crista metopica. Smaridids are a fairly small family; the catalogue of Beron (2008) recognized 55 living species/ subspecies in 11 genera, later Zhang *et al*., (2011), and Zhang (2011) revised it to 10 genera and 53 species which is then subsequently emended to 49 species in nine genera by Makol and Wohltmann (2012). A further species was described by Salarzehi *et al*., (2012). Recently, Bartel *et al.,* (2015) described 3 species of post-larval fossil Smaridid mites from Baltic amber. Fourty-one species of Smarididae are known exclusively from active postlarval forms, seven from larvae, and only five from both. Smaridids can be found throughout the world, except for Antarctica, and are known to occur in grassland and litter habitats (e.g. Southcott 1961, 1963, 1995, 1996; Krantz & Walter 2009). Mites under the family Smarididae are classified into two subfamilies, Smaridinae and Hirstiosomatinae. Smaridinae consists of five genera including *Fessonia* von Heyden 1826.

The taxonomic classification denoted as Genus *Fessonia* presently encompasses a total of 14 recognized species, of which nine have been delineated based on adult specimens. Two Fessonia mite species have been characterized exclusively from their larval stages, namely *F. torshizica* (Salarzehi & Hajiqanbar, 2012) and *F. papillosa* (Hermann 1804). The former is indigenous to Iran, while the latter was previously documented in the European region (Wohltmann 2010). During a faunistic survey conducted to assess mites associated with stored food products in North Kerala, South India, from 2019 to 2022, a *Fessonia* species was discovered inhabiting rice. Notably, there are no prior records documenting the presence of *Fessonia* mites in stored food products, suggesting that this occurrence may be incidental. Subsequent investigations confirmed that the identified species is novel to scientific classification. Until the present study, only two *Fessonia* species had been reported in India: *F. assimuthi* (Oudemans, 1941) and *F. australiensis* (Southcott, 1946). Consequently, the discovery of this species contributes to the enumeration of Indian *Fessonia* species, bringing the total to three.

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Materials and Methods

Samples of rice infested with mites were collected from the Kasaragod district of Kerala state, South India (12° 15' 26.4093" N, 75° 8' 7.278" E). The samples were examined using a Magnus Stereozoom microscope, and mites were collected using a camel hair brush moistened with water. Extracted mites were kept temporarily in lactic acid for clearing. Hoyer's medium was used for making permanent slides. Illustrations and measurements were made using an Olympus CX31 brightfield microscope equipped with a drawing tube. Illustrations were scanned and redrawn using the Adobe Illustrator® program (vector-based graphics software, Adobe Systems Incorporated, San Jose). Measurements were done with Lynx Biolux (Lawrence and Mayo, India) image analysis software. All body measurements are presented in micrometres (µm). Measurements of paratype are provided in parenthesis.

Terminology and abbreviations follow those of Grandjean (1947) and Wohltmann (2010). The type materials are preserved as permanent slides and deposited in the Western Ghat Field Research Centre- Zoological Survey of India, Kozhikode, Kerala, India.

ZooBank registration number : urn:lsid:zoobank.org:pub:669D3CE3-0551-4FE1- 8B73-F33E6B7268D9.

Results and Discussion

Material examined: Holotype, post larval instar. Location: Kasaragod district (Food Corporation of India warehouse, 12° 15' 26.4093" N, 75° 8' 7.278" E) Kerala state, India. Collected on 19th November 2020 from rice. Paratype: 1 (one post larval instar).

Type deposition: Holotype (ZSI/WGRC/I.R.INV.25577) and 1 paratype (ZSI/WGRC/I.R.INV.25578) deposited at the Western Ghat Field Research Centre- Zoological Survey of India, Kozhikode, Kerala, India.

Description
Fessonia indica sp. nov.
Post larval instar-Holotype.

Dorsum (Figure 1*):* Idiosoma 518 (620) long from tip of naso to posterior end of opisthosoma, 258 (308) wide near mid-idiosoma. Crista metopica (Figure 5) nearly extends to mid-diosoma but does not reach the level of leg III bases. The anterior sensillary area is located posteromedial of two pairs of eyes [94 (112) from the tip of propodosoma], with a single seta which is 16 (19) long (normal dorsal setae). Anterior sensilla ciliated, 46 (55) long; their bases 7 (8) apart. Posterior sensilla ciliated, 41 (49) long, 40 (47) away from anterior one and bases 15 (17) apart. Two pairs of eyes of unequal size; anterior eyes 20 (24) in diameter, posterior eyes 14 (17), located slightly posterolateral of anterior eyes. Dorsal setae (Figure 6) are broader 18 (21) long, numerous, brown and dorsally convex as in *F. australiensis*. There with 6-8 lines of serrations, which extend longitudinally to the pedicel of the seta. Ventral surface of dorsal setae flattened. The ratio between the length of idiosoma and the distance between ASA to PSA is 12.95. **Ventrum** (Figure 2): Ventral setae (Figure 7) with strong ciliations (lanceolate pattern), setae 13-22 (15-26) long (slightly smaller than dorsal setae). Genital pore without any surrounding setae.

Legs (Figure 10-13)*:* Legs (coxae to tarsus) covered with long and pointed spiculated setae (Figure 8).

Measurements of lengths of leg I (Figure 10): coxa 77 (92), trochanter 53 (64), basifemur 90 (108), telofemur 111 (134), genu 151 (181), tibia 152 (181), tarsus 163 (195). Tarsus features two specialized setae (Figure 9) that bear a resemblance to solenidion. These setae are also found on the tibia, genu, and telofemur, with one of these setae present on each of these leg segments.

Measurements of lengths of leg II (Figure 11): coxa 81(96), trochanter 44 (53), basifemur 45 (54), telofemur 65 (78), genu 81 (97), tibia 102 (122), tarsus 62 (74)**.**

Measurements of lengths of leg III (Figure 12): coxa 80 (96), trochanter 62 (74), basifemur 57 (68), telofemur 70 (83), genu 94 (112), tibia 117 (140), tarsus 71 (85).

Measurements of lengths of leg IV (Figure 13): coxa 75 (89), trochanter 56 (67), basifemur 60 (72), telofemur 107 (128), genu 124 (148), tibia 134 (160), tarsus 91 (109). All tarsi terminated with paired claws. Details of leg chaetotaxy are provided in Table 1.

Gnathosoma (Figure 3): Gnathosoma 110 (131) long, retractable. Chelicerae 55 (65) long. Cheliceral digits short, 4 (5) long. Dorsal gnathosoma with a pair of

smooth, pointed adoral setae *cs* 9 (11) anteriorly and ventrally with a pair of smooth and pointed subcapitular (tritorostral) setae *bs* 23 (27) and oral setae *as* 18 (23). Palpal trochanter 17 (20) long. The palpal femur is 45 (54) long with four long dorsal setae and one ventral seta, and the length ranges from 12-25 (14-30). Palpal genu 25 (30) long with four dorsal setae, and 2 ventral setae. Palpal tibia with four setae. Odontus not bifurcated 21 (25) long. All setae from palpal femur to palp tibia are similar to leg setae. Palpal tarsus (Figure 4) 15 (18) long with four smooth setae *gc* 7 (8), *ds* 5 (4), *hc* 9 (11), *nc* 20 (24) one solenidion (*w*) and two prominent distal eupathidium (*z*).

Larval and adult stages: Unknown.

Etymology

The species' name is a reference to its native country of origin, India.

Remarks

Trichobothria are conspicuously absent on the legs of post larval active instars of Smaridídae, occurring solely during the larval stage, as documented by Grandjean in 1947. The distinctive characteristics that set *Fessonia indica* apart from other species within the genus *Fessonia* include the quantitative differentiation in the number of setae on tarsi I and the notable presence of solenidion-like specialized setae on legs I-IV in post-larval active instars. Furthermore, *F. indica* sp. nov. can be easily differentiated from other known species within the genus *Fessonia* due to its notably short distance between ASA and PSA.

The only other known *Fessonia* species in India are *F. australiensis* Southcott, 1946 and *F. assimuthi* Oudemans, 1941. *Fessonia indica* can be discerned from other extant species within the genus *Fessonia*, with the

1

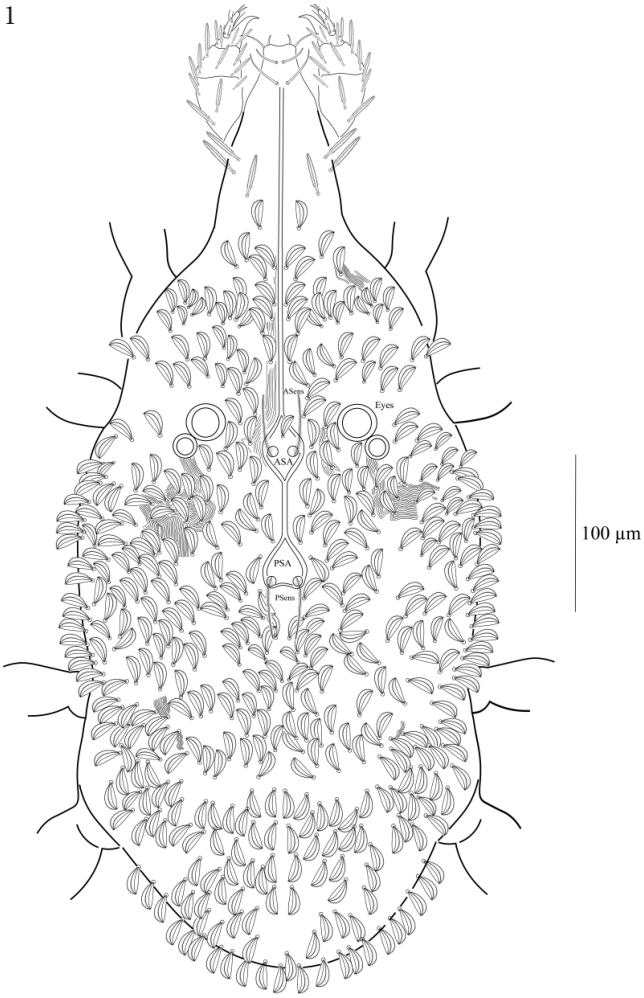

Figure 1: *Fessonia indica* sp.nov. holotype pre larva. 1) Dorsal idiosoma.

2

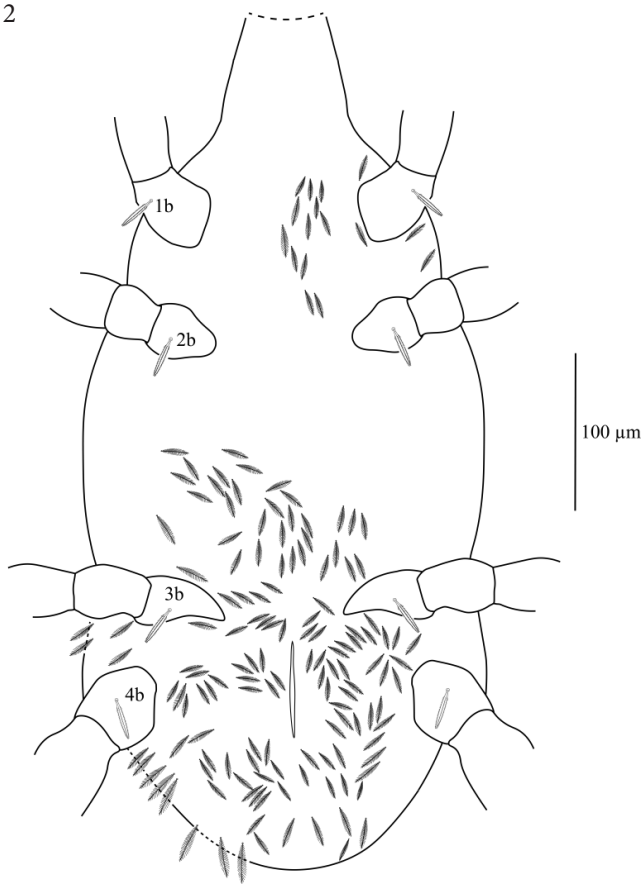

Figure 2: *Fessonia indica* sp.nov. holotype female. Ventral idiosoma

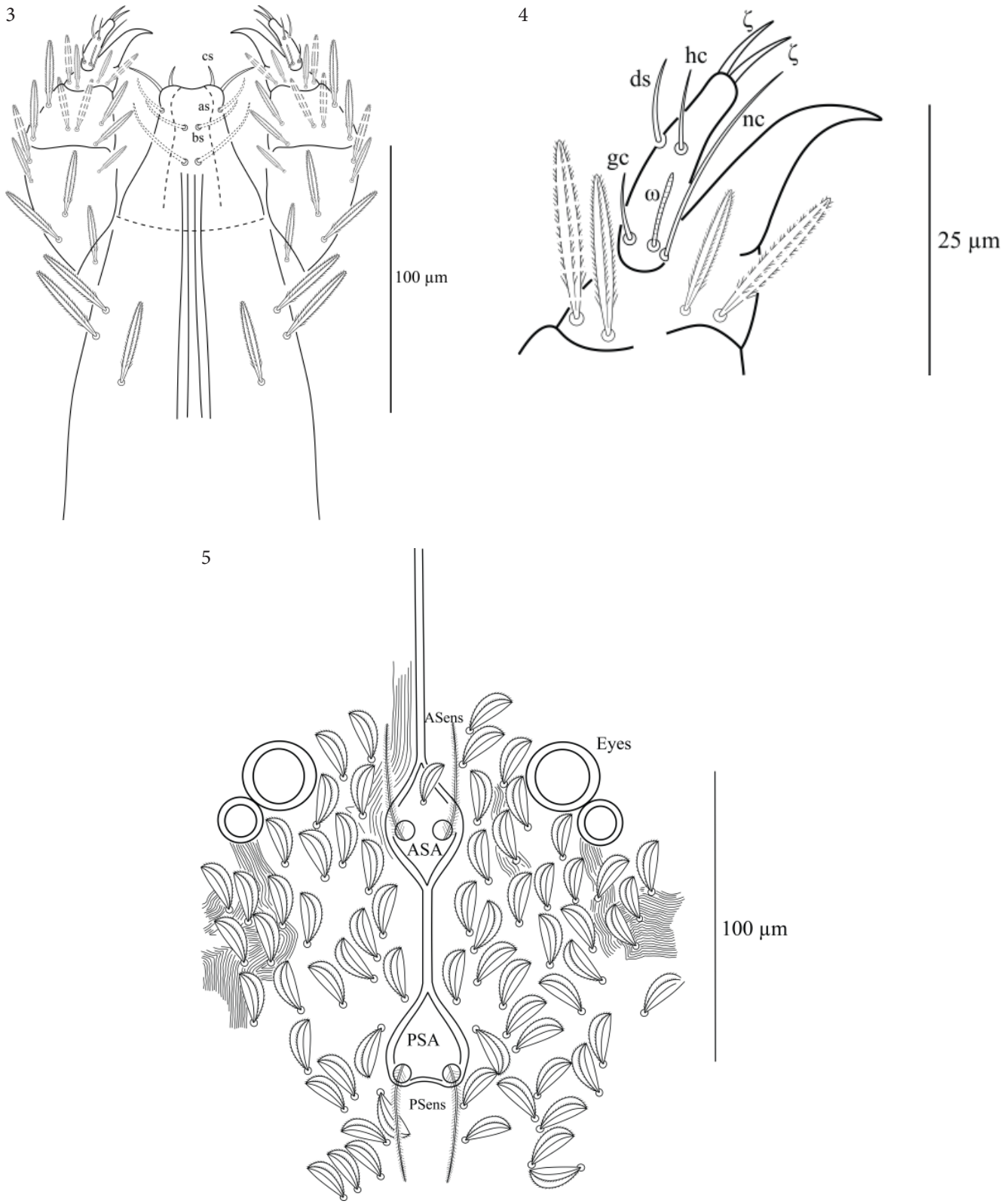

Figure 3-5: *Fessonia indica* sp. nov. holotype pre larva **3**) Gnathosoma; **4**) palpal tibia and tarsus **5**) crista of metopica.

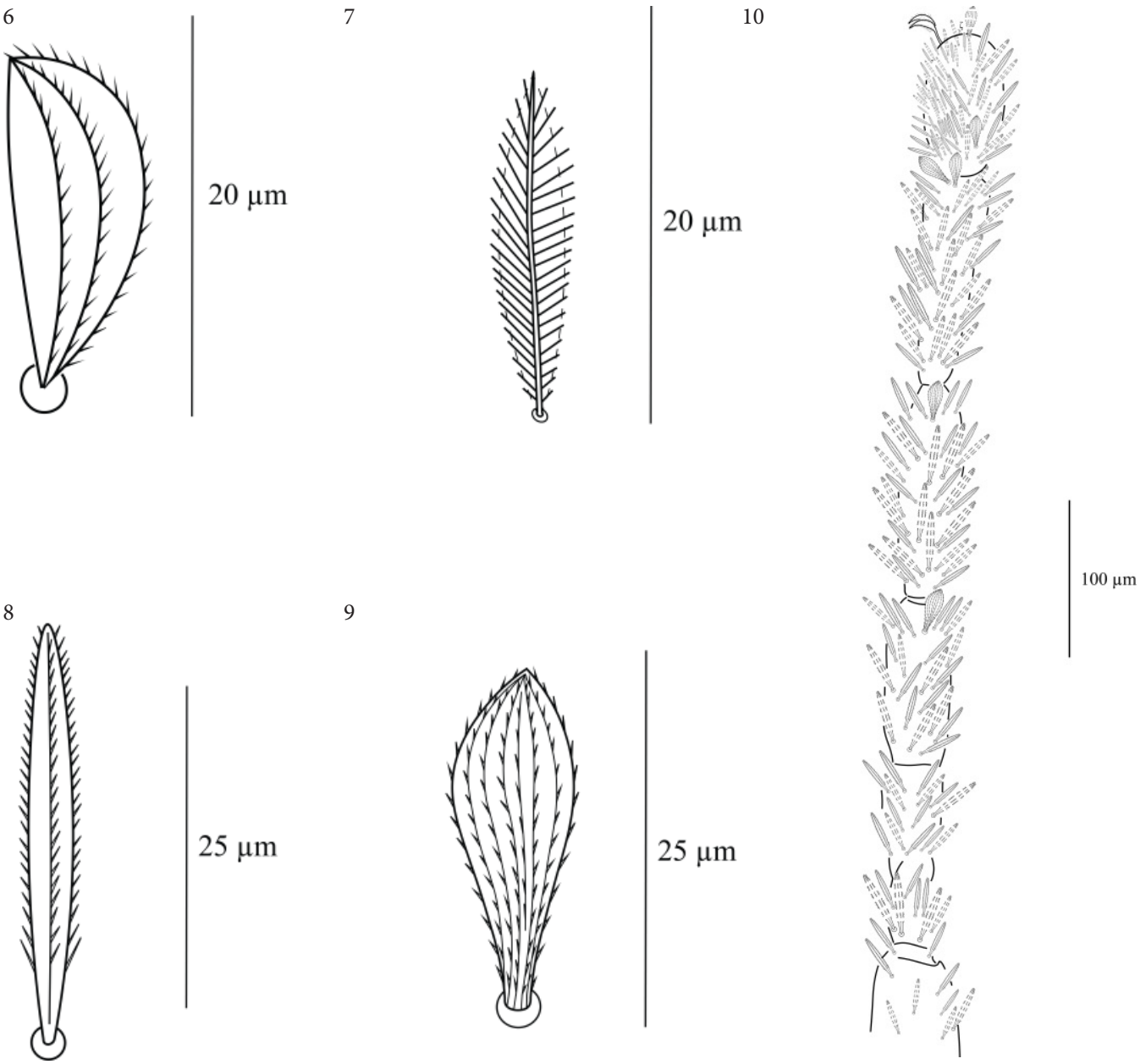

Figure 6-10: *Fessonia indica* sp.nov. holotype pre larva. **6**) dorsal seta; **7**) ventral seta **8**) leg seta **9**) specialized seta on leg I, III & IV **10**) Leg I

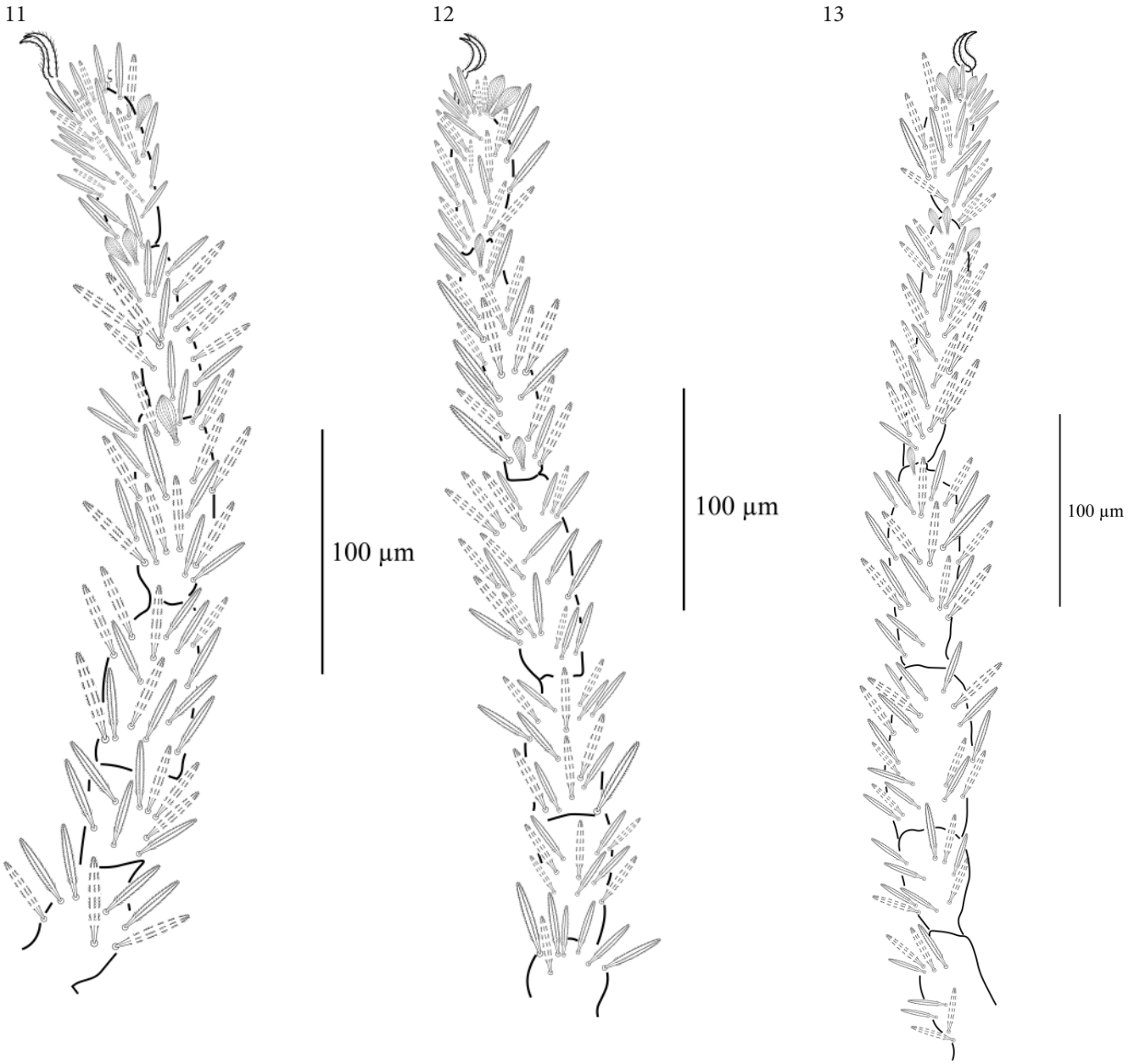

Figure 11-13: *Fessonia indica* sp.nov. holotype pre larva. **11**) Leg II; **12**) Leg III; **13**) Leg IV.

notable exception of *F. australiensis* and *F. assimuthi*, by the distinct morphological features exhibited by its dorsal setae. *F. indica* shares certain morphological features with *F. australiensis* and *F. assimuthi* but exhibits significant differences. Same type of dorsal setae is present on *F. indica* and *F. australiensis*. In *F. assimuthi*, there is a consistent reduction in the length of leg setae along the distal axis, exemplified by a decrease from 50 µm on the trochanter to 30 µm on the tibia. Conversely, no discernible variation in leg setal length is observed in *F. indica*. In *F. australiensis*, the anterior sensillary area features two setae, while in *F. indica*, only one seta is observed. The ventral setae of *F. indica* are strongly ciliated in a lanceolate pattern. The ratio between the length of idiosoma (from the tip of naso to the posterior end of opisthosoma) and the distance between ASA to PSA is 12.95 in *F. indica*., whereas it is 5.82 and 4.16 in *F. australiensis* and *F. assimuthi* respectively. The ratio between the length of leg I and the length of idiosoma is 1.29 in *F. assimuthi* and 1.53 in *F. indica*. *F. indica* is distinctive from *Fessonia papilossa* by virtue of

Table 1. Leg chaetotaxy of post larval instar of *Fessonia indica* sp. nov

Palpal Tr	1 N
Palpal Fe	5 N
Palpal Ge	6 N
Palpal Ti	4 N
Palpal Ta	4 N, 1 ζ, 1 ω
Cx I	1 N
Tr I	9 N
Bf I	22 N
Tf I	21 N, 1 specialized seta
Ge I	30 N, 1 specialized seta
Ti I	36 N, 2 specialized setae
Ta I	67 N, 2 specialized setae, 1 ζ
Cx II	1 N
Tr II	7 N
Bf II	8 N
Tf II	14 N
Ge II	20 N, 1 specialized seta
Ti II	15 N, 2 specialized setae
Ta II	27 N, 1 specialized seta, 1 ζ
Cx III	1 N
Tr III	7 N
Bf III	9 N
Tf III	14 N
Ge III	20 N
Ti III	21 N, 2 specialized setae
Ta III	24 N, 2 specialized setae, 1 ζ
Cx IV	1 N
Tr IV	8 N
Bf IV	9 N
Tf IV	18 N
Ge IV	19 N, 1 specialized seta
Ti IV	23 N, 3 specialized setae
Ta IV	22 N, 3 specialized setae, 1 ζ

possessing two palp tarsus eupathidia. Furthermore, in *F. papillosa*, the palp odontus exhibits bifurcation, whereas in *F. indica*, it remains non-bifurcated. Within the taxonomic context of *Fessonia torshizica*, it is observed that the palp odontus assumes a bifid morphology. *F. indica* can be differentiated from both *F. torshizica* and *F. papillosa* based on the quantitative distinction in the number of setae on the palpal tibia. Specifically, *F. indica* possesses four setae on the palpal tibia, while *F. torshizica* and *F. papillosa* each exhibit three setae on the palp tibia.

Key to the Indian species of the genus *Fessonia*

1. Anterior sensillary area with single seta in addition to trichobothria 2

-Anterior sensillary area with two setae in addition to trichobothria ***F. australiensis***

2. Crista of metopica reaching the base of leg III, palptarsus with 3 terminal eupathidia ***F. assimuthi***

-Crista of metopica not reaching the base of leg III, palptarsus with 2 terminal eupathidia ***F. indica*** sp. nov.

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