



PARASITOIDS (HYMENOPTERA) OF XYLOPHAGOUS BEETLES (COLEOPTERA) ATTACKING DEAD WOOD IN SOUTHERN WESTERN GHATS, KERALA, INDIA, WITH DESCRIPTIONS OF TWO NEW SPECIES

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Abstract: An account is given of four species of Hymenoptera parasitoids probably of the wood boring beetle *Clytocera chinospila* Gahan (Coleoptera: Cerambycidae) from Chinnar Wildlife Sanctuary, southern Western Ghats, Kerala. Two new hymenopteran species, *Eurytoma chinnarensis* (Eurytomidae) and *Foenatopus idukkiensis* (Stephanidae) are described. *Solenura ania* Walker (Pteromalidae) is reported for the first time from Kerala and Western Ghats with a new host record, and *Doryctus* sp. (Braconidae) is reported here.

Keywords: *Eurytoma chinnarensis* sp. nov., Eurytomidae, *Foenatopus idukkiensis* sp. nov., Hymenoptera, new species, parasitoids, Stephanidae, xylophagous beetles.

Abbreviations: AOL - Distance between a posterior ocellus and the anterior ocellus; CC - Costal cell; F1-F5 - Funicular segments 1 to 5; L - Length; m-cu - Transverse medio-cubital vein; MV - Marginal vein; OOL - Ocellular distance; PGA - Pterostigma; PMV - Postmarginal vein; POL - Post-ocellar distance; r - Transverse radial cell; SMV - Submarginal vein; 1-SR+M - Marginal cell section radii Media; 2SR - Submarginal cell section radii; 3-SR - Discal cell section radii; SR1 - Section radii Marginal cell; STV - Stigmal vein; T1-T7 - Gastral tergites 1-7; W - Width; ZSIK: Zoological Survey of India, Western Ghat Regional Centre, Kozhikode, Kerala, India.

The coleopteran (Insecta) families Cerambycidae, Buprestidae, Scolytidae, Anobiidae, Passalidae, Lucanidae and Elateridae mainly include wood boring beetles. Insect parasitoids exert natural control of the populations of wood boring beetles by attacking their immature stages. Major insect parasitoids attacking the wood boring beetles belong to Hymenoptera (Chalcidoidea, Stephanidae, Ichneumonoidea, Proctotrupeoidea, Megalyroidea, Evanoidea, Chrysoidea and Vespoidea). During the faunal exploration surveys conducted in the forest tracts of Chinnar Wildlife Sanctuary, Kerala (10°30'N & 77°17'E; altitude 450m), a piece of dead wood of an unidentified forest tree heavily infested with xylophagous beetles was collected. The infestation of beetles in the wood was indicated by closely arranged holes and saw dust (Image 18). One hymenopteran parasitoid, *Solenura ania* (Walker) (Hymenoptera: Pteromalidae)

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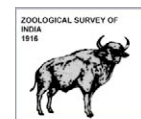
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Competing Interest: None.

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(Image. 17) was collected from the surface of the wood by aspiration. The wood was then cut into small pieces and kept in wide-mouthed glass bottles covered with mulmul cloth. The hymenopteran parasitoids emerged from the wood along with an adult beetle *Clytocera chinospila* Gahan (Coleoptera: Cerambycidae), that were subsequently identified as *Eurytoma chinnarensis* sp. nov. (Eurytomidae), *Foenatopus idukkiensis* sp. nov. (Stephanidae) and *Doryctus* sp. (Braconidae). Among the individual parasitoids that emerged, the number of *Solenura ania* was at a maximum. The beetle *Clytocera chinospila* Gahan (Cerambycidae) was identified as a new host for *Solenura ania* which is reported for the first time from the southern Western Ghats. The specimens of the present study are deposited in Zoological Survey of India, Western Ghat Regional Centre, Kozhikode (ZSIK). The terminology used in the paper follows that of Bouček (1988) for Chalcidoidea, Achterberg (2002) for Stephanoidea and Belokobylskij et al. (2004) for Braconidae.

Descriptions of Parasitoids

Order: Hymenoptera
 Superfamily: Chalcidoidea
 Family: Eurytomidae
 Subfamily: Eurytominae

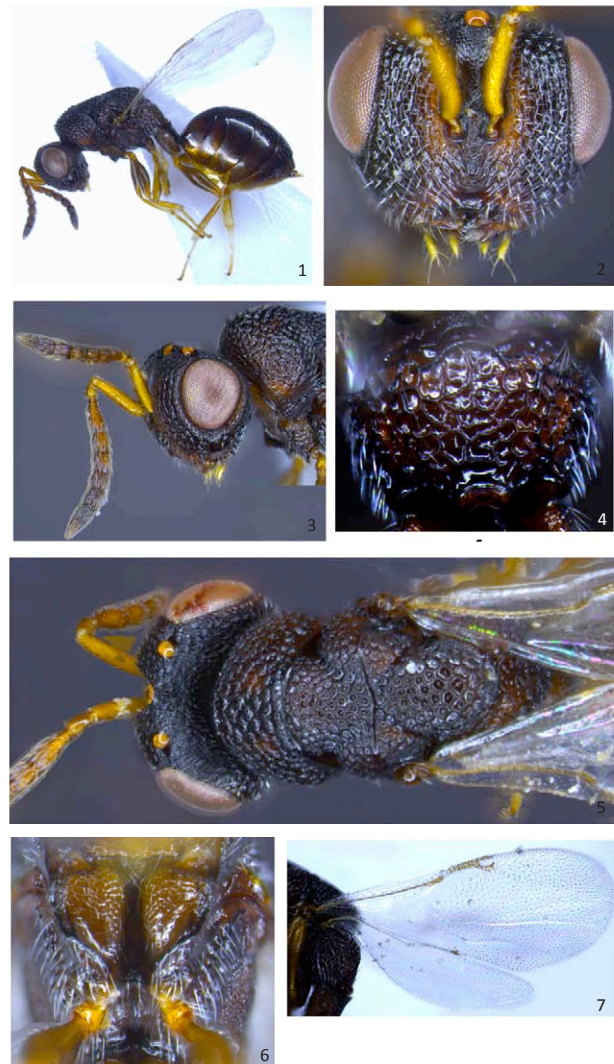
Eurytoma chinnarensis Narendran & Sureshan sp. nov. (Images 1–7)

urn:lsid:zoobank.org:act:1A0D5DCB-6617-4CF4-A4EC-35B3DE9ABB06

Material examined: Holotype: Reg.No. ZSI/WGRC/IR/INV/2349, 04.iv.2012, female, Kuttar, Chinnar Wildlife Sanctuary, Idukki District, Kerala, India, 10°30'N–77°20'E, altitude 450m, emerged from dead wood infested with beetles, coll. P.M. Sureshan.

Paratypes: ZSI/WGRC/IR/INV/2350 (i-ix), 9 females, data same as that of holotype; ZSI/WGRC/IR/INV 2351, 1 female, data same as that of holotype except coll. K. Rajmohana.

Female: (Holotype). Length: 2.75mm. Body black except scape, pedicel, maxillary and labial palps, trochanters, bases and apices of femora, tibiae completely, tarsi and ovipositor yellow; F1, F2, F3 and ventral part of gaster brownish-yellow; F4, F5 and clava brownish-black; ventral surface of cervix pale brownish-yellow; frons and mesosoma with reddish-brown marks (Images.2,4); fore coxae black with sides partially brown; mid and hind coxae pale reddish-brown; femora dark brown medially (Image 1); eyes grey; wings hyaline, veins pale brown; pubescence on body silvery.



Images 1–7. *Eurytoma chinnarensis* Narendran & Sureshan sp. nov. Female: 1 - Body in profile; 2, Head in dorsal view; 3 - Head and antenna in profile; 4 - Head and mesosoma in dorsal view; 5 - Propodeum in dorsal view; 6 - Fore coxae in ventral view; 7 - Wings. © WGRC, ZSI, Calicut

Head: (Image 2–4) width in anterior view 1.43x its height (77:54); width in dorsal view 1.97x its length (75:38); POL: OOL:AOL=24:6:10; anterior ocellus situated outside scrobe; scrobe with raised reticulation; frons with close pits, interstices carinate; scrobal margin carinate laterally; area below toruli with a 'V' shaped carina (Image 2); clypeus smooth and shiny, apex entire; mandibles bidentate; genal carina well developed; postorbital carina faintly indicated; malar sulcus distinct with a patch of faintly reticulated shiny area just below ventral margin of eye. Antennae inserted a little above the level of ventral margin of eyes; antennal formula (excluding radícula) 11153; scape reaching just above anterior ocellus; ratio of L:W of antennal segments: Radícula 2:3; scape 30:7;

pedicel 8:6; F1 14:6; F2 11:7; F3 11:7; F4 8:8; F5 10:7; clava 20:9. F1 slightly narrowed basally with a single row of longitudinal sensillae.

Mesosoma: (Images 4,5) Relative L: W of mesosoma 118:135; mesoscutum 30:60; scutellum 38:36; propodeum 37:45. Pronotum with interstices of pits spiny (Image 3) (clearly visible in side view); propleuron subtriangular; prosternum triangular, posterior margin slightly biconcave with slight median projection, concavity with a row of 5–6 weak setae along anterior margin, procoxa two-thirds from base to apex depressed ventrally (Image 6) for reception of lower head (postgenal carina), depression strongly carinate along outer edge (Image 3) forming a sharp tooth in side view; mesopleuron and mesepisternum in ventral view with semicircular carinae meeting medially and protruding forwards between forecoxae; mesosternal shelf flat, wider than mesocoxal diameter; prepectus subtriangular with posterior margin arcuate, surface reticulate punctate. Propodeum (Image 5) with distinct close pits, median area slightly and broadly concave with an arch like carina at basal median part; spiracle longer than wide (4:3), separated from posterior margin of metanotum by a distance longer than length of spiracle. Hind coxa reticulate punctate on dorso-lateral part. Relative L: W of hind coxa 34:17; hind tibia 49:7. L of first hind tarsal segment: second hind tarsal segment 21:5. Hind tibia with two apical spurs and more than 15 spine like setae on dorsal margin. Forewing (Image 7) 2.4x as long as its width (187:78); SMV with 7–9 dorsal setae; basal one-third of forewing mostly aetose; relative length of CC 79; SMV 66; PGA 15; MV 24; PMV 11; STV 13.

Metasoma: Metasoma (Image 1) longer than mesosoma (155:118) (petiole L 23+ gaster L 132); petiole 2.6x as long as wide (23:9); closely pitted; posterior ventrolateral distal part carinate (with 10–12 longitudinal carinae). Relative dorsal length of gastral tergites, T1 48; T2 11; T3 29; T4 29; T5 27; T6 9; T7 5.5; ovipositor sheath 5.3.

Male: Unknown.

Host: Emerged from dead wood heavily infested with the beetle *Clytocera chinospila* Gahan (Coleoptera: Cerambycidae).

Etymology: The species name is after the collection area Chinnar Kerala.

Variation: Females vary in length 1.87–3 mm. The reddish-brown marks on mesosoma and legs become black in some paratypes, coxae and femora become more blackish and the tibiae with brownish tinge medially. When the ovipositor is tilted upwards in some paratypes the length of gastral segments is shortened.

Remarks: *Eurytoma chinnarensis* sp. nov. runs to couplet number 5 of the key to species of *Eurytoma* of Indian sub-continent by Narendran (1994) but does not go readily beyond the first couplet because of the presence of several (more than 15) dorsal spine like setae in a row on the hind tibia. Ignoring this character, *Eurytoma chinnarensis* sp. nov. will come to *Eurytoma quadrispina* Narendran and *Eurytoma pentaspina* Narendran, but differs from these species in having: (i) interstices of pronotum spiny (in *E. quadrispina* and *E. pentaspina* interstices of pronotum not spiny); (ii) T3 and T4 equal in dorsal length and largest (in *E. quadrispina* and *E. pentaspina* T4 largest and 1.75 to 1.77x as long as T3). Besides these antennal segments also differ in relative proportions.

Eurytoma chinnarensis sp. nov. resembles *Eurytoma dentata* Mayr, *Eurytomachaitra* Narendran, *E. punctigastra* Narendran and *Eurytoma nalanda* Narendran in having fore coxa with a tooth (coxal depression) in lateral view but the new species differs from all these species in having: (i) pronotum with short spine like interstices, (ii) hind tibia with more than 15 spine like setae on dorsal margin, metasoma with a long petiole (0.7x length of hindcoxa, 23:34) and in different proportions of antennal segments and gastral tergites. This new species also resembles *E. xylophaga* Yang (1996) in having: (i) F1 relatively long (ii) in facial and pronotal sculpture (iii) in having scape with reticulation. However it differs from *E. xylophaga* in having gaster not compressed, elongate and subrounded with ovipositor sheath not protruding, POL 4x OOL (in *xylophaga* gaster compressed, not subrounded and ovipositor sheath protruded, and POL 3.4x OOL). *E. chinnarensis* sp. nov. does not come near any other old world species listed by Noyes (2012).

Superfamily: Stephanoidea

Family: Stephanidae

***Foenatopus idukkiensis* Sureshan & Narendran sp. nov.**
(Images 8–14)

urn:lsid:zoobank.org:act:D7057220-4D56-4EEB-A07B-B1DD70442630

Material examined: Holotype: ZSI/WGRC/IR/INV/2346, 04.iv.2012, female, Kuttar, Chinnar Wildlife Sanctuary, Idukki District, Kerala, India, 10°30'N–77°20'E altitude 450m, emerged from dead wood infested with beetles, coll. P.M. Sureshan.

Paratypes: ZSI/WGRC/IR/INV/2347, 1 female, data same as that of holotype; ZSI/WGRC/IR/INV/2348 (i-ii), 2 males, data same as that of holotype.

Female: (Holotype): Body Length 11mm; terebra

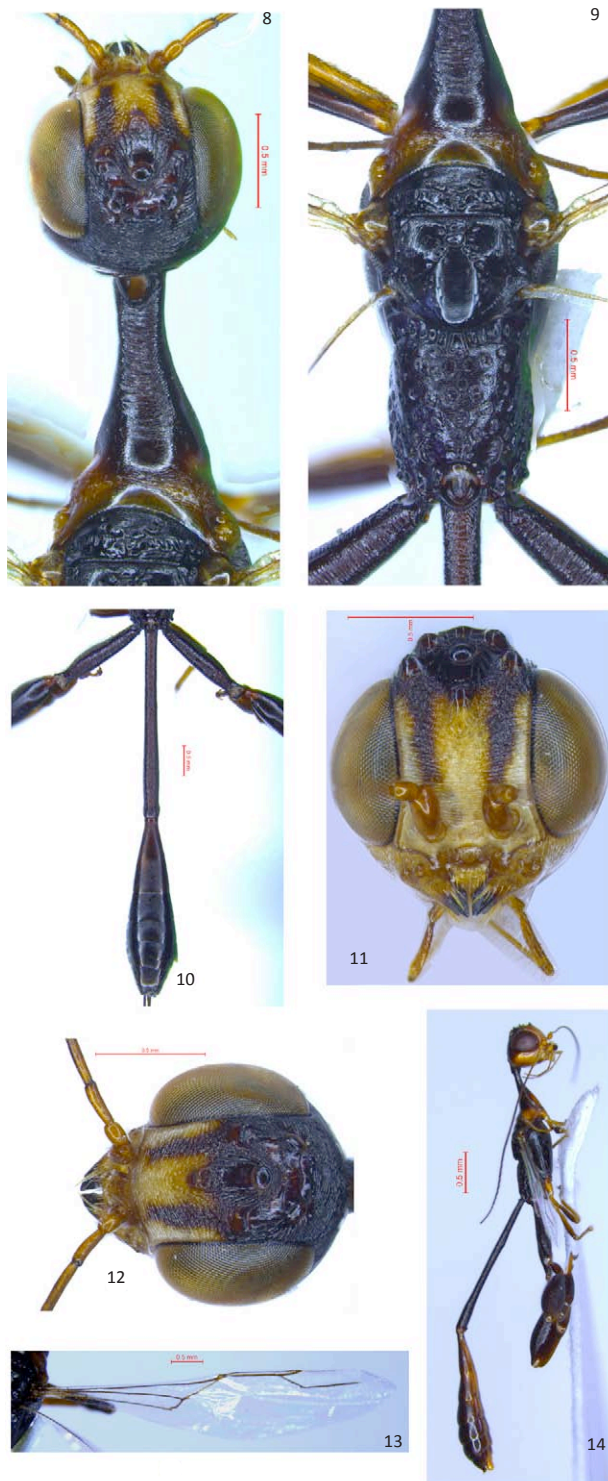


Image 8–14. *Foenatopus idukkiensis* Sureshan & Narendran sp. nov. Female: 8 - Head and pronotum in dorsal view; 9 - Mesosoma dorsal view; 10 - Metasoma and part of hind legs dorsal view; 11 - Head front view; 12 - Head dorsal view; 13 - Fore wing; 14 - male body in profile. © WGRC, ZSI, Calicut

10mm. Colour: body blackish brown with following parts as follows: face upto front ocellus yellow with two longitudinal brown bands starting from toruli, parallel to eye margin reaching upto coronal teeth; gena of same colour reaching upto upper level of eye; mouth parts yellowish-brown except tips of mandible black. Antennae with radicle, scape and pedicel testaceous, remaining segments brown; ocelli concolorous with body; eyes brassy brown; ventral and posterior-dorsal part of pronotum and tegula testaceous; tibiae and tarsi testaceous, larger spines of hind femora white, fore and mid coxae, middle tibiae and tarsi mostly testaceous; gaster ventrally testaceous, terebra with a subapical white band.

Head: (Images. 8, 11, 12) in dorsal view width 1.1x length, vertex distinctly trans-straight carinate, ocellar area obliquely striate; posterior margin of head sharply bordered. Head width in anterior view 1.5x distance between front ocellus and lower margin of clypeus; eye length 1.34x width in profile; area between upper margin of toruli and front ocellus transversely striate-carinate, interstices finely reticulate, area below toruli finely reticulate, gena shiny; three anterior coronal teeth large, lobe shaped, both posterior ones small and part of transverse lamella widened at both end, after this lamella four strong complete regular lamelliform and more or less straight carinae (third one curved), followed by distinct transverse striae, which ends little above occipital carina; area inside the coronal teeth with longitudinal carinae with interstices finely reticulate, almost shiny; temples smooth and shiny; occipital carina distinct. Antennae with 30 segments. Relative lengths of scape, pedicel, first, second and third flagellar segments as 16, 8, 14.5, 21.5, 23.5.

Mesosoma: (Images 8,9) pronotal neck anteriorly distinctly concave, anterior and middle part distinctly transverse reticulate, posterior part finely reticulate, posterior marginal area smooth and shiny, ventrally with a median carina throughout the length and carinae on ventro lateral margins. Posterior part of pronotum distinctly differentiated from middle part, ventral part uniformly and moderately reticulate. Mesoscutum with a broad transverse band of broad pits in the posterior half, anterior half finely and transversely reticulate; axillae separated by a large median pit which is divided into two by a transverse carina, axillae finely but distinctly and longitudinally reticulate. Median part of scutellum with fine aciculations and with sparse small pits on sides. Mesospleuron with dense and closely set white pubescence in the anterior half, very finely reticulate with scattered pits on other regions. Metapleuron with a deep

pit in the anterior part followed by 5–6 transverse carinae distally. Propodeum with broad and shallow pits dorsally and deep and broad pits laterally, interstices distinctly reticulate. Hind coxae strongly annulate carinate, hind femora length subequal to hind coxal length and 2.8x its width, ventral margin with two large teeth, base with two tubercles, interspace between the large teeth with three small denticles, hind tibia 1.13x as long as hind femur, gradually widened sub medially, inner distal part with many bristly setae. Relative dorsal lengths of pronotum 35, mesoscutum 7.5, scutellum 14.5, propodeum 26.5.

Metasoma: (Image.10) Petiole uniformly annulate carinate, length 1.1 xs as long as post petiolar segments. Relative lengths of petiole 88.5, postpetiolar segments combined 86.5, terebra 1.52x as long as rest of gaster, first tergite 2x as long as its maximum width, hind margin straight, basal part with 3-4 transverse carinae remaining area finely granulate reticulate dorsally and shiny ventrally, hind margin of remaining tergites concave, all tergites similarly sculptured as on first tergite. Forewing venation as in Imageure 13.

Male: (Image 14) length 9mm. Resembles female but differs in colour of face which is uniformly yellow below front ocellus, antennal segments up to fourth flagellar segment, mouth parts except tip of mandible, fore and mid legs including coxae, hind femora basally, tarsi except last segment, distal and ventro lateral parts of pronotum golden yellow, gaster with posterior margin of all tergites straight. Antennae with 26 segments.

Etymology: The species name is after the Idukki District of Kerala, where the specimens were collected.

Variation: Length of female varies between 10.3–11 mm and male between 6.1–9 mm.

Remarks: In the key to *Foenatopus* species of Indian subcontinent given by Narendran et al. (2001), this species runs to couplet five and resembles *F. jodhpurensis* Narendran in having hind femur with two large teeth, terebra shorter than body, vertex with two distinct carinae between hind ocelli, etc but differs from it in not having a medina fovea on posterior half of pronotum, propodeum without longitudinal fovea, terebra 0.93x length of body with a distinct subapical white band and different sculpture of the body (in *jodhpurensis*, pronotum with a median fovea on posterior half, propodeum with a longitudinal fovea, terebra 0.73x length of body without sub apical band and different sculpture on vertex, mesoscutum and propodeum).

In having petiole distinctly longer than rest of metasoma, hind femur with two large teeth and terebra with subapical white band this species resembles *F. indicus* (Westwood) but distinctly differs from it in having different

body sculpture, terebra shorter than body, occiput without small longitudinal depression. This species also resembles *F. frontilenea* (Morley) (= *Diastephanus frontilenea*) in having hind femur bidentate, petiole longer than combined length of postpetiolar segments, terebra shorter than body with subapical white band, body length and similar body colour but differs from *frontilenea* in general sculpture of the body which is more coarse, antenna with first and second flagellar segments not equal in length (in *frontilenea* body sculpture more fine on frons, vertex, occiput and propodeum antenna with first and second flagellar segment equal in length).

Superfamily: Ichneumonoidea

Family: Braconidae

Subfamily: Doryctinae

***Doryctus* sp. (Images 15, 16)**

Material examined: ZSI/WGRC/IR/INV/2344 (i-iii), 04.iv.2012, 3 females: Kuttar, Chinnar Wildlife Sanctuary, Idukki District, Kerala, India, 10°30'N–77°20'E altitude 450m, emerged from dead wood infested with beetles, coll. P.M. Sureshan; ZSI/WGRC/IR/INV/2345 (i-v), 5 males, data same as above.



Images 15–16. *Doryctus* sp. Female: 15 - Body in profile; 16 - Fore femora and tibia. © WGRC, ZSI, Calicut

Diagnosis: Female (Images 15, 16) Length body 5.32mm, ovipositor 2.74mm. Head at most very slightly narrower behind eyes than across them; antenna with scape 1.92 as long as its maximum width, third antennal segment 1.3x as long as second segment; vertex, frons, temple and face laterally smooth; face striate medially; sides of ocellar triangle equal; vertex, frons, temple and face with sparse long erect hairs; eyes glabrous, height 1.25x width; mesoscutum not high, coarsely and sparsely crenulate, notauli shallow, wide, complete; sternaulus shallow, narrow; scutellum convex, foveate anteriorly, smooth medio-posteriorly; propodeum densely rugulose-reticulate with two dorsal carinae posteriorly and without lateral tubercles; fore tibia with strong spines arranged in single row on inner side; forewing 3.9x as long as its maximum width; r raising from middle of pterostigma; 3-RS 1.5x r, 0.03x 3R1, 1.08 x 2-SR; 1 SR+M slightly sinuate; m-cu distinctly antefurcal, as long as 2-SR; hind wing vein m-cu antefurcal; gaster with first tergite slightly narrowed basally, sides slightly widened to apex; length of first tergite 1.30x its maximum apical width; first and second tergites longitudinally striate with rugulosity between striae, remaining tergites weakly rugose.

Remarks: Due to non-availability of relevant literature on the genus and need of more specimens of allied species to compare with, the specimens couldn't be confirmed up to species level. Since *Doryctus* is a rare braconid genus little known in the oriental region, there is every possibility of these specimens belonging to an undescribed species.

Family: Pteromalidae
Subfamily: Cleonyminae

***Solenura ania* (Walker) (Image 17)**

1846. *Epistenia ania* Walker, 93–94. F, Philippines (BMNH)

1961. *Solenura ania* (Walker): Hedqvist, *Ent. Ts. Arg.* 90(3): 98. (For further synonymy, see Bouček et al. 1979 and Gibson 2003).

Material examined: ZSI/WGRS/IR-INV-2212 (i-xx), 20 females, ZSI/WGRS/IR-INV-2212 (xxi-xxx), 10 males, 5.iv.2012, Vasyapara, Chinnar Wildlife Sanctuary, Idukki District, Kerala, India, coll. P.M. Sureshan.

Distribution: Oriental region: China, India, Indonesia, Malaysia, Philippines, Taiwan, Thailand; Palearctic Region (China, Japan).

Remarks: The distribution of *Solenura ania* was extended up to Maharashtra, by the record of the species from Lonar Crater Wildlife Sanctuary, Buldhana District, by Sureshan (2005). The present specimens were reared



Images 17–19. 17 - *Solenura ania* (Walker). Female on the dead wood infested with beetles; 18 - The piece of dead wood (cut view) with tunnels of infestation and beetle grub; 19 - *Clytocera chionospila* Gahan. © WGRC, ZSI, Calicut

from the dead wood of a forest tree heavily infested with wood boring beetles *Clytocera chionospila*, which form the probable host of it (Images 18–19). This is the first record of the species from Western Ghats and Kerala with the new host record. *Solenura ania* was earlier reared from *Chrysobothris succedanea* (Buprestidae) and *Trichoferus campestris* (Cerambycidae) (Gibson (2003). Sureshan (2005) reared the species from dead wood of *Ficus* sp. infested with *Olenecamptus bilobus* (Cerambycidae).

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