

Description of a New Species and Redescription of One Species of Silverfish (Insecta: Zygentoma: Lepismatidae) from Amrabad Tiger Reserve, Telangana, India

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Abstract

A new species of the genus *Ctenolepisma* Escherich, 1905 (Zygentoma: Lepismatidae) is described and diagnosed from Amrabad Tiger Reserve, Telangana, India: *Ctenolepisma* (*Ctenolepisma*) *amrabadense* sp. nov. *Acrotelsa collaris* (Fabricius) Escherich has been redescribed and reported as a new record from the state of Telangana.

Keywords: *Acrotelsa*, Amrabad Tiger Reserve, *Ctenolepisma*, Lepismatidae

Introduction

The genus *Ctenolepisma* Escherich, 1905 is the largest genus of Lepismatidae (Zygentoma) as it has been established till now. Wygodzinsky (1955) divided the genus into two subgenera *Sceletolepisma* (Wygodzinsky, 1955) for species with 2+2 bristle combs on urotergite I and the subgenus *Ctenolepisma* (Escherich, 1905) for species which bear 1+1 bristle combs on the urotergite. Irish (1987) redefined these two subgenera based on the presence (*Sceletolepisma*) or absence (*Ctenolepisma*) of medial combs on the urosternites. The subgenus *Ctenolepisma* contains about 40 species (Smith, 2018), distributed over all the continents except Australia, where only introduced species of this genus are known. In India, poor attention has been given to free-living Lepismatidae. To date, five species are known from India, namely *C. alticola* (Silvestri, 1935), *C. boettgerianum* (Pactl, 1967), *C. nigra* (Oudemans, 1890), *C. tripurensis* (Hazra *et al.*, 2000) and *C. longicaudatum* (Escherich, 1905) under this subgenus. Therefore, the occurrence of new species under this subgenus is an important contribution to the knowledge of the Indian fauna of Lepismatidae.

Fabricius (1793) described the species *collaris* in the genus *Lepisma*. Thereafter, Escherich (1905) erected the genus *Acrotelsa* (Escherich, 1905) and transferred the species under this genus. So far *Acrotelsa* is represented by single species (Stach, 1935). This species is recorded for the first time from the state of Telangana. The species

is widely distributed synanthropic species (Pactl, 1967), but it is interesting to note that the present species were obtained from the wild. The present paper deals with the detail description and figures of the species *Acrotelsa collaris* for the first time from India (Hazra *et al.*, 2020).

Materials and Methods

The specimens for the present study were collected by an aspirator and preserved in 70% alcohol. They were dissected, cleared, and mounted using Tendeiro solution (Molero-Baltanás *et al.*, 2000). Phase contrast and PlasDIC Microscope (Zeiss) were used for identification of insects. All the specimens including the type specimens of the newly described species are deposited to the National Zoological Collection, Zoological Survey of India, Kolkata (NZC/ZSI).

The use of neuter gender for *Ctenolepisma* species is followed, according to the Opinion 2427 of the International Commission on Zoological Nomenclature, which ruled that *Lepisma* Linnaeus, 1758 and all generic names derived from this generic name (i.e., those ending in *-lepisma*) are now ruled to be of neuter gender (ICZN, 2018).

Taxonomic Account

Order ZYGENTOMA
Family LEPISMATIDAE
Subfamily CTENOLEPISMATINAE

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Genus *Ctenolepisma* Escherich, 1905

Subgenus *Ctenolepisma* Escherich, 1905

Ctenolepisma (Ctenolepisma) amrabadense sp. nov.

(Figures 1–14, Table 1)

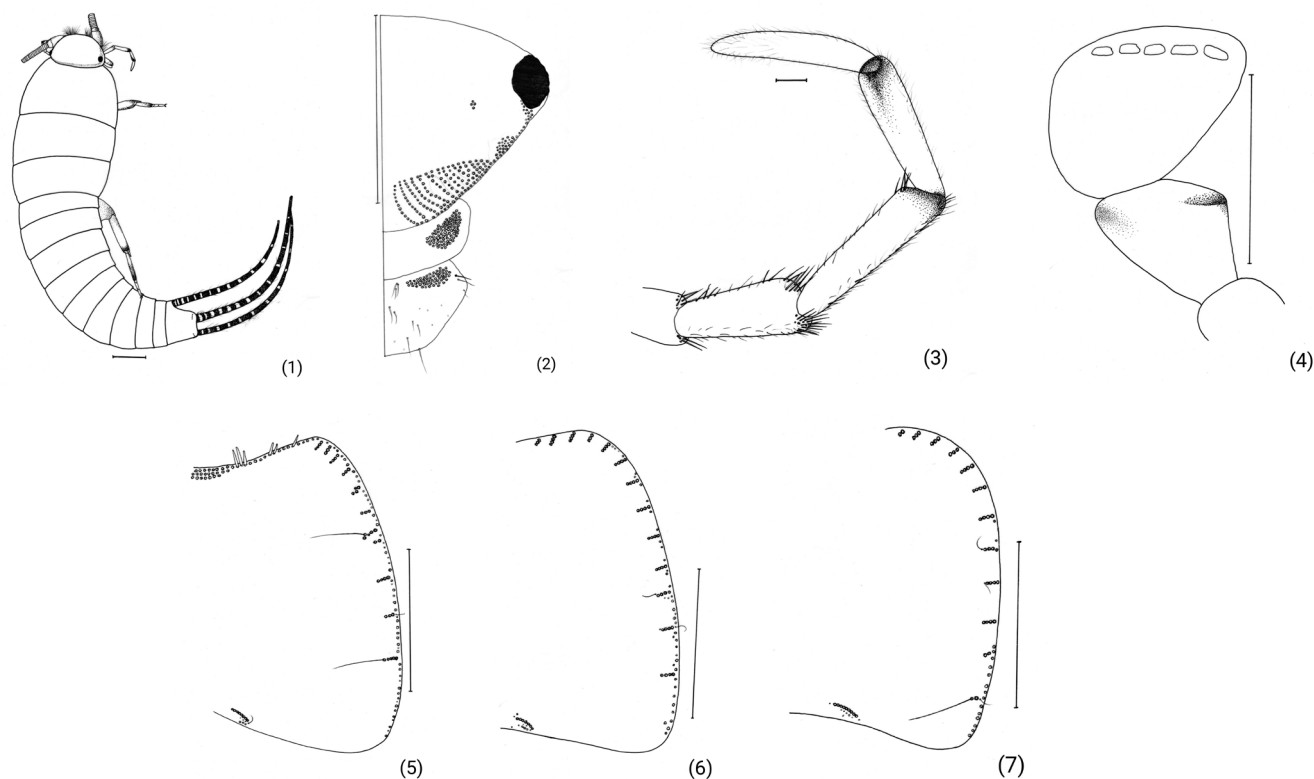
Type material: **Holotype:** “male, under stone, Maddimadugu, Amrabad Tiger Reserve, Nagarkurnool, district, Telangana, India (16°52'19" N and 79°28'61" E), 17.ix.2018, collected S. S. Jadhav & party” [Registration number 3174/H14, Zoological Survey of India, Kolkata]. **Paratypes:** 1 male, 1 female, 6 sub-adults, same locality data as holotype, 17.ix.2018, collected S. S. Jadhav & party [Registration number 3175/H14, Zoological Survey of India, Kolkata].

Description of holotype: Body length of male up to 11.5 mm, female slightly longer (11.6 mm). Habitus (Figure 1) fusiform, with the thorax slightly wider (3.34 mm) than the abdomen base (2.94 mm). Antennae with evenly distributed light pigmentation but terminal filaments show distinct light and dark annulations. Scales dorsally dark brown. Ventral scales lighter pigmented. Apical part of penultimate and third segment of maxillary palp,

outer margin of coxae, apical part of femora and tibia and anterior part of article I of tarsus deeply pigmented. Macrosetae bifid, plumose. Head (Figure 2) semi-circular in outline anteriorly; chaetotaxy of head as usual for the genus. Both clypeus and labrum with numerous bifid and pectinate macrosetae. Clypeus with two tufts of setae, each composed of 80–82 macrosetae and labrum with 58–60. Eyes black.

Antennae incomplete. Apical article (0.55 mm) of maxillary palp (Figure 3) slightly longer than the penultimate (0.49 mm). Apical article of labial palp (Figure 4) axe-shaped and bearing five rectangular sensory papillae arranged in a single row; it is about 2.6 times wider at the apex than at the base and 1.1 times wider than long.

Medial part of the pronotal collar composed of 2–3 rows of macrosetae and both the lateral parts contain a single row of smooth macrosetae. Lateral margins of pronotum (Figure 5) with 11+12 combs composed of 2–4 macrosetae each, including two trichobothrial areas, one in the inner side of the last comb (N) and another in the



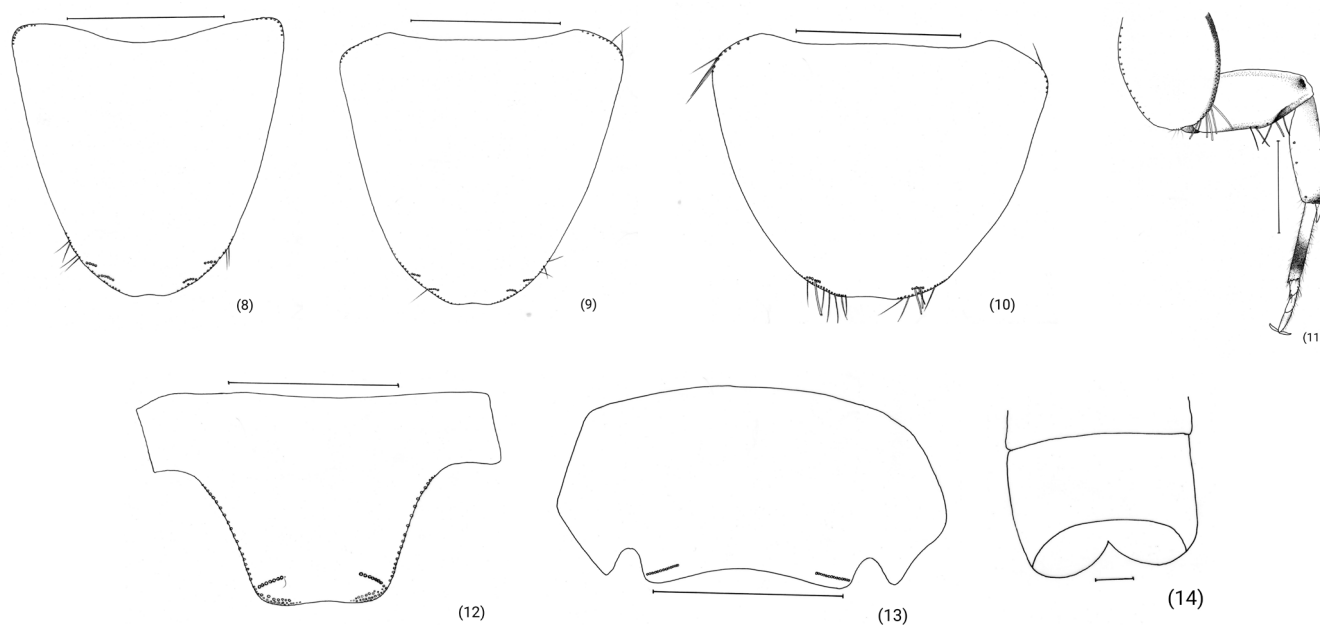
Figures 1-7. *Ctenolepisma (Ctenolepisma) amrabadense* sp. nov. Male. 1. Dorsal habitus; 2. Head chaetotaxy with clypeus and labrum; 3. Maxillary palp; 4. Labial palp (Female); 5. Pronotum; 6. Mesonotum; 7. Metanotum. Scales: 1 mm, except for Fig.3: 0.1 mm.

inner side of the N-4 comb. Mesonotum (Figure 6) lateral margins with 13+14 combs consisting of 2-4 macrosetae; including two trichobothrial areas, one in the inner side of the last comb (N) and another in the outer side of the N-2 comb. Metanotum (Figure 7) lateral margins with 12+13 combs composed of 1-4 macrosetae; including two trichobothrial areas, one in the inner side of the last comb (N) and another in the outer side of the N-1 comb. Hind borders of pro, meso and metanotum with 1+1 bristle combs composed of 7-8 macrosetae each.

Thoracic sternites as in Figures 8-10. Prosternum 1.75 mm in length, its length/width ratio is about 1, with slightly grooved posterior apex; its postero-lateral margin with 2+2 bristle combs, each composed of 4-6 macrosetae. Mesosternum 1.8 mm in length, its length/width ratio is about 0.9, slightly wider than prosternum; its posterior apex slightly indented with 2+2 bristle combs, each composed of 4-5 macrosetae. Metasternum 1.61 mm in length, its length/width ratio is about 0.8; slightly indented apex, with 1+1 bristle combs, each composed of 6 macrosetae; the distance between these combs in prosternum is about 4.1-8.4 times the width of a comb, in mesosternum about 6.9-11.4 times the width of a comb and in metasternum is about 6.1 times the width of a comb.

The length/width ratio of protibiae is about 2.4; of mesotibiae is about 2.7 and of metatibiae is about 3.4. There are two macrosetae present in the dorsal margin of the protibiae and four macrosetae in the ventral margin; mesotibiae with two dorsal and five ventral macrosetae; metatibiae with two dorsal and five ventral macrosetae. In the protarsus, the length of tarsomere I is about 0.46 mm; of tarsomere II is about 0.16 mm; of tarsomere III is about 0.17 mm and of tarsomere IV is about 0.15 mm. In the mesotarsus, the length of tarsomere I is about 0.58 mm; of tarsomere II is about 0.21 mm; of tarsomere III is about 0.18 mm and of tarsomere IV is about 0.26 mm. In the metatarsus, the length of tarsomere I is about 0.91 mm; of tarsomere II is about 0.26 mm; of tarsomere III is about 0.21 mm and of tarsomere IV is about 0.27 mm (Figure 11).

Urotergite I with 1+1 bristle-combs composed of 7 macrosetae. Urotergites II-VI with 3+3 bristle-combs composed of 6-12 macrosetae and urotergites VII-VIII bear 2+2 bristle-combs composed of 7-13 macrosetae. The number of macrosetae per bristle comb on urotergites as in Table 1. Urotergite X trapezoidal, shorter than wide at its base (length 0.75 mm, base width 1.42 mm, apical width 0.69 mm), ratio length/width about 0.52, posterior margin slightly concave (Figure 12) with 1+1 bristle-



Figures 8-14. *Ctenolepisma (Ctenolepisma) amrabadense* sp. nov. Male. **8.** Prosternum; **9.** Mesosternum; **10.** Metasternum; **11.** Hind leg; **12.** Tergite X; **13.** Urosternite VIII; **14.** Penis. Scales: 1 mm, except for Fig. 14: 0.1 mm.

combs of 7 macrosetae each.

Urosternites I and II without setae, III–VIII with 1+1 lateral bristle-combs with 10–16 macrosetae. The width of the bristle combs and the gap distances between them varies in each urosternum. This distance ranges from 4 times the width of a comb in the urosternite VIII to about 9.3 times in the urosternite III (Figure 13).

Both sexes bear two pairs of styli on VIII and IX urosternites. The length of the styli IX is 1 mm. Inner process of coxite VIII in female obliquely rounded. Inner process of the coxite IX about 1.7 times longer than wide at its base and 2.2 times longer than the outer process. Ovipositor longer than the tip of coxite IX. Penis as in Figure 14.

Ecology: *C. amrabadense* sp. nov. generally obtained in maximum numbers, beside small hill stream under rocks in dry leaf litter of the forest floor. The species is abundant in red laterite soil of tropical semi-evergreen forest in Indian Deccan plateau. The protection of this Tiger reserve habitat will help to conserve of this rare *Zygentoma* species.

Etymology: The species is named after the name of the locality Amrabad Tiger Reserve, Telangana, South India, which is the type locality.

Diagnosis

Ctenolepisma (C.) *amrabadense* sp. nov. is closely related to *Ctenolepisma* (C.) *iranicum* Molero-Baltanas, Kahrarian & Gaju, 2016, *Ctenolepisma* (C.) *armenicum* Molero-Baltanas, Gaju-Ricart, Bach de Roca & Mendes, 2010, *Ctenolepisma* (C.) *longicaudatum* Escherich, 1905 and *Ctenolepisma* (C.) *ciliatum* (Dufor, 1831) as they have trapezoidal tenth urotergite, 3+3 bristle combs in urotergites II–VI and two pairs of styli.

All these species with five prominent sensory papillae arranged in one row. Nevertheless, the species can be distinguished by the following characters:

- An important character of the new species is the presence of five rectangular sensory papillae and placed horizontally in a single row on the apical article of the labial palp (Fig. 4), In case of *Ctenolepisma* (C.) *longicaudatum* Escherich, 1905 higher number of sensory papillae occasionally found though the number of papillae is variable in this species but its typical number is five.

- The most remarkable character of *Ctenolepisma* (C.) *amrabadense* is prosternum with rounded apex but slightly concave and 2+2 bristle combs, but the apex of the sternite in *Ctenolepisma* (C.) *ciliatum* is more acute; perhaps no Asian species of *Ctenolepisma* has the apex of the thoracic sternites with slightly concave rounded shape. The apex of the mesosternum of this Indian species is also rounded and truncated with 2+2 bristle combs, but the apex of the mesosternum of *Ctenolepisma* (C.) *ciliatum* is more acute, and the combs of thoracic sternites of *Ctenolepisma* (C.) *armenicum* and *Ctenolepisma* (C.) *iranicum* are consist of 2+2 macrosetae, the posterior margin of the metasternum is broadly rounded apex truncated with 1+1 of the new species.
- The new species is comparatively shorter in body length, antennae and caudal appendages than the *Ctenolepisma* (C.) *longicaudatum*.
- The ovipositor of the new species is long, surpassing the apex of coxite IX but incomplete at the tip, but *Ctenolepisma* (C.) *ciliatum* with 35 – 49, the number of division is higher in case of other known species from India.

Table 1. Number of macrosetae per bristle comb on urotergites in *Ctenolepisma* (*Ctenolepisma*) *amrabadense* sp. nov.

Segment	Urotergite		
	Lateral	Sublateral	Submedial
I	7	-	-
II	8-9	7	7
III	10-11	6-7	6
IV	10-11	5	6-7
V	10	5	6-7
VI	11-12	6	7
VII	-	12-13	7
VIII	-	12	7
IX	-	-	-

Subfamily ACROTELSATINAE Mendes, 1991

Genus *Acrotelsa* Escherich, 1905

Acrotelsa collaris (Fabricius, 1793)

(Figures 15–27, Table 2&3)

1793 *Lepisma collaris* Fabricius in: *Ent. Syst.*, II: 64.

1890 *Lepisma collaris* Oudemans, in: *Apterygota of Indischen Archipels*: 80-82.

Material examined: 1 female, under bark of a tree,

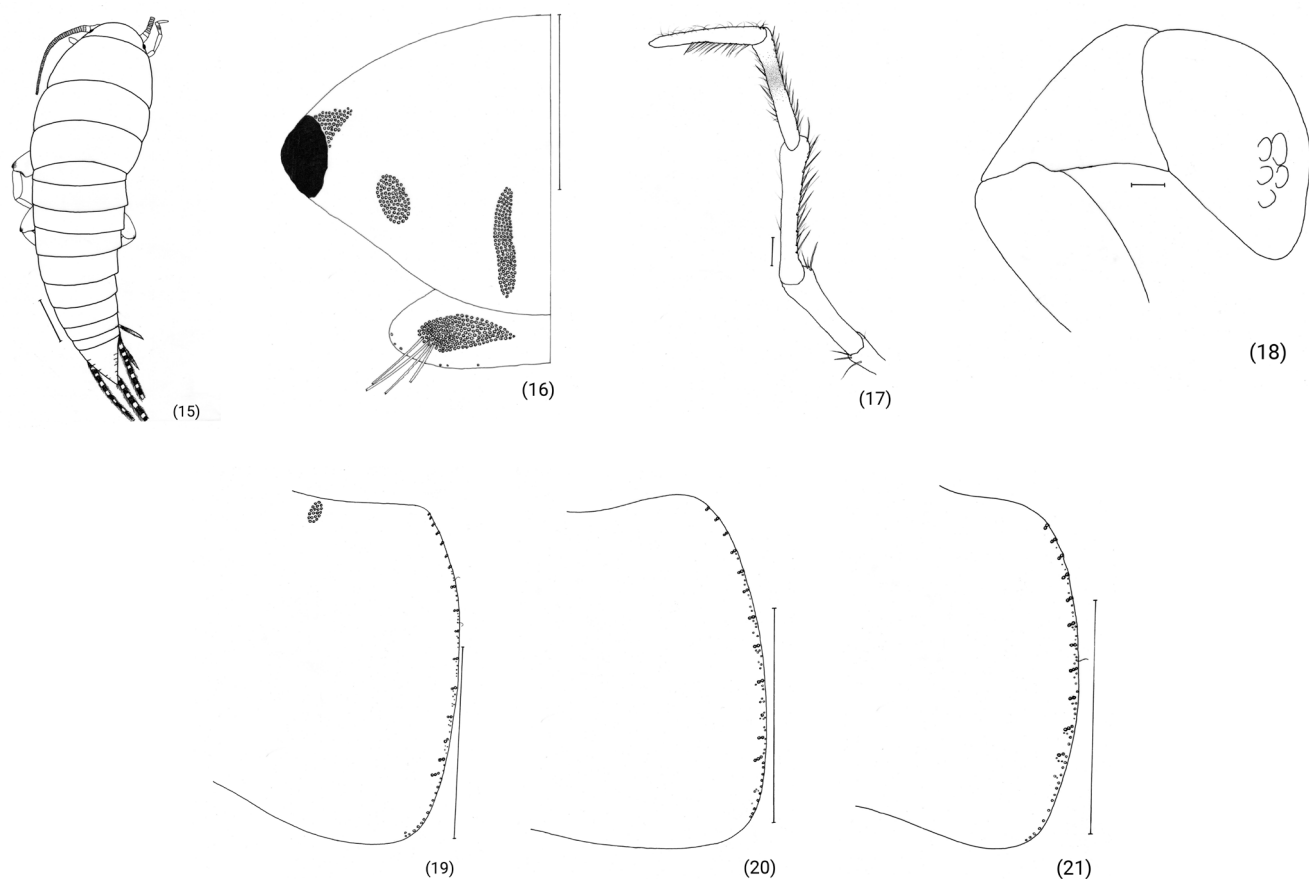
Octopus view point, Domalapenta, Amrabad Tiger Reserve, Nagarkurnool district, Telangana, India [16°22'27" N, 78°83'13" E], 27.xii.2018, collected Deepa J. & party [Registration number 3176/H14, ZSI, Kolkata]; 1 Female, Under leaf litter, Boreddy bovi near Vattavaralapally, Amrabad Tiger Reserve, Nagarkurnool District, Telangana, India [16°24'94" N, 78°76'44" E], 28.xii.2018, 1 female, coll. Deepa J & party, Registration number 3177/H14, Zoological Survey of India, Kolkata; 1 Female, Under bark of tree, Kamanapenta Amrabad division, Amrabad Tiger Reserve, Nagarkurnool District, Telangana, India [16°29'58" N, 78°83'91" E], 18.iii.2019, coll. S. S. Jadav & party, Registration number 3178/H14, Zoological Survey of India, Kolkata.

Redescription: Female: Body length up to 8.1 mm. Base colour (in spirit) dorsally whitish yellow with a covering of light brown scales, ventrally whitish yellow. Shape of the body elongate, more or less parallel sided,

dorso-ventrally compressed anteriorly, sub-cylindrical posteriorly; thorax wider than abdomen (Figure 15). Antennae with uniform brown pigmentation and caudal appendages with alternating dark and light bands of brown pigmentation.

Head semi-circular in outline anteriorly. There are numerous bifid and pectinate macrosetae present in both clypeus and labrum; those of the clypeus are grouped in two tufts composed of 160–170 each. Eyes relatively small, located well behind antennae. Head wider (1.2 mm) than long (0.46 mm) (Figure 16). Antennae length up to 3.65 mm, shorter than body and reaching the second abdominal segment when directed backwards.

Maxillary palp (Figure 17) 5 segmented, penultimate segment (0.45 mm) slightly longer than the terminal segment (0.41 mm). Apical article of labial palp (Figure 18) axe-shaped and bearing five oval sensory papillae arranged in two rows where outer row consists of three



Figures 15-21. *Acrotelsa collaris* Female. 15. Dorsal habitus; 16. Head chaetotaxy with clypeus; 17. Maxillary palp; 18. Labial palp (Female); 19. Pronotum; 20. Mesonotum; 21. Metanotum. Scales: Fig.15,19-21: 1 mm, Fig.16: 0.5 mm, Fig.17: 0.1 mm, Fig.18: 50µm.

sensory papillae and inner row with two; it is about 1.7 times wider at the apex than at the base and 1.3 times wider than long.

A pair of tuft of setae composed of 20-22 each present on the anterior margin of pronotum (Figure 19); lateral margins with 16+16 combs composed of 1-3 macrosetae each, including two trichobothrial areas, one in the outer side of the last comb (N) and another in the outer side of the N-2 comb. Mesonotum (Figure 20) lateral margins with 12+12 combs each consisting of 1-3 macrosetae, including one trichobothrial area in the outer side of the last comb (N). Metanotum (Figure 21) lateral margins with 11+12 combs composed of 1-3 macrosetae including two trichobothrial areas, one in the outer side of the last comb (N) and another in the outer side of the N-1 comb. No bristle combs have been detected on the hind borders of pro, meso and metanotum.

Prosternum (Figure 22) anteriorly rectangular and posteriorly semi-elliptical in shape, 1 mm in length, its length/width ratio is about 1.5; bearing a bush of 48-50 bifid setae at the baso-medial part of it and each of them 0.38-0.56 mm long; bristle combs have not been detected in its apical part. Mesosternum (Figure 23) 0.87 mm in length, its length/width ratio is about 0.78, club-shaped, with no bristle combs apically. Metasternum (Figure 24) 0.83 mm in length, its length/width ratio about 0.58; club-shaped, with no bristle combs apically.

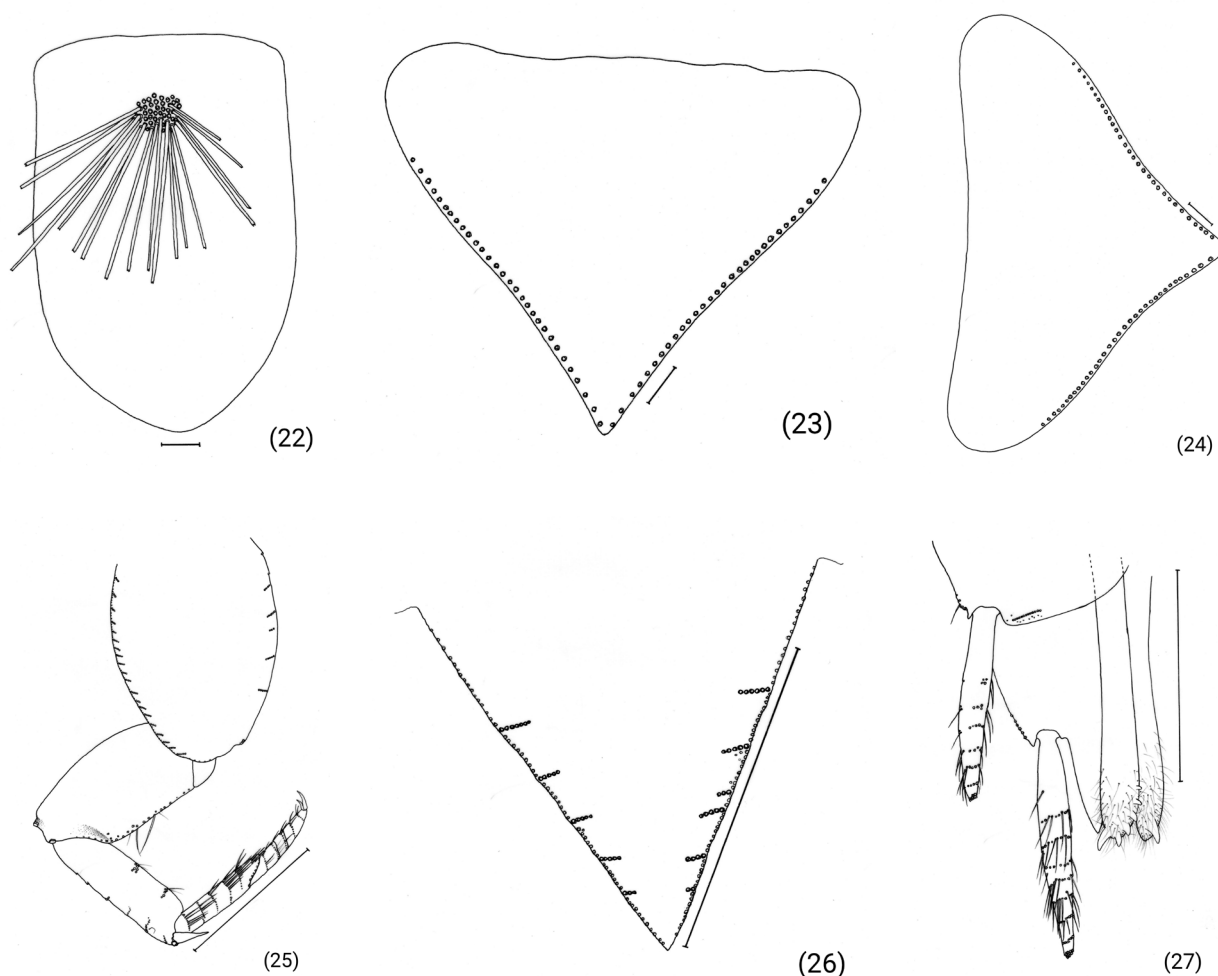
Legs stout; femora short, one strong seta each on their outer and inner margin distally near the junction of tibiae; tibiae and tarsi moderately elongate; pretarsi with slightly curved claws. Length/width ratio of protibiae about 2.5 times longer than wide; protibiae have two bristle combs composed of 6-7 smooth and pointed macrosetae inserted in their dorsal margin and two tuft of setae composed of 4-7 each in their ventral margin. In the protarsus, the length of tarsomere I is about 0.4 mm; of tarsomere II is about 0.16 mm; of tarsomere III is about 0.08 mm and of tarsomere IV is about 0.11 mm. Mesotibiae 2.6 times longer than wide, with two bristle combs composed of 4-6 smooth and pointed macrosetae inserted in their dorsal margin and two tuft of setae composed of 5-6 each in their ventral margin. In the mesotarsus, the length of tarsomere I is about 0.51 mm; of tarsomere II is about 0.18 mm; of tarsomere III is about 0.09 mm and of tarsomere IV is about 0.19 mm. Metatibiae about 3.1 times longer than wide, with four bristle combs composed of 2-8 smooth and pointed macrosetae inserted in their dorsal

margin and two tuft of setae composed of 6 each in their ventral margin. In the metatarsus, the length of tarsomere I is about 0.74 mm; of tarsomere II is about 0.25 mm; of tarsomere III is about 0.11 mm and of tarsomere IV is about 0.23 mm. The outer margin of coxae in prothoracic leg with 21 bristle combs composed of 3-6 macrosetae each and the inner margin with 2 bristle combs composed of 3-5 macrosetae each; in mid leg with 21 bristle combs composed of 3-5 macrosetae each and the inner margin with 4 bristle combs composed of 4-5 macrosetae each and in hind leg (Figure 25) with 20 bristle combs composed of 3-5 macrosetae each and the inner margin with 5 bristle combs composed of 3-5 macrosetae each.

Urotergite I with 2+2 bristle-combs, each composed of 5-6 macrosetae. Urotergites II-VII with 3+3 bristle-combs, each composed of 5-8 macrosetae, and urotergite VIII with 2+2 bristle-combs, each composed of 6 macrosetae. Urotergite IX without bristle combs. The number of macrosetae per bristle comb on urotergites as in Table 2. Urotergite X (Figure 26) triangular in shape apically pointed, shorter than wide at its base (length 1.1 mm, base width 1.2 mm, lateral margin length 1.3 mm), ratio length/width about 0.9. It is with 5+6 bristle-combs of 3-7 macrosetae each.

Urosternites I and II without setae, III-VIII with 2+2 lateral bristle-combs, each composed of 7-14 macrosetae. The number of macrosetae per bristle comb on urosternites as in Table 3. The width of the bristle combs and the gap distances between them varies in each urosternum, so that the ratio between the distance between the combs and the width of a comb varies from 4.5 on urosternite VIII to 7 on urosternite IV. Distance between the lateral combs of an urosternite 4.5-7 times wider than the width of comb.

Two pairs of styli present, inserted on segments VIII and IX. The ratio length of styli IX/ length of styli VIII is about 1.2. Posterior margin of the coxite VIII round. Inner process of the coxite IX long, triangular and pointed at tip, in the female about 2.2 times longer than wide at its base and 2.3 times longer than the outer process. Ovipositor 1.7 mm in length, just surpassing the apex of the inner process of the coxite IX. The apical part of anterior gonapophyses (Figure 27) with six fossorial spines of different sizes, terminal one longest and decreasing the size gradually and the apical part of posterior gonapophyses with one fossorial spine.



Figures 22-27. *Acrotelsa collaris* Female. 22. Prosternum with tuft of setae; 23. Mesosternum; 24. Metasternum; 25. Hind leg; 26. Tergite X; 27. Styli VIII and IX with ovipositor. Scales: Fig.22-24: 0.1 mm, Fig.25-27: 1 mm.

Caudal filament 4.5 mm in length, cerci 3.6 mm in length.

Distribution: INDIA: Andhra Pradesh, Telangana, Uttarakhand, and West Bengal. *Elsewhere:* USA, Neotropical, Ethiopian, Indo-Malayan regions.

Remarks: Body length of *A. collaris* of India is only about 8.1 mm. (length of *A. collaris* Esch. from central American islands reaches 16-18 mm). The antennae of the present Indian species reach up to urotergite II. [Antenna length of Egyptian species (Stach, 1935) doesn't surpass beyond the thorax].

The labial palp axe-shaped anterior margin of the terminal segment extended, five oval shaped sensory papillae arranged in two rows (3+2).

The shape of Prosternum anteriorly rectangular and posteriorly semi-elliptical (Figure 22). The tuft of setae is anteriorly situated on the prosternum, composed of 48-50 smooth macrosetae bifid apically [*A. collaris* from Egypt (Stach, 1935) composed of bush of 60 strong setae located at the middle of prosternum. The setae are finely fringed and apically divided]. Mesosternum heart shaped (Figure 23) and lateral margin with 30+30 macrosetae, the shape of metasternum is cordate and the anterior margin is extended strongly on both side, posterior end deltoid, lateral margins with 30+ 34 macrosetae on both side (Figure 24).

Table 2. Number of macrosetae per bristle comb on urotergites in *Acrotelsa collaris*

Segment	Urotergite		
	Lateral	Sublateral	Submedial
I	-	6	5
II	7-8	5-6	5
III	7-8	6	5-6
IV	7	5-6	5
V	7-8	6	5
VI	6-7	6	6
VII	6	5-6	5
VIII	-	6	6
IX	-	-	-

Table 3. Number of macrosetae per bristle comb on urosternites in *Acrotelsa collaris*

Segment	Urosternite		
	Lateral	Sublateral	Submedial
I	-	-	-
II	-	-	-
III	-	9-10	11-12
IV	-	7-8	11-12
V	-	7-8	11

VI	-	7-8	11
VII	-	7	11-12
VIII	-	6-7	13-14
IX	-	-	-

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