

Notes on some Cyphoderid Collembola of the tropical Asia

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ABSTRACT Five species of Cyphoderid collembola were described with the intensive method of taxonomy from the tropical Asia. Genus *Setoderus* Yosii, 1959 is a synonym of *Serroderus* Delamare, 1948 and the diagnosis of the latter genus is renovated. The African genus *Cephalophilus* Delamare, 1948 has found its species from Java and India.

KEY WORDS Collembola/ tropical Asia/ taxonomy

At the beginning of this second paper on Cyphoderidae of Asia I have to discuss two problems. The first is to point out some new key characters to represent species and the second is to discuss the identity of *Setoderus* Ys., 1959 with *Serroderus* Delamare, 1948.

When I have visited him in 1982, Dr. D.H. Murphy of Singapore has kindly cited me the importance of the clypeal setae, the setae between the prelabrals and frontal area as to represent each species in the genus *Cyphoderus*. Accordingly I have checked it in my collection with the result that it is quite true. From Fig. 1, A, C and Fig. 3 D, it may be clear that their arrangement and character, whether it is smooth or barbed, are highly characteristic to each species. Thus, for example, in *C. borneensis* m. some of the clypeal setae are barbed, while it is not so in *S. hozawai* (Kin.) and *S. dicuspiditermitis* m. In case of *Mimoderus diusi* m. (Fig. 1, D) the area is more plurichaetotic, although the main primary setae are still discernible. Especially the three setae just in front of the area deserve special attention as they are very easily to be observed. At the same time it has been proved that the form of maxilla and its outer lobe must be checked. Head of maxilla is already known to be modified in *Mimoderus saikehi* m. (Yoshii 1980, Fig. 6 C). In other species, also, there may be found a slight difference in the development of the apical lamella, whether it is surpassing the fore-margin of the distal complex of maxilla or not so. Besides, the outer lobe of maxilla has usually II+i setae in *Cyphoderus* spp. and II+ii in *Serroderus* spp.

Secondly, the distinction between *Cyphoderus* and *Serroderus* have been treated in Yoshii 1980 based on characters of the ventral tube although the latter is expressed as *Setoderus* owing to the lack of our knowledge about the key character of the genotypical species. In investigating further materials from various sources, however, I have come to the belief that these two groups may be separated not only by the ventral tube, but also by the chaetal nature of dens.

In all *Cyphoderus* species known to me so far, there is a row of dorsal setae between the inner and outer row of winged scales, which is either smooth (*C. albinus*) or barbed (*C. borneensis*) and usually 4 in number, while in *Serroderus-Setoderus* group such setae are quite absent (Fig. 2 A, B). This distinction seems to me parallel to the characteristic difference of the ventral tube and, accordingly I would like to propose the fol-

lowing rearrangement of the genera. The majority of the data is drawn from the classical work of Delamare Deboutteville 1948.

1. Dens with a row of dorsal setae *Cyphoderus*

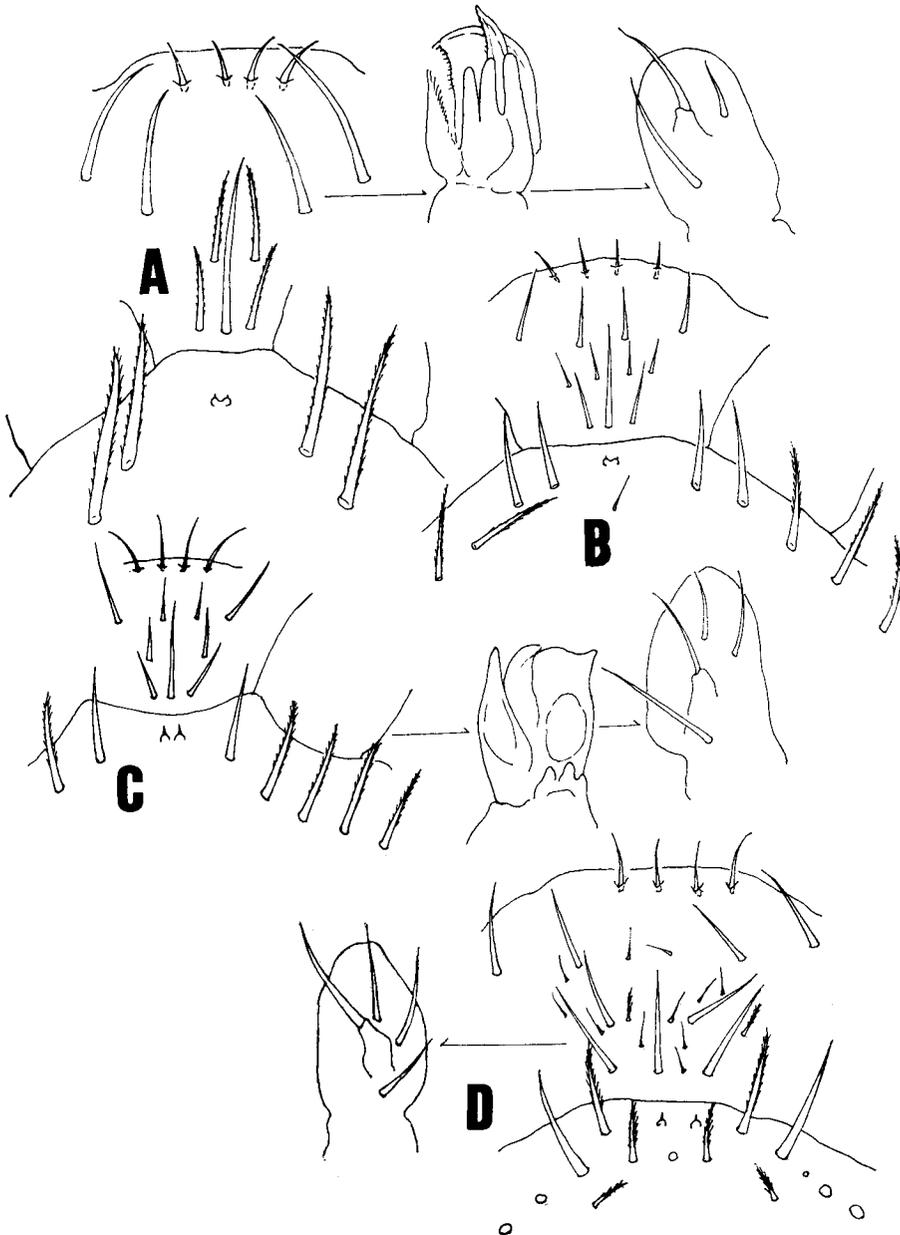


Fig. 1. Clypeal area and mouth parts of Cyphoderidae spp.
 A: *Cyph. borneensis* Ys. from Batu Puteh, Sabah, Borneo.
 B: *Serroderus hozawai* (Kin.) from Tawau, Sabah, Borneo.
 C: *Serroderus dicspiditermitis* (Ys.) from Sepilok, Sabah, Borneo.
 D: *Mimoderus diusi* Ys. from Sepilok, Sabah, Borneo.

- Dens without a row of dorsal setae2
2. Hind tibiotarsus without smooth setae. Dental feathered scales relatively few in number*Serroderus*
- Hind tibiotarsus with smooth setae. Dental scales numerous. Mucro multi-dentate*Mimoderus*

***Cyphoderus* Tullberg, 1871**

Type species: *Cyphoderus albinus* Nicolet, 1841

The genus *Cyphoda* Delamare, 1948 may be regarded a subgenus of *Cyphoderus* by which the mucro is shortened. The type species, *C. maroccanus* Delam., 1948 shows the presence of the dorsal setae of dens (l.c. p. 362, Fig. 75). *Megacyphoderus* Delam., 1948 is also a subgenus of this genus by which the dentation of unguis is well developed.

***Serroderus* Delamare, 1948**

Type species: *Cyphoderus distinctus* Denis, 1942

The diagnosis above inevitably induces me to regard *Setoderus* Yosii, 1959 as a subgenus of *Serroderus* by which the ventral scale of dens are almost setaceous. The

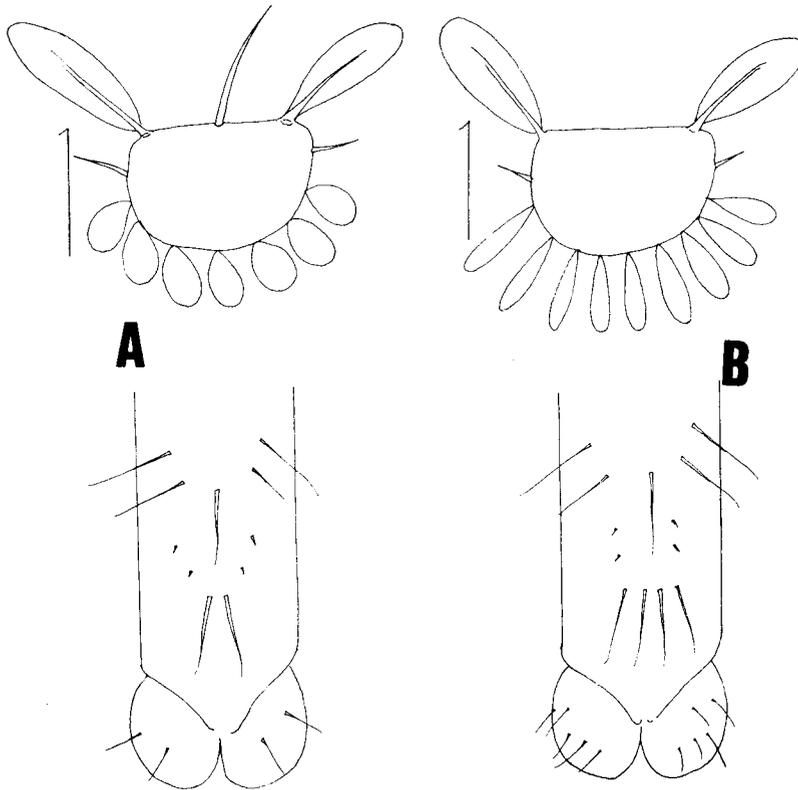


Fig. 2. Diagrammatic figures of dens (cross section) and ventral tube (posterior face) of *Cyphoderus* (A) and *Serroderus* (B).

type species (cf. Denis 1942, p. 2, Fig. 1a) clearly indicates the absence of the dorsal setae of dens. After this new definition of the genus the following species, hitherto included in *Cyphoderus*, must be placed in *Serroderus*, although the final decision must be made after their ventral tube is investigated.

<i>Cyphoderus brevimucronatus</i> Silvestri, 1918	Senegal
<i>Cyphoderus quadridentatus</i> Delamare, 1948	Kilimanjaro
<i>Cyphoderus multidentatus</i> Delamare, 1948	Kenya
<i>Cyphoderus subserratus</i> Delamare, 1948	French Guiana

***Cyphoderus (Cyphoderus) sumatranus* sp. n.** Fig. 3

SUMATRA: Kamang Cave near Bukit Tinggi (15 ex. 8. II 1986, Ys.)

Body length ca. 1.5 mm. Antennae not short. Labrum with setae 4/5, 5, 4, all smooth and the mediolateral pair of the second row are larger than others. There is a thick ridge between prelabrals and the first row. Mandible normal. Outer ramus of maxilla has II+0 setae and maxillar head is not modified. Setae of labial basis is as m-e/l(1). Legs unscaled. Posterior side of hind legs without smooth setae. Trochanteral organ is composed of ca. 12 spinous setae arranged in v-form. Unguis is with a pair of unequally large inner basal teeth and no distal tooth is observed. Unguiculus is with a broad outer tooth. Tenent hair is lightly inflated distally. Ventral tube is anteriorly with 2+2 long setae, the distal one is longer and faintly ciliated, while the other is only rugose. Posterior face has usual number of setae for the genus and two distal setae are smooth, while others are whether faintly ciliated or rugose. Lateral flap bears only 2 setae each. Furca well developed. Manubrium is ventrally scaled and without terminal setae. Dorsal side is with many ciliated setae including 7+7 larger ones in a longitudinal row. Dens bearing 5 outer and 6 inner winged scaly setae, the distalmost of the inner row is the largest, attaining the end of mucro. Dorsal setae are 4, all ciliated. From the basal setae two are ciliated and one is smooth. Scales of the ventral side are rounded in shape. Mucro is ca. 4/5 of dens in length, bidentate, the anteapical one is with a faint lamella and there is an obscure ledge throughout the length.

Chaetal pattern is alike to that of *C. borneensis* Ys. (Yoshii 1980, p. 4), the clypeal setae are 3, 2, 4, all of them are smooth. Frontal setae are all ciliated (Fig. 3, D). The anterior margin of th. II has a row of small setae, but not the modified larger pair. The accessory setae of s.s. on abd. II, III, IV are not enlarged.

From *C. borneensis* Yoshii, 1966 this species can be easily separated by the clypeal setae, all of which are smooth in this species, while lateral two of the first row and two of the second row are ciliated in the cited species. Setae of labial basis are m-e/l(1) in both of them.

The species described here may be identical with *C. javanus* Börner, but as the topotypical example from Cibodas (=Tjibodas), Java has not yet been inspected, it is described tentatively as new species. The Indian species nominated as *C. javanus* and *C. albinus* in Yoshii 1966, p. 382 are not reliable of its identification.

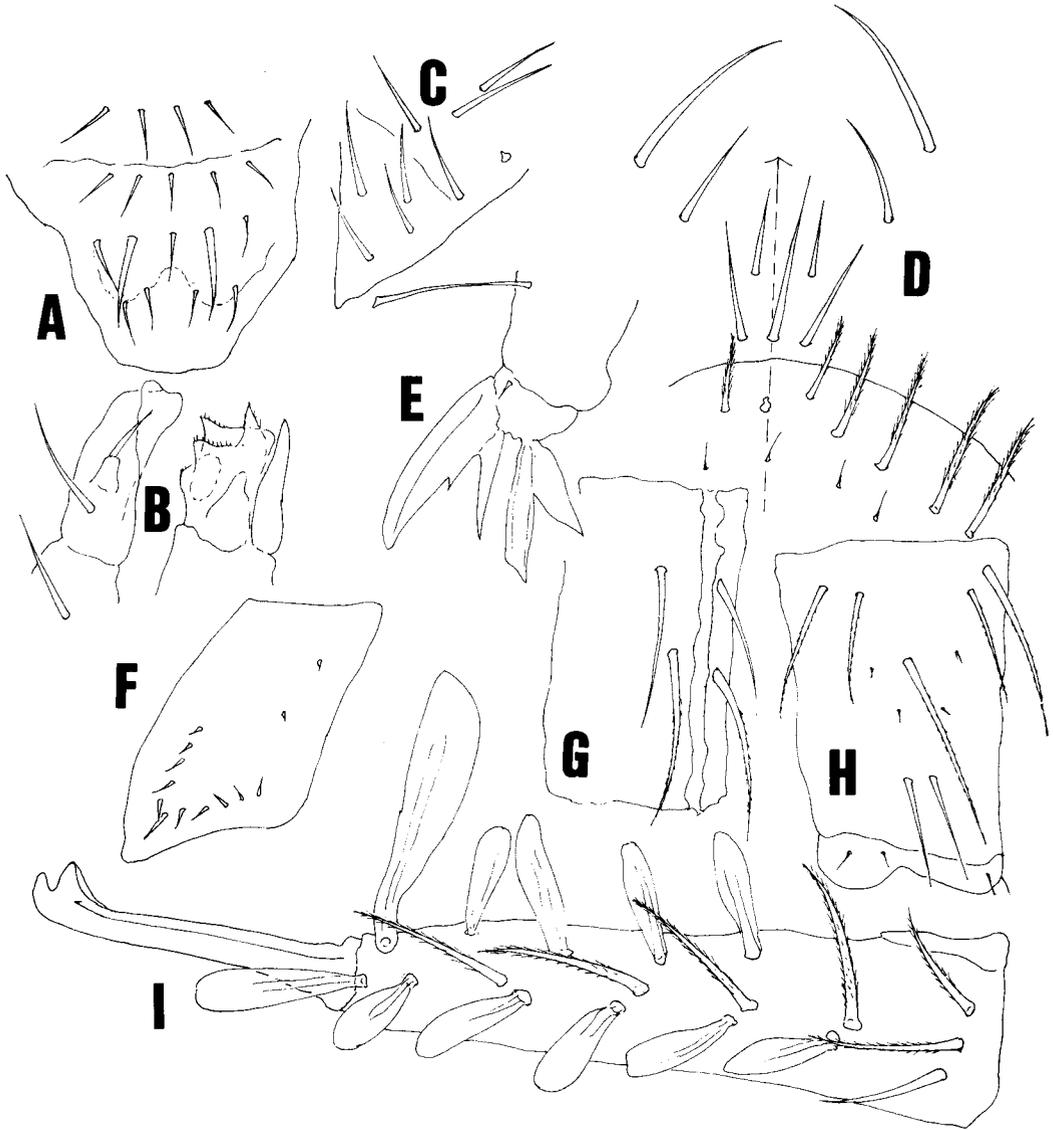


Fig. 3. *Cyphoderus sumatranus* sp. n.

A: Labrum, B: Maxilla and its outer ramus, C: Labial basis, D: Clypeal and frontal area, E: Hind claw, F: Trochanteral organ, G, H: Ventral tube, I: Dens and mucro.

***Cyphoderus (Cyphoderus) lantohi* sp. n.** Fig. 4

BORNEO: Brumas nr. Tawau (4 ex. from a hole drilled by a Cossid moth larva to the trunk of *Gmelina arborea*. 19. III 1982, Saikoh Lantoh leg.)

Body length up to 1.8 mm. White. ant.: head as 7:5. ant. segm. ratio as 10:24:13:40. Ant. I and II with scales dorsally. Ant. II, III and IV have some curving sensory setae. Ant. IV without apical bulb. Ant. III-organ is two very small rods. Labrum with setae 4/5, 5, 4, all smooth. Inner pair of the second row larger

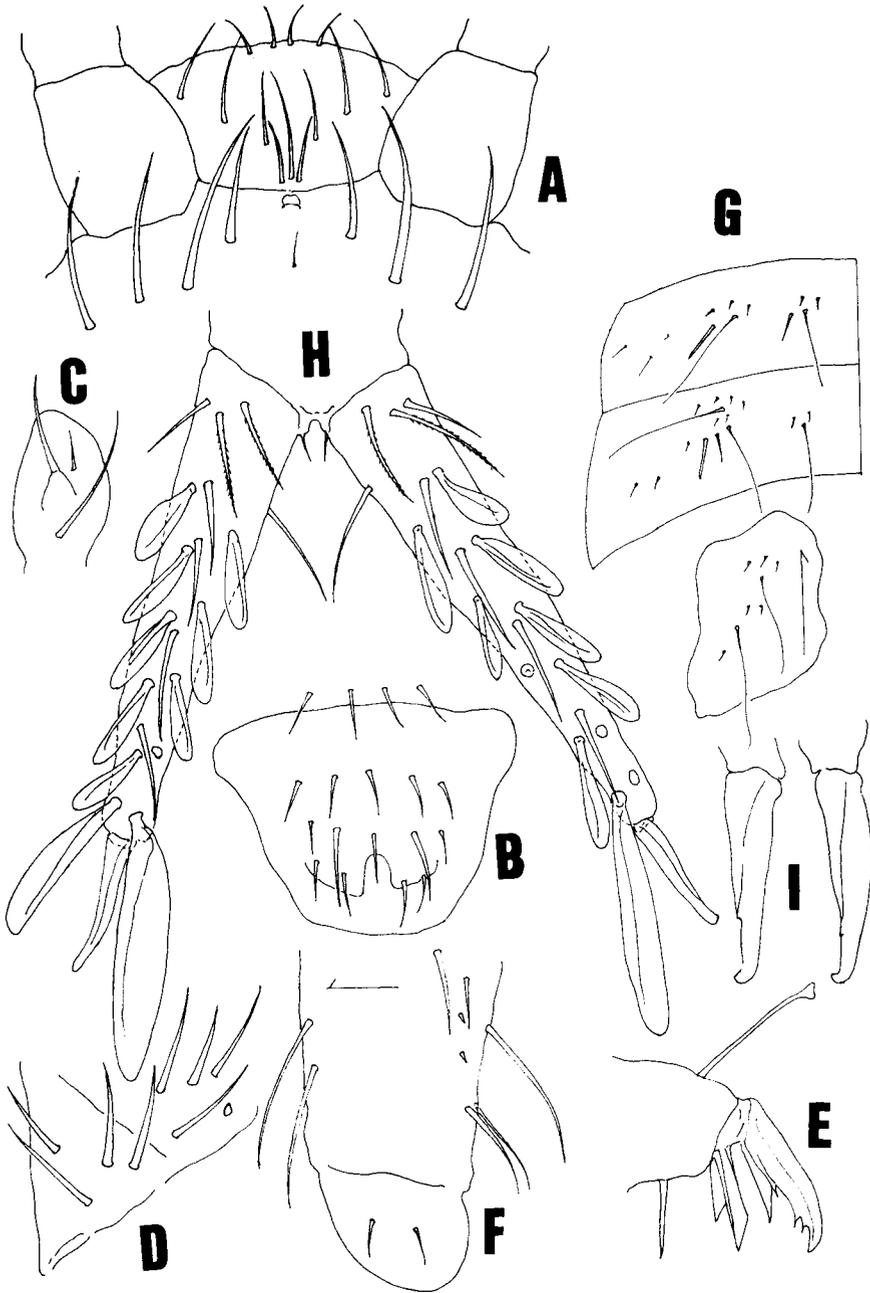


Fig. 4. *Cyphoderus lantohi* sp. n.

A: Clypeal and frontal area, B: Labrum, C: Outer ramus maxilla, D: Labial basis, E: Hind claw, F: Ventral tube, G: Chaetal pattern of abd. II, III and IV (in part), H: Dens and mucro, I: Mucro.

than others and median intrusion is rounded. Labral margin is smooth. Outer maxillary ramus with setae 2+i. Mandible and maxilla not reduced. Setae of labial basis as m-e/l (1), so that l_2 is rudimentary. Legs unscaled. Setae are strong, but no smooth setae. Unguis is broad, with prominent inner basal pair and one or two obscure inner distal teeth. Unguiculus lightly truncate and with one broad outer tooth. Tenent hair is expanded apically. Opposite seta is spiny. Trochanteral organ is composed of ca. 15 setulae arranged in v-form. Ventral tube is anteriorly with 2+2 smooth setae. Posterior face has setae arranged as in other known species of the genus, but all of them are smooth. Lateral flap bears 2 small setae each. Rami tenaculi quadridentate, corpus with one smooth seta. Furca with man:d:mu as 48:32:8. Ventral side is with large scales. Dorsal side of manubrium is with many small, both smooth and ciliated setae on both sides and terminal setae are absent. Dens bears 5 outer and 6 inner scaly setae. The most distal one of them are larger, the distalmost one of the inner row is much longer than the mucro (Fig. 4, H). There are four dorsal setae between these scaly setae, which are practically smooth. Besides, there are 3 basal setae, the outer one is smooth and the other two are finely ciliated. Mucro is straight, without any tooth, but with a faint lateral ridge, whose end is lightly hooked. Chaetal pattern studied by two examples is as follows. Along the foremargin of the head there are 4+4 smooth setulae (f_1-f_4) and f_0 is rudimentary. Clypeal setae (Fig. A) are as 3, 2, 4, all of them are smooth. Marginal setae of th. II are all small, smooth and not differentiated. Setae around s.s. on abd. II, III and IV are as in Fig. G, the pattern is different from that for *Setoderus sabahnus* Ys., 1980, p. 6, Fig. 2, B.

In various respects the species is near *C. zoroastris* Ys., 1963 of Pakistan (Swat District), but different in the form of the basal setae of dens. In the cited form one of them is converted to the long, scaly setae, while all of them are setaceous in this Bornean species. In the African *C. limboxiphius* Börner, 1906 to which the species is also in close relation, all four dorsal setae of dens are ciliated (cf. Delamare 1945, p. 350, Fig. 46). The species is dedicated to the collector, Saiken Lantoh of the Forest Research Centre in Sabah.

***Serroderus (Serroderus) durio* sp. n.** Figs. 5, 6, 7

MALAYA: Pasoh Forest, Negri Sembilan (many ex. from the termite nest, 5. IX 1972, S. Chiba)

Body length up to 1.7 mm., colour white. Body is not depressed. ant: head as 80:50, ant. segm. ratio as 10:25:13:40. Antennal segments are not especially modified. Ant. I is basally scaled on dorsal side. Ant. III is short, somewhat clavate and with some 5~6 curving sensory setae near distal end. Ant. IV has many such curving setae all throughout the length together with the upright smooth ones, but without apical bulb. Foremargin of the head is with a row of 5+5 setae near the antennal basis, f_0 is a small sensillate element and f_1 is smooth, while f_{2-5} are barbed. Clypeal setae are arranged as 3, 2, 4, all smooth. Labral setae 4/5, 5, 4, all smooth. Labral margin with 1+1 rounded tubercles. Mandibular molar plate is not reduced. Maxilla small and its outer ramus is with two marginal setae beside a small papillar

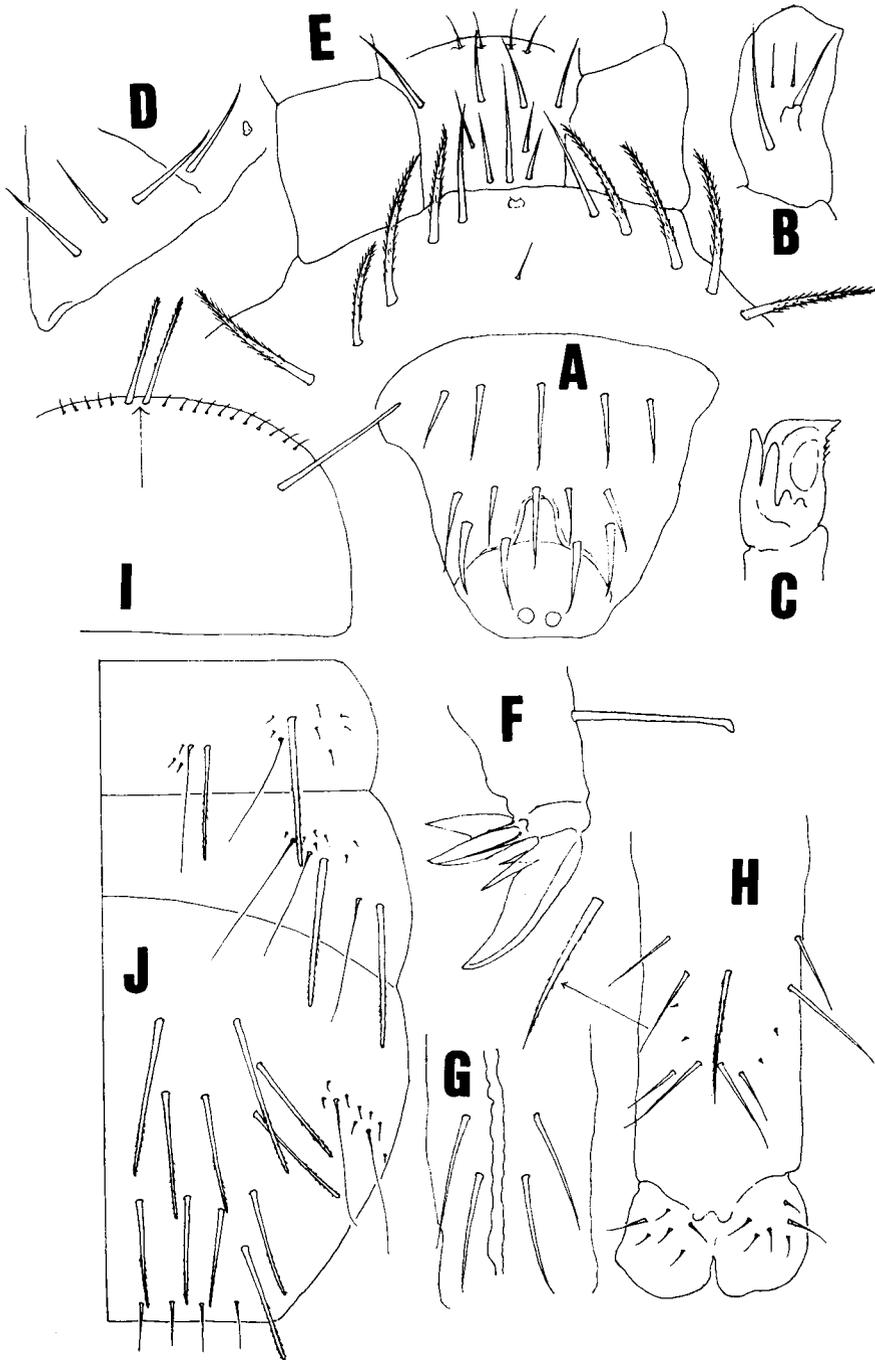


Fig. 5. *Serroderus durio* sp. n.

A: Labrum, B, C: Outer ramus and head of maxilla, D: Labial basis, E: Clypeal and frontal area, F: Hind claw, G, H: Ventral tube, I, J: Chactal pattern of th. II and abd. II, III, IV.

and one subequally large basal seta. Labial basis with setae as mre/l(1), all smooth and (1) is vestigial. Marginal setae of th.II are in one row, small except for the one median pair, which are elongate and barbed on distal half. One seta of the lateral part is extremely elongate, but there is no such large seta on th.III and abd.I. On abd.II and III one seta attached near s.s. of the segment is enormously elongate and ca. 10+10 setae alike in length and form are found on abd.IV in a symmetrical way (Fig. 5, J). Two s.s. of the segment are laterally situated and not accompanied by such large seta. On abd.V and VI the setae are short, but barbed densely and a little clavate. Unguis is with a slender inner paired teeth and without distal tooth. Un-

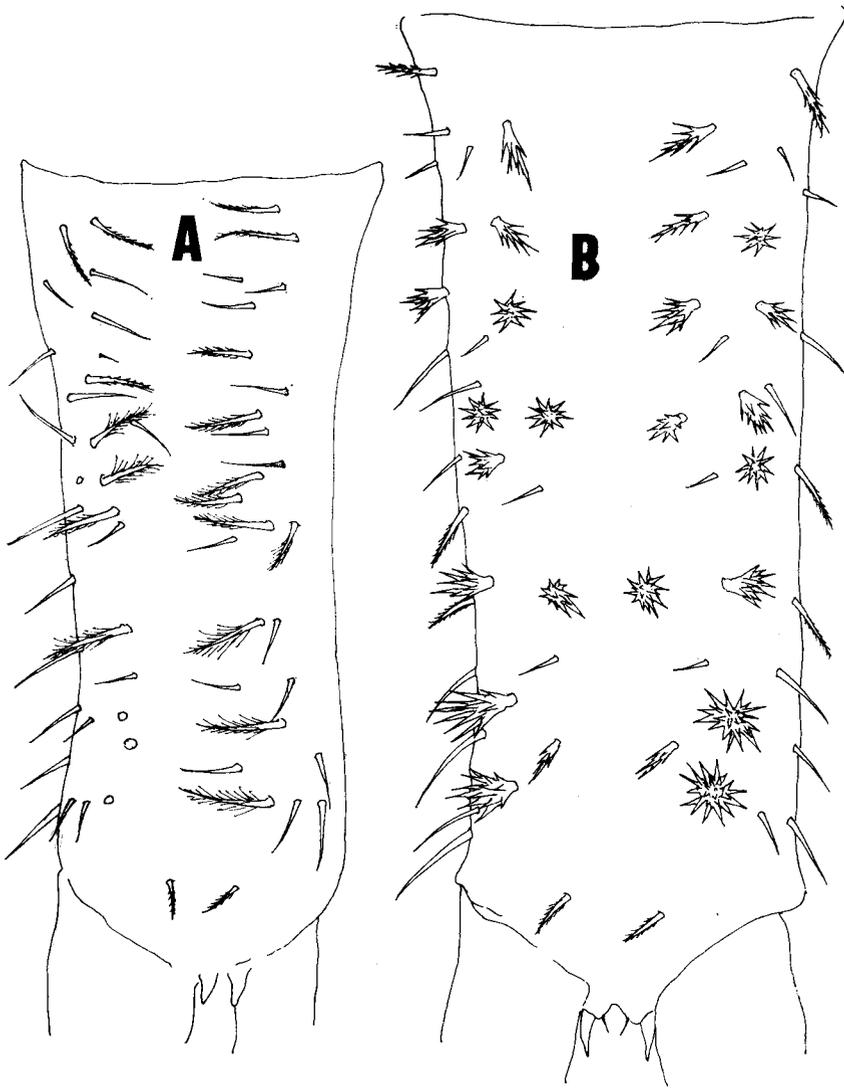


Fig. 6. *Serroderus durio* sp. n. (continued).

A: Manubrium of female, B: ditto of male.



Fig. 7. *Serroderus durio* sp. n. (continued).

A: Trochanteral organ, B: Dental end of manubrium (ventral view),
 C: Dens and mucro in female, D: ditto in male, E, F: Mucro.

guiculus is with a large outer tooth. Tenent hair feebly clubbed apically. Hind tibiotarsus is bearing some 4-5 strong setae along the posterior side, which are peculiarly truncate on apex. Trochanteral organ is feebly developed, composed of about 15 spiny setae arranged in L-form. Ventral tube is anteriorly with 2+2 almost smooth, but rugose setae. Posterior face has 2+2 smooth and 2-1-2 proximal faintly rugose setae together with 2+2 pegs. Lateral flap bears ca. 6 small setae each. Furca in ratio as 40:28:15. Manubrium is scaled ventrally and with 1+1 terminal barbed setae. Dorsally it is unscaled and beset with three kinds of setae, i.e. the first one is short, smooth, the second one is a little longer and densely serrated. The third one is very peculiar being different according to the sex. In the male it is multiramous and cuspidately echinate being composed of many slender cusps and looks like "bouquet", so that it is almost stellate, when seen from above. In the female, however, it is the setae lightly clubbed and heavily barbed. Dens is ventrally with many elongate, hyaline scales as in other species of *Serroderus* and the distalmost one is very long, attaining the mucronal end. Laterally there are 6 outer and 4 inner scaly setae together with a row of 6 outer and 5 inner smooth setae below the row of the scaly setae. There is no dorsal row of setae between these scaly ones. In addition to them there are two setae well developed, which are either echinate (male) or densely barbed (female). The proximal one of them is accompanied by two smooth setae to the outer side and by one seta to the inner (dorsal) side. Mucro is elongate, with a basal tunica and tridentate apically, the third one is with a fine lamella toward the basis. One intermittent tooth is located at one third from apex.

The species is very peculiar by the presence of the echinate setae of furca in male. But it must be defined to be within the genus *Serroderus* by the absence of the dorsal row of dental setae, chaetal pattern of the ventral tube and by the elongated form of the ventral scales of dens. In one example inspected (male) the mucro was without intermittent tooth on one side.

In the description above the sexes are identified by the form of the genital orifice, which is highly elevated in male than in female. The "female" is corresponding to the description of *C. tridenticulatus* Denis, 1948, established by 8 examples from Vietnam. Further researches must be made. From *S. dicuspiditermitis* m. the female is differing by the number of the scaly setae on inner side of dens, which is 4 in number in contrast to 3 of the cited species. In this occasion I have checked numerous examples of the cited species once again without finding out any sexual dimorphism.

The species is named after "Durian", the king of the fruits, whose carpel is just so spiny as the echinate setae of this species.

***Serroderus (Setoderus) alfredi* (Yosii, 1959) Fig. 8**

Setoderus alfredi: Yosii 1959

MALAYA: Pasoh Forest, Negri Sembilan (many ex. 5. IX 1972, S. Chiba)

Additional notes to Yosii 1959, p. 56 is as follows: The body length ca. 1.0 mm, relatively small. Labral setae 4/5, 5, 4, all smooth, but the first row is feeble. Median intrusion is narrow and labral margin is without structures. Head of maxilla not

modified. Outer ramus of maxilla with two marginal setae. Labial basis with setae as mre/l(1). From the head capsule clypeal setae are as 3, 2, 4, all smooth and all the frontal setae are barbed. Legs as in the original and some setae from the hind tibiotarsus are peculiarly truncate at apex. Ventral tube has anteriorly ca. 5+5 setae, some of which may have the sign of serration or rugosity. Posterior face has

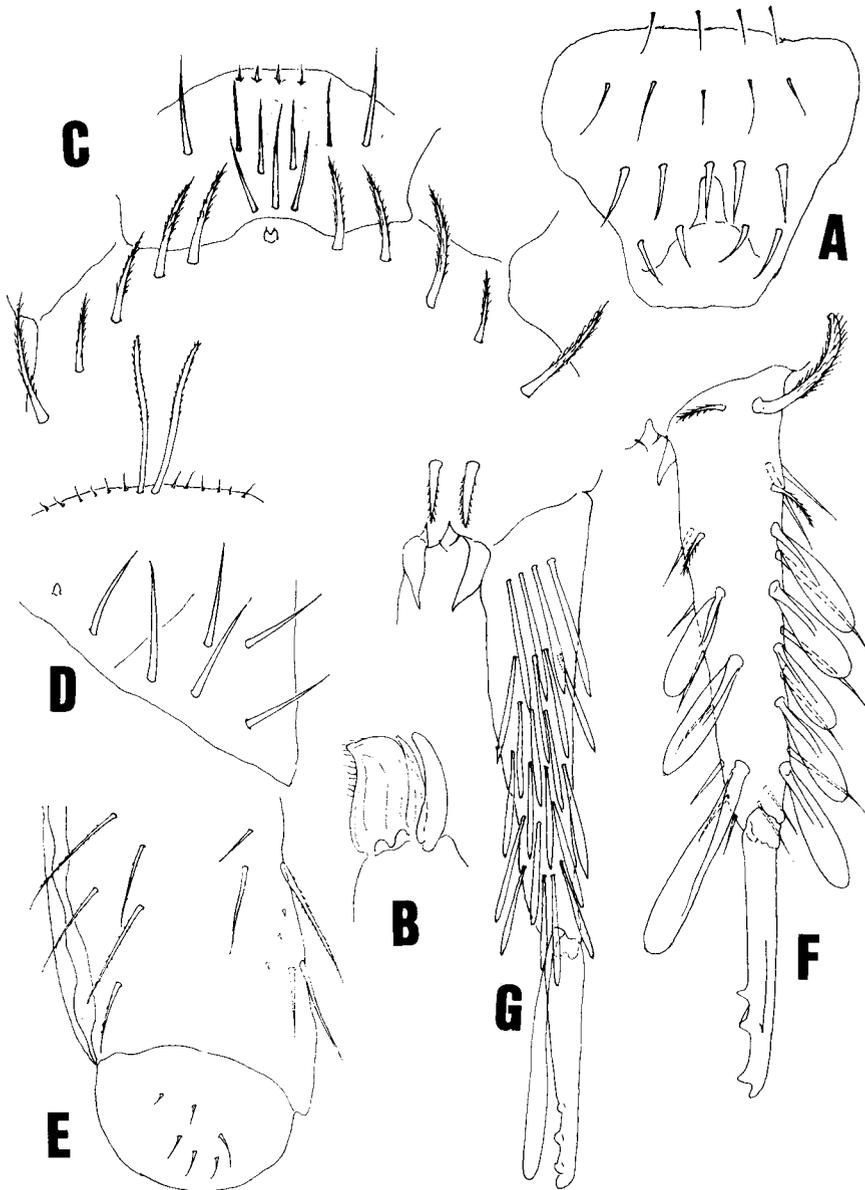


Fig. 8. *Serroderus alfredi* (Ys.) from Pasoh, Malaya.

A: Labrum, B: Maxilla, C: Clypeal and frontal area, D: Labial basis,
E: Ventral tube, F, G: Dens and mucro (dorsal and ventral view).

4 distal setae all smooth and one median plus 2+2 lateral setae, they are usually ciliated, but sometimes without sign of it. 3+3 pegs are present. Each lateral flap bears 5-6 small, smooth setae. Furca is rather short, man:d:mu as 50:26:16. Manubrium is ventrally covered with broad scales and dorsally with many setae, some of them are large and densely ciliated and symmetrically arranged. Dens bears ventrally very narrow scales, often converted to setaceous form all over and there is a hyaline, long scale at the mucronal end. Dorsally there are 5 outer and 3 inner winged setae, the inner distal one is ca. $2/3$ of the mucro in length. One small, ciliate seta is attached to the proximal part of these two rows and there are one small, ciliate and one large, almost clavate, heavily ciliated seta at the basis. To the ventral of the winged setal row there is a row of ca. 5 smooth setae on both sides of the dens. Mucro is quadridentate, with a small lamella attached to the third tooth and there is a minute toothlet near that tooth. Mucronal tunica is conspicuous. Th. II has a pair of median marginal setae especially long and well developed (Fig. 8, G). In other segments the arrangement of macrosetae are just as in *S. durio* sp. n.

The species is described by one specimen from Singapore to which the new examples coincide well. The nearest ally is *S. sabahnus* m. of Borneo from which it is different by less number of setae on labial basis and by the absence of smooth frontal setae of the head. The difference in the chaetal nature of ventral tube such as pointed out in Yoshii 1980, p. 5, is sometimes obscured, when they are not well developed.

Distribution: Malaya.

***Cephalophilus yayukae* sp. n.** Fig. 9

JAVA: Botanical Garden in Bogor, from the termite nest of the ground (4 ex. 14. II 1986, R. Yoshii)

Body flattened, length 1.3 mm. ant.: head as 12:10, ant. segm. ratio as 10:25:10:22, so that ant.III is very short. Head typically hypognathous. Labrum with setae 2/5, 5, 4, all prelabrals and labral setae are barbed. Labral margin without structures. Mandible is apically with 4-5 teeth and molar plate is feebly represented, with much fewer number of teeth than usual. Outer maxillary ramus is reduced in size and it has only one ciliate seta. Labial basis is also reduced, with setae M-E/L (1), where (1) is vestigial. Ant.I and II are scaled dorsally. Ant.II has ventrally one s.s.-like seta. Ant.IV without apical bulb, with many small, cuneate sensillate setae and this type of setae are occupying the dorsal side of ant.III as well and proper ant. III-organ is concealed or masked with them, possibly two obscure curving setae dorsal outer side may represent it. Legs are scaled only on basal two segments. Unguis is with a pair of subequally large inner basal teeth and no distal inner tooth. Unguiculus is with a broad outer tooth. Tenent hair is short and pointed. Trochanteral organ is composed ca. 10 rather long spiny setae arranged in L-form. Ventral tube is anteriorly with 3+3 subequally long setae, minutely serrated. Posterior face has 1+1 dorsal and 1+1 proximal setae, all smooth. Lateral flap has 3 setae each. Rami tenaculi 4-toothed. Furca rather short, man:d:mu as 35:12:10. Manubrium and dens are ventrally with broad scales and no manubrial terminal setae. Dorsally

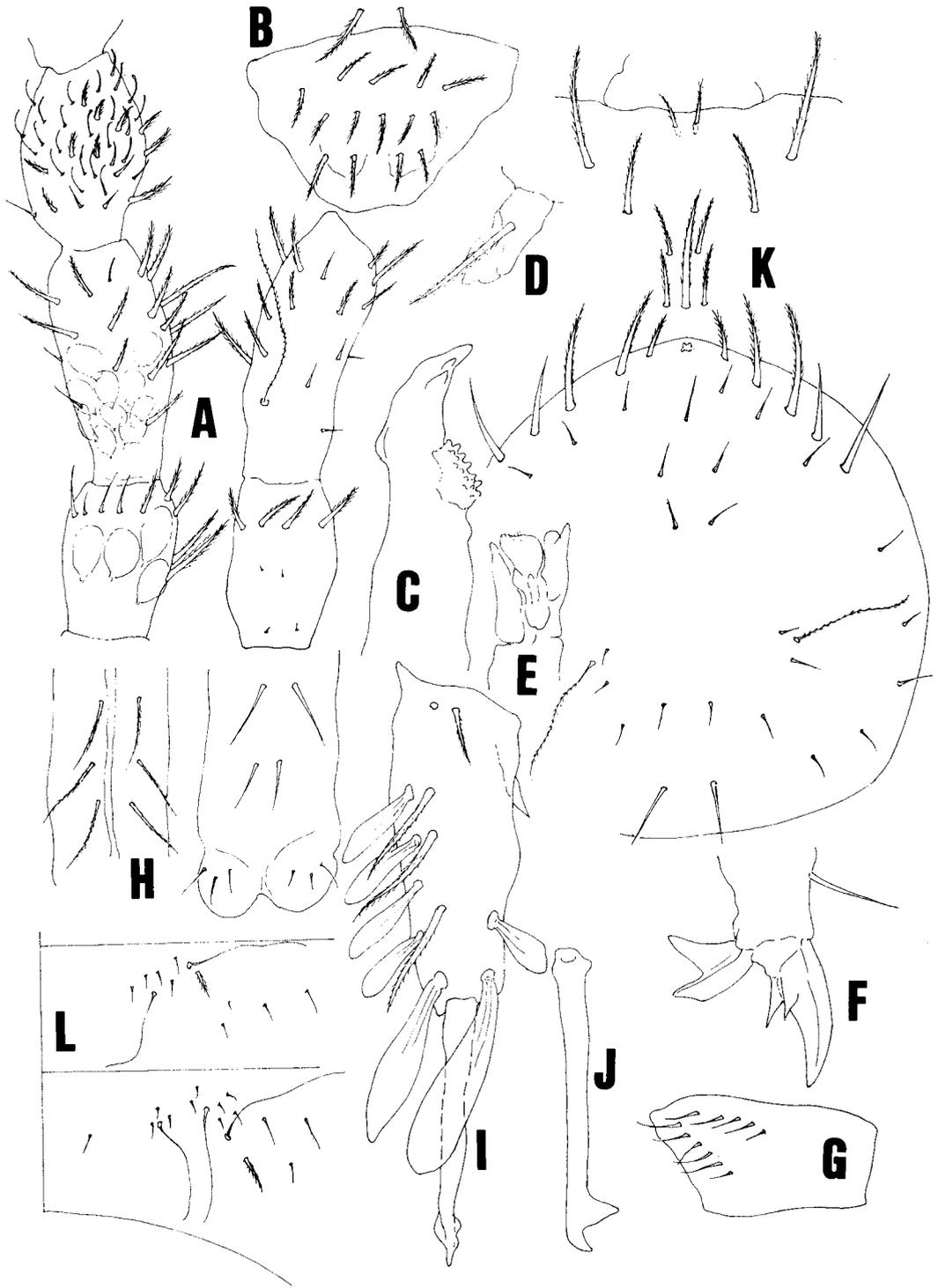


Fig. 9. *Cephalophilus yayukae* sp. n.

A: Ant. I, II and III, B: Labrum, C: Mandible, D, E: Outer ramus and head of maxilla, F: Hind claw, G: Trochanteral organ, H: Ventral tube, I: Dens and mucro (dorsal), J: Mucro, K, L: Chaetal pattern of head and abd. II, III.

manubrium has ca. 20 pairs of feathered, long setae. Dens bears 5 outer and 2 inner feathered scales, the distal one of the outer row is the largest and attaining $3/4$ of the mucro. Besides, there is a row of 3 serrated setae directly dorsal to the outer row. Basal setae are 2, both serrated. Mucro is very elongate and bidentate, the ante-apical tooth broader than the apical one, inner basal process of dentes are well produced acutely.

Chaetal pattern is unique. On frontal area f_0 is vestigial, f_1 - f_3 are barbed, while f_5 , f_6 are smooth. On the clypeal area—between antennae and prelabral setae—the setae are as 3, 2, 4, just as in *Cyphoderus* spp. but all of them are feathered. Posteriorly many microsetae are subsymmetrically scattered on the vertex together with 1+1 s.s. and there are 1+1 relatively large seta near the posterior part of the cervical area. Cervical marginal setae are quite absent as usual of Cyphoderidae. Setae of the trunk is different from *Setoderus* (Yoshii 1980, Fig. 2, B) in that th.II has no special median marginal setae. S.s. of abd.II, III, IV are the same in number and arrangement, but there is no larger setae attached to them, where there are only small accessory ones. Setae of abd.IV are also poorly developed. Abd.V has a transverse row of serrated setae plus 1+1 s.s.-like setae on both sides of the segment. Setae of abd.VI are not differentiated.

This is the first species of the genus found from outside of Africa. The nearest ally may be *C. anoplotermiensis* Barra, 1969 from Gabon, but different by less number of mucronal teeth. As it has the dorsal row of dental setae and as the facial setae are 3, 2, 2, 2, it seems to be more nearly related to *Cyphoderus* than to *Seeroderus*.

The Indian species reported as *Pseudocyphoderus annandalei* Imms in Yosii 1966, p. 384 belongs also to the genus *Cephalophilus* as already pointed out by Mitra 1976, p. 651 by the reduction of mandible. The difference to the present species is clear by the number of prelabral setae and it may be named as *Cephalophilus mitrai* sp. n. herewith.

The species is named in honour of Drd. Yayuk Rahayuningsih Suhardjono, curator of the Museum Zoologicum Bogoriense.

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