

Entomological Report from the Sabah
Forest Research Centre

No. 3

Paronellid Collembola of Sabah

No. 4

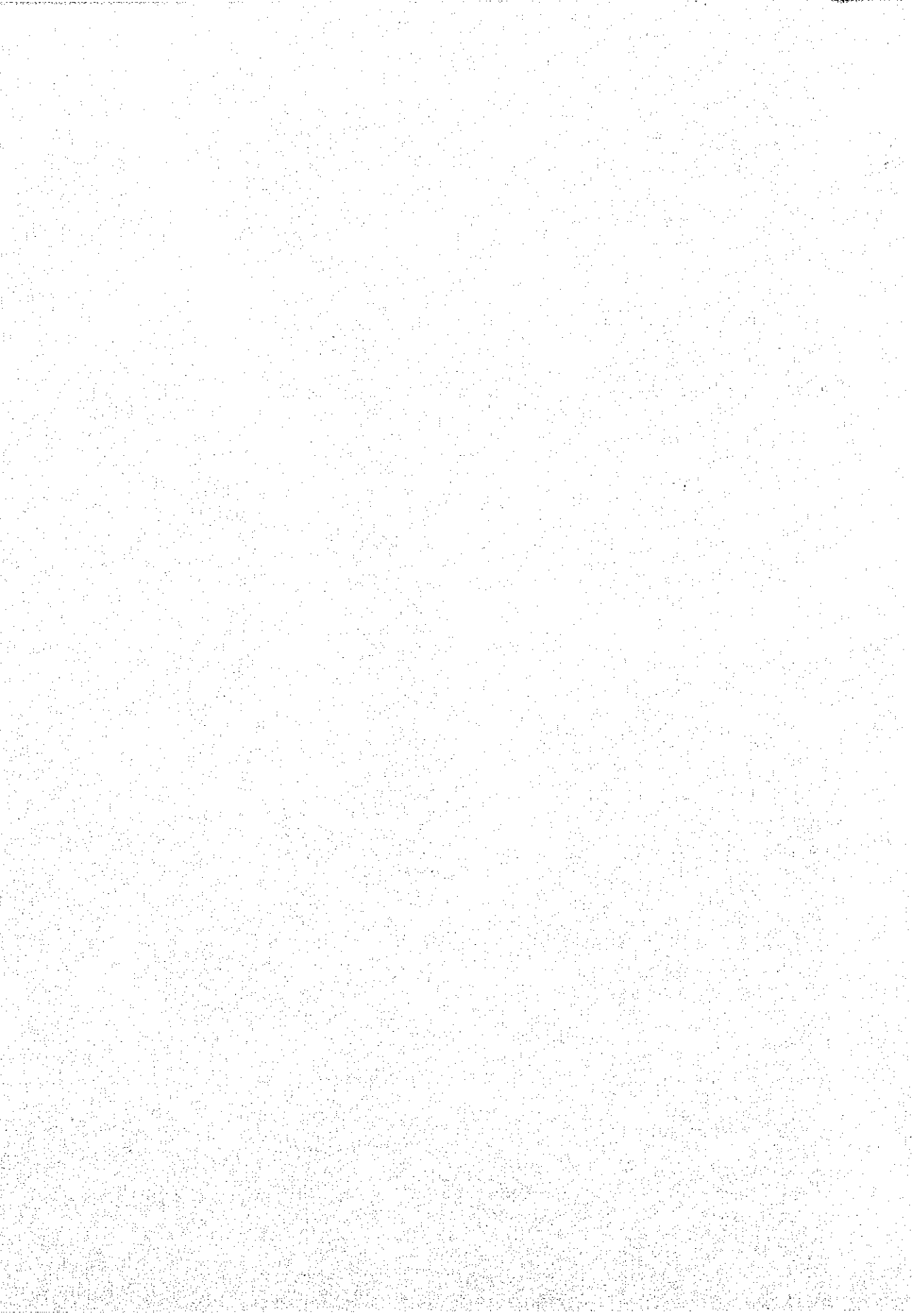
Neanurid Collembola of Sabah

by Ryozo Yoshii (= Riozo Yosii)

March 1981

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Paronellid Collembola of Sabah

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During my staying in the Forest Research Centre in Sepilok, Sandakan in these three years I have worked with the insects causing damages to the forest trees. However, being aware that the pure scientific researches of the silvicultural science must be pursued side by side with the applied scopes of the research, I have undertaken to make the pedobiological analysis of the forest litters. As the result a large amount of collection made both by naked eyes and with the Berlese funnel has been brought to me for inspection and some results have been already published. But the large mass of Paronellidae, which is the most predominant element in the tropical region, has to be studied with special attention as the family is not yet well investigated and very few efforts were paid to systematise them. In the following the conclusion of my research is summarized and as it exhibits a rather satisfactory results for Paronellidae, the same procedure of investigation may be adopted for all Entomobryidae and possibly also for Orchesellidae as well.

Before going further I express my sincere thanks to JICA (Japan International Cooperation Agency) for sending me to Sabah, as well as to the conservator of the Forest Department, Datuk Martyn and Haji Alli Hassan and also to the Senior Research Officer of the Research Centre, Mr. Liew That Chim and Mr. Udarbé, for helping my research in various ways. Hearty thanks are also directed to the staffs of the Entomological Section of the Centre, above all to Saikah Lantoh, Dius Tadong and Mujin Gakial, with whom I have spent nice days of camping and tour in the natural forest of Borneo in various occasions.

Sabahan Paronellidae in my collection comprises of 5 genera, which may be keyed out as:

- | | |
|--|--------------------------|
| 1. Body with scales | 2 |
| Body without scales | <i>Salina</i> |
| 2. Trunk with many macrosetae. Scales roughly sculptured | 3 |
| Trunk without macrosetae. Scales hyaline, very finely sculptured | 4 |
| 3. Antennae normal. Prelabral setae feathered | <i>Callyntrura</i> |
| Antennae heavily setose on ant. I and II. Prelabral setae smooth | <i>Dicranocentroides</i> |
| 4. Mucro bidentate. With femoral organ | <i>Bromacanthus</i> |
| Mucro multidentate, without femoral organ | <i>Microparonella</i> |

Callyntrura Börner, 1906

Genotypical species: *Paronella anopla* Börner, 1906

The genus *Callyntrura* (sensu Yosii 1959) comprises one of the most important group of Collembola in the tropical Asia not only by its abundance in the field, but also by the richness of the species. From the time of Oudemans (1890), Börner (1906) and Handschin (1925, 1929) various species have been reported on the basis of colour pattern of the body. However, being aware of the fact that the colour pattern is floating and quite variable in the same species, it has been tried to replace the specific characters by any other morphological structures. It is not the easy task and since Yosii (1959, 1961) has paid attention to the arrangement of macrosetae as to furnish the key character to each species, the trial is succeeded by Mitra (1974) more intensively in his revisional work of the Indian species. In the present report, which deals with the Sabahan forms of the genus more efforts have been made so that the colour pattern may be regarded as only one of the characters to be studied. First of all the new characters and procedures adopted must be summarized.

Conveniently the example must be decapitated. The head is observed from the dorsal and ventral side. Then the trunk is cut on abd. III. From the anterior half legs and ventral tube are taken off and the example is laid dorso-ventrally to investigate the chaetal arrangement. It is sometimes necessary and possible to take out the gut content by cutting open the ventral side of the body as it obscures the arrangement of the sockets of macrosetae. Posterior half is easier to observe and may be treated in the usual way.

Mouth Parts: Labrum and labium must be investigated. The chaetal arrangement of labrum is always 4/5,5,4 and prelabral setae are always ciliated. Labral margin is either smooth or with 1+1, 2+2 or with more number of rounded tubercles. Noteworthy is that in some species here treated all or the median three setae of the first row are enlarged and blunt ending. The former must be called *Borneaphysa* subg. nov. and the latter must be *Istanaphysa* subg. nov. These modified setae are even ciliate finely and in both cases one basal seta of the outer ramus of maxilla (Fig. 2E) is also turned to blunt seta, which may be also ciliate. Inner side of labrum, which is without structures usually, has a peculiar appendix medially in form of two unequal filamentous processes (Fig. 2D). From the labium the setae of labial basis must be considered. They are MRe/1L (Fig. 2F) in *Borneaphysa* and MRe/1l in *Istanaphysa* (Fig. 8D) with the exception of *C. vexans* m. In some species, however, MMRe/1l may appear (cf. *C. tuhan* m.).

Chaetotaxy: As already known the chaetal pattern is essential for the diagnosis of the species. But there must be some comments as to its systematic understandings.

I. Head: Mitra (1974) is the first who has tried to note the chaetal arrangement of the head in letters. In fig. 1, A the chaetal pattern is diagrammatically illustrated with a slight modification from his diagram. Setae of the head may be grouped in the following way.

1. Antennal group Base of antennae has a row of setae 5-6 in number (an_1 , an_2). They are located almost equidistant, but an_4 , an_5 may be a little broader. Since there is no great difference in their arrangement among the species here treated, the group is not very promising for the identification of species.
2. Subdorsal or ocular group This is a set of 5 setae arranged along the dorsal side of the eye-field. Additionally there is one seta sd' between near sd_2 and sd_3 . This group is rather variable and not easy to observe, especially when the example is not fully mature.
3. Frontal group There are 4+4 minute spines on the frontal area (Frontal spines). They are either simple or slightly barbed. Around the frontal spines there is a complex of setae

as illustrated in fig. 1, C. Two median setae d_0 and d_0' and a paired row of d_1 to d_5 are always to be seen. A pair of large D is always present and there are some small setae connecting D to sd_5 . They are not easy to observe and, even when well observed, seems to furnish no specific characters.

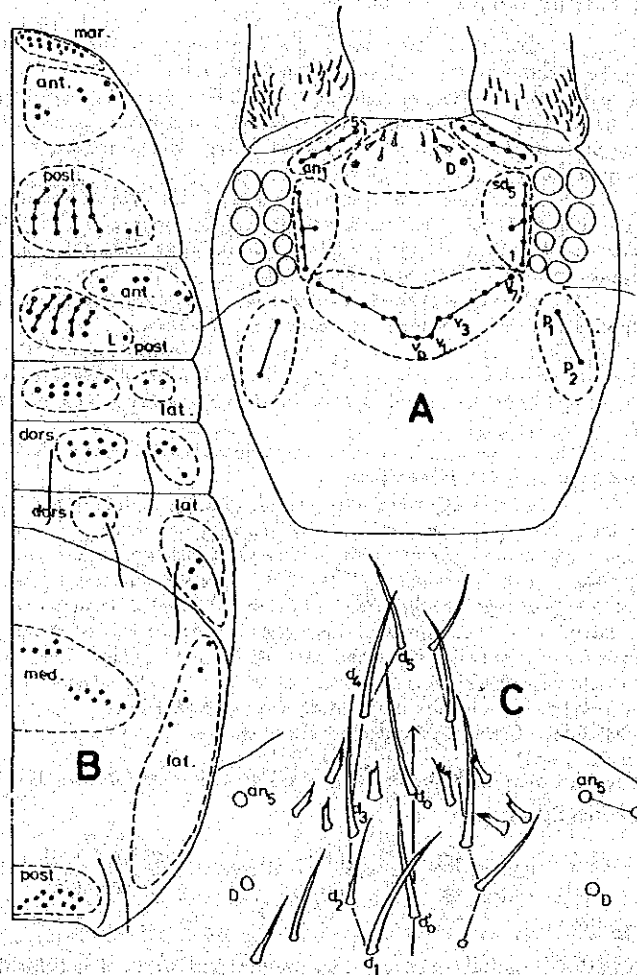


Fig. 1 Chaetal arrangement

4. Vertical group This seems to be the most important group of setae of the head: A series of setae along the posterior margin of area verticalis is relatively constant in their arrangement. First of all the median seta v_0 is either present or absent according to the species. Usually there is an inverted trapezoidal arrangement of setae made by v_1 and v_2 and then follows a linear arrangement of v_3 to v_5 to the side. In some cases v_3 is also absent. It is in *Borneaphysa* spp. where such deviation occurs, whereas in the majority of *Istanaphysa* spp. here treated all of them are present.
5. Posterior group It is composed only with two setae (p_1 and p_2) in all species here treated. This is rather simple compared to other genera of Paronellidae. Seta p_2 may be absent in *C. semiviolacea* (Hds.) according to Mitra (1974, fig. 15).

Trunk: Mitra (1974) has divided the chaetal arrangement of the trunk into many longitudinal zones. This method is not advisable as it is rather difficult to distinguish for

each seta to identify whether it is belonging to one of the certain zone or another. Actually some of the setae are arranged not in the longitudinal direction and in the species with fewer macrosetae it is quite impossible to divide them into zonal groups in such a compulsory way. Practically they may be divided into groups as in fig. 1. B and each group may be investigated one by one. In general their pattern of arrangement is more important for the taxonomy than the number of setae.

1. Mesothorax Numerous setae along the fore-margin of the segment comprise the "marginal group" and although they are specified in *Salina*, it is not very important in *Callyntrura* and restricted to the anterior margin. Anterior group is few in number and their number and arrangement is fairly constant according to my experience in Sabahan species, while in the posterior group the pattern of arrangement is important. Often there is one seta remote to the side (L-seta), whose presence or absence is specific.
2. Metathorax Marginal group is along the side of the segment and anterior group of th.III is halfway turned to the side. The arrangement of this anterior group is fixed for each species and indispensable for identification. The posterior group is just as that of th.II by its importance. In some species the presence of L-seta may be detected.
3. Abd. I Dorsal group is in two transverse irregular rows and lateral group constitutes by 2 setae in the species here treated. When L-seta exists it is 3 in number.
4. Abd. II There are two s.s. on the segment. The arrangement of the dorsal group, which are between these two s.s. is variable, but the number of setae is fairly fixed in some species. Lateral group is conspicuously 3 in *Borneaphysa* and 4 in *Istanaphysa* with the exception of *C. vexans* m.
5. Abd. III There are 3 s.s. laterally. Dorsal group is always 2 in number, but lateral group seems to be variable, but not well investigated.
6. Abd. IV There is a transverse row of setae near the middle of the segment and this median group may be either in one transverse row (*Istanaphysa*) or may be divided into antero-dorsal and posterolateral group (*Borneaphysa*). This last type of arrangement is already known in *C. semiviolacea* (Hds.) of India (Mitra, 1974). Lateral group may be again divided into anterior and posterior subgroups, but they were not yet well orientated. Posterior group is lying just before the hind margin of the segment. In some species it is numerous and in others the number is fewer. But their range is not very stable and only reliable as the whole. There are two pairs of s.s. lying near together on the postero-lateral part of the segment. Some additional s.s.-like setae are also present near by. But they are more thickly built and may not be the true s.s., but a kind of setae which may be found also on the ventral tube of *Borneaphysa* (vide infra).

Referring the system proposed above the chaetal arrangement presented in Fig 1, B may be expressed numerically as:

th.II:	ant.	3/2/2,	post.	4,4,3,4/L
th.III:	ant.	2/2/2,	post.	2,4,4,4,3/L
abd.I:	9/2.	abd.II:	s/7/s/4.	

In some species the chaetal pattern is very simple, but when it is fully developed the posterior group of th.II is in 4 longitudinal rows and that of th.III is in 5 rows.

Antennae: Length of antennae may be indicated by the ratio of ant.I: head, as the distal segments may easily fall off. In Sabahan examples it is found that the *Borneaphysa* has very long, slender antennae compared to the species of *Istanaphysa* and that they may be easily separated even without detailed inspection. Antennae are scaled up to the distal segment in *Handschinphysa* and *Istanaphysa*, but unscaled in *Borneaphysa*.

Around the basis of ant.I (Fig. 1A) there is a ring of small, simple setae grouped in a mass on its outer corner, which may be called as ant.I-organ. But it is present in all species and there is no specific difference. The organ is poorly represented in *Salina* and *Microparonella* than in *Callyntrura*.

Legs (Fig. 3A): For the legs very few is to be added. Unguis has a pair of dorsal teeth

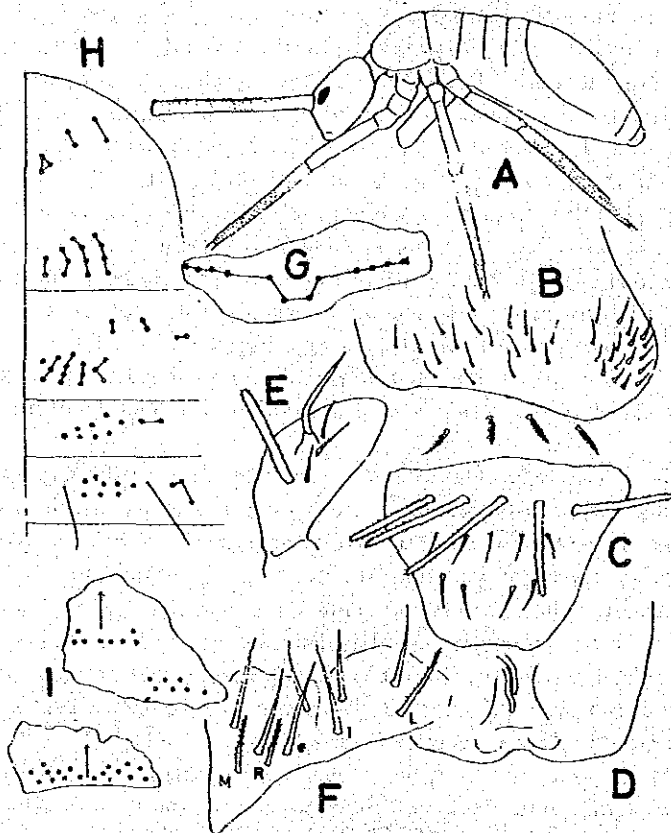


Fig. 2. *Callyntrura (Borneaphysa) borneensis* sp. n.

A: Habitus, B: Ant. I-organ, C: Labrum, D: Inner side of labrum, E: Outer ramus of maxilla, G: V-group of setae of the head, H: Chaetal arrangement of the trunk.

and one paired and one unpaired teeth on the inner side. Unguiculus is half truncate and half lanceolate especially on hind legs. Tenent hair is long and with a broad apex. In *C. bundu* m. the unguiculus has always one outer tooth at the basis of the outer side. Trochanteral organ (Fig. 3E) is composed of many, more than 40 small but rather thick setae, lateral ones are larger. In *Callyntrura* they are not extended to the femoral region in contrast to *Salina*. Scales are present up to femur in *Handschinphysa* and *Istanaphysa*, but absent in *Borneaphysa*.

Ventral Tube: Ventral tube is elongate and unscaled. In *Borneaphysa* (Fig. 3, B) posterior face has the 2+2 long setae very alike to s.s. with its barbed structure. They are quite absent in other subgenera and may serve one other ground to separate them. Anterior face is provided with some 6+6 strong terminal setae and some smaller ones. Lateral flap has both smooth and ciliate setae in *Handschinphysa*, while there are only smooth setae in other groups. Terminal tubule has one diverticulum at about the middle in all species, whose presence is already well known in Paronellid genera (Carpenter, 1917, Stach 1965 etc.).

Furca: In the majority of the species of *Istanaphysa* here treated the dens is provided with a row of spines on its inner dorsal side. Sometimes it is well chitinized and brownish, but usually pale and hyaline, and in *Borneaphysa* and *Handschinphysa* of Sabah the spines are quite absent. Terminal vesicle of dens, which is the key character of *Handschinphysa* is not difficult to find out. Sometimes, however, there may appear a kind of swelling just at the distal corner of the segment to mucro, which is by no means the real dental vesicle, but only the dorsal swelling of dens and they must not be confused. The real vesicle appears a little distant from the mucronal end. Form and structure of the mucro is, as already stated by Mitra (l.c.), not reliable to represent species. However, the general form, whether it is long or short, whether parallel or converging may be useful to identify the species. Setae around the basis of the mucro is thicker, but it is not very specialized as in *Pseudoparonella* and hardly to be adopted as the key character.

Male Genital Opening: As already cited in Mitra (l.c.), there is no fundamental difference of this organ in all species treated here. The structure is quite different from *Salina* spp.

Tenaculum: (Fig. 3, F): Tenaculum of *Callyntrura* is enough complicated. Anteriorly there is one curving seta strongly developed and brownish in colour, which may correspond to the "Hook arising from the second abdominal segment" of Folsom 1924 (P1.4, fig. 33) in *Paronella segmentata* of Sumatra. Anterior to the quadridentate ramus there is an elongate appendix arising from the base of ramus and its posterior side has a large round swelling. Between them one prominent, round median swelling is present together with an insignificant another one posterior to it. The feature is already partly noted in *Aphysa villosa* of Java (Handschin 1925, p.262, fig. 81). The structure is common in all species of *Callyntrura* and no specific difference is to be observed.

Colour Pattern: In some species with peculiar colour pattern of the body (cf. *C. vestita*-group) the pattern is quite fixed, but usually there may appear both depicted and infuscated forms in each species beside the normal examples with typical pattern characteristic to each species. In the pale form some of the patches and pattern of the body are absent, other patterns are remaining in a vestigial way. In dark form, however, not only the normal pattern is enhanced, but also there may appear new elements and what is most conspicuous is the appearance of many longitudinal streaks on the anterior half of abd. IV. As this character is frequently used to represent species in the old literatures, the identification of such species as *C. florensis* (Oud.), *C. sumatrana* (Oud.) etc. is the matter of considerable difficulty. Sometimes the pattern of antennae and legs are more reliable than of the body.

Often I have experienced in the Bornean species the colour pattern is relatively constant in the examples from one collection site, which is slightly different from examples of other collection sites. In accordance with the difference of colour pattern, their chaetal pattern is also slightly different according to the locality showing that their genetical constitution is not the same, although these differences are too small to establish new species to each of them. Since the species of *Callyntrura* is to be identified after the peculiarities of chaetal pattern and others beside the colour pattern of the body, it is almost impossible to identify the species already described by the previous authors from tropical Asia and I have to ignore almost all of them until the details of the body are known by recovering of the topotypical specimens.

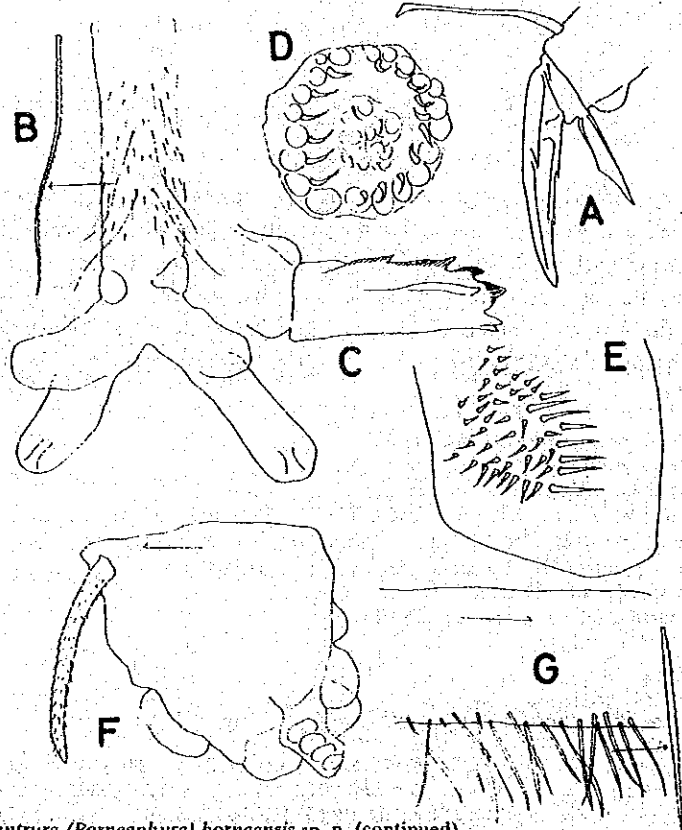


Fig. 3 *Callyntrura (Borneaphysa) borneensis* sp. n. (continued).
 A: Hind claw, B: Ventral tube (Posterior face), C: Mucro, D: Male genital orifice,
 E: Trochanteral organ, F: Tenaculum, G: Ventral scaly setae of dens (lat. view).

Sabahan species may be grouped in three subgenera as:

- | | |
|---|-----------------------------|
| 1. With terminal vesicle on dens | <i>Handschinphysa</i> Paclt |
| Without terminal vesicle on dens | 2 |
| 2. All five setae of the first row of labrum blunt and finely ciliate. Antennae relatively long | <i>Borneaphysa</i> subg. n. |
| Median three setae of the first row of labrum blunt. Others slender and pointed. | |
| Antennae relatively short | <i>Istanaphysa</i> subg. n. |

In dividing the genus *Callyntrura* into such subgenera there is a difficulty, which can not be solved. We know nothing about the detailed structures of the genotypical species, *C. anopla* (Börner) of Java nor of *C. longicornis* (Oud.), the type species of *Aphysa* Hds., 1925. When these species are recovered and well investigated some of the subgenera established must be a junior synonym of them. Presumably the subgenus *Borneaphysa* m. is most susceptible to be a junior synonym of *Callyntrura* (s. str.).

For the research of *Callyntrura* the mouth parts and other extremities must be investigated at first to identify the subgenus and then the study of the chaetal pattern must follow for the identification of species. Furthermore, the inspection of many examples is

very desirable, if not obligatory, as the characters concerned may be variable in a wide range.

Borneaphysa subg. nov.

Typical Species: *Callyntrura borneensis* sp. n.

As mentioned before the subgenus is well represented by the blunt setae of the first row of labrum. Antennae are longer than in others and without scales. Setae of the labial basis is constantly as MRe/1L. Ventral tube has 2+2 s.s.-like setae on its posterior face and dens has neither dental spines nor terminal vesicle. In the chaetal arrangement of abd.IV the median group is divided to the anterior dorsal and posterior lateral groups. Lateral group of abd.II is always 3 in number. V-group of setae of the head has reduction of number.

- | | |
|--|-----------------------------|
| 1. Anterior group of th.II as 3/2/2 or 3/3/2 | 2 |
| Anterior group of th.II as 2/2/2 or 2/1/1 | 3 |
| 2. Unguiculus without outer basal tooth | 4 |
| Unguiculus with one outer basal tooth. With seta L on th.II and III. | <i>C. bundu</i> m. |
| 3. Anterior group of th.II as 2/2/2/ Pale species with few patches | <i>C. signata</i> m. |
| Anterior group of th.II as 2/1/1. With peculiar dorsal patches | <i>C. pulchra</i> m. |
| 4. Pale species without seta L. | <i>C. borneensis</i> m. |
| Coloured species with seta L on th.III | <i>C. lahaddatuensis</i> m. |

Callyntrura (Borneaphysa) borneensis sp. n., Fig. 2, 3, 4

Gum Gum, (18 ex. 18.IX 1978, m.); Sepilok (25 ex. 12.I 1980, m.); Poring (19 ex. 30.XI 1979, m.); Ranau Pass (12 ex. 11.I 1980, m.); Nalapak (12 ex. 12.I 1980, m.); Tamparuli (10 ex. 8.I 1980, m.); Sungai Segaliud (11 ex. 11.XI 1979, Saikeh Lantoh), Mostyn (25 ex. 9.VII 1980, m.)

Body length ca. 2.5 mm, colour pale white all over, head is lightly brownish. Antennae distally infusate. Legs are lightly suffused violet on tibiotarsus. Ventral tube and furca pale. Antennae very slender and long, ant.1: head being 25:10. Labral setae (Fig.2,C) 4/5,5,4. Prelabral setae plumose. All five setae of the first row are converted to blunt and lightly ciliate setae. Labral margin has no structures and its inner side (Fig. 2, D) has two unequally long tubulate processes, which is common with all other species of the genus. Labial basis has setae as MRe/1L (Fig. 2, F) as typical for *Borneaphysa*. Eyes 8+8, black. Frontal 4+4 spines lightly rugose (Fig. 2, C). Legs very long, unguis (Fig.3,A) elongate, unguiculus lightly truncate on distal half, the proximal half is almost parallel. Tenent hair is thick basally, smooth all over and inflated distally. Trochanteral organ (Fig. 3, F) is an assembly of ca. 50 smooth and spiny setae in a quadrangle. Ventral tube is long, anterior face hirsute and with ca. 6+6 terminal setae longer and more distinctly ciliate. Posterior face (Fig. 3, B) is also hirsute with slender smooth setae and among them, there are 2+2 very long setae intensely feathers and look like s.s. in appearance. Lateral flap has ca. 25 all smooth setae. Terminal tubule has a diverticulum at about the middle. Rami tenaculi not specialized (Fig. 3, F). Male genital orifice (Fig. 3, D) not different from that of other species of the genus. Furca in ratio as man: d = 9 : 10 Dens is not converging, without spines and without distal vesicle and its scales are very thin (Fig. 3, G) that they can not be marked as scales. Mucro is rather long, with 6-7 teeth as in others in principle. Integument is heavily beset with brownish to blackish narrowly fusi-

form scales. Macrosetae are also brown and distally lanceolate.

Chaetal pattern is as follows: On the head v-group has no v_0 nor v_3 . On the trunk it is as:

th.II:	ant. 3/2/2,	post. 2,3(4), 4,4.
th.III:	ant. 2/2/2,	post. 1,3,4,4(3),3.
abd.I:	8-10/2	abd.II: s/7-8/s/3.

On abd. IV the median group is in two groups and posterior group is ca. 10+10.

Type: One male from Gum Gum Forest near Sandakan.

This is the commonest species of *Callyntrura* to be found in Sabah and may be identified easily with its long antennae and pale body colour. In nature it likes to live in the freshly fallen leaves of the forest.

C. borneensis is comparable to *Paronella dubia* var. *pallescens* Börner, 1913 of Java in the colouration, but the exact identification is impossible by the lack of the knowledge about the crucial characters. In the type series from Gum Gum the antennae and body are quite pale, while the Poring examples are suffused with brownish pigments along the lateral margin of each segment (Fig. 4). This colour may disappear after some time when the examples are preserved in alcohol. The chaetal pattern (Fig. 4, C) is slightly different from the pale typical ones, but it may be within the scope of its variability.

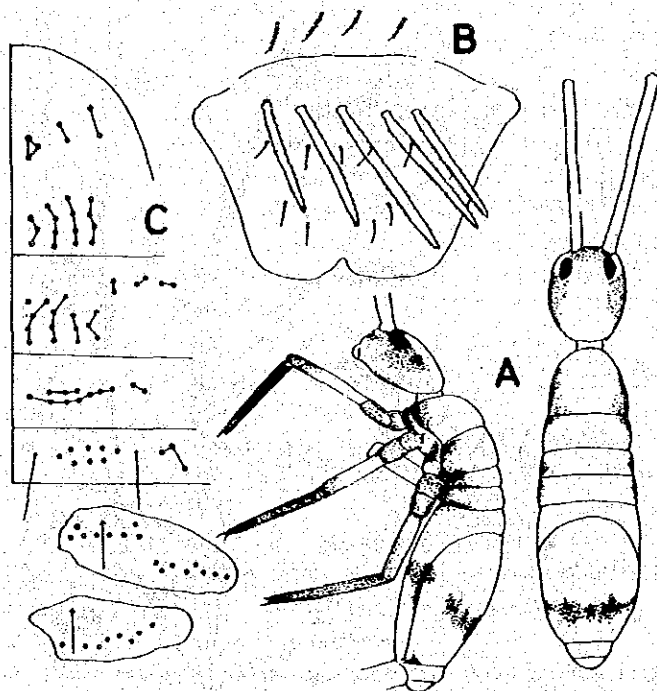


Fig. 4 *Callyntrura (Borneaphysa) borneensis* sp. n. from Poring
A: Habitus, B: Labrum, C: Chaetal pattern of the trunk.

Callyntrura (Borneaphysa) signata sp. n.

Fig. 5

Tamparuli (13 ex. 8.I 1980, m), Kalawat (5 ex. 6.I 1980, m et Dius Tadong), Penampang (18 ex. 7.I 1980, m, et Dius Tadong)

Body length up to 2.5 mm. Ground colour white, banded with brownish pigments. Head mottled on antennal basis and along the sides passing the eye-field. On the trunk sides of each segments have a patch except on th.III and abd.IV, where it is interrupted. Besides there is a strong dorsal transverse patch dorsally on abd.III. Abd.IV has a diffuse brownish band dorsally on the posterior part. Antennae are with a narrow streak laterally. Legs are dark on proximal two segments. Femur and tibiotarsus dark or banded. Ventral tube and furca almost pale. Antennae very long, ant.I: head being 90:30 in length. Labral setae typically of the *Borneaphysa* type and labral margin has a small vellum at the middle. Legs, ventral tube and furca as in *C. borneensis*. Chaetal pattern is as:

th.II:	ant. 2/2/2,	post. 2,4,4,4.
th.III:	ant. 2/2/2,	post. 1,3,4,3,3.
abd.I:	1/8/2.	abd.II: s/8/s/3.
abd.IV:	Median gr. in two subgroups, Post. gr. ca. 9+9.	

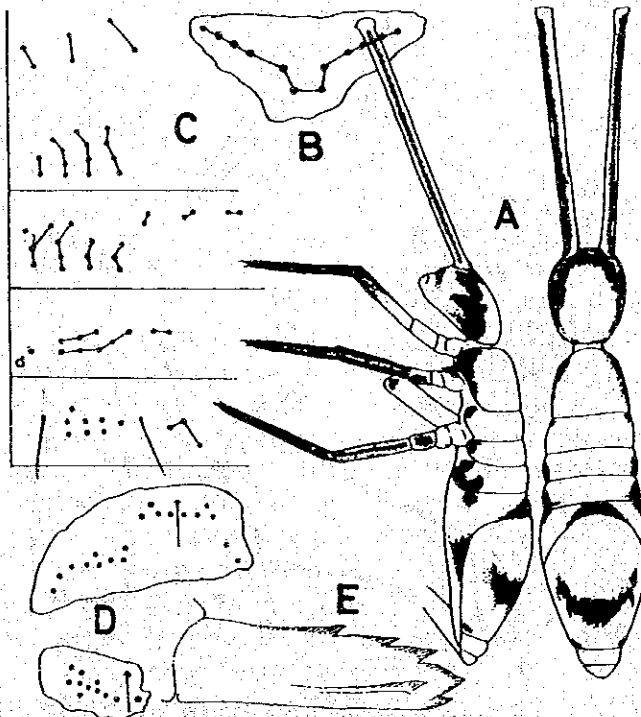


Fig. 5 *Callyntrura (Borneaphysa) signata* sp. n.

A: Habitus, B: V-group of setae of the head, C: Chaetal arrangement of the trunk (D on abd. I is the d-seta), D: Setae on abd. IV, E: Mucro.

The difference to *C. borneensis* m. is, beside the different colouration of the body, consists of the setal number of the anterior group of th.II, which is 2/2/2 constantly and never 3/2/2 in this species. Presence of one seta d on abd.I is also constant.

Typus: One example from Penampang.

Callyntrura (Borneaphysa) bundu sp. n.

Fig. 6

Bundu Tuhan (25 ex. 1.I 1980, m.), Kamborangah (many ex. 3.I 1980, Saikeh Lantoh), Gunung Alab (4 ex. 7.I 1980, Dius Tadong), Ranau (23 ex. 25.V 1980, m.), Pakka, Mt. Kinabalu (5 ex. 17.VI 1980 Mujin)

Body length up to 2.7 mm. Ground colour dirty white, mottled with bluish black pigments all over. It is intense on antennal basis and on the sides of the head, along the margin of th.II, III, abd.I and II. Abd.III is banded dorsally and laterally. Abd.IV has a transverse band at the middle, continuous to the sides. Anogenital area dark. Antennae darkly pale, but the distal end of ant.I and II and whole of ant.III, IV are intensely pigmented. Legs are dark on coxal basis and deeply pigmented on all tibiotarsus. Ventral tube and distal end of furca diffusely pigmented. Ant.I: head as 75:40 Labral setae 4/5,5,4 of which all five setae of the first row are all elongate, broadly blunt and heavily ciliated. Labral margin has no structures, but with a small emargination at the middle. Outer ramus of maxilla has a basal seta blunt and ciliate. Labial basis with setae as MRe/1L. Legs elongate. Unguis, is rather broad and with usual arrangement of teeth. Unguiculus is peculiarly modified, it is with a broad outer lamella, which has a basal corner developed to the distinct tooth. Inner side is also lamellate. Tenent hair is normally long and the opposite seta of hind leg is enormously long and lightly filiform on apex (Fig. 6, E). Trochanteral organ is ca. 50 spiny setae in a quadrangle. Ventral tube long, apical tubule biramous and its posterior face has 2+2 s.s.-like setae. Lateral flap with many smooth setae. Tenaculum normal. Furca with mand as 5:8. Dens is without spines and without vesicular appendix. Mucro is converging, not elongate and with all 7 teeth well represented.

Chaetal arrangement of the head is without v_0 and with or without v_3 . On the trunk it is as in fig. 6,C,D which may be assigned as:

th.II:	ant. 3/3/2,	post. 3,4,4,4/L.
th.III:	ant. 2/2/2,	post. 1,4,4,3,3/L.
abd.I:	2/9/2.	abd.II: s/8/s/3.

Median group of abd.IV is divided and posterior group is more numerous than in *C. borneensis* m. The presence of seta L on th.II and III and of two d-setae on abd.I is characteristic.

The species is near *C. signata* m. in the body colour pattern save that abd.II is not wholly banded. Other details of the body is also alike to it, but clearly different by the shape of unguiculus, elongate opposite seta of hind tibiotarsus and by the converging mucro. Difference in the chaetal pattern is as stated above.

Bundu is a kind of tree belonging to Anacardiaceae in the local Kadazan language and also the name of the village.

Typus: One male from Bundu Tuhan at the foot of Mt. Kinabalu.

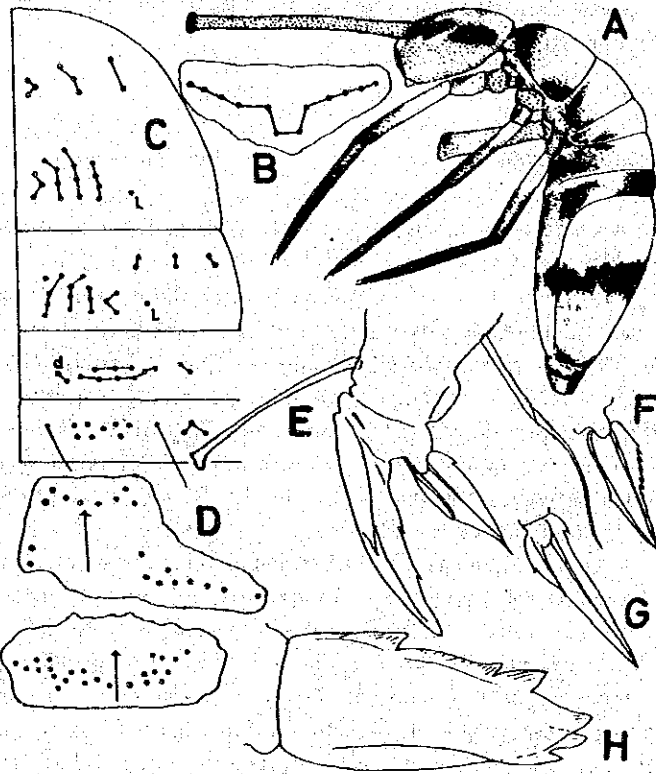


Fig. 6 *Callyntrura (Borneaphysa) bundu* sp. n.

A: Habitus, B: V-group of the head, C: th. II to abd. 2, D: Median and posterior group of abd. 4, F, G: Unguiculus, H: Mucro.

Callyntrura (Borneaphysa) pulchra sp. n.

Fig. 7

Telupid (23 ex. 20.IX 1979, m.), Sepilok (19 ex. 24.X 1979, m.), Sungai Segaliud (1 ex. 5.XI 1979, Saikoh Lantoh), Gunung Alab (3 ex. 7.I 1980, m.), Garinono nr. Sandakan (21 ex. 14.III 1980, m.) Kinabatangan (3 ex. 6.VII 1980 m.)

Body length up to 2.8 mm, slender in general form. Ground colour white, with deep black patches. Head is only with pigmented antennal basis. Trunk has a median dorsal patch on th.II, III and on abd.III. Each of them are triangular in form. Abd.IV is patched on median dorsum in a quadrangular area. Sides of abd.I-III are faintly mottled. Antennal segments are slightly pigmented near distal end. Legs are almost pale, but each tibiotarsus is a little bluish and hind trochanter is dark. Ventral tube and furca are pale. Antennae slender, ant.I: head as almost 3:1. Labral setae 4/5,5,4. Prelabral setae barbed and all 5 setae of the first row are blunt and heavily ciliate. Labral margin without structures, but often with transverse ridges. Basal seta of the outer maxillary ramus very thick, blunt ending and ciliate all over. Labial basal setae as M-Re/1L. Legs are very slender, unguis

and unguiculus normal. Tenent hair is broadly expanded distally. Trochanteral organ composed of ca. 45 spiny setae in a quadrangle. Ventral tube is very slender, with 6 terminal large setae. Posterior face has s.s.-like long setae. Lateral flap is only with smooth setae and terminal tubule is with a diverticulum. Tenaculum normal. Furca very long, mand as 8:15. Dens is without spines and without vesicular appendix. Mucro is long, not converging.

Chaetal pattern is relatively simple and almost fixed. On the head v-group (Fig. 7, B) has no v_0 and no v_3 and even v_1 may be absent. That of the trunk is as in Fig. 7, C, where L-seta is absent and d-seta is present on abd.I. That abd.II has only one lateral seta is conspicuous.

th.II:	ant. 2/2/1,	post. 2,3,3,3.
th.III:	ant. 2/1/2,	post. 1,3,4,3,2.
abd.I:	1/3/2.	abd.II: s/5/s/1.

Median group of abd.IV is clearly divided to anterodorsal and posterolateral groups and posterior group of the segment is with ca. 10+10 setae.

Typus: One female from Telupid.

The species is very well defined with its peculiar colour pattern of the body. Chaetal pattern is also characteristic. Anterior group of th.III is 2/1/2 instead of 2/2/2 of other species. On abd.I the lateral group is absent and on abd.II setae are s/5/s/1 instead of s/5/s/3 of others. Examples from *Brumas* nr. Tawau (4 ex. 23.IX 1979, m.) differs from the typical form by the absence of the dorsal marking on th.II and III. They are, however, quite equal with the typical form in other respects including the chaetal pattern.

The species may be comparable with *Paronella flava* Carpenter, 1917 from Burma,

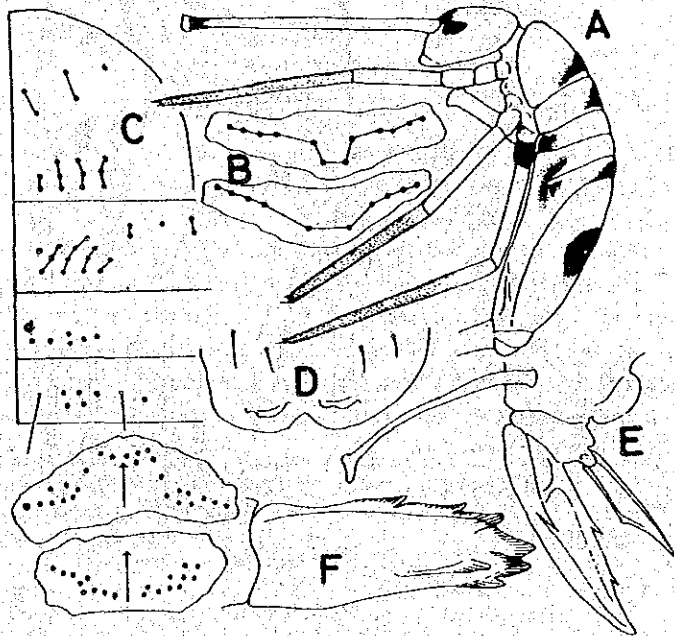


Fig. 7 *Callyntrura (Borneaphysa) pulchra* sp. n.

A: Habitus, B: V-group of the head (two cases), C: Chaetal arrangement of the trunk, D: Labral margin, E: Hind claw, F: Mucro.

by which only th.II, III are dorsally patched. But in this species the antennae are not elongate. Description of *P. anopla* Börner, 1906 coincides to this species especially to those which has no patches on th.II and III.

Callyntrura (Borneaphysa) lahaddatuensis sp. n.

Fig.. 8

Between Batu Puteh and Lahad Datu (26 ex. 5.VII 1980, m.), 1 m. south of Kunak (3 ex. 6.VII 1980, m.)

Body length up to 3.0 mm. Ground colour white, suffused with brownish pigments. Head is diffusely pigmented all over, especially on its anterior half. Eyes intensely black. On the trunk lateral margins of th.II to abd.III are suffused with brownish dark pigments. Abd.III is with a conspicuous transverse band continuous to the sides. Abd.IV is diffusely pigmented brown on its posterior half. Abd.V and VI are also in the same colour.

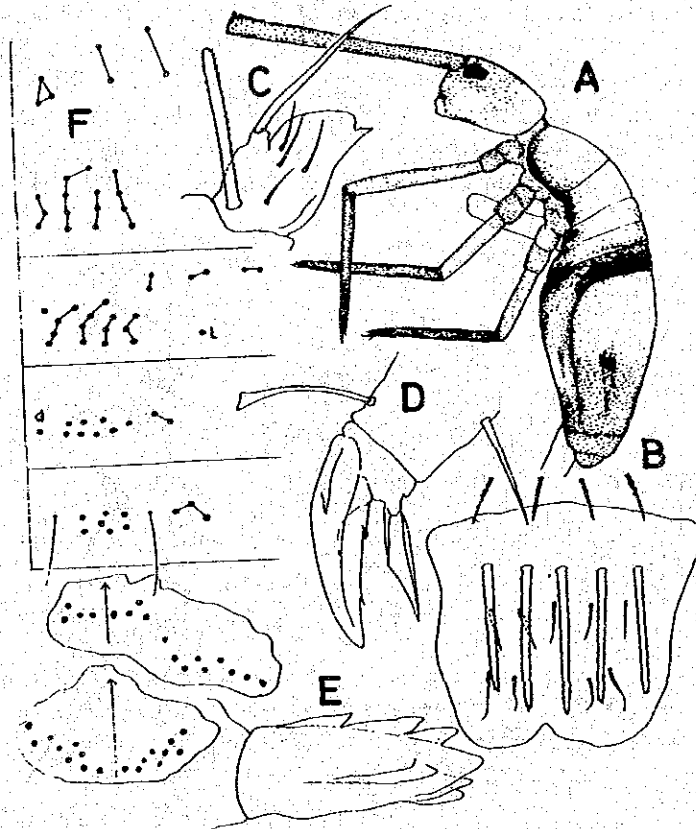


Fig. 8. *Callyntrura (Borneaphysa) lahaddatuensis* sp. n.

A: Habitus, B: Labrum, C: Outer maxillary ramus, D: Hind claw, E: Mucro, F: Chaetal pattern of the trunk.

Antennae and legs are brownish shadowed, deeper on all tibiotarsi. Ventral tube and furca pale. Ant.I: head as 85:40. Antennae unscaled. Eyes 8+8. Labral setae 4/5,5,4, the first row blunt, thick and ciliate. Labral margin has no tubercles but with a median intrusion. Outer ramus of maxilla has a basal seta very broad, blunt and ciliate. Legs long. Unguis is rather broad and short, not much longer than unguiculus, dorsally carinate and with a pair of dorsal and inner proximal teeth. The latter is basally situated. One inner distal tooth is small. Unguiculus faintly truncate, but pointed on apex. Tenent hair is rather short, with enlarged distal end in form of a triangle. Opposite seta of hind legs is straight and spicose. Trochanteral organ composed of ca. 30 spiny setae. Ventral tube has 2+2 s.s.-like setae. Furca with mand as 50:67. Dens bears no scales nor spines. Mucro is elongate-type, with 7 teeth in usual arrangement. The lateral one often with serration.

Chaetal pattern is reduced on v-group of the head. v_0 is always absent, v_3 is usually absent and in rare cases even v_1 is absent. On the trunk the macrosetae are arranged as:

th.II:	ant. 3/2/2,	post. 3,5,3,(4) 4.
th.III:	ant. 2/2/2,	post. 1,4,4,3,3/L.
abd.I:	d/2,2,2,2/2.	abd.II: s/8/s/3.

On abd.IV median group is divided, typical for *Borneaphysa* and posterior group is ca. 10+10.

In the colouration of the body the species is near *C. signata* m., but the pattern is brownish in this species and not blackish. The most decided character of this species is the presence of L on the posterior group of th.III, by which it may be distinguished from all other members of the subgenus. This seta does not appear, however, on th.II in contrast to *C. bundu* m.

Istanaphysa subg. nov.

Typical species: *Callyntrura (Istanaphysa) istana* sp. n.

From the first row of labral setae the median three are blunt ending, but not ciliate. Basal seta of the outer ramus of maxilla is also blunt ending. Compared to *Borneaphysa* m. antennae are shorter and mucro is relatively small. Posterior face of ventral tube without s.s.-like setae. Basal setae of labium with 1₂ and lateral setae of abd.II is 4 in number with the exception of *C. vexans* m. Dens has a row of spines. Antennae and legs with scales.

This is the most prevalent group of the genus in Sabah and differentiated to many species. Sometimes the blunt setae of labrum is half pointed and in this case the basal seta of the outer ramus of maxilla may be the most important key character to separate this subgenus from some species by which all these setae are sharply pointed.

1. Labial basis with setae MRe/11. Lateral group of abd.II as 3 *C. vexans* m.
Labial basis with setae MRe/11 or MMRe/11. Lateral group of abd.II 4 2
2. Labial basis with setae MMRe/11 *C. tuhan* m.
Labial basis with setae MRe/11 3
3. Anterior group of th.II as 5/3/1. Antennae heavily banded *C. aplana* m.
Anterior group of th.II as 4/3/1. Abd.IV with two transverse bands *C. mostynensis* m.
Anterior group of th.II as 3/3/1. Patched with brownish black pigments. *C. istana* m.
Anterior group of th.II as 3/2/1. Eye pigment reduced. Patched only on posterior part of abd.IV *C. tawauensis* m.
Anterior group of th.II as 2/2/1. Trunk with a longitudinal lateral band. *C. miruluensis* m.
Anterior group of th.II as 2/1/1. Body heavily mottled with black pigments. *C. merah* m.

Callyntrura (Istanaphysa) istana sp. n.

Fig. 9

Aphysa dubia Schött, 1925, Junior homonym

Sandakan (87 ex. 12.III 1980, m.), Sepilok Laut (6 ex. 1.III 1980, Saikeh Lantoh), Sungai Segaliud (1 ex. 12.XI 1979, Saikeh Lantoh), Ranau (12 ex. 11.I 1980, m.), Gum Gum (18 ex. 2.IV 1980, m.), Sepilok (4 ex. 12.IV 1979, m.), Poring (25 ex. 21.V 1980, m.), Kunak (30 ex. 7.I 1980, m. et Dius Tadong)

Body length ca 2.5 mm: Ground colour brownish pale and with brownish black patches. Head has a broad transverse band anteriorly across the eye patches. Th.II is patched on anterior half or all over sometimes. Th.III to abd.II are patched laterally leaving a pale dorsal area. Abd.III is deeper pigmented all over. Abd.IV has a transverse band on the posterior half leaving the pale marginal area. Laterally there is a large patch deep in colour and with black spots along the anterior border of the segment. Abd. V is pigmented laterally and abd.VI is pale. Antennae pale and diffusely pigmented. Legs have obscure patches on each tibiotarsus and femur, they are pale in fore-legs and deeper on hind legs. Trochanter of hind legs is coloured. Ventral tube and furcula faintly pigmented.

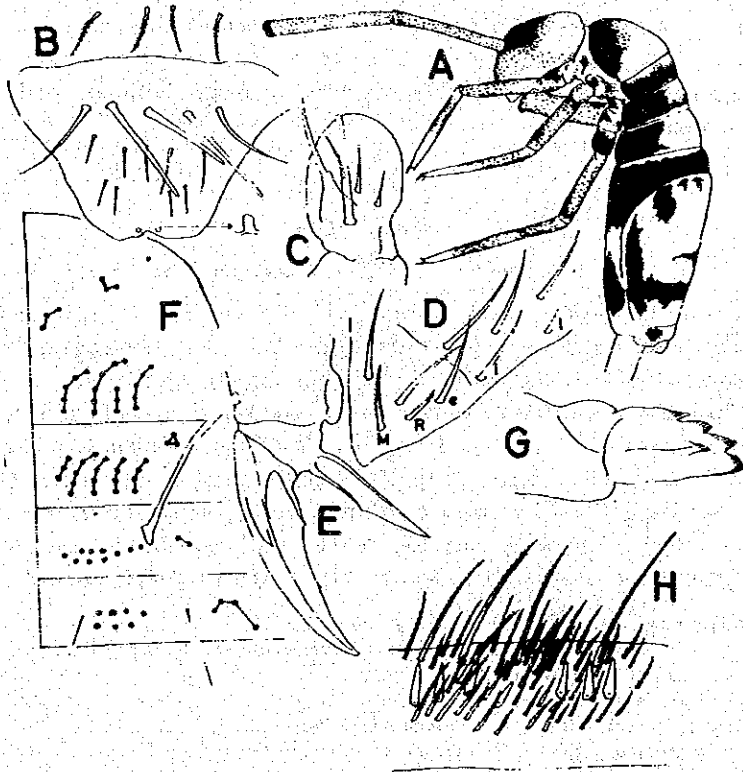


Fig. 9 *Callyntrura (Istanaphysa) istana* sp. n.

A: Habitus, B: Labrum, C: Outer ramus of maxilla, D: Labial basis, E: Hind claw, F: Chaetal arrangement of the trunk, G: Mucro, H: Inner side of dens with spines.

Ant.I: head as 40:45, so that the antennae are rather short. Eyes 8+8, black. Labrum (fig. B) with setae 4/5,5,4. Prelabral setae ciliate, the median three setae of the first row are thick and blunt ending. Labral margin has a pair of tubercles. Outer ramus of maxilla (fig. C) has a seta turned to a blunt smooth seta. Setae of labial basis (fig. D) as MRe/11. Unguis (fig. E) rather broad, with two inner teeth. Unguiculus lightly truncate and tenent hair is not much inflated. Trochanteral organ well developed and composed of ca. 50 simple spines. Ventral tube elongate, without s.s.-like setae on posterior face. Lateral flap with smooth setae only. Tenaculum normal. Furca with mand as 20:25 Dens with a row of ca. 25 small spines along the inner margin (fig. H). Dental scaly appendix is absent, but instead a kind of swelling is sometimes to be seen (fig. G). Mucro is rather short, Chaetal pattern is as in Fig. F. On the head v-group is complete, with v_0 and v_3 .

th. I:	ant.: 3/3/1.	post.: 5,6,3,4 or 5.
th. II:	ant. 3/0/2,	post.: 3,5,4,4,4.
abd. I:	11-12/2.	abd. II: s/7/s/4.
abd. IV:	median: in one zone,	post. ca. 5+5.

The body pattern changes considerably. In pale examples almost all the pattern of the trunk is vanishing although the ground colour is brownish as in the typical form (this may be just after ecdysis). In the intensely coloured examples there may appear many longitudinal streaks on the anterior half of abd. IV, so that it is alike to the figure given for *Paronella florensis* (Oud.) or *Paronella sumatrana* (Oud.) in Schött, 1903. Supposingly the examples just before ecdysis are more deeply coloured than usual and the identity of these classical species above would be a matter of considerable difficulty. *C. istana* m. is very common around Sandakan and *Aphysa dubia* Schött, 1925 from Sarawak may include the present species. But as may be easily imagined from his description he must have mixed various species under this name and that his 'dubia' is quite dubious. To our great pleasure the name is already preoccupied by *Paronella dubia* Börner, 1913 of Java, so that Schött's name may be abolished from our mind. Istana means palace in Malayan language. In Kunak examples abd. IV has two transverse bands in stead of one, the median patch of the segment being developed laterally. In chaetal pattern the anterior group of th. II is 4/3/1 constantly. But since there is no other difference of any kind they may be placed in the same species for the moment.

Callyntrura (Istanaphysa) vexans sp. n.

Fig. 10

Brumas nr. Tawau (10 ex. 24.XI.1979, Saikoh Lantoh), Ibid. (5 ex. 10.III.1980, Yano), Ibid (30 ex. 6.III. m.), Paginatan (2 ex. 12.I.1980, m. et Dius Tadong), Sepilok (2 ex. 3.IV.1979, m.), Madai (21 ex. 14.VIII.1980, m.), Semporna (4 ex. 27.VI.1980, m. et Dius Tadong)

Body length up to 3.0 mm. Ground colour brownish white, with black patches. Head bears a diffuse band across the antennal basis, which extends posteriorly from the eye-fields. Trunk is with diffuse pigmented area laterally, deeper along the segmental margins and ending a little before abd. V. Abd. III has a triangular dorsal area intensely pigmented and divided sometimes with a pale median streak. Abd. IV has a large dorsal spot just so deeply coloured. Both abd. V and VI has a faint lateral spots. Antennae are finely pigmented on each distal end. Legs are beautifully patched. Coxal basis, coxa and trochanter are mottled. Femur and tibiotarsus bears two bands reddish black in colour. Ventral tube and furca are pale. Antennae not elongate, ant. I: head being 50:35. Labral

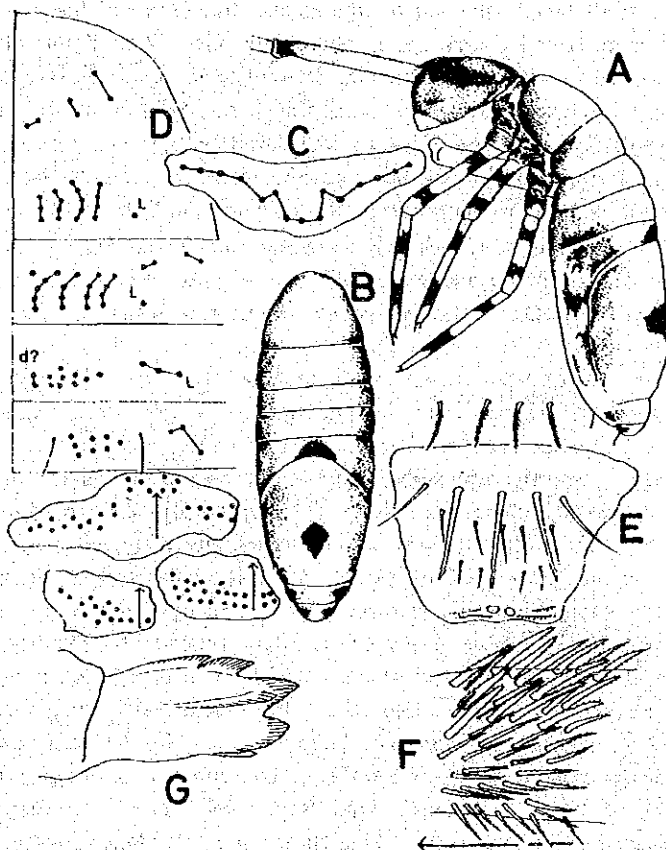


Fig. 10 *Callyntrira (Istanaphysa) vexans* sp. n.

A: Habitus, B: Dorsal patches of the trunk, C: V-group of the head, D: Chaetal pattern of the trunk, E: Labrum, F: Dorsal view of dens, with ciliate spines, G: Mucro.

setae 4/5,5,4. Prelabral setae ciliate. Median 3 setae of the first row are thicker, straight and blunt. Labral margin with 2 round tubercles. Basal seta of the outer maxillary ramus blunt and faintly rugose. Setae of the labial basis as M-Re/1L. Unguis und unguiculus normal. Tenent hair and opposite seta of hind legs are rather short. Trochanteral organ is ca. 50 spiny smooth setae in a quadrangle. Ventral tube elongate, anterior terminal setae ca. 9+9. Posterior face has no s.s.-like setae. Lateral flap and tubes normal. Tenaculum not different from others. Furca with man:d as 48:65. Dens (fig. F) is dorsally with many thick setae in random arrangement. Many of them are thick and alike to long spines, but they are all ciliate and gradually transient to usual setae. The true spines are not observed. Dental vesicle absent. Mucro is rather short, but not converging and with 6 normal teeth.

Chaetal pattern is as in fig. D. V-group of the head (fig. C) has v_0 and v_3 .

th.II:	ant. 2/2(1)/2(1),	post. 3,4,4(5)/L.
th.III:	ant. 2/2/2.	post. 1,5,4,4,4/L.
abd.I:	12/3 or 2/9/2+L.	abd.II: s/7(8)/s/3.

Median group of abd.IV is obscurely divided in two rows and posterior group is ca. 14+14.

These chaetal arrangement is relatively constant. Presence of L on th.II, III and 3 lateral setae on abd.I is the character not to be observed in other species of *Istanaphysa*. These characters indicate the present species as intermittent between *Istanaphysa* and *Borneaphysa*.

The species is peculiar among the Bornean forms treated here. In the labrum and in the shortness of antennae and legs, it is belonging to *Istanaphysa* without doubt. But the setae of labial basis and chaetal pattern of the trunk are the *Borneaphysa* type, while the ventral tube and setae of abd.IV belongs to *Istanaphysa*. Furca is characteristic to this species. As it has no dental spines it is not *Istanaphysa*, but there are many thick ciliated setae almost like spines, which is not observed in *Borneaphysa* and the species may be duly the intermittent form between these two subgenera. Possibly the species indicates the presence of an another group of *Callyntrura* and many species hitherto reported as "without dental spines" may belong to this group.

Body colour is somewhat variable and may be mixed with *C. istana* m. in the first sight, but the chaetal arrangement is quite different. When they are mixed, *C. vexans* may be separated from it by the colourless ventral tube as it is coloured in *C. istana*. Banded legs are sometimes growing to be paler, but still faintly coloured in the same way.

In the colour pattern the species is near *C. longicornis* (Oudemans, 1890) from Sumatra and Java, which is later redescribed by Schött, 1903 and Handschin, 1925. But in this cited species antennae are very long, ant.I: head being almost 2.0 or more, while the ratio is almost 1.0 in this species. *C. longicornis* must be more exactly studied by the type or topotype before we may identify it with certainty. *C. longicornis* sensu Denis 1948 from Vietnam may be the different species as the mucro is long and with a minute dental appendix at the end, which is comparable to that of *C. microphysarum* m., 1965 from Formosa. That of Gapud, 1971 from Philippine may be the present species with its short antennae, but its chaetal pattern has the peculiarity that the median group of abd.IV is very proximally situated. Mitra's topotype of *C. longicornis* in 1974 differs from this species having 4 setae of the lateral group of abd.II instead of 3 of this species. Chaetal pattern of *C. vexans* is near that of *C. variabilis* Mitra, 1974 from India, but in this species the labral setae are not modified and with 5 (after description it is 4) granules on the labral margin.

Typus: One example from Brumas near Tawau.

Callyntrura (Istanaphysa) tuhan sp. n.

Fig. 11

Bundu Tuhan (31 ex. 1.I 1980, m.), Kiau (25 ex. 9.I 1980 m.), Kudat (6 ex. 6.I 1980, m. et Dius Tadong), Tamparuli (3 ex. 3.I 1980, m.), Sosopodon (30 ex. 10.I 1980, m.), Kundasan (20 ex. 9.I 1980, m.), Ranau (12 ex. 11.I 1980, m.), Ulu Lokan (5 ex. 5.I 1980, Saikoh Lantoh et Dius Tadong).

Body length up to 2.8 mm. Ground colour dirty brown to gray and pigmented with bluish black patches. Antennae intensely black on distal end of each segment, but ant.IV is dark all over. Ant.II may have a pale patch at about the middle of the segment. Head infuscate but paler dorsally. Th.II to abd.III are pigmented laterally without forming definite bands. Abd.IV is with many obscure longitudinal striae on the anterior half terminating with a small median black spot of the dorsum. Posterior half of abd.IV is densely black laterally until a little before the posterior margin, but the dorsal side is rather pale.

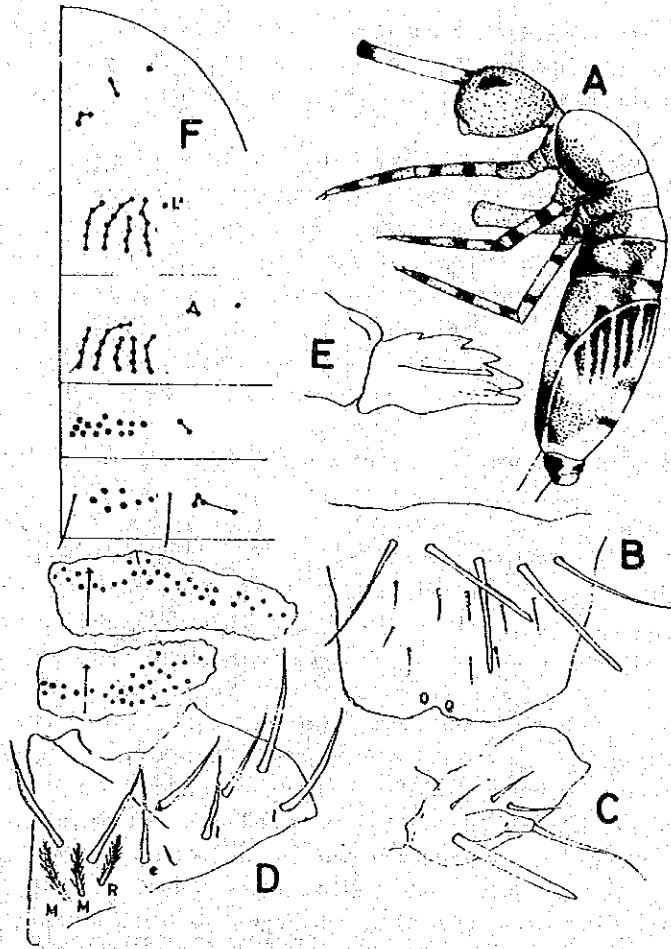


Fig. 11 *Callyntrura (Istanaphysa) tuhan* sp. n.

A: Habitus, B: Labrum, C: Outer ramus of maxilla, D: Labial basis, E: Mucro, F: Chaetal pattern of the trunk.

There is a small median spot constantly on the posterior half of abd.IV. Anogenital area is dark. Legs are heavily banded. Basal segments are darkly pigmented. Femur is patched near the proximal and distal portion and tibiotarsus is with distinct band proximally and distally as well as at the middle of the segment. Ventral tube griseous. Furca lightly pigmented on distal half. Ventral side of the trunk paler. Ant.I: head as 50:40. Labral setae as 4/5,5,4, the median 3 setae of the first row are longer and blunt ending, but not ciliate. Labral margin has 1+1 small tubercles. One basal seta of the outer ramus of maxilla is thick, blunt and almost smooth, but very faintly ciliate on distal half. Setae of labial basis are as MMRe/11, in contrast to many other species of the genus having two MM on it. Unguis, unguiculus and tenent hair as well as trochanteral organ are not different from others. Ventral tube is long, anterior face has distally 2+2 median and 4+4 lateral setae much larger than others. Posterior face is equally beset with many slender setae and no s.s.-like setae is to be found. Lateral flap with many smooth setae and each terminal tubule has one diverticulum. Tenaculum normal. Furca with man:d as 50:75

Both of them are intensely hirsute. Dens bears row of dental spines along the inner dorsal side, each of which are almost smooth, but sometimes with a sign of faint striae. Scaly appendix is absent. Mucro is short, converging and with usual teeth.

Chaetal pattern is peculiar. On the head v-group has both v_0 and v_3 . Setae of the trunk is as:

th.II:	ant. 3(4)/2/1(2),	post. 5,5,4,6/(L').
th.III:	ant. 3/1/0,	post. 4,6,4,4,4.
abd.I:	15/2	abd.II. s/8/s/4.

Among them the presence of one seta L' on th.II is peculiar and almost constant. Both the median and the posterior group of abd.IV are very numerous, much more than in the related species and lateral group consists of 6-7 setae.

The species is characteristic with its special arrangement of the setae on labial basis, having additional seta M_2 . Colour pattern seems to be fairly constant, but there are some specimens whose abd.IV is with many longitudinal striae resembling to *S. sumatrana* (Oud.), *C. insignis* (Imms) and *C. indica* (Hds.). But as the morphological details of these species are quite unknown, their identity must be retained. Species name comes from the type locality, Bundu Tuhan, where Tuhan means landslide in the local Kadazan language.

Typus: One female from Bundu Tuhan.

In Ulu Lokan examples labral margin has 4 granules and M_1 is larger than M_2 and R. But since body color and chaetal pattern is not different they must be regarded as conspecific.

Callyntrura (Istanaphysa) apiana sp. n.

Fig. 12

Kota Kinabalu (16 ex. 1.I 1980, m.), Tamparuli (10 ex. 6.I 1980, m.), Tuaran (6 ex. 4.I 1980, m.), Kiau (9 ex. 9.I 1980, m.), Nalapak (5 ex. 12.I 1980, m.), 25 m. south of Kunak (7 ex. 7.VII 1980, m.), Mostyn (5 ex. 9.VII 1980 m.).

Body length up to 2.8 mm. Ground colour dirty white, patched with violet black pigments. Head is obscurely pigmented near the antennal basis and along the sides. Th.II, III to abd.II are patched along the lateral margin. Abd.III is wholly pigmented deeply and abd.IV has a median patch extending to the elongation of abd.III and its anterior and posterior margin is faintly patched. Abd.V, VI are almost pale. Antennal segments have strong band on each distal end, especially ant.II has a weaker band at about the middle. Coxal basis, coxa and trochanter of all legs are diffusely patched, but deeper on hind trochanter. Femur and tibiotarsus of all legs are deeply bluish and distal end of each femur is a little deeper pigmented. Ventral tube diffusely dark. Furca is more strongly pigmented on its distal half. ant.I: head=30:40. Ant.I-organ is well represented. Labral setae 4/5,5,4, of which the median 3 of the first row are straight and blunt ending. Prelabral setae ciliate. Labral margin has 1+1 small tubercles. Basal seta of the outer maxillary ramus is blunt, thick and finely ciliate. Setae of labial basis is as M-Re/11, so that l_2 is not ciliate. Eyes 8+8, black. Unguis, unguiculus as usual. Tenent hair not much elongate. Trochanteral organ composed of ca. 50 smooth spines in a quadrangle. Ventral tube has anteriorly some thicker setae, but their arrangement and relative length is not fixed. Posterior face has no s.s.-like setae. Lateral flap has many smooth setae. Tenaclum as usual. $man:d=35:55$. Dens has a row of uncoloured, but distinct spines on its proximal half on its inner dorsal

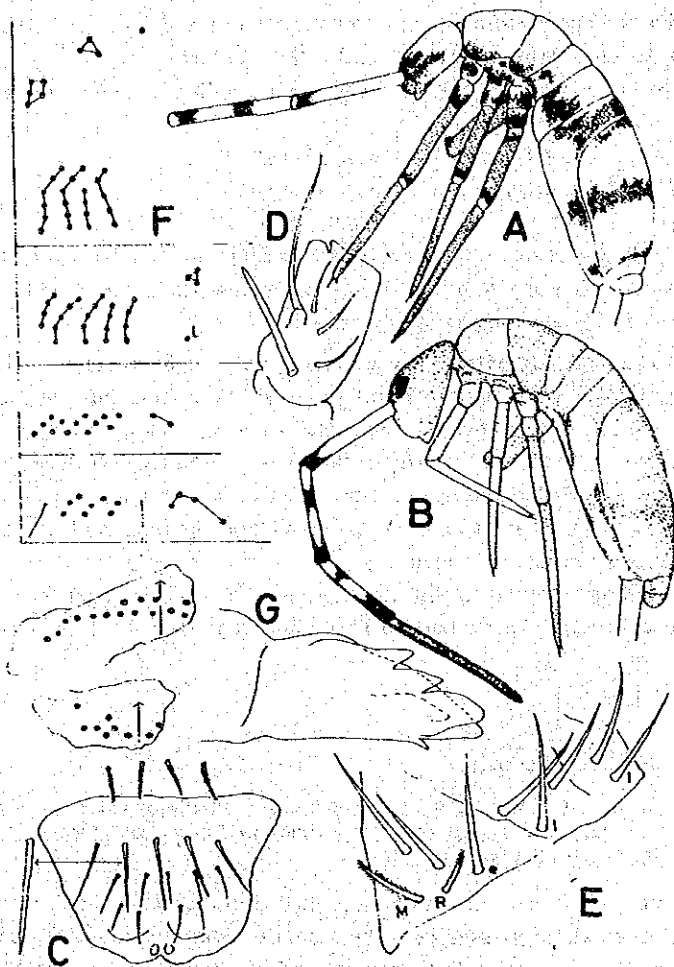


Fig. 12 *Callyntrura (Istanaphysa) apiana* sp. n.

A: Habitus (coloured example), B: Ditto (pale example), C: Labrum, D: Outer ramus of maxilla, E: Labial basis, F: Chaetal pattern of the trunk, G: Mucro.

side. No distal appendix is present. Mucro is rather short, slightly converging and with some 6 teeth in an usual manner.

Chaetal pattern is as in fig. F, which may be represented as:

th.II:	ant. 5/3/1,	post. 6,6,4,5.
th.III:	ant. 3/0/2,	post. 4, 5, 5, 4, 4/L
abd.I:	13/2.	abd.II: s/8/s/4.
abd.IV:	median gr. ca 15+15 in one row. posterior group ca. 10+10.	

Peculiar to this species th.III has one L constantly and anterior group of th.II 5/3/1. V-group of the head has no reduction.

With its peculiar banded antennae the species may be identical with *C. segmentata* (Folsom, 1924) of Sumatra, for which we know nothing about the chaetal arrangement. Species name is derived from the Malayan language meaning "Fire", which is also the old name of the town of Kota Kinabalu.

Callyntrura (Istanaphysa) mostynensis sp. n.

Fig. 13

Mostyn (26 ex. 7.VII 1980, m.), 5 m. north of Kunak (10 ex. 6.VII, 1980, m.), Ulu Segama (5 ex. 5.VII 1980, m.), Mostyn (16 ex. 9.VII 1980, m.)

Body length up to 3.5 mm. Ground colour dusky white, with suffusion of brownish colour and heavily patched. Head is dark all over, the dorsal part paler. Th.II to abd.II are shadowed laterally and dorsal part is mottled somewhat with brownish pigments. Abd. III is transversely black banded with brownish hue. Abd. IV has two transverse black bands: one at about the middle and the another anterior to the distal margin, both of which are connected to the heavily coloured extension of abd. III of the side. Besides the anterior half of the segment is with many longitudinal streaks, which may be faintly present in a pale form of the species by which only two transverse bands are remaining. Antennae are diffusely dark all over, while legs are darker. Subcoxal portion of the body

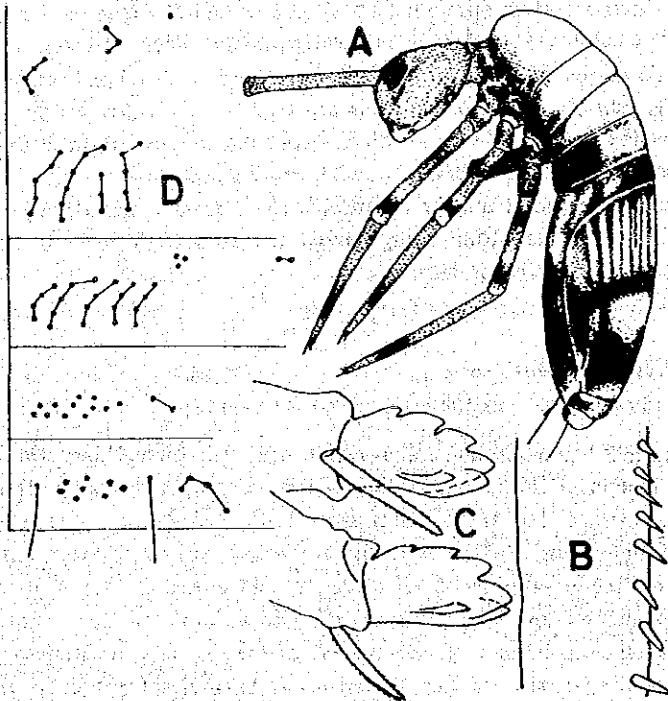


Fig. 13. *Callyntrura (Istanaphysa) mostynensis* sp. n.

A: Habitus, B: Dental spines, C: Mucro, D: Chaetal pattern of the trunk.

are deeply coloured as well as coxae and trochanter of all legs. Femur is lighter and with two bands. Tibiotarsus is darker than femur and with an obscure band near distal end. Ventral tube heavily pigmented. Furca is pale and pigmented on distal half of dens.

Ant.I: head as 80:55. Labral setae as usual for *Istanaphysa* and with a pair of marginal tubercles. Basal seta of the outer saxillary ramus is blunt and thickly built. Basal setae of labium as MRe/11, where R is smaller than M. Unguis unguiculum and others of the legs as usual. Opposite seta of hind leg is straight and spiny. Ventral tube without s.s.-like setae. Furca in ratio as 70:90. Dens: is with a row of short, uncoloured spines, but without vesicular appendix. Mucro is rather small for the genus, short and converging and some of the teeth are rounded apically. There is a dorsal swelling just at the articulation of dens to mucro, which is by no means the real appendix.

On the head v-group is often reduced in number, v_0 and / or v_3 being often absent. Chaetal pattern of the trunk is as:

th.II:	ant. 4/3/1,	post. 5,5(6),3,4.
th.III:	ant. 3/0/2,	post: 4,5,4,4,4.
abd.I:	13/2.	abd.II: s/8/s/4.

On abd.IV median group is in one transverse row and posterior group is relatively few, being ca. 6+6 in number.

The species is to be distinguished from others by the anterior group of th.II which is constantly 4/3/1 in number, thus differing from *C. apiana* and *C. istana* m. The colour pattern is variable. The habitus in fig. A is the infusate form and when the colour reduces, the longitudinal streaks of abd.IV disappear, while the transverse median band is remaining. Thus the pattern is almost alike to the infusate form of *C. istana* m. and to be distinguished only by the number of setae on th.II. From the coloured form of *C. apiana* m. it is easier to be separated by the antennae, which is not banded.

The species is provisional as it may be identical with *C. sumatrensis* (Oud.) or with *C. florensis* (Oud.) the coloured form being almost the same with them in habitus. Comparative study of chaetal pattern is desirable.

Callyntrura (Istanaphysa) tawauensis sp. n.

Fig. 14

Brumas nr. Tawau (6 ex. III 1980, m.), Mostyn (5 ex. 7-9 VII 1980, m.)

Body length up to 3.5 mm. Ground colour white, with blackish markings. On the body only the posterior margin of abd.IV has a broad transverse band and other parts are quite pale. Antennae not banded, but ant.IV is infusate distally. Legs are coloured only on distal part of each tibiotarsus. Ventral tube and furca pale. Antennae short, ant.I: head being as 25:30. ant. segm. ratio as 25:30:20:35. so that ant.III is shorter than ant.II. Eyes 8+8, poorly pigmented and each cornea is definable without treatment. Labrum with setae 4/5,5,4, prelabral setae barbed. Median 3 setae of the first row are straight, but not much different from the lateral ones. Labral margin has 2 granules. Basal seta of the outer maxillary ramus is thickly built. Basal setae of the labium as MRe/11. Unguis carinate, with two inner and a pair of dorsal teeth as usual. Unguiculus elongate, with a inner tooth. Tenent hair shorter than the inner side of unguis and lightly spatulate. Trocanteral organ is composed of ca. 45 spines in a quadrangle. Ventral tube has no s.s.-like setae on posterior face. Tenaculum normal. Furca with man.d. as 50:80 Dens has a row of hyaline spines

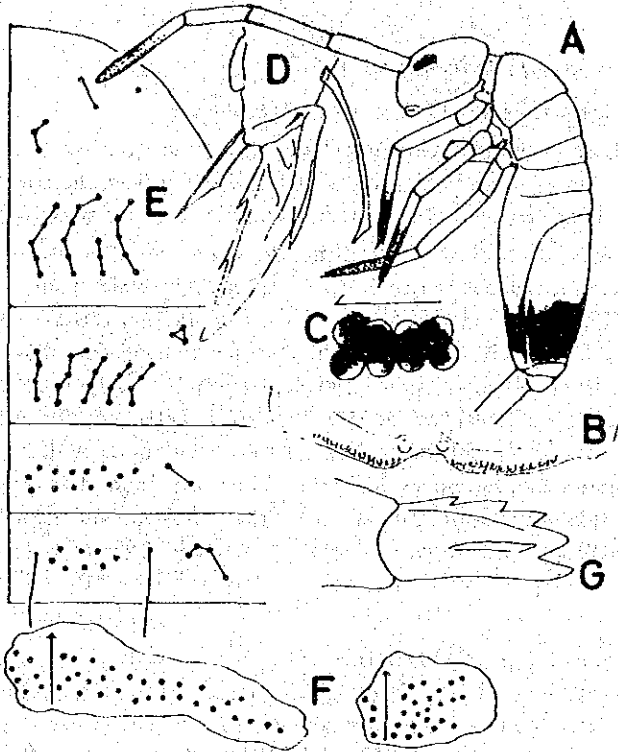


Fig. 14 *Callyntrura (Istanaphysa) tawauensis* sp. n.

A: Habitus, B: Labral margin, C: Mucro, D: Hind claw, E: Chaetal pattern of th. II to abd. II, F: Ditto of abd. IV.

ca. 15 in number on anterior half of it. No vesicular appendix. Mucro is rather small, but not converging and with 7 teeth in a usual way. Chaetal pattern is as:

head	v_0 and v_3 present.	
th. II:	ant. 3/2/1,	post. 5,6,3,5.
th. III:	ant. 3/0/2,	post. 4,5,4,4,4.
abd. I:	13/2.	abd. II: s/8/s/4,
abd. IV:	med. many (ca. 30+30) setae in one zonal arrangement. post. ca 20+20.	

In the chaetal pattern this species comes near *C. istana* m., but the colour pattern is quite different and there is no transient forms between them. That the eyes are reduced in pigmentation and that there are many setae on abd. IV may be characteristic to this species. Labral setae are almost not differentiated, but the basal seta of the maxillar outer ramus indicates it belonging to *Istanaphysa*.

Typus: One male from Brumas near Tawau.

Callyntrura (Istanaphysa) miruluensis sp. n.

Fig. 15

Nalapak near Ranau (3 ex. 12.I 1980, m. et Saikoh Lantoh).

Body length up to 2.5 mm. Ground colour yellow to stramineous brown, with heavily black patches. There is a broad longitudinal streak laterally from the antennal basis up to abd.V and there is no transverse bands at all. Antennae dark blue all over, deeper laterally. Legs are pale basally and with two bluish bands on femur and tibiotarsus. Ventral tube and furca uncoloured. Ant.I:head is as 45:30. Eyes 8+8, intensely black. Labral setae (Fig. B) as 4/5,5.4. Prelabral ones plumose and 3 median setae of the first row are straight, not very blunt ending, but obtuse on apex. Labral margin has 1+1 median large and 1+1 lateral smaller granules. Basal seta of the outer maxillary ramus is thickly built, but smooth and pointed apically. Setae of labial basis as MRe/11. Unguis and unguiculus not differentiated. Trochanteral organ with ca. 50 spines. Ventral tube is anteriorly with 7+7 brownish terminal setae. Posterior face has no s.s.-like setae. Furca with man. d. as 40:60. Dens with a row of some 50 spines on its anterior half, but without vesicular appendix distally. Mucro (Fig. E, F) is small and with usual arrangement of teeth. Chaetal pattern is as follows:

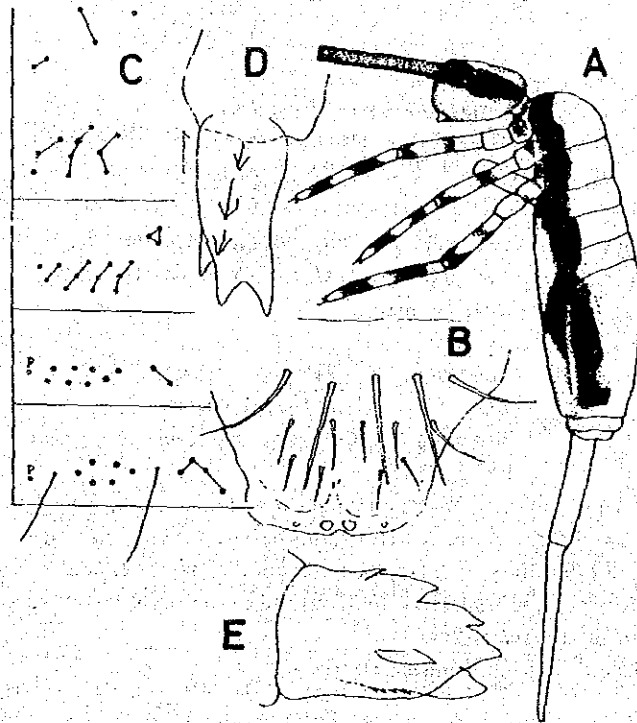


Fig. 15 *Callyntrura (Istanaphysa) miruluensis* sp. n.

A: Habitus, B: Labrum, C: Chaetal pattern of the trunk, D: Mucro (dorsal view),
E: Mucro (lateral view).

head: with v_0 , but without v_3 in the type and without v_0 but with v_3 in another example.

th.II:	ant. 2/2/1,	post. 2,4,3.
th.III:	ant. 3/0/2,	post. 1,2,3,3,3.
abd.I:	8/2,	abd.II: s/6/s/4.
abd.IV:	ant. ca. 15+15 in one row,	post. ca 7+7.

Thus the posterior group of th.II and III are small in number compared to other species here treated and its arrangement seems to be fixed. On abd.I and II dorsal pseudocellus (p in fig. C) is clearly to be seen.

The species is unique with its simplified chaetal pattern and by the deficient vertical setae within *Istanaphysa*. From the colour pattern I can find no comparable species except for *C. serrata* Salmon, 1957 from Assam.

Typus: One example from Nalapak.

Callyntrura (Istanaphysa) merah sp. n.

Fig. 16 —

Tamparuli (12 ex. 6.1 1980, m.)

Body length ca. 2.5 mm. Ground colour white, but heavily pigmented to pichy black. Whole of the head, th.II, III are deeply black. Abd.I and II are quite pale, while abd.III is also deeply pigmented up to the lateral extension of the segment. Abd.IV is pale, but the margins are slightly pigmented. Abd.V, VI are pale. Antennae and furca quite uncoloured. Legs are with blackish patches on basal two segments, distinctly dark on femur and uncoloured on tibiotarsus. Ventral tube is either pale or somewhat dark. Antennae short, ant.I: head being 30:28 in length. Labrum as in *C. apiana* the median three of the first row being straight and lightly blunt ending. Labral margin has 2+2 granules, the inner pair larger than the outer ones. Basal seta of the outer maxillary ramus is blunt ending. Labial basal seta is as MRe/11. Unguis, unguiculus and other appendages not differentiated. Ventral tube has anteriorly only 4+4 terminal large setae. Posterior face has no s.s.-like setae and with scattered slender setae. Lateral flap with only smooth setae. Tenaculum normal. Furca with man.:d. as 32:60 Dens bears a row of smooth, hyaline spines about 35 in number on the inner dorsal side. Vesicular appendix absent. Mucro is short, converging and with 6 teeth. Chaetal pattern is as follows:

Head:	v-group complete.
th.II:	ant. 2/1/1 (rarely 3/1/1), post. 4,4,4,4.
th.III:	ant. 3/0/-, post. 3,4,4,4,3.
abd.I:	9/2. abd.II: s/5/s/4.
abd.IV:	median ca. 15+15 in one row, post. ca. 6+6

Characteristic to this species the anterior group of th.II has only 2/1/1 setae, anterior group of th.III only with 3/0 and posterior group of abd.IV relatively few in number.

With its peculiar colour pattern of the body the species is to be distinguished easily from other members of the group. Species name means "red" in the Malayan language.

Typus: One female from Tamparuli.

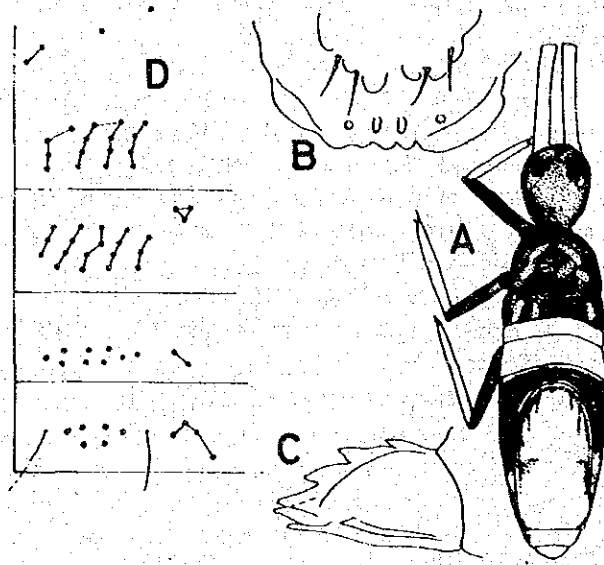


Fig. 16 *Callyntrura (Istanaphysa) merah* sp. n.

A: Habitus, B: labral margin, C: Mucro, D: Chaetal pattern of th.II to abd. II.

Handschinphysa Pacit, 1945

Typical Species: *Entomobrya lineata* Parona, 1892.

In contrast to other regions of Southeast Asia *Handschinphysa* is not well represented in Sabah and there has been found only three species in my collection. In morphological details they are nearly related to *Istanaphysa* by the modified labral setae and by the chaetal pattern of the body. Antennae are scaled dorsally on proximal three segments. Manubrium and dens is ventrally beset with elongate scales, but without dental spines. As these characters are not yet well investigated in other continental species, it may be that our species represent a special group within *Handschinphysa*, which may be divided into some subgenera. More intensive survey of this group must be made.

- | | |
|---|---------------------------|
| 1. Lateral group of abd.I with 3 setae | 2 |
| Lateral group of abd.I with 4 setae | <i>C. musarum</i> m. |
| 2. Mucro almost parallel. Body banded laterally | <i>C. tamparuliana</i> m. |
| Mucro rather converging. Heavily pigmented on anterior half of the body | <i>C. kudatensis</i> m. |

Callyntrura (Handschinphysa) tamparuliana sp. n.

Fig. 17

Tamparuli (4 ex. 6.I 1980, m. et Dius Tadong), Poring (10 ex. 7.III 1980, Saikoh Lantoh).

Body length ca. 3.0 mm. Ground colour brownish yellow, with light violet bands. There is an obscure longitudinal band behind the black eye-field and a dark spot between eyes. Trunk has a mottled band along the lateral margin of each tergite from th.II up to

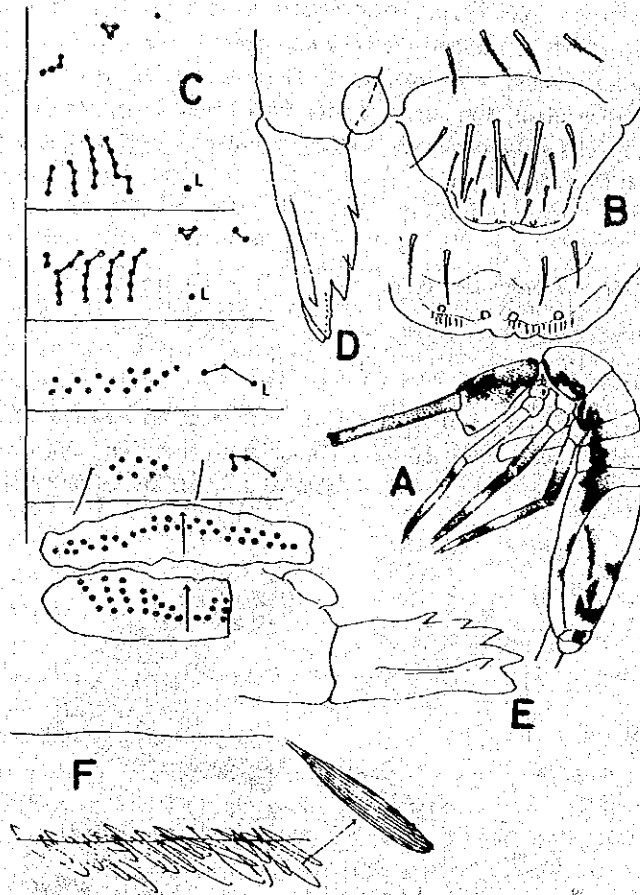


Fig.17 *Callyntrura (Handschinphysa) tamparuliana* sp. n.

A: Habitus, B: Labrum, C: Chaetal-pattern, D,E: Mucro, F: Ventral side of dens with scales.

abd.III. Abd.IV is with a small median patch a little posterior from the middle and a faint lateral band connected posteriorly before the margin. Abd. V has a pair of spots. Antennae dark brown, deeper on each distal end. Legs pale, but distal two segments are faintly brownish. Ventral tube and furca pale. Ant. 1: head as 45:30. Labral setae 4/5, 5,4, the median 3 setae of the first row are straightly directed, but not very thick. Labral margin with 2+2 minute tubercles. Basal seta of the maxillar ramus is blunt and thick. Labial basis with setae as MRe/11. Unguis, unguiculus and trochanteral organ not differentiated. Tenaculum normal. Ventral tube is as in *C. kudatensis* m., having no s.s.-like setae. Furca with man.:d. as 5:7. Dens has no row of spines, but with a vesicular appendix of middle size. Mucro is elongate and parallel in outer form.

Chaetal pattern is as:

V-group of the head: complete.

th.II:	ant. 4/3/1,	post. 3,4,5,6/L.
th.III:	ant. 3/2/0,	post. 2,6,5,5,5/L.
abd.I:	16/3.	abd.II: s/8/s/4.
abd.IV:	median ca. 19+19; in one row,	post. ca. 20+20.

Chaetal pattern is almost concordant with *C. kudatensis* as in fig. C and different only on posterior group of th.II, III, where there are more number of setae.

Although the species is quite different from *C. kudatensis* m. in the colour pattern, they are near to each other in all morphological details. The vesicular appendix of dens is a little smaller in this species and mucro is more elongate and more or less parallel in form.

Typus: One male from Tamparuli.

Callyntrura (Handschinphysa) kudatensis sp. n.

Fig. 18

Kudat (20 ex. 4.I 1980, m. et Dius Tadong), Langkon nr. Kudat (14 ex. 5.I 1980, m. et Dius Tadong), Kota Kinabalu (14 ex. 4.I 1980, m.), Sandakan (6. ex. 6.II 1980, m.), Silam nr. Lahad Datu (23 ex. 7.VII 1980, m.), Tawau (18 ex. 7.VII 1980, m.)

Body length up to 3.0 mm. Ground colour white, with deep black patches. Head and anterior half of the body totally with deep black colour up to abd.I including the ventral side, coxa, trochanter of all legs and the ventral tube. Abd.II, III are quite pale all over.

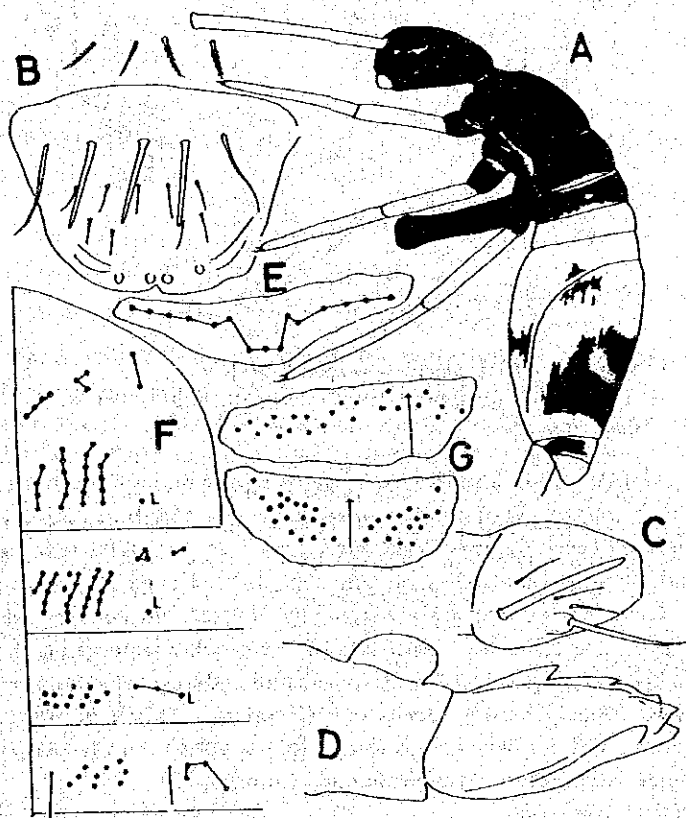


Fig. 18 *Callyntrura (Handschinphysa) kudatensis* sp. n.

A: Habitus, B: Labrum, C: Outer ramus of maxilla, D: Mucro, E: V-group of setae of the head, F: Chaetal pattern of the trunk, G: Ditto of abd. IV.

Abd.IV has a broad black patch on its posterior half extending slightly to the posterior extension of abd.III and leaving a narrow pale area along the hind margin of the tergite. Occasionally the median part of this transverse patch is depicted and there may arise two transverse patches. Abd.V is patched laterally and abd.VI is pale. Antennae are not pigmented excepting distal two segments and furca is lightly violet on distal part of dens and mucro. Ant.I: head is as 70:40. Labral setae 4/5,5,4. Prelabral setae feathered. Three labral setae of the first row are straight and blunt ending. Labral margin has 2+2 small granules. Eyes 8+8, black. Basal seta of the outer maxillar ramus is thick and ending blunt. Labial basis with setae as MRe/1L. Unguis, unguiculus and tenent hair not different from others. Trochanteral organ is composed of ca. 40 smooth spiny setae. Ventral tube very long, with ca. 7+7 anterior terminal setae. Lateral flap bears many setae, some of which are slightly feathered. Posterior face has no s.s.-like setae. Furca in ratio as 55:65. Dens has no dental spines, but with well developed appendix of *Handschinphysa*-type. Mucro is short and with usual arrangement of 6 teeth. Scales of the body is intensely brown, almost black.

Chaetal pattern is as below of fig. F. Cephalic v-group is full in number.

th.II:	ant. 4(3)/3/2,	post. 4,6,6,6/L or 5,6,6,6/L.
th.III:	ant. 3/2/0,	post. 3,8,6,6,6/L or 4,7,7,7/L.
abd.I:	12(17)/3.	
abd.II:	s/9(8)/s/4.	
abd.IV:	median gr. in one zone,	post. gr. numerous.

Among them the presence of seta L on th.II, III and on abd. I is common with *C. tanparuliana* m. and perhaps the specific character of this group.

Typus: One female from Kudat.

This is the unique species of *Callyntrura* with modified labral setae. The presence of 2+2 tubercles on labral margin is also characteristic. From its colour pattern it is near *C. prabhooi* Mitra, 1974 of India, but different by the intensely coloured ventral tube. From *C. vestita* (Hds., sensu Mitra 1974) this new species differs by the pale abd.II, III and by the presence of a broad patch on abd.IV and V. Chaetal pattern is also quite different from his figure. *C. kudatensis* is also near *C. delamarei* Mitra, 1974 of India in the body pattern, but legs are not banded and ventral tube is quite black. *C. attygalei* (Fernando, 1957) of Ceylon must be also a related species.

Callyntrura (Handschinphysa) musarum sp. n.

Fig. 19

Sandakan mite 9 (7 ex. 10.VI.1980, Dius Tadong et Saikah Lantoh)

Body length ca. 3.0 mm. Colour white, with a few small black spots. On the head only the antennal basis and around eyes are patched. Trunk has faint patches along the margin of th.II, III. Subcoxae of all legs and lateral corner of abd.II are with small patches. Antennae lightly brownish and distal end of each segment is distinctly dark. Legs are also lightly brownish and darker on distal half of femur and tibiotarsus. Ventral tube and furca quite pale. Ant.I: head is as 7:5. Antennae scaled on ant.I-III. Frontal spines are long and smooth. Labrum with setae 4/5,5,4, all smooth and median 3 of the first row are pointed, not much different from others, but straightly directed. Labral margin with 4 small granules. Basal seta of outer maxillary ramus is a little thick, but not blunt ending. Setae of labial basis as MRe/1L. Legs not different from others. Trochanteral organ with more than 50 spiny setae. Ventral tube without s.s.-like setae on posterior face. Furca with man:d.

as 60:90 in length. Dens bears no spines, but the dorsolateral setae of the proximal half are thickly built and almost like spines, although they are long and ciliate. Ventral side has no typical scales, but the setae are narrowly flattened. Vesicular appendix is well developed and with minute striae on its surface. Mucro is lightly converging and with 6 teeth in usual arrangement.

Chaetal arrangement is different from other two species here treated.

V-group of the head: complete or v_0 is missing.

th.II: ant. 3/4/2, post. 4,4,5,5/L₁ L₂.

th.III: ant. 3/2/2, post. 5,3,5,5,5/L₁ L₂.

abd.I: 2,2,3,3,3,2/4. abd.II: s/3,2,3,1/s/4.

abd.IV: median group in two zones, post. gr. ca. 11+11.

Therefore this is the only species of Sabah having two L-setae on th.II, III and 4 lateral setae on abd.I. All these characters are constant in all examples examined. That the median group of abd.IV is in two zones as in case of *Borneaphysa* is also characteristic.

Typus: One female from Sandakan mile 9 Labuk Road.

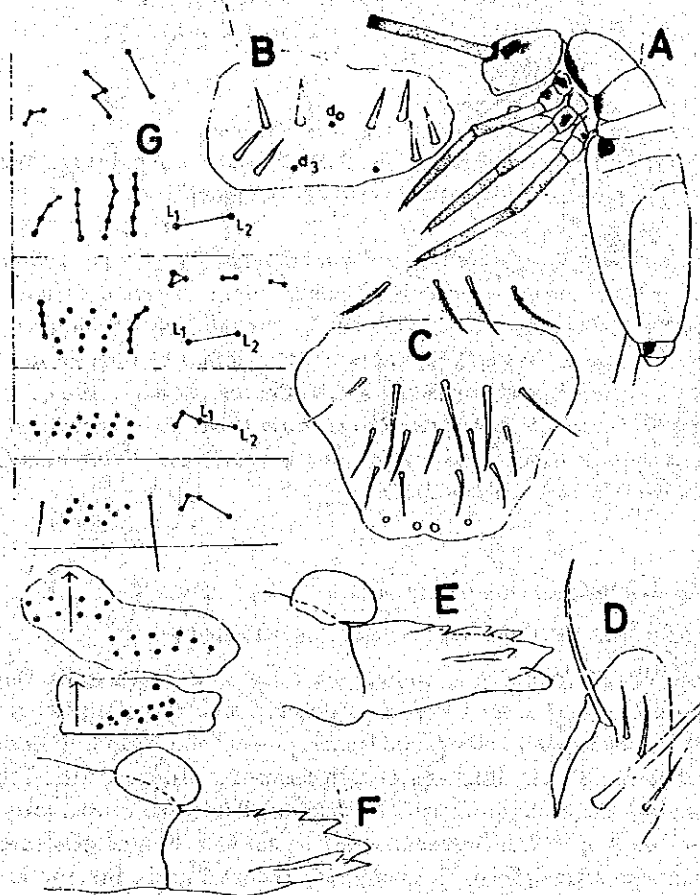


Fig. 19 *Callyntrura (Handschinphysa) musarum* sp. n.

A: Habitus, B: Frontal spines, C: Labrum, D: Outer maxillary ramus,

E, F: Mucro, G: Chaetal pattern of the trunk.

All examples at hand are quite constant in colouration and with a peculiar chaetal pattern as mentioned above. As the species is found only once from the neighbourhood of the town in the Banana plantation near the village, it may be the introduced species. Colour pattern is near *C. lineata* (Parona) in Mitra 1974, fig. 3, but the chaetal pattern of his fig. 4 shows no such peculiarity as above. Anyhow this is one of the species which has been hitherto included in the "lineata" complex.

* * * *

There has been reported quite a large number of species referable to *Callyntrura* from the tropical Asia under the name of *Paronella*, *Microphysa* etc. and almost all of them must be reviewed once again. They are as tabulated below:

- | | |
|--------------|---|
| Japan: | <i>Paronella japonica</i> Kinoshita, 1917.
<i>Paronella vestita</i> Hds., Uchida 1954. |
| Fromosa: | <i>Callyntrura microphysarum</i> Yosii, 1965.
<i>Callyntrura taiwanica</i> Yosii, 1965. |
| Philippines: | <i>Callyntrura longicornis</i> (Oud.): Gapud 1971. |
| Thailand: | <i>Callyntrura unilineata</i> Yosii, 1961.
<i>Callyntrura semilineata</i> Yosii, 1961.
<i>Callyntrura marginata</i> Yosii, 1961.
<i>Callyntrura spinifera</i> Yosii, 1961. |
| Vietnam: | <i>Paronella fissimucronata</i> Denis, 1948.
<i>Microphysa lineata</i> (Par.): Denis, 1948, Stach 1965.
<i>Aphysa longicornis</i> (Oud.): Denis 1948. |
| Burma | <i>Entomobrya lineata</i> Parona, 1892, Schött 1903.
<i>Entomobrya feae</i> Parona, 1892, Schött 1903. |
| Malaya: | <i>Callyntrura bukittimahensis</i> Yosii, 1959.
<i>Callyntrura bimaculata</i> Yosii, 1959.
<i>Callyntrura malayana</i> Yosii, 1959.
<i>Callyntrura zonata</i> Yosii, 1959.
<i>Callyntrura brevicornis</i> Yosii, 1959. |
| Indonesia: | <i>Entomobrya longicornis</i> Oudemans, 1890; Schött 1903, Handschin 1925.
<i>Entomobrya florensis</i> Oudemans, 1890. Schött 1903, Handschin 1925.
<i>Sira sumatrana</i> Oudemans, 1890: Schött 1903.
<i>Paronella tarsata</i> Börner, 1906.
<i>Paronella anopla</i> Börner, 1906.
<i>Paronella dubia</i> Börner, 1913.
var. <i>palescens</i> Börner, 1913.
var. <i>violacea</i> Börner, 1913.
<i>Paronella segmentata</i> Folsom, 1924. |

- Microphysa vestita* Handschin, 1925.
Microphysa lineata (Par.); Handschin 1925.
Aphysa villosa Handschin, 1925.
- Ceylon:
Campylothorax ceylonicus Ritter, 1910; Yosii 1966.
Pterikrypta fasciata Ritter, 1910.
Paronella attygaei Fernando, 1958.
Campylothorax viharamahadevi Fernando, 1960.
Pterikrypta jane Fernando, 1960.
Paronella claudioprocula Fernando, 1960.
- India:
Paronella boernerii Imms, 1912; Yosii 1966.
Paronella travancorica Imms, 1912; Prabhoo 1971.
Paronella gracilis Imms, 1912.
Paronella phanolepis Imms, 1912.
Paronella insignis Imms, 1912.
Paronella flava Carpenter, 1913.
Paronella elongata Carpenter, 1913.
Paronella brunnea Carpenter, 1924.
Aphysa carli Handschin, 1929.
Aphysa indica Handschin, 1929.
Aphysa fissisetosa Handschin, 1929.
Microphysa escheri Handschin, 1929.
Microphysa semiviolacea Handschin, 1929; Mitra 1974.
Microphysa lineata (Par.); Handschin, 1929
Microphysa cingulata Bonet, 1930 Yosii 1966.
Paronella serrata Salmon, 1957
Aphysa nigerrima Prabhoo, 1971.
Aphysa sudindica Prabhoo, 1971.
Callyntrura lineata (Par.): Mitra 1974
Callyntrura delamarei Mitra, 1974.
Callyntrura vestita (Hands.); Mitra 1974.
Callyntrura prabhooi Mitra, 1974.
Callyntrura zaheri Mitra, 1974.
Callyntrura variabilis Mitra, 1974.

After examining various forms of *Callyntrura* I am now inclined to believe the species hitherto identified as *C. lineata* (Parona) and *C. longicornis* (Oud.) must be groundly reviewed. Once I myself (Yosii 1956) has regarded *C. lineata* as a species widely distributed in Asia and synonymized even *C. japonica* (Kinoshita, 1917) with it, although the latter has quite a different chaetal pattern of the trunk (Yosii, l.c. fig. 227). All these species must be investigated from the new point of view.