

# On some Collembola of Japan and adjacent Countries

RIOZO YOSHII

Yoshida College, Kyoto University, Japan

During these three years I have occasionally investigated some forms of collembola from Japan and adjacent countries. Some of them have been already described in connection with the species of other countries. In the present paper I have to enumerate others, which are either new to science or to be mentioned from the present state of taxonomy.

Especially the materials from the archipelago of Ryukyu and Formosa (Taiwan) were intensively studied. Collembola of Yakushima and Tanegashima were collected by myself in 1954. Those of the Tokara Island (Nakanoshima, Takarajima) are the gift of the Municipal Science Museum of Osaka and of the Explorer's Club of the Kyoto University, a part of which is already published (YOSHII, 1955). For the Island of Okinawa rich materials were given to me by Mr. T. NAGAYAMA (Mawasi City), Mr. M. HIGASHIHIRAJI (Plant Quaranteen Station of Naha) and Mr. M. NISHIHIRA (Ryukyu University), which include both berlesed and naked-eye collections. For Yaeyama Islands, the southern Group of the archipelago, Mr. NISHIHIRA has given valuable examples collected by the joint expedition of the Ryukyu and the Kyoto University in 1961. Some specimens from Formosa (Taiwan) were collected either by myself in 1960 or by Dr. K. BABA (Niigata). For these friends I must express my hearty thanks. Furthermore, the kind abvices of Prof. T. TAKARA (Ryukyu University) must be mentioned with cordial thanks.

For the name of collectors following abbreviation is made:

HH: S. HIGASHIHIRAJI,	KEC: KYOTO EXPLORER'S CLUB,
NH: M. NISHIHIRA,	RY: R. YOSHII.

## *Ceratophysella denticulata* BAGNALL, 1941

15 expl. Nagata, Yakushima 26. X 1955 RY

2 expl. Miyanoura, Yakushima 24. X 1955 RY

35 expl. Futemma, Okinawa 4. IV 1959 NH

Dr. P. N. LAWRENCE and I have come to the conclusion that *C. exilis* YOSHII, 1956 is synonymous with *C. denticulata* BAGNALL, 1941.

*Ceratophysella communis* (FOLSOM, 1897)

Yosii 1960, 1962

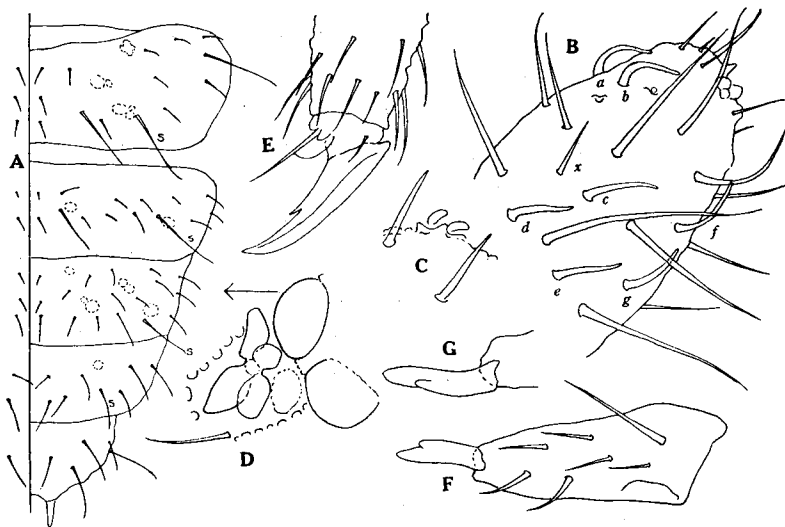
25 expl. Yabuson, Okinawa 20. III 1959 NH

Distribution: Japan, China, India, Mexico, Argentine

*Ceratophysella yakushimana* sp. n. Fig. 1

3 expl. Nagata, Yakushima 26. X 1955 RY

Body length up to 1.3 mm. Colouration brownish gray, lighter ventrally and upon extremities. Terminal bulb of ant. IV is apparently divided into three lobes. Sensory setae of the segment are all short, blunt, thick and curving, thus contrasting clearly from usual antennal setae, but their location is normal as stated in Yosii 1962. Eyes 8 + 8, intensely pigmented. PaO composed of 4 elements, the anterior ones lying in a line. An accessory tubercle is situated behind them. Legs subequal, tibiotarsal setae typically arranged and no large tenent hairs present. Unguis without lateral teeth, but with an inner tooth. Unguiculus attaining the inner tooth, setaceous. The basal lamella is very distinct. Ventral tube with 4+4 setae. Rami tenaculi quadridentate. Furcula well developed. Dentes bears 7 setae including a basal longer one and two inner thicker ones. Mucro ca. 2/5 the dentes in length, very narrow, apically rounded and with an outer lobe, which is very low. Anal spines not large, almost pale, curving and upon papillae, which are 3 granules remote to

Fig. 1 *Ceratophysella yakushimana* sp. n.

A: Chaetotaxy of body, B: Ant. IV, C: Ant. III-organ, D: Postantennal organ, E: Fore-claw, F: Dens and mucro (dorsal view), G: Mucro (dorsal view).

each other. Integument is uniformly granular, slightly larger upon abd. IV, V and VI, but without forming any granulated zones or areas. Body setae are all simple, smooth and not plurichaetotic. Upon th. II, III  $b_2$  is larger than others and posteriorly dislocated. Upon abd. I-IV all setae are subequal in length, that it is difficult to decide, whether it belongs to *communis*- or *armatus*-group of the genus. Presumably it is a *communis* group. s.s. of all segments are slender and longer than usual setae. Fovula of abd. V lies lateral to  $a_2$ .

The species is near *H. paradoxa* sp. n. in the mucro form, but chaetal arrangement of the trunk and ant. IV clearly show the typical phase of *Caratophysella* and no plurichaetosis is to be seen. Tenent hair is not modified.

*Hypogastrura* (s. str.) *paradoxa* sp. n. Fig. 2

5 expl. Nagata, Yakushima 26. X 1955 RY

Body length up to 2.3 mm. Colour dark gray all over the body, but strongly mottled. Extremities are paler and pigments are in plaster form. Ant. ratio as 20:22:23:24. Ant. IV with an end-bulb, dorsally with 8 slender sensory stae (outer 3, dorsal 1, inner 4). Ventral side has some short, blunt setae. Between ant. III/IV there exists an eversible sac, which is, although not very large, yet quite distinct. Ant. III-organ is a pair of small rods incerted in a groove, accompanied by a blunt small seta to each side. Eyes 8+8, upon black patches. PaO is smaller than one eye and composed of 4 subequal, rounded lobes. Upon legs tibiotarsal setae are arranged as usual (cf. YOSH 1962).  $1_1$  is longer than others and truncate on apex. Unguis is dorsally carinate, with a pair of lateral and one inner tooth near the apex. Unguiculus is setaceous, 2/3 of the unguis and basal lamella is broadly quadrangular in lateral view. Ventral tube with 4+4 setae. Rami tenaculi quadridentate. Furcula ratio as 30:26:12. Dentes dorsally granulated finely and with 7 setae, a basal one of which is larger than others. Mucro is narrow, apically rounded, inner side is thickly chitinous and outer side with a narrow lamella extending about 4/5 of the length. Anal spines are short, curving and upon basal papillae which are 3 granules remote to each other. All body setae are short and blunt. Larger setae are slightly serrated and rugose distally near the end. Their arrangement is typical for *Hypogastrura* (s. str.) upon head and upon th. I to abd. I. Segments posterior to abd. II are progressively plurichaetotic, so that abd. IV bears 4 pairs of dorsal median setae and s.s. is in position of  $p_6$ . Abd. V is uniformly with larger granules and plurichaetotic. Abd. VI is normal.

The species is very peculiar having *Hypogastrura* type of chaetotaxy upon thorax (s.s. =  $p_1$ ) and an eversible antennal sac. Postantennal organ is *Hypogastrura*

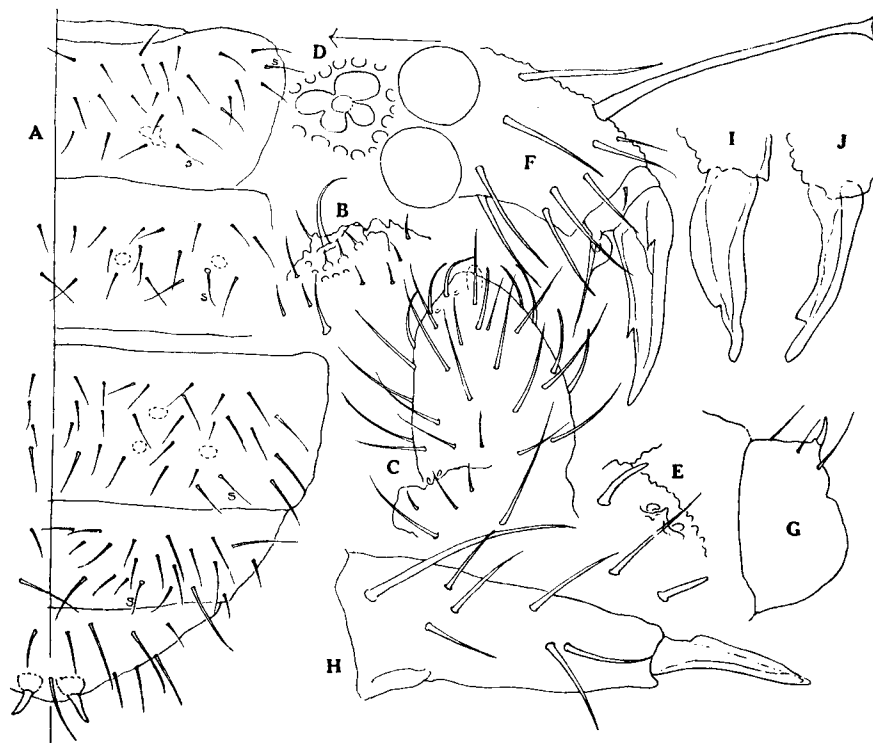


Fig. 2 *Hypogastrura paradoxa* s. p. n.

A: Chaetotaxy upon th. II, III and abd. IV-VI, B: End of antenna (ventral), C: ant. IV (dorsal), D: Postantennal organ, E: Ant. III-organ, F: Fore-claw, G: Profil of abd. VI, H: Dens and mucro (dorsal), I: Mucro (dorsal), J: Mucro (lateral view).

(s. str.) type. Such combination of characters is puzzling for the taxonomic system proposed by CASSAGNAU (1959) and YOSHII (1960, 1962) and I would like to place it into *Hypogastrura* (s. str.) provisionally. Dr. P. N. LAWRENCE (Brit. Mus.) has kindly sent me a slide of *Hypogastrura* from Jura, Vaudois, Switzerland, the type locality of NICOLET's *C. armata*. This form has also a combination of (1) antennal eversible sac present (2) *Hypogastrura*-type of postantennal organ, (3) s.s. being in position of  $p_1$  upon th. II and III (4) *commnis* type (= *denticulata* type or A type) of chaetotaxy upon abdomen. This example is surely different from *C. armata* NICOLET settled by GISIN (1949), CASSAGNAU (1959) and YOSHII (1960, 1962).

*Brachystomella hawaiiensis* sp. n.

Fig. 3

5 expl. Mauna Kaala, Oahu, Hawaii 19. I 1945 K. CHRISTIANSEN

Body length ca. 2.5 mm. Colour uniformly dark blue, strongly mottled, ventral

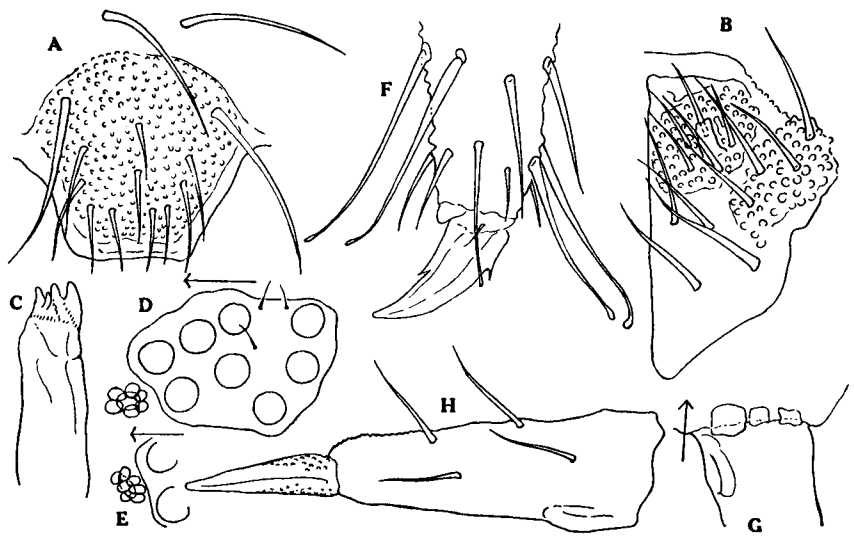


Fig. 3 *Brachystomella hawaiiensis* sp. n.

A: Labrum, B: Labium, C: Mandible, D: Eyes and postantennal organ, E: Postantennal organ, F: Mid-claw, G: Terminal thickening of manubrium, H: Dens and mucro (dorsal view).

side paler. All extremities are also darkly pigmented. Ant./head as 4:3. Ant. ratio as 3:3:4:4. Ant. IV distally with trilobed apical bulb in a deep pit. Sensory setae are poorly differentiated both dorsally and ventrally. Ant. III is almost confluent with and. IV, ant. III-organ is a pair of small rods in a shallow groove, accompanied on both sides by one sensory seta, which are remote from the organ itself. Ant. I, II with a single row of small setae. Labrum trapezoid, prelabral setae presumably 1+1, labral setae are in four rows as 3, 2, 3, 4. Whether such arrangement is derived from 5, 3, 4 or 3, 5, 4 by the reduction of normal 5, 5, 4 is not to be determined. Lateral pair of setae from the first row is very large. Labral margin without any structures and the surface is evenly granulated all over. Mandible typical for the genus, apically with many teeth. Maxilla absent. Labium broad, with many equally large setae, one of which is upon distinct papilla. Eyes intensely black, 8+8. Post-antennal organ directly before eyes, composed of 6-7 small tubercles and a central pit, forming a rosette of 1.5 times of an eye in diameter. Unguis broadly carinate, with one inner tooth at about the middle. Lateral tooth is present basally only on outer side of the unguis, the other side being untoothed. Unguiculus absent. Tibio-tarsus with two quirl of setae, the arrangement is not different from *Hypogastrura* (cf. YOSH, 1962 p. 3). From the lower row three anterior setae ( $1_1, 1_2, 1_7$ ) are very

long, large and swollen at the end, two lateral ones ( $1_3$ ,  $1_6$ ) are smaller, but also distally swollen, while others are simple. Setae of the higher row are all large,  $h_1$ ,  $h_6$  (posterior ones) are larger and apically swollen, others are pointed. Thus we have many (ca. 7) tenent hairs in all. Ventral tube with 3+3 setae. Rami tenaculi tridentate, but the apical one is slightly subdivided. Furca well developed, d:mu as 11:5. Manubrium ventrally without setae, ventral distal margin with 3+3 thickening of the integument, which is very characteristic for the species. Dentes dorsally finely granulated and with 4 slender setae. Mucro is straight, converging distally, slightly lamellate marginally and with some insignificant granules. Body setae short, smooth and simple. s.s. are a little longer. Their arrangement is not investigated. Anal spines absent. Integument is equally granular.

This species is characteristic by the number of dental setae, clubbed setae of tibiotarsus. Nearest allied species must be *B. terrafolia* SALMON, 1944 of New Zealand, which has, however, 5 dental setae and no tenent hairs.

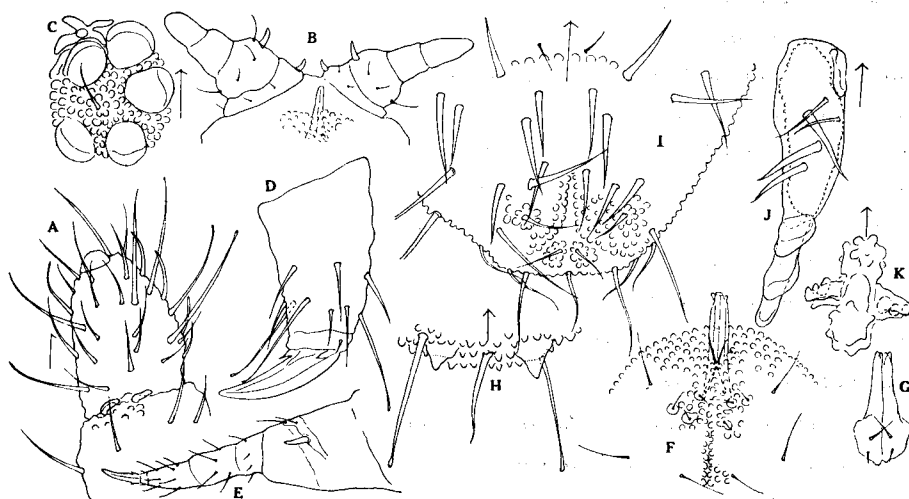
*Odontella cornuta* sp. n. Fig. 4

2 expls. Yoshino, Pref. Nara 7. VIII 1959 G. IMADATÉ

1 expl. Fujiike, Tsurugisan, Pref. Tokushima 18. X 1937 RY

1 expl. Katsuoji, Pref. Osaka 24. XII 1952 T. SAWADA

Body length up to 2.0 mm. Colour intensely dark purple, strongly mottled and each segmental margins are pale. Antennae deep black. Ventral side and other extremities pale. Ant./head as 1:1. Ant. ratio as 10:18:15:25. Antennae conical in shape. Ant. IV is bearing one large vesicular swelling and ca. 10 slender, curving sensory setae. Ventral side is with some 8 short setae. The segment is beset with many long setae, some of which are blunt on apex. Ant. III-organ is two rods inclined to the inner side of the segment. Both ant. IV and III are dorsally granular and each granules are arranged to form many transverse folds. Ant. II and I broad, each beset with one transverse row of short setae and the inner lateral seta is converted to a conspicuous spine. The spine of ant. II is ca. 2 times longer than that of ant. I. Buccal cone elongate, basal portion is concealed by the chitinous swelling and exact feature is not easily to be detected, apparently it is with 1+1 small setae. Eyes 5+5, intensely black. Postantennal organ is stellate, with 4 lobes and one central pit. Legs bearing one blunt, strong spine to each coxal basis on outer side upon mid- and hind legs, but without it upon fore-legs. Unguis broad, dorsally carinate and with one distinct inner basal tooth. A pair of lateral teeth is near the basis. Unguiculus absent. Tibiotarsus apically with long setae 2, 3, 3 in number. They are especially long and apically swollen to form tenent hairs.

Fig. 4 *Odontella cornuta* sp. n.

A: End of antenna, B: Spines of antennae (Ventral view), C: Eyes and postantennal organ, D: Mid claw, E: Hind leg with a basal spine, F: Ventral view of buccal cone, G: Ditto in juvenil example, H: Anal horns (dorsal view), I: Abdominal end in ventral view, J: Dens and mucro (dorsal view), K: Tenaculum.

Ventral tube with 3+3 setae. Tenaculum with 3 toothed rami and the median corpus is longitudinally developed. Rami have an another pair of processes. The anterior part of corpus with 3 small tubercles. Furcula large, dentes posteriorly granular and with 5 setae, the inner 3 of them are remarkably thick. Mucro elongate, apically blunt and with two dorsal lobes crossing the mucro as usual of the genus. Anal spines are a pair of enlarged integumentary granules, wide apart, conical and erecting. Body densely granular, body setae rather large. Median ones are in three transverse rows upon th. II, III and upon abd. IV, while they are in two rows upon abd. I-III and V. They are somewhat rugose and obtuse apically. Those of the posterior segments are longer and distally clavate. S.s. are longer, slender, apically pointed and situated as  $p_1$ ,  $p_4$ ,  $p_5$  upon abd. I-III, abd. IV, abd. V respectively. Setae near the anal region of ventral side are considerably thickened, decidedly different from usual setae.

This species is peculiar by the possession of special spines upon ant. I, II and upon coxal basis of mid- and hind-legs. Presence of tenent hairs, modified anal setae are also very characteristic.

The description of *Odontella thauma* BÖRNER, 1909, to which the new genus *Odontellodes* STACH, 1949 was proposed, has some resemblance to this species. How-

ever, the postantennal organ is quite different and ant. IV without trilobed bulb.

In juvenile examples of 1.5 mm. the colour is bluish dark. Antennal spines are present only upon ant. I. Coxal spine of mid- and hind-legs are setaceous, corpus tenaculi without modification and the setae around the anal orifice are not thick. Genital opening is not yet formed. Buccal cone is straight, attaining the fore-margin of head, not concealed by integumentary swelling basally and beset with 2+2 setae, the distal one longer, but about 1/3 of the cone in length. Body setae are slender, usual setae very short, while s.s. are extremely long, more than 5 times the usual setae in length upon abd. I, III. Their arrangement is, however, not different from adult specimens.

*Pseudachorutes insularis* sp. n. Fig. 5

2 expl. Yassa, Iriomote Is. 23. III 1961 KEC

Body length 0.6 mm. Colour bluish gray, mottled. Integument is coarsely granulated and each granules are separately pigmented as in *Odontella*. Ant./head subequal. Ant. ratio as 1:1:(2), the last two segments being dorsally ankylosed. Ant. IV with 3 small apical bulbs and 6 slender, curving sensory setae. Ant. III-organ is a pair of short rods in a groove, accompanied by long, slender d- and v- setae. Buccal cone long, pointed. Labral setae, which seems to be significant for the subdivision of the genus, may be formulated as 2, 3, 3, 2, 2 (fig. C), the distal pair is much longer than others. Prelabral setae 2+2, remote to each other. Mandible distally bidentate. Maxilla styliform. Labium with setae arranged as in fig. D. Eyes 8+8, upon black patch. Postantennal organ lies directly before the eye patch, oblong, two, times the diameter of an eye and composed of ca. 16 peripheral and 20 central elements. Unguis slender, with an inner tooth nearer to the basal end. Unguiculus and tenent hair absent. Ventral tube with 2+2 setae. Rami tenaculi tridentate, corpus without setae. Furcula in ratio as 15:10:6. Manubrium dorsally with 5+5 or 4+4 setae. Dentes dorsally granulated and with 6 sudequal setae. Mucro arcuate, narrow, apically bent and with an outer lamella basally lobed. Th. II-abd. III have subsegments. Abd. V is shorter than other segments. Abd. VI has no anal spines, not hidden in dorsal view and somewhat verrucose with warty granules. Body setae are short, simple and smooth. Their arrangement as in fig. A. S.s. are larger and at the position of  $p_3$  (th. II, III), quite lateral (abd. I-III),  $p_1$  (abd. IV) and  $P_2$  (abd. V). Thus the chaetotaxy is alike to that of *Ps. longisetis* YOSHII (1961, fig. 9), but more numerous than that. Anyhow it is in two rows upon th. II-abd. III.

The species is near *P. dahlii* (SCHÄFFER, 1898) of New Britain, but different in postantennal organ and mucro. From *P. longisetis* YOSHII it is readily separated by shorter body setae. Structure of postantennal organ corresponds to *Americotri-*



*meria* STACH 1949, although paratergites are not developed and eyes are in full number.

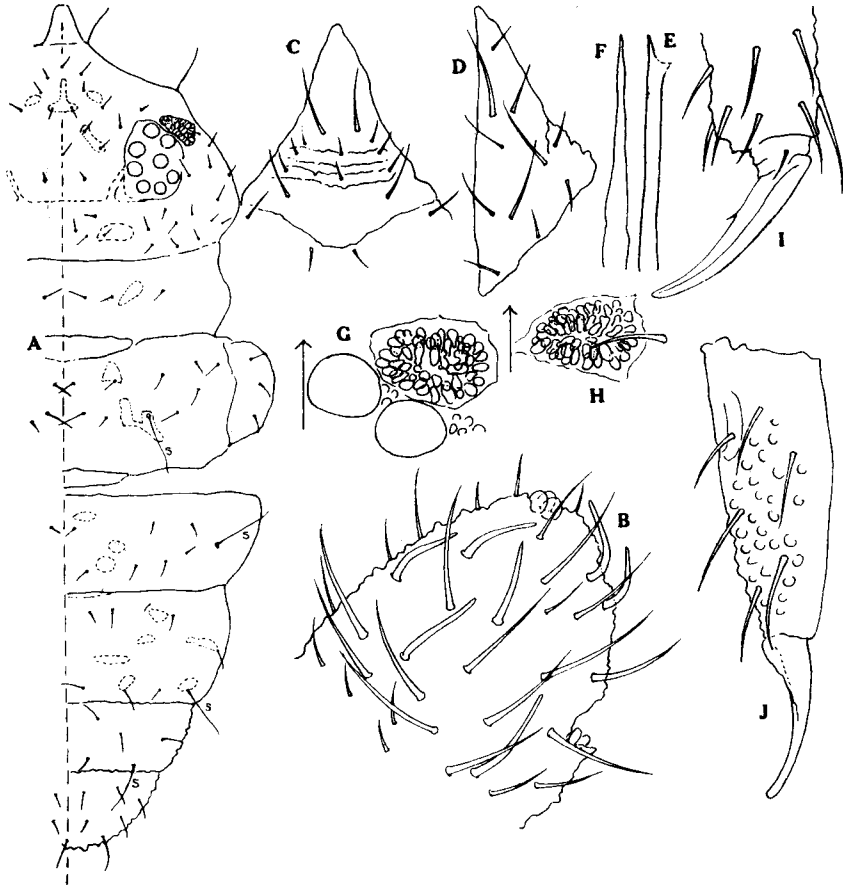


Fig. 5 *Pseudachorutes insularis* sp. n.

A: Chaetotaxy, B: End of antenna, C: Labrum, D: Labium, E: Mandible, F: Maxilla, G: H: Postantennal organ, I: Mid claw, J: Dens and mucro (dorsal view).

*Paranura formosana* sp. n. Fig. 6

1 ♀ Taipei, Formosa 16. XI 1962 K. BABA leg.

Body length 1.0 mm. Totally white. Antenna shorter than head, conical, last two segments totally ankylosed. Ant. IV apically with 3 end-bulbs and 8 blunt, curving sensory setae arranged as in fig. B in the same way to *Lobella* and p-seta is present. Ant. III-organ is composed from 2 short rods in a groove, d-seta blunt and straight, v-seta is longer, blunt apically and curving in spirilliform. Ant. I, II with a row of

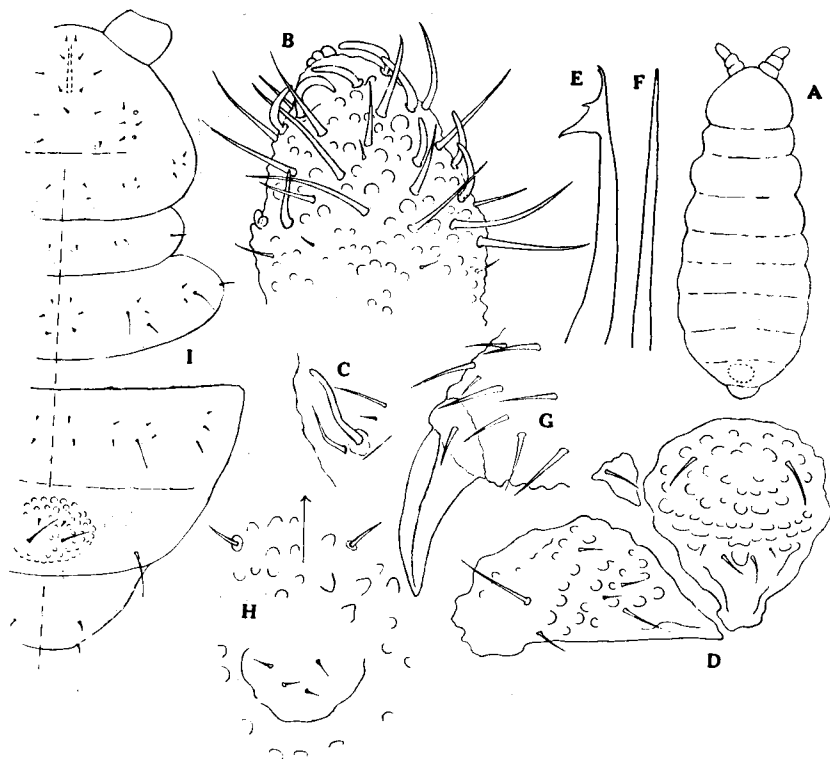


Fig. 6. *Paranura formosana* sp. n.

A: Habitus, B: End of antenna, C: v-seta of ant. III, D: Labrum and labium, E: Mandible, F: Maxilla, G: Hind elaw, H: Furcal rest, I: Chaetotaxy of body segments.

small setae. Buccal cone poorly developed. Labrum granulated proximally, with 3+3 setae in two rows as 1+1, 2+2. Mandible slender, ending in three teeth, the distal one with slight denticulation. Maxilla simple, styloform. Outer ramus of maxilla small, with one small seta on it. Labium short, acute, with 2 long and 5 short setae as fig. D. Eyes 2+2, unpigmented and wide apart to each other. Each cornea is not much larger than the integumentary granules and easily to be overlooked. Unguis carinate dorsally, without tooth. Unguiculus and tenent hair absent. Ventral tube with 4+4 minute setae. Rest of furcula is a median, rounded area having 4 very minute setae. Integument is coarsely granulated all over the body. Abd. V has a median, rounded low swelling, upon which the integument is distinctly and coarsely granulated. Abd. VI rounded. Body setae are short, about 2-3 times the diameter of the granules. Their arrangement is, as reproduced in fig. I, somewhat near *Aphoromma* (cf. YOSHII, 1961, p. 14, fig. 11) and *Paranura s-uenoi* (loc cit

p. 12, fig. 10). Setae sensuales are longer than usual setae and in two pairs upon th. II, III and one pair taking the position of  $p_3$ ,  $p_2$  upon abd. I-IV and abd. V respectively. The median dorsal swelling of abd. V has 2+2 ( $a_1$ ,  $p_1$ ) setae on it.

Our knowledge about the genus *Paranura* is scanty. The present form is near *P. sexpunctata* AXELSON, 1902 of Europe, but differing in the shape of mouth parts and in the shortness of body setae. It is also different from *P. coeca* FOLSOM, 1916 (USA) by the absence of a long sensory seta upon ant. IV and by the presence of eyes.

*Pseudanurida billitonensis* SCHÖTT, 1901

YOSH 1955, UCHIDA 1962

8 expl. Ohara, Iriomote Is. 22. III 1960 NH

Distribution: Indonesia, Australia, Japan

*Neanura (Metanura) sanctisebastiani* (YOSH, 1954)

Fig. 7, Fig. 8 F

*Metanura Sancti-Sebastiani*: YOSH, 1954

*Metanura sebastiani*: YOSH, 1956

Body length up to 2.8 mm, usually smaller. Dark blue dorsally and paler ventrally. Pigments mottled. Antennae shorter than head. Ant. III and IV dorsally confluent. Ant. IV with 3 apical bulbs and 8 blunt, curving sensory setae in usual arrangement. p-seta is present. Ant. III-organ is composed of two minute rods in a groove. d- und v-seta are long, curving and blunt, the latter is placed ventrally. Ant. I with well defined tuberculated area. Buccal cone slender, protruding. Labrum strongly converging and with 3 pairs of setae, the distal pair very long, the second pair small, the third one small and proximally situated. Prelabral setae absent. Mandible and maxilla weakly developed, the former is apically tridentate, the latter is styliform. Labium also acuminate, with 1+1 long and some short setae, the basis of the former is definitely crenulated. Eyes 2+2, unpigmented. Upon head the antennal tubercles are absent as usual for *Neanurini*. Apical, central and ocular tubercles are confluent in a large mass and the distinction between the last two tubercles is indicated by a slight groove or furrow of the posterior margin of the area. It is sometimes very slight and sometimes considerably long. Occipital tubercles are in 3 pairs and the dorsal one bearing 2 large and 2 small setae. Upon th. I the dorsal tubercle is either absent or vestigially present, represented always by a seta. which is winged. Th. II, III is bearing 4 pairs of tubercles, each bearing 3, 3+s, 3+s, ca. 4 subequal setae. Abd. I-III is beset with 4 tubercles having 2, 3+s, 2-3, 1-2 setae. Abd. IV has 2, 2+s, 2, 1 setae. Upon abd. V the dorsal tubercles are confluent dorsally having 2+2 setae, the anterior pair smaller, but distinctly winged. Lateral

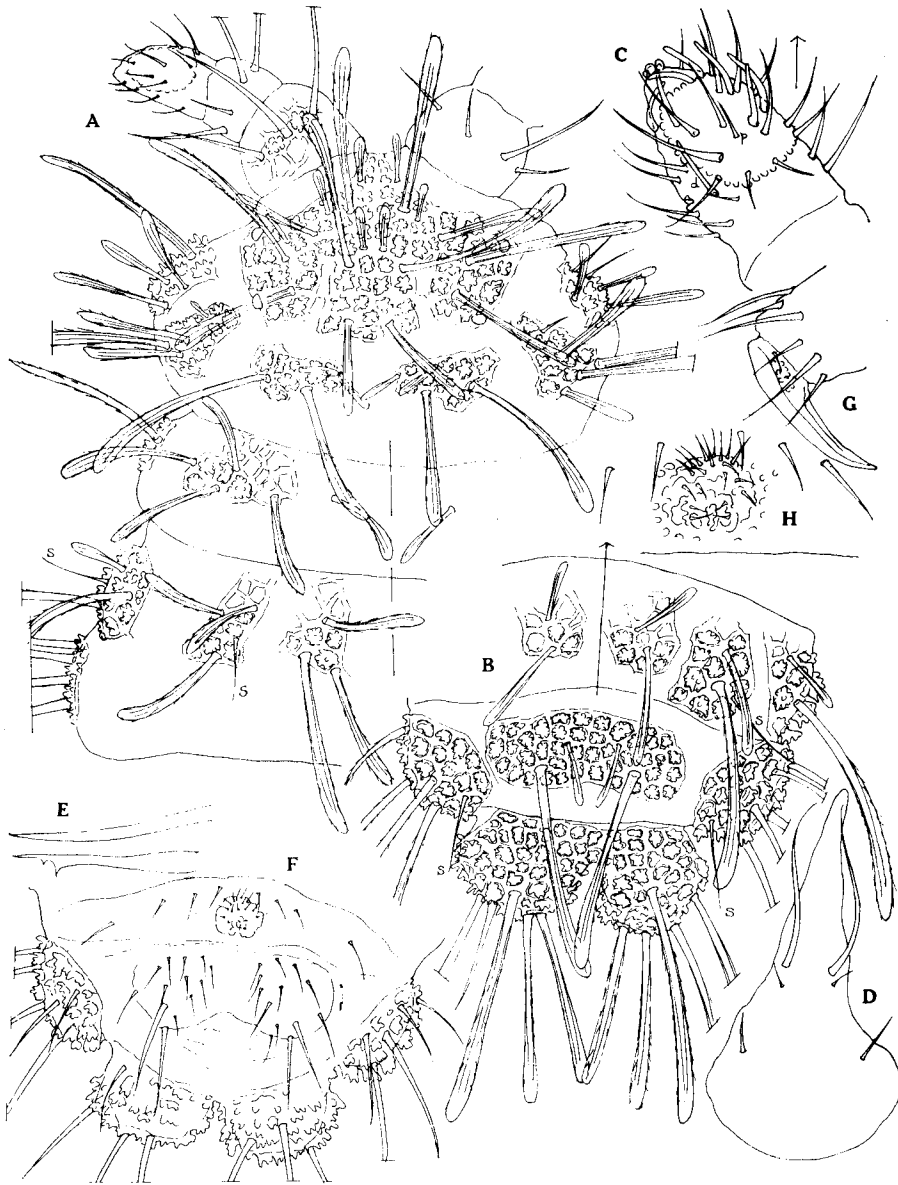


Fig. 7 *Neanura sanctisebastiani* (YOSHII)

A: Head and th. I, II, B: Abd. IV-VI C: Ant. IV, D: Labrum,  
E: Mandible and maxilla, F: Ventral view of abdominal end, G: Mid  
claw, H: Male genital orifice.

tubercles distinct, with a spiny s.s. on dorsal side. Abd. VI is tuberculated all over, without median area. Unguis small, without inner tooth and the inner side is granulated basally. Anal valve is not typically bilobed, assuming a form of two tubercles (fig. F) with some large and small setae, all of which are spinose. All body setae are distinctly winged, with ciliated margins. Body tubercles are well furrowed and fielded, especially those upon head and distal body segments are well defined from granulated area.

This is a very common species to be found in the forest liter of Japan. My previous description about this species is dubious and not sufficient, so the new diagnosis and figures are given. By comparing the mouth parts of this with *N. muscorum* TEMPLETON of Europe, I could find no fundamental difference between them. The name *Metanura* YOSII, 1954 must be regarded, therefore, to represent a subgenus of *Neauura*, by which the central tubercle of the head is coalescent more or less with the ocular tubercles of both sides.

*Neanurini* and *Lobellini* are hitherto divided only by the structure of body tubercles (YOSII, 1961, p. 15). However, there seems to exist a large difference in the setal arrangement of labrum. In *Neanurini* the first pair of the labral setae are very long, attaining the apex of labrum, while in *Lobellini* there are another arrangement and form of setae, differing in each species.

The general shape of labrum and labium seems to be related with the form of mandible and maxilla. Both in *Neanurini* and *Lobellini*, when the formers are acuminate and pointed apically, so the latters are reduced. When the formers are broad and truncate apically, so the latters are less reduced.

*Neauura (Metanura) okinawana* sp. n. Fig. 8 A-E, 9

5 expls. Onnadake, Okinawa 13. X 1960 NH

Body length 1.5 mm. Colouration lightly gray mottled with black pigments. Antennae pigmented basally, other extremities pale. Ant./head as 4:5. Ant. ratio as 25:20:30. Ant. I subcylindrical and with slight fielding on basal half. Ant. I and II with a row of setae. Ant. III and IV quite confluent, dorsally granulated upon distal half. Apical bulbs 3, sensory setae 7 in usual arrangement, p-seta short. Ant. III-organ is a pair of small rods in a deep groove, accompanied by long, blunt d- and v-seta. Distally the ventral setae are short and spiny. Eyes 2+2, slightly pigmented. Buccal cone sharply pointed, mandible apically bidentate, maxilla styli-form. Labium as in fig. 9B. They are concordant with *N. sanctisebastiani* YOSII, 1956 in details. Unguis carinate, without inner tooth and its inner side is basally granulated. Furcular rest absent. Anal lobe has many setae including a long one.



Fig. 8 *Neanura okinawana* sp. n.

A: Head and th. I, II, B: End of antenna (dorsal view), C: ditto in ventral view, D: Fore claw, E: Subdorsal tubercle of abd. I.

*Neanura sanctisebastini* (Yoshi)

F: Subdorsal tubercle of abd. I.

Arrangement of setae and tubercles of the body as follow: Upon head clypeal, frontal and ocular tubercles are united in one mass as characteristic of *Metanura*, with 7+7 setae upon it. 2+2 eyes are lying lateral to this united tubercle. Of occipital tubercles 3+3 are present. Th. I: dorsal tubercle absent, setae as 1, 3, 1, dorsal pair of setae spinous and not winged. Th. II, III: setae as 3, 3+s, 3+s, 4. Abd. I-IV: setae as 2, 2+s, 3, 3. All of them with definite fielded area of the integument. Upon abd. V dorsal tubercles are united medially, bearing 1+1 posterior

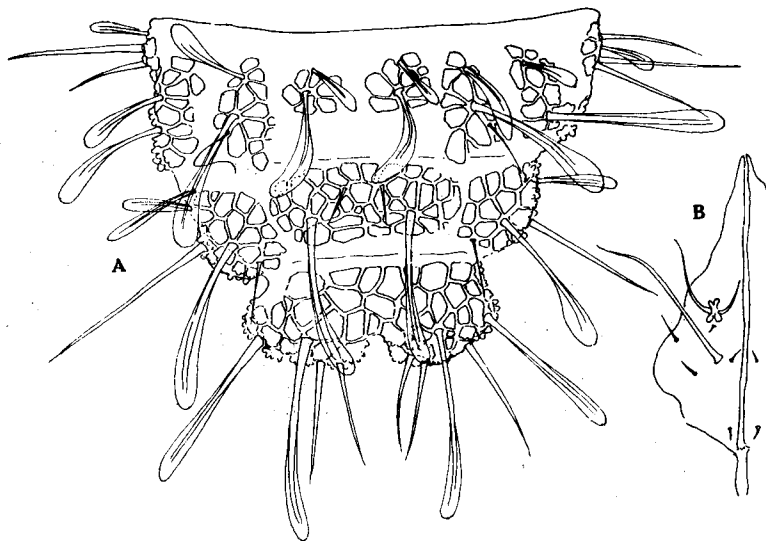


Fig. 9. *Neanura okinawana* ss. n.  
A: Abd. IV-VI, B: Labium.

winged and 1+1 smaller anterior spinose setae. Subdorsal tubercle is united with lateral one and s.s. lies on dorsal side of the tubercle. Abd. VI has a pair of tubercles united to each other medially by the fielding of the integument. All body setae of the dorsal side are broadly foliaceous with spatulate wings in a plane and their margins are slightly feathered

The species is very near *N. sanctisebastiani* Yosii in almost all details. Body setae are, however, relatively short and more broadly winged. More precisely, they may be separated by the shape of setae upon th. I and abd. V, they are all winged in the cited species and some of the dorsal pairs are spiniform in this species. Besides, the subdorsal tubercle of abd. I-III is bearing 2+s setae in *N. okinawana* and 3+s setae in *N. sanctisebastiani* (Fig. 8, E, F).

*Neanura (Metanura) iriomotensis* sp. n. Fig. 10, 11

2 expls. Yassa, Iriomote Is. 23. III 1961 KEC

Body length up to 2.0 mm. Colour dark gray, strongly mottled with black pigments. Ant./head as 6:9. Ant. ratio as 5:3: (5). Ant. IV with 3 apical bulbs and 7 slender, curving sensory setae. Ant. III-organ is a pair of rods in a groove. d- and v- setae long. Ant. I is with areolas proximally. Buccal cone narrowly pointed. Mandible and maxilla as in *okinawana*. Labium more narrowly elongate than that. Eyes 2+2, black, situated at the margin of central tubercle (all fused) of the head.

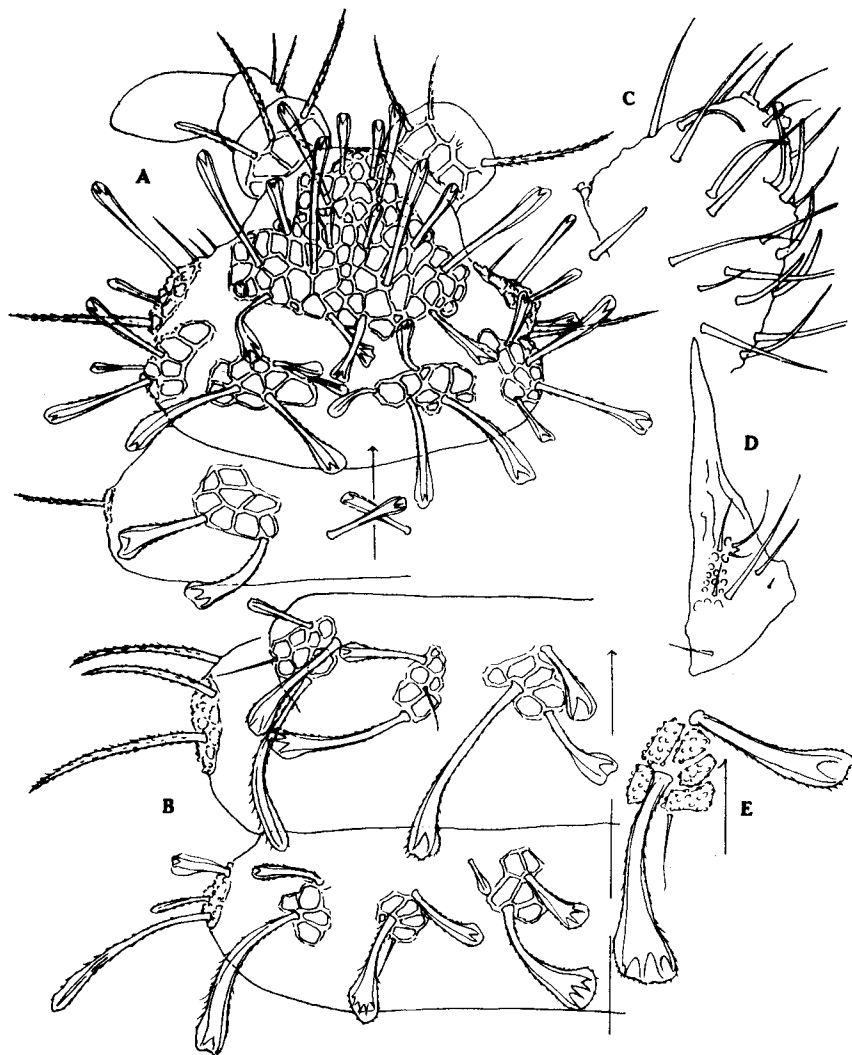


Fig. 10 *Neanura iriomotensis* sp. n.

A: Head and th. I. B: Th. III and abd. I. C: Antennal end,  
D: Labium, E: Subdorsal tubercle of abd. I.

Unguis untoothed, granulated on inner side. Ventral tube with 4+4 setae. Furcal rest absent. Distribution of segmental tubercles and setae are all concordant with *okinawana*. But almost all body setae of dorsal side are heavily spathulated distally and their axial shaft is distally divided and forked dichotomically. Two anterior setae of the dorsal tubercle in occipital region, 1+1 setae representing the dorsal



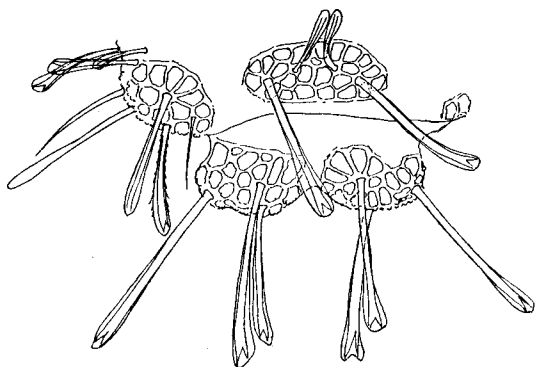


Fig. 11 *Neanura iriomotensis* sp. n.  
Abd. V and VI in dorsal view.

tubercle of th. I, 1+1 anterior setae of the median (dorsal) tubercle of abd. V are simple in *N. okinawana* and spatulate in *N. iriomotensis*. A pair of tubercles of abd. VI are connected by integumentary areolas in the cited species and separate in the present one. In other details they are concordant.

Distributions: Endemic of Ryukyu (Iriomote).

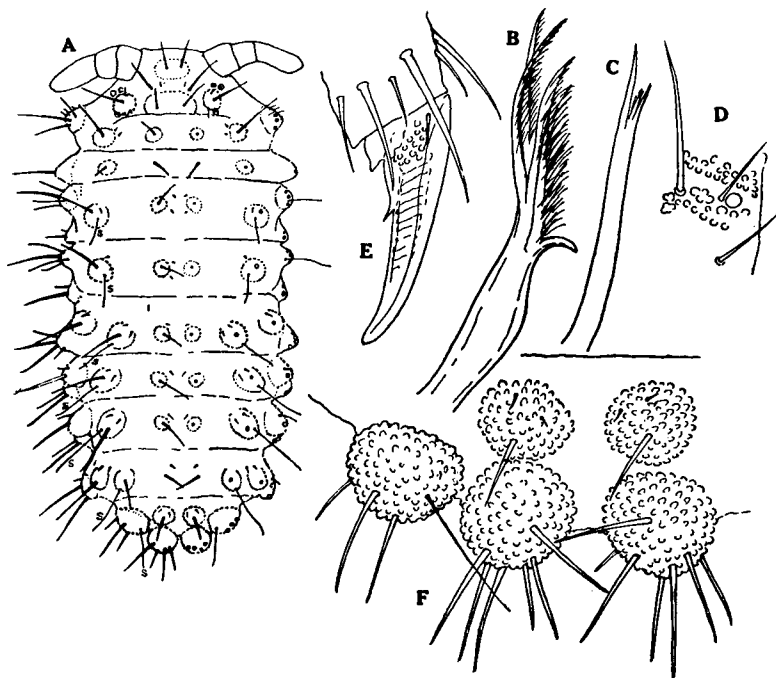
*Crossodonthina formosana* sp. n.

Fig. 12

5 expls. Uh-lai near Taipei, Formosa 24. X 1960 RY

Body length up to 3.0 mm. Colour bright red in living and wholly white in alcohol. Antennae shorter than the head. Ant. IV distally with 3 apical bulbs and 8 sensory setae in usual arrangement. One of them is, however, quite setaceous in appearance. Ant. III-organ also normal, d- and v- setae are well elongated. Eyes 3+3, weakly pigmented black. Postantennal field wide and conspicuous. Buccal cone weakly developed. Medial part of labial plate has one rounded area interior to the seta  $m_1$ . Mandible alike to *C. appendiculata* YOSH, 1956 having two distal ciliated flagellae, 2 fringed lamellae and one basal prominent tooth. Maxillar head distally bi- or trifurcate and somewhat barberated. Unguis dorsally carinate and with one large inner tooth. Inner side of the unguis is granulated basally and with many transverse striae medially. Ventral tube with 4+4 setae. Furcular hump low, medially situated and with 3 setae. Body tubercles sphaerical. Upon head a pair of antennal tubercles reduced. Sublateral, lateral and subocular tubercles united to one. Frontal tubercle with 1+1 setae. Dorsal tubercles of th. II—adb. III obscurely developed. Subdorsal, sublateral and lateral tubercles normally situated and well defined. Upon abd. IV dorsal tubercles practically absent. 3+3 other tubercles are transversely situated. Abd. V has 2+2 rounded tubercles and s.s. lies on the dorsal side of the lateral one. Paired tubercles of abd. IV are spherical, a little apart to each other. All body setae are uncoloured, simple, smooth and pointed on apex.

The species is easily discriminated from all other known species of *Crossodonthina* by having 2+2 tubercles upon abd. V.

Fig. 12 *Crossodonthina formosana* sp. n.

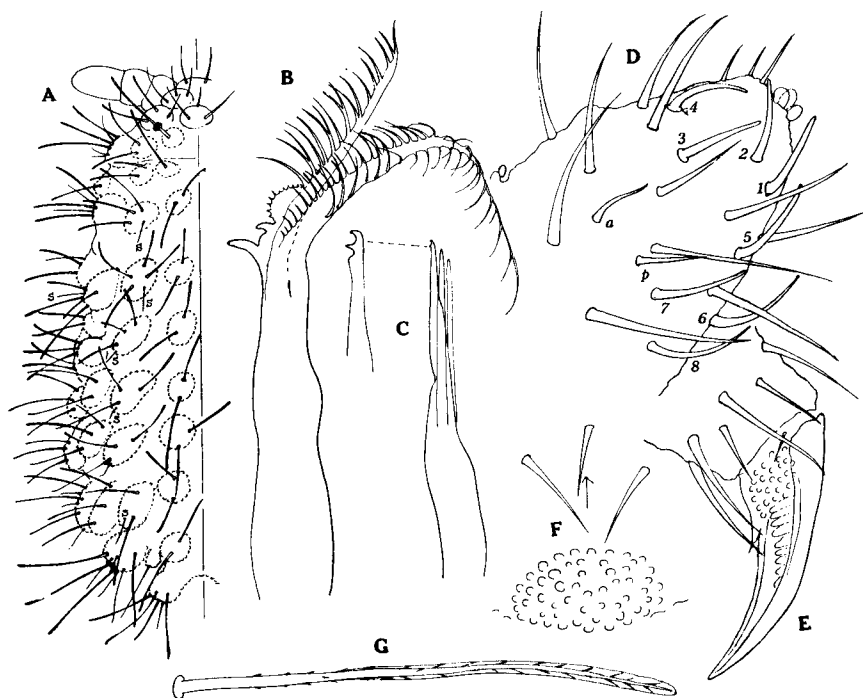
A: Habitus, B: Mandible, C: Maxilla, D: Integumentary granules at the base of middle large seta of labium, E: Mid claw, F: Abd. V and VI.

*Crossodonthina alatoserrata* sp. n.

Fig. 13

5 expl. Taipei, Formosa 16. XI 1962 K. BABA

Body length up to 2.0 mm. Colour totally white in alcohol. Ant./head as 1:1. Ant. III, IV dorsally ankylosed. Ant. IV bearing 3 end-bulbs and 8 curving, sensory setae arranged in the usual way as in other species of the genus (cf. YOSHI et LEE, 1963, fig. 1B for *C. koreana*). Ventral side of the segment with many short, spiny setae. Ant. III-organ is two rods in a groove. d-seta remote from it, v-seta ventrally present. Mouth strongly hypognathous, labrum truncate, granulated and with 2+2 subequal setae. Prelabral setae absent. Mandible elongate, deeply bifurcate, longer ramus is intensely feathered, while another is not only feathered in the same way, but also with two teeth and a hyaline, serrated lamella near the basis. Maxilla almost needle-shaped, but with minute teeth apically and accompanied with two thin lamellae of equal length. Eyes 3+3, anterior two of them near each other. They are poorly pigmented into violet colour. Unguis dorsally carinate, with one large inner tooth. It is basally granulated and inner side is with many transverse striae.

Fig. 13 *Crossodonthina alatoserrata* sp. n.

A: Left half of the body, B: Mandible, C: Maxilla, D: Ant. IV (dorsal), E: Hind claw, F: Furcal rest, G: A seta from the dorsal tubercle of th. III.

Ventral tube with 4+4 setae. Furcal rest is a rounded median hump with 3 setae anterior to it. All body tubercles are well represented and rounded or papillated. Setal arrangement is peculiar for the genus and all of them are well developed in the following manner: Upon head frontal tubercle with 3 strong setae. 3 setae of ocular tubercle well represented. Antennal tubercle well defined and with three long setae. Clypeal tubercle reduced, with 1+1 long setae. All tubercles of occipital region well developed, each separated and with setae arranged as 1, 3, 2, 4-6. Th. I with 3+3 tubercles having 1, 2, 1 strong setae each. Th. II, III bearing large setae 2, s+4, 4+s, 3-5. Abd. I-III with setae arranged as 2, 3+s, 2, - in number. Upon abd. IV setae are 2, 2+s, 3, -. Abd. V bears 3+3 tubercles, the dorsal one with two long subequal setae, subdorsal one small and only with one s.s. on it. Lateral tubercle is large and bearing many setae. Abd. VI with a pair of well developed tubercles with many setae on it. All body setae are long, slightly brownish, with narrow marginal wings on distal half, ending in a rounded apex and often heavily

serrated. s.s. are short, feeble and smooth.

The species is characterized by the well developed body setae, all subequal in length. All dorsal tubercles of the trunk have two long setae on it, while one of them is missing or vestigially small in other known forms of the genus. Mandible is peculiar in form.

*Lobella (Lobella) decipiens* sp. n. Fig. 14

1 ♂ Anno, Tanegasima 22. X 1955 RY

1 ♂, 2 ♀ Nagata, Yakushima 26, X 1955 RY

Body length up to 2.5 mm. Colour red in living and white in alcohol. Ant./head as 1.0. Ant. IV bears appically 3 end-bulbs and 6 slender sensory setae, some of which are often distally coiling. Two other setae (no. 7, 8) are almost setaceous. Ventrally the segment has some distal setae strongly spiny and surpassing the apex of it as in *L. stachi*. Ant. III-organ and d- seta of it are as usual. Buccal cone is truncate distally, chaetal disposition and graunlation of the ventral side as in fig. B. Mandible with two apical, 5 intermittent and one broad basal teeth, no outer ramus. Maxilla very long, almost styliform, but with two apical teeth. A pointed lamella is attached to it. Eyes 3+3, black. Postantennal field rounded and considerably large. Disposition of tubercles and setae of the body as in fig. A. Setae

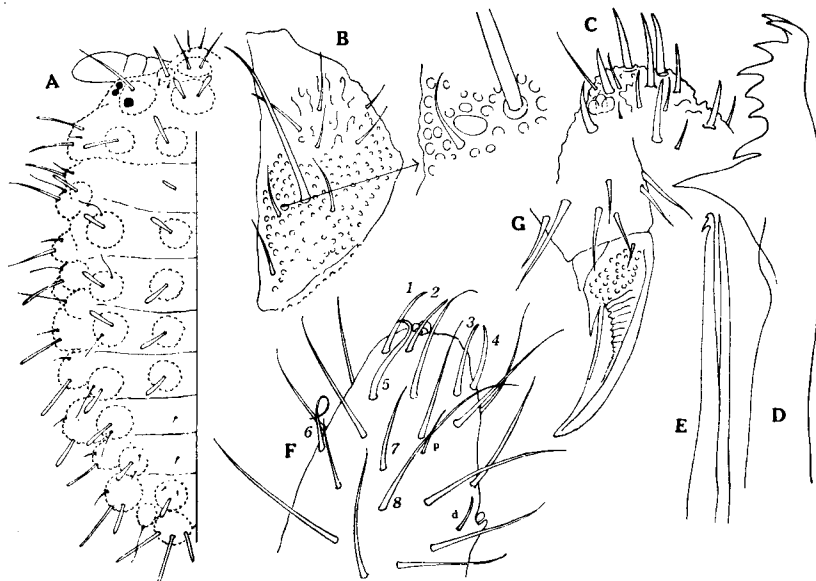


Fig. 14 *Lobella decipiens* sp. n.

A: Left half of the body, B: Labium, C: End of antenna (ventral),  
D: Mandible, E: Maxilla, F: Ant. IV (dorsal).

of the dorsal and subdorsal rows of tubercles as well as that of the frontal tubercle of the head are converted to dagger-like, spathulate setae. Dorsal tubercles of abd. III and IV are missing, together with the modified setae upon it. Abd. V bears 3+3 tubercles and s.s. is placed upon subdorsal ones. Paired tubercles of abd. VI are standing side by side. All these tubercles are rounded, sphaerical and not mammilated. Unguis strong, inner side basally granulated and then with many transverse folds. An inner tooth is present nearer to the basis. Furcular rest is a median, rounded boss bearing 3 setae upon it.

The species is very nearly related to *Lobella* (*Lobella*) *stachi* YOSII, 1956 of southern Japan with its peculiar modified setae and others. But the cited species has dorsal tubercles upon abd. III, IV, while they are absent in *L. (L.) decipiens* sp. n.

*Bilobella parvituberculata* sp. n. Fig. 15

6 expl. Nagata, Yakushima 26. X 1955 RY

Body length 1.2 mm, rather elongate. Colour red in living and white in alcohol. Ant. IV distally with distinct three end-bulbs, guarded by some spiny setae. Sensory setae of dorsal side are well differentiated from normal setae, 7 in number. p- seta present. Ventrally some spiny setae are to be seen. Ant. III-organ lying in a groove and a seta on dorsal side of it is rather long and blunt. Buccal cone almost pointed, not granular and with some setae as fig. C. Maxilla styliform. Mandible distally bicuspidate. Eyes 3+3, in two groups, lightly pigmented. Postantennal field absent. Unguis long, dorsally carinate, without inner tooth and quite smooth on inner side. Ventral tube with 4+4 setae. Furcal rest is a median rounded area with 5 (3, 2) small setae. Segmental tubercles are very feebly developed. Upon head clypeal one is reduced. Frontal tubercle is represented by 3 setae upon it. Of occipital tubercles the dorsal pair is almost reduced, represented by one seta. Th. I has 3+3 setae without tubercles, the dorsal pair of which are very minute. Upon th. II to abd. III, dorsal tubercles are almost reduced, represented by one seta and some rough integumentary granules surrounding it. Subdorsal tubercles are small, rounded and with 2 (th. II, III) or 1 (abd. I-III) seta and one small s.s. Sublateral tubercles bearing s.s. and 2 setae upon th. II, III and without s.s. upon others. Upon abd. IV the dorsal pair of tubercles and setae are quite disappearing and 1+1 minute setae subequal to one integumentary granule are to be seen. Small fovula is placed lateral to them. Subdorsal and other tubercles are as in precedent segments. Abd. V has 2+2 pairs of tubercles and small s.s. is lying on the dorsal side of the lateral one. Paired tubercles of abd. VI not concealed by abd. V and they are far remote to each other. Body setae are all small, larger ones are colourless and distally rounded as in case of *B. pygmaea* (YOSII 1954).

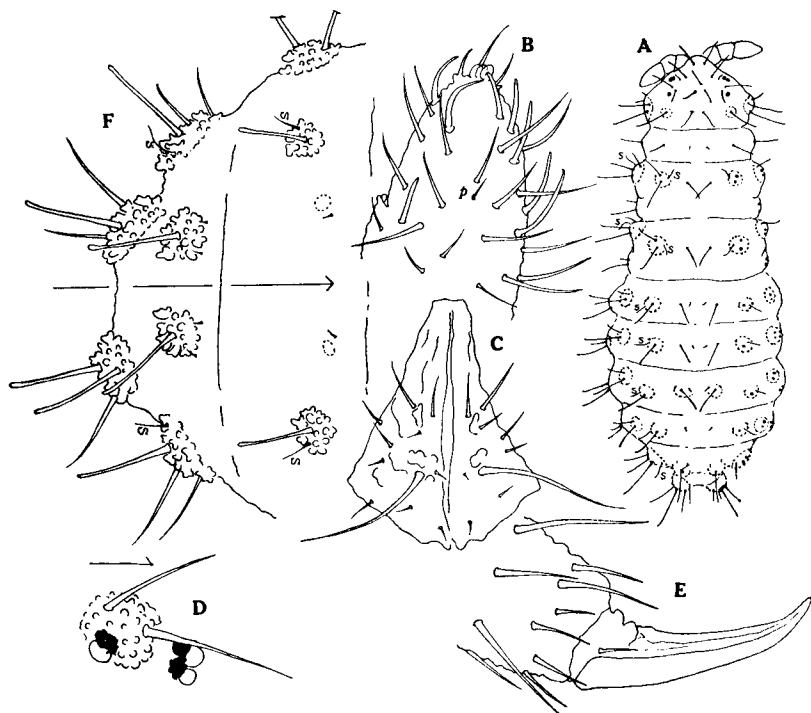


Fig. 15 *Bilobella parvituberculata* sp. n.

A: Habitus, B: Ant. IV, C: Labium, D: Eyes, E: Hind claw,  
F: Abd. V and VI.

*Mesaphorura krausbaueri* (BÖRNER, 1901)

3 expl. Onnadake, Okinawa 13. X 1960 HH,

7 expl. Yassa, Iriomote Is. 23. III 1961 KEC

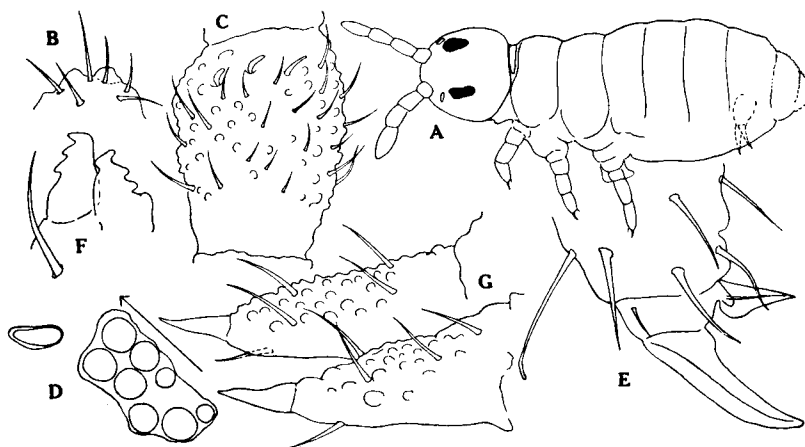
Distribution: cosmopolitan, new for Japan.

*Coloburella (Astephanus) japonica* sp. n.

Fig. 16

1 expl. Daimonji, Kyoto 13. IV 1961 KITAZAWA leg.

Body length 0.7 mm. Form elongated and alike to *Friesea* to some extent. Antennae and dorsal side of the body dark violet, mottled with black pigments. Ventral side and other extremities are pale. ant./head as 9:8. Ant. ratio as 8:11:10:17. Ant. IV with an obscure apical bulb. Ant. III-organ is composed of 2-3 blunt rods each separated. Eyes 8+8, G and H are smaller. They are well pigmented and in a definite eye-field. Postantennal organ lentiform, 1.6 times the diameter of an eye. Labral margin without structures (?). Unguis broad, carinate and without teeth. Unguiculus triangular, acute and with rounded inner margin. Tenent hairs

Fig. 16 *Coloburella japonica* sp. n.

A: Habitus, B: End of antenna, C: Ant. III-organ, D: Eyes and postantennal organ, E: Fore-claw, F: Tenaculum, G: Furca.

1, 2, 2, slightly larger than other setae and blunt on apex. Ventral tube with 4+5 small lateral setae. Rami tenaculi tridentate and corpus with one seta. Furca small, not attaining the ventral tube, but each segments differentiated. Manubrium is broad, ventrally without setae, dorsally granulated and with many setae.  $d:mu$  as 3:1. Dentes also dorsally granulated, dental setae are dorsally 4-5 and ventrally 1, near the mucronal end. Mucro is distinctly separated from dentes, converging and ending in a pointed apex. Anal spines absent. Anus subventral in position. Dorsal side of the body is strongly granulated. Th. I is represented by a small, narrow tergite, which is granular but without setae on it. Abd. VI is distinctly separated and rounded posteriorly. Body setae are typically polychaetotic, all setae are smooth, short and uniformly dispersed. No specialised setae are to be observed upon tergites.

The species is near *Astephanus linnaniemi* DENIS, 1926 of Italy in many details. But eyes are 8+8, tibiotarsus with tenent hairs and mucro is not confluent with dentes. *Coloburella*, *Boernerella* and *Astephanus* are probably derived from *Guthriella*.

### *Dagamaea* g. n.

The genus is very near *Isotomodes*, but abd. V+VI has no minute setae. Ventral setae of manubrium and the dorsal setae of dentes are present in *Dagamaea*, while they are absent in *Isotomodes*. The name is dedicated to DR. MARIA MANUELA DA GAMA of Coimbra, who, after investigating the type material, has kindly informed me that it represents a new genus quite different from *Isotomodes*.

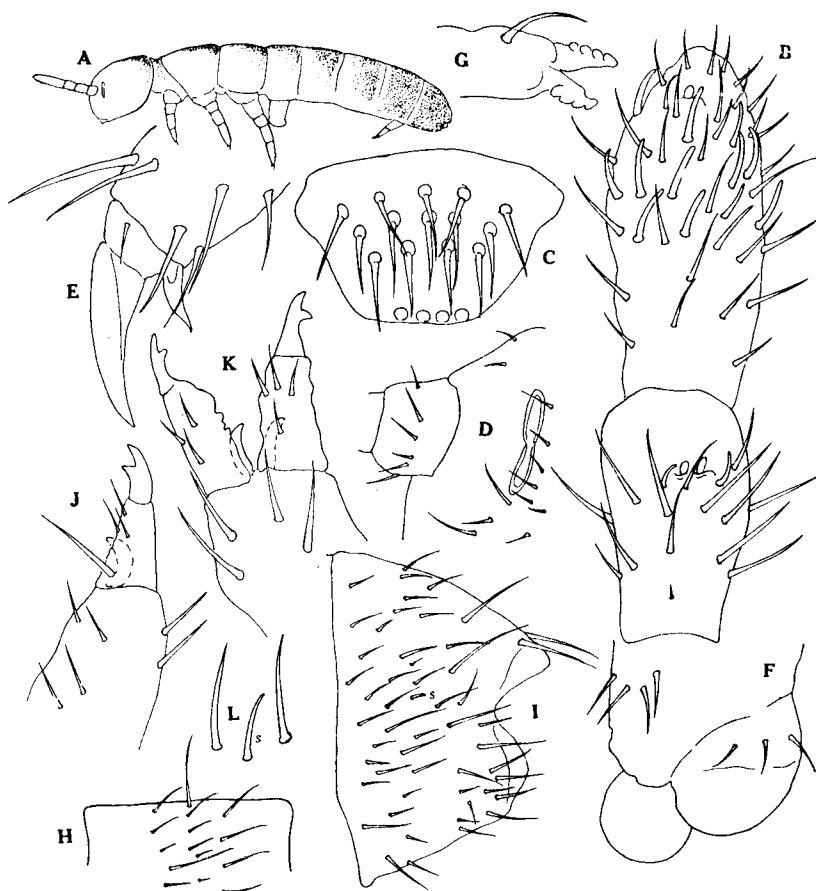
Genotypical species: *Dagamaea japonica* g. n. sp. n.

*Dagamaea japonica* g. n. sp. n. Fig. 17

15 expl. Ikomasan, Pref. Osaka 25. I. 1956 G. IMADATÉ

4 expl. Sobosan, Pref. Oita V. 1961 M. MORISHITA et al

Body length 0.8-0.9 mm, narrowly elongate. Colour white, but strongly mottled with black pigments upon dorsal side of the body. The pigment is scarce anteriorly but rich upon posterior body segments, where the colour is sometimes almost black in appearance. Ant./head as 7:10. Ant. ratio as 10:17:17:22. Ant. IV is clavi-form, with an obscure, broad apical swelling and with ca. 12 curving sensory setae.

Fig. 17 *Dagamaea japonica* g. n. sp. n.

A: Habitus, B: Ant. III and IV, C: Labrum, D: Postantennal organ, E: Hind claw, F: Ventral tube (posterior-lateral view), G: Tenaculum, H: Abd. III (lateral), I: Abdominal end (lateral), J: Furca (lateral), K: Furca (ventral), L: A blunt seta upon abd. III.



Dorsally there is a subapical pit, in which one rod-like sensilla is located. Ant. III-organ is a pair of small rods in a shallow groove, accompanied by a curving sensory setae to each side. Ant. I is only with a transverse row of setae. Labral setae 4/5, 5, 4, all subequally large and upon broad sockets. Distal margin with 2+2 rounded tubercles. PaO narrow, very long, being longer than the breadth of ant. I and with a distinct constriction at about the middle. Eyes absent. Legs without tenent hairs. Unguis broad, without any teeth. Unguiculus small, apically acute and not dentated. Ventral tube has anteriorly no setae. Posterior face has 2+2 distal setae and lateral flap has 3 setae each (fig. F). Rami tenaculi quadridentate, corpus with one anterior seta. Furcula very short, ratio as 25:18:10. Manubrium has ventrally varying number of strong setae, from 1+1, 2+2 up to 3+3. Often the asymmetric disposition as 1+2, 2+3 is to be found. Dorsal side of the segment always with 4+4 feeble setae. Dental ventral setae are also variable in number up to 7, but usually 4. Dorsal side of it is slightly crenulated and beset with 1 strong proximal and some 3 to 5 distal, smaller setae. Inner hook of dentes very strongly developed. Mucro is with two subequal strong teeth. All body segments are subequal in length. Abd. V and VI are completely fused to a single mass (fig. I). and anus opens posteriorly. This segment, however, is not equipped with such special groups of setae as in *Isotomodes productus* (AXELSON, cf STACH 1947, pl. XIII, fig. 8). All body setae are simple, arranged in 3-4 transverse rows on each segment. Abd. I-IV are bearing, besides, 1+1 sensory setae laterally at about the middle, which are subequal to other body setae in length (fig. L).

This species is very alike to the original description of *Isotomodes tenuis* FOLSOM, 1937 of USA. But according to M.M. DA GAMA, who has investigated the paratypes of FOLSOM's collection, this species is really an *Isotomodes* with minute setae upon anogenital tergite (DA GAMA, 1963, p. 24-26).

*Micrisotoma achromata* BELLINGER, 1952                      Fig. 18

10 expls. Mt. Sobosan, Pr. Oita, M. MORISHITA et al leg.

Body length 0.6 mm. Colour totally white. Ant./head as 1/1. Ant. ratio as 5:8:7:13. Ant. IV with a conical papilla apically and with some 10 slender, curving, sensory blunt setae on dorsal side. A subapical pit with a rod-like sensilla is present. Ant. III-organ is composed of two sensory rods in a common groove, accompanied by two short, curving setae, the lateral one of which is basally dislocated. Another such seta is present laterally at about the middle of the segment. Ant. II without sensory elements. Ant. I with only one transverse row of setae including two ventral setae converted to blunt sensory ones. Labrum with

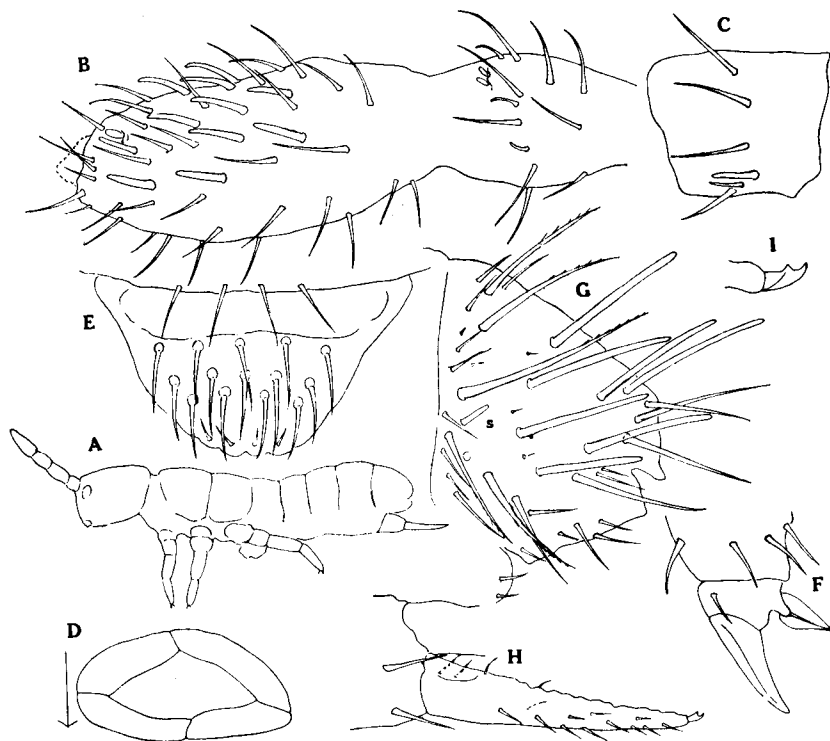


Fig. 18 *Micrisotoma achromata* BELLINGER

A: Habitus, B: Ant. III and IV. C: Ant. I. (oblique dorsolateral view), D: Postantennal organ, E: Labrum, F: Hind claw, G: Abd. VI in lateral view, H: Furca (ventral view), I: Mucro.

setae 4/5, 5, 4. All labral setae are upon heavy sockets. Distal margin is beset with 4 spiny small setae. PaO is very large, being about the breadth of ant. I, ovate, with thick margins and is divided into 4 sections as fig. D. Unguis broad, unguiculus acutely triangular, without tenent hairs. Ventral tube short, anterior face without setae, Posterior face with 1+1 setae. Lateral flap bears 3 setae each. Rami tenaculi 4-dentate, corpus with 1 seta. Furcula in ratio as 1:3. Manubrium short, dorsally with many small setae and ventrally with 1+1 distal setae. Dentes tapering, ventrally with ca. 12 setae. Dorsal side is crenulated and with some 3 basal and 2 distal setae. Mucro very minute and with 2 equal teeth. Trunk elongated, abd. V and VI totally ankylosed. Body setae are spiny. Head capsule bearing only short, simple setae. Each segment of the trunk has, beside the simple smooth setae, which are becoming larger posteriorly, also strongly feathered ones, larger than the former. They are located 1+1 laterally upon th. II, III, 2+2 upon

abd. I-III and 1, 3, 2 upon coxal basis. Abd. IV bearing some 3+3 of them. Upon anogenital segment the chaetal arrangement is strikingly fixed as stated by BELLINGER (1952, fig. 8). Namely a transverse row of long, serrated setae are along the anterior margin and 6+6 in number, together with minute and short ones. There is constantly a blunt sensory rod at about the middle to each side (fig. G, S). Distal part (or the area of anal segment in reality) is beset with many long setae, which are ending in a rounded apex. At the basis of these long, blunt setae some minute setae are present anterior to the area.

Japanese examples coincide very well with the diagnosis and figures given by BELLINGER, but the manubrial ventral setae are 1+1 in all examples at hand, instead of 2+2 of American ones. This may imply variation or race within one species.

The genus *Micrisotoma* may be, as already stated, a near relative of *Proisotoma*, but the structure of labral margin is decidedly different from it.

*Folsomia nakajimai* YOSHII, 1959

12 expls. Hanejison, Okinawa 19. VII 1959 HH

Distribution: Japan, Tonga Is.

*Folsomia hasegawai* YOSHII, 1959

10 expls. Nagata, Yakushima Is. 26. X 1955 RY

*Folsomia ezoensis* sp. n. Fig. 19

5 expls. *Abies-Sasa* Formation, Mt. Asahi, Daisetsu, Hokkaido 29. VII 1959 K. MORIKAWA.

Body length 1.3 mm. Colour quite white. Ant./head as 6:7. Ant. ratio as 3:6:5:9. Ant. IV with an apical cone and some 6 typical sensory setae. Ant. III-organ is a pair of short rods in a groove, accompanied by a pair of blunt setae. Ant. I with a transverse row of setae. Eyes absent. Postantennal organ narrowly elongate, with a deep constriction at about the middle and as long as the breadth of ant. I. Labrum low, with setae arranged as 4/5, 5, 4 and the distal margin is furnished with a transverse fold of the integument. Eyes absent. Unguis and unguiculus slender, untoothed. Without tenent hair. Ventral tube anteriorly without setae, posteriorly with 8 setae. Lateral flap bearing 5 setae each. Rami tenaculi quadridentate, coprus with one seta. Furcula relatively short, only attaining the distal end of abdomen. man:d.:mu as 20:15:4. Manubrium anteriorly with 2+2 strong setae. Posterior face in female with ca. 10 very feeble setae. Dentes anteriorly with 10 setae arranged as v, v, v, oi, oi, ovi. Dorsal setae feeble, 3 basally and one

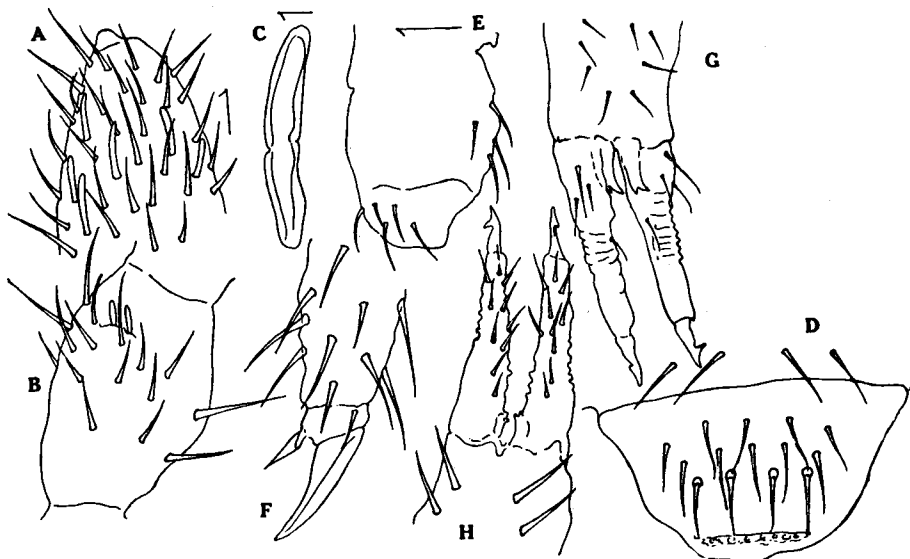


Fig. 19 *Folsomia ezoensis* sp. n.

A: Ant. VI, B: Ant. III, C: Postantennal organ, D: Labrum,  
E: Ventral tube (lateral), F: Hind claw, G: Furca (dorsal),  
H: Ditto (ventral view).

on inner side. Mucronal teeth 2, subequally large. Body setae are rather small, not attaining segmental margin upon abd. I. Female genital orifice anteriorly with 4+4 subequal setae.

The species is closely related to *F. inoculata* STACH, 1947 of Europe, but may be divided by the absence of blunt setae upon abd. V.

***Folsomia onychiurina* DENIS, 1931**

10 expl. Yassa, Iriomote Is. 24. III 1961 NH et KEC

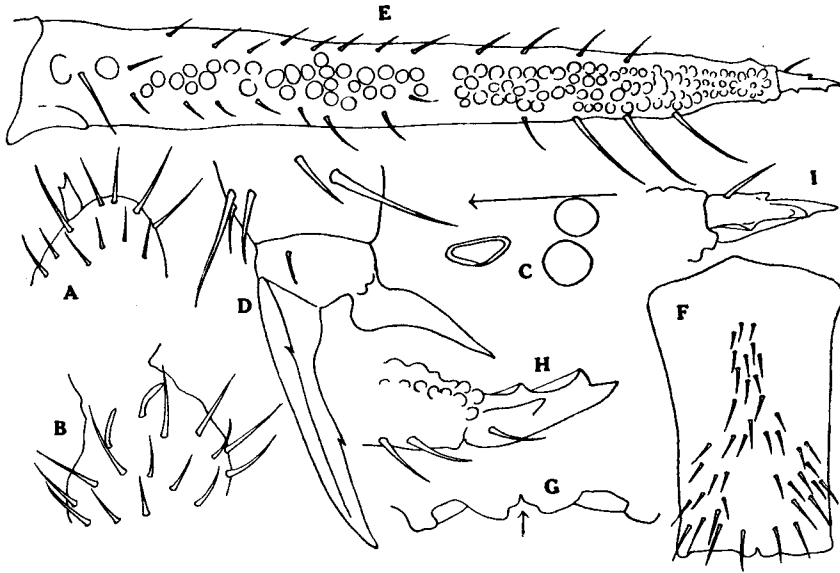
They are in good accord with DENIS' description.

Distribution: North and Central America, Australia, Japan (nov.)

***Granisotoma sadoana* sp. n. Fig. 20**

15 expl. Snow surface, Aikawa, Sado Is. Pref. Niigata, 28. II 1962 S. HIGUMA

Body length 1.7 mm. Colour castaneous brown. Antennae deeply pigmented. Head lighter. Body segments are almost chestnut brown and each segmental margins are paler. Legs and furcula lightly brownish. Ant./head as 3/2. Ant. ratio as 10:15:13:21. Ant. IV with a high conical subapical papilla lightly bifurcate. Ant. III-organ is a pair of long blunt setae situated independently and without

Fig. 20 *Granisotoma sadoana* sp. n.

A: Antennal end, B: Ant. III-organ, C: Postantennal organ, D: Hind claw, E: Dens and mucro in dorsal view, F: Manubrium in ventral view, G: Terminal thickening of manubrium, H: Mucro (outer view), I: Ditto (dorsal view).

guard setae. Ant. III and IV are bearing some curving, slender sensory setae among usual ones. Labral setae 4/5, 5, 4, the third row of them with large sockets. Labral margin is with 4 longitudinal short ledges and incisions as in case of *Desoria* and *Isotomurus*. Postantennal organ small, elliptical and 1.5 times the diameter of an adjacent eye in axis. Eyes 8+8, intensely black and G, H are smaller than others. All legs without tenent hairs. Unguis very long and slender, dorsally keeled and with a pair of minute lateral teeth and one small inner tooth. Unguiculus triangularly elongate, apically acute and with broad inner margins. Ventral tube short, anteriorly with 2+2 small setae. Posterior face has 2+2 distal and some 6-7 proximal setae all small. Lateral flap has 4 setae each. Rami tenaculi quadridentate, corpus with 6 setae, including a pair of larger distal ones. Furcula long, ratio as 5:9:1. Manubrium has ventrally a triangular field intensely hirsute, dorsal side with many short setae. Terminal thickening obscurely rounded. Dentes not much tapering, with many rounded granules in a few irregular rows, becoming obscure distally. The granular structure is interrupted in a short distance at about the middle of dentes. Of dorsal setae the number is basal 1 outer 13 and inner 12. Some 4 setae of inner dis-

tal ones are longer than others. Ventral side of dentes with many spinous, stiff, short setae. Mucro elongate, quadridentate. Apical and anteapical one subequal. The third one is subdorsal, erect, at about the middle of mucro, the fourth one outer lateral in position. Anteapical and the third tooth are both bearing a faint lamella of their own extended to the mucronal basis. An outer mucronal seta present. Integument is smooth, all body setae are short and smooth. Abd. III and IV subequal in length. All body segments well separated.

The species is a near relative of *Gr. kisoana* (YOSHI) sensu YOSHI 1962, from which it is to be discriminated by longer unguis and mucro.

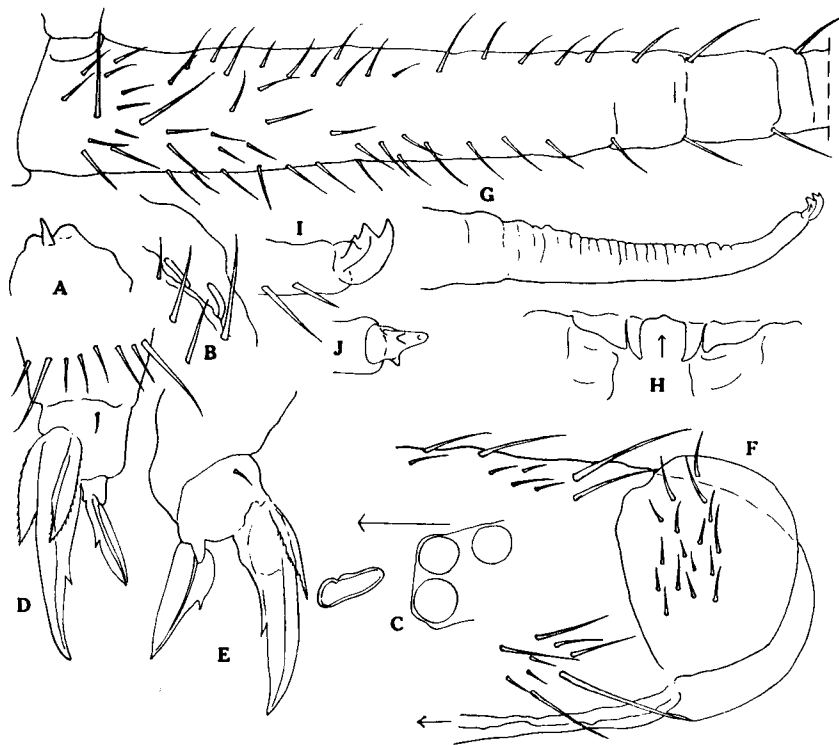
*Pteronychella ezoensis* sp. n. Fig. 21

12 expls. Nayoro, Hokkaido 10. IV 1956 T. YAMADA

3 expl. Onnenai, Hokkaido 20. V 1962 T. YAMADA et M. KAWAKATSU

13 expls. Aikawa, Sado Is. Pref. Niigata 23. II 1962 S. HIGUMA

Body length ca. 2.5 mm. Colour brownish black all over the body. Antennae, legs and furcula are paler and dark brown, thus apparently very near *Granisotoma kisoana* (YOSHI), from which it is differing by larger body length. Ant./head as 2:1. Ant. ratio as 25:50:47:70. Ant. IV apically with an insignificant swelling and a subapical cone. Ant. III-organ is two reclinate rods incerted in a groove. No special accessory sensory setae are present. PaO. elliptical, 1.5 times the adjacent eye in long-axis and slightly constricted near the middle. Eyes 8+8, intensely black. Labral setae 4/5, 5, 4. Labral margin has 2+2 incisions with high collars. Unguis stout, a pair of lateral teeth are converted to pseudonychia, whose margins are finely serrated. One inner tooth distal to the middle. Unguiculus with four wings or margins, the inner one has always one tooth, while others are not toothed. Tibiotarsal setae short and no tenent hair is differentiated. Ventral tube anteriorly with ca. 10 pairs of setae, including 2 larger ones. Posterior face has ca. 17 setae and distal 2+2 are stronger than others. Lateral flap has 14 simple setae. Rami tenaculi 4 toothed, corpus with many (more than 20) unequal setae. Furcula well developed, man:d as 8:15. Manubrium is dorsally hirsute and ventrally also with many setae arranged in a triangular area as in *Isotoma*. Distal marginal thickening of ventral side has 1+1 spiny process interior to the usual thickening. Dentes are ventrally with many short, strong setae. Dorsal side is transversely crenulated upon distal half. Dorsal dental setae are more numerous than in *Pt. perfulchra* BÖRNER (cf. YOSHI 1961) upon proximal portion, in which 2 larger setae are included. Their arrangement is not to be formulated. Mucro very short, quadridentate, apical tooth subequal to anteapical and an outer tooth is larger than the inner one. A ledge is

Fig. 21 *Pteronychella ezoensis* sp. n.

A: Antennal end, E: Ant. III-organ, C: Postantennal organ, D: Mid claw,  
 E: Hind claw, F: Ventral tube, G: Dens and mucro in dorsal view,  
 H: Terminal thickening of manubrium, I, J: Mucro in outer and dorsal view.

running from the anteapical to the mucronal basis. No outer mucronal seta. Body setae dense, all simple and not exceptionally long.

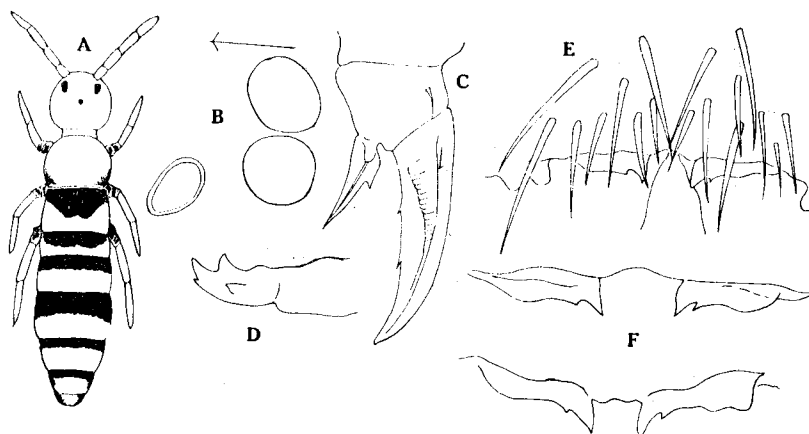
The species is near *P. perpulchra* BÖRNER 1909, but different by the absence of tenent hairs upon all legs.

*Isotoma nishihirai* sp. n. Fig. 22

1 expl. Hanejison, Okinawa 20. III 1959 NH

3 expl. Mawasi, Yogi, Okinawa M. NAGAYAMA

Body length 2.5 mm. Ground colour brownish white. Purple transverse band along the proximal part of each tergites of th. III to abd. V. Th. II and abd. VI without such band and with a pair of lateral marginal markings. Antennae diffusely pigmented distally. Legs pigmented only upon coxae. Furca pale. Ant./head as 5:3. Ant. ratio as 35:50:60:60. Ant. IV subapically with a conical process. Ant.

Fig. 22 *Isotoma nishihirai* sp. n.

A: Habitus, B: Postantennal organ, C: Mid claw, D: Mucro, E: Terminal portion of manubrium in ventral view, F: Two examples of manubrial terminal thickening.

III-organ is a pair of curving rods, distal part of ant. III with numerous sensory setae, slightly modified than usual setae. Postantennal organ is almost rounded and as large as an eye. Eyes 8+8, black. Labral structure as in other species of the genus. Unguis with 2, 2, 2 inner teeth and with transverse striae on inner side. Unguiculus acutely lanceolate, with a prominent inner tooth. Ventral tube short, anterior face with ca. 25 pairs of equal setae. Posterior face has ca. 32 subequal setae, the terminal pair slightly larger than others. Lateral flap with ca. 20 setae. Rami tenaculi quadridentate, corpus with ca. 20 setae. Furca with man: d as 7:20. Manubrium dorsally hirsute, ventrally with many setae in a triangular field and distal ones are spiniform, but not intensely so. Marginal thickening is characteristic in that it has two teeth and the outer one smaller than the inner pair. Lateral setae of dentes are considerably feathered in inner row and lightly so in outer row. Mucro quadridentate as in *I. pinnata*. Body setae brownish, larger ones of the posterior abdominal segments are roughly feathered and smaller setae are all smooth.

Morphologically the species is near *I. anglicana* LUBBOCK (sensu YOSHI, 1963) having bidentate terminal thickening of manubrium. But these two teeth are subequal in the cited species and anisomorphic in the present species. In colour pattern of the body it is near *I. virgata* YOSHI of the Yakushima Island.

*Entomobrya proxima* FOLSOM, 1924 Fig. 23

6 expls. Okinawa, 13. II 1958 M. NAGAYAMA leg.

10 expls. From the lumber cargo transported from Philippine to Okinawa,



## 1. V 1959 HH

Body length up to 2.0 mm. Colouration dirty yellow, pigmented uniformly with dusky gray upon all body segments. Head capsule has dorsally a frontal area darker than other parts. Antennae bluish. Legs and furcula pale. Ant./head as 8:3. Ant. ratio as 20:40:35:60. Antennae not subsegmented. Ant. IV has one or two spherical end-bulbs. Ant. III-organ is a pair of hyaline rods. Eyes 8+8, black. Pre-labral setae practically smooth. Labral setae 5, 5, 4. Labral margin with 2+2 low, transverse papillae each having 2 secondary spinules. Median intrusion of smooth area is broadly triangular, not reaching the second row of setae. Unguis slender, with a pair of inner basal and 2, 2, 2 inner distal teeth. Unguiculus lanceolate, untoothed. Tenent hair slender, as long as the inner margin of unguis and apically broad. Trochanteral organ composed of 10 setae in L-shape. Ventral tube anteriorly with many setae, proximal ones are small and practically smooth, while terminal ones are larger and distinctly barberated. Posterior face has some 4+4 short setae, terminal 1+1 are stronger. All of them apparently smooth. Lateral flap has 8-9 smooth setae each. Furcula well developed. man:d as 5:7. Manubrium is dorsally hirsute with many feathered setae. Lateral setae are larger and with a row of intensely barberated, large ones near the proximal end. Ventral setae are almost smooth. Distal marginal thickening is not conspicuous, composed of a pair of low, rounded hills. Ventral side of dentes is also only with smooth setae, while dorsal side has proximally 3 (outer 2, inner 1) especially large and barberated setae together with many smaller, feathered ones, which lie on both sides of the dorsal crenulation. Distal smooth part 1.8 times the length of mucro, which is bidentate equally and with a basal spine. Body oligochaetotic and not a single truncate seta is to be found upon it except on anterior border of th. II. Male genital opening is surrounded with many long papillae. The first pair of genital setae are considerably long, the second ones are shorter and the third and fourth pairs are foliaceous, broad and geniculate. Other 6-8 dorsal ones are slender and slightly surpassing the dorsal papillae of the genital opening. Abd. III:IV as 24:75.

In male genital ring and other characters the species is almost equal to *E. assuta* FOLSOM, 1924 (sensu CHRISTIANSEN, 1958) of USA. But body colour is quite different and not striped. Presence of large barberated setae laterally upon manubrium and dentes, smooth ventral setae of these segments and oligochaetotic state of body setae are very peculiar. Probably the *assuta*-group takes a special position within the genus *Entomobrya*.

As for the identity of names there are some problems. It may be synonymous with *Entomobrya straminea* BÖRNER, 1913 (= *E. stramineola* WOMERSLEY, 1942) of

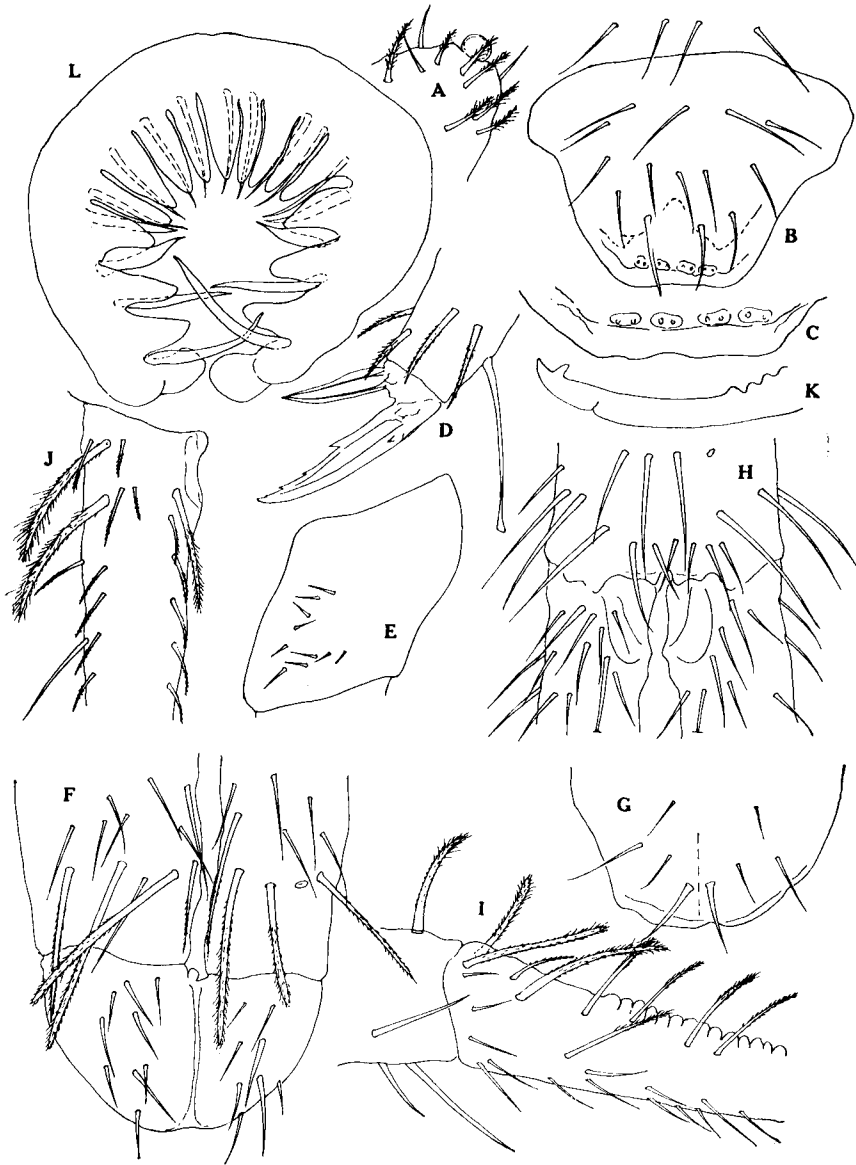


Fig. 23 *Entomobrya proxima* FOLSOM

A: Antennal end, B: Labrum, C: Labral margin, D: Fore claw,  
 E: Trochanteral organ, F: Ventral tube (anterior face), G: Ditto  
 (posterior face), H: Manubrium end of dens (ventral view), I: Proximal  
 part of dens in outer view, J: Ditto in dorsal view, K: Mucro,  
 L: Male genital orifice.

Java, Sumatra and New Britain. This name is to be rejected being homonym with *E. straminea* FOLSOM, 1899 of Japan. *E. lactea* FOLSOM, 1932 of Hawaii may be the present species. *E. assuta* of DA SELGA, 1962 from Annobon Is. may be also the present species.

*Entomobrya thalassicola* sp. n.

Fig. 24

10 expls. Sea shore in front of the Usa Biological Station of the Kochi University, Pref. Kochi, 17. X 1958 RY

Body length ca. 1.8 mm. General colour of the body dark gray, lateral margin of thoracal tergites and posterior border of abd. IV are more or less blackish. Head capsule and all abdominal segments darker than two thoracal tergites. Furca and ventral tube pale. Ant./head as 3.6. Ant. ratio as 12:20:20:33. Ant. IV bears two conspicuous apical bulbs. Ant. III-organ is a pair of small separately situated rods. Eyes 8+8, black. Prelabral setae 2+2, smooth. Labral margin with 2+2 small papillae each ending in a pointed, spinous process. Unguis with a pair of basal and

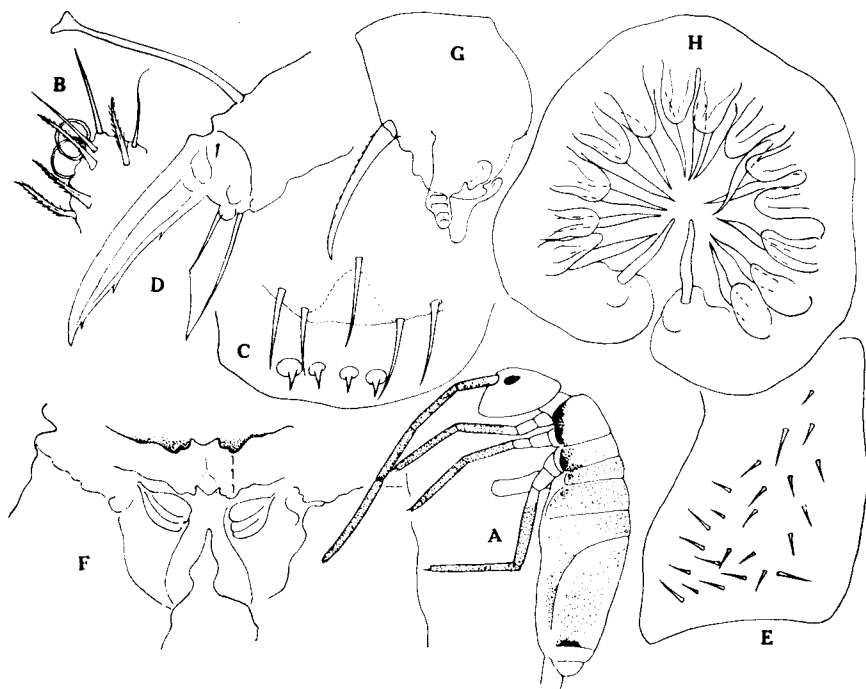


Fig. 24 *Entomobrya thalassicola* sp. n.

A: Habitus, B: Antennal end, C: Labral margin, D: Mid claw,  
E: Trochanteral organ, F: Terminal thickening of manubrium,  
G: Tenaculum, H: Male genital orifice.

two distal inner teeth. Dorsal and lateral teeth not well investigated. Unguiculus rather broad and somewhat truncate on apex. Tenent hair well developed, as long as unguis (inner margin), thick and distally inflated. Trochanteral organ is composed of 25 stout, spinous setae in a triangular area. Ventral tube anteriorly with many setae, the terminal group of 4+4 of them are larger than others. Posterior face has some 25 small setae, terminal 1+1 are smooth, while others are minutely ciliated. Lateral flap has 6 smooth and ca. 10 feathered setae. Rami tenaculi quadridentate and with a low basal swelling. Furcal ratio as 10:12. Manubrium hirsute both dorsally and ventrally, the lateral setae are larger, stronger and apically blunt. Articulation of dentes to the manubrium is alike to *Homidia* spp., but manubrial thickening has two low, obscure process on each side, instead of one in the formers. Dentes with filiform, ciliated setae both ventrally and laterally. Dorsal setae are stronger, but not modified. Mucro equally bidentate and with a basal spine. Male genital orifice is encircled by 14 papillae and 16 slightly sigmoid setae, the first pair of them are without papillae, slightly longer than others and bluntly ending on apex. Body setae are brownish and apically brush-shaped. Their location is variable. Abd. III:IV as 4.5.

Apparently the species is to be included in *Entomobrya* by the possession of a basal mucronal spine, although the unguiculus is broad and apically truncate, reminding the genus *Mesentotoma* SALMON (sensu CHRISTIANSEN, 1956).

*Entomobrya koreana* sp. n.

Syn.: *E. handschini* (nec STACH) YOSHI et LEE, 1963

Compared to the revised description of *handschini* in STACH, 1963 p. 48, the Korean species is very alike to it in colour pattern of the body. But the male genital orifice is quite different, the setae around it are very thick in *E. koreana* and the first pair is not blunt on apex (cf. STACH, l.c. Pl. XIV Fig. 6 and YOSHI et LEE, 1963 p. 7 Fig. 4, G).

*Seira iricolor* YOSHI et ASHRAF, 1964

8 expl. Mawasi, Okinawa M. NAGAYAMA leg.

In chaetotaxy and the ventral tube they coincide well with the Pakistanese species. This species seems to be widely distributed in tropical countries as corticoles. From the lumber of *Dipterocarpaceae* imported from Philippine and Malaya to Osaka port I have collected many examples of this species by tipping the bark of lumbers. Even from the lumber of hard-wood imported from Mozambique in East Africa I have got some specimens of this species.

*Acanthocyrtus bicolor* sp. n. Fig. 25

3 expls. Uh Lai, Formosa 24. X 1964 RY

Body length 2.7–3.0 mm. Ground colour white, deep purple patches are upon mesothorax (Laterally and proximally), abd. II (posterior half), abd. III (all) and upon abd. IV (posteriorly). Antennae bluish pigmented. All extremities are pale with the exception of hind femur which is beautifully pigmented as the trunk on proximal 2/3. Antennae rather long, ant/head as 20:9. Ant. ratio as 15:23:21:42. All antennal segments unscaled. Ant. III-organ is a pair of sensory rods. Ant. IV not annulated and distally with an obscure end-bulb. Distal two antennal segments with many short spiny setae together with usual ciliated ones. Frontal setae of head not differentiated. Eyes 8+8, black, of which A, B are larger than others. Thorax is considerably hanging over the head, but th. II itself is not very large, being only slightly longer than th. III. Abd. III:IV as 6:62. Legs unscaled, unguis straight with a pair of inner basal and one distal teeth. A paired lateral teeth present. Unguiculus is acutely lanceolate and not dentated. Tenent hair long, slender and distally dilated. Trochanteral organ composed of ca. 40 rather large setae in quadrangular area. Ventral tube anteriorly with many small setae and 2+2 terminal ones are much larger than others. Posterior face has one large median seta at about the middle of the length. Other setae are slender but not strong. No lateral comb is to be observed. Furcula in ratio as 1:1. Manubrium dorsally with many ciliated setae. Ventral side has proximally long, fusiform scales which are becoming smaller distally. Terminal setae 3+3, accompanied by a bundle of filiform setae on both sides of it. Laterally a row of strong, ciliated setae (ca. 15+15) are differentiated as in some species of *Acrocyrtus*. Dentes converging, provided with a row of stout spines along the inner side. Basal tubercle of dentes has 2 ciliated setae and the area near the tubercle has some modified setae either filiform or short and spiny. Ventral side has many small, scale-like setae. Mucro bidentate, apical tooth smaller than the anteapical and with a basal spine. Body scales are fusiform and usually small with the exception of those along the hind margin of thoracal segments, where they are large. Some scales upon coloured portions are brownish, while others are very hyaline. Chaetotaxy is oligochaetotic, upon th. II they are not along the hind margin, but rather proximally near the place where the tergite is strongly protruded. Th. III has 10+10 setae in peculiar arrangement and at about the middle of the segment. Abd. I has 3+3 rather feeble setae. Others as in fig. J. Abd. IV has remarkably a transverse row of large setae at about the middle of the segment as in case of *Homidia*. Setae sensuales needle-like, 2, 3, 3 upon abd. II, III, IV and accessory setae are strongly

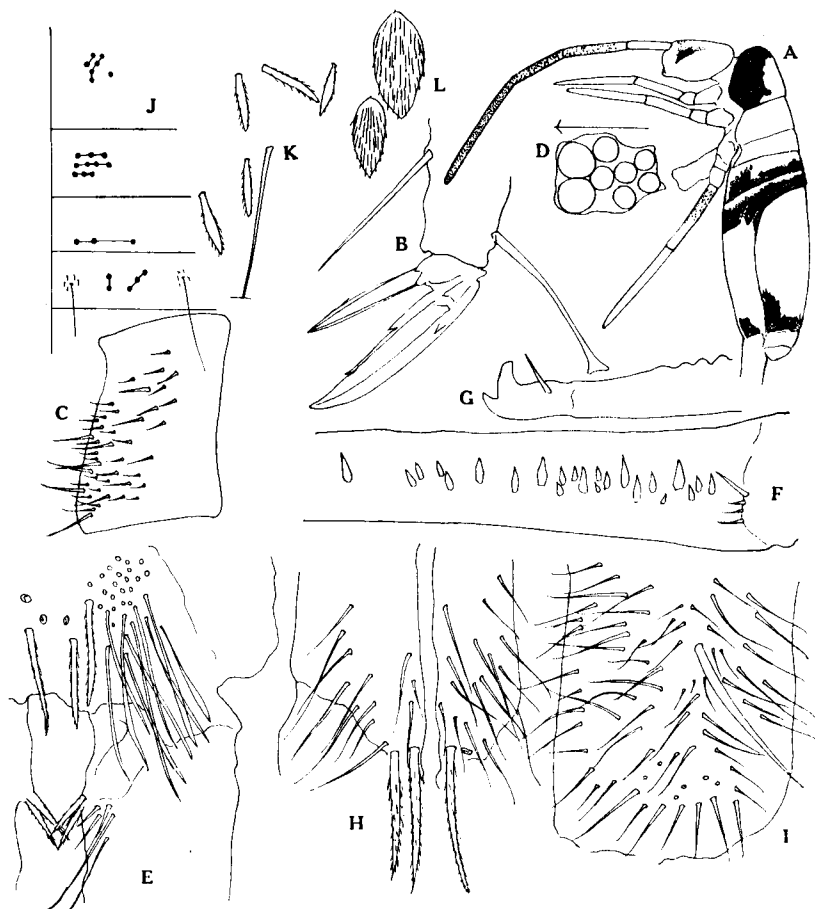


Fig. 25 *Acanthocyrtus bicolor* sp. n.

A: Habitus, B: Hind claw, C: Trochanteral organ, D: Eye field, E: Articulation of man. and dens in ventral view, F: Dental spines, G: Mucro, H: Ventral tube in anterior face, I: Ditto in posterior face, J: Chaetotaxy of body, K: s.s. of abd. II, L: Scales of abd. II,

brownish in colour.

The species is easily to be descriminated from *Acanthocyrtus spinosus* (SCHÖTT, 1917) from Australia by the body colour and by the dental spines. The form reported afterwards by WOMERSLEY 1939 as the cited species represents, to judge from the body colour, an another species. *Acanthocyrtus* sp. of UCHIDA, 1943 may be the present species.

The genus *Acanthocyrtus* is to be included within *Seirinae* YOSHI, 1956 by the form of body scales and is characterised by the presence of dental spines.

*Harlowmillsia oculata* (MILLS, 1937) Fig. 26

1 expl. Mt. Sobosan, Pref. Oita, V 1961, M. MORISHITA et al leg.

Body length 0.7 mm. Ground colour is whitish, dotted with minute black pigments all over the body to give a gray-blue appearance. All extremities are pale. Ant./head as 40:25. Ant. IV bearing one remarkable apical appendix ca. 1/3 of ant. IV and its apex is broad, curving, sickle-like. No sensory setae are present. Ant. III-organ is a thick ridge at the end of the segment, without having any sensory rods etc. Labrum not observed, but other mouth parts are normally built. Eyes 4+4, black, but pigments are dispersed and each cornea is separated from one another. PaO is obscurely chitinized and therefore difficult to observe, but there seems to exist a central pit, around which some 7 elongate elements are located almost parallel to each other. Two elements of dorsal side are extremely long and slender. Legs subequal, unguis without teeth, unguiculus broadly lanceolate, without tenent hair. A basal appendix of unguis is not present. Rami tenaculi 4 toothed, corpus without setae. Furcula well developed. Manubrium ventrally only with hyaline scales and dorsally with 2+2 smooth and ca. 10+10 ciliated, small setae in symmetrical arrangement as in fig. G. Dentes divided into two parts subequal in length. Ventral side is scaled and dorsal side is beset with numerous spines and setae. Distal half has both inner and outer lateral row of short spines (inner 5, outer 4), the inner ones larger than others and both of them are seemingly not serrated. Outer distal spine is the strongest and surpassing dentes. Dorsal side is beset with 5 (1, 2, 2) intensively ciliated, broad setae and very minute simple setae, the distal one of formers is the largest of all. Proximal half has a inner row of 4 spines, which are intensely incised and broad on basis. Dorsal setae are numerous and, when observed in one example at hand, composed of 12 ciliated setae arranged as 4, 1, 4, 3, together with one smooth, spiny seta near the basis. Mucro is slender and arcuate. Basal part is swollen and beset with 2 ciliated scaly setae. Apical and anteapical and some 4 intermittent teeth are present (fig. I) and they are connected by a hyaline, longitudinal lamellae. Integument smooth, partly minutely granulate and covered with hyaline scales. Dorsal to the antennal basis there are some club-shaped, modified setae or scales (fig. D). Setae along the hind margin of abd. VI are also clubbed, ciliated and barberated (fig. F). In other parts of the trunk it is achaetotic and no large setae nor s.s. have been observed..

As may be imagined from the description above, the specimen is almost the same with *H. oculata* (MILLS 1937) sensu BONET 1943, but the dorsal scaly setae of dentes are "en numero de tres en el segmento distal y 4-5 en el proximal" (BONET, 1943), while they are 5 and 12 in the Japanese form.

Distribution: North and Central America, Japan (nov.)

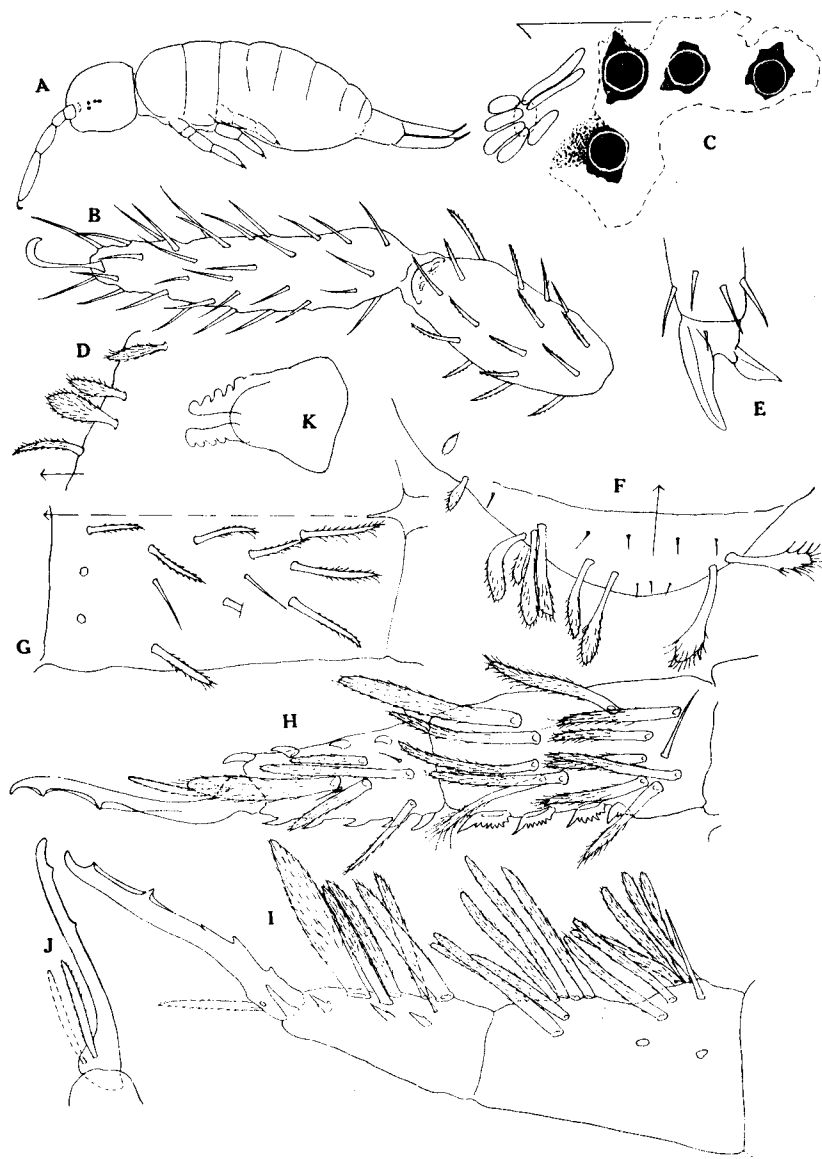


Fig. 26 *Harlowmillsia oculata* (MILLS)

A: Habitus, B: Ant. III and IV, C: Eyes and postantennal organ, D: Setae near the antennal basis of head, E: Hind claw, F: Setae of abdominal end (dorsal view), G: Manubrial setae (dorsal side), H: Dens and mucro in dorsal view, I: Ditto in outer view, J: Mucro in ventral view, K: Tenaculum.

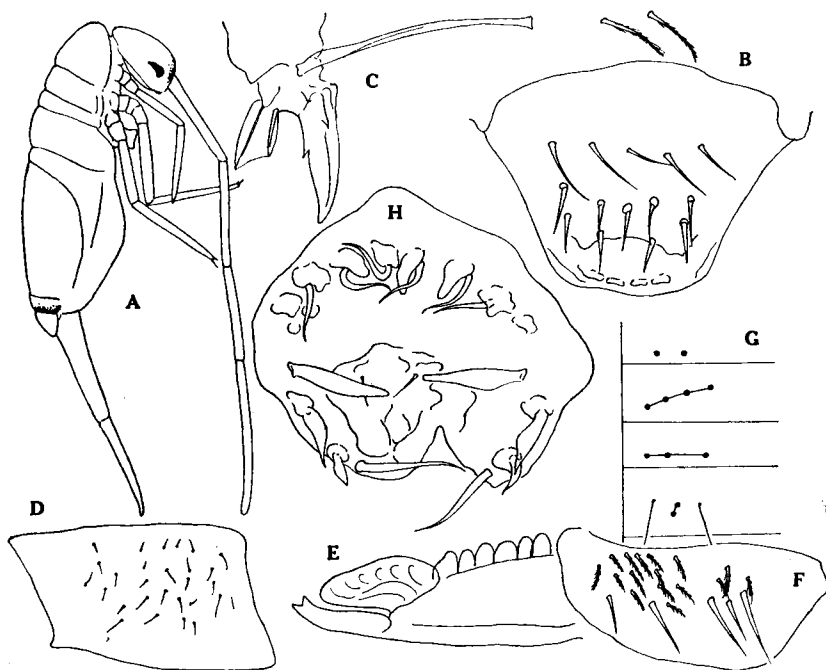


*Akabosia matsudoensis* KINOSHITA, 1919      Fig. 27Syn: *Salinella kinoshitai*: UCHIDA, 1940*Akaboshia matsudoensis*: YOSHII, 1954

5 expl. Tanegashima 22. X 1955 RY,

1 expl. Nakanoshima 8. VI 1953 S. UENO.

Body length 2.0 mm. Colouration uniformly yellowish white. Antennae diffusely dark distally. Base of antennae, ventral side of the body and distal margin of abd. V are sprinkled with bluish dark pigments and the example is extremely akin to *Salina celebensis* in appearance. Antennae very long, surpassing the body in length. Ant./head as 70:10. Ant. ratio as 25:35:35:45. Distal two segments are faintly annulated. Ant. IV with a small apical bulb. Ant. III-organ normal. Eyes 8+8, black, each eye-pigments separated and arranged in two longitudinal rows, but G, H are smaller than others. Prelabral setae 1+1 in all examples examined. They are feathered. Labral setae 5, 5, 4. The second and the third row of setae are strongly setaceous and with broad socket at the basis. Distal smooth area is medially not intruded into the granulated area. Distal margin has 2+2 transverse thickenings or ledges, which have no special structure on it. Internally the labrum has no trabeculae at all. Fore margin of head with 1+1 small spines as in *Salina*. Trunk rather long, ratio as (65:40):(30:55:15:170:15:20), so that abd. II is about twice the length of abd. I and abd. III:IV is as 1:11. Legs long, tenent hair well developed, ca. 1.7 times the unguis in length, apically truncate and very minutely ciliated. Unguis short, dorsally carinate and with one inner and a pair of lateral teeth. Unguiculus broad, two ledges diverging, truncate distally on inner side and both margins are lamellated. Trochanteral organ is composed of ca. 20 very feeble, small setae in a quadrangle. Ventral tube anteriorly with some 4 pairs of feeble and 3 pairs of larger setae all feathered. Posterior face has ca. 20 small, ciliated setae, terminal setae 1+1, slightly larger and also ciliated. Lateral flap has 5 larger, smooth and ca. 15 smaller feathered setae. man:d as 10:10. Manubrium is hirsute with many feeble, ciliated setae on all sides. Distal marginal thickening of ventral side is medially protruded and very characteristic in form. Dentes also hirsute with ciliated setae both ventrally and laterally. Some longer setae are laterally present. Dorsal side is glabrous and with distinct crenulations on its whole length. Mucronal end has a dorsal large elliptic swelling homologous to that of *Salina* and *Callyntrura*, but distinctly larger and occupying the dorsal side of the mucro, which is elongate, slightly curving and apically bidentate in two equal teeth. Body surface is not scaled, setae are feebly developed and yellowish. Larger setae are ending blunt apically and distributed as in fig. G. It is, therefore, almost achaetotic as

Fig. 27 *Akabosia matsudoensis* KINOSHITA

A: Habitus, B: Labrum, C: Hind claw, D: Trochanteral organ,  
 E: Mucro and dental scale, F: Lateral flap of ventral tube,  
 G: Chaetotaxy of body, H: Male genital orifice.

*S. celebensis*. Setae sensuales have no accessory setae or scales. Male genital area is near that of *Salina*, its basal pair of setae are large and setaceous, then follows two pairs of small foliaceous setae. The third pair is without papillae and large, thin and foliaceous. Other distal group of setae are with papillae, small. Some smaller papillae are also laterally present.

Compared to the original diagnosis of the species, the length of antennae are longer in Ryukyu examples, but this value is considerably variable among examples from Japan proper. *Akabosia* is thus apparently related to *Salina* of the *celebensis*-group.

*Callyntrura microphysarum* sp. n.

Fig. 28 A-E

7 expls. Uh Lai near Taipei, Formosa 24. X 1960 RY

Body length up to 2.8 mm. Ground colour dirty white. Reddish purple or pale violet colour forms a diffuse pattern of the body as fig. A. Th. II-abd. III are deeper pigmented laterally. Abd. IV has some obscure longitudinal stripes on an-

terior half and with or without transverse stripes or reddish colour upon posterior half. Abd. V, VI deeper pigmented. Head diffusely dark and with black markings on antennal bases. Antennae reddish dark or pale throughout. Legs also diffusely pigmented as antennae. A subsegment of each tibiotarsus is marked by a whitish ring. Ventral tube slightly dark. Furcula pigmented upon dentes, manubrium is almost pale except near the proximal end. Antennae very long, ant. I/head as 2/1. Ant. ratio as 10:11:8:22. All segments not divided. Eyes 8+8, black. Frontal setae 4+4, short and brownish. Legs long, reaching the abdominal end. All tibiotarsus has a slight subsegment at about 1/3 from the apex and the place has some larger setae. Trochanteral organ normal. Tenent hair distally inflated. Unguis carinate, with a pair of lateral and two small inner teeth. Unguiculus acute and truncate, short in fore- and long in hind legs. Ventral tube very long, with more setae than in *Salina*. Anteriorly with some long filiform, ciliated setae and the terminal row of them thicker than others. Posteriorly they are more numerous and covering the whole length of the tube extending to the lateral portion of it. Furcula long, man/d as 7:10. Manubrium distally and dentes on proximal half with many seta-like, spindle-shaped scales on ventral side. Dentes with many ciliated setae, which are longer on inner side. No spines are present. Distal swelling is very small in all examples examined. Mucro is rather long and typically toothed for the genus. Body setae intensely brownish, scales are small and spindle shaped. Chaetal arrangement of body segments almost constantly as in fig. E. Those of abd. I, II are characteristic.

The species is perhaps identical with Type II and III described by UCHIDA (1943) as *Paronalla japonica*. The species is characterised by diffuse pigmentation of the body and by the small distal swelling or scale of dentes. Some of the material of DENIS 1948 determined as *Microphysa lineata* might be regarded as *C. microphysarum*.

*Callyntrura microphysarum* f. *striata* f. n. Fig. 28 F-H

10 expls. Uh Lai near Taipei, Formosa 24. X 1960 RY.

In all morphological details, including the setal arrangement of the body, they coincide fairly well with the typical *microphysarum*. Colour pattern is, however, quite different, pigments being not diffuse, but forming a distinct longitudinal stripe along the lateral margin from th. II to abd. III. Legs banded. Antennae and furcula not coloured. Terminal appendix of dentes seems to be slightly larger than the typical form. The form corresponds to UCHIDA's *P. japonica* Type I.

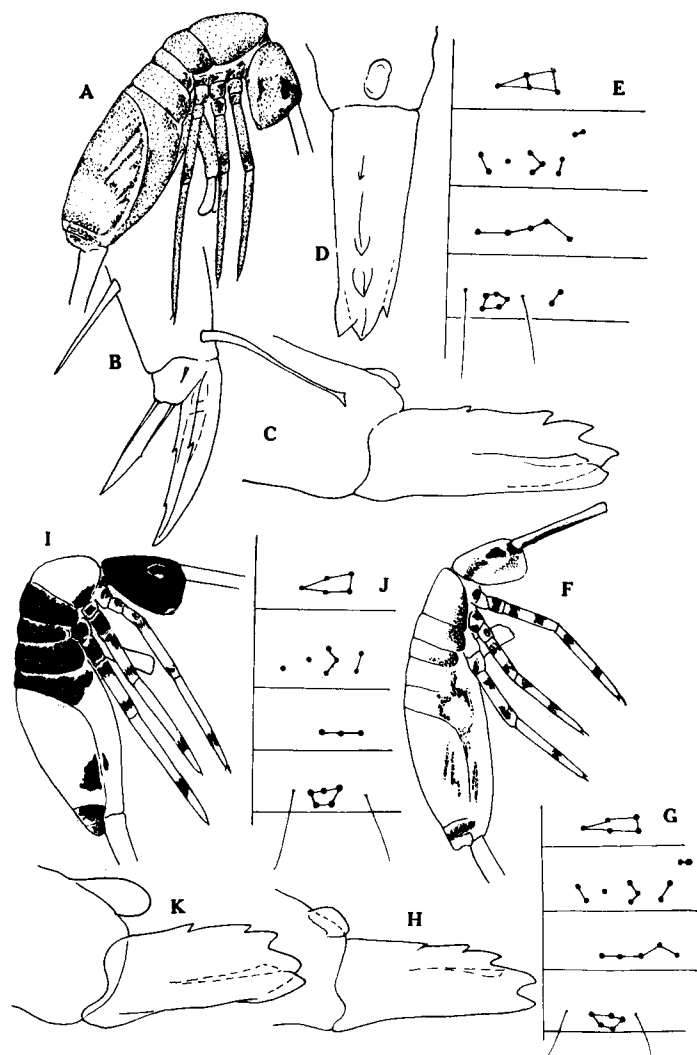


Fig. 28

*Callyntrura microphysarum* sp. n.

A: Habitus, B: Hind claw, C: Dens and mucro, D: Ditto in dorsal view, E: Chaetotaxy of the body.

*Callyntrura microphysarum* f. *striata* f. n.

F: Habitus, G: Chaetotaxy of the body, H: Dens and mucro.

*Callyntrura taiwanica* sp. n.

I: Habitus, J: Chaetotaxy of the body, K: Dens and mucro.

*Callyntrura taiwanica* sp. n. Fig. 28 I-K

5 expl. Uh-Lai near Taipei, Formosa 24. X 1960 RY.

Body length up to 2.5 mm. Ground colour white, purplish black pigments covers the whole head, th. III-abd. II, anterior part of abd. III and abd. V, VI. Abd. IV has laterally a small spot of the same colour. Antennae and furcula pale. Legs are pigmented basally upon coxae and trochanters. Each femur has 2 patches to each. Tibiotarsus pigmented at the place of subsegment. Ventral tube pale. Antennae long, ant. I/head as 50:28. Ant. I, II with narrow scales dorsally. Frontal margin with 4+4 short spines. Eyes 8+8, black. Legs scaled up to femur, but not upon tibiotarsus. Unguis and tenent hair as in *C. microphysarum*. Trochanteral organ and ventral tube also same to the cited species. Manubrium ventrally with hyaline scales, dorsally and laterally with many setae. Dentes also alike to *C. microphysarum* having no spines at all, but the terminal scaly appendix on it is well developed, as large as the usual one. Mucro 6-dentate, rather long. All setae and scales well chitinised and brownish in colour. The chaetal arrangement of larger body setae are astonishingly almost equal to *P. microphysarum*, although they are reduced in number upon abd. I, where 3+3 setae are in a row.

The species is alike to *C. zonata* YOSHII, 1959 (Singapore) in colour pattern, but quite different in morphological details. Chaetal arrangement is almost equal to *C. microphysarum* sp. n. The fact indicates probably the faunal character of *Callyntrura* in Taiwan, where a species group with the same type of chaetotaxy is predominant.

*Neelides folsomi* CAROLI, 1912 Fig. 29

Caroli 1912, Bonet 1947

1 expl. Miyanoura, Yakushima, 23. X 1955 RY

Body colour dirty white, head and dorsal side being diffusely pigmented. Length 0.3 mm. Antennae short, distinctly 4 segmented in ratio as 4:7:16:16. Ant. I is low, cylindrical and with 1 seta. Ant. II clavate, with 2-3 setae. Ant. III is fusiform, with some 15 usual setae. Ant. III-organ is a pair of small rods incerted in a groove. On both sides of the organ and somewhat apart from it, there exists a long sensory seta ending with blunt apex. Ant. IV is apically with long setae, each having an un conspicuous, but broad socket of the integument. Some 6-7 blunt, short sensory setae are present on one side of the segment and one of which is larger than others. Head without eyes. Labrum is considerably granulated and warty in appearance. In contrast to other *Symphypleona* but in concordance with *Arthropleona* the prelabral setae are 2+2, feeble. Labral setae 5, 5, 4. No marginal structure is present. Mandible with a heavy molar plate and apically with 4 teeth.

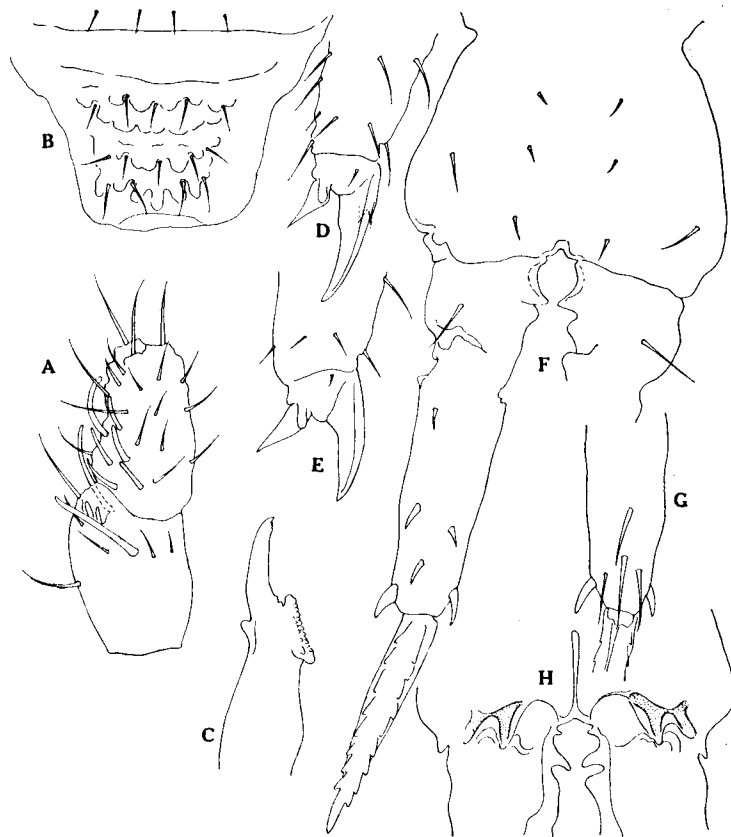


Fig. 29 *Neelices folsomi* (CAROLI)

A: Ant. III and IV, B: Labrum, C: Mandible, D: Mid claw, E: Hind claw, F: Furca in dorsal view, G: Distal part of dens in ventral view, H: Articulation of manubrium and dens in ventral view.

Maxillar head well lamellated and stout. Unguis is slender upon fore- and mid-legs and shorter upon hind-legs. They are always without inner tooth but with a pair of lateral teeth, which are, however, not very conspicuous. Unguiculus triangular, acute and without tooth. No triangular process is to be seen. Tenent hair absent. Ventral tube with a median posterior swelling and 2+2 small distal setae. Furcula in ratio as 8:13:8. Manubrium is constricted proximally, ventrally without setae and with a median furrow distally. Dorsal side of it has 4+4 small setae. Dentes are articulated to manubrium with a delicate hinge ventrally and two strong teeth are emerging from both segments to form a distinct structure of the integument. Inner side of the dentes are roundly ingulfed basally to a

blunt process. Dentes are divided into shorter proximal and longer distal parts by the constriction. The former has dorsally one slender seta, the latter has dorsally 6 short spines (outer 3, dorsal 1, inner 2) and ventrally as 3,1. Mucro is straight, ending acute and both margins have 8-9 distinct teeth of equal shape. Basal mucronal pseudonychium is attached to it.

In the structure of antennae and furcula the species is almost equal to *Neelides minutus* (FOLSOM 1901, sensu BONET 1947). However, the absence of an inner tooth of the unguis permits us to separate *folsomi* from *minutus*. In the present example the lateral teeth of unguis are not so well developed as the CAROLI's figure.

Distribution: This is the second report of the species from the world. It is described from Italy (Astroni).

*Deuterosminthurus okinawanus* sp. n. Fig. 30

1 ♀ Ginowan, Okinawa, 3. VII 1959 HH

Body length 0.8 mm. Ground colour white, bluish longitudinal, uncontinuous patches are adorning the trunk in 3 pairs. Anal and genital segments separated, each with a pair of dorsal patch. Antennae slightly bluish red distally. Head with suffusion of bluish pigments. Ant./head as 14:9. Ant. ratio as 7:9:15:28. Ant. IV has 5 secondary subsegments, each having some 10 radiating setae. Ant. III-organ is a pair of small rods incerted deeply in a groove. All antennal setae small and simple. Eyes 8+8, upon black eye-patch. Frontal setae not modified and small setae are dispersed in symmetrical arrangement as in fig. I. Prelabral setae 3+3. Labral setae 5, 5, 4. Distal margin with a pair of transverse ridges, upon which 2+2 small spinules are present (cf. JEANNENOT 1956 for *D. quinquefasciatus* KRB.). Unguis basally granulated, apex acute and without teeth. Unguiculus basally granulated, without lamellae and it is represented by a long setaceous filament, whose apex is surpassing the unguis and where it is not clavate. Tenent hairs long, distally spathulated, 5, 4, 4 in number. Some setae along the hind margin of each tibiotarsus are thick, spiny, but not especially modified. Ventral tube large, without setae and terminal tubes are warty. Tenaculum with a high median papilla ending in 4 minute setae. Rami tenaculi tridentate, without basal appendix. Furcula in ratio as 10:20:7. Manubrium has dorsally 8+8 small setae in symmetrical arrangement (fig. E). Ventral side without setae and with a median furrow on distal half. Dental setae arranged as outer 8, inner 8, dorsal distal 5, dorsal proximal 3. Ventral setae as 4, 2, 1, 1, . . . . 1. Mucro is broadly lamellated on both sides, ventrally carinate and with a proximal pseudonychium. No mucronal seta present. Larger abdominal spherical in shape, not dorsally depressed and with many smooth simple setae. Genital

segment separated. Appendix analis is simple, seta-like, but thicker than usual setae.

The species is apparently near *D. circumfasciatus* STACH, 1956 from eastern Europe. Morphologically it is also nearly related to it, but tibiotarsal tenet hairs are 5, 4, 4 in number and unguiculus is represented by a long seta in the present form. Such special structure of unguiculus seems to have some affinities with *Corynephoria* ABSOLON 1901, which has a clavate seta at the place.



Fig. 30 *Deuterosminthurus okinawanus* sp. n.

A: Female, E: Labrum, C: Fore claw, D: Hind claw, E: Manubrium and dentes in dorsal view, F: Mucro in dorsal view, G: Anogenital segment of female, H: Appendix analis, I: Vertex seen from above.

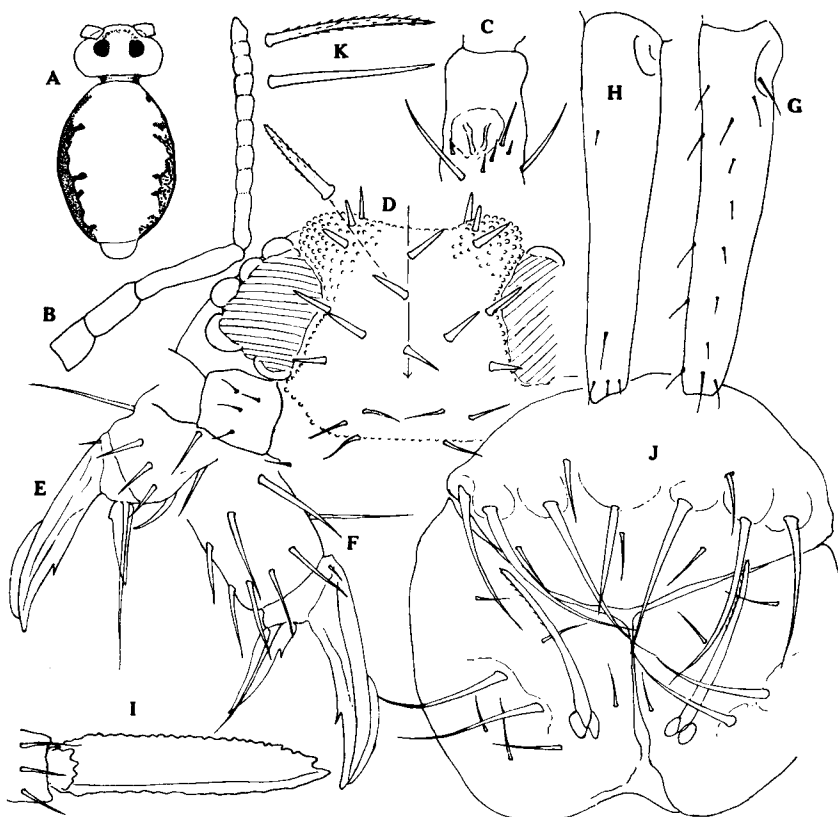


*Sphyrotheca formosana* sp. n.

Fig. 31

1 ♀, Uh Lai, Formosa 24. X 1960 RY

Body length 0.6 mm. Ground colour yellow brown. Antennae diffusely pigmented. Head almost pale. Both sides of the trunk with purplish longitudinal band as fig. A. Anogenital segment slightly pigmented dorsally. Other extremities pale. Ant./head as 10/7. Ant. ratio as 2:3:5:10. Ant. III-organ is accompanied by 2-3 minute setae around the low elevation, upon which two longitudinal fissures are to be seen. Ant. IV is distinctly subsegmented to 9-10. Eyes black. Vertical setae robust, but pointed on apex and their location is typical for the genus, having 3 median setae above the frontal patch. A pair of vertical tubercles above eyes are

Fig. 31 *Sphyrotheca formosana* sp. n.

A: Habitus, B: Antenna, C: Ant. III-organ, D: Vertical setae, E: Fore claw, F: Hind claw, G: Dens in dorsal view, H: Ditto in ventral view, I: Mucro in ventral view, J: Anogenital segment of female, K: Two types of body setae.

rounded and roughly granulated. No thoracic vesicles are observed. Unguis slender, tunicate dorsally upon distal half and with a inner tooth. Unguiculus is lanceolate, with one inner tooth basally. Axial filament of it is surpassing the apex and as long as unguis upon fore- and mid-legs and slightly so upon hind-legs. Furcula rather short, ratio as 5:8:3. Manubrium dorsally with 7+7 setae and ventrally nude. Dentes not much converging and feeble setae are arranged as

Dorsal: 1, 1, 1, 1, 1, 1, 1=7,                      Outer: 1, 1, 1, .... 1, 1=5,  
 Inner: 1 ..... 2=3,                      Ventral: 3, 1 ..... 1=5

Mucro is apically incised, both margins slightly crenulated and with distinct basal pseudonychium. Body setae of the trunk is rather large, somewhat inclined and equally distributed upon dorsum. Some of them are slightly ciliated (fig. K) and others not. Anal appendage large, very long, apically blunt and slightly feathered distally.

The species is very near *S. dawydoffi* DENIS, 1948 of Vietnam in chaetotaxy of head, appendices anales etc. But the cited species has no tunica upon unguis, vertical setae of head blunter and both margins of mucro are entire.

*Lipothrix magnificata* (SALMON, 1951)                      Fig. 32

4 expls. Rangoon, Burma 17. X 1951 RY

Body length up to 1.0 mm. Ground colour yellowish white, median dorsum and posterior part of abdomen brownish pigmented. Antennae blue distally. Legs and furcula slightly bluish pigmented. Antennae short, ratio as 2:4:5:9. Ant. III-organ is represented by a rounded elevation with two longitudinal furrows with two sockets. Ant. IV distinctly divided into 10 subsegments. Eyes 8+8, black. Vertical region of the head with 10 prominent, blunt setae, which are large, rugose and obtusely ending. All of them are upon large papillae of their own. Other facial setae are short and smooth, not modified. A pair of thoracic vesicles are well developed and pointed distally. Precoxa of I, II with an anterior process. Trochanter with a large, blunt seta. Unguis broad, dorsally tunicate, with a pair of foliaceous and serrated pseudonychia and without inner tooth. Unguiculus triangularly acute, without tooth. A large axial seta of it is two times the length of the unguiculus, remarkably spatulated near the apex upon fore- and mid-legs and lightly so upon hind-legs. Tenent hair is not to be observed. Ventral tube with 1+1 apical setae, terminal tubules are long and with 3-4 rows of granules. Furcula in ratio as 3:3:1. Manubrium dorsally with 8+8 smooth setae and ventrally nude. Dentes with smooth, slender setae arranged as dorsal: I, 1, 1, I, 1, 1, I=7, outer: 1, 1, 1 ..... 1=4, inner: 2, ..... 1, 2=5, ventral: 1 ..... 1=2 (vestigially small). Mucro almost parallel sided, ventrally carinate and both margins are al-

Fig. 32 *Lipothrix magnificata* (SALMON)

A: Antenna, B: Ant. III-organ, C: Vertical setae, D: Ditto in posterior view, E: Vesicular appendix of prothorax, F: Fore claw, G: Hind claw, H: Dens in dorsal view, I: Mucro in dorsal view, J: Ditto in lateral view, K: Anogenital segment of female, L: Appendix analis, M, N: Two sorts of setae of the body.

most entire. Often slight serration is to be seen proximally upon inner margin of it. Ventral pseudonychium present, often serrated. Apically the mucro is deeply notched and the outer lobe is more heavily projecting than the inner lobe. Body setae well developed. Anterior setae are as long as mucro, lightly rugose and apically truncate. Posterior ones are more numerous, slightly shorter than the

anterior ones, almost smooth and lightly capitate on apex. Female anogenital segment is observed in one example. The genital segment has dorsally 2+2 blunt, short setae, without unpaired seta. Anal segment has one well developed  $a_0$ , accompanied by 1+1 small setae and with  $a_{1-3}$ . s-setae present.  $sa$  is smaller than  $sa'$ . Lateral flap has  $a_{1-4}$  well represented, but  $a_1$  is smaller than others.  $sa_{1-3}$  subequal. Appendix analis is a strong, smooth, curving and apically pointed seta.

The Burmese material coincides fairly well with the SALMON's description and figure on Singapore examples, provided his fig. 44 represents hind-leg and the crenulated mucronal margins of fig. 43 are exceptional.

*Lipothrix mirabilis* sp. n.

Fig. 33

3 ♀, Daimonji, Kyoto, Japan 15. X 1952 RY

1 ♀, Ohnogahara, Ehime, Japan 3. VIII 1954 K. MORIKAWA

Body length 1.0 mm. Colour strongly mottled with bluish black pigments all over. Antennae, legs and furcula also diffusely pigmented bluish black. Anogenital segment pale. Ant./head as 8/7. Antennal ratio as 10:17:25:30. Ant. II and III with corrugated surface and with some blunt and setaceous setae. Ant. III-organ is two rods in two integumentary folds. Ant. IV is strongly corrugated on distal half and beset with many long setae. A kind of irregular subsegment is to be observed. Eyes 8+8, black. A pair of interorbital tubercles are strongly developed and beset with 2+2 setae. Vertical setae of head are spatulate or cylindrical rods, blunt on apex and with some marginal serrations. They are arranged in symmetrical way as in fig. B. Lower portion of the head has usual simple setae also symmetrically arranged. Labrum (fig. C) with prelabral setae 3+3, all subequal. Labral setae with different length, arranged as 5, 5, 4. The median three of the first row and a median seta of the second row are smaller than others. Three deep incisions of chitinous ledges are separating the distal row of these setae. Distal margin with 2+2 obscure, rounded lobes. Prothoracal part has a pair of digital vesicular process (fig. D). Legs short, unguis dorsally tunicate, with one inner tooth (often absent upon hind-legs) and with a pair of serrated pseudonychia. Unguiculus is fusiform, apically acute and without tooth. An axial filament attached to it is surpassing by far the apex, somewhat broad distally upon fore-legs and simply setaceous upon other legs. No tenent hair is to be seen, but one dorsal seta of each legs is contorted to the horizontal direction, thus turning to the lateral part of the tibiotarsus. Setae along the ventral side are thicker and stronger than others in all legs. Rami tenaculi tridentate, corpus with a high anterior process ending in 4 small setae. Furcula in ratio as 25:40:15. Manubrium ventrally



Fig. 33 *Lipothrix mirabilis* sp. n.

A: Antenna, B: Setae of the head, C: Labrum, D: Vesicular appendix of prothorax, E: Fore claw, F: Hind claw, G: Dens in dorsal view, H: Mucro in lateral view, I: Ditto in dorsal view, J: Anogenital segment of female, K: Setae from the dorsum of abdomen, L: Appendix analis.

glabrous and dorsally with 6-7 pairs of setae. Dentes slightly converging and with setae formulated as, dorsal: I, 1, 1, I, 1, 1, I=7, outer: 1, 1, 1, . . . . 1=4, inner: 1, . . . . . 1, 1, 2=5, ventral:0. All these setae are simple and setaceous. Mucro boat-shaped, ventrally with a mucronal basal pseudonychium. A large notch is present subapically on inner side, inner margin coarsely serrated with 9-10 teeth, while outer margin is almost entire with the exception of one obscure incision on proximal half. In the female anogenital segment is broadly attached to the larger abdominal segment, being no constriction between them. Genital segment has no larger setae. Dorsal flap of anal segment bears 3 + 1 + 3 large anal setae, each upon low integumentary elevation.  $a_0$  bears basally a pair of small setae. An another pair of setae between  $a_1$  and  $a_2$  are larger. Lateral flaps have 4 anal setae each. All of these anal setae are smooth and not ciliated. Appendix analis is very long, slightly curving, smooth and truncate on apex, where it is minutely ciliated. Integument is coarsely granular all over the body with the exception of smooth anogenital segment. Setae of the trunk are dorsally modified to foliaceous, fan-like form (fig. K). Such setae are numerous upon dorsal side until a little before the genital segment. Some smooth, short setae are mingled with them. The species is very clearly to be discerned by the peculiar body setae and others. It is near *Neosminthurus clavatus* BANKS, 1897 in many respects. But anal appendage is pointed in the cited species, while it is truncate on apex in this species.

*Lipothrix amabilis* sp. n.

Fig. 34

2 ♀, Taipai, Formosa, 16. XI 1962 K. BABA leg.

Body length 1.3 mm. Colouration brownish violet all over, slightly mottled. Head paler. Antennae, legs and furcula also pigmented in the same colour. Ant./head as 11:10. Ant. ratio as 3:5:7:7, all segments rugose in appearance. Ant. IV corrugated but not subsegmented, apically without bulb, almost all setae of the segment are slightly capitate. Ant. III-organ is a pair of rods each in a furrow. Eyes 8+8, black. Labrum not different from *L. mirabilis*. Vertical setae are minute, but modified to blunt rods, facial setae small, slightly winged or not. Setae near the labrum are larger and stronger, not modified. Th. II, III separated by a faint groove of the integument and the colour is paler in these grooves. Mesothorax with a finger-like process laterally. Unguis broad, without tooth. Lateral pseudonyncha and dorsal tunica very prominent. Unguiculus triangular, an axial seta is more than two times the length of unguiculus and its distal half is broad in all legs. Tenent hair absent, but one dorsal seta is stretching horizontally in all tibiotarsus as in case of *L. mirabilis*. Femur of all legs with a lunate

Fig. 34 *Lipothrix amabilis* sp. n.

A: Setae of the head, B: Vesicular appendix of prothorax, C: Hind claw, D: Lunate thickening of fore femur, E: Ventral tube, F: Tenaculum, G: Dorsal view of dentes, H: Mucro in lateral view, I: Ditto in dorsal view, J: Anogenital segment of female, K: Appendix analis, L: Setae from the dorsal part of abdomen.

thickening of the wall and hind trochanter with a capitate seta on inner side. Ventral tube is long, with 1+1 apical setae and its terminal tubes are provided with some 4-5 rows of rounded granules. Rami tenaculi tridentate, corpus anteriores with 4 setae, corpus posteriores very low. Furcula in ratio as 5:4:1. Manubrium ventrally nude, dorsally with 6 pairs of smooth setae. Dentes slightly tapering, with dental setae as : dorsal: I, 1, 1, I, 1, 1, I = 7, outer: 1, 1, 1 .... 1 = 4, inner: 1, .... 1, 1, 1, 2 = 6, ventral: 1, ..... 1. All of them are smooth

and the ventral two setae are minute, almost vestigial. Mucro parallel-sided, outer margin straight, inner margin with 5-6 faint denticles distally and with a prominent, deep apical notch or incision, whose outer tooth is very well developed and projecting upwards. Outer margin of mucro is entire and inner margin is faintly serrated with 5-6 denticles on distal half. Ventral mucronal pseudonychium present, lightly serrated. Integument is distinctly granular. Body setae of the dorsum consists of two sorts of setae: one is simple and setaceous, others are foliaceous and with ciliated margin. Anogenital area of the female is beset with many strong anal setae,  $a_0$  and a pair of setae on both sides of it (p) are upon low integumentary tubercle.  $a_0$  has, besides, a pair of small setae near the basis of the tubercle. Upon lateral flaps  $a_1$ - $a_4$  present, but  $a_2$  is converted to small granulated body, instead of setae. Appendix analis is upon heavy sockets, dagger-like and minutely fringed on one side. Female genital orifice is surrounded with 6 pairs of small, simple setae.

This new species is very near *L. mirabilis* sp. n. of Japan in the presence of horizontal setae of tibiotarsus, foliaceous body setae etc., but it may be easily separated by the peculiar form of appendix analis.

If we admit the secondary subsegment of ant. IV to represent the subgeneric rank, then the genus *Lipothrix* may be split into the following way:

Subgenus *Lipothrix* (s. str.)

Typus: *Sminthurus lubbocki* TULLBERG, 1872

Subgenus *Neosminthurus* MILLS, 1934

Typus: *Sminthurus longisetis* GUTHRIE, 1903

***Dicyrtomina leptothrix* BÖRNER**

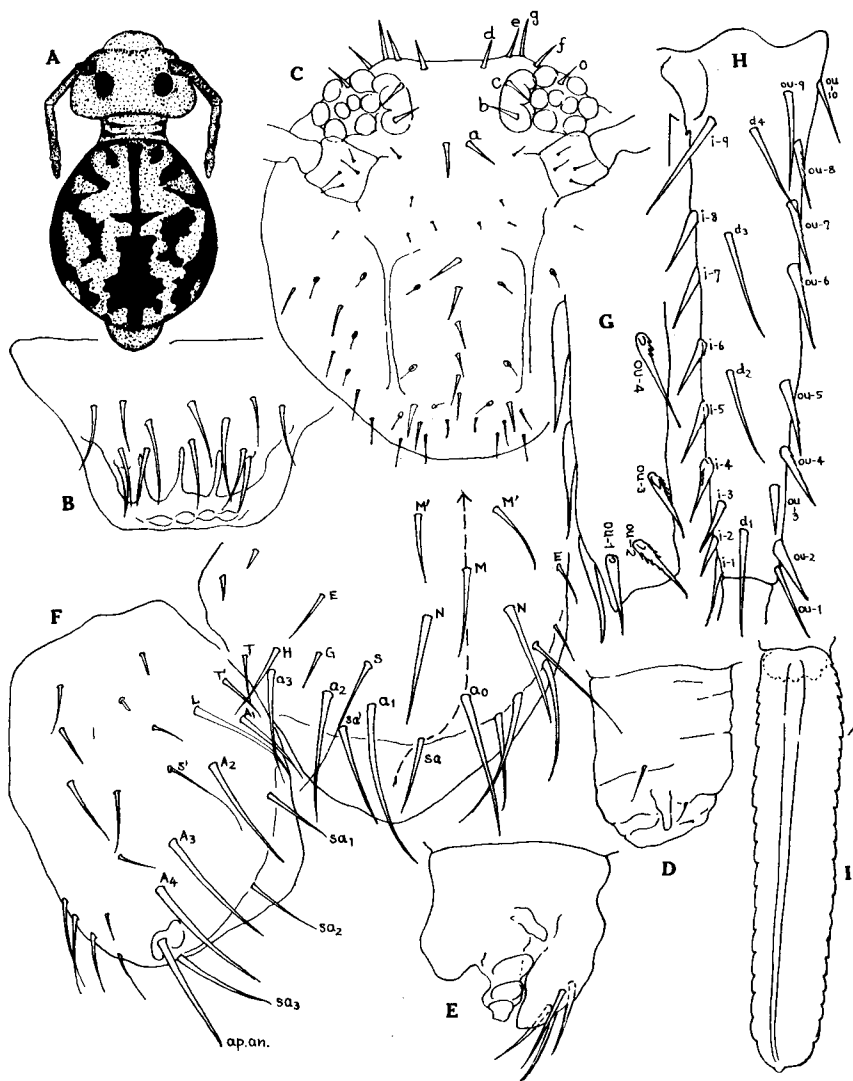
Fig. 35

BÖRNER 1909, YOSHII 1961.

Syn. nov. *Dicyrtomina rufescens* f. *nivalis* : UCHIDA 1953.

This interesting species occurring abundantly upon melting snow of spring in central and northern Japan, have been already described in YOSHII 1961, p. 820. Following notes are to be added for it. Body colour is extremely variable. In dark species body is uniformly brownish black, without any sign of patterns, while in the majority of specimens the trunk is mottled irregularly with brownish, paler spots and speckles. In pale examples, which are rather rare, the ground colour is brownish yellow, upon which heavy patterns are to be found as in fig. A. BÖRNER's original may have been based on such materials. Extremities are, however, in all cases, deeply pigmented. Upon head, the vertical setae are well developed, spiny and not blunt apically. They are 7+7 (small 2+2 exclusive) and are arranged as



Fig. 35 *Dicyrtomina leptothrix* BÖRNER

A: Habitus, B: Labrum, C: Frontal and vertical setae, D: Ventral tube, E: Tenaculum, F: Anogenital segment of female, G: Outer lateral view of distal part of dentes, H: Dorsal view of dentes, I: Mucro (Dorsal view).

in *Ptenothrix* (YOSII et Lee 1963, p. 22) and the nomenclature is applicable also in this species. Eyes 8+8. Facial setae blunt and arranged as 1, 1, 1, 1, 3, but an additional median one may be added. Labral setae 6/5, 5, 4 and all setae of the first row are subequal in length. Distal margin has 2+2 obscure, transverse tub-

ercles. Setae of the large abdominal anteriorly with 5+5 setae in W-shape as in *Ptenothrix*, they are acutely pointed apically and 0.6 times the mucro in length. Posterior dorsum with many small, blunt setae ca 1/3 of anterior ones in length. Ventral tube rather short, basal shaft with 1+1 lateral and 1+1 distal setae. Near the distal setae there exists 1+1 finger-like process of unknown meaning. Tenaculum with tridentate rami having a basal process. Corpus anteriores with 4 setae. Upon anogenital segment of female both M, M', N are acute and not blunt apically, as already stressed by BÖRNEE 1909. M is distally dislocated. Other dorsal setae of abd. V are not developed in contrast to *D. minuta*. Chaetal arrangement of anal flaps near *Ptenothrix*, but H, T, L are not blunt. H' near S. Upon upper anal flap  $a_{0-3}$  all smooth and subequal.  $sa'$  larger than  $sa$ . Upon lateral flaps  $a_{1-4}$  all subequal,  $sa_{1-3}$  all large and subequal and setaceous. Appendix analis setaceous, not much different from usual setae. Manubrium is ventrally nude, dorsally with 8+8 setae in symmetrical arrangement, the lateral 1+1 larger than others. All smooth. Dental setae as dorsal 4, inner 9, outer 10 and ventral 3, 2, 1, 1, . . . 1.  $ou_1$  smooth,  $ou_{2-8}$  finely ciliated,  $ou_{8,9}$  almost smooth.  $ou_{1-4}$  represented as 30:28:28:32. Inner row is composed of 9 setae constantly and  $in_{1-8}$  are ciliated, while  $in_9$  is smooth. Thus it is probably  $in_{10}$ , which is absent. Mucro parallel sided, serrated on both sides (inner and outer ca. 25) and ending apically with a small, rounded tooth to which the mucronal shaft is attained. Mucronal tunica conspicuous. Localities: Karigahara, Pref. Fukui 18. III 1961, R. YOSII, Ishiuchi, Pref. Niigata, 23. IV 1959 R. YOSII, Nagaoka, Pref. Niigata 21, IV 1959, R. YOSII, Shigakôgen, Pref. Nagano, 23. III 1957 S. HIGUMA.

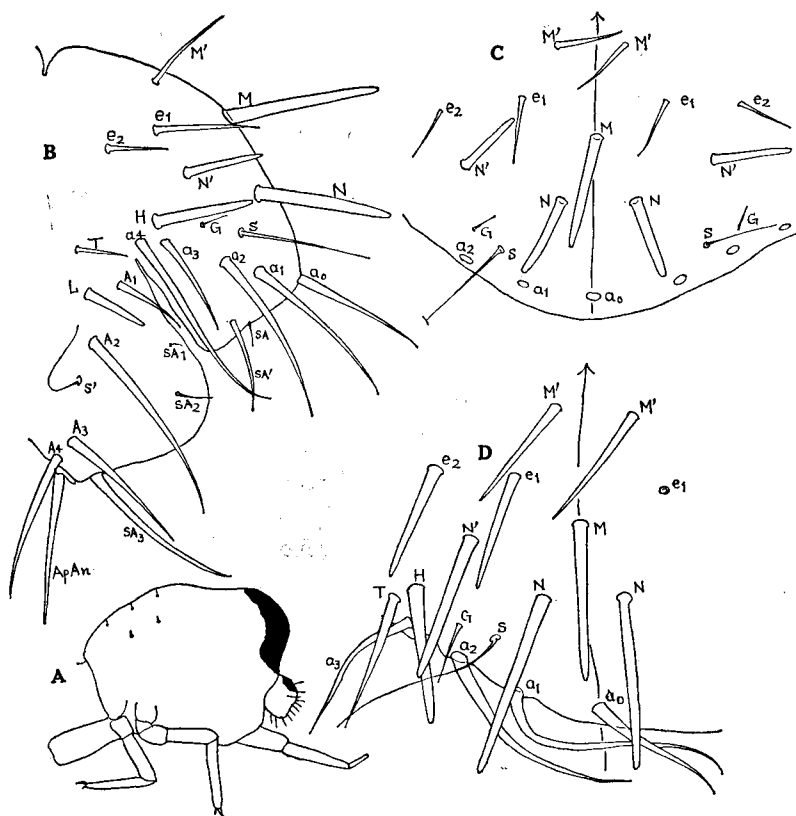
The species is characteristic in many respects. From *D. minuta* (O. FABR.) it is different in the form of vertical, genital and anal setae as well as by less number of dental inner setae. UCHIDA's *D. rufescens* from Japan seems to be identical with this species. As pointed out by STACH, 1957, p. 41, this name is *species inquirenda* and not to be used for the moment.

### *Dicyrtomina minuta* (FABRICIUS, 1783)

Fig. 36

This type species of the genus *Dicyrtomina* was well investigated in STACH 1957, some notes about the chaetal nature are to be added by using the nomenclature above mentioned. I have investigated examples from Munich (Germany) and Liège (Belgium), both with typical black postero-median marking of dorsum (Fig. A).

Examples from Munich (Fig. B, C): Upon anogenital tergite around M-seta, there are 4 pairs of setae and it is not easy to decide which of them represents M' in reality. After recognising usual position of M' in *Calvatomina* etc,

Fig. 36 *Dicyrtomina minuta* (FABRICIUS)

A: Lateral view of abdomen, B: Anogenital segment of female in lateral view, C: Dorsal view of female genital segment (example from Munich, Germany), D: Ditto (example from Liege, Belgium).

I have chosen a pair directly behind M, which is not blunt, but setaceous in nature. Both M and a pair of N are large and blunt on apex. A pair of blunt setae directly outside to N-pair is named as N' and there are two pairs of other spinous setae  $e_1, 2$  before it. N' may be  $e_3$ . H is large and blunt, while G is small and setaceous. All anal setae slender,  $a_3$  small,  $a_4$  long. sa is much smaller than sa'. Upon lateral flaps appendix analis is spiniform, shorter than  $sa_3$ . L is a small macrochaeta.  $sa_1$  minute,  $sa_2$  also not large.

Examples from Liège (Fig. D) is larger (2.0 mm.). Setal arrangement is just the same as above, but all  $e_1, 2$  setae are much larger and macrochaetotic, only slightly different from other setae.

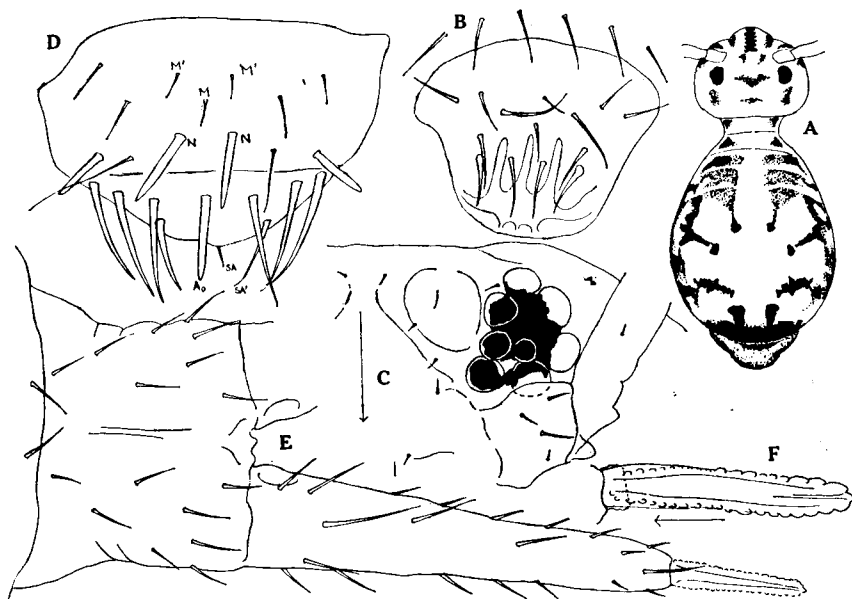
*Dicyrtomina (Calvatomina) yaeyamensis* sp. n.

Fig. 37

2 expl. Yomitanison, Okinawa 16. VI 1962 HH

20 expl. Miyakojima, Yaeyama-group, 24. V 1959 HH

Body length 1.8 mm. Ground colour dirty yellow to browish yellow, pigmented with black spots as in fig. A, which represents the well pigmented example. Usually the body pattern is paler. Dorsal tubercle has always a small dot and posterior part of trunk heavier pigmented. Antennae bluish red throughout, but deeper distally. Legs with two transverse striae upon femur and tibiotarsus of all legs. Ventral tube and furcula pale. Ant./head as 8:5. Ant. ratio as 15:60:70:20. All antennal segments not subsegmented. Ant. III-organ normal. Prelabral setae 3+3. Labral setae arranged as fig. B and lateral pair of the distal row with heavy socket and thick. Three intrusions are distinct and continuous with a distinct ledge. Labral margin with a pair of smaller median and longer lateral papillae. Eyes 8+8, often poorly pigmented and each cornea is divisible without treatment. Frontal setae short, not different from others of the head. Unguis small, dorsally beset with heavy pseudonychia and tunica attaining almost the apex of it. Inner tooth 2, 2, 2. Unguiculus broadly lanceolate, with one distinct

Fig. 37 *Dicyrtomina yaeyamensis* sp. n.

A: Habitus, B: Labrum, C: Eyes and vertical setae, D: Anogenital segment of female in dorsal view, E: Manubrium, dentes and mucro in dorsal view, F: Mucro in dorsal view.

inner tooth. Axial seta of it is slightly surpassing the apex upon all legs. Modified setae of the hind tibiotarsus are blunt, shorter than usual setae. Furcula in ratio as 7:12:5. Manubrium is ventrally nude and dorsally with 9+9 setae in in symmetrical order. Dental setae outer 9, dorsal 4, inner 9, ventral 4, 2, 1, 1...1 =9 in well developed specimens, but often as outer-8, inner-8. Lateral setae all smooth and not feathered. Mucro well denticulated on both sides (outer 28, inner 30), apically with a small projection to which a short ventral ridge is ventrally attached. Pseudonychium basally present. Female anogenital segment with M and M' reduced to small usual setae, while N are blunt and thick. G seta present or absent. H.T.L blunt and subequal in length. Dorsal flap of anus has  $a_0$  blunt and as large as N.  $sa'$  are large than  $sa$ . Upon lateral flaps  $sa_1$  is very short,  $sa_2$  is normally large and  $sa_3$  is the largest, attaining the length of  $a_1$ . Appendix analis in thick, slightly curving and as long as  $sa_3$ . Proximal setae of the trunk poorly developed, as large as posterior ones, which are numerous and somewhat spiny upon posterior part of the abdomen.

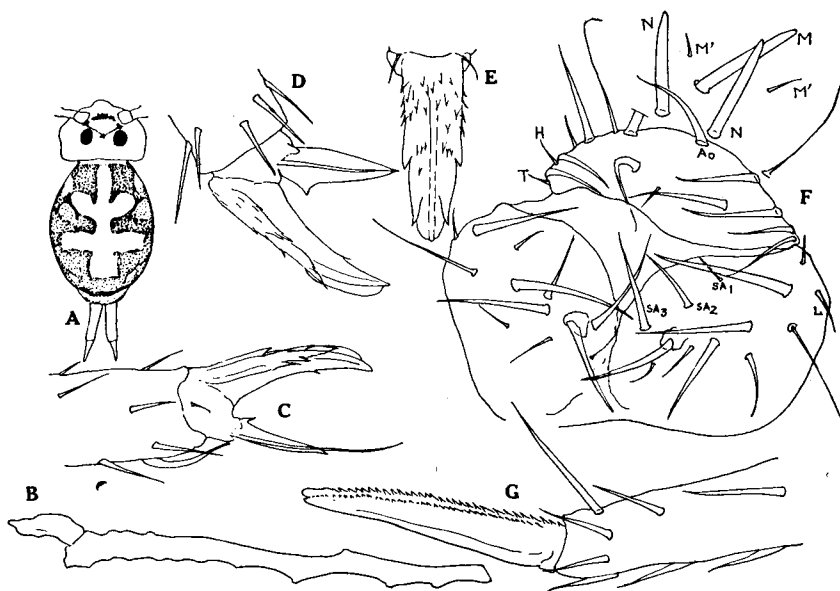
Morphologically the species is characterised by the reduction of M-seta under the *Calvatomina* species of tropical Asia.

*Dicyrtomina (Calvatomina) formosana* sp. n.

Fig. 38

3 ♀, Uh Lai, Formosa 24. X 1960 RY

Body length 1.0 mm. Ground colour white. Antennae violet, deeper distally. Head almost pale, eyes black and a streak between them lightly pigmented. Trunk brownish purple dorsolaterally, leaving a pale longitudinal median patch and two transverse branches of it. Some pale spots are laterally present. Anogenital segment, ventral side and extremities are almost pale. Ant./head as 17:9. Ant. ratio as 10:60:85:15. Ant. III distally corrugated, but not annulated. Ant. IV is incerted obliquely to ant. III and not subsegmented. Eyes 8+8, poorly pigmented. A pair of large infraocular tubercles are present between eyes, which are almost touching each medially. Vertical setae weak, smaller than frontal setae of head. Unguis carinate, with dorsal pseudonychia well developed and with tunica. Inner tooth one to each. Unguiculus is acutely elongate and with long axial filament upon fore-legs. That of mid legs are intermediate in form. No tenent hair. Tibiotarsal setae of hind legs blunt and setaceous. Furca in ratio as 20:52:18. Manubrium dorsally with 9+9 setae, ventrally nude. Dentes chaetotaxically not different from *Ptenothrix*, but both outer and inner rows of setae are not plumose. All of them are spiny and distal three setae of outer row are almost of equal length. Mucro is apically incised and both margins are equally with fine serration.

Fig. 38 *Dicyrtomina formosana* sp. n.

A: Habitus, B: Antenna, C: Fore claw, D: Hind claw, E: Ditto in frontal view, F: Anogenital segment of female, G: Outer view of mucro and distal part of dentes.

Trunk is spherical, posterior dorsal hump not prominent. Anterior setae of dorsum very poorly developed and much smaller than those of posterior dorsum, where setae are thick, blunt and numerous. Anterior seta: posterior seta as 1:2. 3+3 bothriothrica rather short. Anogenital segment dorsally with 3 macrochaeta representing M and paired N. M' small. All anal setae of the dorsal flap subequal in shape. sa short, sa' longer. G absent. H and T setaceous. L short and setaceous. sa<sub>1</sub> minute, sa<sub>2</sub> larger and sa<sub>3</sub> largest. Appendix analis is spiny and as long as sa<sub>3</sub>.

The species is easily recognised by the body pattern of dorsum. Morphologically it differs from *D. yaeyamensis* sp. n. by the blunt, large M-seta.

*Ptenothrix tsutsuii* YOSII, 1955

Fig. 39

YOSII 1955, STACH 1957.

2 expl. Nakanoshima, Tokara, 5. VI 1953 S. UENO leg. (paratype)

Following description is to be added for my diagnosis of this species. Labral setae usual, labral margin with 2+2 low, transverse ridges. Ant. III, IV with 6, 2 subsegments respectively. Vertical setae not large, blunt and subequal (A-seta

slightly larger). o-seta blunt?. Axial filament of unguiculus is apically swollen upon fore- and mid legs and not so upon hind legs. Tenaculum usual. Dental setae arranged in typical way. Of the outer feathered setae,  $ou_1$  is slender, smooth.  $ou_2$  subequal or a little shorter than that and feathered.  $ou_3$  is, as already stated, about 3 times the length of  $ou_2$ . Thus  $ou_{1-4}$  is as 10:8:28:32. Proximal two setae of the same row are smooth. Mucro coarsely serrated on both sides (outer 26-30, inner 34-37), apically not tapering and with a deep incision. Anogenital setae M, N are rather long, G-seta short and spiny. H, T, L blunt and H is the longest. All anal setae shorter than usual, smooth.  $sa$  is 3 times longer than  $sa'$ , but it is about half the length of N. Upon lateral flaps  $sa_1$  is short,  $sa_2$  long,  $sa_3$  about 2/3 the length of elongated appendix analis. Anterior dorsal setae 5+5, blunt, slender and ca. 3/4 the mucro in length. Posterior abdominal setae short, conical and numerous.

Morphologically it is characterised by the shortness of  $sa'$  and  $sa_1$  upon anal lobes.

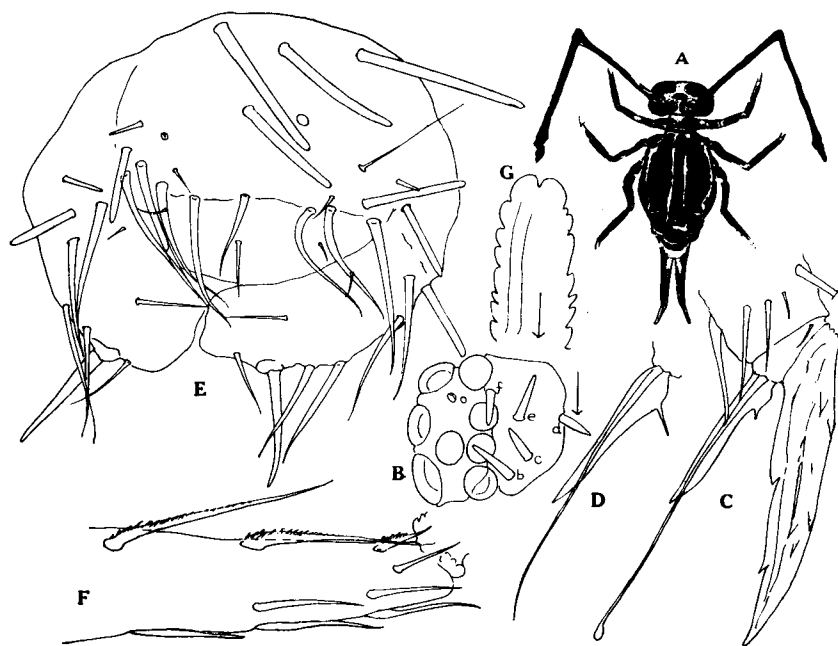


Fig. 39 *Plenothrix tsutsuii* sp. n.

A: Habitus, B: Vertical setae, C: Fore claw, D: Hind unguiculus,  
E: Anogenital segment of female, F: Distal outer row of dental setae,  
G: Mucro end (dorsal view).

*Ptenothrix tokarensis* sp. n. Fig. 40

Syn. nov.: *Ptenothrix corynephora* f. *shibanaii*: YOSHII 1955

5 expl. Nakanoshima, Tokara Is., 6. VI 1952 S. UENO leg.

Detailed studies of this form reveals it an independent species. Body colour differs from *corynephora* by its head being totally dark, trunk with a median dorsal stripe. 2+2 small pale spots may be present side by side to the stripe. Antennae and legs red purple on definite places as in fig. A. Body length 2.0 mm. Ant./head as 37:20. Ant. ratio as 10:56:70:12. Ant. III, IV with 6, 2 subsegments each. Labral structure normal. Vertical setae as Fig. B, all of them are blunt. o-seta blunt (setaceous in *corynephora*). Facial setae 1, 1, 2, 2, 1, 3, all subequal and as large as *a*. Eyes 8+8, black. Unguis slender with obscure dorsal pseudonychium and with 2, 2, 2 inner teeth. Unguiculus also elongate, pointed and with an inner tooth. Axial filament is apically swollen upon fore-legs and not so upon others. Ventral tube with 1+1 lateral and 1+1 terminal setae. Tenaculum typical. Furcula with

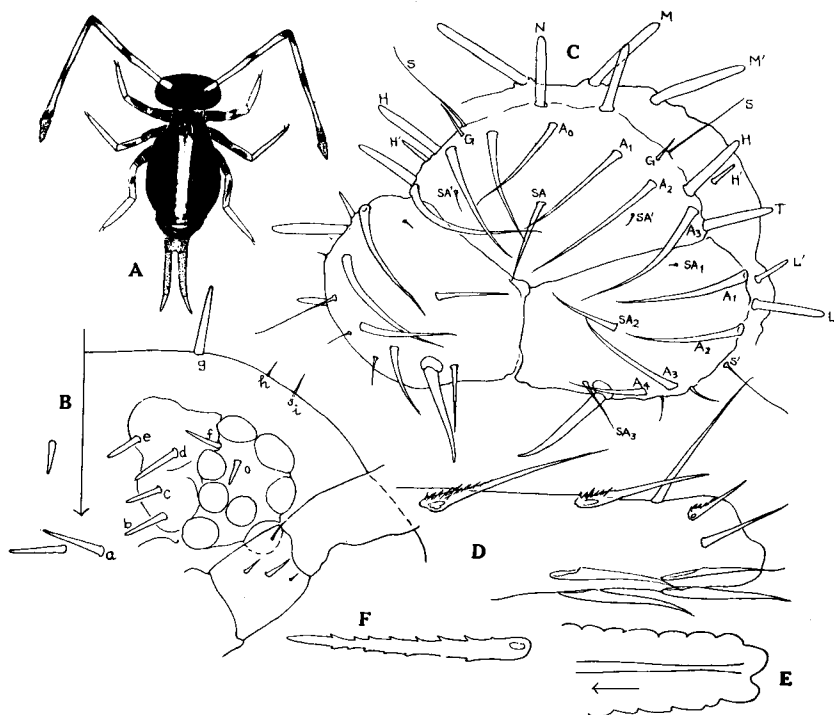


Fig. 40 *Ptenothrix tokarensis* sp. n.

A: Habitus, B: Vertical setae, C: Anogenital segment of female, D: Outer distal setae, E: Mucro end (dorsal view), F: Modified setae of hind tibiotarsus.



d:mu as 3:1. Dental setae typically arranged.  $ou_1$  is long, smooth and simple.  $ou_2$  is feathered and shorter than  $ou_1$ . Other setae rather poorly feathered and  $ou_{1-4}$  is related as 35:25:48:65. Mucro apically with a broad incision and both sides are well denticulated (outer 32, inner 36-42). Anogenital segment is characteristic. M, M' are short, smaller than sa. G setaceous. H, T, L blunt. H', L' both small and blunt. Slender anal setae are not ciliated, sa as long as M, while sa' are vestigially small. Upon lateral flap  $sa_1$  is minute,  $sa_2$  very long and as large as sa.  $sa_3$  moderately long. Appendix analis is long, slender, slightly curving and blunt on apex. Anterior body setae 5+5, feebly developed and 0.5 times the mucro in length. Posterior ones are small, conical and numerous.

Morphologically the species is near *P. tsutsuii* Yosii, 1955 and may be separated by short M and N. From *corynephopa* it is easily divided by small sa' upon anal flaps.

Distr: Endemic to Tokara.

*Ptenothrix yakushimana* sp. n.

Fig. 41

1 ♀, Nagata, Yakushima Is. 26. X 1955 RY

3 ♀, Miyanoura, Yakushima Is. 24. X 1955 RY

Body length up to 2.0 mm. Ground colour white. Antennae deeply violet all over. Head with a purplish transverse band across the ocular patches, but without distal frontal band. Large abdominal part deeply blackish, divided into three parts by two white transverse bands. Ventral tube pigmented. Legs distally dark or banded. Furca pale. Ant./head as 93:38. Ant. ratio as 4:35:45:9. Ant. III, IV with 7, 2 subsegments respectively. Labral structure equal to other species of the genus and labral margin has 2+2 low, transverse elevations. From the vertical setae b-seta is larger than others. Facial setae as 1, 1, 2, 2, 1, 3. Unguis slender, with obscure dorsal pseudonychium and the inner tooth is 1, 2, 2 in number. Unguiculus also slender, with an inner process, which is low upon fore-legs and high upon others. Axial filament is well elongated, longer upon fore legs than on others and ending in a swollen bulb upon fore and mid legs and blunt upon hind-legs. Eyes 8+8, black. Modified setae of hind legs are bluntly ending and with fewer small denticles. Ventral tube laterally with 1+1 setae, terminal filament very long. Rami tenaculi 3 toothed, corpus has a high median process, upon which 4 setae are present. Furcula has d:mu as 3:1. Dental setae typically arranged,  $ou_1$  is smooth and spiny,  $ou_2$  slightly longer and feathered. Ratio of  $ou_{1:2:3:4}$  as 3:3:7:8. Inner row of lateral setae all feathered as in *P. denticulata*. Mucro well serrated on both sides (outer 23-26, inner

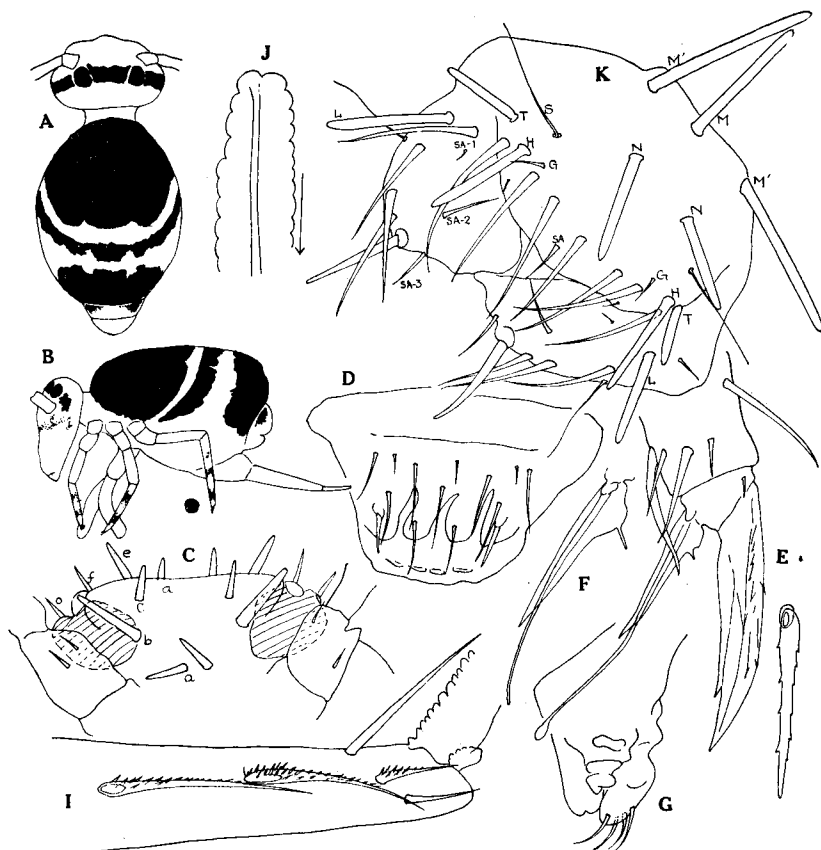


Fig. 41 *Ptenothrix yakushimana* sp. n.

A, B: Habitus, C: Vertical setae, D: Labrum, E: Fore claw, F: Hind unguiculus, G: Tenaculum, H: Modified seta of hind tibiotarsus, I: Distal outer row of dental setae, J: Mucro end (dorsal view), K: Snotogenital segment of female.

33-37). Distal end of it is not incised, but ending in a pair of larger, rounded denticles. Anogenital setae well developed. M, M' and N long and blunt. G seta small and setaceous. H, T, L are all blunt setae. H is as long as N. L is shorter (H:L as 8:7). All anal setae smooth, setaceous. Upon dorsal flap sa is large, while sa' are very small. Upon lateral flaps sa<sub>1</sub> is also minute and sa<sub>2</sub> is larger. Appendix analis is long, slender and bluntly ending. sa<sub>3</sub> is rather small and attaining only the half of the appendix. 5+5 anterior setae of the trunk are blunt, the proximal 2+2 are smaller than others. Posterior body setae are short, somewhat conical.

Morphologically it is the near relative of *P. tsutsuii* Yosii from Tokara Is. by the short  $sa'$  and  $sa_1$  of anal flaps, but the species is characterised by large b-seta of vertex. In colour pattern it is near *P. narumii* UCHIDA, 1940 of Manchuria, but different in less feathered dental setae. Colouration is also near *P. pineolae* WRAY, 1946 of USA.

*Ptenothrix higashihirajii* sp. n. Fig. 42

6 expl. Izumi, Okinawa, 30. X 1961 HH

Body length up to 2.0 mm. Blackish purple, but dorsal side of the trunk is broadly pale. Antennae pale, banded into violet colour at the end of ant. II, III, middle of ant. III, whole of ant. IV. Head pale dorsally upon vertex, frontal region is strongly mottled. Legs, ventral tube and furcula pale. Ant./head as 2:1. Ant. ratio as 5:35:45:9. Ant. III and IV with 6, 2 subsegments each. Labral setae normal of the genus. Eyes 8+8, black. Vertical setae not long, a, b, c, d, e all subequal, but g is about 1.5 times the length of others. o blunt, as large as f.

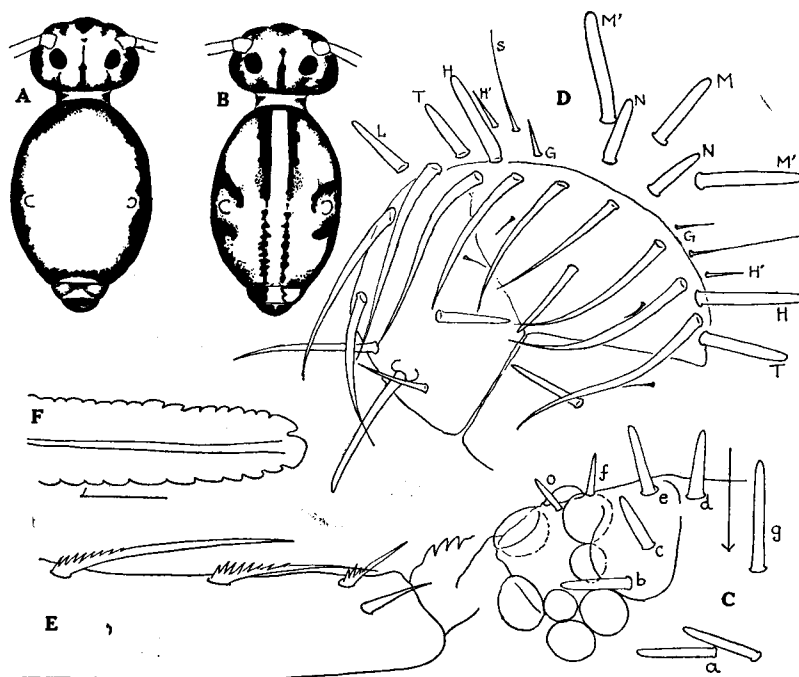


Fig. 42 *Ptenothrix higashihirajii* sp. n.

A: Habitus, B: Ditto of f. *bilineata*, C: Vertical setae, D: Anogenital segment of female, E: Outer distal dental setae, F: Mucro end (dorsal view).

Facial setae 1, 1, 2, 2, 1, 3, all subequal and as long as a-seta of vertex. Unguis well developed, dorsal pseudonychia rather conspicuous and with 1-2 inner teeth. Unguiculus acute, with a corner tooth on inner side. Axial seta longer than unguis and prominently swollen distally upon all legs. Modified seta of hind-legs lightly feathered and apically blunt. Ventral tube and tenaculum normal. Furcula in ratio as 24:35:12. Dental setae dispersed in full number.  $ou_1$  is smooth,  $ou_{1-4}$  related as 25:25:60:80.  $ou_2/ou_3$  as 2.4. Mucro is serrated (outer 28, inner 37) and the apical notch is conspicuous and deep. Anterior dorsal setae of trunk 5+5, blunt and 0.6 times the mucro in length. Posterior ones are minute and spiny. Anogenital setae of ♀ with blunt but very short M, M' and N.  $M/a_0$  being  $2/3$  and N is shorter than that. G setaceous. H, T, L, L' blunt, but not short. H' is setaceous. All anal setae smooth.  $sa$  and  $sa_2$  very strong, about  $1/2$  of  $a_0$  and almost blunt on apex, while  $sa'$  and  $sa_1$  are short and setaceous. Appendix analis is slender, slightly curving and longer than  $sa_3$ .

Morphologically the species is not much different from *P. tokarensis* sp. n., by its short N. But the shape of H' is blunt in *tokarensis* and setaceous in the present species. Also  $sa'$  is not very small and  $sa$ ,  $sa_2$  are thick, almost blunt on apex.

The species is dedicated to Mr. Seiji Higashihiraji. The collector of many valuable examples.

*Ptenothrix higashihirajii* sp. n. *bilineata* f. n. Fig. 41 B

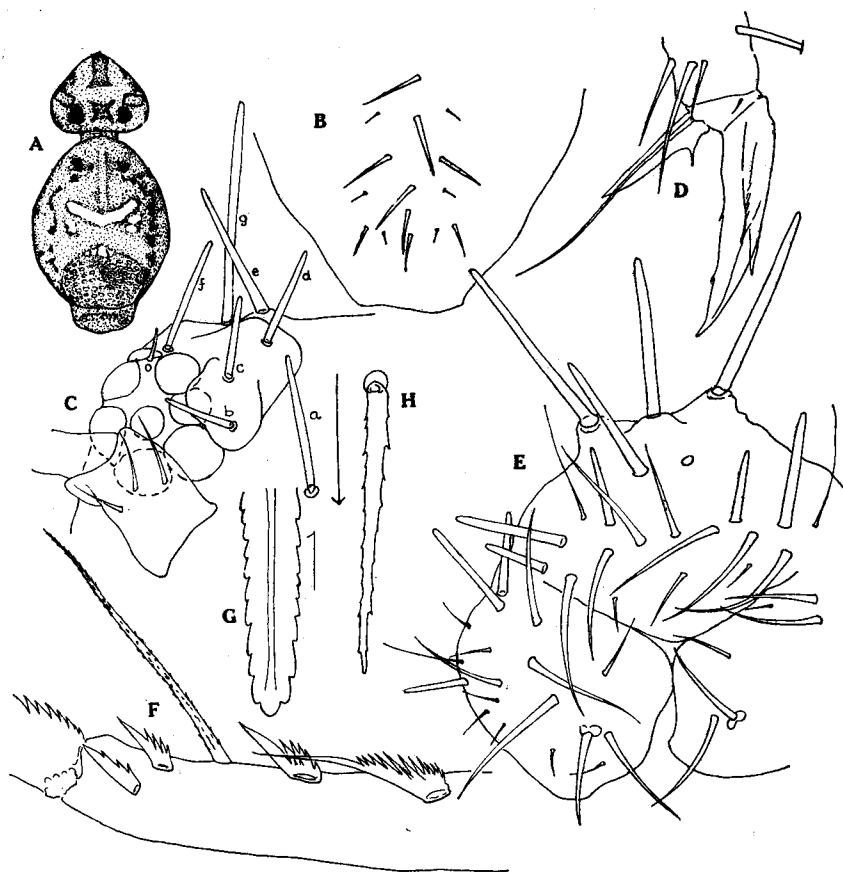
3 expl. Izumi, Okinawa, 30. X 1961 HH

Body colour is not much different from the principal form, but the dorsal median area is beset with a pair of prominent longitudinal striae extending from the neck to the anogenital junction. The stripe is interrupted at the middle and the anterior half is broad, while the posterior half is a continuous moniliform line. In morphological details it is concordant with the principal form.

*Ptenothrix higumai* sp. n. Fig. 43

5 expl. Awashima, Pref. Niigata, 15. VII 1961 S. HIGUMA leg.

Body length 2.2 mm. Ground colour light brownish, strongly mottled with castaneous black pigments. Antennae brownish dark throughout. Head with a median broad patch of light brown, both sides of the head also mottled with the same colour. Trunk with a faint pale median stripe on anterior half, terminating by a large pale V-form at about the middle. Anterior half and lateral part of the trunk is irregularly and heavily mottled. Posterior dorsal part is provided with a uniformly brown area, with minute pale spots on it at the basis of each setae. Legs dark brown. Furcula and ventral tube lightly pigmented. Ant./head as 9:5

Fig. 43 *Ptenothrix higumai* sp. n.

A: Habitus, B: Facial setae, C: Vertical setae, D: Hind claw,  
E: Anogenital segment, F: Outer dental setae, G: Mucro (dorsal),  
H: Modified setae of hind tibiotarsus.

Ant. ratio as 7:35:38:10. Ant. III and IV with 7, 3 subsegments each. Labral setae 6/5, 5, 4 and distal margin without structures. Frontal setae long, arranged as 1, 1, 2, 1, 1, 3, thus differing completely from other species. Eyes 8+8, black. Interorbital process prominent. Vertical setae very long and rugose upon their surfaces. d, e upon slight tubercle. g is by far the longest. o-seta short and blunt. Upon legs tibiotarsal setae are rugose. Unguis with relatively well developed pseudonychium and with 2, 2, 2 inner teeth. Unguiculus acute, with a inner tooth. Axial seta very long, surpassing the unguis and distally setaceous, not ending in a spherule. Modified tarsal setae blunt, feebly feathered. Furcula in ratio as 30:35:10. Manubrium dorsally with 9+9 symmetrically disposed setae. Arrangement

of dental setae normal. All four dorsal setae are long and rugose, so that they may be described as ciliated. Lateral setae are strongly feathered,  $ou_1$  short and with 3-4 rami,  $ou_{2,3}$  short and barberated.  $ou_{4-8}$  strongly feathered basally,  $ou_9$  rugose and  $ou_{10}$  smooth. Inner row of dental setae almost the same as the outer row. Mucro densely serrated on both sides (outer 34, inner 22) distally without large incision. Pesudonychium ventrally present. Anterior body setae 5+5, very long (as long as mucro) and blunt, posterior ones are minute and spiny. Upon anogenital segment of female M and M' very strong, as long as mucro and upon low papillae. N blunt, 4/5 of M in length. G-seta blunt and large. H, T, L all blunt. All anal setae rather slender,  $sa$  is 1/2 of  $a_0$ ,  $sa'$  smaller.  $sa_1 = sa'$ ,  $sa_2 = sa$ ,  $sa_3$  very long, longer than appenidx analis, which is very thin and apically acute, so that it is not much different from usual anal setae.

The species, which is near *P. marmorata* (PACKARD 1873) of USA in body colouration, differs from other species in many respects. So the disposition and number of frontal setae of head are peculiar. Frontal setae very long, g-seta extremely long, axial seta of unguiculus not swollen, dental dorsal setae ciliated, dental  $ou_{1-3}$  feathered, anterior dorsal setae of trunk long, etc. It may be near *P. vinnula* UCHIDA, 1957, but the pattern of the body is different on anterior dorsum.

The species is dedicated to Mr. SEIJI HIGUMA of the Nagaoka Municipal Museum, the collector of many remarkable collembola of the Niigata Prefecture.

#### Literatures Cited

- BELLINGER, P. F. 1952 A new Genus and Species of *Isotomidae*, Psyche **59**: 20-25  
 BONET, F. 1943 Sobre la classification de los *Oncopoduridae*. Ann. Esc. Nac. Cienc. Biol. **3**: 127-153  
 ——— 1947 Monografia de la Familia *Neelidae*. Rev. Soc. Mexicana Hist. Nat. **8**: 131-192  
 BÖRNER, C. 1909 Japans Collembolenfauna. SB. Ges. naturf. Fr. 1909: 99-135  
 ——— 1913 Zur Collembolenfauna Javas. Tidskr. v. Entom. **56**: 44-61  
 CAROLI, E. 1912 Su di un nuovo genere di *Neelidae*. Ann. Mus. Zool. Univ. Napoli NS. Suppl. 1-5, tav. 1.  
 CASSAGNAU, P. 1959 Faune Française des Collemboles X, Vie et Milieu **10**: 68-88  
 ——— 1959 Faune française des Collemboles IX, Vie et Milieu **9**: 476-503  
 CHRISTIANSEN, K. 1958 The nearctic Members of the genus *Entomobrya*, Bull. Mus. Comp. Zool. **118**: 439-545  
 DENIS, J. R. 1931 Collembolles de Costa Rica I, Boll. Lab. Zool. Portici **25**: 69-170  
 ——— 1948 Collemboles d'Indochine, Notes d'Entom. Chinoise **12**: 184-311  
 FOLSOM, J. W. 1932 Hawaiian Collembola, Proc. Hawaii entom. Soc. **8**: 51-80  
 GAMA, M. M. da 1963 Monografia do genero *Isotomocdes*, Est. Mus. Zool. Univ. Coimbra no. 280, 44 pp.  
 GISIN, H. 1949 Notes sur les Collemboles etc. Mitt. schw. ent. Ges. **22**: 385-411  
 LAWRENCE, P. N. 1962 A Review of BAGNALL's *Hypogastrura* Types, Entom. Gazette **13**: 132-151  
 MILLS, H. B. 1934 A monograph of the Collembola of Iowa, Ames, 1934  
 ——— 1937 A north American *Oncopodura*, Canad. Entom. **69**: 67-69

- SALMON, J. T. 1944 New Genera, Species and Records of New Zealand Collembola etc. Rec. Dominion Mus. 1: 123-182
- 1951 Some Collembola from Malay, Proc. R. ent. Soc. Lond. B 20: 131-141
- SCHÄFFER, C. 1898 Collembolen des Bismarck Archipels, Arch. f. Naturges. 64: 393-425
- SCHÖTT, H. 1917 Results of Dr. Mjöberg's Schwedisch Scientific Expedition to Australia. Arch. f. Zoologi 11: no. 8, 60 pp.
- SELGA, D. da 1962 Resultados de la Expedicion Perez Alvarez a la Isla de Annobon. V, P. Inst. Biol. Apl. 33: 17-32
- STACH, J. 1949 The Apterygotan fauna of Poland etc. *Neogastruridae, Brachystomellidae*, Polska Akad. Umiej. 341 pp.
- 1949 Ditto, *Anuridae* and *Pseudachorutidae*, Polska Akad. Umiej. 122 pp.
- 1956 Ditto, *Sminthuridae*, Polska Akad. Umiej. 287 pp.
- 1957 Ditto, *Neelidae* and *Dicyrtomidae*, Polska Akad. Umiej. 113 pp.
- UCHIDA, H. 1943 On some Collembola *Arthropleona* from Nippon, Bull. Tokyo Sci. Mus. no. 8
- 1953 On three new Species and a new Form of Japanese *Sminthuridae*, Annot. zool. Jap. 26: 1-13
- 1957 On some Sminthurid Collembolans from Hokkaido, Insecta Matsumurana 21: 22-30
- WOMERSLEY, H. 1942 New Genera and Species and Records of Collembola from Australia etc. Trans. R. Soc. S. Austr. 66: 23-31
- WRAY, D. L. 1946 New Collembola from North Carolina, Bull. Brooklyn ent. Soc. 41: 79-85
- YOSHII, R. 1954 Springschwänze des Ozé Naturschutzgebietes, Sci. Res. Ozegahara Moor, 777-830
- 1955 Meeresinsekten der Tokara Inseln VI, Collembolen, Publ. Seto mar. biol. Lab. 4: 379-401
- 1959 Studies on Japanese Collembola VI, Kontyu 27: 116-118
- 1959 Studies on the Collembolan Fauna of Malay and Singapore, Contr. biol. Lab. Kyoto Univ. no. 10, 65 pp.
- 1961 Phylogenetische Bedeutung der Chaetotaxie bei den Collembolen, Contr. biol. Lab. Kyoto Univ. no. 12, 37 pp.
- 1961 Studies on Japanese Collembola VII, Cryophilous Species of the Niigata Prefecture, Bull. Nagaoka Mus. 2: 14-19
- 1962 Studies on the Collembolan Genus *Hypogastrura* II, Contr. biol. Lab. Kyoto Univ. no. 13, 25 pp.
- 1963 On some Collembola of Hindukush, with notes on *Isotoma* and its allies. Res. Kyoto Univ. Sci. Exped. Karakorum, Hindukush, 4: 3-42
- YOSHII, R. et C. LEE, 1963 On some Collembola of Korea. with notes on the genus *Plenothrix*, Contr. biol. Lab. Kyoto Univ. no. 15, 37 pp.