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## FOUR NEW SPECIES OF *NEPHROCERUS* ZETTERSTEDT (DIPTERA : PIPUNCULIDAE) FROM JAPAN\*

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### Abstract

Four new species of the genus *Nephrocems* Zetterstedt (Pipunculidae : Diptera), *grandis*, *japonicus*, *flexus* and *spineus*, are described and illustrated from Japan.

### Introduction

Up to now only five species of flies of the genus *Nephrocems* Zetterstedt in the family Pipunculidae have been known to science. Three of them are the European species (*N. lapponicus* Zett., *N. flavicornis* Zett. and *N. scutellatus* Macquart) and another two are the Nearctic ones (*N. daeckei* Johnson and *N. slossonae* Johnson).

In the course of my systematic studies on the Pipunculidae (Diptera) of Japan, I have been able to accumulate 22 specimens (6 males and 16 females) of this genus from Japan (Kyushu, Honshu and Hokkaido). Based on the six male specimens, Japanese species are classified in four new species which are described in this paper. No attempt was made to classify the females because our knowledge on the combination of sexes for the *Nephrocems* species is poor at present.

### Genus *Nephrocerus* Zetterstedt

*Nephrocems* Zett., 1838, Ins. Lap. 578.

Description. Male. Head : Hemispherical ; eyes touching on frons, hind margin of eyes noticeably concave at middle when viewed from side ; ocellar triangle bare, ocelli slightly raised ; frontal triangle and face covered with silvery white pubescence which are longer and denser on face ; antenna with third segment largest, reniform ; anterior margin of first and second antennal segments with many bristles which are slightly longer on second segment above and below ; occiput moderately wide, sparsely covered with numerous short hairs.

Thorax dorsally with long bristles on particular areas as follows : Two on notopleuron, one on supra-alar, one or two on the end of dorso-central line; humeri conspicuously enlarged, quite protruded ; scutellum with 4-8 long marginal bristles.

Legs long and slender, with rather dense pubescence and bristles. Tarsi longer than femora, and

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also longer than tibiae due to first and second tarsal segments very long.

Wings (Figs. 1-4) long, about three times as long as broad ; stigma short and uncolored, *r-m* situated about basal one-third to one-fourth of discal medial cell ; vein M2 present on last section of fourth vein (M1) about basal one fourth to one fifth, rather long but never reaching the wing margin.

Abdomen rather long and narrow, densely covered with pubescence and bristles. Tergite 2 longest ; tergites 7 and 8 turned to the right ; tergite 7 scarcely seen from above ; tergite 8 swollen, very **large**.

Genitalia as in Figs. 5-10. Tergite 9 (epandrium) enlarged, horse shoe-shaped, terminated with well-developed surstyli ; right surstylus with apex produced to form a hook-like process ; left surstylus clamp-shaped. Sternite 9 (hypandrium) reduced to a small plate when compared with epandrium, articulated laterally with basal part of pregonites (gonopod). Pregonites with enlarged apex (Fig. 9). Postgonites (parameres) jointed at apical margin of pregonites, situated at ventral base of aedeagus, small, oval. Aedeagus raised among pregonites and postgonites, pointed between surstyli, coil-shaped, rather long when extended ; aedeagal apodeme well-developed, produced a basal process for supporting aedeagal base.

Female. Resembling male but differing as follows : Eyes dichoptic ; tergite 7 rather long ; sternite 6 with numerous short tack-like spines on posterior half. Ovipositor with very short base and short blade-like piercer.

#### KEY TO MALES OF JAPANESE *Nephrocerus*

- Hind tibia almost straight (Fig. 15), apex without circlet of stiff bristles ; hind trochanter without any spine beneath ; third antennal segment (Fig. 32) small slightly wider than the second, dark orange ; genitalia as in Fig. 41 ..... **japonicus** sp. n.
- Hind tibia bent, apex with circlet of stiff bristles ; hind trochanters with spines beneath ; third antennal segment (Fig. 24) twice as wide as the second, yellowish ..... 2
- Hind trochanter with a dense group of 5-8 black spines beneath (Fig. 11), hind tibia slightly bent from middle (Fig. 14), genitalia as in Fig. 40 ..... **grandis** sp. n.
- Hind trochanter with plate-like black spines beneath (Fig. 13) ; hind tibia bent from middle (Fig. 16) ..... 3
- Scutellum entirely black ; genitalia as in Fig. 42 ..... **flexus** sp. n.
- Scutellum almost entirely yellow except near anterior margin brown ; genitalia as in Fig. 43 ..... **spineus** sp. n.

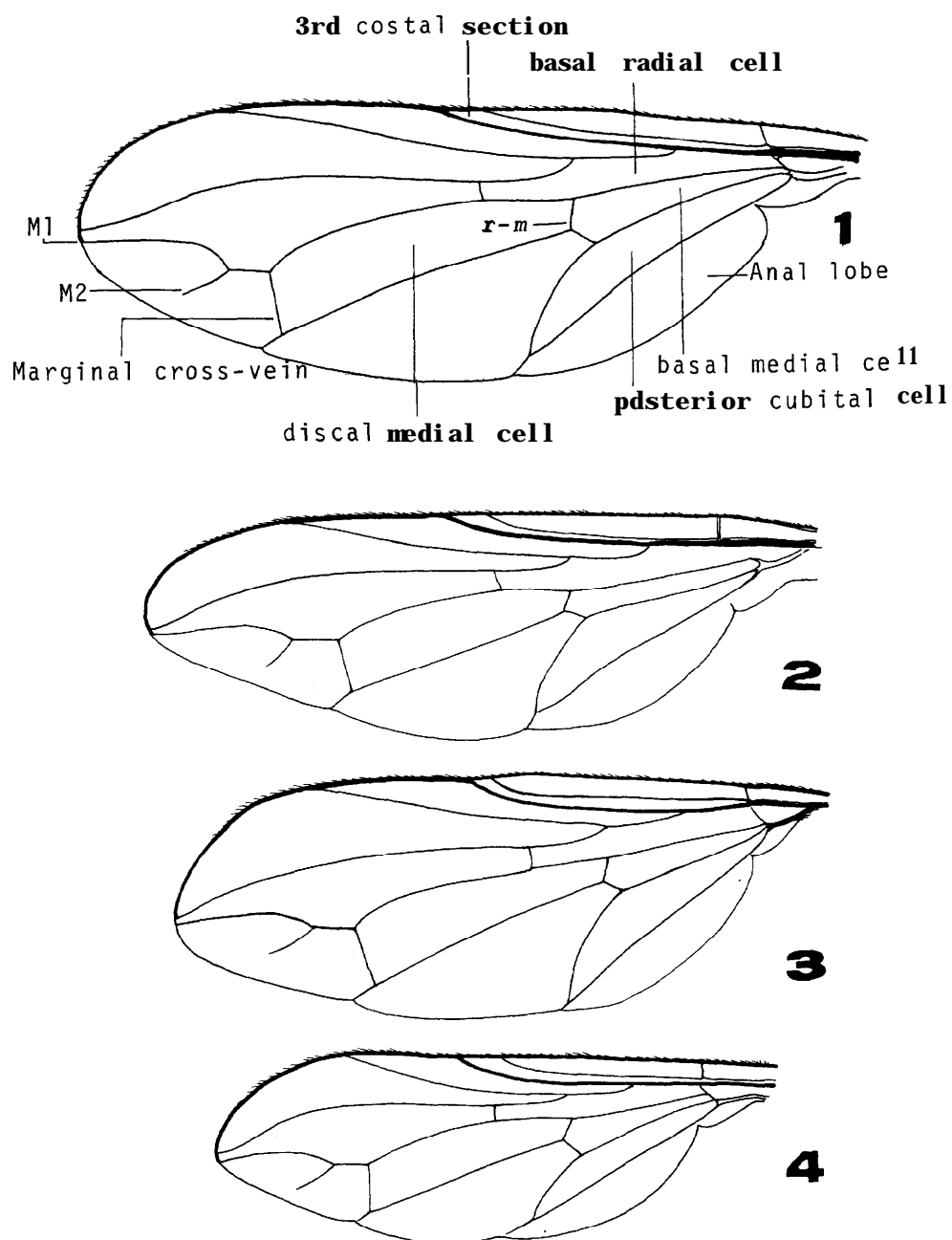
#### *Nephrocerus grandis* sp. n.

Length: Body 7.5-12 mm. ; wings 7-12 mm.

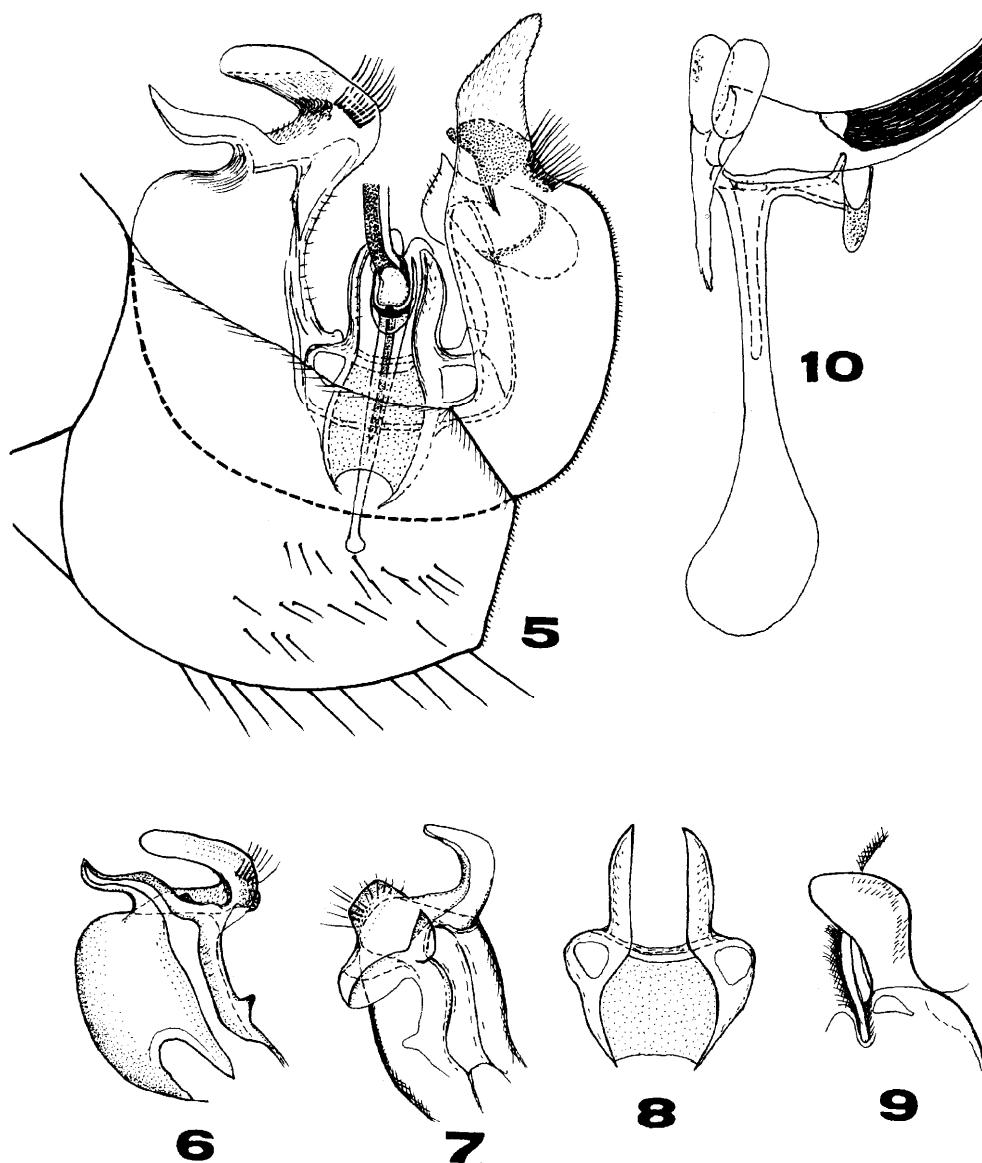
**Male.** Head : Eyes touching on frons for about 1.1 times as long as frontal triangle. Antennae (Fig. 24) all bright yellow, third segment large about twice as wide as second segment, reniform, arista slightly longer than third segment, with enlarged yellow base, remainder black. Occiput cinereous, sparsely covered with numerous yellowish hairs.

Thorax (Fig. 17) shining black on dorsum, cinereous when seen from front ; back of humeri through base of wings more cinereous; humeri enlarged, slightly protruded, whitish cream; post-alar calli and scutellum brownish black ; scutellum with four to six strong black marginal bristles; pleurae brownish black, greyish pruinose ; propleural fan with about ten long black bristles.

Legs all bright yellow ; hind trochanter with conspicuous dense group of 5-8 black spines beneath (Fig. 11) ; hind tibia slightly bent on distal half (Fig. 14), apex with circlet of stiff brown bristles ; last



**Figs. 1-4.** Wings of *Nephrocerus*: 1, *grandis* sp. n.; 2, *japonicus* sp. n.; 3, *flexus* sp. n.; 4, *spineus* sp. n.



Figs. 5-10. Male genitalia of *Nephrocerus grandis* sp. n. : 5, genitalia, ventral ; 6, left parts, inner-side, lateral ; 7, right parts, inner-side, lateral ; 8, hypandrium and pregonites, ventral ; 9, pregonites, lateral ; 10, aedeagal apodeme, lateral.

tarsal segment with five long brownish bristles dorso-apically (Fig. 25).

Wings (Fig. 1) hyaline, tinged with brown except basal radial (br), basal medial (bm) and posterior cubital (cup) cells and basal half of anal lobe rather clear; fourth costal section about three to four times as long as the third ; *r-m* situated at about basal one-fourth of discal medial cell (dm) ; vein

M2 placed beyond basal one-fifth of last section of vein M1, slightly shorter than marginal cross-vein ; halteres and calypteres yellow.

Abdomen (Figs. 17-23) slightly narrower than and about twice as long as thorax ; tergite 1 black, with yellow marking, antero-laterally with a tuft of long black bristles; tergite 2 longest, tergites 2 and 3 yellow, each of them with black marking dorsally as shown in Fig. 17 (see "Remarks" for variation) ; tergites 4-7 shining black ; tergite 8 black, brownish pruinose, triangular as seen from above.

Genitalia (Figs. 5-10 and 40) large, almost entirely black, brownish pruinose. Right surstylus (Fig. 7) with large hook-like apex and large complicated folding basal process, and also with brush-like long black bristles near base ; inner side with a small pointed process. Left surstylus (Fig. 6) composed of two lobes ; upper lobe large, rectangular shape with round apical margin, basally with brush-like long black bristles ; lower lobe smaller, laminate, quadrate as seen from caudal view, occasionally expanded at ventral outer corner to form a small beak-like process.

**TYPE MATERIAL :** Holotype male (Type No. 2641, Kyushu Univ.), Mt. Hiji, Oita Pref. (KYUSHU), 5. VI. 1985 (R. Morakote). Paratypes : 1 male, same data as holotype, 1 male, Rausu Onsen, Nemuro (HOKKAIDO) (R. Morakote).

**REMARKS :** This new species closely resembles the European species *N. flavicornis*, but differs as follows: hind trochanter with a conspicuous dense group of 5-8 black spines beneath (1-2 spines in *flavicornis*); *r-m* situated at basal one-fourth of discal medial cell (one-third in *flavicornis*). The tergites 1 and 2 are variable in coloration as follows : Usually yellow with black markings dorsally and ventrally as shown in Figs. 17 and 18, but sometimes almost entirely black, with posterior margin yellow as shown in Figs. 22 and 23. All the three specimens were collected by me when they were hovering over herbaceous plants below trees, and about 0.5-1.5 metres above ground.

### *Nephrocerus japonicus* sp. n.

Length : Body 8.8 mm. ; wings 8.8 mm.

Male. Head : Eyes touching on frons for about twice as long as frontal triangle. Antenna (Fig. 32) with third segment quite smaller than other species, only slightly longer than second, dark orange, reniform ; arista slightly longer than third antennal segment, enlarged base orange, remainder black. Occiput cinereous, sparsely covered with numerous yellowish hairs.

Thorax almost similar to that of *N. grandis*, but different as follows : Scutellum entirely yellow (Fig. 33), with three strong and five weak black marginal bristles. Propleural fan with 14 long black bristles.

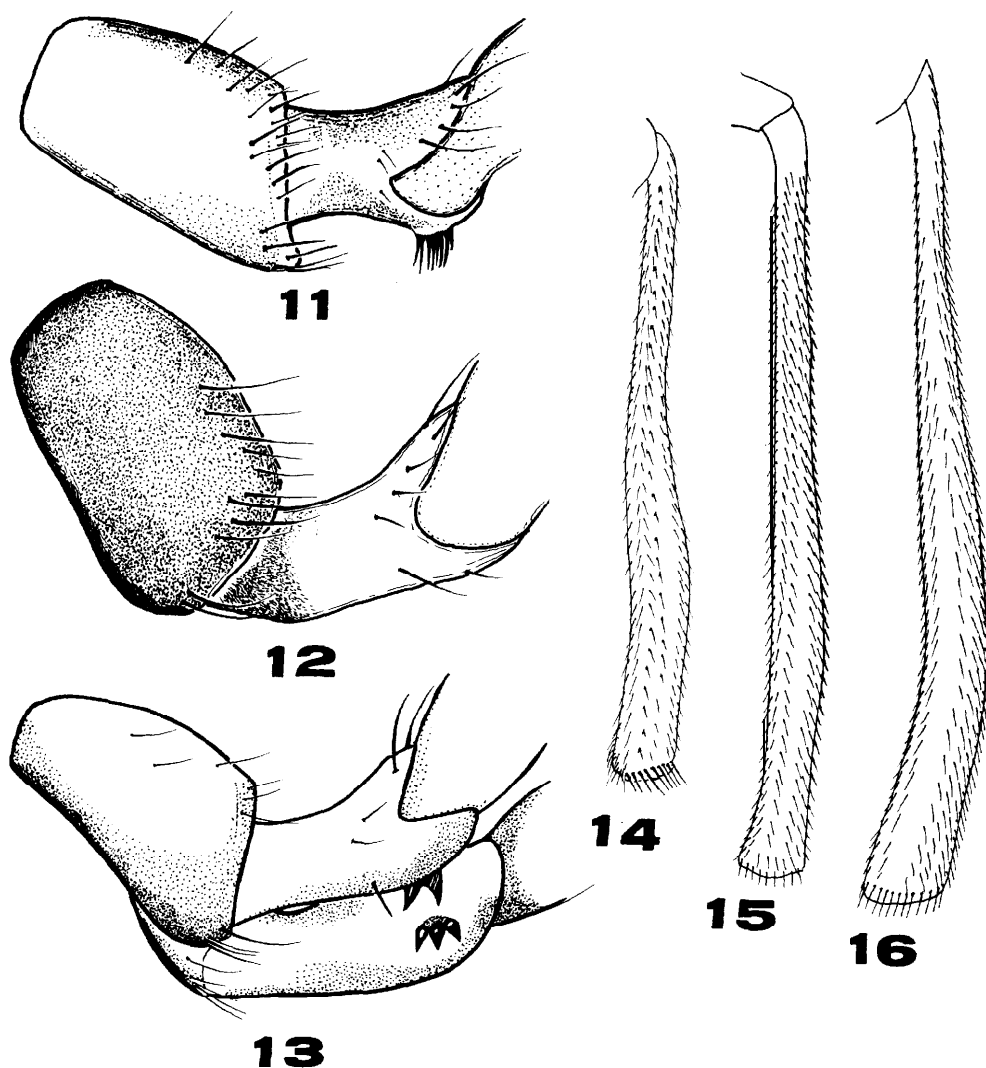
Legs yellowish except coxae and base of trochanters brownish black ; hind trochanter bare, without any spine beneath (Fig. 12) ; hind tibia (Fig. 15) almost straight, apex without a circlet of stiff bristles ; last tarsal segment with five long brownish bristles dorso-apically.

Wings (Fig. 2) similar to that of *N. grandis*, *r-m* situated about basal one-third of discal medial cell.

Abdomen (Figs. 26-31) with tergite 1 entirely black, tergites 2 and 3 equal in length, yellow, each tergite with anterior black marking as shown in Figs. 26 and 27. Otherwise similar to *N. grandis*.

Genitalia (Fig. 41) quite similar to that of *N. grandis*, but different as follows: Smaller; surstyli without any long black bristles ; right surstylus rather long and narrow than that of *N. grandis* ; left surstylus with lower lobe slightly smaller than upper lobe ; lower lobe rectangular, with ventral outer corner expanded to form moderately long beak-like process.

**TYPE MATERIAL :** **Holotype male** (Type No. 2642, Kyushu Univ.), Mt. Chausu-dake, 1700 m, Aichi Pref. (HONSHU), 18. V. 1986 (K. Yamagishi).



**Figs. 11-13.** Trochanters of *Nephrocerus*, male, lateral view : 11, *grandis* ; 12, *japonicus* ; 13, *spineus*.

**Figs. 14-16.** Tibiae of *Nephrocerus*, male, lateral view : 14, *grandis* ; 15, *japonicus* ; 16, *flexus*.

REMARKS : This new species closely resembles the European species *N. scutellatus* Macquart but differs from it as follows : Enlarged base of arista orange (entirely black in *N. scutellatus*) ; surstyli without any long black bristles (present in *N. scutellatus*).

***Nephrocerus flexus* sp. n.**

Length: Body 9 mm ; wings 9 mm.

Male. Head : Eyes touching on frons for a long space, about twice as long as frontal triangle ; otherwise same as *N. grandis*.

Thorax similar to that of *N. grandis*, but different as follows : Scutellum with 4 strong and 3 weak marginal bristles (Fig. 39) ; propleural fan with 14 long black bristles.

Legs all bright yellow ; right hind trochanter with a trifid apical plate-like black spine beneath, (left hind leg of specimen lost) ; hind tibia noticeably bent on distal half (Fig. 16), apex widened, with circlet of stiff brown bristles.

Wings (Fig. 3) with fourth costal section about three times as long as the third ; *r-m* situated slightly after one third of discal medial cell ; vein M2 placed about one-fifth of last section of vein M1, slightly shorter than marginal cross-vein. Otherwise similar to those of *N. grandis*.

Abdomen (Figs. 34-38) with tergite 1 black, with oval yellow marking laterally ; tergites 2 and 3 yellow, each tergite with black marking anteriorly as shown in Figs. 34 and 35, middle half of posterior margin of black marking dorsally paralleled with posterior margin of tergite when viewed from above. Otherwise similar to that of *N. grandis*.

Genitalia (Fig. 42) : Right surstylus with basal folding process in different shape from those of *N. grandis* and *japonicus*, with brush-like long black bristles at base ; inner-side with rectangular projecting process. Left surstylus also different from those of *N. grandis* and *japonicus* by having a large triangular upper lobe and a small rectangular lower lobe.

TYPE MATERIAL : Holotype male (Type No. 2643, Kyushu Univ.), Mt. Hikosan, Fukuoka Pref. (KYUSHU), 18. V. 1986 (Malaise trap) (Ko Myung Kyune).

REMARKS : This species is clearly distinguished from *N. grandis*, *N. japonicus* spp. n. and other species by having a trifid apical plate-like black spine beneath the right hind trochanter. The surstyli decidedly differs from those of *N. grandis* and *japonicus*.

### *Nephrocerus spineus* sp. n.

Length : Body 7 mm. ; wings 7 mm.

Male. Head : Similar to that of *N. flexus*.

Thorax differing from *N. flexus* as follows: Scutellum almost yellow except anterior margin brown, with four strong and six weak black marginal bristles.

Legs with coxae brownish; right hind trochanter with a trifid apical plate-like black spine beneath, but left hind trochanter with a bifid apical plate-like black spine beneath (Fig. 13) ; hind tibia same as that of *N. flexus*.

Wings (Fig. 4) with fourth costal section about three times as long as the third ; *r-m* situated slightly beyond one third of discal medial cell ; vein M1 placed about basal one-fourth of last section of fourth vein M1. Otherwise similar to those of *N. grandis*.

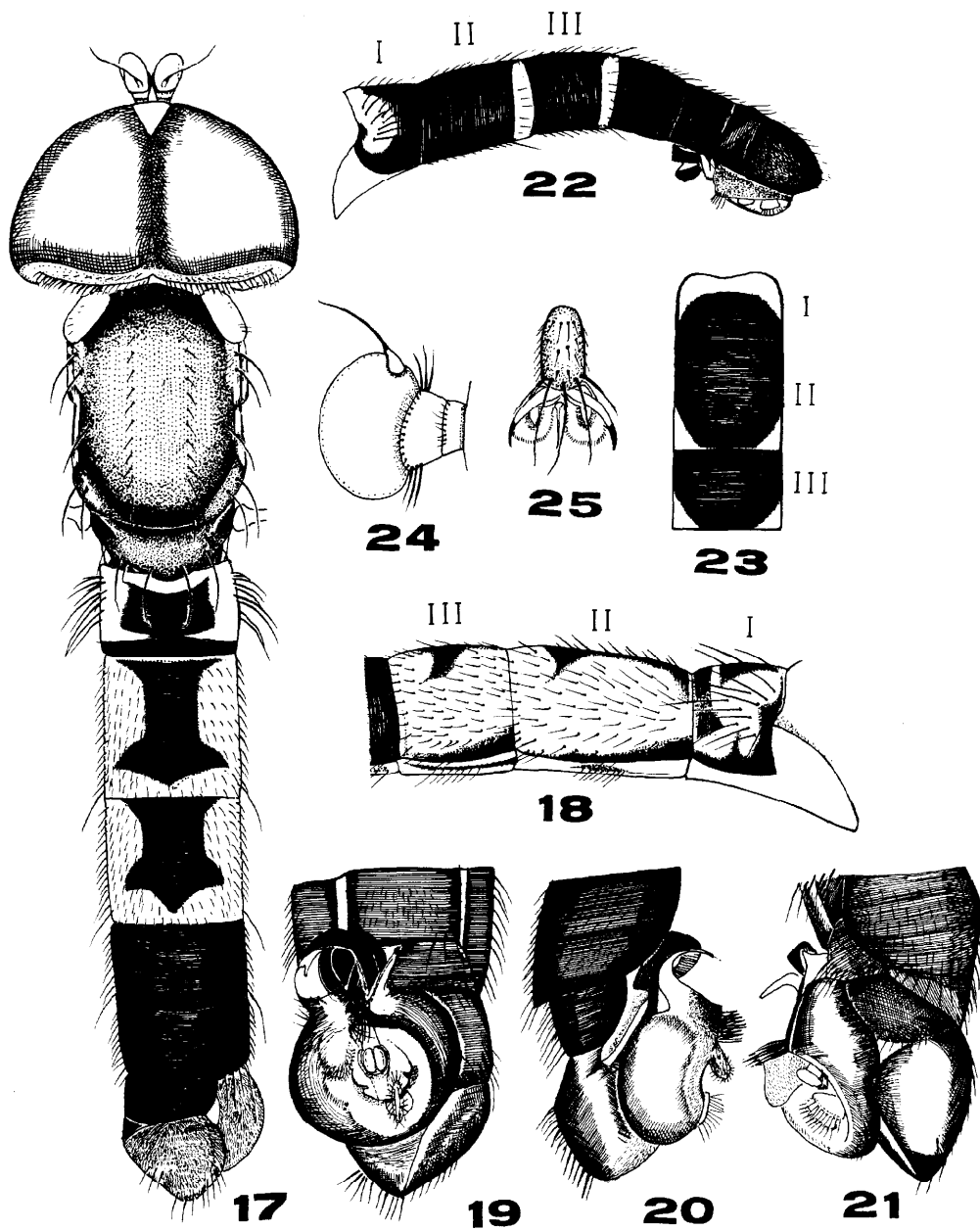
Abdomen same as that of *N. flexus*.

Genitalia (Fig. 43) quite similar to that of *N. flexus*, but different as follows : Basal folding process of right surstylus smaller than that of *N. flexus* and different shaped, anterior part covered with numerous microscopic hairs ; upper lobe of left surstylus triangular shape but less acuminate than that of *N. flexus* at apex.

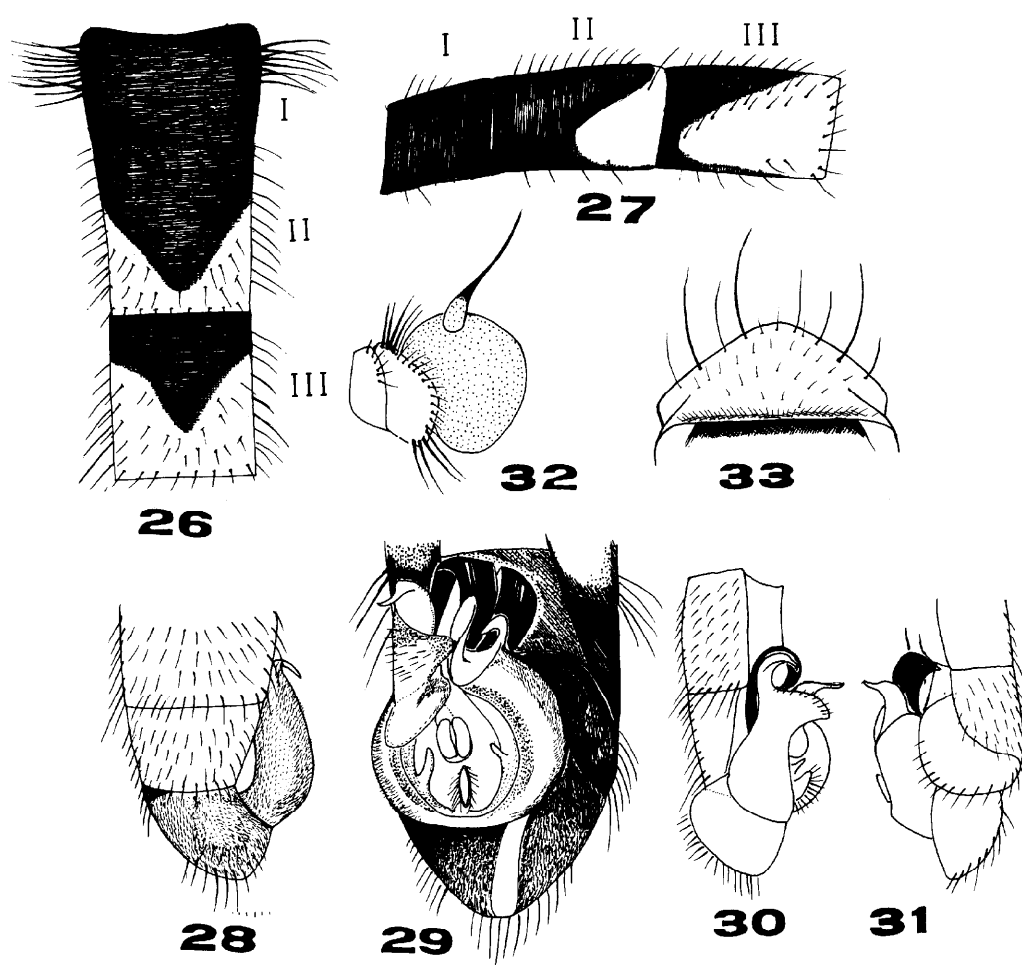
TYPE MATERIAL : Holotype male (Type No. 2644, Kyushu Univ.), Shibecha, Kushiro (HOK - KAI DO), 16. VI. 1985 (M. Abe).

REMARKS : This species seems to be closely related to *N. flexus* in having the plate-like spines beneath the hind trochanters and the same pattern of coloration on the tergites 1-3. However, it can be distinguished from *N. flexus* by the yellow scutellum (black in *flexus*) and the shape of basal folding process of right surstylus which is quite different as shown in Figs. 42 and 43.

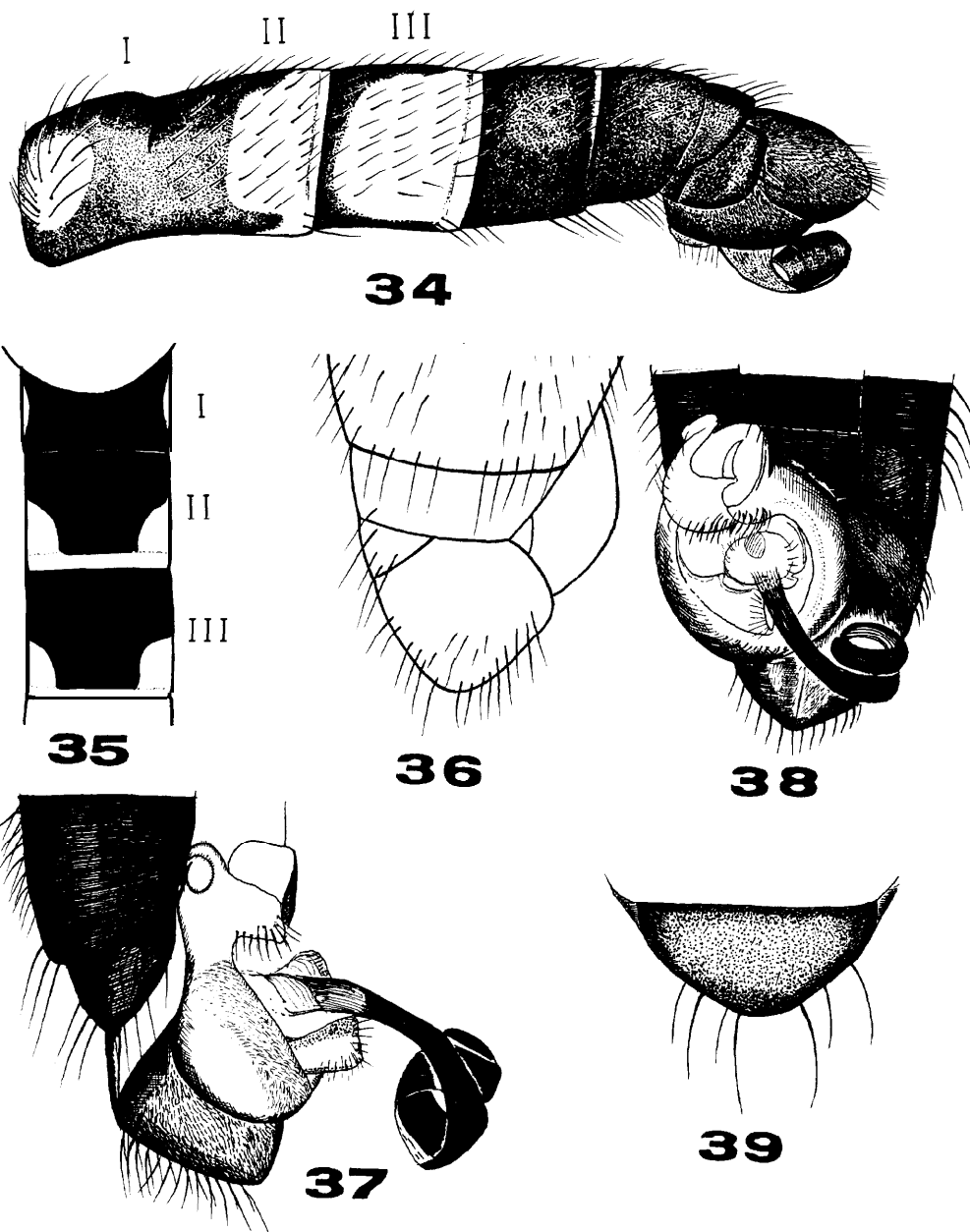




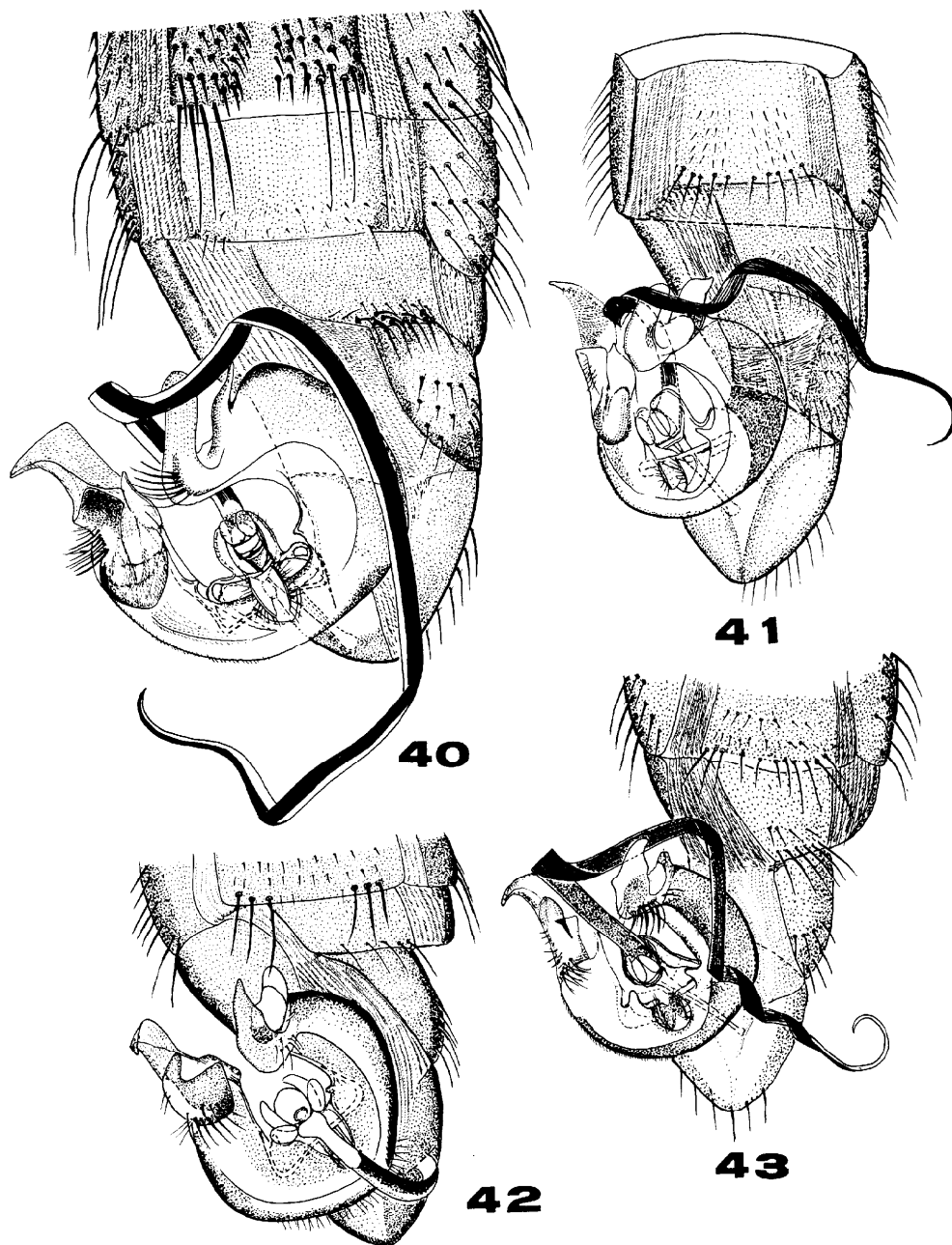
**Figs. 17-25.** *Nephrocerus grandis* sp. n. (male) : 17, body, dorsal ; 18, tergites 1-3, lateral ; 19-21, abdominal terminalia, 19, ventral, 20, right side, 21, left side; 22, abdomen, lateral ; 23, tergites 1-3, dorsal ; 24, antenna, lateral ; 25, last tarsal segment, dorsal.



Figs. 26-33. *Nephrocerus japonicus* sp. n. (male) : 26 and 27, tergites I-3, 26, dorsal, 27, lateral ; 28-31, abdominal terminalia, 28, dorsal, 29, ventral, 30, right side, 31, left side ; 32, antenna, lateral ; 33, scutellum, dorsal.



**Figs. 34-39.** *Nephrocerus flexus* sp. n. (male) : 34, abdomen, lateral ; 35, tergites 1-3, dorsal ; 36-38, abdominal terminalia, 36, dorsal, 37, right side, 38, ventral ; 39, scutellum, dorsal.



Figs. 40-43. Male genitalia of *Nephrocerus*, dorsal view : 40, *grandis* sp. n. ; 41, *japonicus* sp. n. ; 42, *flexus* sp. n. ; 43, *spineus* sp. n.

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