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**A REVISION OF THE CHINENSIS GROUP OF PEGOMYA  
IN JAPAN (DIPTERA: ANTHOMYIIDAE)**

By Masaaki SUWA

*Abstract*

SUWA, M. 2000. A revision of the *chinensis* group of *Pegomya* in Japan (Diptera: Anthomyiidae). *Ins. matsum. n. s.* 57: 89–127, 141 figs.

The Japanese species of the *Pegomya chinensis* group are revised and five species are recognized. *P. chinensis* Hennig, 1973, has been confused with *P. orientis* Suwa, 1974, in Japan, and is here recorded as new to Japan. The female of *P. chinensis* is described for the first time. In the males of some species, the right 6th and 7th spiracles are shifted in membrane of the genital pouch distant from the corresponding tergites, and the left 7th spiracle is reduced to a small opening or a closed minute point. These are quite unusual in the family Anthomyiidae. A brief discussion is given on the systematic position of the group and on the phylogenetic relationships among the Japanese species.

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## INTRODUCTION

The concept of the *Pegomya chinensis* group was proposed by Suwa (1974) for species having a cylindrical or club-shaped abdomen with a large setose 6th tergite and surstyli deeply cleft into a strongly sinuate inner process and a wider outer process in the males, and a laterally compressed ovipositor in the females. He recognized five species to be referred to the group, namely, *P. chinensis* Hennig, 1973 found in China, and *P. orientis* Suwa, 1974, *P. vera* Suwa, 1974, *P. japonica* Suwa, 1974, and *P. robusta* Suwa, 1974 in Japan. After that some species were added to the group in China, and *P. japonica* and *P. orientis* were recorded also in China. The group is now represented by twelve species distributed in China and Japan. As any species belonging to the group have not been found in Europe or North America, where the anthomyiid fauna has rather well been investigated, the group may be restricted to Asia in distribution. There may be some or more species yet to be described in southern Palaearctic or northern Oriental region.

Although no information is available on the biology of any members, the sheath-like ovipositors of the species whose females are known may indicate a phytophagous life in their biology. Their eggs may be laid into tissues or shoot-axils of plants endemic to Asia. Bamboos or bambóo grasses are quite likely candidates for such plants. In this connection, *Phyllostachys* spp. and *Sasa kurilensis* are known as host plants of *Pegomya phyllostachys* Fan, 1964, and *Pegomya acklandi* Suwa, 1974, respectively (Fan, 1964; Suwa, 1999), though these two species of *Pegomya* are not representatives of the *chinensis* group.

*P. acklandi* is a species described from Japan and has many allied species in southern China, forming a close group, the *P. acklandi* group (Fan *et al.*, 1988). The *acklandi* and *chinensis* groups of *Pegomya* may have similar scenarios for their evolution and biogeography. To read the scenarios we need more complete lists of the existent species of the groups and more information on their distributions and phylogenetic relationships.

In this paper the Japanese species of the *P. chinensis* group are revised and five species are recognized. One of the species, *P. chinensis*, has been confused with *P. orientis* in Japan, and is here recorded as new to Japan. A brief discussion is given on the systematic position of the group and on the phylogenetic relationships among the Japanese species.

## THE PEGOMYA CHINENSIS GROUP

The group may easily be recognized by the following aspects though some characters are not confirmed on the species known only from China: Male abdomen cylindrical or club-shaped; 6th tergite large and densely armed with setae apart from a row of marginal setae; 5th sternite with outer marginal setae reduced in number and strength; surstyli deeply cleft, with inner process strongly sinuate except in *P. wuyiensis* Fan et Huang, 1984, which has a straight inner process; basiphallus of aedeagus with dorsal flaps well developed to sheathe postgonites. Female with ovipositor elongated at least as long as main part of abdomen, and laterally compressed especially on 8th segment and proctiger; cerci flattened to triangular plates.

The Japanese species treated in this paper are generally described as follows:

♂. Body blackish in ground colour, sometimes partly brownish on interfrontalia, orbits and processes of 5th sternite; greyish in pollinosity, more or less tinged with blue, and scarcely to distinctly tinged with brown. Antennae blackish, at most slightly brownish on A<sub>2</sub> apically; palpi blackish, sometimes paler basally; haustellar mentum blackish or

dark brown, thinly pollinose. Mesonotum in caudal angle of view with sublateral vittae discernible between rows of *dc* and *ia* behind suture except in *P. japonica*. Abdomen with median vitta variable in width, usually sharp. Wings more or less tinged with brown or brownish yellow; calyptrae pale, a little or rather distinctly tinged with yellow or brown; halteres brownish basally and yellowish at knob.

Frons a little narrower to a little wider than anterior ocellus; parafrontals contiguous to each other, or sometimes separated by linear interfrontalia;  $A_3$  twice or more as long as wide, sometimes shorter than twice the width in smaller specimens; arista minutely pubescent; genae variable in height though always higher than  $A_3$ -width. Mesonotum with posterior *ph* and *pra* well developed and strong. Abdomen with epandrium well lobated posterolaterally and densely tomentose on the lobe inside; 5th sternite with an underside projection developed on each process laterally, this projection being chitinized and bulgy or hook-shaped; distiphallus with paraphalli serrated on dorsal margin near apex or more; genital pouch with a median sclerite made of reversed bottom membrane of the pouch.

Mid femur with no distinct *av*;  $f_3$  with a row of some strong and usually a few weaker *av* except near base, and always with 1 or a few preapical *pv*;  $t_1$  with apical *pd* well developed;  $t_2$  generally with 1 *ad*, 1 *pd* and 2 *p-pv*;  $t_3$  with apical *pd* well developed. Wings with costal thorns minute to rather strong; lower calyptra smaller than the upper.

♀. Body with pollinosity denser and paler than in male, and with ground setulae shorter and sparser than in male. Frons as wide as or a little wider than one-third head-width; interfrontalia with *if* lacking, at most a single or paired vestigial *if* occasionally discernible. Mesonotum with posterior *ph* fine and indistinguishable from adjacent ground setulae.

Abdomen with 6th spiracle situated usually in membrane just near lateral margin of 6th tergite, 7th spiracle on 6th tergite near lateral margin; 8th sternite composed of two plates as usual in the family, the plates close to each other and fused or not; hypoproct divided into median plate and side walls by a pair of deep slits (this enabling the proctiger to be compressed), and with a pair of narrow paralobes arising from dorsobasal corners of side walls, the paralobes being attached to ventral margins of cerci. Femora with setae fewer than in male; tibiae with setae stouter than in male. Wings with costal thorns much stronger than in male.

#### KEY TO THE JAPANESE SPECIES OF THE GROUP

##### Males

1. Hind femur swollen near base on posterior surface, with a dense patch of short setae there (Fig. 58); 5th sternite long tomentose and velvety, processes with a prominent angle near apex on inner margin and distinctly concave between the angle and apex (Figs. 59–60).  
..... 3. *P. vera* Suwa
- Hind femur not swollen on posterior surface and without a patch of setae; 5th sternite otherwise in structure. .... 2
2. Mid tibia with 1 distinct *a* present; 5th sternite with processes very broad, about as long as wide, and truncated apically (Figs. 87–88). .... 4. *P. robusta* Suwa
- Mid tibia without *a*; 5th sternite with processes longer than wide and narrowing apicad.  
..... 3
3. Mesonotum with longest *pre-acr* as strong as or stronger than *ori*; *stpl* 2:3 or 2:4; 5th sternite densely armed with short and stiff setae along inner margin, processes with apical area scarcely lobated (Figs. 116–117). .... 5. *P. japonica* Suwa

- Mesonotum with longest *pre-acr* usually much weaker than *ori*; *stpl* 1:3; 5th sternite rather sparsely armed with longer setae along inner margin, processes with apical area broadly lobated (Figs. 6 & 31). ..... 4
- 4. Processes of 5th sternite distinctly concave on inner margin near middle and not parallel to each other, with apical section of inner margin between apex and inner subapical angle longer than apical section of outer margin between apex and lateral underside projection (Figs. 30–31); surstyli with dorsobasal expansion recurved apically and long setose there (Figs. 26 & 33). ..... 2. *P. orientis* Suwa
- Processes of 5th sternite parallel to each other on main part, with apical section of inner margin shorter than apical section of outer margin (Figs. 5–6); surstyli with dorsobasal expansion not recurved apically and short setulose there (Figs. 2 & 8). ..... 1. *P. chinensis* Hennig

### Females

1. Mid tibia with 1 strong *a*; *f*<sub>2</sub> and *f*<sub>3</sub> wholly yellow, at most darkened apically; mesonotum with longest *pre-acr* usually much stronger than ground setulae; ovipositor as in Figs. 100–112; cerci weakly sinuate on dorsal margin and gently curved at posteroventral corner. .... 4. *P. robusta* Suwa
- Mid tibia without *a*; otherwise in combination of characters mentioned above. .... 2
2. Mesonotum with *pre-acr* much stronger than ground setulae at least in 1 pair; *stpl* 2:2 or 2:3; ovipositor as in Figs. 127–140; cerci weakly sinuate on dorsal margin and gently curved at posteroventral corner, with apical section of ventral margin between apex and posteroventral corner a little longer than basal section of the margin. .... 5. *P. japonica* Suwa
- Mesonotum with *pre-acr* fine and not stronger than ground setulae; *stpl* 1:2 or 1:3; ovipositor otherwise in structure. .... 3
3. Femora almost wholly blackish; *t*<sub>3</sub> without *p*; mesonotum with 4 or more pairs of fine *pre-acr*; ovipositor as in Figs. 70–82; cerci weakly sinuate on dorsal margin, with acute apex. .... 3. *P. vera* Suwa
- Femora wholly yellow to almost wholly blackish; *t*<sub>3</sub> with or without *p*; mesonotum with 3 or less pairs of fine *pre-acr*; ovipositor otherwise in structure. .... 4
4. Ovipositor as in Figs. 42–53; cerci distinctly sinuate on dorsal margin and angulated at posteroventral corner. .... 2. *P. orientis* Suwa
- Ovipositor as in Figs. 15–25; cerci weakly sinuate on dorsal margin and gently curved at posteroventral corner. .... 1. *P. chinensis* Hennig

### DESCRIPTIONS

#### 1. *Pegomya chinensis* Hennig, 1973 (Figs. 1–25)

*Pegomya chinensis* Hennig, 1973: 542; Fan *et al.*, 1984: 220; Fan *et al.*, 1988: 367; Wei *et al.*, 1999: 789.

“*Pegomya orientis* Suwa”: Suwa, 1974: 219, *partim* (2 ♂, 3 ♀ from Tokyo, Shōdo-shima, Fukuoka and Kumamoto); Suwa, 1999: 235, *partim*.

“*Pegomya vera* Suwa”: Suwa, 1974: 223, *partim* (1 ♀ from Kagoshima).

Material examined. Honshu. Iwate-ken: Morioka, 6 ♂, 4 ♀, 26.iv.1975 (M. Suwa), 1 ♀, 13.v.1967 (S. Yamane). Saitama-ken: Sayama, 2 ♀, 20.iv.1968 (H. Takizawa); Kōnan,

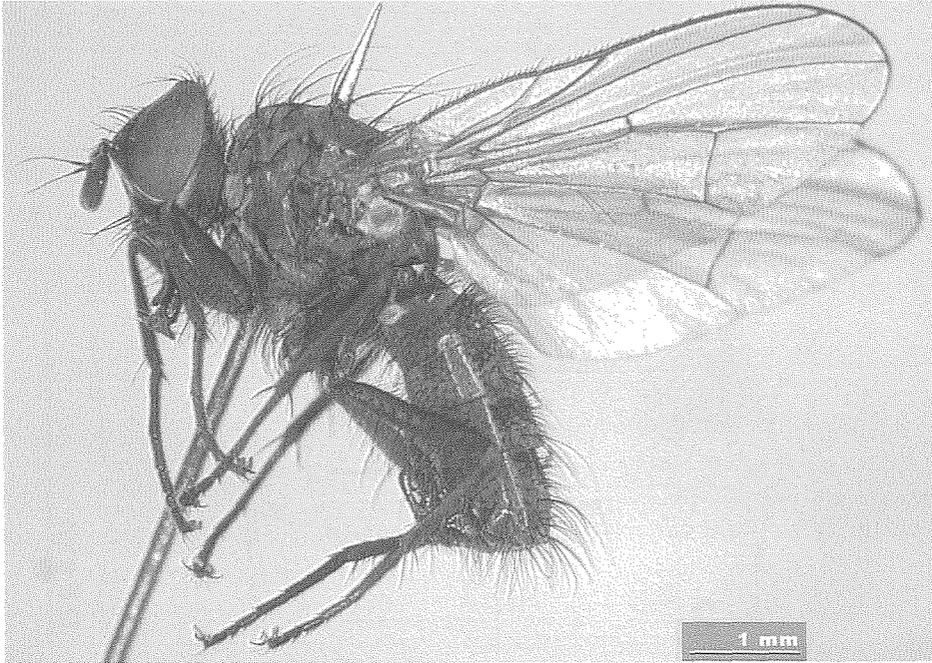
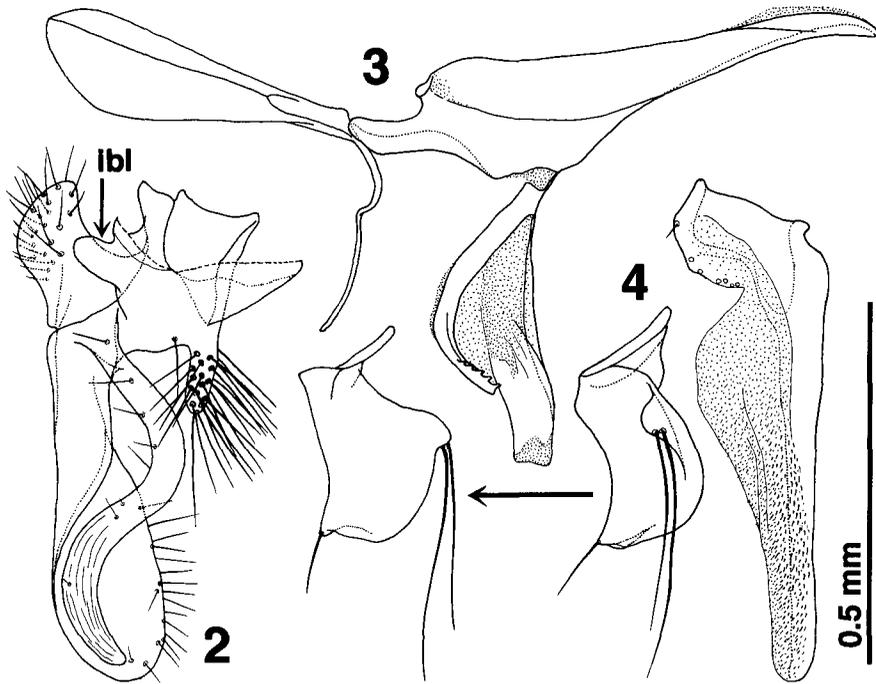


Fig. 1. *Pegomya chinensis*, ♂. Morioka, Iwate-ken.

3 ♂, 5.iv.1973 (K. Hara); Kamikawa, 1 ♀, 27.iv.1973 (K. Hara). Chiba-ken: Kiyosumi-yama, 2 ♀, 4.iv.1971 (M. Suwa). Tokyo-to: Tokyo, 1 ♀ (paratype of *P. orientis*), 7.iv.1967 (T. Kocha); Setagaya-ku, 1 ♀, 16.iv.1986 (H. Mitsui). Yamanashi-ken: Momokura-yama, 1 ♀, 25.v.1978 (M. Suwa). Nagano-ken: Shimosuwa, 2 ♀, 22.v.1979 (M. Suwa). Ishikawa-ken: Kanazawa, 3 ♂, 8.iv.1967 (H. Kurahashi); Mt. Iozen, 2 ♂, 17.v.1970 (H. Kurahashi). Shikoku. Kagawa-ken: Shôdo-shima, 1 ♂ (paratype of *P. orientis*), 25.iii.1971 (M. Suwa). Kyushu. Fukuoka-ken: Fukuoka, 1 ♂ (paratype of *P. orientis*), 17.iv.1967 (M. Suwa), 2 ♂, 8 ♀, 9.iv.1978 (K. Maetô), 1 ♀, 5.v.1979 (K. Maetô); Tachibana-yama, 1 ♀, 9.v.1965 (K. Yano); Wakasugi-yama, 1 ♀, 3.v.1963 (T. Saigusa); Hikosan, 1 ♀, 16–24.iv.1979 (T. Gotô), 2 ♀, 25–29.iv.1979 (T. Gotô). Ôita-ken: Mt. Kuju, 2 ♂, 1 ♀, 23.iv.1969 (T. Saigusa), 1 ♀, 21.v.1971 (A. Nagatomi). Kumamoto-ken: Kumamoto, 1 ♀ (paratype of *P. orientis*), 8 ♀, 24.iv.1967 (M. Suwa); Kikuchi-suigen, 1 ♀, 27.iv.1978 (K. Ôhara). Miyazaki-ken: Takachiho, 1 ♂, 1 ♀, 8.iv.1969 (H. Kurahashi). Kagoshima-ken: Kagoshima, 1 ♀ (paratype of *P. vera*), 12.iii.1970 (H. Takizawa), 1 ♀, 4.v.1970 (K. Kanmiya).

Distribution. Japan (Honshu; Shikoku; Kyushu); China (Shanghai; Chekiang; Fukien; Hunan; Szechwan).

♂. Wing-length 4.9–6.0 mm. Body a little to strongly tinged with brown in pollinosity. Interfrontalia and orbits sometimes brownish in ground colour. Mesonotum with narrow and sharp median and sublateral vittae usually discernible at low angle in caudal view, with presutural and postsutural lateral patches discernible at rather high angle of view. Abdomen with median vitta narrow and sharp, about as wide as tibial diameter, usually a little narrowing caudad on each tergite; 5th sternite with processes dark brownish. Coxae blackish, a little



Figs. 2–4. *Pegomya chinensis*, ♂. 2, left sursylus, inner view, ibl: inner basal lobe; 3, aedeagus; 4, pregonite and postgonite. Shōdo-shima, Kagawa-ken.

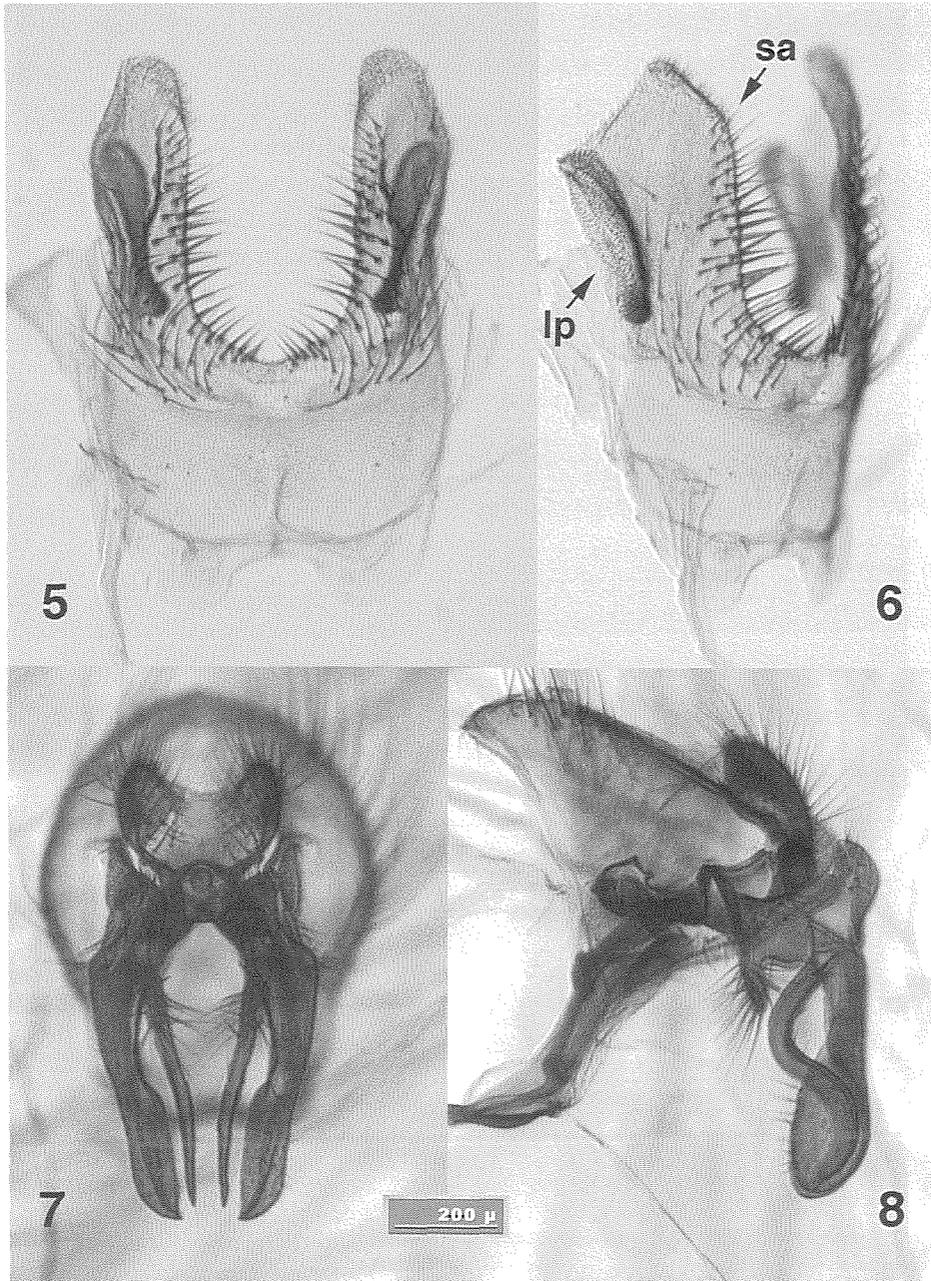
paler in part; trochanters dark brownish; all femora much darkened and almost wholly blackish, at most narrowly brownish at base and apex; tibiae variable in colour, all yellow to all dark brown or blackish, paler on  $t_3$  in intervenient specimens; tarsi brown to blackish. Wings slightly to distinctly tinged with brown or brownish yellow, darker basally; calyptrae whitish, slightly tinged with yellow or brown.

Parafrontals with 3–6 strong and 1 or a few fine *ori*;  $A_3$  2.0–2.3 times as long as wide; orbits at parafrontal angle a little narrower than  $A_3$ , at most as wide as the latter; genae 1.1–1.3 times as high as  $A_3$ -width, with genal setae in 1 or 2 rows.

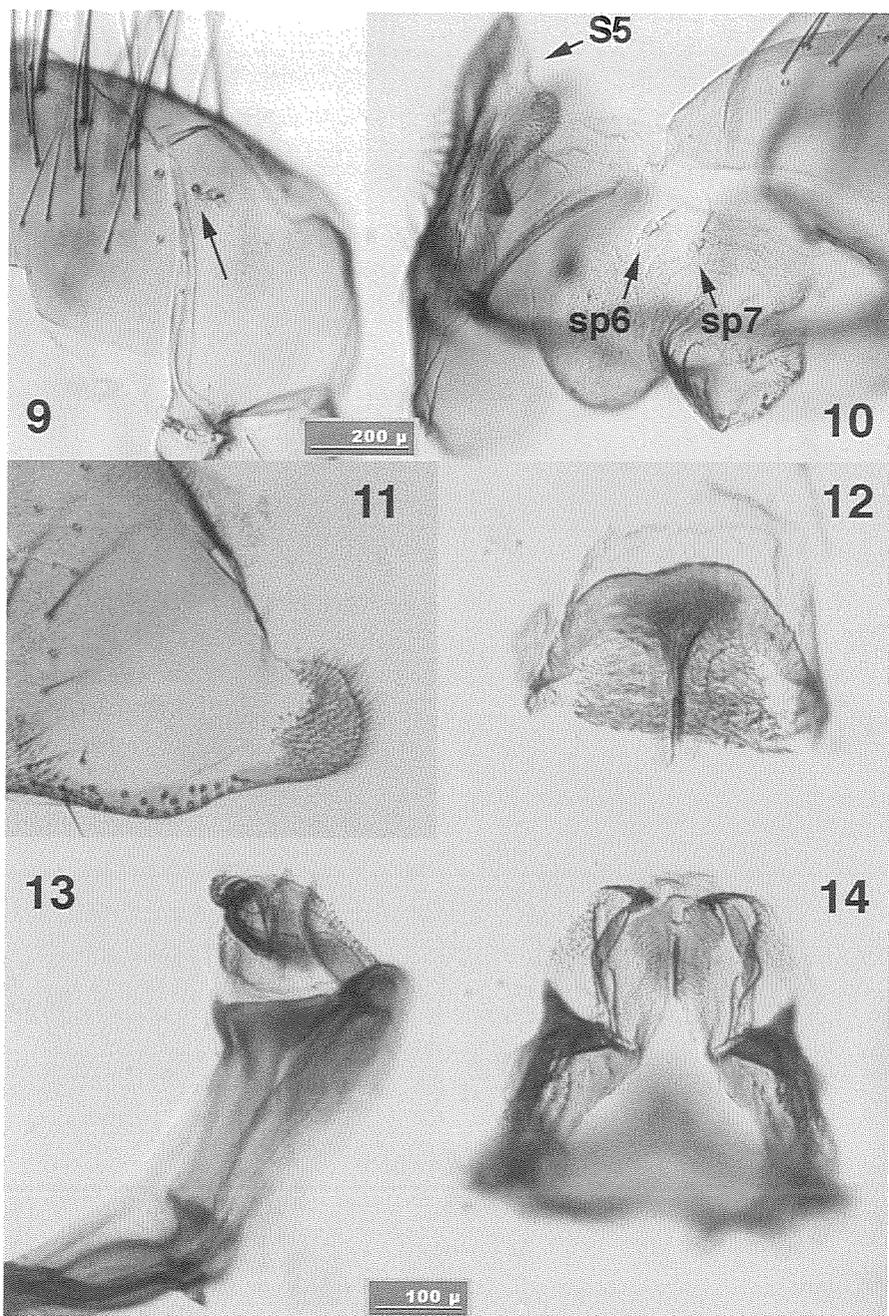
Mesonotum with 1–3 pairs of fine *pre-acr*, without accessory setulae between the rows, setae of the longest pair (the middle when 3 pairs present) being separated from each other by a distance 0.5–0.8 times as long as that to adjacent *dc*-row; *stpl* 1:3, an additional setula usually distinguishable from ground setulae below the anterior and also below the posteriors, the posterior additional sometimes a little developed.

Fifth sternite (Figs. 5–6) with inner margins of processes parallel to each other on main part; apical section of inner margin between apex and inner subapical angle of process shorter than apical section of outer margin between apex and lateral underside projection. Surstyli (Fig. 2) covered with short setulae on dorsobasal expansion; pregonite (Fig. 4) with 2, occasionally 1 or 3, long dorsal setae and 1 short ventral seta; postgonite with basal seta much reduced to a minute setula and sometimes hardly discernible. Right 6th and 7th spiracles (Fig. 10) situated in membrane of genital pouch; left 7th spiracle (Fig. 9) reduced to a small opening.

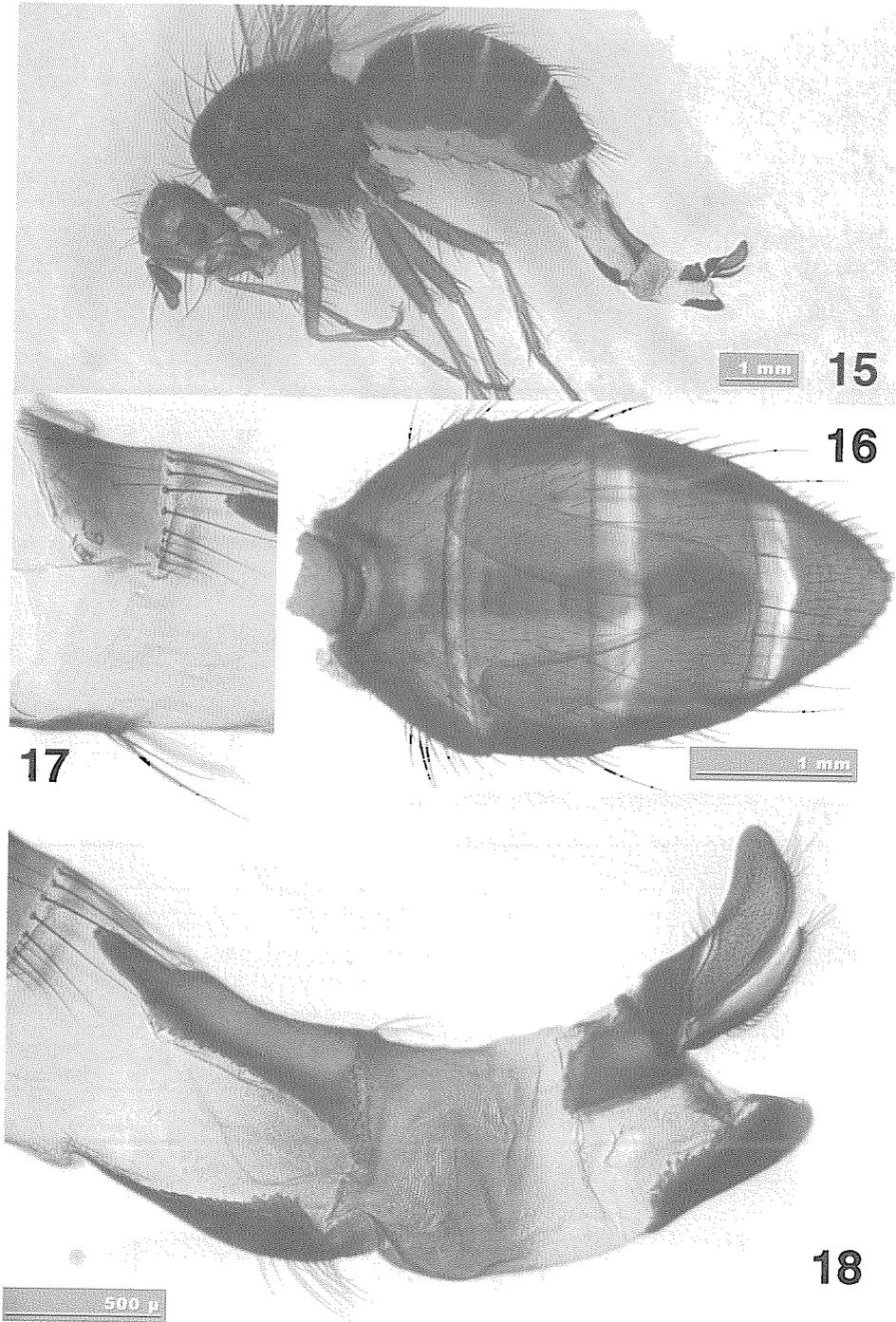
Mid femur with 3–7 slender or rather strong *pv* on basal third or half;  $f_3$  with a row of some *pv* on basal two-thirds, the *pv* being much weaker than *av* and the row often interrupted



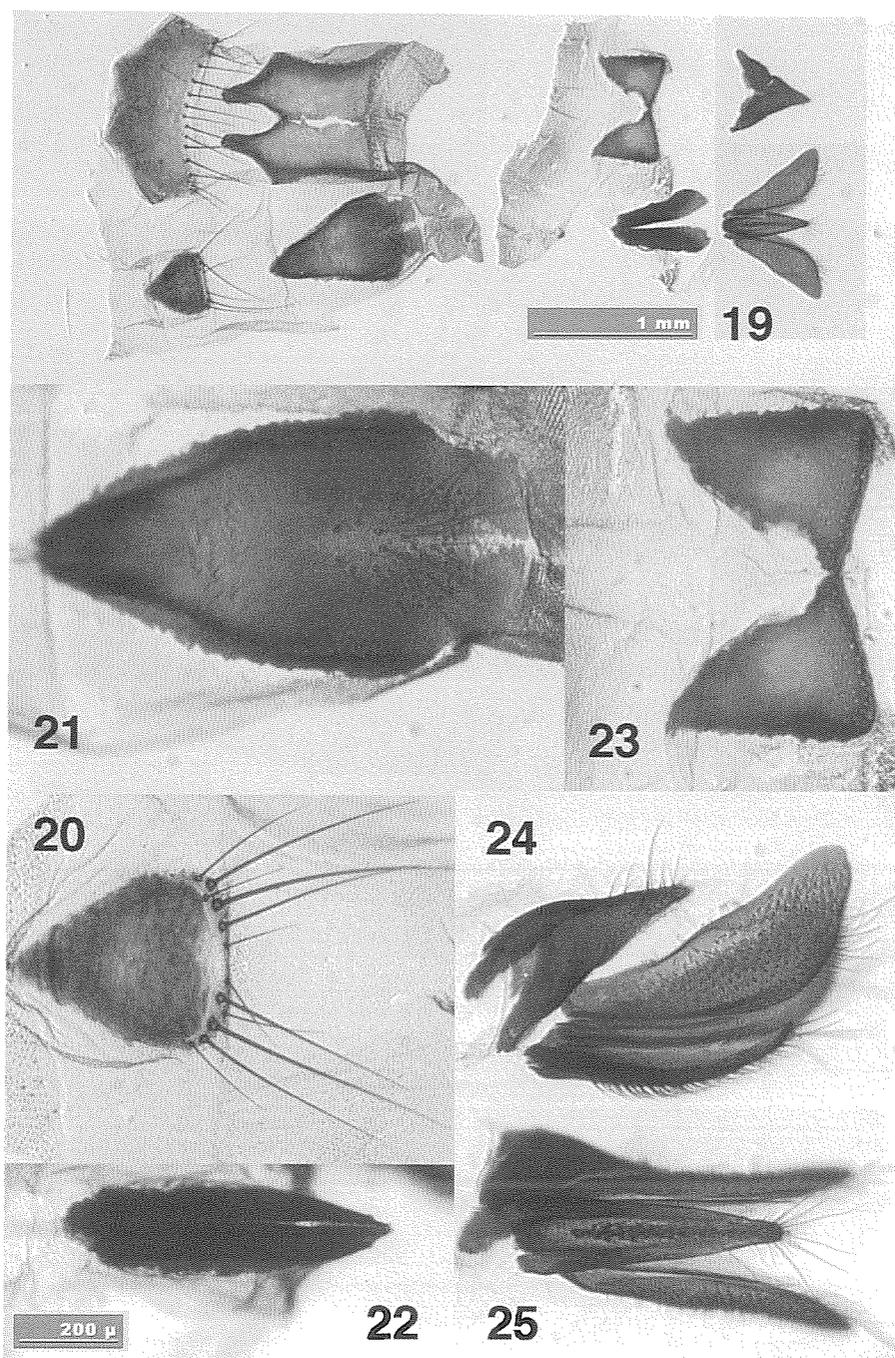
Figs. 5–8. *Pegomya chinensis*, ♂. 5, 5th sternite, ventral view; 6, ditto, ventrolateral view, lp: lateral underside projection, sa: subapical angle; 7, hypopygium, dorsal view; 8, ditto, lateral view. Figs. 5–6, Mt. Kuju, Ôita-ken; 7–8, Shôdo-shima.



Figs. 9–14. *Pegomya chinensis*, ♂. 9, left part of pregenital sclerite, arrow indicating left 7th spiracle; 10, genital pouch, right lateral view, showing inside surface of the pouch, S5: 5th sternite, sp6: 6th spiracle, sp7: 7th spiracle; 11, right posterolateral lobe of epandrium, inner view; 12, median sclerite of genital pouch; 13, hypandrial arm and intergonopodal sclerite, left lateral view; 14, ditto, dorsocaudal view. Magnification same for Figs. 9–10; for 11–14. Figs. 9, 11, Shōdo-shima; 10, Morioka; 12, Fukuoka; 13–14, Mt. Kuju.



Figs. 15–18. *Pegomya chinensis*, ♀. 15, general features; 16, abdomen, showing eggs contained; 17, 6th segment, showing 6th and 7th spiracles; 18, ovipositor. Magnification same for Figs. 17–18. Fukuoka.



Figs. 19–25. *Pegomya chinensis*, ♀. 19, ovipositor; 20, 6th sternite; 21, 7th sternite; 22, 8th sternite, unopened view; 23, 8th tergite; 24, proctiger, showing left cercus in lateral view; 25, proctiger, showing hypoproct in ventral view between loosened cerci. Magnification same for Figs. 20–25. Figs. 19, 23, Kumamoto; 20–22, 24–25, Fukuoka.

near basal third;  $t_1$  with 1 short *ad* usually distinguishable from adjacent setulae, and with 1 or rarely 2 strong *p-pv*;  $t_2$  with 2 or sometimes 3 *p-pv*;  $t_3$  with 1–2 or sometimes 3 small *av*, 3 *ad* and 3 or 4 *pd*, and with 1, or sometimes no, short to rather long *p* discernible, often with another small *p* also discernible. Wings with costal thorns distinct, usually shorter than *h*-vein, yet sometimes a little longer than the vein.

♀. Wing-length 4.6–6.3 mm. Interfrontalia brownish yellow to brown on lower half or more in ground colour; parafacials and genae often largely brownish in ground colour; palpi more or less brownish basally. Femora dark brown to blackish, sometimes largely yellow to brown; tibiae yellowish.

Parafrontals with usually 3 *ori*, 1 proclinate and 2 or sometimes 1 reclinate *ors*. Mesonotum with *stpl* 1:2, often a little to rather developed seta discernible below the posteriors. Ovipositor about as long as main part of abdomen (Fig. 15); plates of 8th sternite (Fig. 22) fused to each other on anterior half or more; cerci (Fig. 24) weakly sinuate on dorsal margin and gently curved at posteroventral corner. Hind femur often with no *pv* discernible except for basal one;  $t_3$  with *p* often absent.

Remarks. Although *P. chinensis* is smaller and darker on average than *P. orientis*, it is often difficult to distinguish the two taxa unless their genital structures are seen. In males the shape of the 5th sternite and the setal pattern on the dorsobasal expansion of surstyli are useful as stated in the key even for identification of dried specimens. In females the shape of cerci is useful. The occurrence of *p* seta on the hind tibia and the protrusion of setose ventrobasal area of the surstyli indicate a close relationship between *P. chinensis* and *P. orientis*.

This species is rather rare in Japan, and has not been found in Hokkaido, where *P. orientis* is abundant. In most localities given above, *P. chinensis* was collected together with *P. orientis*.

## 2. *Pegomya orientis* Suwa, 1974 (Figs. 26–53)

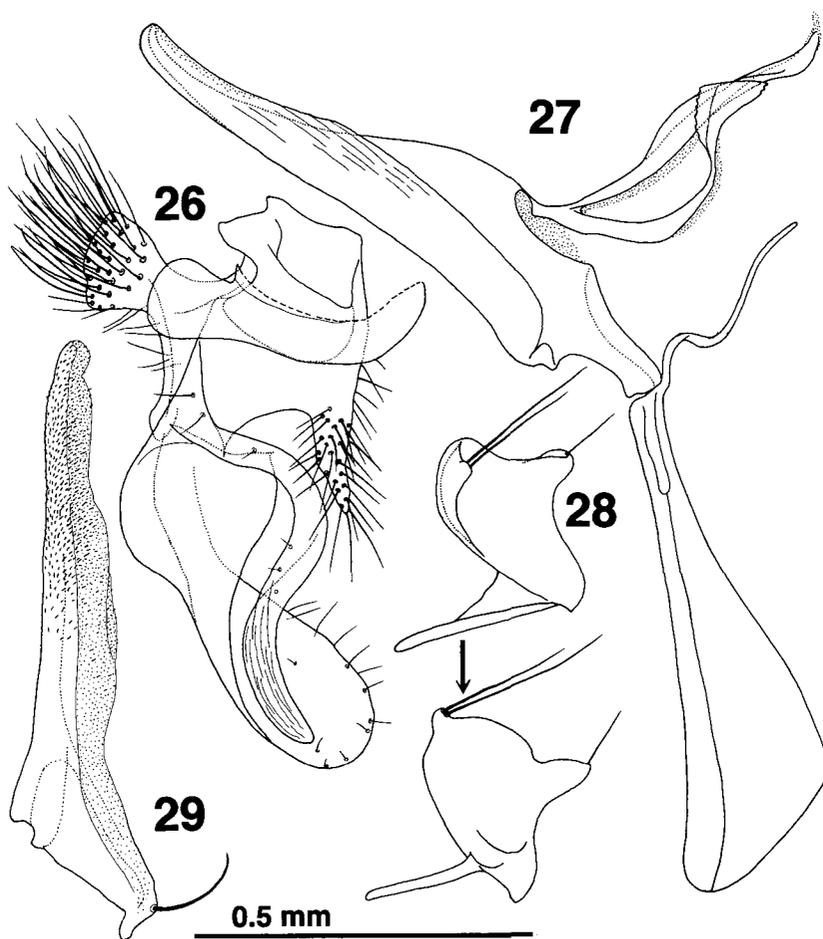
*Pegomya orientis* Suwa, 1974: 219, *partim* (excluding some specimens referred to *P. chinensis* from a few localities); Fan *et al.*, 1988: 368; Wei *et al.*, 1999: 791; Suwa, 1999: 235, *partim*.

Material examined. I have examined a lot of specimens of *P. orientis* collected at various localities in Japan as recorded by Suwa (1999), although Shôdo-shima, Shikoku, should be removed from the localities of *P. orientis* and is referred to *P. chinensis*.

Distribution. Japan (Hokkaido; Honshu; Kyushu; Nansei Isls.); China (Shanghai; Hunan).

♂. Wing-length 4.4–7.9 mm. Body with pollinosity pale grey or bluish grey, and hardly to rather distinctly tinged with brown. Abdomen with median vitta narrow and sharp, sometimes a little wider than tibial diameter; 5th sternite with processes yellow to brown, sometimes much darkened. Fore femur largely yellow, darkened dorsally;  $f_2$  and  $f_3$  wholly yellow, at most slightly darkened near apex dorsally; yet, femora sometimes more darkened, and all largely blackish in some cases; tibiae yellow; tarsi yellow to dark brown. Wings slightly to rather distinctly tinged with brownish yellow; calyptae with a slight to rather distinct yellow tinge.

Parafrontals with 3–7 strong and usually 1 or a few fine *ori*;  $A_3$  2.0–2.3 times as long as wide; orbits at parafrontal angle slightly narrower to a little wider than  $A_3$ ; genae 1.2–1.4



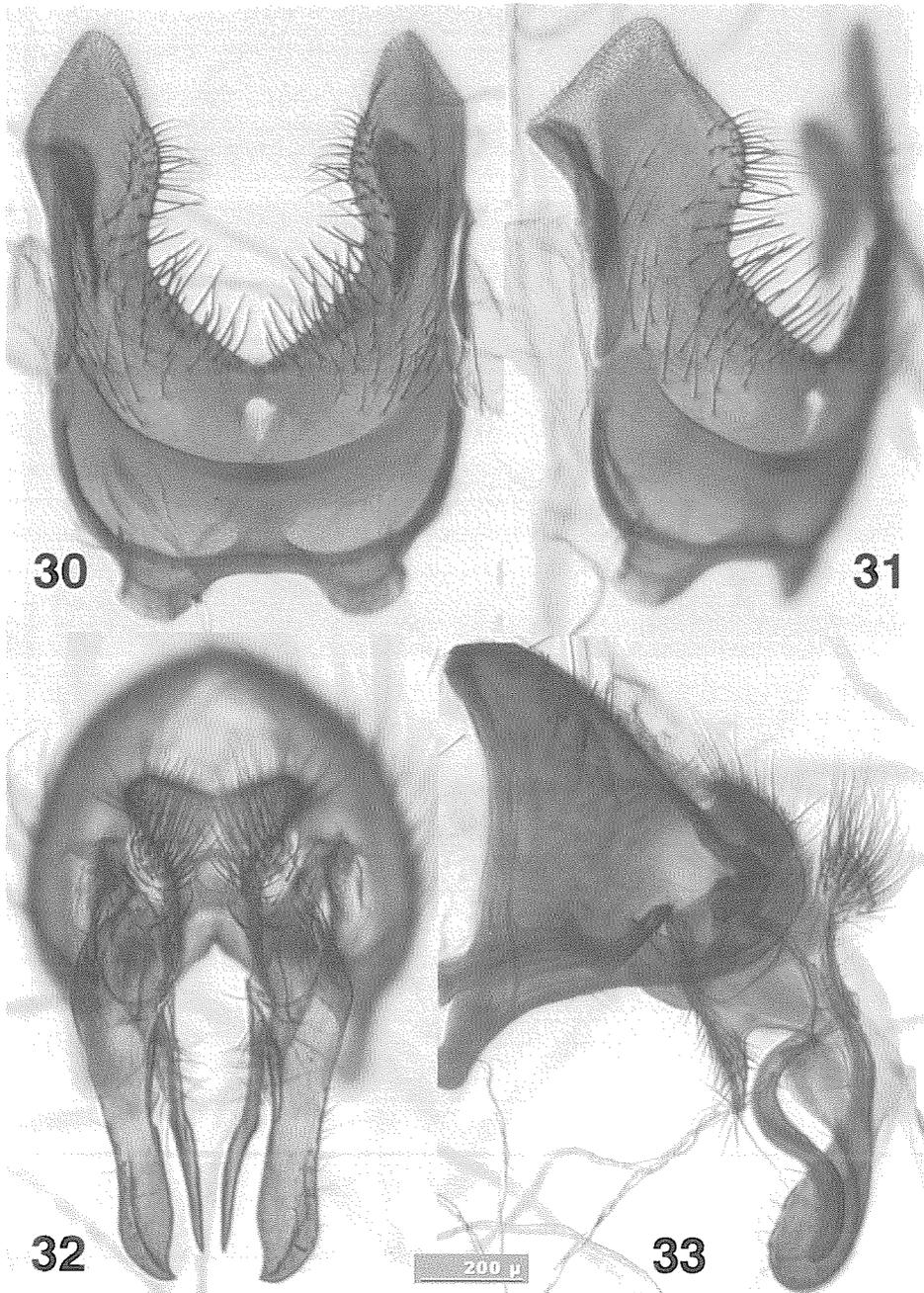
Figs. 26–29. *Pegomya orientis*, ♂. 26, left surstylus, inner view; 27, aedeagus; 28, pregonite; 29, postgonite. Noppero, Hokkaido.

times as high as  $A_3$ -width, with genal setae in 1 or sometimes 2 rows.

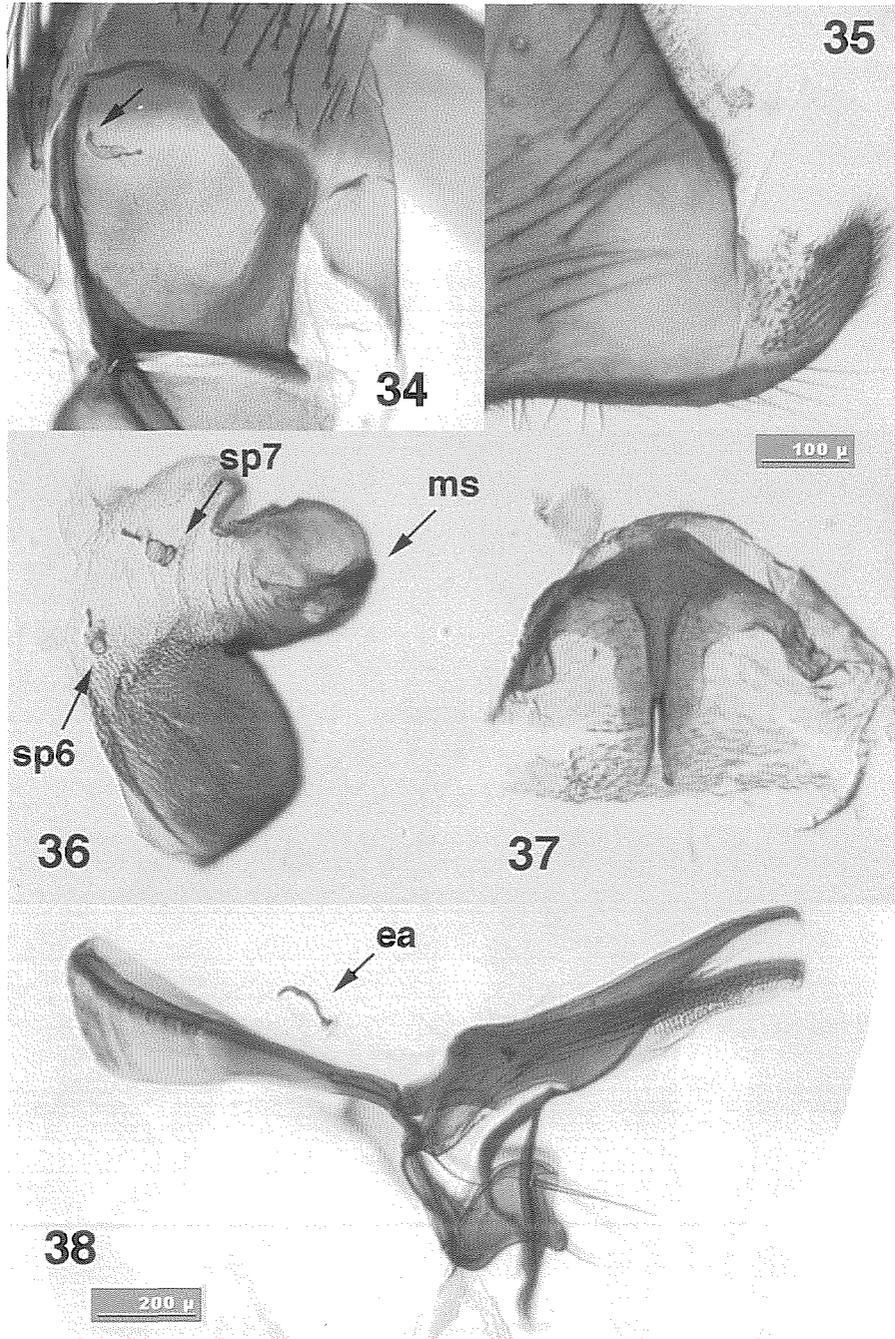
Mesonotum with 2–3, rarely 4, pairs of fine *pre-acr*, usually without accessory setulae between the rows, distance between setae of the longest pair being a little shorter than that to adjacent *dc-row*; *stpl* 1:3, usually an additional seta distinguishable below the anterior *stpl* and also below the posteriors.

Fifth sternite (Figs. 30–31) with inner margins of processes distinctly concave near middle; apical section of inner margin longer than apical section of outer margin. Surstyli (Fig. 26) with dorsobasal expansion recurved apically and long setose there; outer process of surstylus with a flap-like expansion developed on dorsal and also on ventral side near junction with inner process; pregonite (Fig. 28) with 2, occasionally 1 or 3, long dorsal setae and 1 short ventral seta; postgonite (Fig. 29) with basal seta distinct. Right 6th and 7th spiracles (Fig. 36) situated in membrane of genital pouch; left 7th spiracle (Fig. 34) reduced to a small opening.

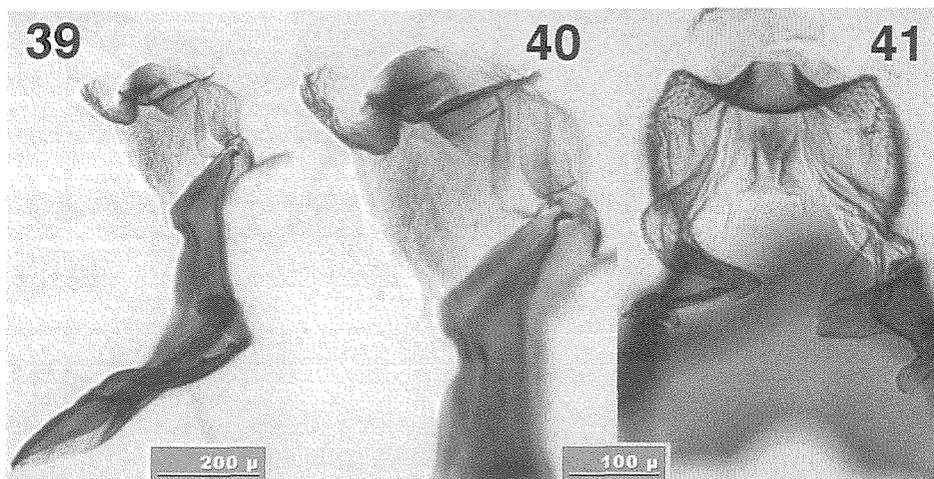
Mid femur with a few or some rather weak to strong *pv* on basal third or half, or



Figs. 30–33. *Pegomya orientis*, ♂. 30, 5th sternite, ventral view; 31, ditto, ventrolateral view, 32, hypopygium, dorsal view; 33, ditto, lateral view. Nopporo.



Figs. 34–38. *Pegomya orientis*, ♂. 34, left part of pregenital sclerite, arrow indicating left 7th spiracle; 35, right posterolateral lobe of epandrium, inner view; 36, genital pouch, right lateral view, showing inside surface of the pouch, ms: median sclerite, sp6: 6th spiracle, sp7: 7th spiracle; 37, median sclerite of genital pouch; 38, aedeagus, ea: ejaculatory apodeme. Magnification same for Figs. 34, 36, 38; for 35, 37. Nopporo.



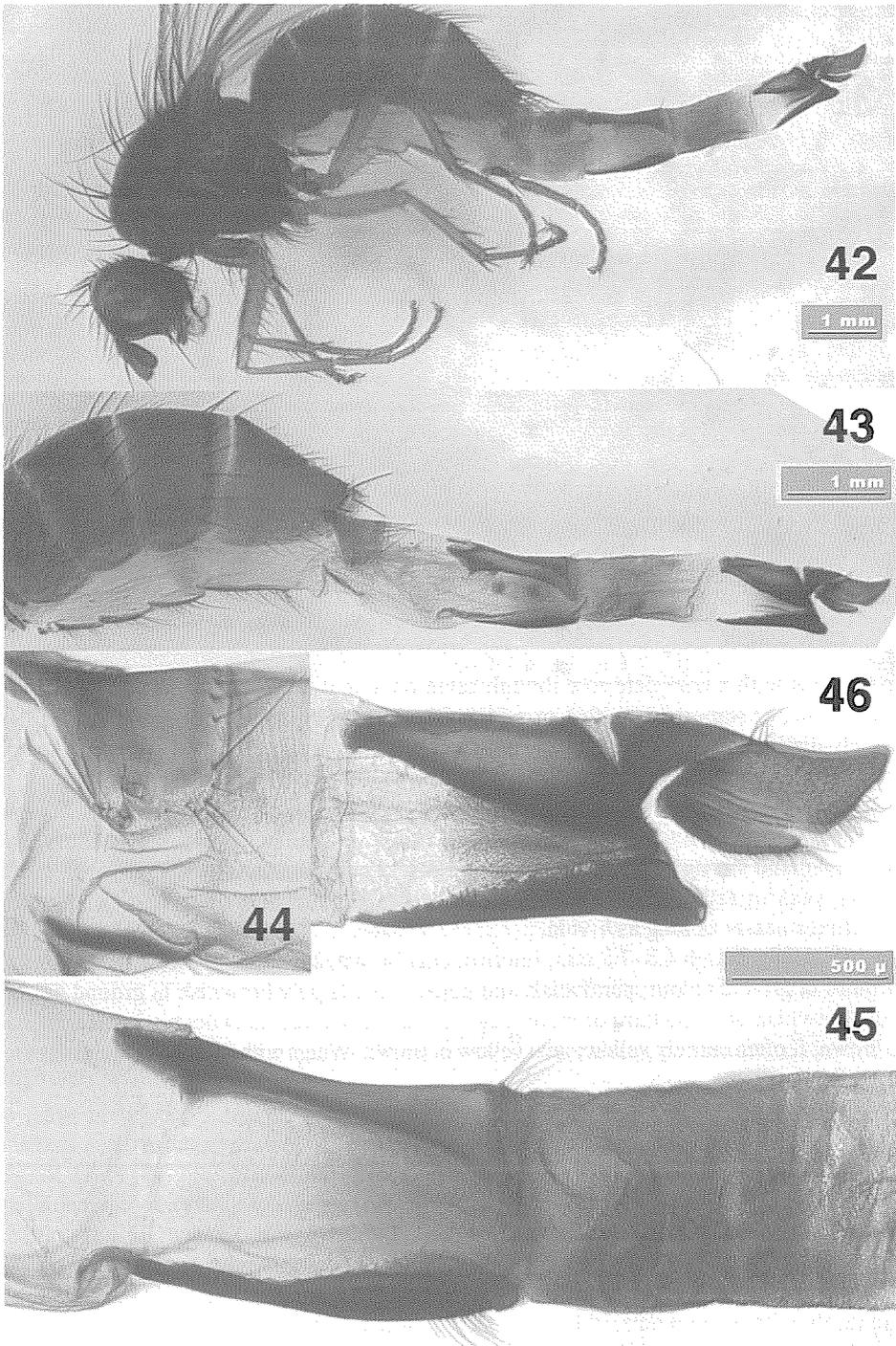
Figs. 39–41. *Pegomya orientis*, ♂. 39, hypandrium and intergonopodal sclerite, left lateral view; 40, hypandrial arm and intergonopodal sclerite, left lateral view; 41, ditto, dorsocaudal view. Sapporo.

sometimes with a complete row though setae on apical third much finer;  $f_3$  with no  $pv$  discernible, or sometimes with 1 or a few rather strong  $pv$  on median third;  $t_1$  with 1  $ad$  usually distinguished from adjacent setulae, sometimes well developed and much longer than tibial diameter, sometimes with an additional  $ad$  also discernible, and with 1 or sometimes 2 strong  $p-pv$ ;  $t_2$  with 1 or rarely 2  $ad$ , 1 or rarely 2  $pd$  and 2–4 (usually 2)  $p-pv$ ;  $t_3$  with 2 or sometimes 3 (rarely 4)  $av$ , 3–4  $ad$ , 3–5  $pd$  and 1  $p$ , the  $p$  seta usually well developed and strong, rarely absent, another  $p$  seta rarely discernible. Wings with costal thorns weak or rather distinct and always easily distinguishable from costal spinules, sometimes nearly as long as  $h$ -vein.

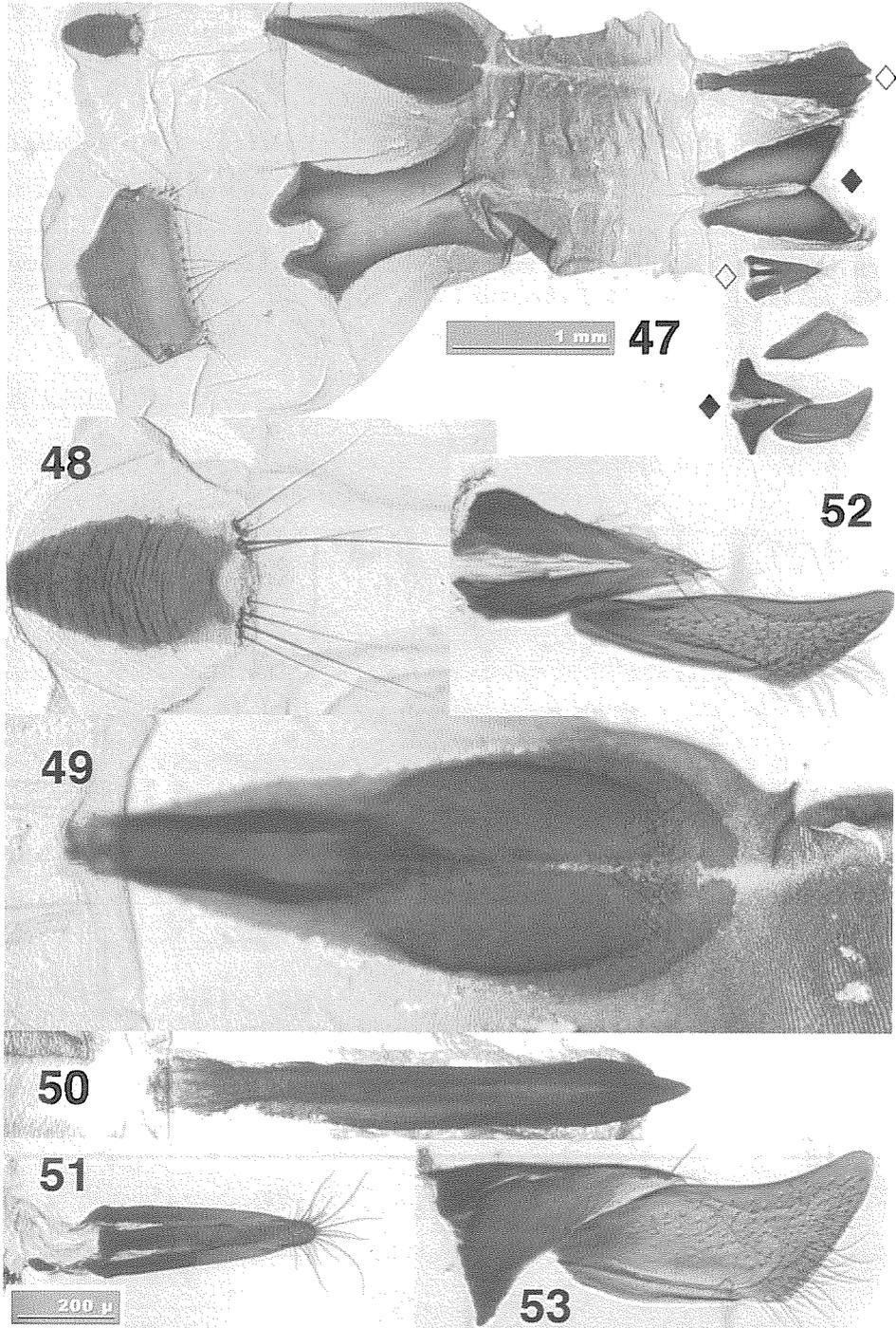
♀. Wing-length 4.8–7.8 mm. Interfrontalia brownish yellow to brown on lower half or more in ground colour; parafacials and genae often largely brownish in ground colour; palpi brownish on basal third or more. Legs less darkened than in male; trochanters yellow to brown;  $f_1$  often entirely yellow; tarsi yellow or brown. Wings with a rather strong yellowish tinge.

Interfrontalia often with very minute  $if$  discernible; 3–4  $ori$ ; 1 proclinate and 1 or sometimes 2 reclinate  $ors$ . Mesonotum with  $stpl$  1:2 or 1:3. Ovipositor much elongated and distinctly longer than main part of abdomen (Fig. 42); 8th tergite (Fig. 47) much longer than wide on each plate; plates of 8th sternite (Fig. 50) entirely fused to each other; epiproct (Fig. 52) deeply cleft by membranous area medially; cerci (Fig. 53) distinctly sinuate on dorsal margin and angulated at posteroventral corner. Mid femur with 1 or a few distinct or rather strong and 1 or a few weak  $pv$  on basal half;  $f_3$  with rather fine basal  $pv$  discernible and rarely with  $pv$  on median third;  $t_3$  with  $p$  sometimes absent.

Remarks. The surstyli with long setose dorsobasal expansion and with flap-like expansions near junction with inner process and the much elongated ovipositor in *P. orientis* may be more advanced than the corresponding characters in *P. chinensis*.



Figs. 42–46. *Pegomya orientis*, ♀. 42, general features; 43, abdomen, showing elongated ovipositor; 44, 6th segment, showing 6th and 7th spiracles; 45, 7th segment; 46, 8th segment and proctiger. Magnification same for Figs. 44–46. Fig. 42, Nopporo; 43–46, Sapporo.

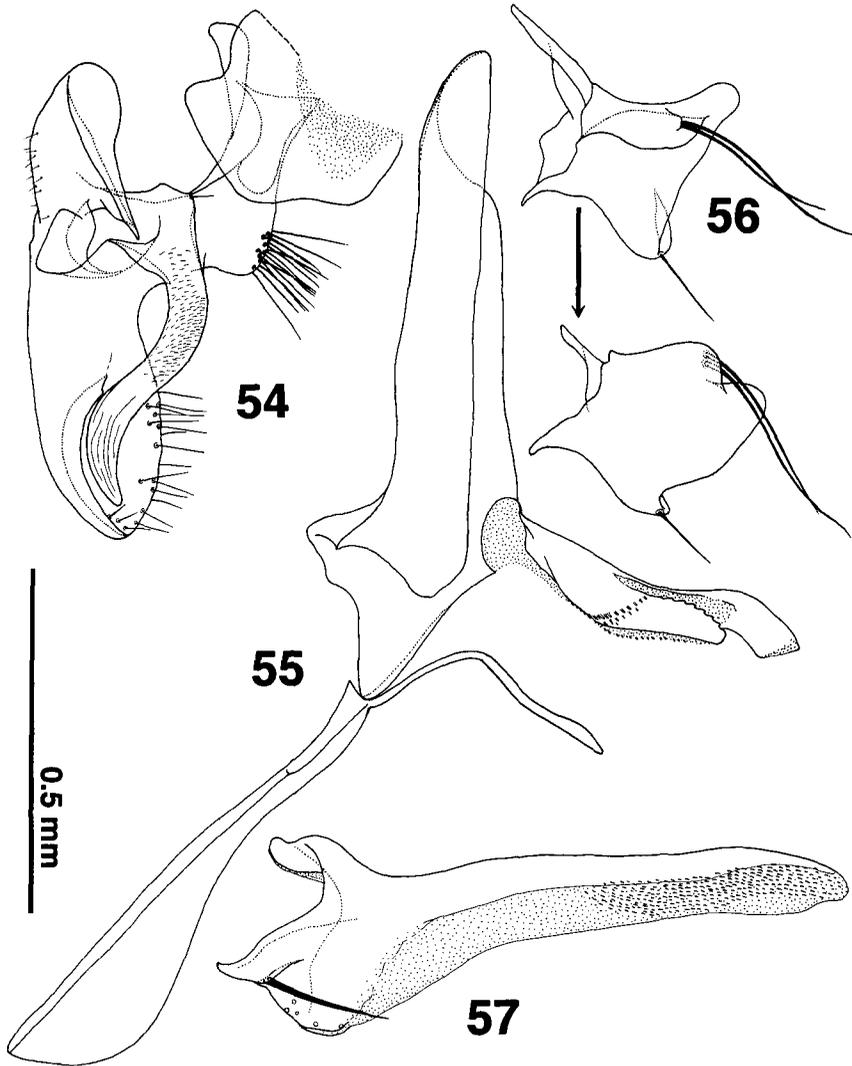


Figs. 47–53. *Pegomya orientis*, ♀. 47, ovipositor; 48, 6th sternite; 49, 7th sternite; 50, 8th sternite, unopened view; 51, hypoproct; 52, proctiger, showing epiproct in dorsal view; 53, proctiger, showing left cercus in lateral view. Magnification same for Figs. 48–53. Sapporo.

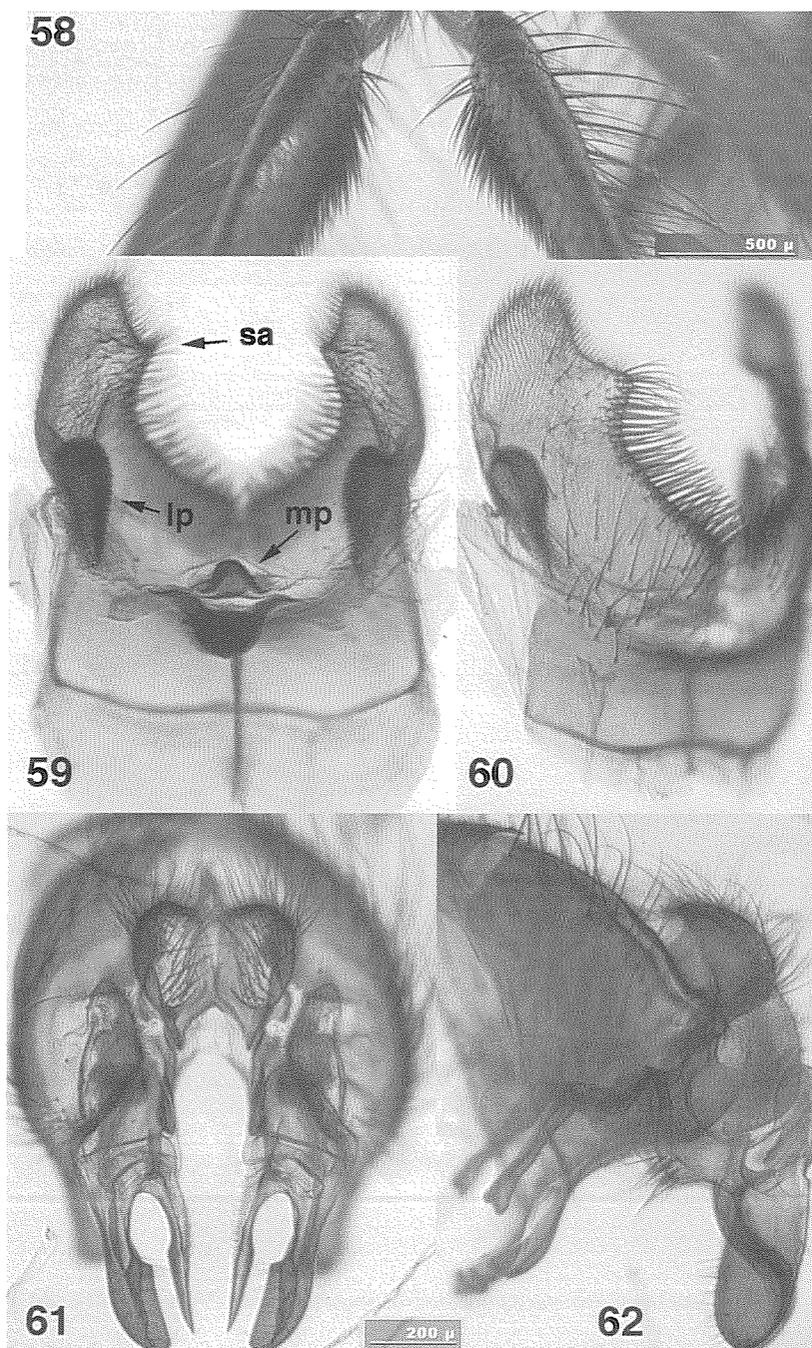
3. *Pegomya vera* Suwa, 1974  
(Figs. 54–82)

*Pegomya vera* Suwa, 1974: 223, *partim* (excluding 1 ♀ from Kagoshima referred to *P. chinensis*);  
Suwa, 1999: 237, *partim*.

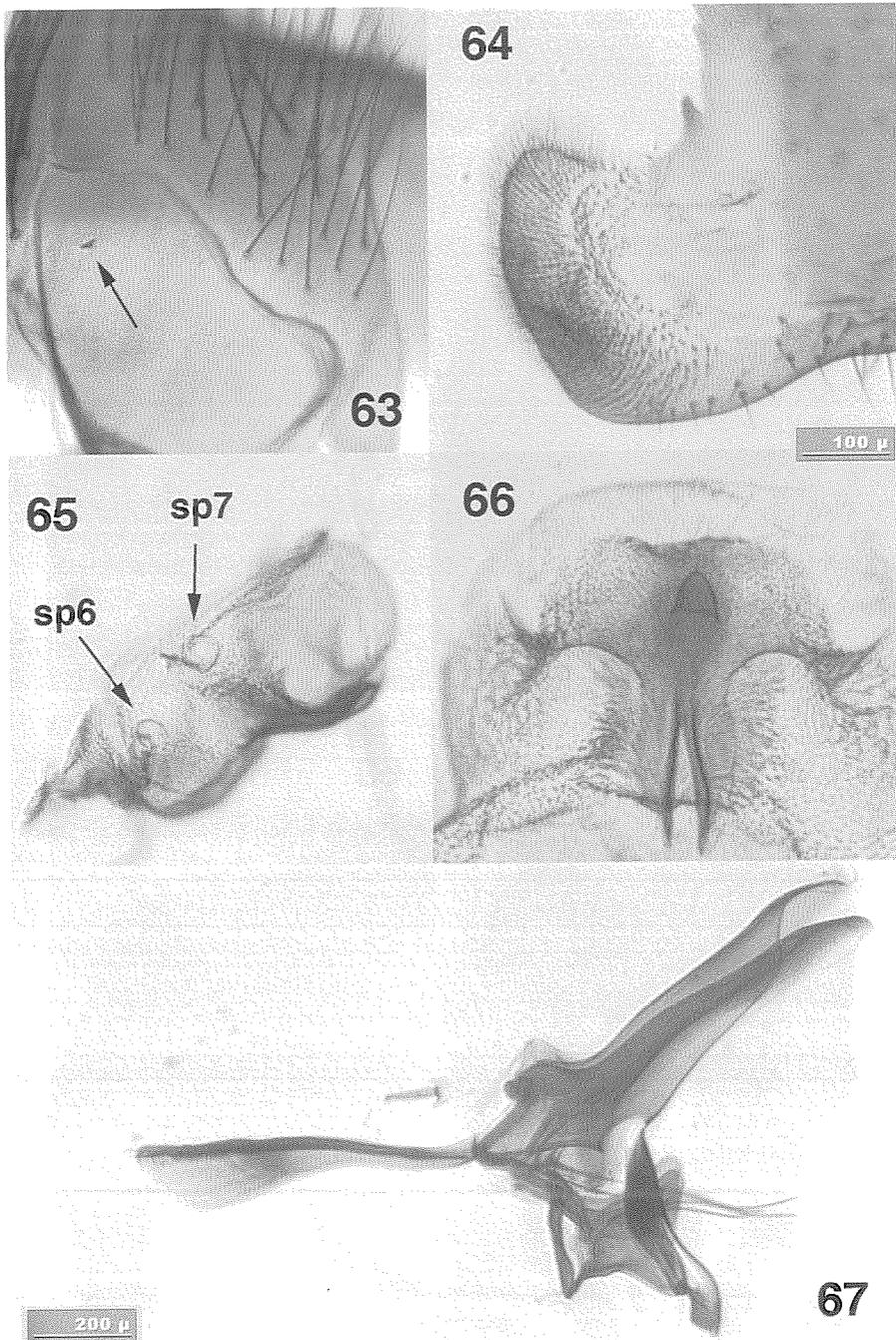
Material examined. There are at hand a lot of specimens collected at various localities from Hokkaido to Kyushu. A record from Kagoshima based on a female specimen in Suwa (1974 and 1999) is referred to *P. chinensis*.



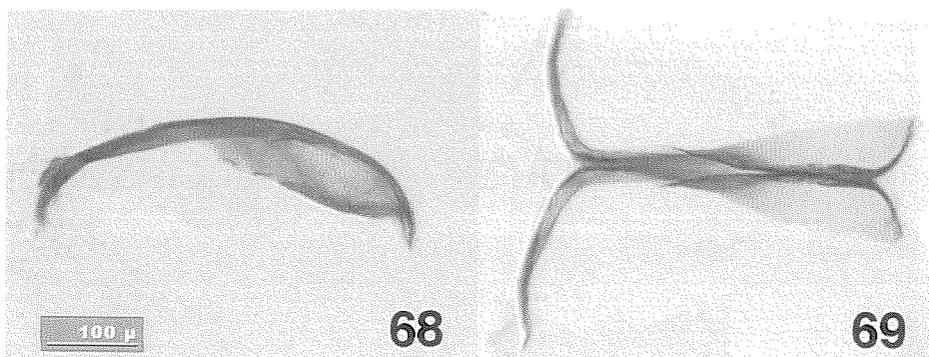
Figs. 54–57. *Pegomya vera*, ♂. 54, left surstylus, inner view; 55, aedeagus; 56, pregonite; 57, postgonite. Nopporo.



Figs. 58–62. *Pegomya vera*, ♂. 58, hind femora, showing a patch of setae; 59, 5th sternite, dorsal (underside) view, lp: lateral underside projection, mp: median underside protuberance, sa: subapical angle; 60, ditto, ventrolateral view, 61, hypopygium, dorsal view; 62, ditto, lateral view. Nopporo (Figs. 58, 60–62, same specimen; 59, another specimen).



Figs. 63–67. *Pegomya vera*, ♂. 63, left part of pregenital sclerite, arrow indicating vestigial left 7th spiracle; 64, left posterolateral lobe of epandrium, inner view; 65, genital pouch, right lateral view, showing inside surface of the pouch, sp6: 6th spiracle, sp7: 7th spiracle; 66, median sclerite of genital pouch; 67, aedeagus. Magnification same for Figs. 63, 65, 67; for 64, 66. Noppero.



Figs. 68–69. *Pegomya vera*, ♂. 68, intergonopodal sclerite, left lateral view; 69, ditto, ventral view. Noppero.

Distribution. Japan (Hokkaido; Honshu; Shikoku; Kyushu).

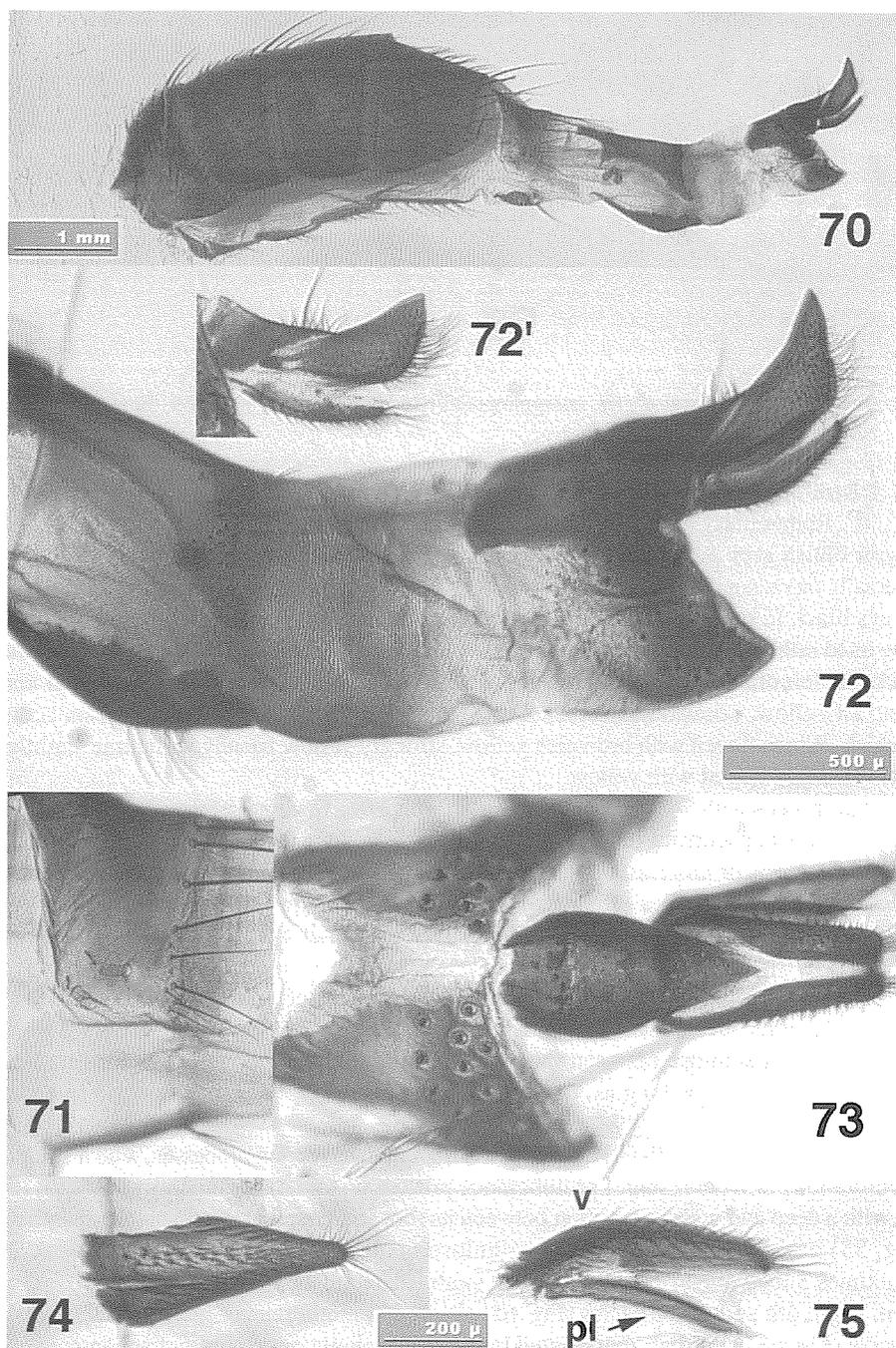
♂. Rather hairy especially in larger specimens. Wing-length 4.3–8.0 mm. Body pale grey or bluish grey pollinose, scarcely to rather strongly tinged with brown in pollinosity especially on mesonotum. Interfrontalia sometimes brownish in ground colour; orbits almost always black in ground colour except in teneral material. Abdomen with median vitta as wide as to rather distinctly wider than tibial diameter, usually sharp. Coxae and trochanters black; all femora almost wholly black, at most very narrowly yellow or brown at apex; tibiae all yellow, occasionally much darkened and blackish on  $t_1$  and  $t_2$ , paler on  $t_3$ ; tarsi blackish. Wings tinged with brownish yellow, strongly yellow basally; calyptae slightly to rather strongly tinged with yellow.

Parafrontals with 5–8 *ori*, usually mingled with 1 or a few fine setulae;  $A_3$  comparatively wide in smaller specimens, only 1.6 times as long as wide in the smallest specimen at hand, yet usually twice or more as long as wide; orbits at parafrontal angle as wide as or a little wider than  $A_3$ , sometimes a little narrower than the latter especially in smaller specimens; genae a little to distinctly higher than  $A_3$ -width, with genal setae well developed and arranged in 2–3 rows.

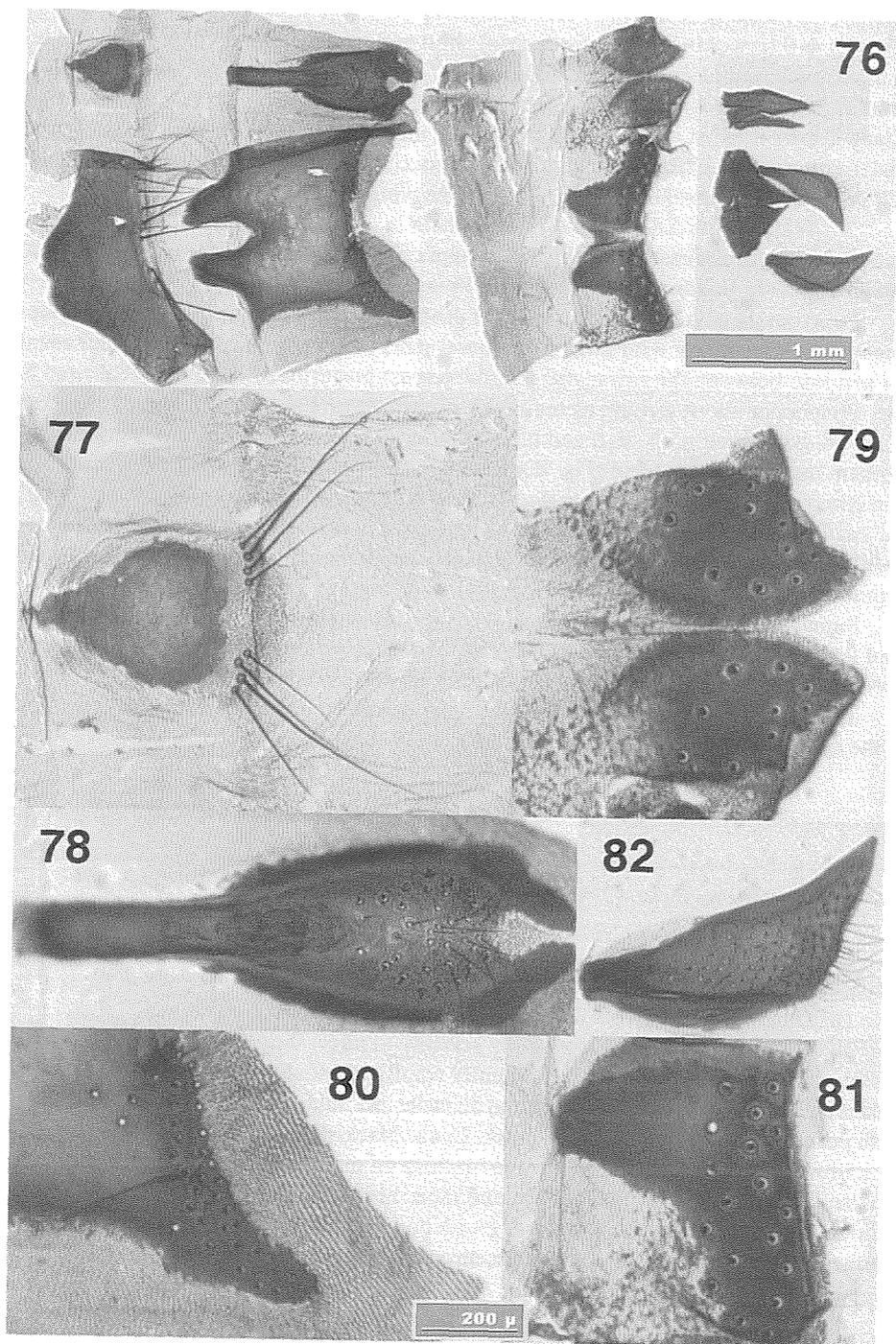
Mesonotum with 1–2 rather strong and some finer pairs of *pre-acr*, and setulose between the rows in larger specimens, yet less hairy in smaller specimens, sometimes only 2–3 pairs present and not setulose between the rows; distance between setae of the longest pair a little shorter than, or as long as, that to adjacent *dc*-row; *stpl* 1:4, or often 1:3 in smaller specimens.

Fifth sternite (Figs. 59–60) densely tomentose and velvety on processes, with a chitinous (membranous in teneral stage) protuberance present on underside medially. Surstyli (Fig. 54) with a deep and wide excavation between its root and dorsobasal expansion; distiphallus (Fig. 55) with paraphalli minutely spinulose medially; pregonite (Fig. 56) with 2 or sometimes 3 long dorsal setae and 1 short ventral seta; postgonite (Fig. 57) with basal seta stout. Right 6th and 7th spiracles (Fig. 65) situated in membrane of genital pouch; left 7th spiracle (Fig. 63) vestigial, represented by a closed minute point, and not accompanied by a trachea.

Mid femur with a row of *pv*, setae on basal half being long and rather strong, and with ground setulae behind the primary *pv*-row more or less developed especially in larger specimens;  $f_3$  swollen near base posteriorly, there with a dense patch of short setae (Fig.



Figs. 70–75. *Pegomya vera*, ♀. 70, abdomen; 71, 6th segment, showing 6th and 7th spiracles; 72, ovipositor; 72', proctiger; 73, 8th tergite and proctiger, dorsal view; 74, hypoproct, ventral view; 75, ditto, right lateral view, pl: paralobe, v: ventral side. Magnification same for Figs. 71–72'; for 73–75. Figs. 70–75, Nopporo; 72', Daibosatsu, Yamanashi-ken.



Figs. 76–82. *Pegomya vera*, ♀. 76, ovipositor; 77, 6th sternite; 78, 7th sternite; 79, 8th sternite; 80, 7th tergite, showing left posterolateral corner; 81, left plate of 8th tergite; 82, left cercus. Magnification same for Figs. 77–82. Nopporo.

58), with 4–9 (fewer in smaller specimens) short and strong *pv* on median third, and with basal *pv* much weakened and hardly discernible;  $t_1$  with 1 or sometimes 2 short *ad* and 1 or sometimes 2 strong *p-pv*;  $t_2$  with 2–3 *p-pv*;  $t_3$  with 1 or sometimes 2 weak *av*, 3 (rarely 2) *ad* and 2 long median and 2–5 short distal *pd*, and without *p*. Wings with costal thorns small or minute, often hardly distinguishable from costal spinules, though sometimes rather well developed in dorsal or ventral thorn on one wing.

♀. Wing-length 5.6–7.6 mm. Interfrontalia in ground colour usually brownish near lunule or more; orbits usually blackish in ground colour as in male. Femora often distinctly, though narrowly, yellow or brown at apex; tibiae rarely darkened.

Parafrontals with 3–4, rarely 5, *ori*; 1 proclinate and 2 reclinate *ors*; genal setae in single row. Mesonotum with some (4 or more) pairs of short and fine *pre-acr* and usually not setulose between the rows; *stpl* 1:3, the lowest posterior often much weakened and fine. Ovipositor about as long as main part of abdomen (Fig. 70); 7th and 8th segments (Figs. 78–81) armed with short and blunt setulae on tergites and sternites, setulae on 8th segment much stronger; cerci (Fig. 82) weakly sinuate on dorsal margin, with acute apex. Mid femur with *pv* fewer and finer than in male, a few or some discernible on basal half;  $f_3$  not swollen near base and without a patch of setae, with basal *pv* discernible, and near middle with only 1 or a few weak *pv* discernible, sometimes lacking;  $t_3$  with 2 short (usually both strong) *av*, 3 long *ad* and 2 long median and 1 or 2 shorter distal *pd*.

Remarks. Even in undissected material, the male of *P. vera* is easily recognized by the hind femora with a dense patch of short setae. The cerci with an acute apex of the ovipositor may be useful for identification of undissected female material.

The reduction of the male left 7th spiracle in *P. vera* is suggestive of a close relationship of the species with *P. chinensis* + *P. orientis*.

#### 4. *Pegomya robusta* Suwa, 1974 (Figs. 83–112)

*Pegomya robusta* Suwa, 1974: 228; Suwa, 1999: 236.

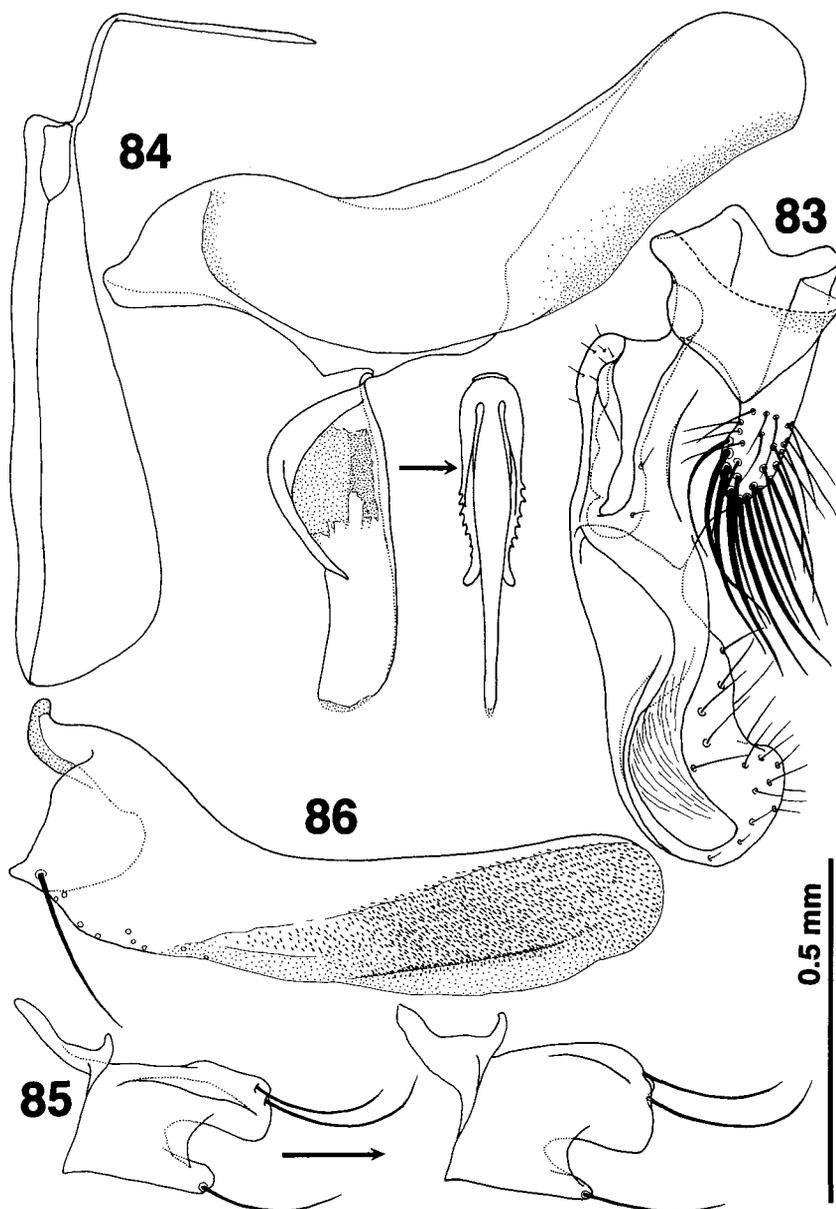
Material examined. A lot of specimens collected at various localities in Japan as recorded by Suwa (1999).

Distribution. Japan (Hokkaido; Honshu; Kyushu).

♂. Wing-length 4.9–7.3 mm. Body scarcely to rather distinctly tinged with brown in pollinosity. Interfrontalia and orbits usually wholly blackish in ground colour. Abdomen with median vitta usually wider than tibial diameter and rather obscure-margined; 5th sternite with processes dark brownish to blackish. Coxae blackish, dark brown in part; trochanters dark brown to blackish;  $f_1$  dark brown to blackish on main area, narrowly yellow or brown at base and apex on posterior surface and more broadly so on anterior surface;  $f_2$  and  $f_3$  yellow, more or less darkened on apical fourth dorsally; tibiae yellow; tarsi blackish. Wings distinctly tinged with brownish yellow, strongly yellow basally; calyptreae more or less tinged with yellow.

Parafrontals with 4–6 *ori*;  $A_3$  2.0–2.3 times as long as wide, occasionally distinctly shorter than twice the width in smaller specimens; orbits at parafrontal angle as wide as or slightly wider than  $A_3$ , sometimes a little narrower than  $A_3$  especially in smaller specimens; genae 1.1–1.5 times as high as  $A_3$ -width, with genal setae in 1 or sometimes 2 rows.

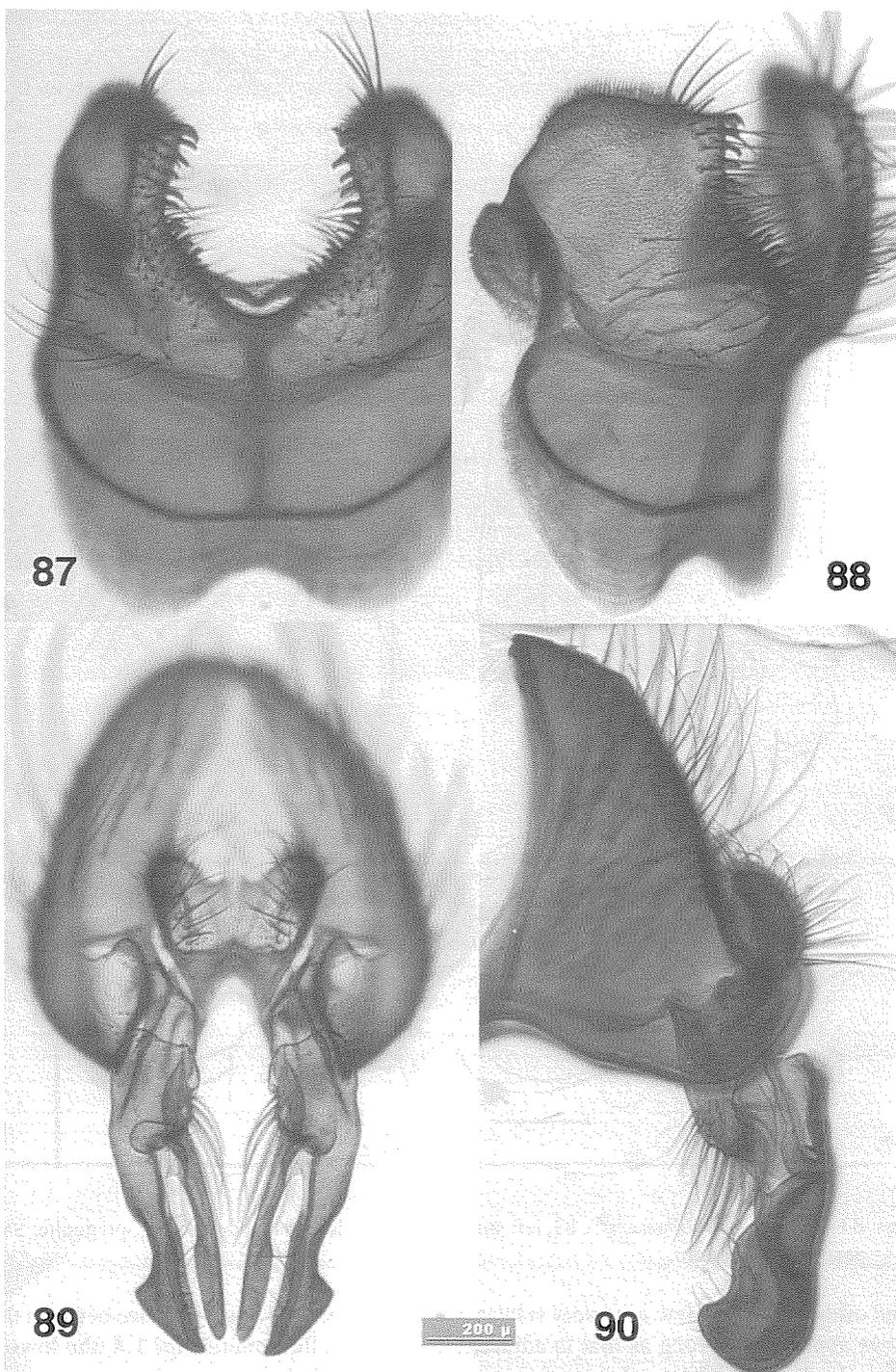
Mesonotum with 2–4 pairs of *pre-acr*, of which 1 or 2 pairs are rather well developed,



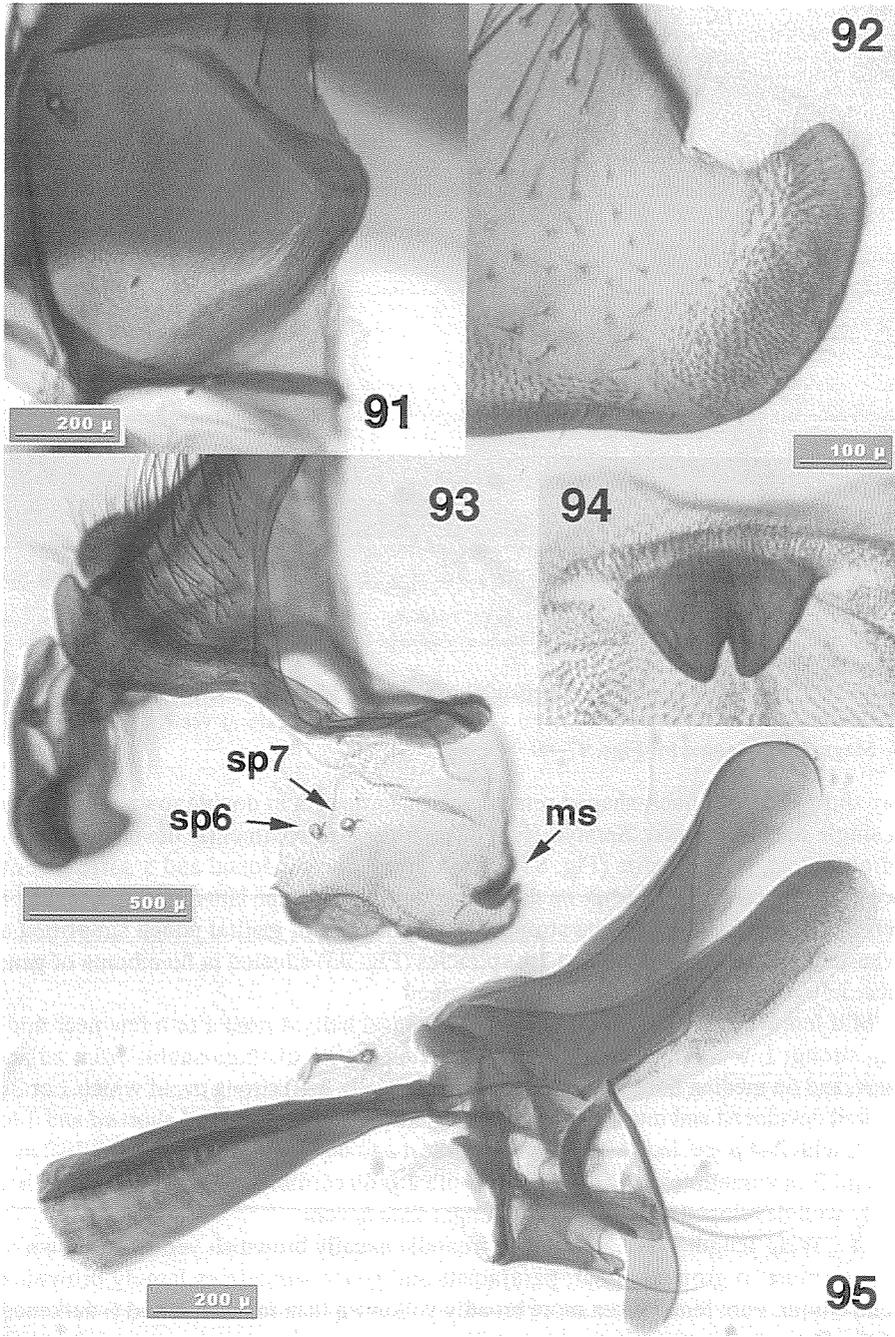
Figs. 83–86. *Pegomya robusta*, ♂. 83, left surstylus, inner view; 84, aedeagus; 85, pregonite; 86, postgonite. Noppero.

and often with 1 or a few accessory setulae present between the rows; distance between the rows about half as long as that to adjacent *dc*-row or a little more; *stpl* 1:4, the lowest posterior variable in strength from fine to well developed, below the anterior *stpl* a more or less developed setula often discernible.

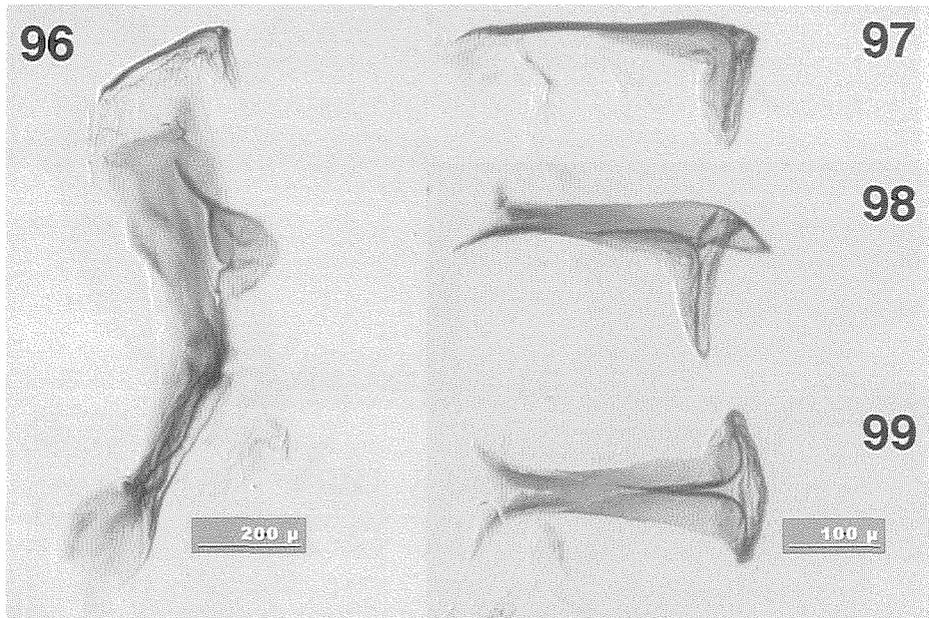
Fifth sternite (Figs. 87–88) raised on caudal half towards inner margin; processes with



Figs. 87–90. *Pegomya robusta*, ♂. 87, 5th sternite, ventral view; 88, ditto, ventrolateral view, 89, hypopygium, dorsal view; 90, ditto, lateral view. Nopporo.



Figs. 91–95. *Pegomya robusta*, ♂. 91, left part of pregenital sclerite, showing left 7th spiracle; 92, right posterolateral lobe of epandrium, inner view; 93, genital pouch attached to hypandrium, right lateral view, showing inside surface of the pouch, ms: median sclerite, sp6: 6th spiracle, sp7: 7th spiracle; 94, median sclerite of genital pouch; 95, aedeagus. Magnification same for Figs. 92, 94. Noppero (Figs. 91–94, same specimen; 95, another specimen).



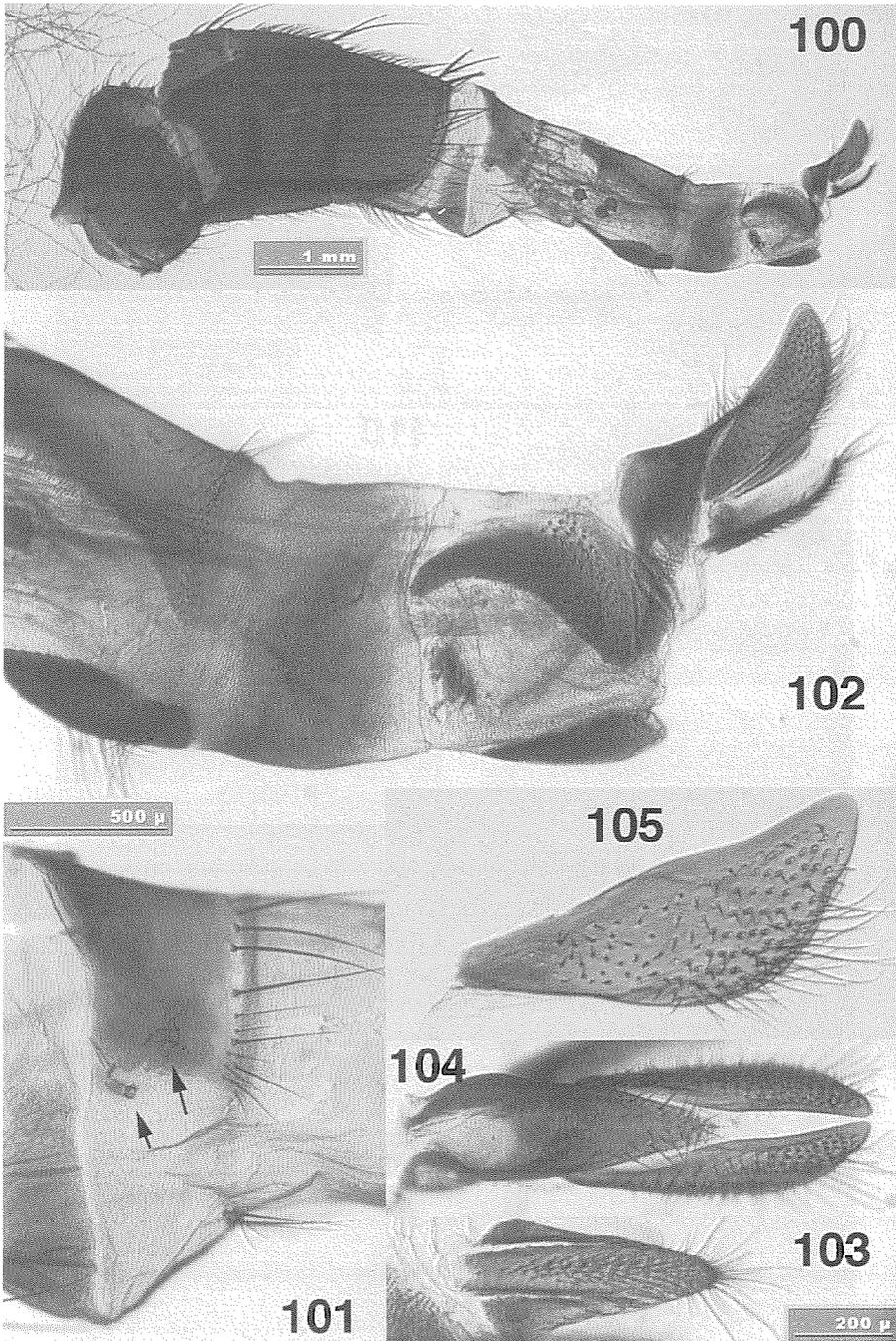
Figs. 96–99. *Pegomya robusta*, ♂. 96, hypandrium and intergonopodal sclerite, left lateral view; 97, intergonopodal sclerite, left lateral view; 98, ditto, dorsolateral view; 99, ventral view. Magnification same for Figs. 97–99. Nopporo.

many short and stout hook-shaped setae along inner margin in double rows near apex and in a single row on the rest. Surstyli (Fig. 83) with some prominently developed setae on ventrobasal angle; pregonite (Fig. 85) divided into a broad dorsal and a narrow ventral process, 2 or occasionally 3 setae on the former and 1 seta on the latter; postgonite (Fig. 86) much broadened, with basal seta strong. Median sclerite of genital pouch simplified and cloven-hoof-shaped. Right 6th and 7th spiracles (Fig. 93) situated in membrane of genital pouch; left 7th spiracle (Fig. 91) well maintained.

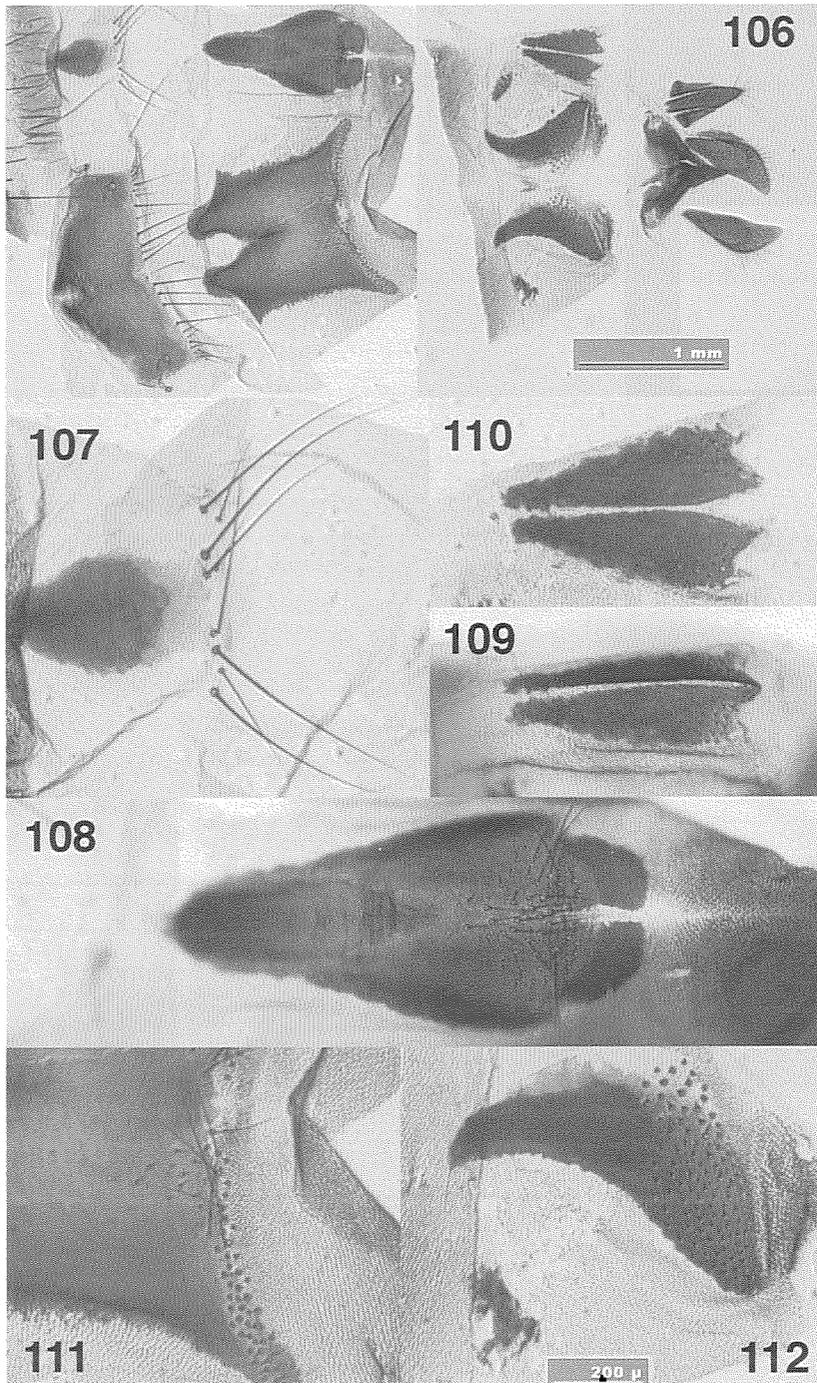
Mid femur with some (usually 4–5) *pv* on basal half, at least 1 or a few near middle being strong; *f*<sub>3</sub> with basal *pv* very fine and often hardly distinguishable from adjacent setulae, and on median third with a few or some (usually 3–4) strong *pv*, of which 1 or 2 are very well developed and much longer than height of the femur; *t*<sub>1</sub> with 1 short *ad* and 1 long *p-pv*; *t*<sub>2</sub> with 2–4 *p-pv*, and with 1 (rarely 2) short and distinct *a* present; *t*<sub>3</sub> with 0–2 *av*, 2–3 *ad* and 3 or sometimes 4 *pd*, and rarely with 1 *p* discernible. Wings with costal thorns usually well developed, often distinctly longer than *h*-vein.

♀. Wing-length 4.5–7.5 mm. Interfrontalia usually brownish yellow to brown near lunule or more in ground colour; parafacials and genae sometimes largely brownish in ground colour. Fore femur often more broadly yellowish than in male; *f*<sub>2</sub> and *f*<sub>3</sub> darkened or not apically.

Interfrontalia with a single or paired vestigial or minute *if* often discernible; usually 3 *ori*; 1 proclinate and 2 or sometimes 1 reclinate *ors*. Mesonotum with *pre-acr* much weaker than in male though at least 1 pair much stronger than ground setulae in most cases; *stpl* 1:2, sometimes a little developed seta discernible below the posteriors. Ovipositor about as long as main part of abdomen (Fig. 100); each plate of 8th tergite accompanied by an



Figs. 100–105. *Pegomya robusta*, ♀. 100, abdomen; 101, 6th segment, arrows indicating 6th and 7th spiracles; 102, ovipositor; 103, hypoproct, ventral view; 104, proctiger, dorsal view; 105, left cercus. Magnification same for Figs. 101–102; for 103–105. Noppero.



Figs. 106–112. *Pegomya robusta*, ♀. 106, ovipositor; 107, 6th sternite; 108, 7th sternite; 109, 8th sternite, unopened view; 110, ditto, opened view; 111, 7th tergite, showing left posterolateral corner; 112, left plate of 8th tergite. Magnification same for Figs. 107–112. Nopporo.

isolated small fragment anteroventrally (Fig. 102); plates of 8th sternite (Figs. 109–110) separated from each other; cerci (Fig. 105) weakly sinuate on dorsal margin and gently curved at posteroventral corner. Mid femur with usually 2–3 *pv* on basal half; *f*<sub>3</sub> occasionally with 1 strong *pv* near middle, yet usually with no strong *pv*; *t*<sub>2</sub> with *p-pv* usually 2 in number, and with *a* well developed; *t*<sub>3</sub> with 1–4 (usually 2–3) *av*, 3 *ad* and 3 (rarely 2) *pd*, and rarely with 1 *a* or 1 *p*.

Remarks. The presence of an *a*-seta on the mid tibia is a good stable character for identification of this species. The shifted right 6th and 7th spiracles of the male suggest a closer relationship of *P. robusta* to the preceding three species than to the succeeding *P. japonica*.

#### 5. *Pegomya japonica* Suwa, 1974 (Figs. 113–140)

*Pegomya japonica* Suwa, 1974: 225; Fan *et al.*, 1988: 365; Suwa, 1999: 234.

*Pegomya japonica mohanensis* Fan, 1982: 202; Fan *et al.*, 1988: 365; Wei *et al.*, 1999: 789.

*Pegomya japonica japonica*: Wei *et al.*, 1999: 789.

Material examined. I have examined a lot of specimens from various localities in Japan as recorded by Suwa (1999).

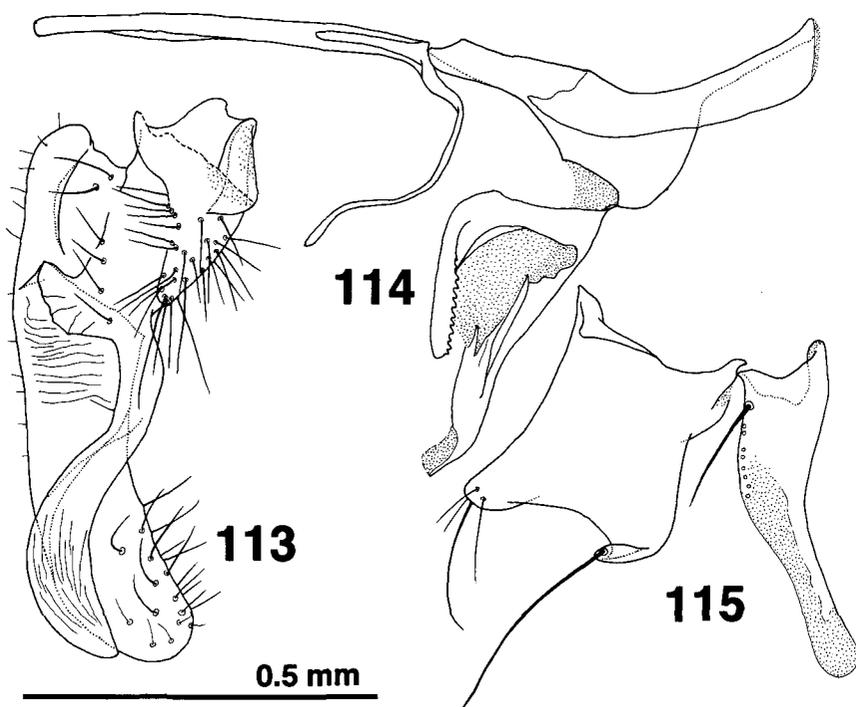
Distribution. Japan (Hokkaido; Honshu; Kyushu); China (Chekiang; Fukien; Szechwan; Hainan).

♂. Wing-length 4.8–7.3 mm. Body scarcely to rather distinctly tinged with brown in pollinosity. Interfrontalia and orbits sometimes brownish in ground colour; palpi sometimes much paler near base. Abdomen with median vitta variable in width, narrower to much wider than tibial diameter, often with fore-marginal bands; 5th sternite with processes dark brown or blackish, and polished around apex. Coxae blackish, dark brown in part; trochanters dark brownish; *f*<sub>1</sub> largely dark brown or blackish, sometimes much paler and largely brownish yellow; *f*<sub>2</sub> and *f*<sub>3</sub> entirely yellow, or slightly to rather distinctly darkened; tibiae yellow; tarsi dark yellow or brown basally and darkening apicad. Wings distinctly tinged with brownish yellow, strongly yellow basally; calyptrae a little or rather distinctly tinged with yellow.

Frons narrower than anterior ocellus, at most as wide as the latter; parafrontals with 4–7 *ori*; *A*<sub>3</sub> 2.0–2.3 times as long as wide; orbits at parafrontal angle about as wide as *A*<sub>3</sub>; genae 1.1–1.4 times as high as *A*<sub>3</sub>-width, with genal setae in 1 or 2 rows.

Mesonotum with about 3 distinct or strong pairs of *pre-acr* and often with 1 or 2 additional fine pairs, 1 or a few accessory setulae often present between the rows; distance between the rows about half as long as that to adjacent *dc*-row or a little more; *stpl* 2:3, or sometimes 2:4 though the lowest posterior weaker than the uppers.

Fifth sternite (Figs. 116–117) densely armed with short and stiff setae along inner margin of each process; lateral underside projection hook-shaped. Surstyli (Fig. 113) with inner basal lobe not developed; pregonite (Fig. 115) divided into a prolonged and recurved dorsal and a short ventral process, 1 seta on the former and 1 seta and a few setulae on the latter; postgonite comparatively short, with basal seta strong; aedeagal apodeme (Fig. 114) with median keel scarcely or weakly developed even in well matured specimens. Right 6th spiracle situated in membrane just near 6th tergite, and 7th spiracle on pregenital sclerite anterolaterally (Fig. 121); left 7th spiracle (Fig. 120) well maintained.

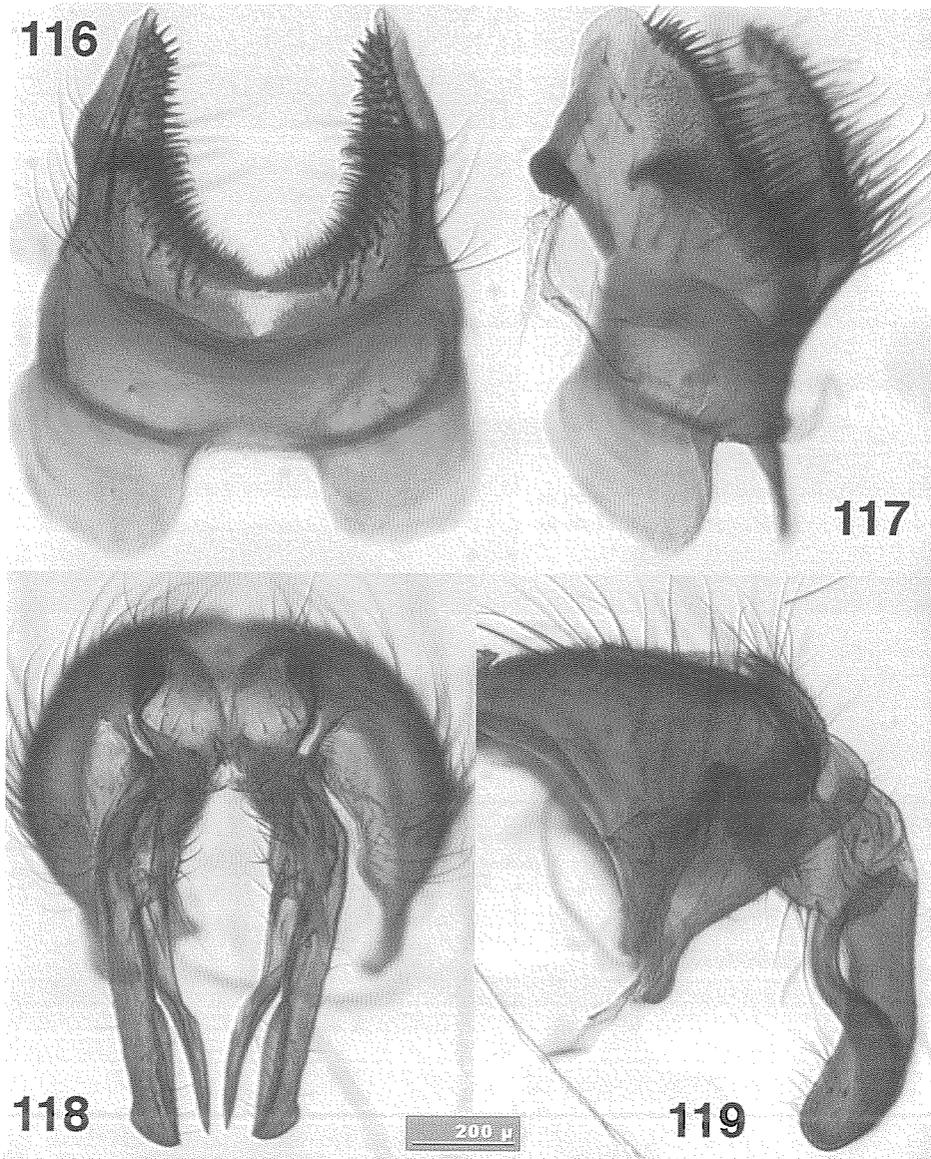


Figs. 113–115. *Pegomya japonica*, ♂. 113, left surstylus, inner view; 114, aedeagus; 115, pregonite and postgonite. Nopporo.

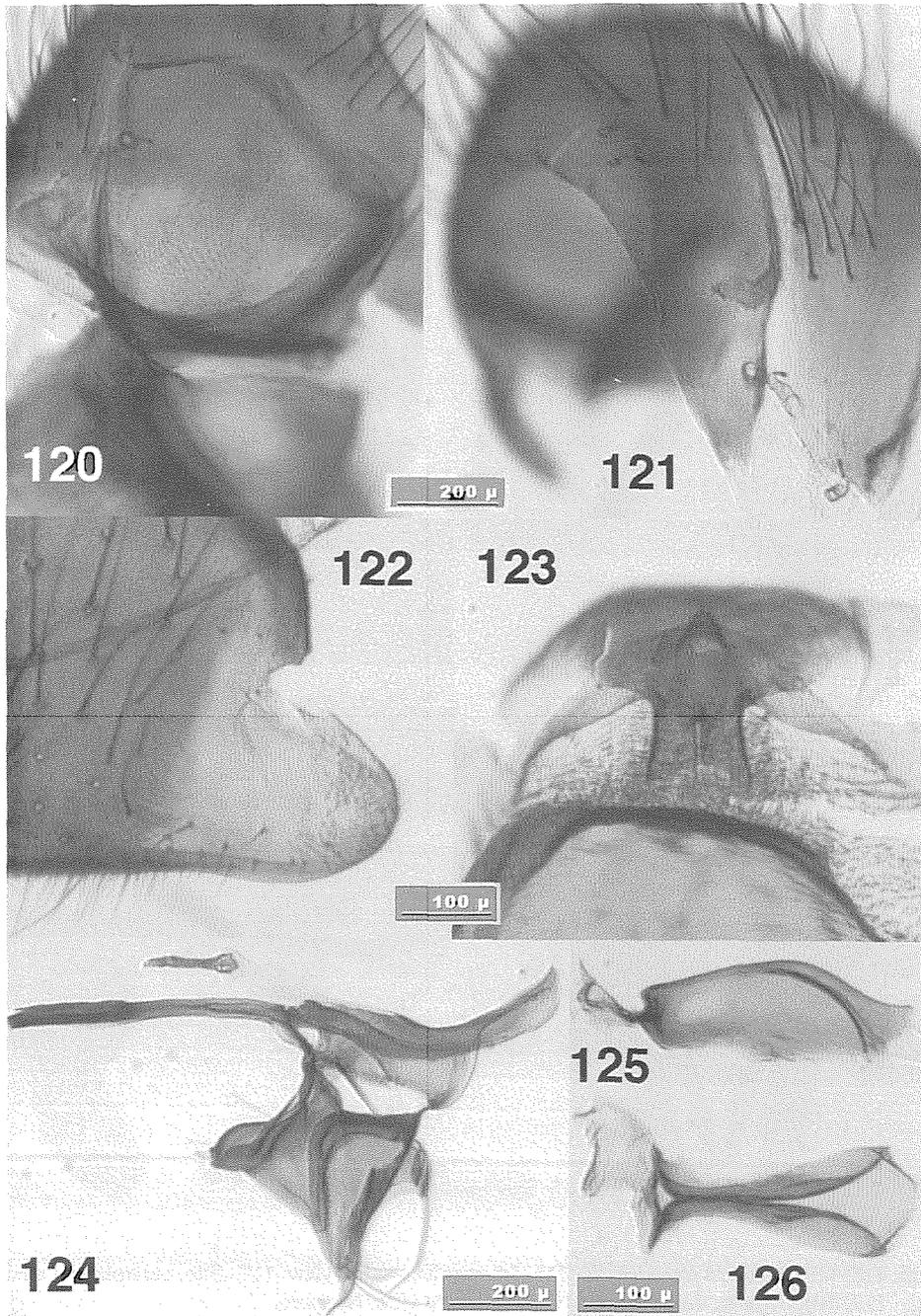
Mid femur with 5–8 *pv* on basal half or two-thirds, or sometimes with a complete row of *pv* though setae on apical third much weaker; *f*<sub>3</sub> with basal *pv* very fine and usually indistinguishable from adjacent setulae, and on median third with a few or some short *pv* and near apical third with 1 or a few strong *pv*, the latter being a little to much longer than height of the femur and sometimes forming a continuous row together with preapical *pv*; *t*<sub>2</sub> with 2–3 (rarely 4) *p-pv*; *t*<sub>3</sub> with 1–3 (rarely 4) *av*, 3 *ad* and 3 or sometimes 4 *pd*, and rarely with 1 *p*. Wings with costal thorns distinct, usually shorter than *h*-vein, yet distinctly longer than the vein in some cases.

♀. Wing-length 4.4–6.8 mm. Interfrontalia brownish near lunule or more in ground colour; parafacials and genae brownish to blackish in ground colour; palpi more or less paler basally, sometimes brownish yellow on basal half or two-thirds. Femora entirely yellow, or sometimes slightly or rather distinctly darkened especially on *f*<sub>1</sub>, yet all femora largely darkened in most of the specimens examined from Kyushu.

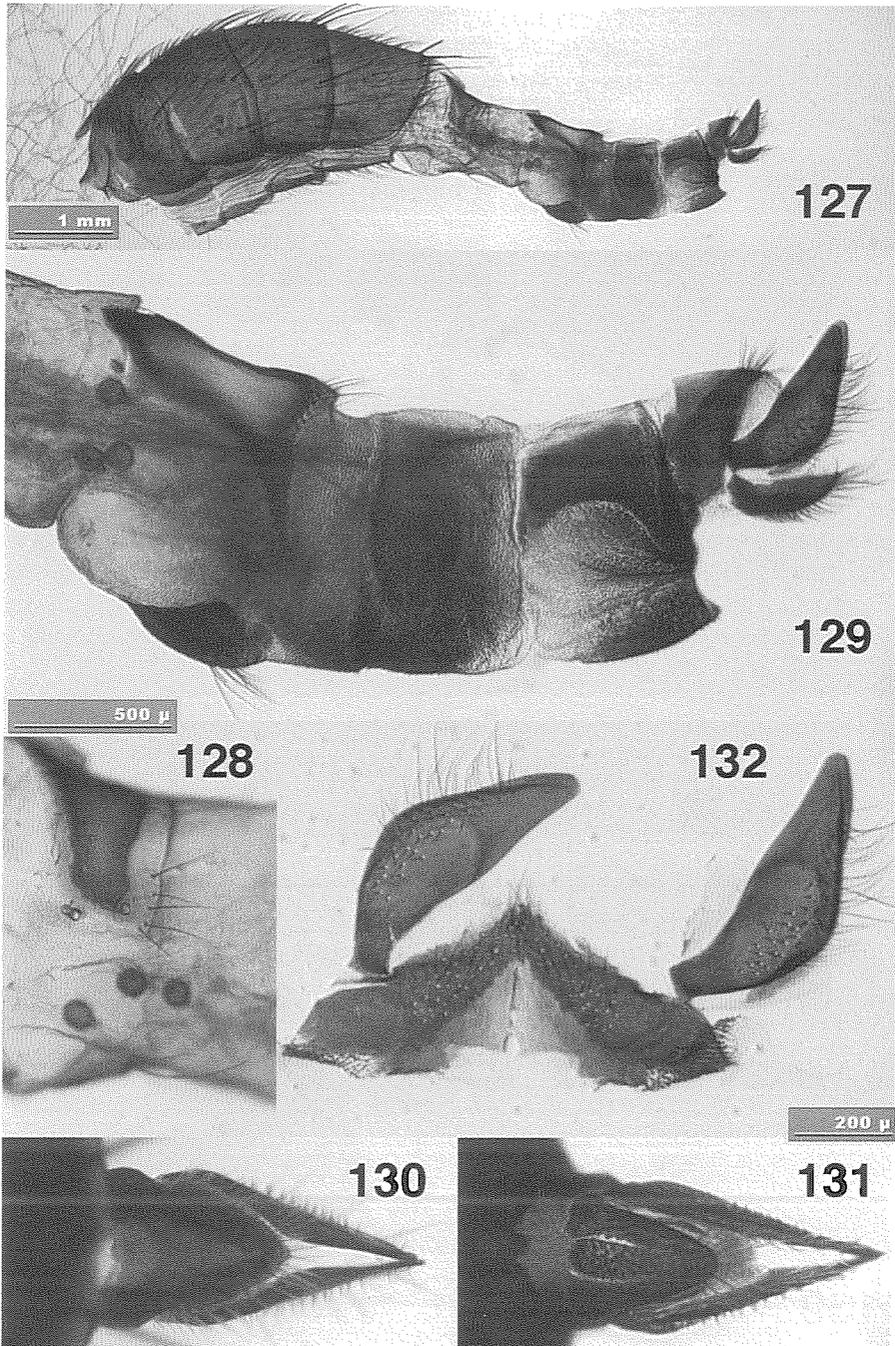
Parafrontals with 3 or sometimes 2 (rarely 4) *ori*; 1 proclinate and 2 reclinate *ors*. Mesonotum with *pre-acr* weaker than in male and stronger than ground setulae; *stpl* 2:2, or sometimes 2:3 though the lowest posterior distinctly shorter than the uppers. Ovipositor about as long as main part of abdomen (Fig. 127); plates of 8th sternite (Fig. 137) separated from each other by a linear membranous area; epiproct (Fig. 132) weakly chitinized medially; cerci (Fig. 132) weakly sinuate on dorsal margin and gently curved at posteroventral corner, with apical section of ventral margin between apex and posteroventral corner a little longer than basal section of the margin. Mid femur with about 3 *pv* on basal third or half; *f*<sub>3</sub> with



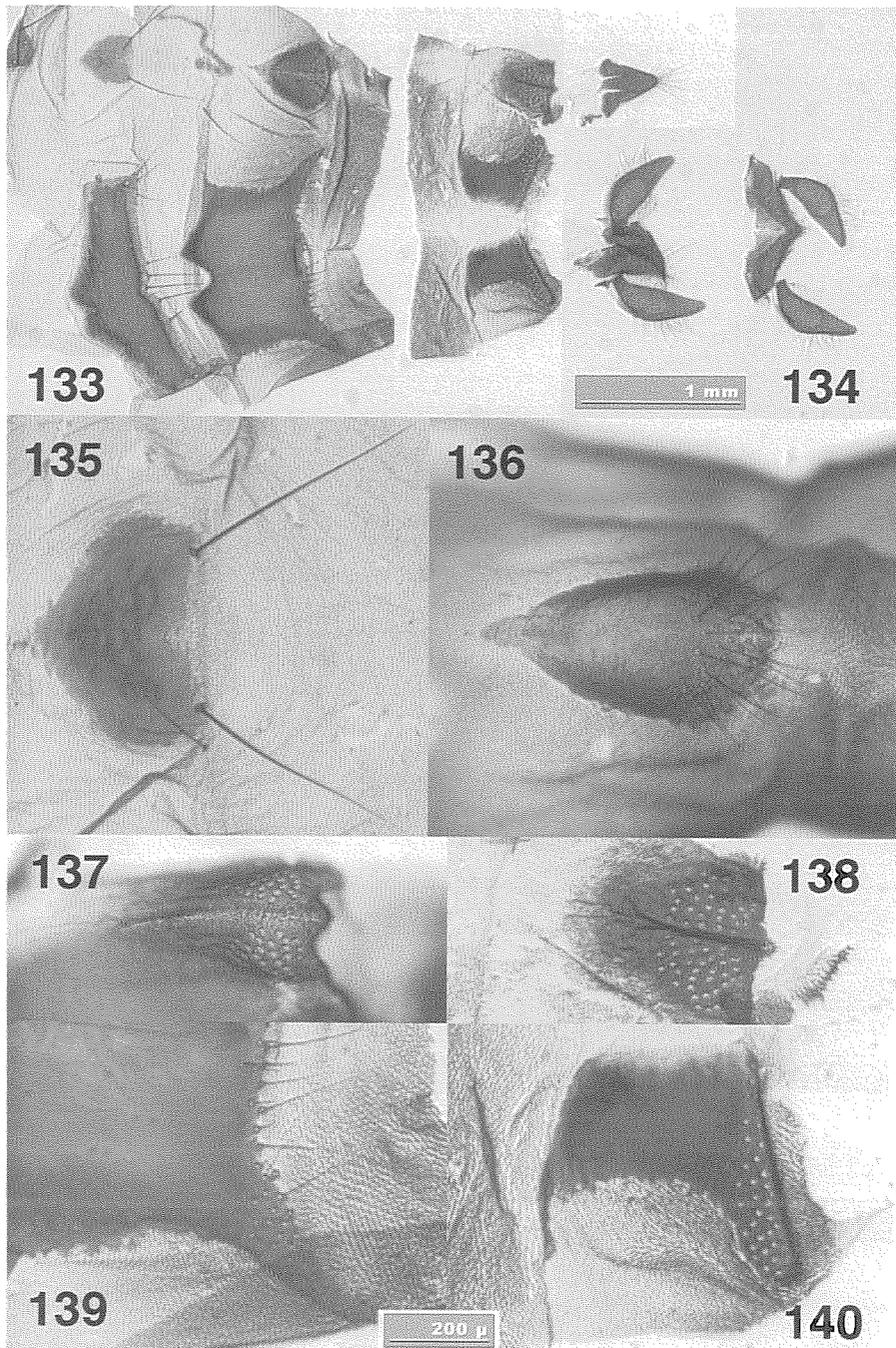
Figs. 116–119. *Pegomya japonica*, ♂. 116, 5th sternite, ventral view; 117, ditto, ventrolateral view, 118, hypopygium, dorsal view; 119, ditto, lateral view. Nopporo.



Figs. 120–126. *Pegomya japonica*, ♂. 120, left part of pregenital sclerite, showing left 7th spiracle; 121, 6th tergite and pregenital sclerite, right lateral view, showing 6th and 7th spiracles; 122, right posterolateral lobe of epandrium, inner view; 123, median sclerite of genital pouch; 124, aedeagus; 125, intergonopodal sclerite, left lateral view; 126, ditto, ventral view. Nopporo.



Figs. 127–132. *Pegomya japonica*, ♀. 127, abdomen; 128, 6th segment, showing 6th and 7th spiracles; 129, ovipositor; 130, proctiger, dorsal view, somewhat loosened by maceration; 131, ditto, ventral view; 132, epiproct and cerci, stretched view. Magnification same for Figs. 128–129; for 130–132. Nopporo.



Figs. 133–140. *Pegomya japonica*, ♀. 133, ovipositor; 134, epiproct and cerci; 135, 6th sternite; 136, 7th sternite; 137, 8th sternite, unopened view; 138, ditto, opened view; 139, 7th tergite, showing left posterolateral corner; 140, left plate of 8th tergite. Magnification same for Figs. 135–140. Nopporo (Figs. 133, 139–140, same specimen; 134, another specimen; 135–138, a third specimen).

basal *pv* distinguishable though fine or weak, and without any other distinct *pv* except for preapical one(s).

Remarks. The male 5th sternite with rigid and less lobated processes and the female cerci with apical section of ventral margin longer than the basal section are reliable characters for identification of *P. japonica* based on dried specimens. The unshifted right 6th and 7th spiracles of the male and the less prolonged basiphallus and postgonites of the aedeagus in this species may indicate a comparatively ancestral condition of the structures in the *P. chinensis* group.

#### PHYLOGENETIC RELATIONSHIPS

According to Griffiths (1983), the *Pegomya chinensis* superspecies in his sense, equivalent to the present *P. chinensis* group, is included in the *Pegomya rubivora* section together with two other superspecies and a few sole species including *P. acklandi*, which is now known to have a lot of allied species in China.

In the male of *P. acklandi*, the genital pouch has a transverse median lamina made of reversed bottom membrane of the pouch. The lamina is chitinized medially and protruded anteriorly to form a triangular median sclerite. In the superspecies of the *P. rubivora* section other than the *P. chinensis* group, such median sclerite is not present, and only a pair of fingerlike membranous processes is seen in *Pegomya rubivora* (Coquillett, 1897). The median sclerite of genital pouch in the *P. chinensis* group is also made of reversed bottom membrane of the pouch, and the group might be placed near the *P. acklandi* group though no information on the genital pouch is available for other species of the *acklandi* group. An additional ventral sclerite (Griffiths, 1982) on the male genital pouch is sometimes present in *Pegomya*, for example *P. versicolor* (Meigen, 1826) and *P. holosteeae* (Hering, 1924). As it is uncertain for me at present whether the median sclerite of the genital pouch in the *chinensis* group and the additional ventral sclerite in others are homologous or not, it is difficult to say the monophyly of *P. chinensis* group + *P. acklandi* group on the basis of this character alone.

The five species of the *chinensis* group found in Japan are inferred to have relations one another as shown in a cladogram given in Fig. 141. The characters corresponding to the numbers in the cladogram are as follows:

1. Male: 6th tergite enlarged and densely armed with setae apart from a row of marginal setae; surstyli deeply cleft, with inner process strongly sinuated; basiphallus of aedeagus with dorsal flaps much developed to sheathe postgonites; postgonite with ventral seta moved basally. Female: ovipositor laterally compressed; cerci flattened into triangular plates.

2. Male: 5th sternite with short and stiff setae densely developed along inner margin of each process; pregonite reduced in number of setae on dorsal process, with only one seta apically. Female: cerci with posteroventral corner shifted basally.

3. Male: right 6th and 7th spiracles shifted in membrane of genital pouch and distant from corresponding tergites; aedeagus with basiphallus and postgonites prolonged apicad.

4. Mid tibia with *a*-seta developed. Male: 5th sternite with processes broadened and truncated apically, with many short and hook-shaped setae developed on inner margin; surstyli with ventrobasal setae much developed; aedeagus with basiphallus and postgonites much broadened; pregonite with dorsal process broadened.

5. Male: left 7th spiracle gained a tendency of reduction.

6. Male: *f*<sub>3</sub> swollen posterobasally and with a dense patch of short setae developed

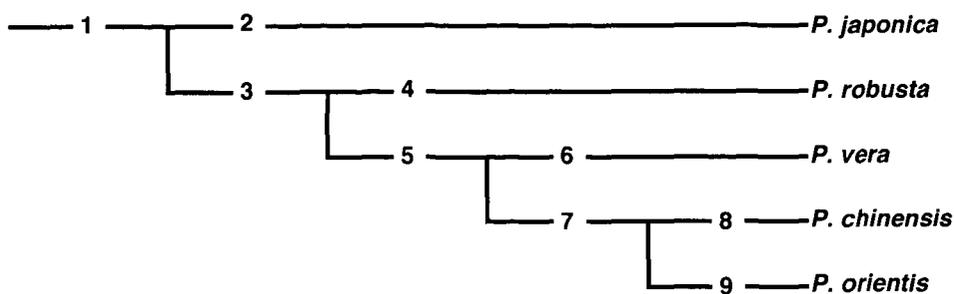


Fig. 141. Cladogram for the *chinensis* group of *Pegomya* in Japan. Numbers refer to characters mentioned in the text.

there; 5th sternite with tomenta became longer and denser; left 7th spiracle atrophied, represented by a closed minute point, and not accompanied by a trachea. Female: ovipositor with setulae on 7th and 8th segments became stout and blunted.

7. Hind tibia with *p*-seta developed though somewhat unstable in occurrence. Male: surstyli with setose ventrobasal angle prominently protruded. Female: plates of 8th sternite gained a tendency of fusion to each other.

8. Male: postgonites of aedeagus with basal seta much reduced to a minute setula.

9. Male: dorsobasal expansion of surstylus recurved apically, with setae developed and long. Female: ovipositor elongated, longer than main part of abdomen; plates of 8th sternite entirely fused to each other.

To evaluate and confirm the reliability of the characters used here, we need more information on the Chinese species of the group. The Japanese species treated in this paper are undoubtedly a small part of the group. The females have not yet been determined for any species of the group other than the species found in Japan.

It may be said that the *chinensis* group of *Pegomya* originated in southern China or neighbouring areas and radiated there, and that a part of the group migrated north to Japan. This pattern of origin and dispersal is similar to that presented for the *alticola* and *nigra* groups of *Pegomya* (Suwa, 1989, 1997), although the latter groups are found in mountainous areas at higher altitudes. The evolutionary history and the biogeography of these groups may be explained in connection with the orogenesis of the Himalayas including neighbouring areas and the Quaternary glacial epochs.

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