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**THE GENUS ANTHOMYIA IN PALAEARCTIC ASIA  
(DIPTERA : ANTHOMYIIDAE)**

By MASAOKI SUWA

*Abstract*

SUWA, M. 1987. The genus *Anthomyia* in Palaearctic Asia (Diptera: Anthomyiidae). *Ins. matsum. n. s.* 36: 1-37, 1 tab., 210 figs.

The genus *Anthomyia* in Palaearctic Asia is revised, and 8 species are recognized. Three of them are described as new to science, namely *A. avisignata* (= *A. pluvialis* (Linné) sensu Suwa, 1974), *A. latifasciata* (= *Anthomyia* sp. B: Suwa, 1974), and *A. pectoralis*. Some male characters are examined and phylogenetic considerations are given. The relationship between *Anthomyia* and *Craspedochoeta* is briefly discussed.

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## INTRODUCTION

Recently Michelsen (1985) has extended the generic concept of *Anthomyia* to include two other groups, *Craspedochoeta* Macquart and *Chelisia* Rondani. His opinion is, however, not adopted here, and the genus *Anthomyia* is understood as before. In the sense adopted the genus is a rather small group for a genus of the family Anthomyiidae, and has been represented by less than 30 species mostly known in the Old World.

The genus is readily distinguished from other genera of the family by the characteristic colour pattern on the mesonotum and abdomen and by the setulose propleura. The included species, however, have often been misidentified through little knowledge on genital structures and the variation in the mesonotal pattern. Some European species, *Anthomyia pluvialis* (Linné) and its allies, were revised by Michelsen (1980), and we recognize now 7 species of the genus in Europe. For some years I have been exchanging information on the genus with Mr. D.M. Ackland, Oxford, and we have agreed that the Asian species should be revised now. This paper presents my study on Palaearctic Asian species. The species of the Oriental region are revised by Mr. Ackland in the other paper in the same issue.

In the Palaearctic Asian region 7 species have been recorded in the genus (Fan, 1965; Suwa, 1974; Suh & Kwon, 1985). Four of them, however, have remained undetermined or misidentified. In the course of my recent study on the genus in this region I have recognized 8 species including the above mentioned 7. These species, including 3 new species, are dealt with in the following lines.

The holotypes of the new species are deposited in the collection of the Entomological Institute, Hokkaidô University. The other specimens examined are also in the same collection unless otherwise stated. Depositories of specimens are abbreviated as follows: - British Museum (Natural History) (BMNH); D.M. Ackland (DMA); Entomological Institute, Hokkaidô University (EIHU); Entomological Laboratory, Kyûshû University (ELKU); Hikosan Biological Laboratory, Kyûshû University (HBKU); H. Kurahashi (HK); Hungarian Natural History Museum (HNHM); State University of Moscow (MSU); S. Fukushi (SF); Tôkyô Medical and Dental University (TMDU).

## GENUS ANTHOMYIA MEIGEN

*Anthomyia* Meigen, 1803: 281. Type-species: *Musca pluvialis* Linné, 1758.

On the basis of the species examined by myself a diagnosis of the genus and some notes will be given as follows\*: -

♂. Body with dark markings on mesonotum and abdomen contrasted to the surrounding greyish pollinose areas. Mesonotal dark markings basically separated into a pair of presutural spots and 5 postsutural ones (large median and lateral spots

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\* According to Ackland (in litt.) a species of *Anthomyia* from Sulawesi does not entirely agree with the generic concept given in the present paper. The discussion on the relationship among the species of *Anthomyia* and to the genus *Craspedochoeta* in this paper is, therefore, rather tentative. The species from Sulawesi will be dealt with in the following paper by Mr. Ackland.

and small supra-alar ones) as typically represented by *pluvialis* (Linné, 1758) (Figs. 1-6); presutural spots well developed or variously reduced, sometimes completely lacking; postsutural spots clearly separated from each other, or variously fused and often forming an entire transverse band, which may, however, be sometimes redivided as in the N. American *oculifera* Bigot, 1885, and the European *plurimotata* Brullé, 1832 (Figs. 111 & 115); scutellum with a pair of lateral dark markings (lateral spots), which are widely separated from each other or variously fused and often expanded on most or whole dorsal surface of scutellum, or sometimes again reduced to a basal marking as in *illocata* Walker, 1856 (Figs. 188-189). Abdomen with fore-marginal bands developed on 3rd to 5th tergites, these bands usually much expanded caudad on each side of abdomen and forming lateral triangular spots, which are sometimes disconnected from median vitta.

Parafrontals contiguous to each other or narrowly separated, usually with 1 minute *ors*; arista variously haired, minutely pubescent to rather long plumose. Mesonotum with *pra* present; propleura setulose; pteropleura and hypopleura with no setae or setulae.

Abdomen depressed, not cylindrical; 6th tergite much reduced and not setose; 5th sternite with processes expanded dorsad on apical half, and with a membranous or weakly chitinized lobe developed on each process ventroapically; 6th sternite with a process developed at middle; cercal plate more or less cordate in dorsal view, with some (usually 4) short and flattened setae at apex; surstyli cleft inside near apex, with a few stout setae on the inner lobe distally; distiphallus with a projection on dorsal side though sometimes suppressed.

Mid tibia with 1 *pd* in apical half and usually with 1 more *pd* in basal half, the latter *pd* being a little shifted towards posterior surface, in addition 1 or 2 further *pd* present in certain species (e.g. *pectoralis* sp. nov.);  $t_3$  without apical *pv*. Wings with costal thorns minute.

♀. Body with dark markings less developed than in male; mesonotal dark markings sometimes shaped into vittae. Hind tibia usually with no *pv* discernible.

*Members.* The Palaearctic Asian species treated in this paper are as follows: -

1. *Anthomyia pluvialis* (Linné, 1758).
2. *A. avisignata* sp. nov.
3. *A. procellaris* Rondani, 1866.
4. *A. koreana* Suh & Kwon, 1985.
5. *A. latifasciata* sp. nov.
6. *A. pectoralis* sp. nov.
7. *A. plumiseta* Stein, 1918.
8. *A. illocata* Walker, 1856.

*Relationship among the species.* Little has been made concerning phylogenetic relationship within the genus. On this occasion preliminary considerations on some male characters will be given (see also Table 1).

1. Mesonotal colour pattern. Two extremes are seen in the variation of the dark markings: a spotted pattern as represented by *pluvialis* and a banded pattern as shown in *illocata*. In the family Anthomyiidae the mesonotum is generally marked with some dark vittae even if obscurely. It may be reasonable to suppose that the spotted pattern is evolved from the general vittate pattern through some modifications: shortening, broadening, and increasing colour contrast, of the vittae.

The postsutural markings of the spotted pattern may be fused in a broad cross band as in *latifasciata* and *pectoralis* (Figs. 152 & 158). The median protrusions of the band in these species may be homologous with the anterior and posterior ends of the median marking in the spotted pattern. The band-mark lacking these protrusions in *plumiseta* and *illocata* is accordingly considered more advanced. In *illocata* the mesonotal dark markings are less developed than in *plumiseta*. This may be due to further modification. A morphocline from a spotted to a banded pattern may be formed. The mesonotal pattern of *plurinotata* (Fig. 115) is also a spotted one, but is quite different from that of *pluvialis* in lacking the median spot. It may belong to another series connected to the state in *latifasciata* through *oculifera* (Fig. 111) and *koreana* (Figs. 98-110).

2. Cercal plate. Two types are recognized. One of them, which may be called the *illocata*-type, is characterized by the cercal apex distinctly prolonged dorsad (cf. Fig. 178). This type is seen in *pectoralis*, *plumiseta* and *illocata*. The other is the *pluvialis*-type, with cercal apex hardly prolonged dorsad (cf. Figs. 14 & 131) though variously narrowed in dorsal view. This type is seen in all the remaining species treated in this paper. The *pluvialis*-type seems to be less specialized and may be more primitive than the *illocata*-type. This is not contradictory to the morphocline formed for the mesonotal markings.

3. Median process of the 6th sternite. The process is hairy in *plumiseta* and *illocata* and hairless in the others. When the grouping for these antipodal characters is applied to the morphocline for the mesonotal markings, the hairless state must be primitive. In fact, the process in *Craspedochoeta*, a group closely related to *Anthomyia*, is also hairless. The completely divided process in *illocata* may be still more advanced.

4. Dorsal projection of the distiphallus. The projection is more or less distant from the base of the distiphallus in most species, yet is situated at the base in *plumiseta* or completely suppressed in *pectoralis* and *illocata*. The sequences in the other features discussed above suggest that the distant type is primitive. *A. pectoralis* is less advanced than *plumiseta* in having the medially protruded mesonotal band and the hairless median process of the 6th sternite. The suppression of the dorsal projection may have occurred independently in *pectoralis* and *illocata*.

*Relationship to the genus Craspedochoeta\**. A close relationship between the genera *Anthomyia* and *Craspedochoeta* except *angulata* (Tiensuu, 1938) is indicated by the following synapomorphic characters: - Fifth sternite with processes extending dorsad on apical half; 6th sternite with a process developed at middle; surstyli cleft inside near apex, with stout setae on the inner lobe distally, and in profile expanded dorsally at base; distiphallus with a projection on dorsal side (the distiphallus morphocline in *Anthomyia* may indicate the occurrence of the distant-type projection in the common ancestor of the two genera). *Anthomyia* is, however, clearly distinguished from *Craspedochoeta* by the characteristic colour pattern on the body, the setulose propleura, and the flattened apical setae on the cercal plate. All these characters may be interpreted as autapomorphic. On the other hand, *Craspedochoeta* may be defined by the distiphallus with dorsally trifurcated apex, the post-

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\* *Craspedochoeta xanthopus* Hennig, 1976, is not considered here. Its systematic position should be discussed elsewhere.

Table 1. Morphoclines for some male characters of Palaearctic Asian species of *Anthomyia*.

Feature	Morphocline	Sequence of species*
1. Mesonotal colour pattern	Spotted to banded pattern, further modification in reduction or redivision of the band	$\left[ \begin{array}{l} \textit{pluvialis} \\ \textit{avisignata} \\ \textit{procellaris} \end{array} \right] \rightarrow \textit{latifasciata} \rightleftharpoons \textit{pectoralis} \rightarrow \textit{plumiseta} \rightarrow \textit{illocata} \text{ (reduction)}$ $\downarrow$ $\textit{koreana} \rightarrow \textit{oculifera}^{**} \rightarrow \textit{plurinotata}^{**} \text{ (redivision)}$
2. Cercal plate	Prolongation of apex in dorsal direction	$\left[ \begin{array}{l} \textit{pluvialis} \\ \textit{avisignata} \\ \textit{procellaris} \\ \textit{latifasciata} \\ \textit{koreana} \end{array} \right] \rightarrow \left[ \begin{array}{l} \textit{pectoralis} \\ \textit{plumiseta} \\ \textit{illocata} \end{array} \right]$
3. Median process of 6th sternite	Hairless to hairy state, and further modification to complete division of the process	$\left[ \begin{array}{l} \textit{pluvialis} \\ \textit{avisignata} \\ \textit{procellaris} \\ \textit{koreana} \\ \textit{latifasciata} \\ \textit{pectoralis} \end{array} \right] \rightarrow \textit{plumiseta} \rightarrow \textit{illocata}$
4. Dorsal projection of distiphallus	Shift of the position towards base of distiphallus to the extent of complete suppression of the projection	$\left[ \begin{array}{l} \textit{pluvialis} \\ \textit{avisignata} \\ \textit{koreana} \end{array} \right] \rightarrow \textit{procellaris} \rightarrow \textit{latifasciata} \rightarrow \textit{plumiseta} \rightarrow \left[ \begin{array}{l} \textit{illocata} \\ \textit{pectoralis} \end{array} \right]$

\* The sequence does not directly mean an ancestral-descendant series as indicated by disagreement among the sequences.

\*\* N. American and European species respectively.

gonite with quadrate outline in its main part, the lengthened cercal plate and the hind tibia with strong apical *pv*. These characters except the last one might be autapomorphic. In this respect *C. angulata* is exceptional. Its inclusion in this genus may be supported by the subapically cleft and stoutly setose surstyli, the distiphallus with dorsal projection, the 6th sternite with median process, and the hind tibia with strong apical *pv*. The species is, however, quite different from other species of *Craspedochoeta* in the following aspects: - Distiphallus similar to that of *A. plumiseta* in outline, with apex bifurcated dorsally and with dorsal projection situated at base; cercal plate not so lengthened; 5th sternite with processes not extending dorsad; 6th sternite with median process small and simple-shaped; surstyli less expanded dorsally in profile. At present it is difficult for me to give any reasonable phylogenetic place to this species. If these differences are due to the primitiveness of *angulata*, this species should be regarded as a descendant from the stock which existed prior to the supposed common ancestor of the two genera. In this case the genus *Craspedochoeta* in the current sense should be paraphyletic. However, I do not necessarily refuse to accept a paraphyletic group. At any rate, the genus *Anthomyia* in the present sense may be a monophyletic group sharply defined by some characters as mentioned above. This sharpness may be one good reason for recognizing *Anthomyia* as distinct from *Craspedochoeta*.

#### KEY TO THE SPECIES OF ANTHOMYIA KNOWN FROM PALAEARCTIC ASIA

##### Males

1. Mesonotum with postsutural dark markings separated into 3 spots in dorsal view, sometimes narrowly fused anteriorly. . . . . 2
- Mesonotum with postsutural dark markings broadly fused in a transverse band, which is entire or ending near lateral margins of mesonotum in dorsal view, posterior margin of the band almost straight to strongly indented. . . . . 4
2. Mesonotum with lateral spots separated from, or at most very narrowly fused with, supra-alar spot (Fig. 2); arista with longest hairs clearly shorter than basal diameter of arista; 5th sternite with basal inner margin of each process distinctly convex (Fig. 7); cercal plate less narrowing apicad (Fig. 13). . . . . 1. *pluvialis* (Linné)\*
- Mesonotum with lateral spots broadly fused with supra-alar one; arista with the longest hairs at least as long as basal diameter of arista; 5th sternite with basal inner margin of each process concave or only a little convex (Figs. 27-28 & 61-62); cercal plate more narrowing apicad (Figs. 32, 67 & 74-79). . . . . 3
3. Mesonotum with lateral spots narrowly fused with median one anteriorly and much recessed on posterior margin near to 1st *ia* (Figs. 19-20); postgonite with a more expanded seta (Fig. 39); distiphallus with dorsal projection set apart from base by a distance longer than the projection (Figs. 35-37). . . . . 2. *avisignata* sp. nov.
- Mesonotum with lateral spots widely separated from median one, if more or less fused anteriorly, then hardly or only slightly recessed on posterior margin around 2nd *ia* (Figs. 41-42, 44 & 46-47); postgonite with a less expanded seta (Figs. 92-95); distiphallus with dorsal projection set apart from base by a distance not longer than the projection (Figs. 87-88). . . . . 3. *procellaris* Rondani
4. Mesonotum with postsutural band strongly indented on posterior margin at rows of *dc* and *ia* and not covering 2nd *post-dc* or 2nd *ia* (Fig. 18); abdomen with 6th and 7th spiracles much enlarged (Figs. 30-31). . . . . 2. *avisignata* sp. nov.

\* Based on European material. No Asian male specimens of *pluvialis* have been examined by myself.

- Mesonotum with postsutural band not strongly indented on posterior margin at rows of *dc* and *ia* and reaching near to or past 2nd *post-dc* and 2nd *ia*; abdomen with 6th and 7th spiracles not enlarged, at most a little larger than the preceding spiracles. . . . . 5
- 5. Mesonotum with presutural spots expanded to 2nd *pre-dc*, and with postsutural band distinctly protruded cephalad at middle; 6th sternite with hairless median process. . . . . 6
- Mesonotum with presutural spots not expanded to 2nd *pre-dc*, or entirely lacking, and with postsutural band hardly or never protruded cephalad; 6th sternite with hairy median process. . . . . 8
- 6. Prosternum with a few setulae near each lateral margin; cercal plate with apex prolonged dorsad (Fig. 178); postgonite with an expanded seta (Fig. 181); distiphallus without dorsal projection (Fig. 179). . . . . 6. *pectoralis* sp. nov.
- Prosternum with no setulae; cercal plate with apex not prolonged dorsad; postgonite with an unexpanded seta; distiphallus with dorsal projection. . . . . 7
- 7. Mesonotum with postsutural band entire or variously retreated between *ia* and *sa* to the extent of complete interruption, sometimes a little protruded caudad at middle (Figs. 98-110); scutellum usually grey along basal margin narrowly; arisal hairs at most about twice as long as basal diameter of arista;  $t_2$  usually with 1 *pd*; praegonite with setae a little longer than the gonite (Fig. 133); postgonite protruded at lower posterior corner (Fig. 134); distiphallus with dorsal projection distant from base (Fig. 132). . . . . 4. *koreana* Suh & Kwon
- Mesonotum with postsutural band entire and always rather distinctly protruded caudad at middle (Figs. 152-153); arista with the longest hairs 2-3 times as long as basal diameter of arista;  $t_2$  usually with 2 *pd*; praegonite with setae much longer than the gonite (Fig. 169); postgonite not protruded at lower posterior corner (Fig. 169); distiphallus with dorsal projection near base (Fig. 169). . . . . 5. *latifasciata* sp. nov.
- 8. Occiput much darkened on upper plane; mesonotum with postsutural band passing 2nd *post-dc* (Figs. 183-184); scutellum mainly or wholly blackish, at most narrowly grey at apex; 6th sternite with median process half divided into 2 lobe-like projections (Fig. 207); postgonite with a much expanded seta (Figs. 203-205); distiphallus with dorsal projection at base (Figs. 200-201). . . . . 7. *plumiseti* Stein
- Occiput wholly greyish; mesonotum with postsutural band extending at most around 2nd *post-dc* (Figs. 188-189); scutellum with dark marking rarely expanded to discal setae and not reaching to lateral margins of scutellum; 6th sternite with median process completely divided into 2 stick-like projections (Fig. 210); postgonite with a less expanded seta (Fig. 209); distiphallus without dorsal projection (Fig. 208). . . . . 8. *illocata* Walker

#### Females\*

- 1. Mesonotum with postsutural dark markings separated into spots or vittae. . . . . 2
- Mesonotum with postsutural dark markings fused in a transverse band. . . . . 5
- 2. Mesonotum with a pair of long vittae along rows of *dc* and without a vitta or spot along rows of *acr* (Figs. 116-117). . . . . 4. *koreana* Suh & Kwon
- Mesonotum with no vittae along rows of *dc* and with a vitta or spot along rows of *acr*. . . . . 3
- 3. Mesonotum with lateral spots never or only slightly discernible in dorsal view (Figs. 22-23). . . . . 2. *avisignata* sp. nov.
- Mesonotum with lateral spots distinctly discernible in dorsal view. . . . . 4
- 4. Mesonotum with lateral spots widely separated from supra-alar one (Fig. 6); arista with the longest hairs clearly shorter than basal diameter of arista;  $t_1$  with no *ad*. . . . . 1. *pluvialis* (Linné)
- Mesonotum with lateral spots broadly fused with supra-alar one (Figs. 56-57); arista with longest hairs longer than basal diameter of arista;  $t_1$  with 1 distinct *ad*. . . . . 3. *procellaris* Rondani
- 5. Mesonotum with presutural spots expanded to 2nd *pre-dc*, and with postsutural band rather distinctly protruded cephalad at middle (Figs. 154-155). . . . . 5. *latifasciata* sp. nov.

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\* The female of *pectoralis* is unknown.

- Mesonotum with presutural spots not expanded to 2nd *pre-dc* or entirely lacking, and with postsutural band hardly or never protruded cephalad. .... 6
- 6. Mesonotum with presutural spots always present and usually connected to each other anteriorly by a darkening shift of the space between the spots (Figs. 186-187); scutellum almost wholly darkened. .... 7. *plumiseta* Stein
- Mesonotum with presutural spots sometimes present, restricted around 1st *pre-dc* and not connected to each other (Fig. 192); scutellum broadly greyish on apical half or more. .... 8. *illocata* Walker

DESCRIPTIONS OF THE SPECIES

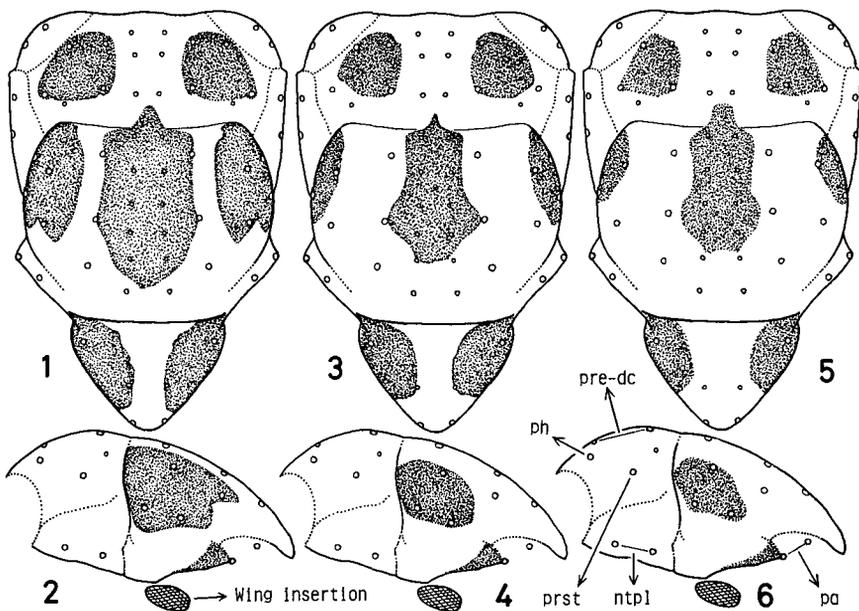
1. *Anthomyia pluvialis* (Linné, 1758)  
(Figs. 1-17)

*Anthomyia imbrida* Rondani sensu Fan, 1965 : 38.  
*Anthomyia pluvialis* : Michelsen, 1980 : 285.

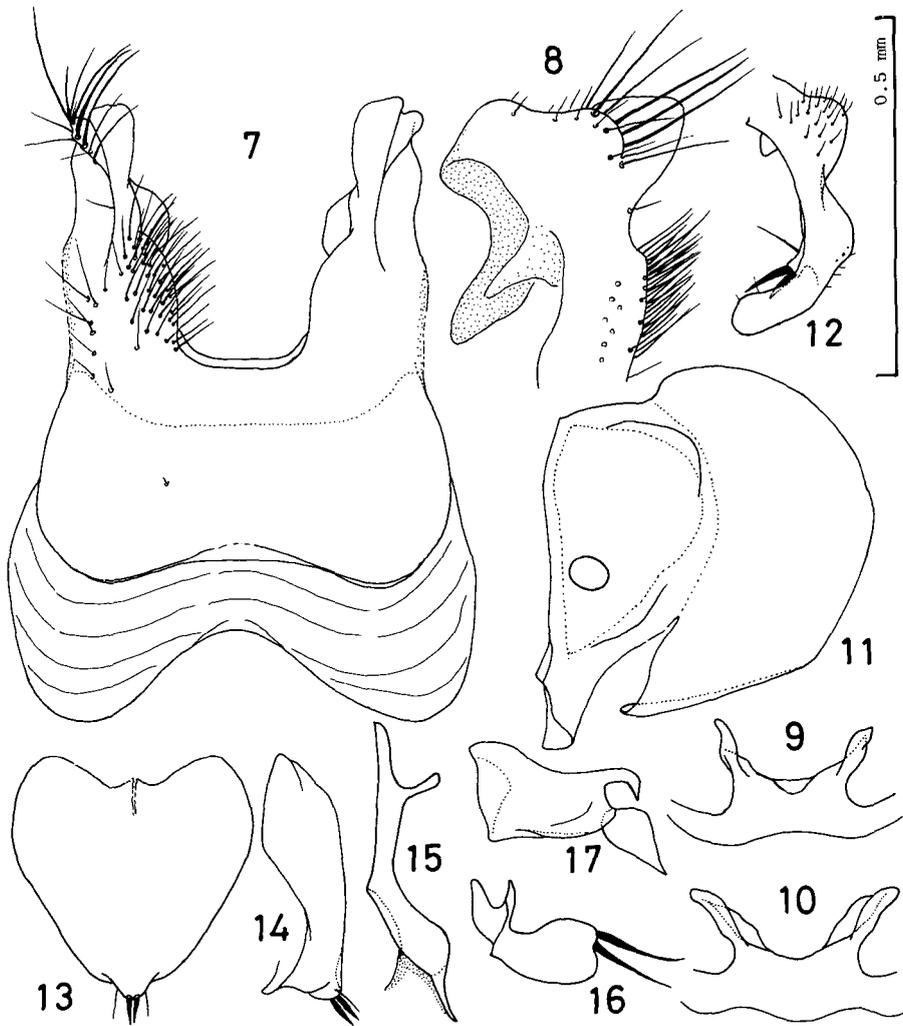
Material examined. U.S.S.R. Kazakhstan : - Alma-Ata, 1 ♀, 7. v. 1953, G. Victorov (MSU).

♂. No Asian male representatives have been examined by myself.

♀. Mesonotum with postsutural dark markings widely separated into 5 spots, namely, large median and lateral spots and small supra-alar ones (Figs. 5-6). Arista with longest hairs clearly shorter than basal diameter of arista. Mesonotum with *pra* slightly shorter than posterior *ntpl*. Fore tibia with no *ad* and 1 *pv*; *t*<sub>2</sub> with 1 *ad*, 1 (on left leg) or 2 *pd* and 2 *pv*; *t*<sub>3</sub> with 1 *av*, 2 (1 more additional on left leg) *ad*,



Figs. 1-6. *Anthomyia pluvialis*, ♂ (1-2) and ♀ (3-6). 1, 3, 5, mesonotal pattern, dorsal view; 2, 4, 6, ditto, lateral view. Presutural markings are omitted in lateral view (same in the succeeding figures). England (1-2), Spain (3-4) and Alma-Ata (5-6).



Figs. 7-17. *Anthomyia pluvialis*, ♂. 7, 5th sternite, ventral view; 8, ditto, lateral view; 9-10, median process of 6th sternite; 11, pregenital sclerite, left lateral view; 12, surstylus, lateral view; 13, cercal plate, dorsal view; 14, ditto, lateral view; 15, distiphallus; 16, praegonite; 17, postgonite. Stalingrad (7-9, 11-17) and England (10).

2 *pd* and no *pv*.

Distribution. Palaearctic region; India; ? North America. According to Michelsen (1980) and Ackland (in litt.) *A. pluvialis* occurs in Europe, N. Africa, Mongolia and India. I have also examined some specimens from Algeria, Catania, Budapest, Moscow and Stalingrad (= Volgograd). Judging from the figures of the mesonotal pattern and of the male genitalia, *A. imbrida* sensu Fan, 1965, from Sinkiang and Inner Mongolia, China, may be identical with *pluvialis*. This species has not been found in Japan. *A. pluvialis* sensu Suwa, 1974, from Japan is a distinct species, which is described as new to science in the following lines. I have little to

say on the record from North America.

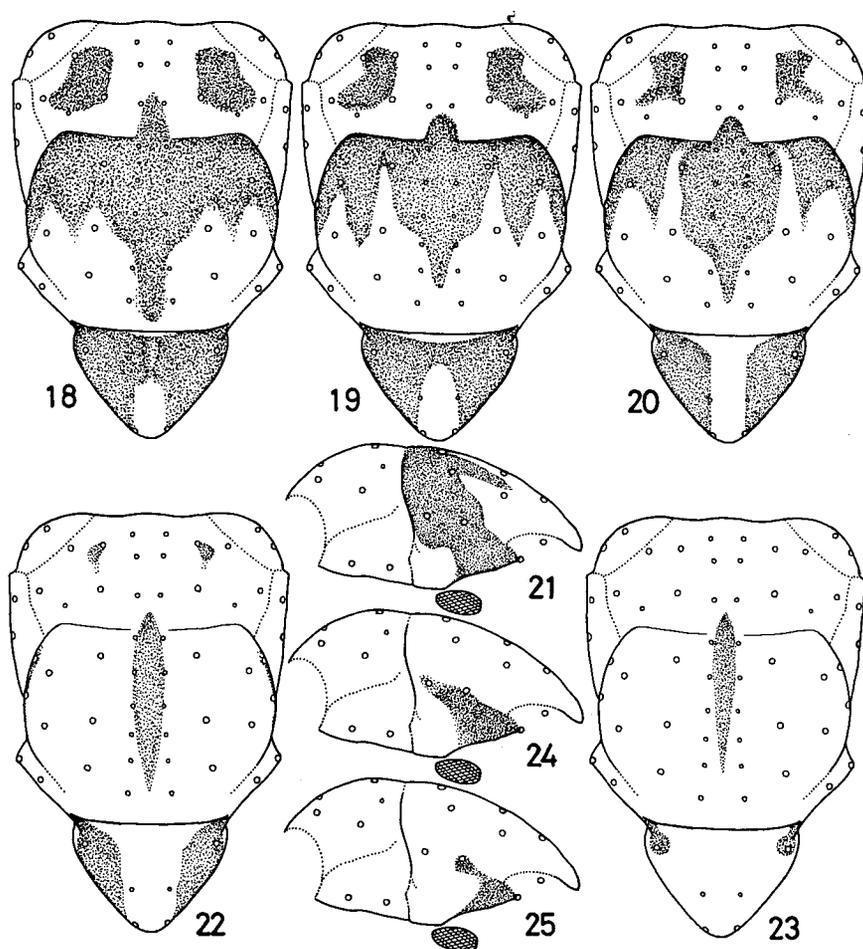
2. *Anthomyia avisignata* sp. nov.

(Figs. 18-40)

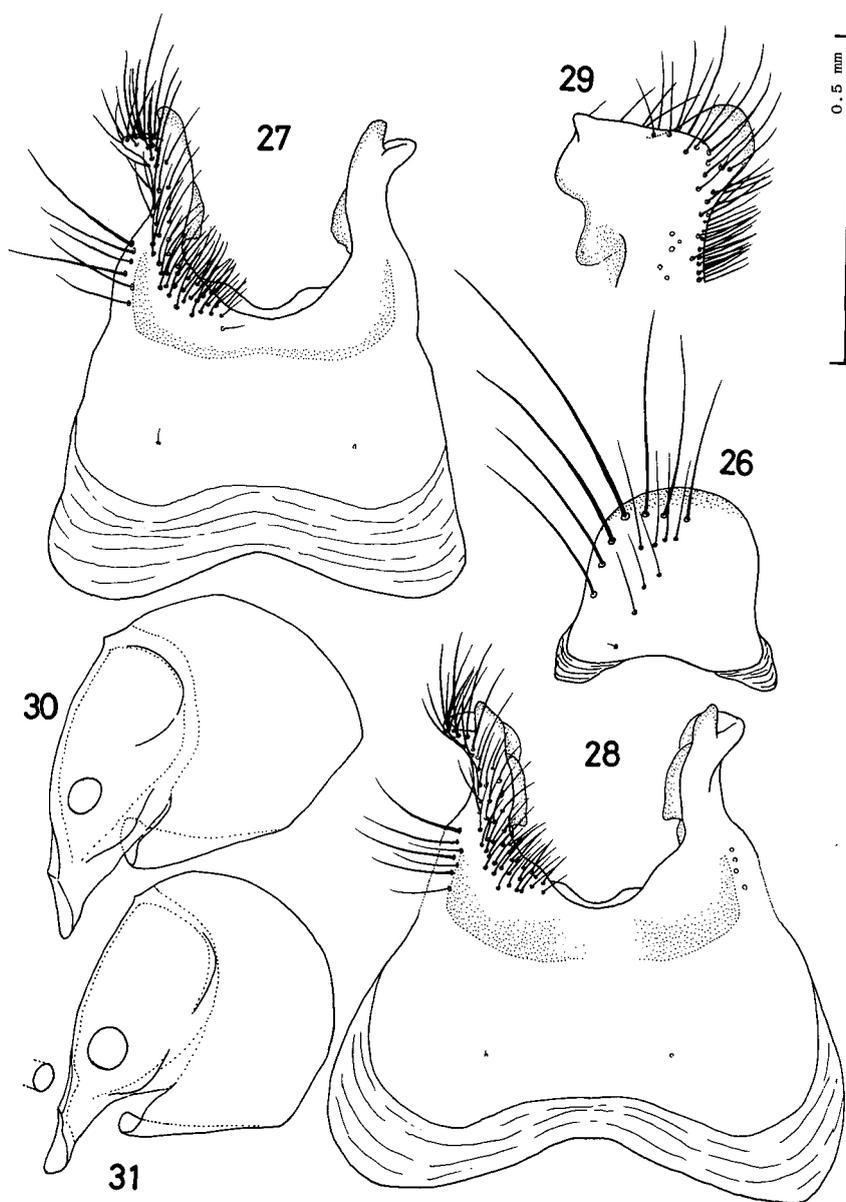
*Anthomyia pluvialis* (Linné) sensu Suwa, 1974 : 48.

*Anthomyia* sp. : Suwa & Park, 1982 : 502.

Type material. *Japan*. Hokkaidô : - Sapporo, 1♂, 5. vi. 1916, S. Kuwayama ; ditto, 2♂, 14. v. 1985, 1♂, 4♀, 28. v. 1985, and 2♀, 27. vi. 1985, T. Nikkuni ; Teine, Sapporo, 1♀, 15. v. 1959, S. Ueda ; Nopporo, 1♂, 6. v. 1968, 1♂, 1♀, 14. v. 1969 (BMNH), 12♂ (one the holotype), 25. v. 1970, 3♂, 3. vi. 1973, and 1♂, 10. vi. 1975, M. Suwa ; Asahikawa, 1♀, 7. viii. 1979 and 5♀, 6. ix. 1979, T. Inaoka. Honshû : - Mt.



Figs. 18-25. *Anthomyia avisignata*, ♂ (18-21) and ♀ (22-25). 18-20, 22-23, mesonotal pattern, dorsal view ; 21, 24-25, ditto, lateral view. Holotype from Nopporo (18) and paratypes from Nopporo (19, 21), Sapporo (22, 24), Itayanagi (20) and Urabandai (23, 25). Japan.



Figs. 26-31. *Anthomyia avisignata*, ♂. 26, 4th sternite; 27-28, 5th sternite, ventral view; 29, ditto, lateral view; 30-31, pregenital sclerite, lateral view, 6th spiracle also shown in Fig. 31. Holotype from Nopporo (28) and paratypes from Sapporo (26-27, 29; 31) and Nopporo (30). Japan.

Iwaki, Aomori-ken, 1 ♀, 31. vii. 1966, S. Fukushi; Itayanagi, Aomori-ken, 1 ♂, 19. v. 1968, S. Fukushi; Hirosaki, Aomori-ken, 1 ♂, 5. vii. 1965, 2 ♀, 18-20. vii. 1965, 1 ♂, 22. v. 1971, and 2 ♀, 29. vii. 1981, S. Fukushi (SF and EIHU); Urabandai, Fukushima-ken, 1 ♀, 2. ix. 1966, M. Suwa; Aoki-ko, Nagano-ken, 2 ♂, 25. vii. 1975, H. Kurahashi (HK and EIHU); Mt. Asama, Nagano-ken, 1 ♂, 11. viii. 1976, H. Kurahashi (HK);

Ina, Nagano-ken, 1♂, 27. vii. 1971, S. Shinonaga (TMDU). *Korea*. Jeju-do : - Gwanumsa, 1♂, 17. vi. 1973, J.S. Park. *U.S.S.R.* Primorskij Kraj : - 40 km south-east of Ussurijsk, 1♂, 27. vi. 1985, A. Ozerov (MSU).

Other material examined. *Japan*. Hokkaidô : - Nopporo, 1♂, 25. v. 1970 and 1♂, 10. vi. 1975, M. Suwa (HNHM and DMA).

♂. Body-length 4-6.2 (usually 5-6) mm ; wing-length 3.6-5.3 mm. Mesonotum (Figs. 18-21) with dark markings rather densely brownish pollinose and obscurely margined, becoming black in caudal angle of view ; presutural spots moderate to large, or sometimes rather small and fine ; median spot longitudinally protruded at middle especially caudad ; lateral spots deeply cleft on posterior margin at row of *ia*, slightly to broadly fused with median spot and broadly fused with supra-alar one ; scutellum with lateral spots widely separated from each other, or narrowly to rather broadly fused on anterior half of scutellum. Abdomen with median vitta narrower than  $f_3$ -height and gradually tapering caudad, usually rather obscure on 2nd tergite ; lateral triangular spots completely separated from median vitta, or narrowly to rather broadly fused with the vitta on 3rd and 4th tergites anteriorly.

Frons as wide as or slightly to distinctly narrower, rarely a little wider, than anterior ocellus ; parafrontals usually contiguous ; arista with longest hairs usually a little longer than basal diameter of arista, sometimes twice as long as the diameter.

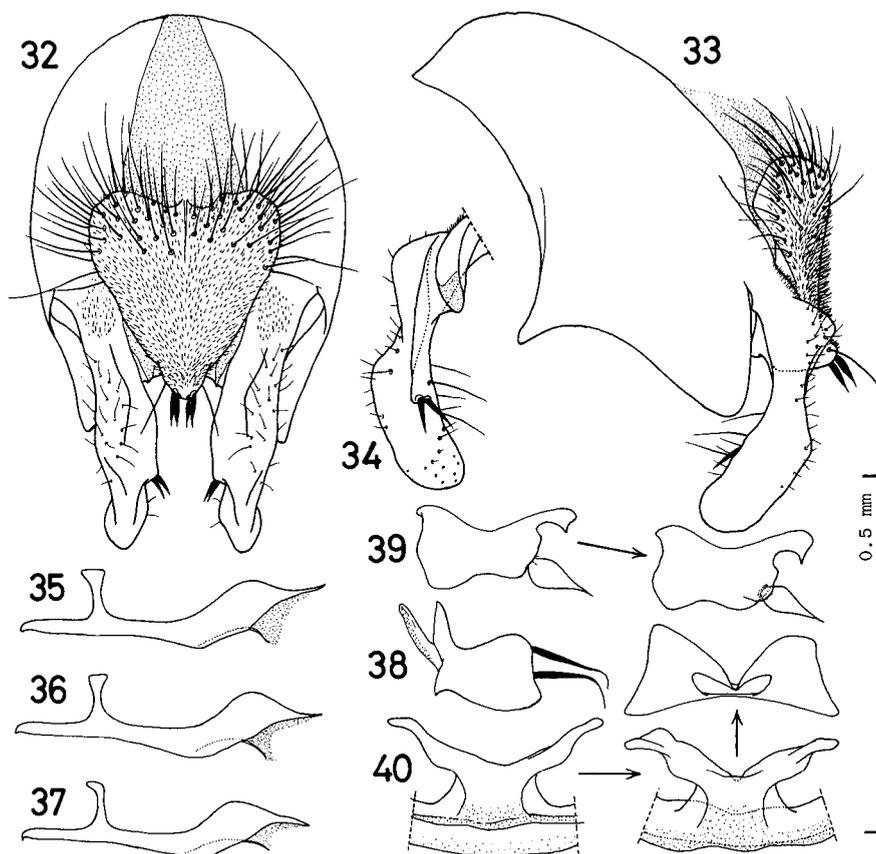
Mesonotum sparsely setulose, with 0-3 setulae between the level of *prst* and notopleuron ; *pra* as long as or a little shorter, sometimes slightly longer, than posterior *ntpl* ; mesopleura with 1-4 (usually 2-3) accessory setulae near *pstg* ; *stpl* 2 : 2, lower anterior much weaker than the upper ; scutellum on dorsum very sparsely setulose, at most with about 5 setulae towards each lateral margin.

Abdomen with 6th and 7th spiracles, especially 7th ones, much enlarged (Figs. 30-31) ; 4th sternite about as long as wide, with basal apodeme developed and widely divided (Fig. 26) ; 5th sternite with processes concave or only a little convex on basal inner margin, and with inner series of setae continuous (Figs. 27-29) ; median process of 6th sternite with wide and short stem and with well developed distal lobes (Fig. 40) ; cercal plate rather evenly narrowing apicad in dorsal view, with 1 pair of slender setae near apex (Fig. 32) ; surstylus hardly tapering apicad on apical half in profile (Fig. 33) ; distiphallus with dorsal projection set apart from base by a distance longer than the projection (Figs. 35-37) ; praegonite more or less rounded at posterior corners, with setae about as long as the gonite (Fig. 38) ; postgonite hardly protruded at lower posterior corner, inside with a blade-like seta just near the corner (Fig. 39).

Fore tibia with 1 or rarely 2 *pv* ;  $t_2$  with 1 *ad*, 2 *pd* and 2 or sometimes 3 *pv* ;  $t_3$  with 1 *av*, 2 long and 1-6 (usually 3-4) shorter *ad*, 2 long and often 1-2 additional *pd* and a few or some fine *pv*.

♀. Mesonotum with dark markings much reduced (Figs. 22-25) ; presutural spots very small, sometimes hardly discernible or completely lacking ; lateral spots much reduced and absorbed into supra-alar one, the resultant supra-alar spot reaching to *sa* or even to *pra* ; scutellum with lateral spots usually reaching to apical setae or nearly so, sometimes much more reduced and restricted to areas around basal setae (Fig. 23).

Fore tibia with 1 distinct *ad* and 1 *pv* ;  $t_2$  with 1 *ad*, 2 *pd* and 2 *pv* ;  $t_3$  with 1 *av*, 5 or rarely 6 *ad*, 2 *pd* and no *pv*, sometimes 1 or 2 fine *pv* discernible.



Figs. 32-40. *Anthomyia avisignata*, ♂. 32, hypopygium, dorsal view; 33, ditto, lateral view; 34, surstylus, inside view; 35-37, distiphallus; 38, praegonite; 39, postgonite; 40, median process of 6th sternite. Holotype from Nopporo (32-35, 38-39) and paratypes from Nopporo (36, 40) and Sapporo (37). Japan.

Distribution. Japan (Hokkaidô and Honshû); Korea; Ussuri.

Remarks. This species is closely related to *pluvialis* by having the following characters in the male: - Abdomen with enlarged 6th and 7th spiracles; praegonite with more or less rounded posterior corners and with rather short setae; distiphallus with dorsal projection situated at a distance from base. *A. avisignata* has, however, a different mesonotal pattern and longer aristal hairs, and also differs in having the following characters: - In the male, median process of 6th sternite with stem somewhat narrower and longer; 5th sternite with processes less convex on basal inner margin, and with inner series of setae continuous; cercal plate narrower near apex; surstylus less concave at inner base in dorsal view, and broader on apical half in profile, with spine-like setae weaker; praegonite with setae wider apart from each other; postgonite with a narrower seta. This species has not yet been found sympatrically with *pluvialis*.

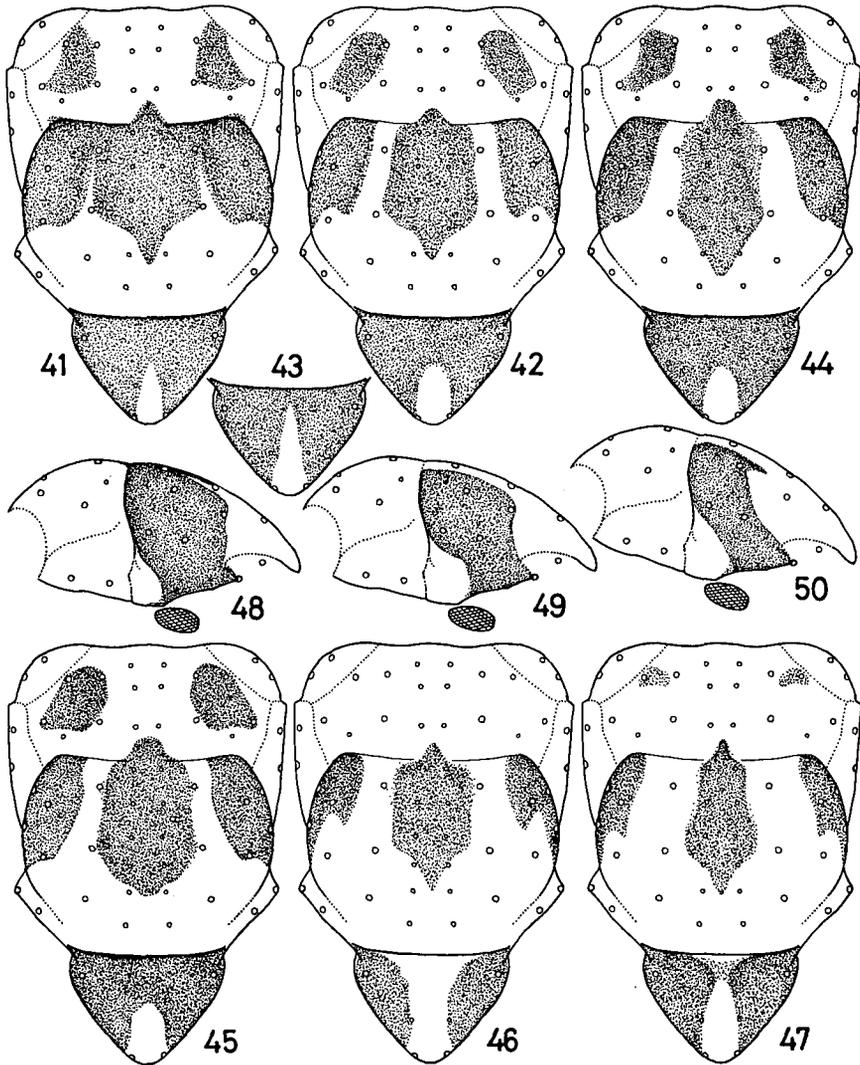
3. *Anthomyia procellaris* Rondani, 1866

(Figs. 41-97)

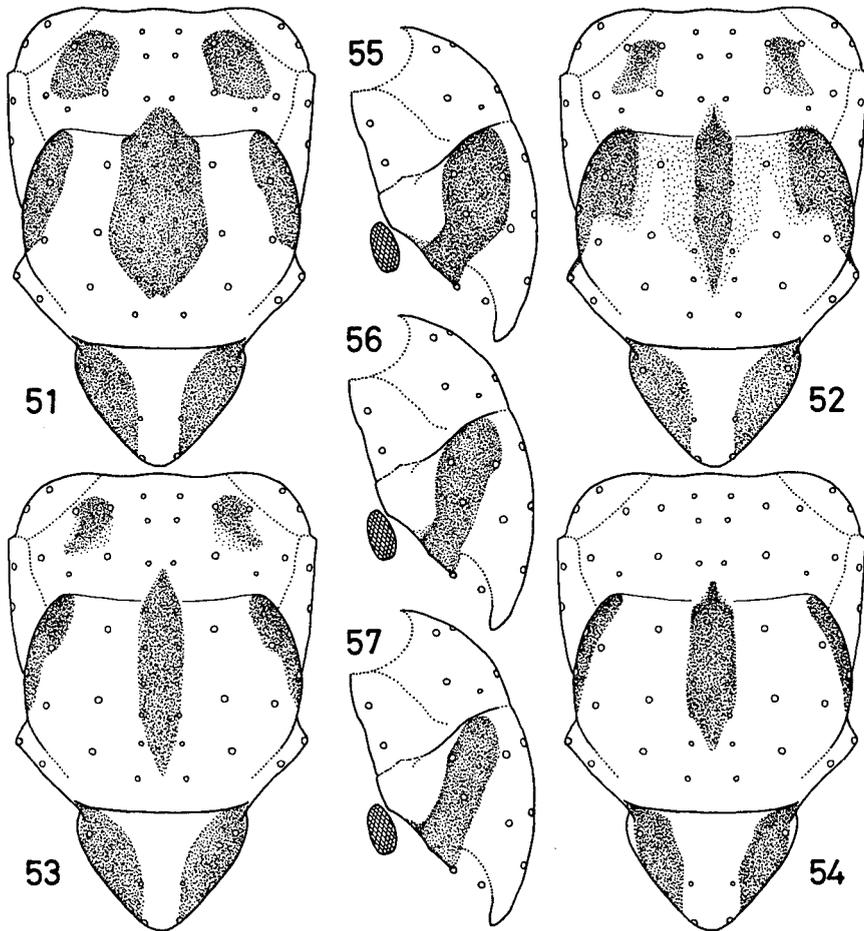
*Anthomyia pluvialis* var. *procellaris* : Tiensuu, 1935 : 13.

*Anthomyia procellaris* : Steyskal, 1967 : 240 ; Suwa, 1974 : 49 ; Michelsen, 1980 : 286.

Material examined. *Japan*. Hokkaidô : - Sapporo, 6♂, 2. vi. 1968, K. Kusigemati (1♂ in DMA, 1♂ in HNHM, others in EIHU) ; Mt. Soranuma, 1♂, 24.



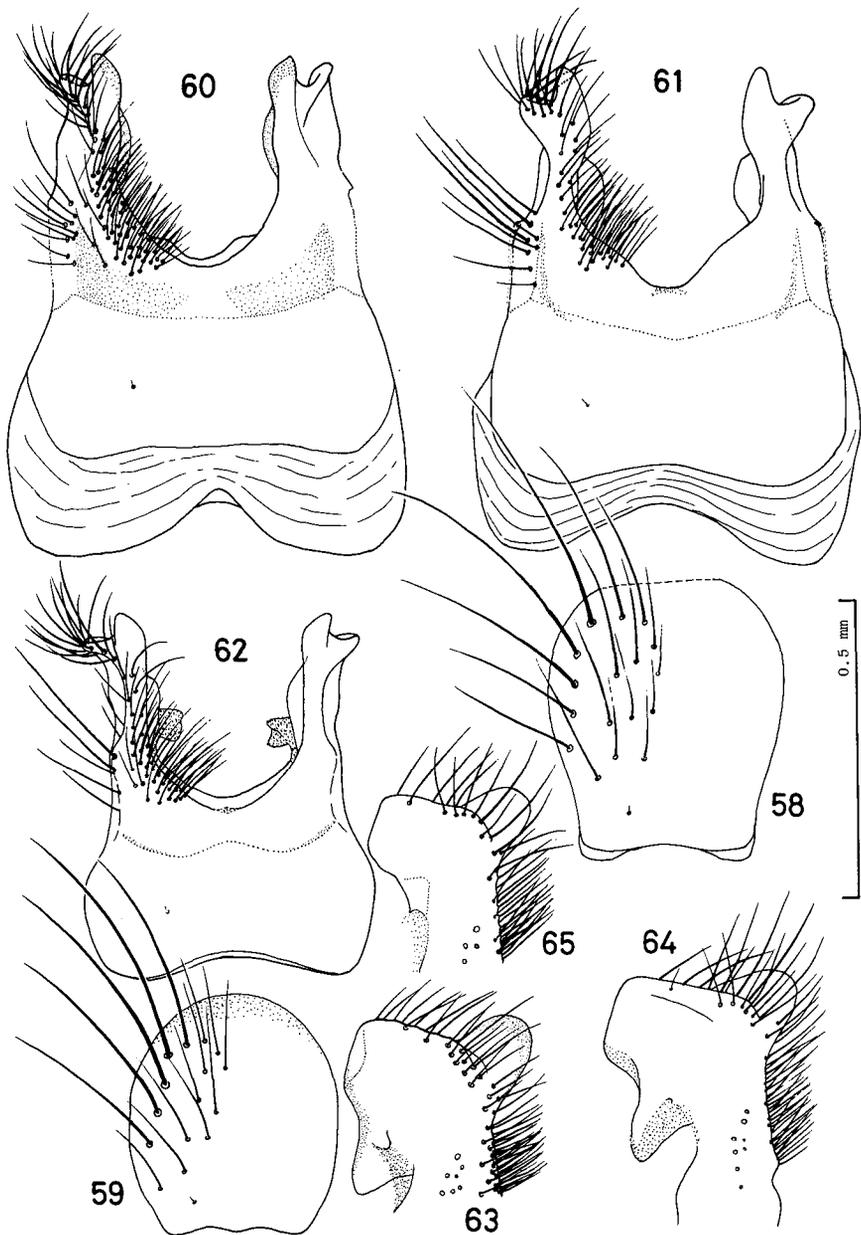
Figs. 41-50. *Anthomyia procellaris*, ♂. 41-47, mesonotal pattern, dorsal view ; 48-50, ditto, lateral view. Japan (41, 48 ; 42 ; 43, all from Sapporo), Korea (44), England (45, 49) and Ussuri (46, 50 ; 47).



Figs. 51-57. *Anthomyia procellaris*, ♀. 51-54, mesonotal pattern, dorsal view; 55-57, ditto, lateral view. England (51, 55), Japan (52, Takao-san; 53, 56, Jōzankei) and Ussuri (54, 57).

vi. 1985, M. Suwa; Jōzankei, 1 ♀, 26. v. 1968, K. Kusigemati. Honshū: - Takao-san, Tōkyō-to, 1 ♀, 23. v. 1967, M. Suwa. Korea. Kangweon: - Seolag-san, 1000-1300 m, 1 ♂, 27. v. 1982, T. Fujisawa. U.S.S.R. Primorskij Kraj: - 40 km southeast of Ussurijsk, 3 ♂, 2 ♀, 26. viii. 1984 (eggs), 17-19. ix. 1984 (emerged), A. Ozerov (1 ♂, 1 ♀ in EIHU, others in MSU).

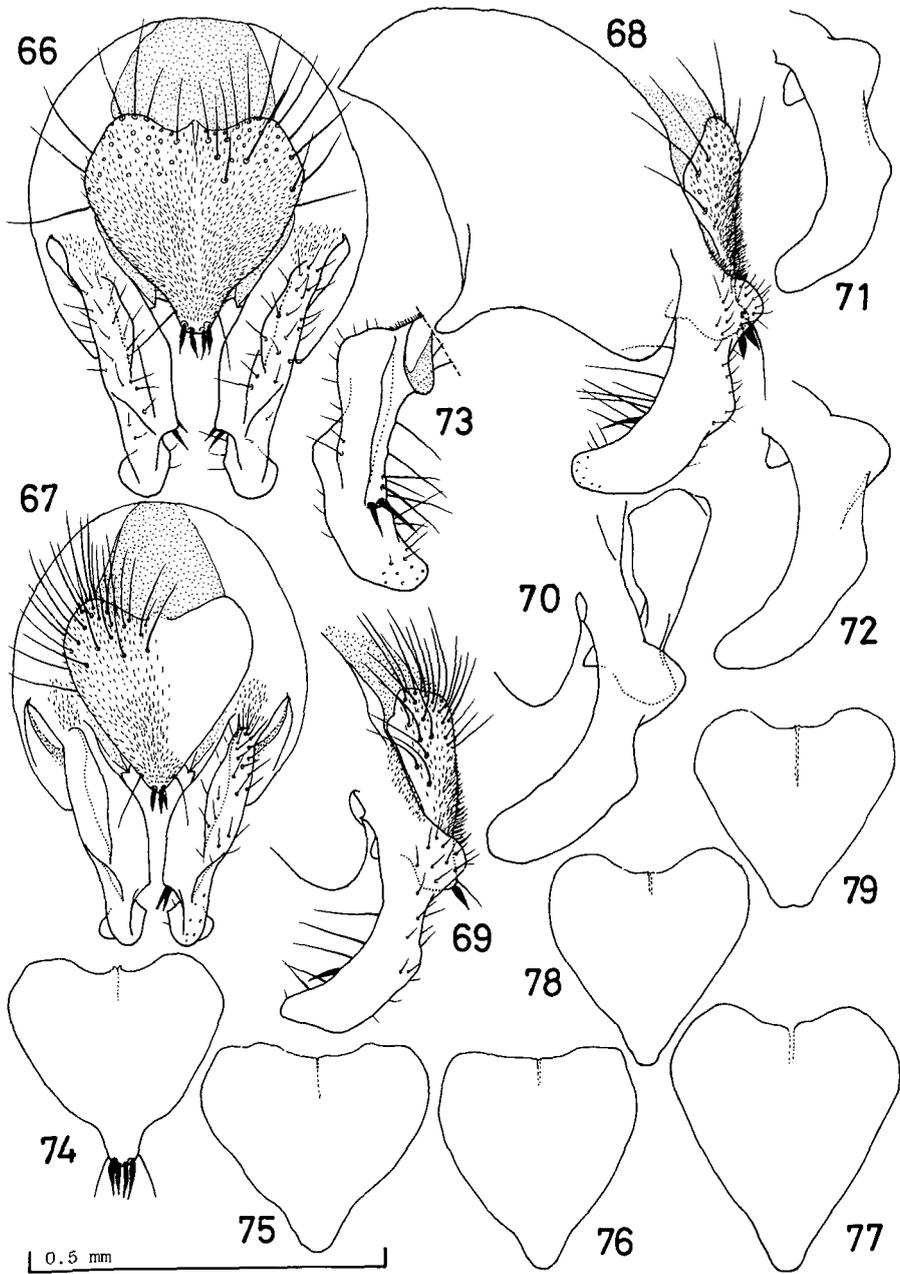
♂. Mesonotum with dark markings less sharply margined than in the European form, and variable in development (Figs. 41-44, 46-48 & 50; cf. Figs. 45 & 49, England); presutural spots large and distinct in the Japanese and Korean specimens, yet much reduced and only discernible in certain angle of view (Fig. 47) or completely lacking (Fig. 46) in the specimens from Ussuri; median spot often narrowly fused with lateral ones anteriorly (Japan), or widely separated (Ussuri); lateral spots expanded to 2nd *ia* or nearly so (Japan and Korea), or much less developed (Ussuri), and always broadly fused with supra-alar spot; scutellum largely blackish and with median grey area not reaching to base (Japan and Korea), or broadly greyish



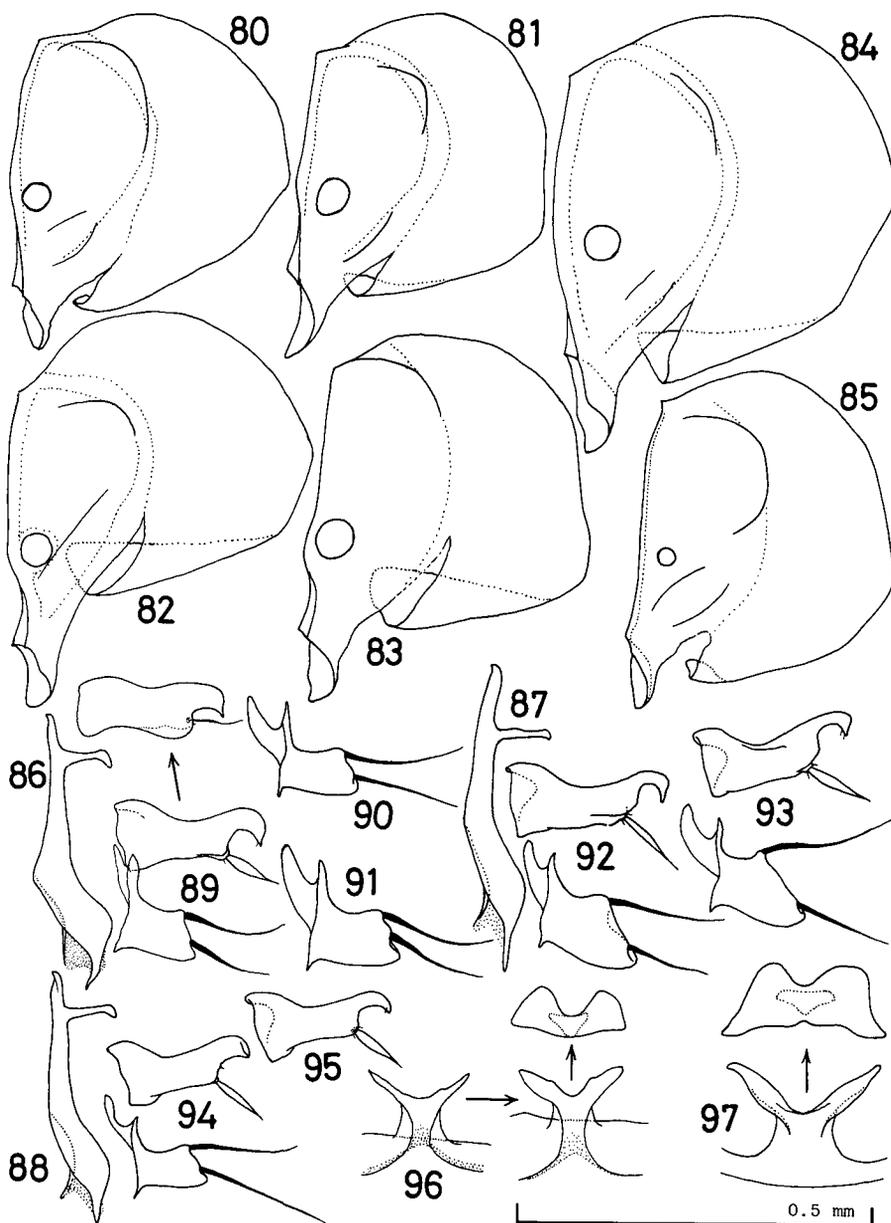
Figs. 58-65. *Anthomyia procellaris*, ♂. 58-59, 4th sternite; 60-62, 5th sternite, ventral view; 63-65, ditto, lateral view. Japan (58, 61, 64, Sapporo), Ussuri (59, 62, 65) and Europe (60, 63).

medianly and with lateral spots widely separated or rather obscurely fused near base (Ussuri).

Frons distinctly (Japan) or very slightly (Korea) narrower than, or about as wide as (Ussuri), anterior ocellus; parafrontals contiguous for a considerable length;



Figs. 66-79. *Anthomyia procellaris*, ♂. 66-67, hypopygium, dorsal view; 68-70, ditto, lateral view; 71-72, surstylus, lateral view; 73, ditto, inside view; 74-79, cercal plate. Europe (66, 68, 73), Netherlands (71), Moscow (79), Ussuri (67, 69; 78), Japan (70, 74, Sapporo; 75, Sapporo; 76, Mt. Soranuma) and Korea (77).



Figs. 80-97. *Anthomyia procellaris*, ♂. 80-85, pregenital sclerite, lateral view; 86-88, distiphallus; 89, 92-94, praegonite and postgonite; 90-91, praegonite; 95, postgonite; 96-97, median process of 6th sternite. Europe (86, 89), Netherlands (80), Moscow (81, 90), Ussuri (85; 88, 94, 96; 95), Korea (84, 91) and Japan (82, 87, 92, 97, Sapporo; 83, Mt. Soranuma; 93, Sapporo).

arista with longest hairs about as long as to slightly longer than (Japan), distinctly longer than (Korea), or about twice as long as (Ussuri) basal diameter of arista. Mesonotum with *pra* slightly to distinctly longer than posterior *ntpl*.

Abdomen with 6th and 7th spiracles a little (Ussuri) or much (Japan and Korea) enlarged (Figs. 82-85, showing 7th only); 5th sternite with processes concave or at most slightly convex on basal inner margin (Figs. 61-62); cercal plate rather variable in outline, hardly to distinctly concave on lateral margins near apex (Figs. 67 & 74-78); surstylus in profile with apical half usually rather well maintained throughout in width (Japan, Fig. 70), or somewhat narrowing apicad (Ussuri and Korea, Figs. 69 & 72); distiphallus with dorsal projection set apart from base by a distance as long as or shorter than the projection.

Mid tibia with 1 *ad*, 2 *pd* and 2 (Japan and Korea) or 2-4 (Ussuri) *pv*;  $t_3$  with 1 (Japan and Korea) or 1-3 (Ussuri) *av*, 5-9 *ad*, 2 long and usually 1-2 additional *pd*, and 3-9 *pv*.

♀. Mesonotum with dark markings much reduced (Figs. 52-54 & 56-57). Arista somewhat longer pubescent than in male. Fore tibia with 1 distinct *ad* and 1 *pv*;  $t_2$  with 1 *ad*, 2 *pd* and 2 *pv*;  $t_3$  with 1 (2 in 1 Ussuri specimen) *av*, 5-6 *ad*, 2 (2-3 in Ussuri specimens) *pd* and no *pv*.

Distribution. Holarctic region.

Remarks. In having the much reduced dark markings on the female mesonotum, the surstylus usually less tapering apicad in profile, and the praegonite more retreated on upper side, the Japanese form is different from the European form of *procellaris*, yet it agrees well with the latter in most other features. The Korean form, represented by only 1 male specimen available, is similar to the Japanese one in the mesonotal pattern, yet agrees better with the European form in other aspects. The Ussuri form is slightly different from the Korean one in the vanishment of the presutural spots on the mesonotum and the secondary reduction of the 6th and 7th spiracles of the male abdomen. Thus the differences among these forms are not enough to separate any of them as distinct from the others, and may be referred to geographical variations.

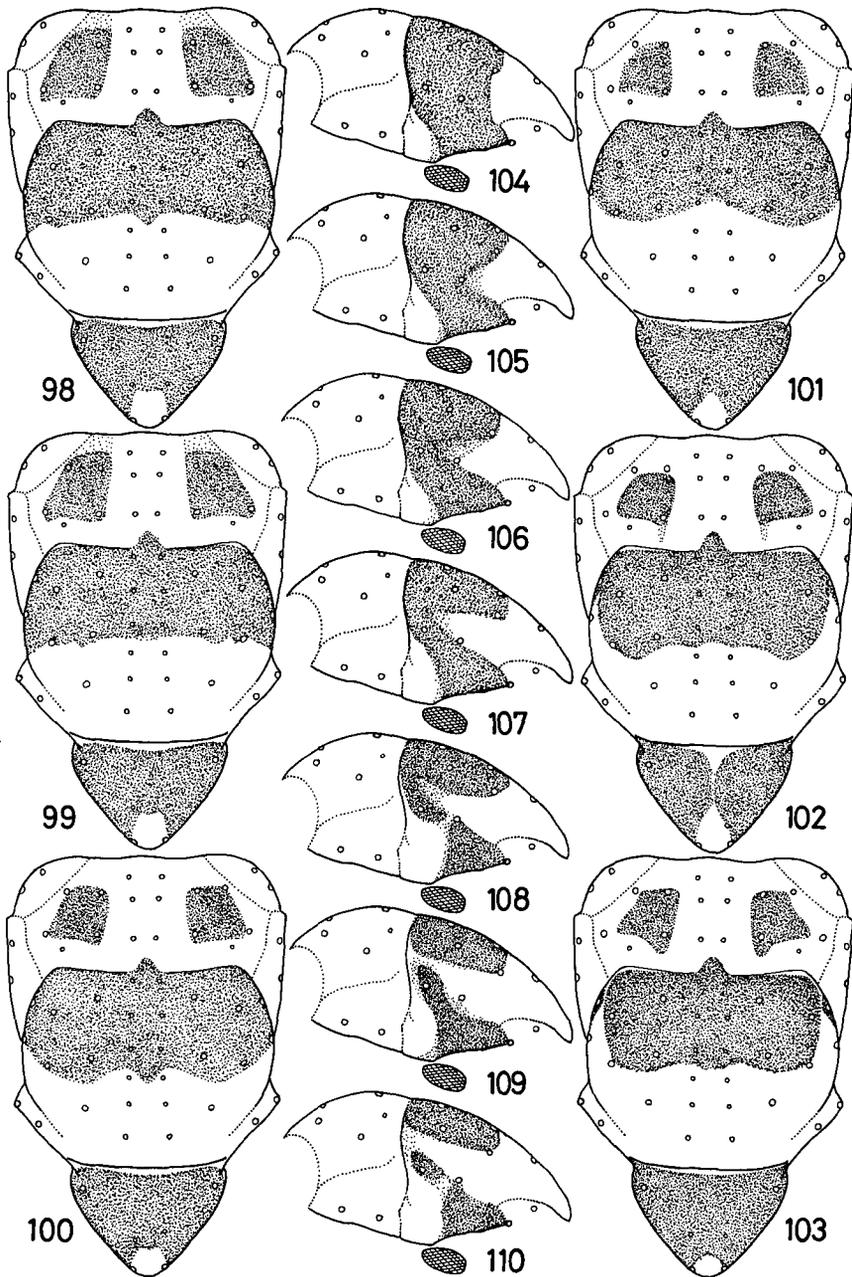
#### 4. *Anthomyia koreana* Suh & Kwon, 1985 (Figs. 98-110 & 116-137)

*Anthomyia koreana* Suh & Kwon, 1985: 170.

Material examined. *Korea*. Kangweon: - Seolag-san, 600-1000 m, 31♂, and 1000-1300 m, 3♂, 2♀, 24-27. v. 1982, M. Suwa; Odae-san, 1300-1550 m, 51♂, 29-30. v. 1982, M. Suwa & T. Fujisawa. Taegu: - Palgon-san, 400-600 m, 1♂, 4. vi. 1982, M. Suwa. Kyeongnam: - Jiri-san, 800 m, 1♂, 6-7. vi. 1982, M. Suwa; Kaya-san, 800-1000 m, 68♂, 6♀, 9. vi. 1982, M. Suwa; ditto, 4♂, 8. vii. 1982, J.L. Kim.

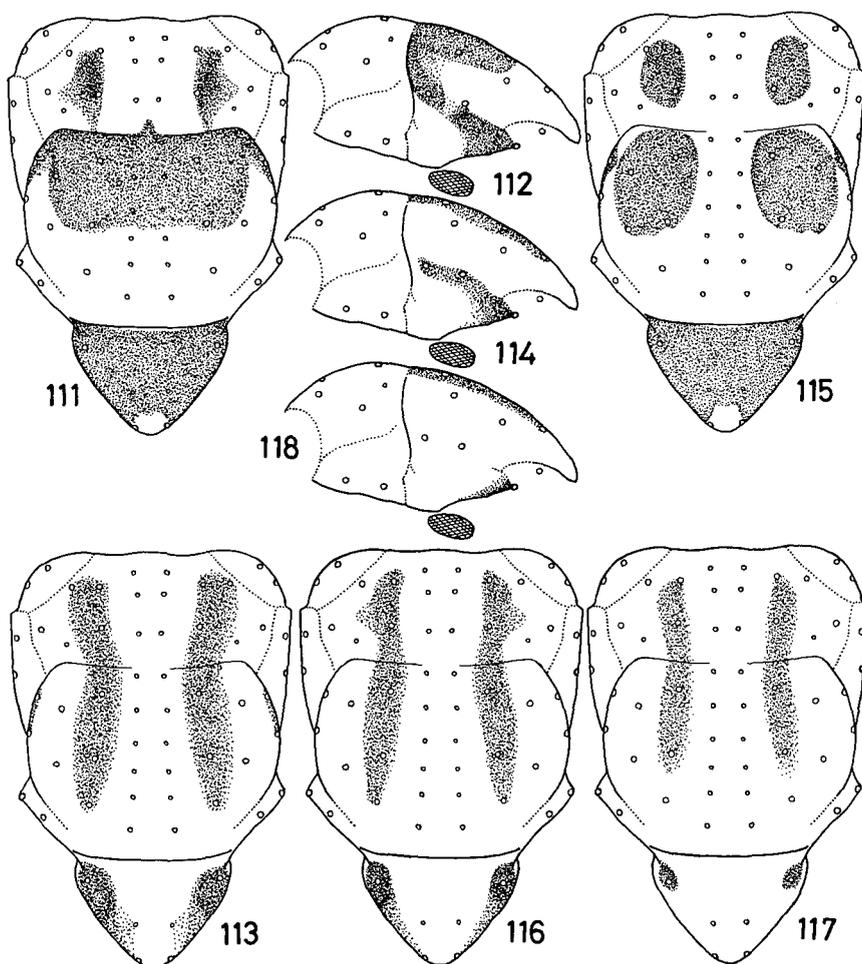
♂. Variable in body-size and mesonotal pattern. Body-length 4.2-6.8 mm; wing-length 3.6-6 mm. Mesonotum showing gradual variation in development of dark markings (Figs. 98-110); postsutural spots completely fused in a broad transverse band in one extreme (most of the large specimens and some smaller ones), and variously retreated between *ia* and *sa* to the extent of complete interruption; scutellum largely blackish, with a small grey spot at apex and usually also with a very narrow grey band along basal margin, these greyish areas being rarely connected (Fig. 102).

Frons about one-third to the full width of anterior ocellus, relatively wide in



Figs. 98-110. *Anthomyia koreana*, ♂. 98-103, mesonotal pattern, dorsal view; 104-110, ditto, lateral view. Korea.

smaller specimens; parafrontals contiguous; arista with longest hairs slightly to much longer than basal diameter of arista, about twice as long as the diameter in large specimens. Mesonotum with 0-3 (rarely to about 5) accessory setulae between rows of *pre-acr*; *pra* somewhat longer than, rarely as long as or slightly shorter



Figs. 111-118. *Anthomyia* spp., mesonotal pattern in dorsal view (111, 113, 115-117) and in lateral view (112, 114, 118). 111-112, *oculifera*, ♂, Canada; 113-114, ditto, ♀, Canada; 115, *plurinotata*, ♂, Hungary; 116-118, *koreana*, ♀, Korea.

than, posterior *ntpl*.

Abdomen with some characters shown in Figs. 119-137; 6th and 7th spiracles only a little larger than preceding ones; 5th sternite with apical lobes small, inner series of setae continuous, and basal inner margin of each process hardly convex; cercal plate narrowing apicad in various degrees, with usually 2 pairs of slender setae near apex; praegonite squarish, with setae situated in upper half of posterior margin; postgonite protruded in a lobe at lower posterior corner, with an unexpanded seta behind the lobe; distiphallus with dorsal projection set apart from base by a distance longer than the projection.

Fore tibia with 1 or rarely 2 *pv*;  $t_2$  with 1 *ad*, 1 or quite rarely 2 *pd* and 2-4 (rarely 5) *pv*;  $t_3$  with 1 *av*, 5-9 *ad*, 2 long and usually 1 additional *pd*, and 3-10 *pv*.

♀. Mesonotum with colour pattern quite different from that of male, with a pair of longitudinal dark vittae along rows of *dc* from 1st *pre-dc* to 2nd or 3rd *post-dc*

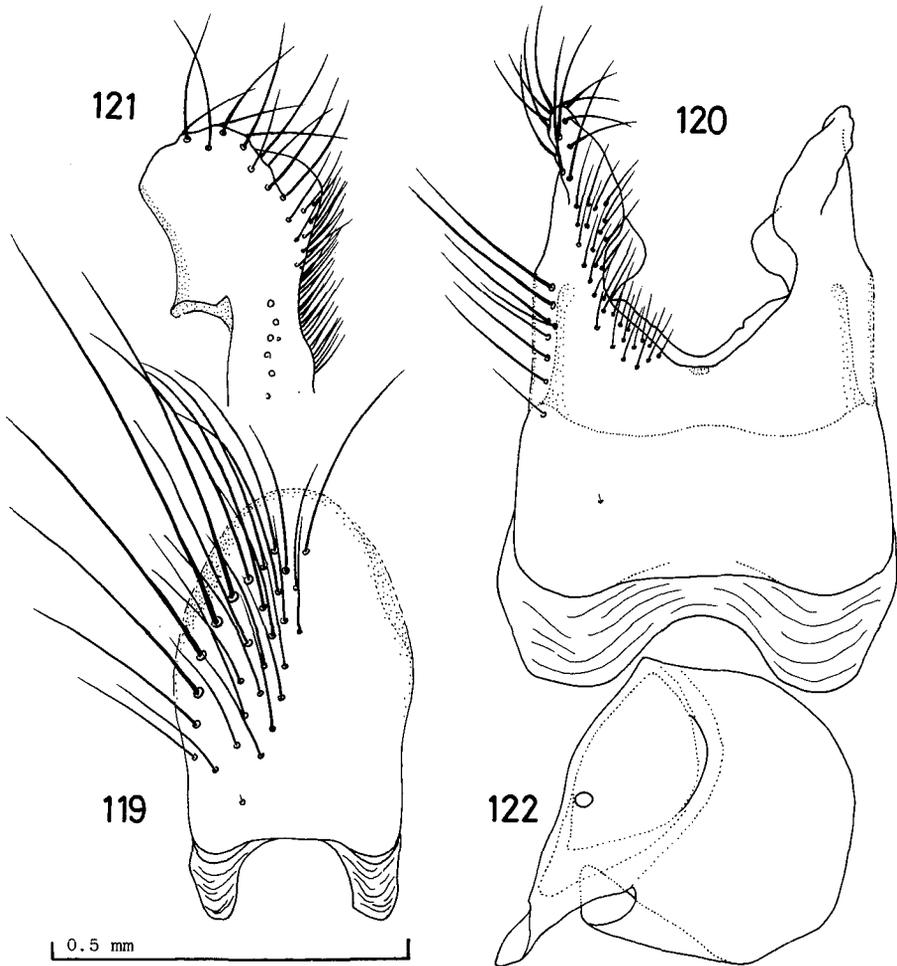
(Figs. 116-117), and with supra-alar spots restricted at lateral margins, not extending upwards (Fig. 118) ; scutellum with lateral spots restricted around basal setae in any angles of view, or extending to apical setae in caudal view.

Fore tibia with 1 *ad* and 1 *pv*, 1 strong *pd* being present on left leg in 1 specimen ;  $t_2$  with 1 *ad*, 2 *pd* and 2 (3 on left leg in 1 specimen) *pv* ;  $t_3$  with 1 *av*, 5-7 *ad*, 2 and sometimes 1 additional *pd*, and no *pv* (1 fine *pv* discernible in 1 specimen).

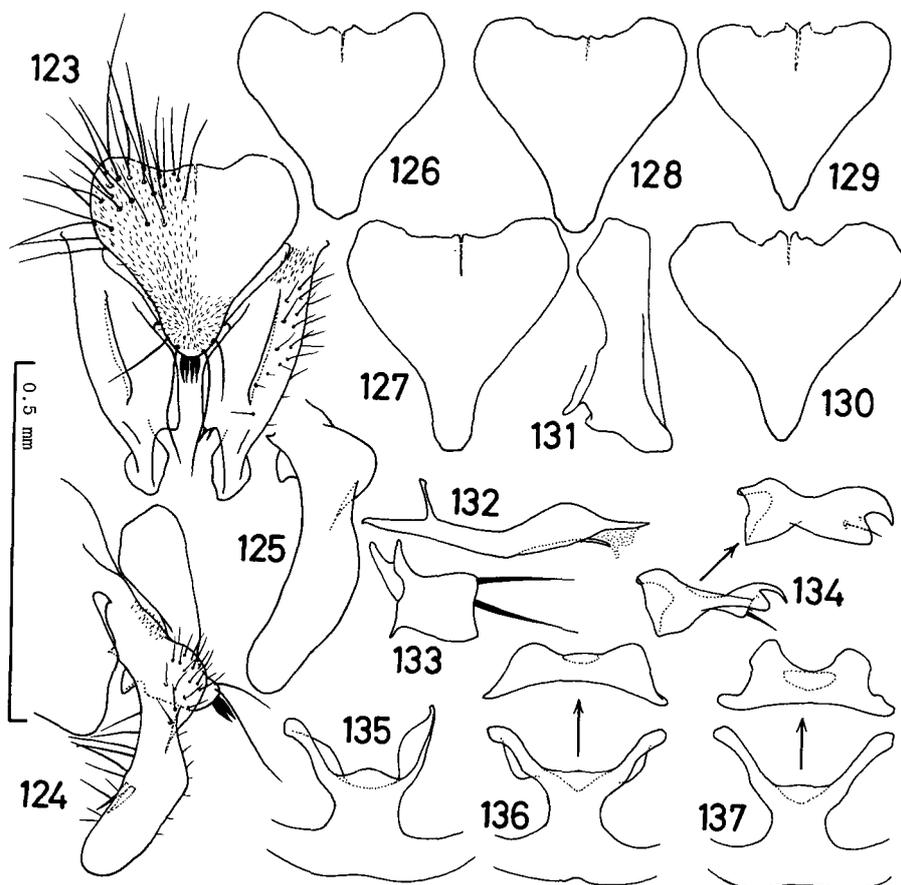
Distribution. Korea.

Remarks. The male specimens examined are rather remarkably variable in the mesonotal pattern, yet the variation is gradual and no significant differences are seen in other features. These specimens are, therefore, considered to belong to a single species, and are referred to *koreana* by the genital structures agreeing with Suh & Kwon (1985).

Excepting male specimens with less retreated dark band on the mesonotum, A.

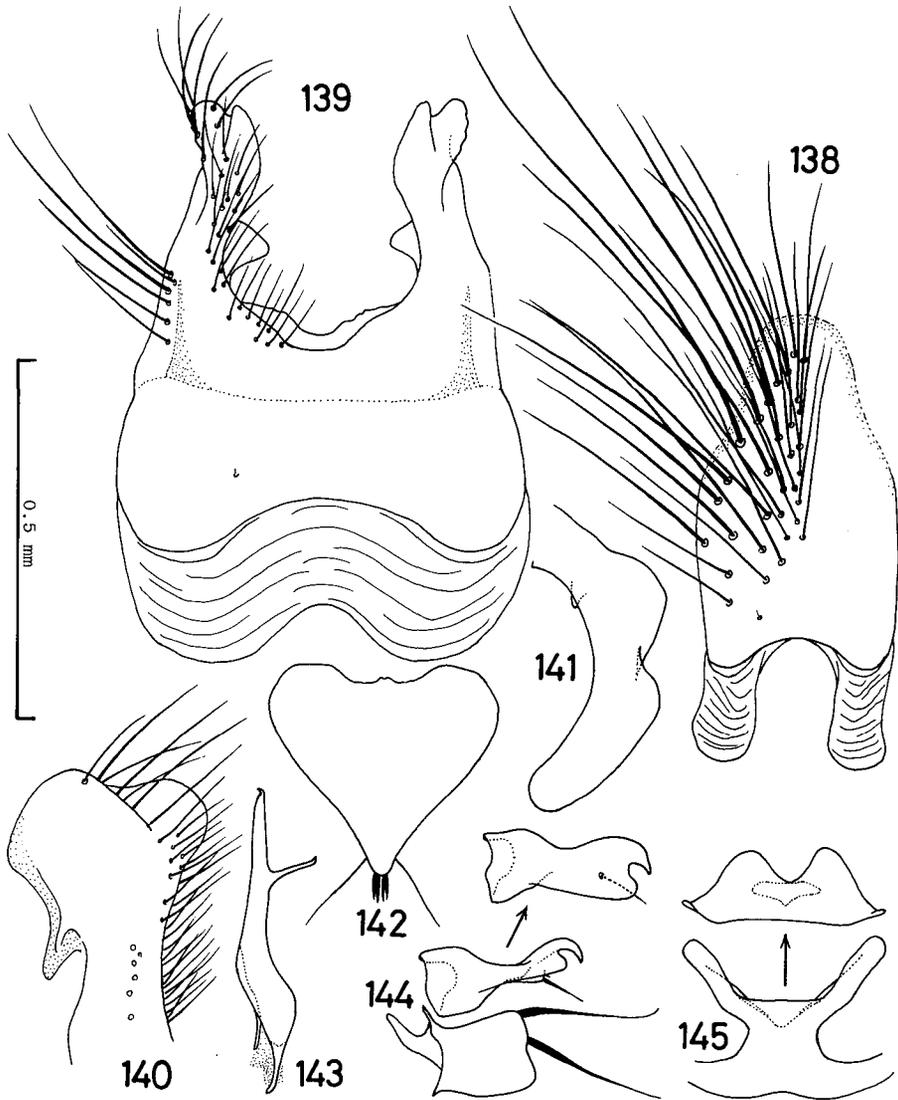


Figs. 119-122. *Anthomyia koreana*, ♂. 119, 4th sternite ; 120, 5th sternite, ventral view ; 121, ditto, lateral view ; 122, pregenital sclerite, lateral view. Korea.



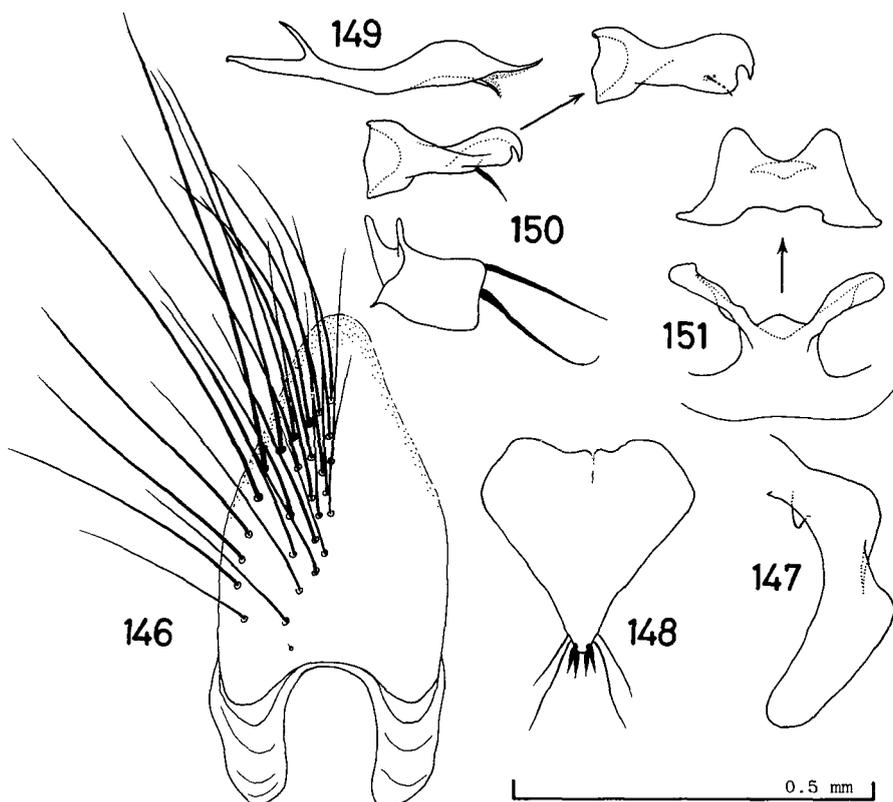
Figs. 123-137. *Anthomyia koreana*, ♂. 123, hypopygium, dorsal view; 124, ditto, lateral view; 125, surstylus, lateral view; 126-130, cercal plate, dorsal view; 131, ditto, lateral view; 132, distiphallus; 133, praegonite; 134, postgonite; 135-137, median process of 6th sternite. Korea.

*koreana* is very similar to the North American *A. oculifera* Bigot, 1885. In this species (1♂ and 1♀ examined by myself, cf. Figs. 111-114 & 138-145) the male 4th sternite is with setae a little denser and relatively long; the male 5th sternite with apical lobes slightly larger; the cercal plate with 1 pair of slender setae near apex; and the female mesonotum with supra-alar spots reaching to *pra*. Although *A. koreana* is recognized as distinct from *oculifera* in this paper, the differences between the two are very slight and the treatment is quite tentative. *A. koreana* is also closely related to the European *A. plurinotata* Brullé, 1832, in having the male genitalia of the same type with those of the latter species (Figs. 146-151) though clearly different in details. The mesonotal pattern of *plurinotata* may easily be derived from that of a much retreated type of *koreana* through a median division of the postsutural dark band. The mesonotal pattern of male *koreana* with a complete postsutural band is very similar to that of the following *A. latifasciata* sp. nov. (cf. Fig. 152), and it is not easy to distinguish the two species unless their genital



Figs. 138-145. *Anthomyia oculifera*, ♂. 138, 4th sternite; 139, 5th sternite, ventral view; 140, ditto, lateral view; 141, surstylus, lateral view; 142, cercal plate; 143, distiphallus; 144, praegonite and postgonite; 145, median process of 6th sternite. Canada.

structures are examined. The following characters in *koreana* may, however, be useful for identification: - Mesonotum with postsutural band not or less protruded caudad at middle; scutellum usually greyish along basal margin; arista usually shorter pubescent;  $t_2$  with usually 1 *pd*.



Figs. 146-151. *Anthomyia plurinotata*, ♂. 146, 4th sternite; 147, surstylus, lateral view; 148, cercal plate; 149, distiphallus; 150, praegonite and postgonite; 151, median process of 6th sternite. Hungary.

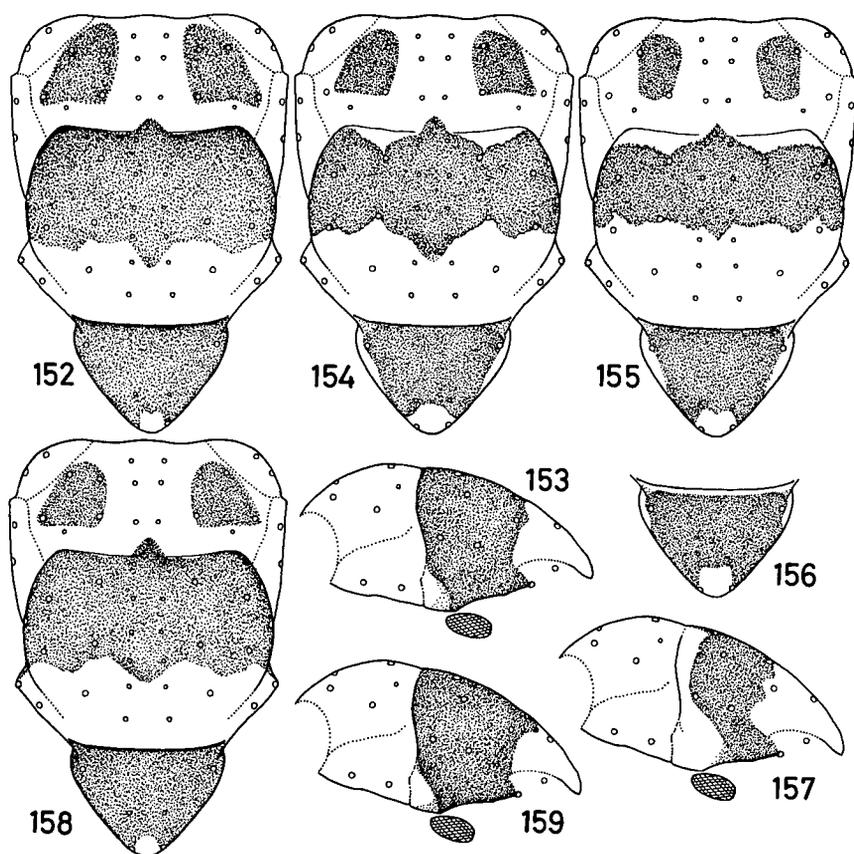
5. *Anthomyia latifasciata* sp. nov.

(Figs. 152-157 & 160-170)

*Anthomyia* sp. B: Suwa, 1974: 52.

*Anthomyia* sp.: Suwa, 1981a: 102.

Type material. *Japan*. Honshû: - Mt. Tanzawa, Kanagawa-ken, 1♂, 2. v. 1975, M. Suwa; Mt. Komagatake, Kanagawa-ken, 1♂, 27. vi. 1976, H. Takizawa; Mt. Osorakan, 1350 m, Hiroshima-ken, 1♂, 10. vii. 1978, N. Kashiwai (BMNH). Shikoku: - Bizan, Tokushima-ken, 1♂, 2♀, 9. iv. 1961; Mt. Tsurugi, Tokushima-ken, 1♀, 16. vii. 1971, M. Suwa; Mt. Ishizuchi, Ehime-ken, 1♂, 29. vi. 1969, S. Shinonaga (TMDU). Kyûshû: - Inunaki-yama, Fukuoka-ken, 1♀, 5. v. 1966, H. Shima (ELKU); Hiko-san, Fukuoka-ken, 1♀, 15. v. 1967, M. Suwa; ditto, 1♀, 7. v. 1969, 1♀, 18. v. 1970, and 1♀, 15. v. 1973, Malaise Trap (HBKU); ditto, 2♀, 16-24. iv. 1979, T. Gotô; Unzen, Nagasaki-ken, 1♀, 17. vii. 1946, M. Moritsu & Y. Kurosawa (ELKU); Mt. Hakuchô (=Shiratori-yama), 1300 m, Kumamoto-ken, 1♂ (holotype), 1♀, 5-7. vi. 1980, M. Suwa; ditto, 1♀, 5-7. vi. 1980, T. Gotô (BMNH); ditto, 1♀, 7. vi. 1980, T. Saigusa; Amakusa, Kumamoto-ken, 1♀, 7. iv. 1969, H.



Figs. 152-159. *Anthomyia* spp., mesonotal pattern in dorsal view (152, 154-156, 158) and in lateral view (153, 157, 159). 152-153, *latifasciata*, ♂, paratype from Tanzawa; 154-157, ditto, ♀, paratypes from Hiko-san (154), Mt. Hakuchō (155, 157) and Bizan (156); 158-159, *pectoralis*, ♂, holotype from Shiga-kōgen. Japan.

Kurahashi (HK); Terayama, Kagoshima-ken, 1♂, 8. v. 1970, K. Kusigemati; Eboshi-dake, Kagoshima-ken, 1♀, 15. v. 1970, K. Kusigemati. Nansei Iss.: - Mt. Miyanoura, Yakushima, 2♂, 1♀, 17. v. 1972, S. Shinonaga (1♂ in EIHU, others in TMDU); Naze, Amami-Ōshima, 1♀, 23. iii. 1970, H. Takizawa. *Korea*. Gyongsangbug-Do: - Sudo-san, 1000 m, 1♂, 1. viii. 1977, K. Yamagishi. Taegu: - Palgon-san, 400-600 m, 1♂, 4. vi. 1982, M. Suwa.

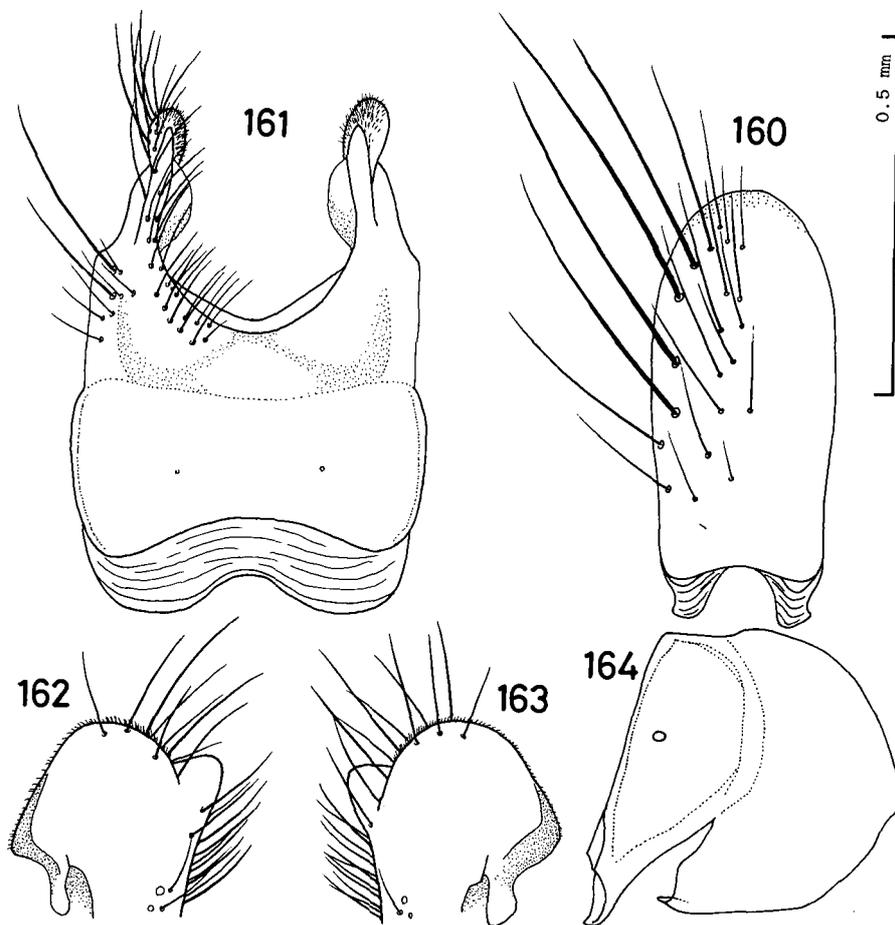
Other material examined. *Japan*. Kyūshū: - Mt. Hakuchō, 1300 m, Kumamoto-ken, 1♂, 5-7. vi. 1980, M. Suwa (DMA).

♂. Body-length 5.8-6.8 mm; wing-length 5-6.2 mm. Occiput blackish on upper plane in most angles of view, with brownish pollinosity. Mesonotum with dark markings well developed (Fig. 152), contrasted with surrounding grey area in dorsal to caudal angle of view, yet becoming obscure in frontal angle of view owing to a darkening shift of the grey area; presutural spots expanded to include insertions of 1st and 2nd *pre-dc*, of *ph* and usually also of *prst*, and extending near to anterior margin of mesonotum; postsutural spots all fused in a broad band, which

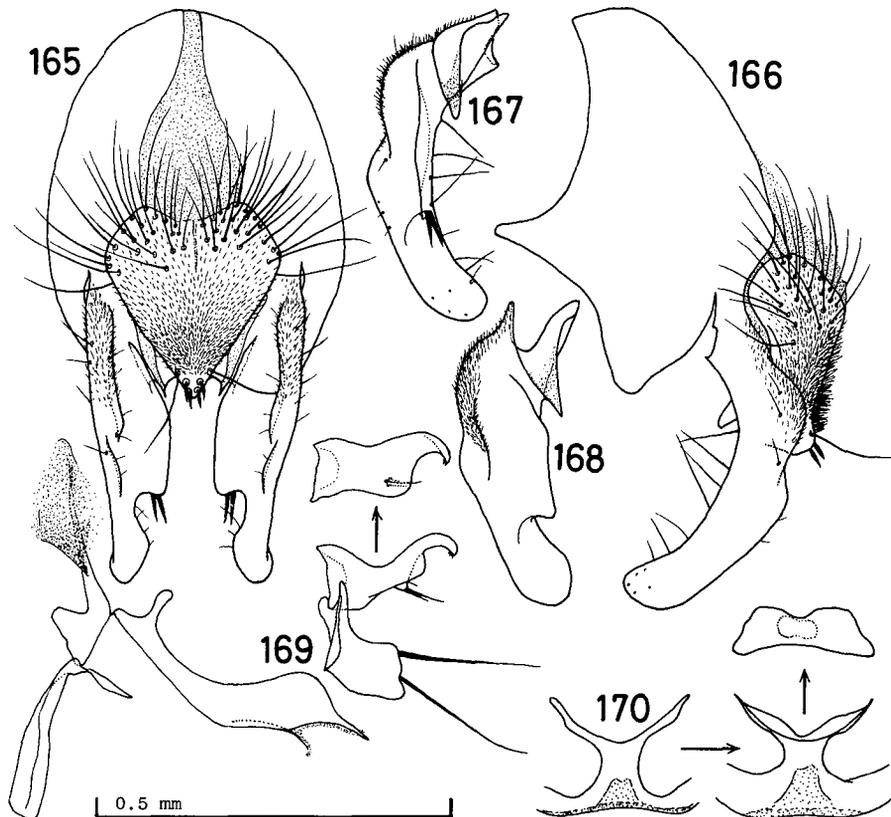
extends past 2nd *post-dc* and more or less protruded cephalad and caudad at middle ; scutellum mainly black, with a small grey spot at apex. Abdomen with median vitta a little or much obscured on 2nd tergite, as wide as or slightly narrower than  $f_3$ -height on 3rd tergite and narrowing caudad ; fore-marginal band broad on 3rd and 4th tergites and rather narrow on 5th, more or less expanded caudad near lateral margins of abdomen.

Frons narrower than anterior ocellus, usually about half as wide as the ocellus ; parafrontals contiguous, with 4-7 *ori* and 1 vestigial *ors* ; 1 pair of fine *if* ;  $A_3$  2.4-2.6 times as long as wide ; arista with longest hairs 2-3 times as long as basal diameter of arista. Mesonotum with 3-7 accessory setulae between rows of *pre-acr* ; *pra* 1.2-1.4 times as long as posterior *ntpl* ; mesopleura with 3-6 accessory setulae around *pslg* ; scutellum on dorsal surface hardly or very sparsely setulose.

Abdomen with some characters shown in Figs. 160-170 ; cercal plate constantly narrowing apicad ; praegonite rather squarish, with setae much longer than the



Figs. 160-164. *Anthomyia latifasciata*, ♂. 160, 4th sternite ; 161, 5th sternite, ventral view ; 162-163, ditto, lateral view ; 164, pregenital sclerite, lateral view. Paratypes from Tanzawa (160-163) and Komagatake (164), Kanagawa-ken, Japan.



Figs. 165-170. *Anthomyia latifasciata*, ♂. 165, hypopygium, dorsal view; 166, ditto, lateral view; 167, surstylus, inside view; 168, ditto, slightly different view; 169, aedeagus; 170, median process of 6th sternite. Paratypes from Tanzawa (165-169) and Komagatake (170), Japan.

gonite; postgonite not protruded at lower posterior corner, inside with 1 distinct and 1 weaker seta and 1 minute setula; distiphallus with dorsal projection near base.

Fore tibia with 1 (2 in 1 specimen) *pv*;  $t_2$  with 1 *ad*, 2 or rarely 1 *pd* and 2-3 *pv*;  $t_3$  with 1 or sometimes 2 *av*, 6-12 *ad*, 2 and rarely 1-2 additional *pd*, and 3-7 *pv*.

♀. Wing-length 4.5-6.3 (usually 5-6) mm. Mesonotum with dark markings less developed than in male (Figs. 154-157); postsutural band extending from a little behind transverse suture and scarcely passing 2nd *post-dc*; scutellum narrowly grey laterally and often also basally, the lateral grey areas being not connected to apical grey spot in dorsal view.

Fore tibia with 1 *ad* and 1 *pv*;  $t_2$  with 1 *ad*, 2 *pd* and 2-3 *pv*;  $t_3$  with 1 *av*, 5-9 *ad* and 2 *pd*, sometimes 1 or a few fine *pv* discernible.

Distribution. Japan (Honshū, Shikoku, Kyūshū and Nansei Iss.); Korea.

Remarks. The present species is closely related to the Indian *A. vittiventris* Ackland (MS)\* and also to the Burmese *A. malaisei* Ackland (MS)\* and there are found no reliable differences in their male genital structures. They are, however,

\* Both species will be described by Mr. Ackland in the following paper.

sharply different from one another in the mesonotal pattern. In *vittiventris* : - Presutural spots smaller in both sexes ; postsutural dark markings completely separated into spots in female. In *malaisei* : - Mesonotal dark markings quite broadly developed in male, presutural spots being fused with postsutural band laterally, the latter reaching to 3rd *post-dc*.

6. *Anthomyia pectoralis* sp. nov.

(Figs. 158-159 & 171-182)

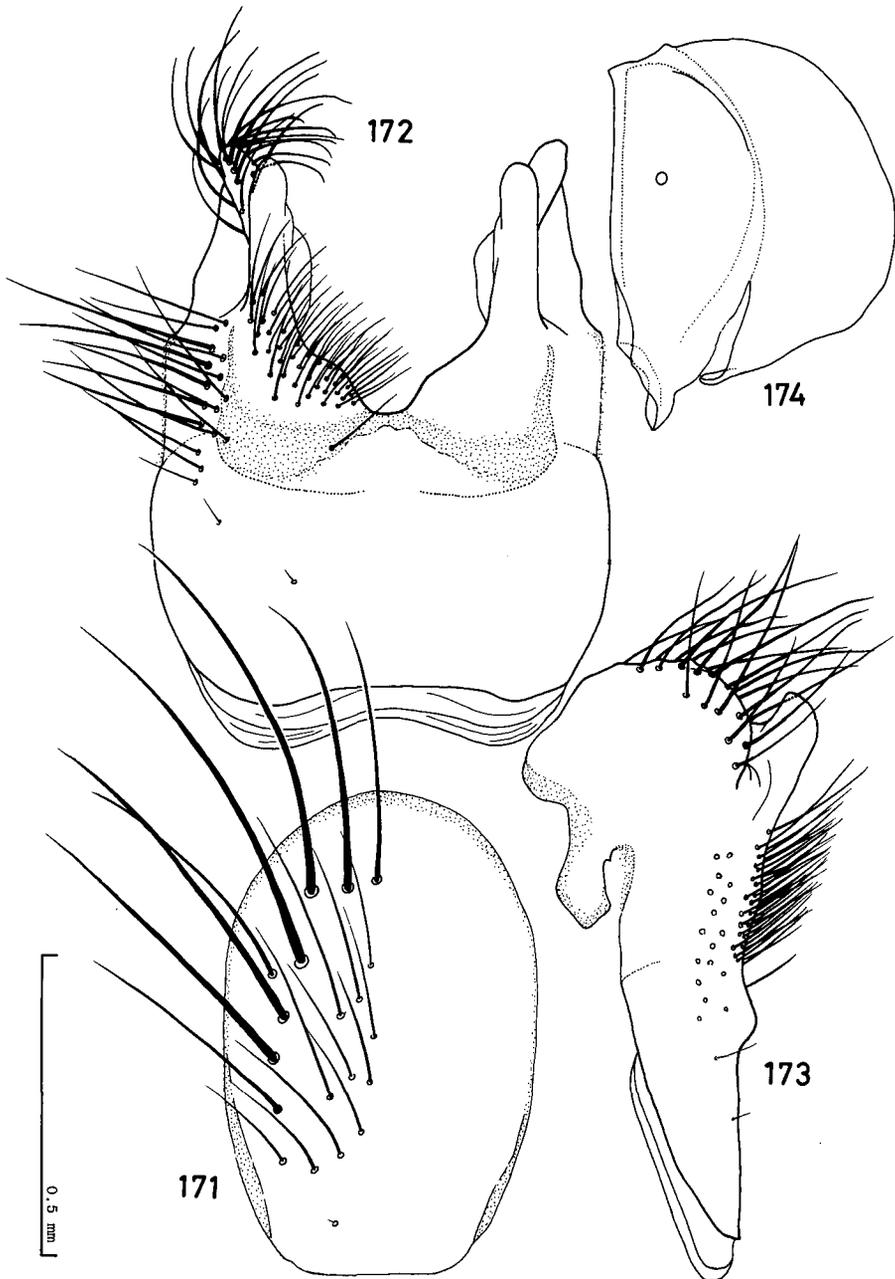
Type material. Japan. Honshû : - Kawaragoya, Shiga-kôgen, Nagano-ken, 1♂ (holotype), 30. v. 1975, A. Nakanishi & J. Emoto.

♂. Body-length 7.7 mm ; wing-length 7.1 mm. Body including appendages blackish in ground colour. Occiput blackish on upper plane in most angles of view, with brownish pollinosity discernible there in some lights. Mesonotum with dark markings well developed (Figs. 158-159) and well discernible in any angles of view, the surrounding grey area being only a little darkened even if viewed from front ; presutural spots expanded to include insertions of 1st and 2nd *pre-dc*, *ph* and *prst*, and widely separated from each other ; postsutural spots fused in a broad band, which occupies more than anterior half of postsutural scutum, is a little protruded cephalad at middle and is indented on posterior margin near 2nd *post-dc* and 2nd *ia* ; scutellum mainly blackish, with a small grey spot apically. Abdomen with dark markings more or less obscured on 1st and 2nd tergites ; lateral triangular spots connected with median vitta by a rather narrow fore-marginal band on 3rd and 4th tergites and separated on 5th tergite.

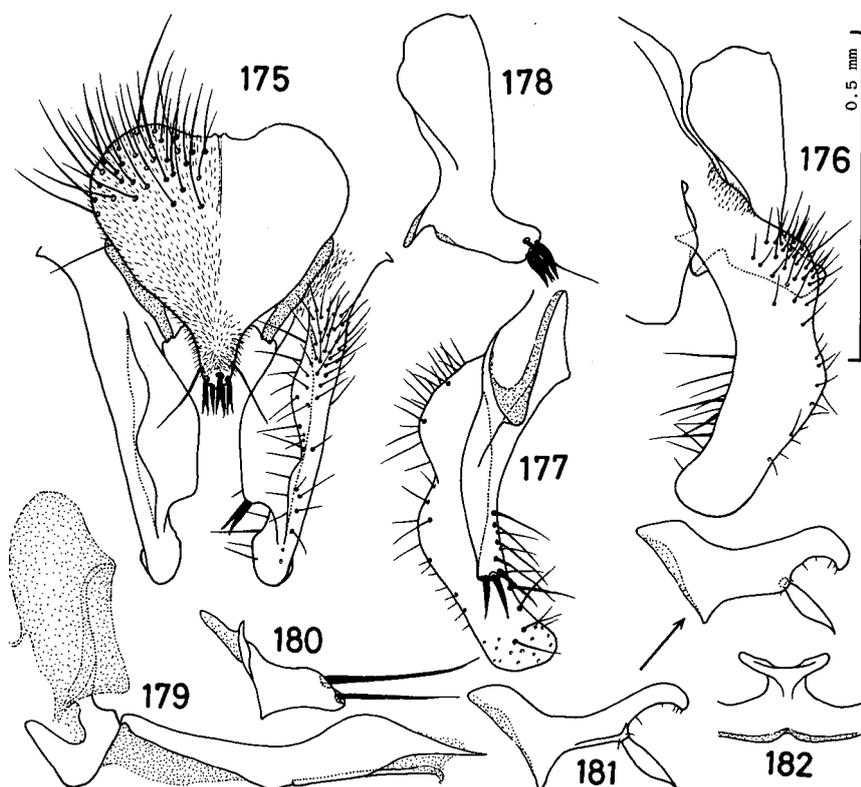
Frons nearly equal to anterior ocellus in width ; parafrontals contiguous for a considerable length, with 4 *ori* and 1 minute *ors* ; 1 pair of vestigial *if*, hardly discernible unless carefully examined ; parafacials at narrowest part about two-thirds as wide as  $A_3$  ;  $A_3$  2.2 times as long as wide ; arista short pubescent, with longest hairs slightly longer than basal diameter of arista.

Mesonotum with no accessory setulae between presutural spots and transverse suture, 1 or 2 setulae between *prst* and notopleura, and rather numerous setulae on anterior part of presutural spots, along rows of *post-acr* and *post-dc*, between rows of *post-acr* posteriorly, and between rows of *ia* and *pra-sa* ; 4 pairs of *pre-acr* present, 3rd pair probably additional, right seta of the pair being much weaker and situated a little inside the row ; no accessory setulae present between rows of *pre-acr* ; *pra* well developed, 1.6-1.7 times as long as posterior *ntpl* and about as long as anterior *ntpl* ; 1-2 additional *ia* discernible, the additional seta near 2nd *ia* on right row being as strong as the 2nd ; mesopleura with 2 fine setulae visible around *pstg* on left body-side (hidden by fore leg on right body-side) ; prosternum with 2-3 setulae along each lateral margin anteriorly ; scutellum rather densely setulose dorsally except on basal centre.

Abdomen with some characters of posterior segments shown in Figs. 171-182 ; 4th sternite long-ovoid, with basal apodeme not developed ; 5th sternite with inner series of setae interrupted near apical lobe ; median process of 6th sternite hairless, with distal lobes rather small ; cercal plate with apex much narrowed and directed dorsad, and with 5 apical setae discernible, side ones of the setae being bifurcated (uncertain whether obligatory or not) ; distiphallus without dorsal projection.



Figs. 171-174. *Anthomyia pectoralis*, ♂. 171, 4th sternite; 172, 5th sternite, ventral view; 173, ditto, lateral view; 174, pregenital sclerite, lateral view. Holotype from Shiga-kōgen, Japan.



Figs. 175-182. *Anthomyia pectoralis*, ♂. 175, hypopygium, dorsal view; 176, ditto, lateral view; 177, surstylus, inside view; 178, cercal plate, lateral view; 179, basiphallus and distiphallus; 180, praegonite; 181, postgonite; 182, median process of 6th sternite. Holotype from Shiga-kôgen, Japan.

Mid femur with 9 *pv* on basal half;  $f_3$  with a row of about 12 *av* except near base, a row of about 7 *p-pv* in basal half, 1 *pv* near base, some *pv* on middle third and some *pv* near apex, and with fine and slender setulae discernible near base anteroventrally and on posterior to posteroventral surface throughout;  $t_1$  with 2 *pv*;  $t_2$  with 1 *ad*, 3-4 *pd* and 3-4 *pv*;  $t_3$  with 1 *av*, 10-11 *ad*, 6-8 *pd* and 8-9 *pv*.

♀. Unknown.

Distribution. Japan (Honshû).

Remarks. This species is the largest among the species treated in this paper and is quite peculiar in having the setulose prosternum. Some male characters of *pectoralis*, namely, the 4th sternite with long-ovoid shape and without basal apodeme, the cercal plate with dorsally prolonged apex, the prae- and postgonite with similar shape, and the distiphallus without dorsal projection, clearly indicate that the present species is closely related to *A. illocata*, although it is very easy to distinguish the two by other characters. The mesonotal pattern of *pectoralis* is very similar to that of *latifasciata*, and the hairless median process of 6th sternite is also seen in the latter species. This seems to show some phylogenetic relationship between the two species.

7. *Anthomyia plumiseta* Stein, 1918

(Figs. 183-187 & 193-207)

*Anthomyia* sp. A : Suwa, 1974 : 51 ; Suwa, 1981b : 17.

*Anthomyia plumiseta* : Ackland, 1986 : 40.

Material examined. *Japan*. Hokkaidô : - Sapporo, 1♂, 2. vi. 1967 and 1♀, 21. vii. 1974, M. Suwa ; Misumai, Sapporo, 1♀, 22. vi. 1967, T. Kumata ; Nopporo, 1♀, 10. vi. 1975, M. Suwa (DMA) ; Shikotsu-ko, 1♀, 17. vii. 1977, Sk. Yamane. Honshû : - Ôtani, Toyama-ken, 1♀, 10. v. 1964, H. Kurahashi (HK) ; Takao-san, Tôkyô-to, 1♂, 3. v. 1971, R. Kano (TMDU) ; Minamitama, Tôkyô-to, 1♂, 21. iv. 1972, S. Shinonaga ; Chichibu, Saitama-ken, 1♂, 24. iv. 1977, K. Hara (DMA). Kyûshû : - Izuhara, Tsushima, 1♀, 21. v. 1981, T. Fujisawa. Nansei Iss. : - Amami-Ôshima, 1♀, 17. iv. 1967, T. Kocha. *Korea*. Kangweon : - Seolag-san, 200-300 m, 1♂, 25. v. 1982, M. Suwa. *U.S.S.R.* Primorskij Kraj : - 40 km southeast of Ussurijsk, 1♂, 26. viii. 1984 (egg), 15. ix. 1984 (emerged), A. Ozerov (MSU).

♂. Body-length 4.8-6.4 mm ; wing-length 4.4-5.8 mm. Mesonotum with presutural spots not expanded to 2nd *pre-dc* or to *prst*, usually extending to anterior margin of mesonotum and connected to each other by a darkening shift of the space between the spots ; postsutural band occupying anterior half or more of postsutural area of scutum, with posterior margin a little or much past 2nd *post-dc* and hardly or distinctly waving ; scutellum wholly blackish, or with a small grey spot apically. Abdomen hardly to rather distinctly yellowish in ground colour near base on lateral to ventral side.

Frons as wide as or usually a little narrower than anterior ocellus ; *if* absent (only a single fine one discernible in 1 specimen) ; arista with longest hairs about 3 times (5 times in the Ussuri specimen) as long as basal diameter of arista. Mesonotum with *pra* slightly to rather distinctly longer than posterior *ntpl* ; mesopleura with no accessory setulae around *pstg* (1 setula discernible on left body-side in 1 specimen).

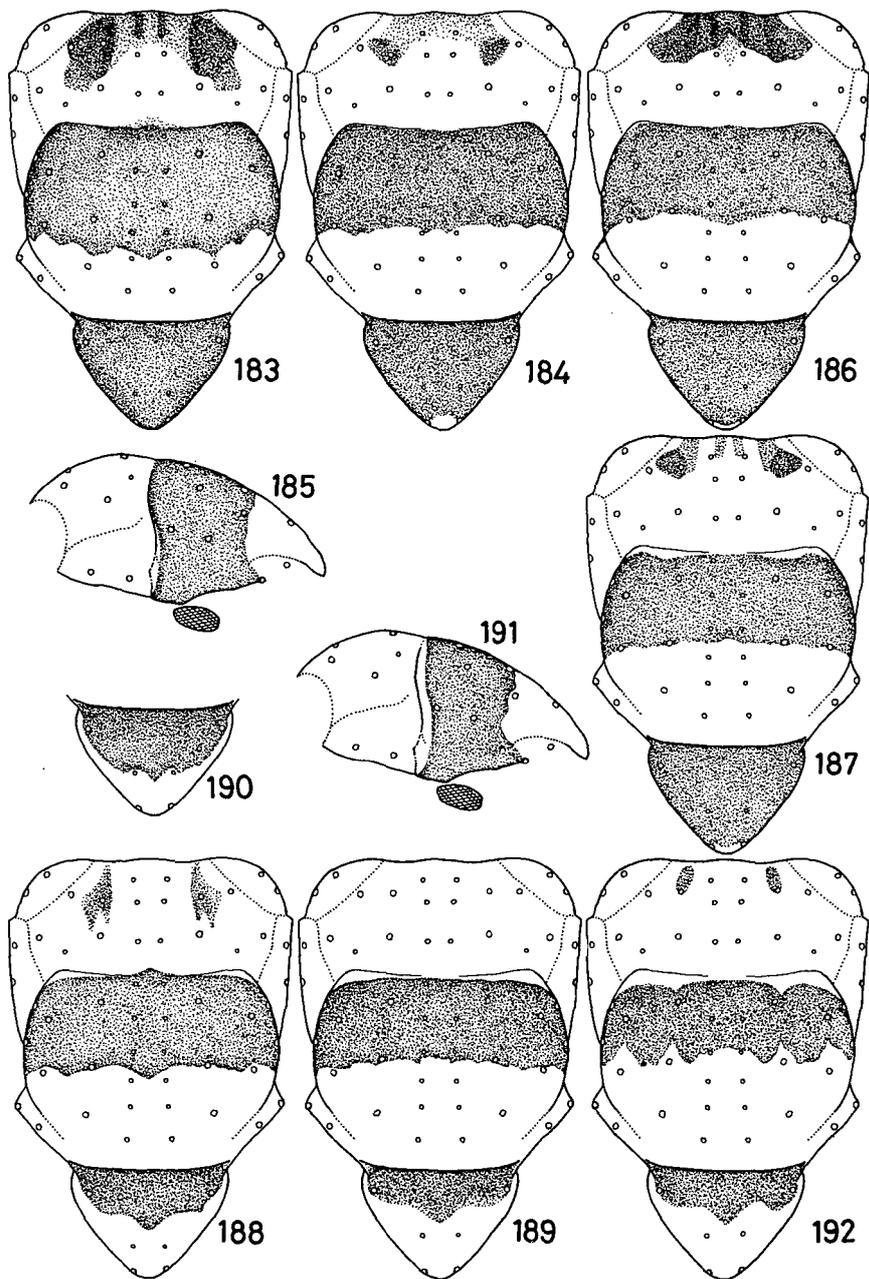
Abdomen with some characters shown in Figs. 193-207 ; 4th sternite with basal apodeme not developed ; 6th sternite with median process half divided into 2 lobe-like hairy projections ; cercal plate with apex prolonged dorsad ; distiphallus with dorsal projection at base.

Fore tibia with 1-2 *pv* ;  $t_2$  with 1 *ad* (indiscernible on left leg in 1 specimen), 2 *pd* and 2-3 (4 on left leg in the Ussuri specimen) *pv* ;  $t_3$  with 1 *av*, 5-7 *ad*, 2 *pd* and 1-5 (0 on right leg in 1 specimen) fine *pv*.

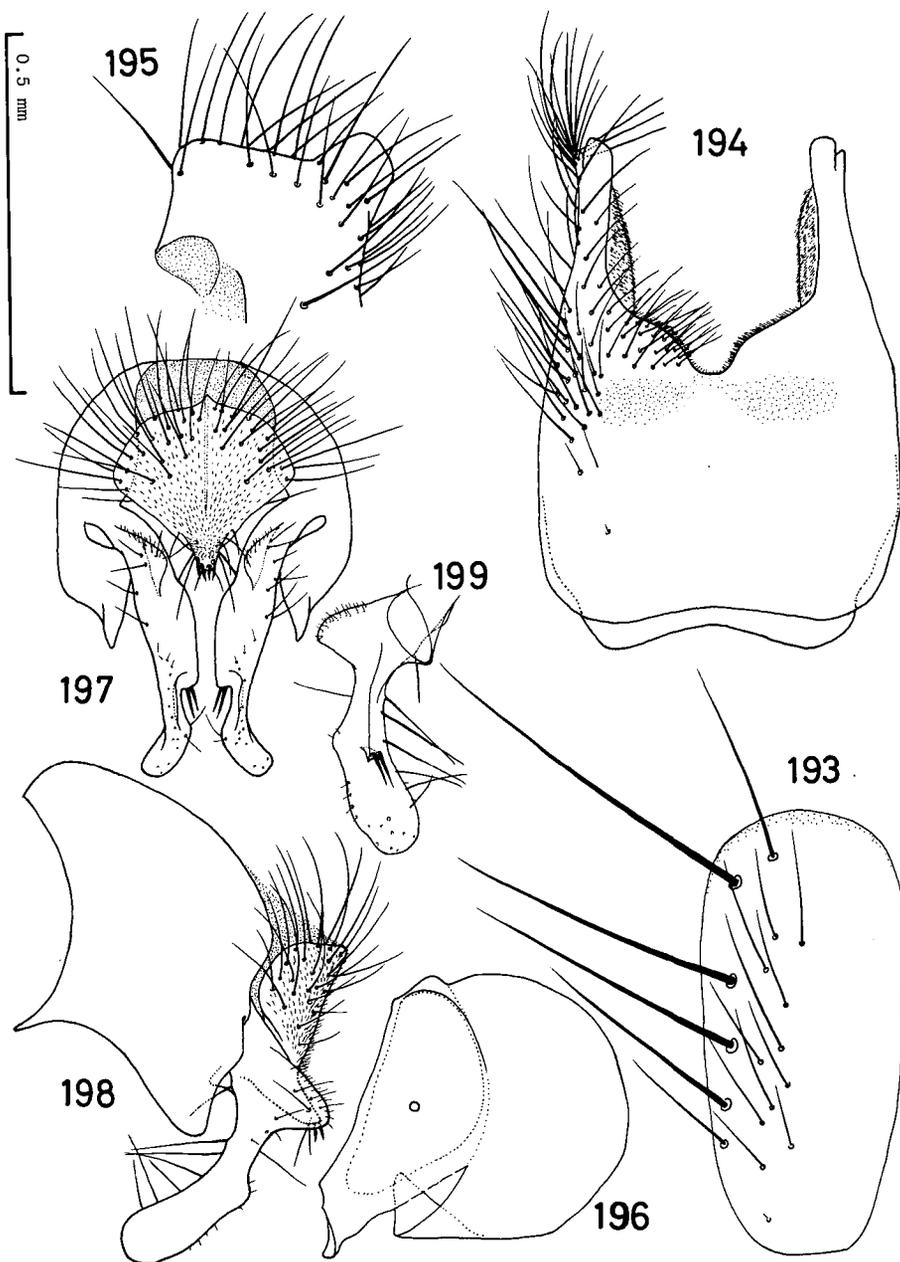
♀. Mesonotum with postsutural band ending at 2nd *post-dc* or extending a little past there. Arista with hairs usually longer than in male, the longest ones being 3-5 times (usually 4 times) as long as basal diameter of arista. Fore tibia with 1 or sometimes 2 *ad* and 1 *pv* ;  $t_2$  with 1 *ad*, 2 *pd* and 2 *pv* ;  $t_3$  with 1 or rarely 2 *av*, 4-7 *ad*, 2 *pd* and no or rarely 1 *pv*.

Distribution. Japan (Hokkaidô, Honshû, Kyûshû and Nansei Iss.) ; Korea ; Ussuri ; Oriental region.

Remarks. Some specimens of *plumiseta* from India (1♂, 3♀), Sri Lanka (1♂, 1♀) and Taiwan (1♀) are available for this study. Having compared them with the



Figs. 183-192. *Anthomyia* spp., mesonotal pattern in dorsal view (183-184, 186-190, 192) and in lateral view (185, 191). 183-185, *plumiseta*, ♂, Sapporo (183) and Minamitama (184-185); 186-187, ditto, ♀, Amami-Oshima (186) and Otani (187); 188-191, *illocata*, ♂, Makurazaki (188), Yoron-tô (189, 191) and Yakushima (190); 192, ditto, ♀, Okinawa-Hontô. Japan.



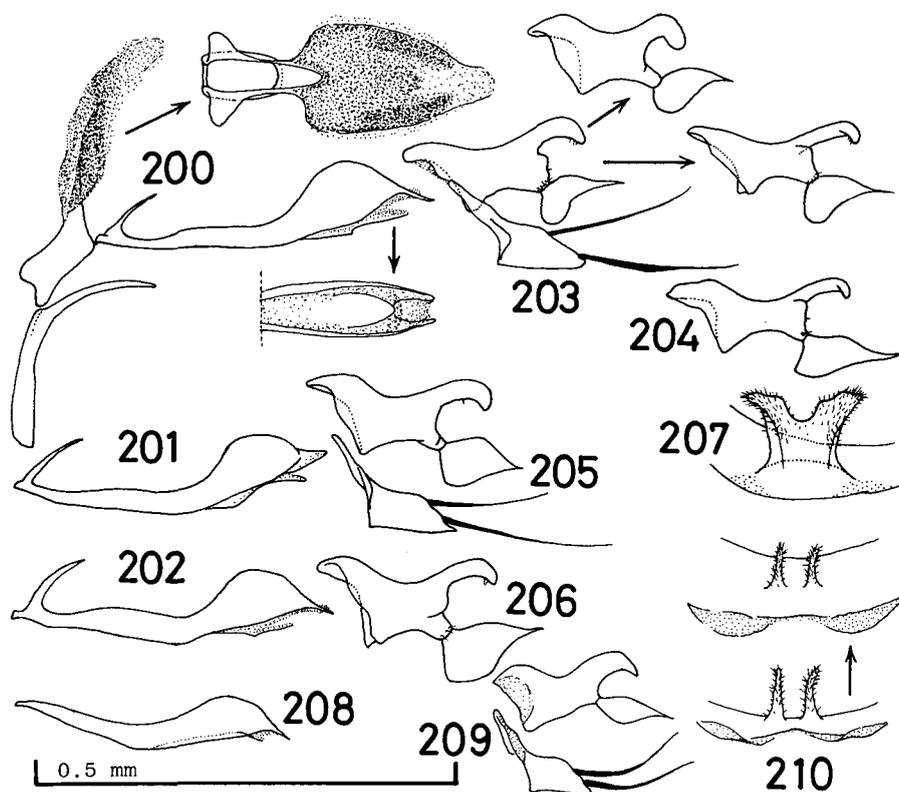
Figs. 193-199. *Anthomyia plumiseta*, ♂. 193, 4th sternite; 194, 5th sternite, ventral view; 195, ditto, lateral view; 196, pregenital sclerite, lateral view; 197, hypopygium, dorsal view; 198, ditto, lateral view; 199, surstylus, inside view. Minamitama (193-195, 197-199) and Takao-san (196), Japan.

present specimens from Palaearctic Asia, there is found only a slight difference: - In the Palaearctic specimens, especially in the male ones, the aristal hairs are relatively short and the ground colour of the abdominal base is darker.

8. *Anthomyia illocata* Walker, 1856  
(Figs. 188-192 & 208-210)

*Anthomyia illocata*: Fan, 1965: 38; Suwa, 1974: 50; Suh & Kwon, 1985: 169; Ackland, 1986: 42.

Material examined. *Japan*. A lot of specimens have been examined. Their localities are as follows. Honshû: - Hegurajima & Kanazawa, Ishikawa-ken; Yorii, Saitama-ken; Hôya & Yumenoshima, Tôkyô-to; Futtsu, Chiba-ken; Yokohama & Kamakura, Kanagawa-ken; Saimyôji-san, Aichi-ken; Wakayama-ken; Hachijô-jima. Kyûshû: - Okinoshima, Nagasaki-ken; Kagoshima, Makurazaki, Kajiki, Shigetomi & Eboshi-dake, Kagoshima-ken; Tsushima; Meshima. Nansei Iss.: - Yakushima; Amami-Ôshima; Tokunoshima; Yoron-tô; Okinawa-Hontô;



Figs. 200-210. *Anthomyia* spp., ♂. 200-202, 208, distiphallus, basiphallus also shown in Fig. 200; 203, 205, 209, praegonite and postgonite; 204, 206, postgonite; 207, 210, median process of 6th sternite. 200-207, *plumiseta*, Japan (200, 203, Minamitama; 204, Takao-san), Ussuri (201, 205, 207) and India (202, 206); 208-210, *illocata*, Okinawa-Hontô, Japan.

Ishigaki-jima. Korea. Taegu: - Palgon-san, 1♂, 21. v. 1982, M. Suwa.

♂. Body-length 4-5.9 mm; wing-length 3.7-5.3 mm. Mesonotum with dark markings densely brownish pollinose; presutural spots sometimes appearing around 1st *pre-dc*, small; postsutural band extending from slightly behind transverse suture to around 2nd *post-dc*; scutellum with dark marking on basal third or half, rarely expanded to discal setae, and not reaching to lateral margins. Arista with longest hairs 2-3 times as long as basal diameter of arista. Abdomen with median process of 6th sternite completely divided into 2 hairy projections; cercal plate with apex narrow and prolonged dorsad; distiphallus without dorsal projection.

♀. Mesonotum with postsutural band as in male, or somewhat reduced and rather distinctly indented especially on posterior margin.

Distribution. Japan (Honshū, Shikoku, Kyūshū and Nansei Iss.); Korea; China; Oriental region.

Remarks. The resemblance in the male 4th sternite, the cercal plate and the prae- and postgonite shows that this species is closely related to *pectoralis* and to *plumiseta*, and the surstyli with a well developed expansion near base dorsally and the male 6th sternite with a hairy median process strongly suggest a closer relationship to *plumiseta* than to *pectoralis*. If this is the case, the dorsal projection of the distiphallus should have been independently suppressed in the lines to *illocata* and to *pectoralis*. In any case, *A. illocata* may be the most derivative among these species in having the hairy and completely divided median process of male 6th sternite, the complete suppression of the dorsal projection of distiphallus and the most reduced mesonotal dark markings.

#### ACKNOWLEDGEMENTS

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