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INSECTA MATSUMURANA

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ANTHOMYIID FLIES FROM SAKHALIN (DIPTERA: ANTHOMYIIDAE)

By Masaaki Suwa

Abstract

Suwa, M., 2013. Anthomyiid flies from Sakhalin (Diptera: Anthomyiidae). *Ins. matsum. n. s.* 69: 133−194, 191 figs., 3 tabs.

Specimens of anthomyiid flies recently collected in Sakhalin were examined and 57 species were recognized. Together with 13 species already recorded in the literature and a species newly found in the collection of the Hokkaido University Museum, 60 species in total are enumerated as occurring in Sakhalin. Distributional patterns of the species of Sakhalin and adjacent territories are briefly discussed. Three species are described as new to science, *Alliopsis lobata*, *Chiastocheta sachalinensis* and *Delia curvistylata*.

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Introduction

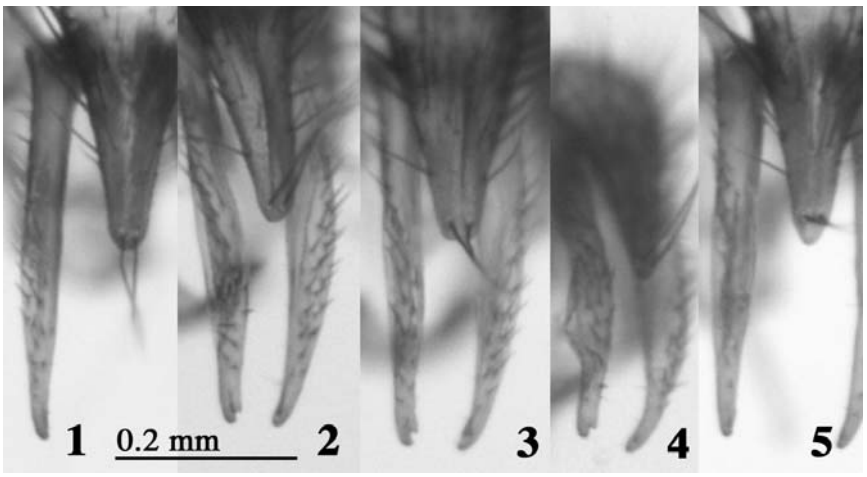
The family Anthomyiidae is worldwide in distribution and well developed in temperate to boreal or mountainous regions of the Northern Hemisphere. Faunal information of the family is, however, insufficient in eastern half of Eurasia, especially in Siberia and northern areas of the Far East. From Kamchatka 54 species are known (Suwa et al., 2000), and from Sakhalin 13 species (Suwa, 1981b; Pellmyr, 1992). These numerals are much smaller than we expect there. In North America, 210 species are confirmed in the Yukon Territory and Alaska exclusive of the Panhandle (Griffiths, 1998b), and in Japan 228 species have been recorded (Suwa, 1999, and others).

In summer of 2002 I had a chance to collect flies in Sakhalin for about three weeks. Among the material obtained 57 species of Anthomyiidae were recognized. Together with the published records and a newly found species in the collection of the Hokkaido University Museum, 60 species of the family are now known to occur in Sakhalin. These are enumerated in the following text. Distributional patterns of the species of Sakhalin and adjacent territories are briefly discussed. Three species are described as new to science.

Material and Methods

The present work is mainly based on specimens collected by myself in connection with the Research Trip in Sakhalin, 2002, supported in part by the Japan Society for the Promotion of Science, and partly on specimens preserved in the collection of the Hokkaido University Museum.

The specimens used are preserved in dried condition. Male and female terminalia, and sometimes legs, were macerated in 10% KOH solution as necessary. Male terminalia were observed and photographed in glycerin. Ovipositors and abdominal sternites other than the male 5th were mounted on microscope slides with Canada balsam for photographing. Photographs were made with a digital camera (Olympus DP20-5)



Figs 1−5. *Adia cinerella* (Fallén), ♂, surstylus, showing variation in apical notching. 1, Sakhalin; 2, Sakhalin; 3, Spain; 4, Sicily; 5, Sicily.

mounted on a stereomicroscope (Olympus SZX16).

The holotypes of the new species described in this paper are preserved in the Hokkaido University Museum. Some duplicates will be deposited in the Institute of Biology and Soil Science, Vladivostok, Russia.

Abbreviations in terminology are as follows: – Head: A_3, 3rd antennal segment; *if*, interfrontal seta; *ori*, frontal seta; *ors*, orbital seta. Thorax: *dc*, dorsocentral seta; *mpl*, mesopleural seta; *ntpl*, notopleural seta; *ph*, posthumeral seta; *pra*, prealar seta; *pre-acr*, presutural acrostichal seta; *pstg*, prostigmatal seta; *stpl*, sternopleural seta. Legs: f_1, f_2, f_3, fore, mid and hind femur respectively; t_1, t_2, t_3, fore, mid and hind tibia respectively. Wings: *h*, humeral crossvein; *dm-cu*, discal medial-cubital crossvein. Terms of genital structures of both sexes are as in Suwa and Darvas (1998) except for the usage of "pregonite" and "postgonite" instead of "gonopod" and "paramere", respectively.

Enumeration

*1. *Adia cinerella* (Fallén, 1825)
(Figs 1–5)

Paregle cinerella: Hennig, 1967: 161; Suwa, 1974: 95.

Adia cinerella: Suh and Kwon, 1985: 189; Wei et al., 1998: 669; Suwa, 1999: 205; Griffiths, 2001: 2153; Suwa, 2011b: 79.

Material examined. Southern Sakhalin: Sokol, Field Station, 8 km south of Dolinsk, 1♂, 1♀, 4.viii.2002; Prigorodnoye, 8 km east of Korsakov, mouth of Mereya River, 10♂, 9♀, 15–16. viii.2002. Central Sakhalin: Pervomayskoye, alt. 150 m, 40 km northeast of Smirnykh, 1♀, 10.viii.2002.

Distribution. Holarctic and Oriental regions.

Remarks. According to Suwa (2011b) the surstyli of *A. cinerella* are notched apically in the European form, but barely so in the Asian. In the Sakhalin form the surstyli are usually (in five of seven dissected males) unnotched apically (Fig. 1), but sometimes (in two of the seven) distinctly notched (Fig. 2). And I have recently found a male specimen from Sicily, Italy, having unnotched surstyli (Fig. 5). Further investigations are necessary to know the actual state of variation in the apical notching of surstyli of *A. cinerella*.

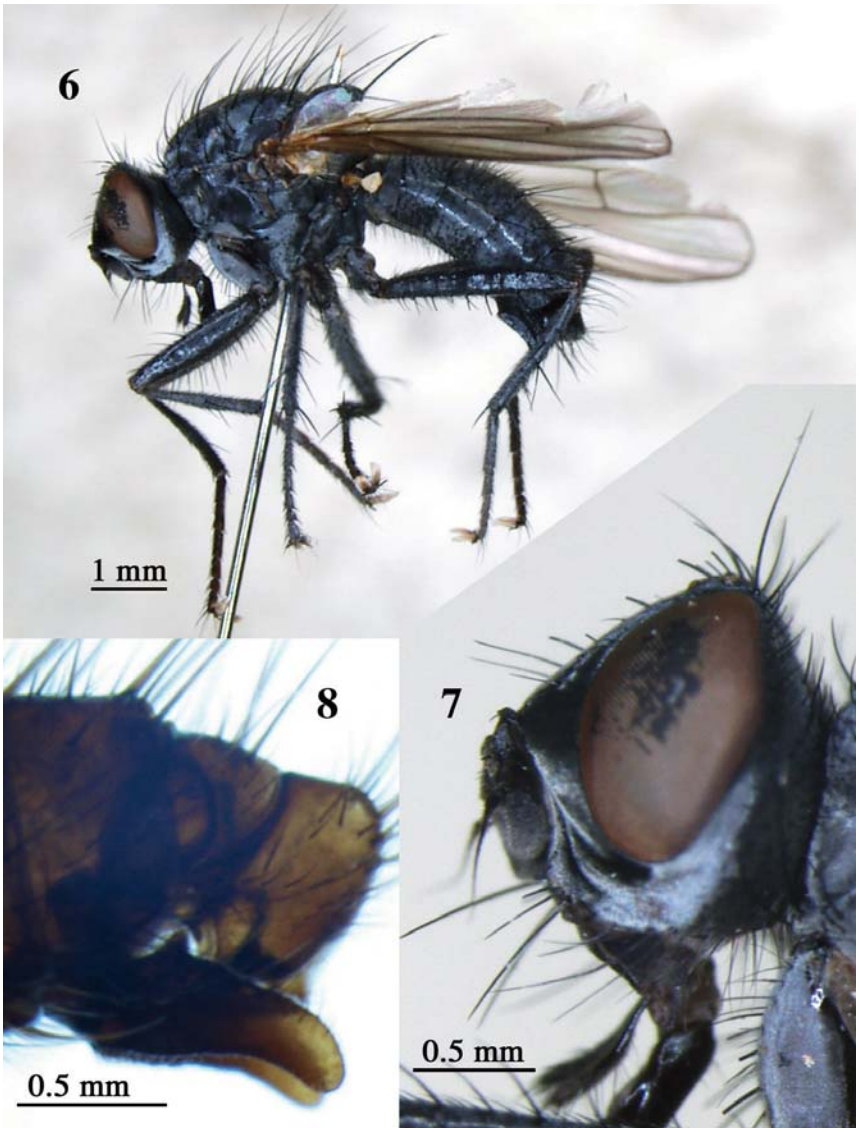
*2. *Alliopsis lobata* sp. nov.
(Figs 6−17)

Type material. Central Sakhalin: Riverside, alt. 50 m, Pilenga River, 70 km east-northeast of Smirnykh, 1♂ (holotype), 11.viii.2002.

Distribution. Sakhalin.

♂. Wing length 6.4 mm. Body including appendages black in ground colour, with pollinosity pale grey and more or less bluish. Haustellar mentum polished. Mesonotum rather thinly pollinose except on densely pollinose peripheral regions, and broadly darkened when viewed from frontal angle and also from caudal. Abdomen with median vitta much narrower than tibial diameter on 2nd and 3rd tergites, broadening posteriorly on 4th and obscure on 5th; fore-marginal bands rather broad on 2nd tergite, narrow

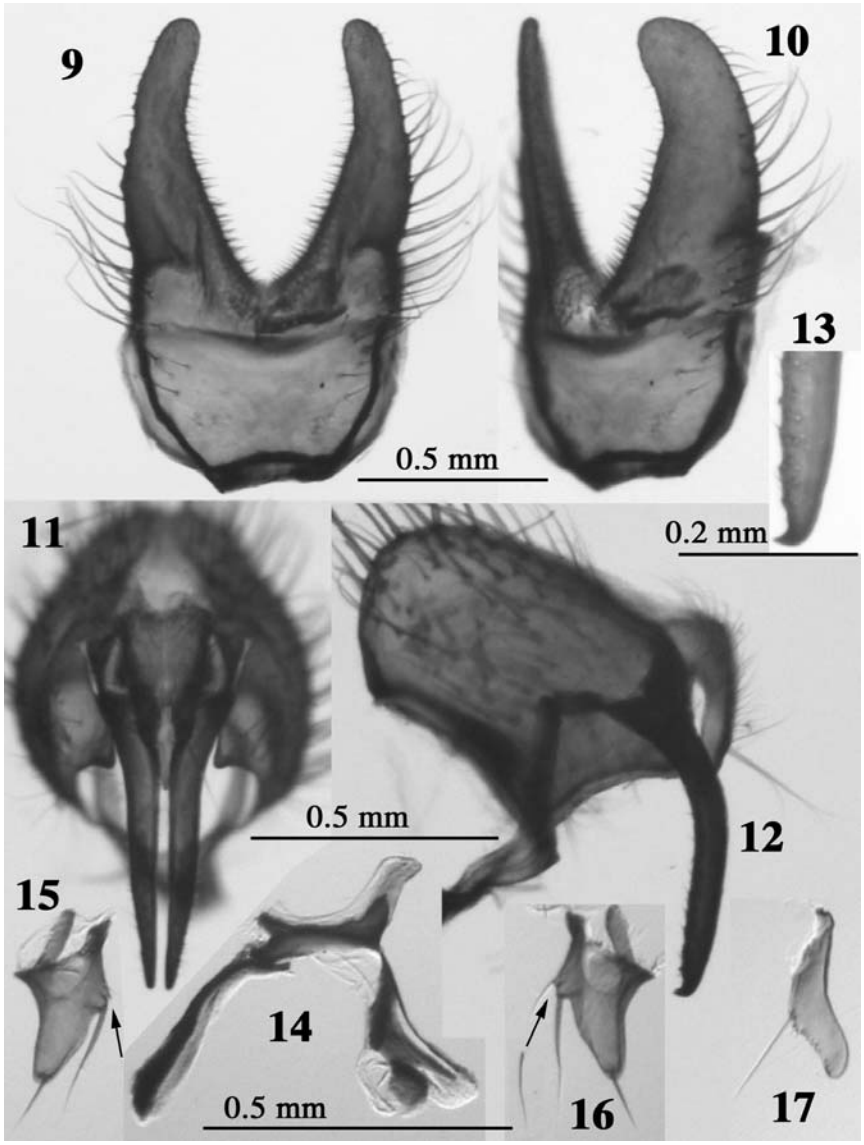
* The species with an asterisk is new to Sakhalin.



Figs 6–8. *Alliopsis lobata* sp. nov., ♂. 6, general features; 7, head, lateral view; 8, abdomen, caudal segments, lateral view. Holotype. Pilenga R., 70 km ENE of Smirnykh.

on 3rd, and hardly discernible on 4th and 5th tergites; hind-marginal bands hardly discernible, only narrowly visible on 2nd tergite medially; pregenital sclerite and epandrium thinly pollinose, and polished along anterior margin; 5th sternite polished.

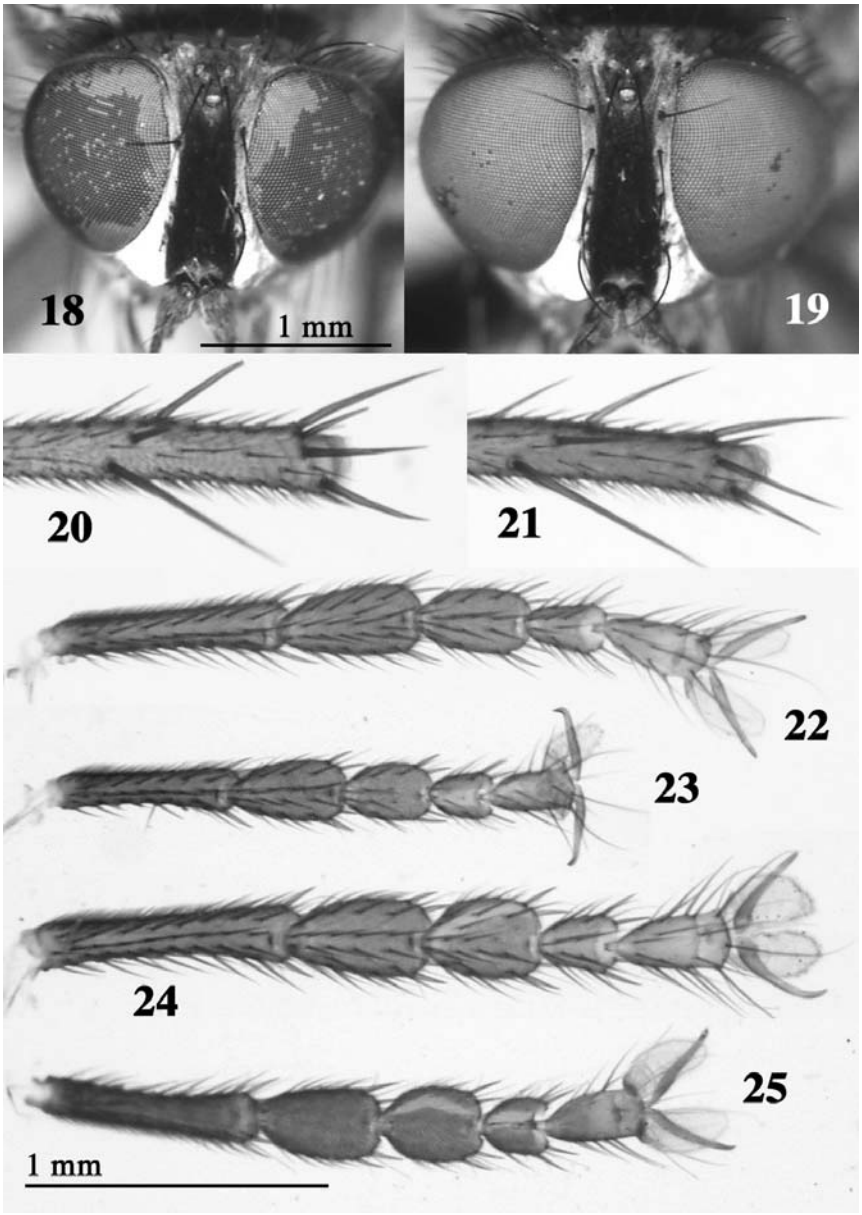
Head (Fig. 7) about 1.2 times as high as long; frons 1.3 times as wide as distance between posterior ocelli inclusive; interfrontalia about two-thirds as wide as frons, with a pair of strong *if* and with some short or minute setulae around *if*; parafrontals with 3 strong and 1 short *ori* and no *ors*; A_3 slightly longer than twice the width; arista with pubescence shorter than basal diameter of arista; orbits at parafrontal angle about 1.5



Figs 9−17. *Alliopsis lobata* sp. nov., ♂. 9, 5th sternite, ventral view; 10, ditto, ventrolateral view; 11, hypopygium, dorsal view; 12, ditto, lateral view; 13, left surstylus, apical part, lateral view; 14, aedeagus; 15, left pregonite, arrow indicating position of a missing seta; 16, right pregonite; 17, left postgonite. Magnification same for Figs 14−17. Holotype. Pilenga R., 70 km ENE of Smirnykh.

times as wide as A_3; genae slightly higher than orbital width at parafrontal angle, with 3 genal setae in a row, 1 short seta discernible above the row on right gena; epistoma situated behind tip of parafrontal angle; occiput setulose on postocular plains.

Mesonotum with 6 irregular pairs of *pre-acr* in closely approximated rows, 2 or 3 setae in each row being rather strong; posterior *ph* not differentiated; *pra* longer than



Figs 18−25. *Alliopsis* sp., ♀. 18–19, head, dorsal view; 20–21, right fore tibia, distal part, posterior view; 22–25, right fore tarsus, dorsal (22–24) and ventral (25) views, cleft on 4th and 5th segments ventromedially (23), on 3rd ventrolaterally (24), or on 3rd and 4th ventrolaterally (25). Magnification same for Figs 18−19, and for Figs 20−25. Pilenga R., 70 km ENE of Smirnykh (18, 20, 22; 19, 24; 21, 25; 23).

anterior *ntpl*; mesopleuron with 2 differentiated anterior *mpl*; 1 strong *pstg*, associated with 7–8 fine setulae; *stpl* 1:2, 1 weakly differentiated setula discernible below the anterior *stpl* and also below the posteriors; prosternum bare; scutellum bare on dorsal

center.

Mid femur with complete rows of *av* and *pv*, the longest *av* probably shorter than height of the femur (the seta is broken in the present specimen), and the longest *pv* (broken) probably a little longer than the femur height; f_3 with a complete row of *av*, the longest seta about 1.5 times as long as height of the femur, and with an almost complete row of *pv* (interrupted around apical fourth), the longest about as long as the femur height; t_1 with 2 *ad*, 1 *pd* and 1 *pv*, and with 3 strong apical setae (*d*, *p* and *pv*); t_2 with 1 *av*, 2 *ad*, 2 *pd* and 1 *p*/*pv*; t_3 with 1 *av*, 1 *a*, 3 *ad*, 3 *pd* and 1 *pv*. Wings with costal thorns small though stronger than costal spinules; costa setulose on ventral surface before subcostal break and almost bare beyond the break; *dm-cu* a little oblique and slightly sinuate.

Abdomen conical, about 2.3 times as long as wide; 6th tergite with no setae; 5th sternite (Figs 8−10) with processes prolonged and in profile somewhat downcurved apically, and with outer marginal setae rather strong around middle of the sternite and much weakened subapically; surstylus prominently hook-shaped apically (Figs 12−13); pregonite (Figs 15−16) with 1 apical seta and with 3 setae on dorsal corner, basalmost seta being fine and on left pregonite hardly discernible unless carefully examined; postgonite (Fig. 17) with a long seta ventrally.

♀. Unknown.

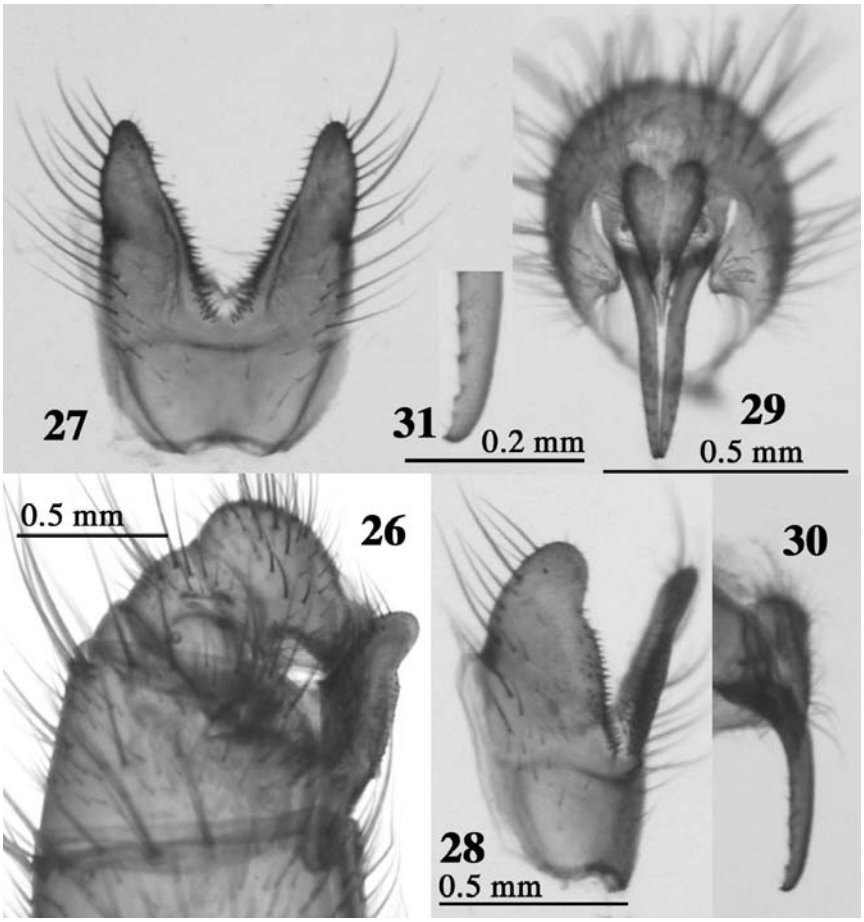
Remarks. The male 5th sternite with prolonged and broadly bare processes of the present species indicates a close relationship to *A. teriolensis* (Pokorny, 1893) known from Europe and North America. In a redescription of the latter species based on a Nearctic male specimen Griffiths (1987) says: peristomal margin in lateral view distinctly projecting beyond level of parafrontal angle; genal setae in more or less 2 rows; dorsal surface of scutellum almost entirely setulose; 6th tergite with a few strong setae on its posterior margin. In addition, the male 5th sternite of *A. teriolensis* figured in the redescription has much weakened outer marginal setae (cf. Fig. 1009, Griffiths, 1987). These differences may be enough to recognize *A. lobata* as distinct from *A. teriolensis*.

Together with the holotype of *A. lobata* eight females and no males of *Alliopsis* were collected. Of the females one is referred to *A. silvestris* (Fig. 35) and three others to *A. silvatica* (Fig. 37). The remaining four females (Figs 18−25) are, however, different from the typical form of *A. silvatica* in having the fore tarsi with the first segment as long as or shorter than the 2nd and 3rd combined. At present I am not sure whether the four females are regarded as mere variants of *A. silvatica* or referred to another species, e.g. *A. lobata*. It will be better to leave a conclusion to future investigation.

*3. *Alliopsis silvatica* (Suwa, 1974)
(Figs 26−32, 34, 36−37, 39)

Paraprosalpia silvatica Suwa, 1974: 62; Suwa, 1981b: 11.
Alliopsis silvatica: Suh et al., 1991a: 43; Wei et al., 1998: 756; Suwa, 1999: 206.

Material examined. Southern Sakhalin: Sokol, Field Station, 8 km south of Dolinsk, 1♂, 29.vii.2002, 1♀, 14.viii.2002; Riverside forest, Sokol River, 5 km southeast of Sokol, 1♀, 30.vii.2002; Mt. Zhdanko, alt. 100−250 m, 25 km north of Vzmor'ye, 1♂, 1♀, 2.viii.2002; Ugledarsk, near seashore, 14 km north-northeast of Vostochnyy, 4♀, 3.viii.2002; East side of Lake Busse, 20 km southeast of Ozerskiy, 1♂, 8♀, 16.viii.2002. Central Sakhalin: Northwest of Mt. Chamga, alt. 450−500 m, 42 km east-southeast of Tymovskoye, 8♀, 8.viii.2002; Smirnykh,

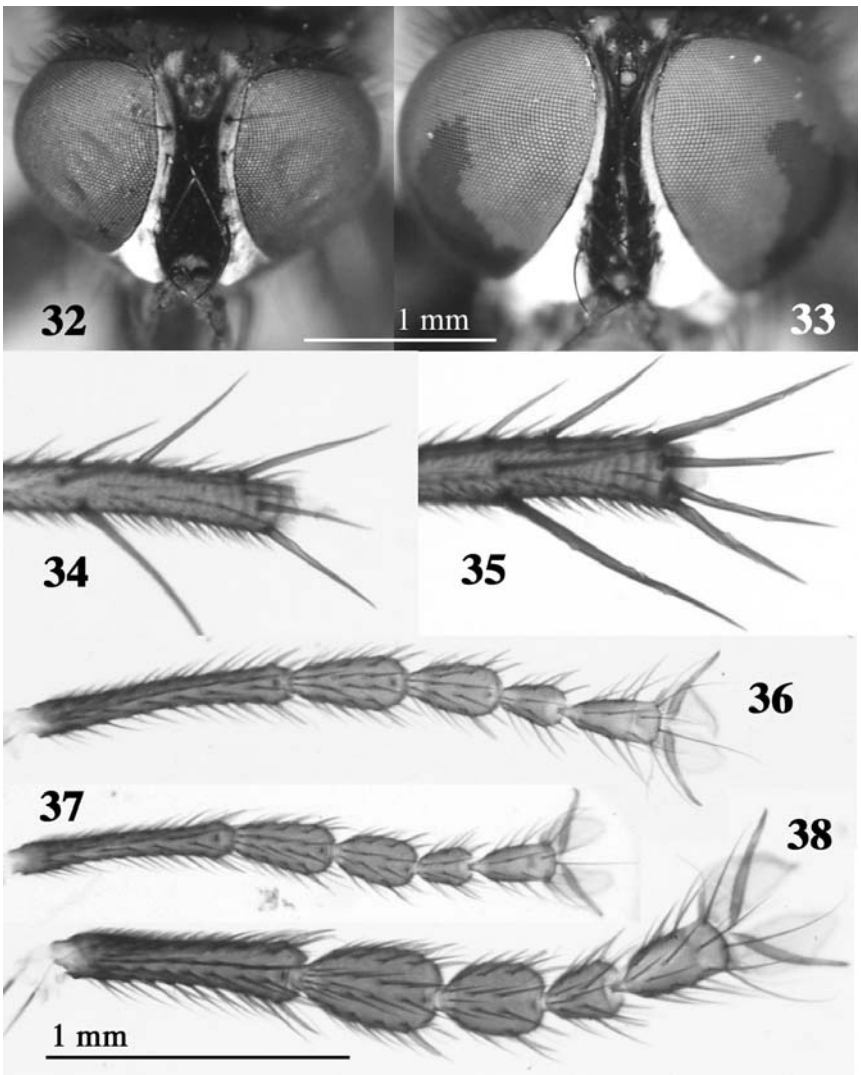


Figs 26–31. *Alliopsis silvatica* (Suwa), ♂. 26, abdomen, caudal segments, lateral view; 27, 5th sternite, ventral view; 28, ditto, ventrolateral view; 29, hypopygium, dorsal view; 30, ditto, lateral view; 31, left surstylus, apical part, lateral view. Magnification same for Figs 27−28, and for Figs 29−30. Smirnykh (26−28); Tym' R., 25 km E of Palevo (29−31).

riverside, alt. 70 m, Orlovka River, 1♂, 9.viii.2002; Tym' River, alt. 200 m, 25 km east of Palevo, 4♂, 3♀, 9.viii.2002; Riverside, alt. 50 m, Pilenga River, 70 km east-northeast of Smirnykh, 3♀, 11.viii.2002.

Distribution. Sakhalin; Kurils (Kunashiri); Japan (Hokkaido; Honshu); Korea; NE China.

Remarks. The female specimens recorded above are referred to *A. silvatica* by the fore tibiae (Fig. 34) with 3 strong apical setae and the fore tarsi (Figs 36−37) with the 1st segment longer than the 2nd and 3rd combined. The fore tarsi have the 2nd and 3rd segments less expanded than in *A. silvestris*. As the female of *A. lobata* is unknown, further investigation is needed for reliable information on differences between the females of *A. lobata* and *A. silvatica*.

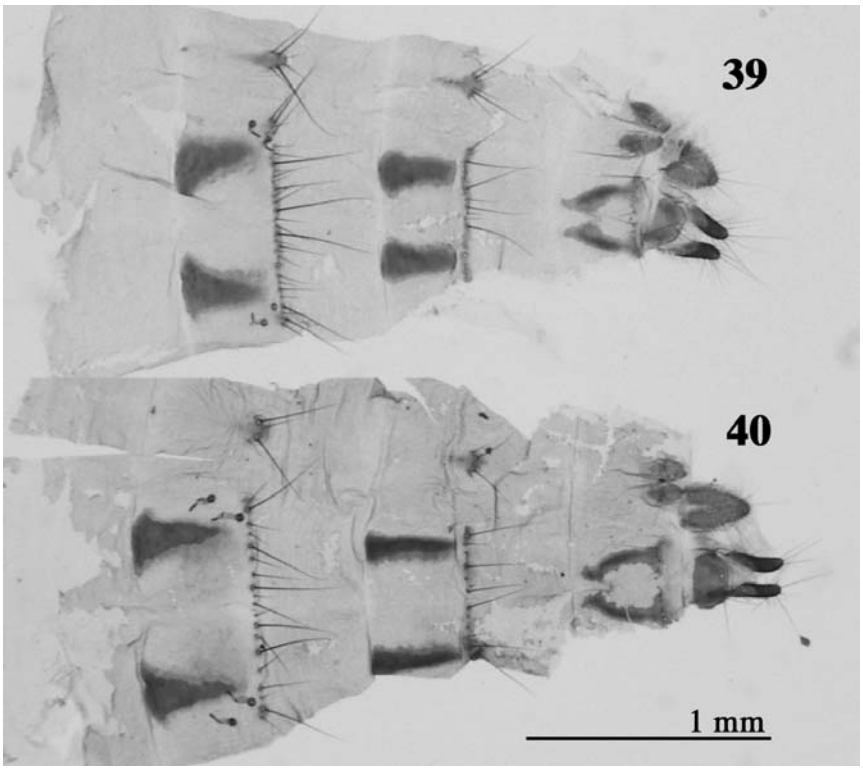


Figs 32–38. *Alliopsis silvatica* (Suwa), ♀ (32, 34, 36–37) and *A. silvestris* (Fallén), ♀ (33, 35, 38). 32−33, head, dorsal view; 34−35, right fore tibia, distal part, posterior view; 36–38, right fore tarsus, dorsal view. Magnification same for Figs 34−38. Tym' R., 25 km E of Palevo (32); east side of Lake Busse (34, 36); Pilenga R., 70 km ENE of Smirnykh (35; 37); lower reaches of Langeri R. (33, 38).

4. *Alliopsis silvestris* (Fallén, 1824)
(Figs 33, 35, 38, 40)

Paraprosalpia silvestris: Hennig, 1967: 97; Suwa, 1974: 64; Suwa, 1981b: 11.

Alliopsis silvestris: Griffiths, 1987: 839; Suh et al., 1991a: 43; Wei et al., 1998: 756; Suwa, 1999: 206; Suwa et al., 2000: 164.



Figs 39−40. Ovipositor of *Alliopsis* spp. 39, *A. silvatica* (Suwa); 40, *A. silvestris* (Fallén). East side of Lake Busse (39); Pilenga R., 70 km ENE of Smirnykh (40).

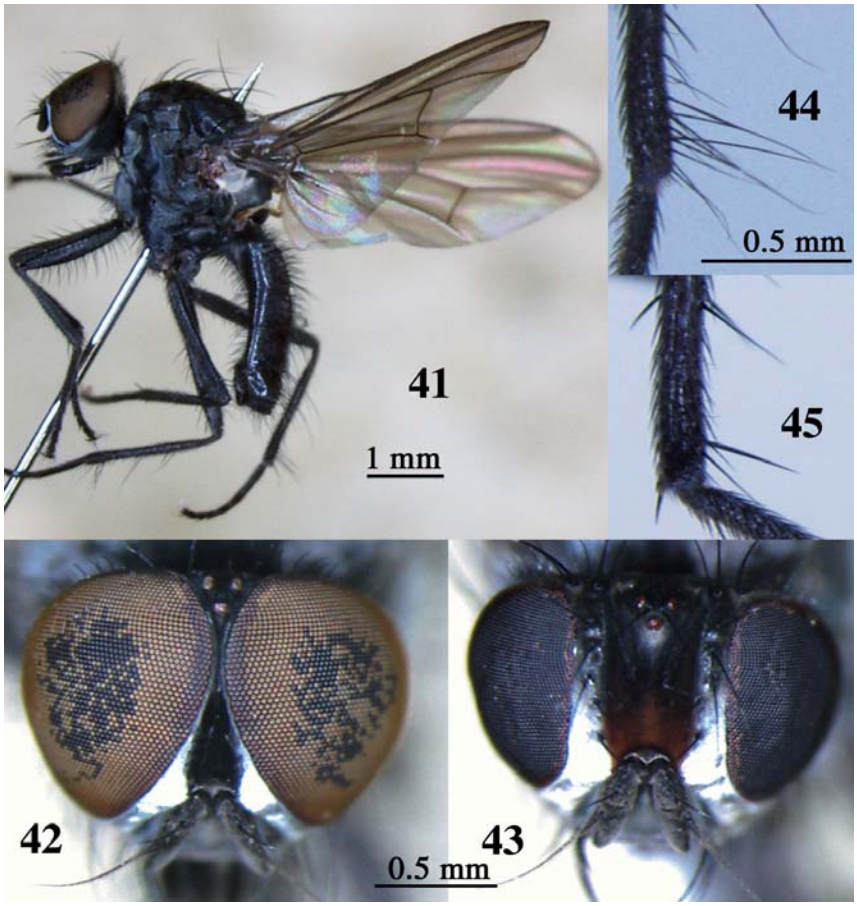
Material examined. Sachi (the locality indicated by this name is not yet confirmed), 1♀, 17.viii.1942 (H. Takahashi). Southern Sakhalin: Mt. Zhdanko, alt. 100−250 m, 25 km north of Vzmor'ye, 1♀, 2.viii.2002. Central Sakhalin: Lower reaches of Langeri River, alt. 100 m, 5 km west of seaside, 5♀, 11.viii.2002; Riverside, alt. 50 m, Pilenga River, 70 km east-northeast of Smirnykh, 1♀, 11.viii.2002.

Distribution. Sakhalin; Kurils (Paramushir); Japan (Hokkaido; Honshu); Korea; NE China; Kamchatka; Irkutsk; Europe; N America.

Remarks. The present female specimens are identified with *A. silvestris* by the following features: frons (Fig. 33) narrow, 1.2−1.5 times as wide as distance between posterior ocelli inclusive; parafrontals with no *ors*; fore tibia (Fig. 35) with 4 strong apical setae; fore tarsus (Fig. 38) with 1st segment as long as or shorter than the 2nd and 3rd combined and with the 2nd and 3rd segments much expanded. The 7th tergite of ovipositor seems to be represented by narrower lateral sclerites (Fig. 40) than in *A. silvatica* (Fig. 39) though it should be verified by further observasions.

*5. *Alliopsis tibialis* (Fan and Wang, 1982)
(Figs 41−45)

Paraprosalpia tibialis Fan and Wang in Fan et al., 1982: 221; Suwa, 1983a: 4; Wei et al., 1998: 760.



Figs 41−45. *Alliopsis tibialis* (Fan and Wang), ♂ (41−42, 44) and ♀ (43, 45). 41, general features; 42−43, head, dorsal view; 44−45, right hind tibia, distal part, posterior view. Sokol R., 5 km SE of Sokol (41−42, 44); NW of Mt. Chamga (43, 45).

Alliopsis tibialis: Suwa, 1999: 206.

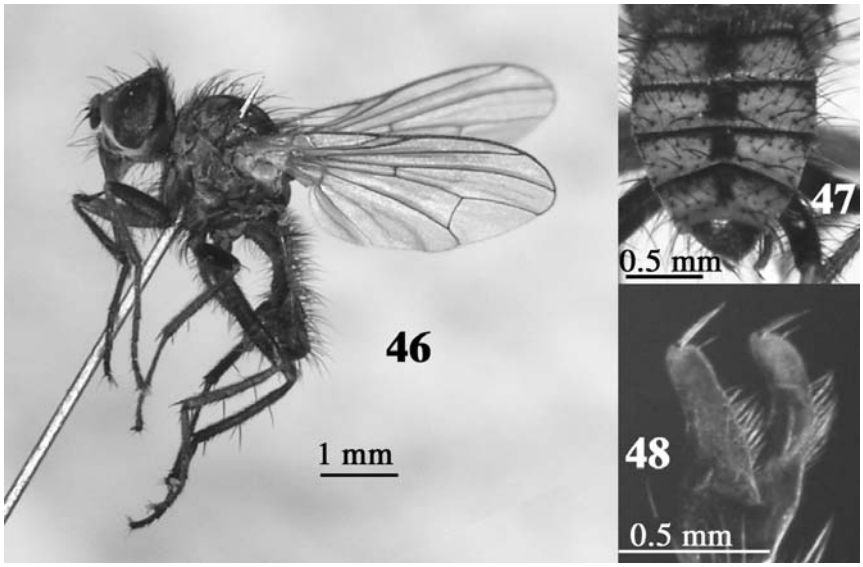
Material examined. Southern Sakhalin: Riverside forest, Sokol River, 5 km southeast of Sokol, 1♂, 1♀, 30.vii.2002. Central Sakhalin: Northwest of Mt. Chamga, alt. 450−500 m, 42 km east-southeast of Tymovskoye, 2♀, 8.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu); China (Shanxi; Liaoning).

Remarks. In having a characteristic bundle of setae near the apices of hind tibiae (Fig. 44) in the male, and widely separated eyes (Fig. 43) in the female, Griffiths (1987: 905) placed the present species in the *Alliopsis sepiella* superspecies of his sense.

*6. *Botanophila apiciseta* (Ringdahl, 1933)
(Figs 46−48)

Pegohylemyia apiciseta: Hennig, 1970: 355.



Figs 46–48. *Botanophila apiciseta* (Ringdahl), ♂. 46, general features; 47, abdomen, dorsocaudal view; 48, 5th sternite, ventrolateral view. Mt. Chamga.

Botanophila apiciseta: Thompson and Pape, 2010: http://www.diptera.org/; Michelsen, 2012: http://www.faunaeur.org/.

Material examined. Central Sakhalin: Mt. Chamga, alt. 1000–1300 m, 45 km east-southeast of Tymovskoye, 1♂, 7.viii.2002.

Distribution. Sakhalin; Europe; N America (Quebec).

Remarks. Thompson and Pape (2010) recorded Quebec as a distribution area of this species in addition to some countries of Europe. According to Michelsen (2012) *B. apiciseta* is also distributed in the East Palaearctic region, though no locality is given.

This species is distinguishable by the polished haustellar mentum and the male 5th sternite (Fig. 48) with a strong apical seta on each process.

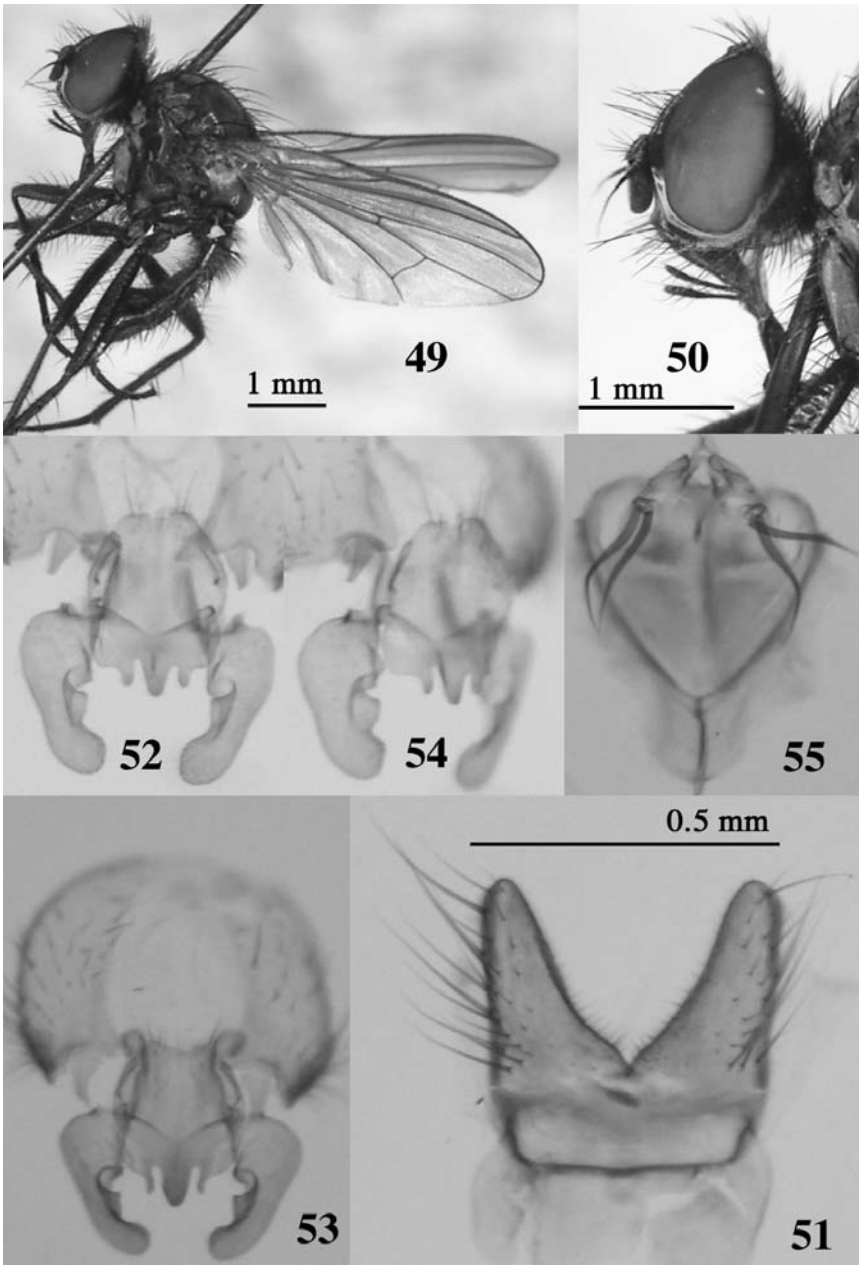
*7. *Botanophila biciliaris* (Pandellé, 1900)

Pegohylemyia norvegica: Hennig, 1970: 389.
Pegohylemyia appendiculata: Suwa, 1974: 117.
Botanophila appendiculata: Suwa, 1999: 207; Suwa et al., 2000: 164.
Botanophila biciliaris: Michelsen, 2012: http://www.faunaeur.org/.

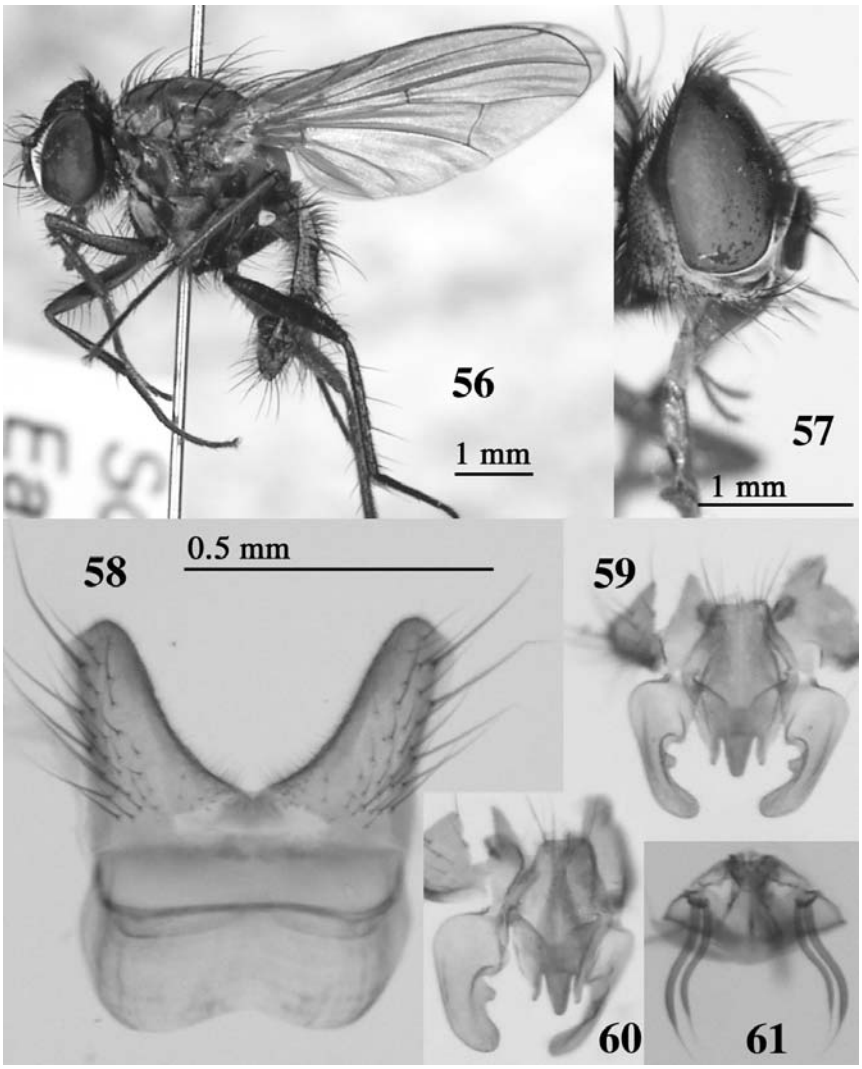
Material examined. Central Sakhalin: Northwest of Mt. Chamga, alt. 450–500 m, 42 km east-southeast of Tymovskoye, 12♂, 8.viii.2002.

Distribution. Sakhalin; Kurils (Kharimkotan); Japan (Hokkaido); Europe; N America.

Remarks. According to Michelsen (2012) *Hylemyia appendiculata* Malloch, 1920, and *Pegohylemyia norvegica* Ringdahl, 1952, are conspecific with *B. biciliaris* (Pandellé, 1900).



Figs 49−55. *Botanophila cognata* Suwa, ♂. 49, general features; 50, head, lateral view; 51, 5th sternite, ventral view; 52−53, hypopygium, dorsal view; 54, ditto, dorsolateral view; 55, hypandrium and associated parts, ventral view. Magnification same for Figs 51−55. NW of Mt. Chamga (49−50, 52, 54; 51, 53, 55).



Figs 56−61. *Botanophila fugax* (Meigen), ♂. 56, general features; 57, head, lateral view; 58, 5th sternite, ventral view; 59, hypopygium, dorsal view; 60, ditto, dorsolateral view; 61, hypandrium and associated parts, posteroventral view. Magnification same for Figs 58−61. East side of Lake Busse (56−58, 61; 59−60).

*8. *Botanophila cognata* Suwa, 2011
(Figs 49−55)

Botanophila cognata Suwa, 2011a: 77.

Material examined. Central Sakhalin: Northwest of Mt. Chamga, alt. 450−500 m, 42 km east-southeast of Tymovskoye, 2♂, 8.viii.2002.

Distribution. Sakhalin; Japan (Honshu).

Remarks. *Botanophila cognata* was described on the basis of three male specimens from Honshu, Japan. The present specimens from Sakhalin are referred to this species by the cercal plate distinctly concave at outer bases of lateral apical projections and the surstyli with a triangular process on inner margin medially. The Sakhalin form is slightly different from the Japanese one in having comparatively short setae on the femora: f_2 with longest *pv* 1.4−1.5 times (1.6−1.8 times in Japanese) as long as height of the femur; f_3 with longest *av* about twice (2.0−2.4 times in Japanese) as long as height of the femur, and longest *pv* 1.3–1.5 times (about 1.8 times in Japanese) as long as the femur height. The available material is too meagle to say whether these differences are due to individual or geographical variations.

*9. *Botanophila fugax* (Meigen, 1826)
(Figs 56−61)

Pegohylemyia fugax: Hennig, 1970: 369.

Botanophila fugax: Suwa, 1986: 43; Wei et al., 1998: 689; Suwa et al., 2000: 165; Suwa, 2011a: 81.

Material examined. Southern Sakhalin: Sokol, Field Station, 8 km south of Dolinsk, 1♂, 4.viii.2002; East side of Lake Busse, 20 km southeast of Ozerskiy, 2♂, 16.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido); Kurils (Paramushir); Kamchatka; China; Urals; Europe; N America.

Remarks. This species is widely distributed in the Holarctic region. It is not easy to distinguish the species from the preceding *B. cognata* unless its terminalia are examined.

*10. *Botanophila gemmata* (Zetterstedt, 1860)
(Figs 62−65)

Botanophila gemmata: Hennig, 1970: 330; Suwa, 1974: 95; Suwa, 1999: 208; Michelsen, 2012: http://www.faunaeur.org.

Material examined. Central Sakhalin: Northwest of Mt. Chamga, alt. 450−500 m, 42 km east-southeast of Tymovskoye, 1♂, 8.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido); Finland; Norway; Sweden.

Remarks. The present species may widely be found in high latitude areas from Fennoscandia to the Far East.

*11. *Botanophila isikariana* (Suwa, 1974)

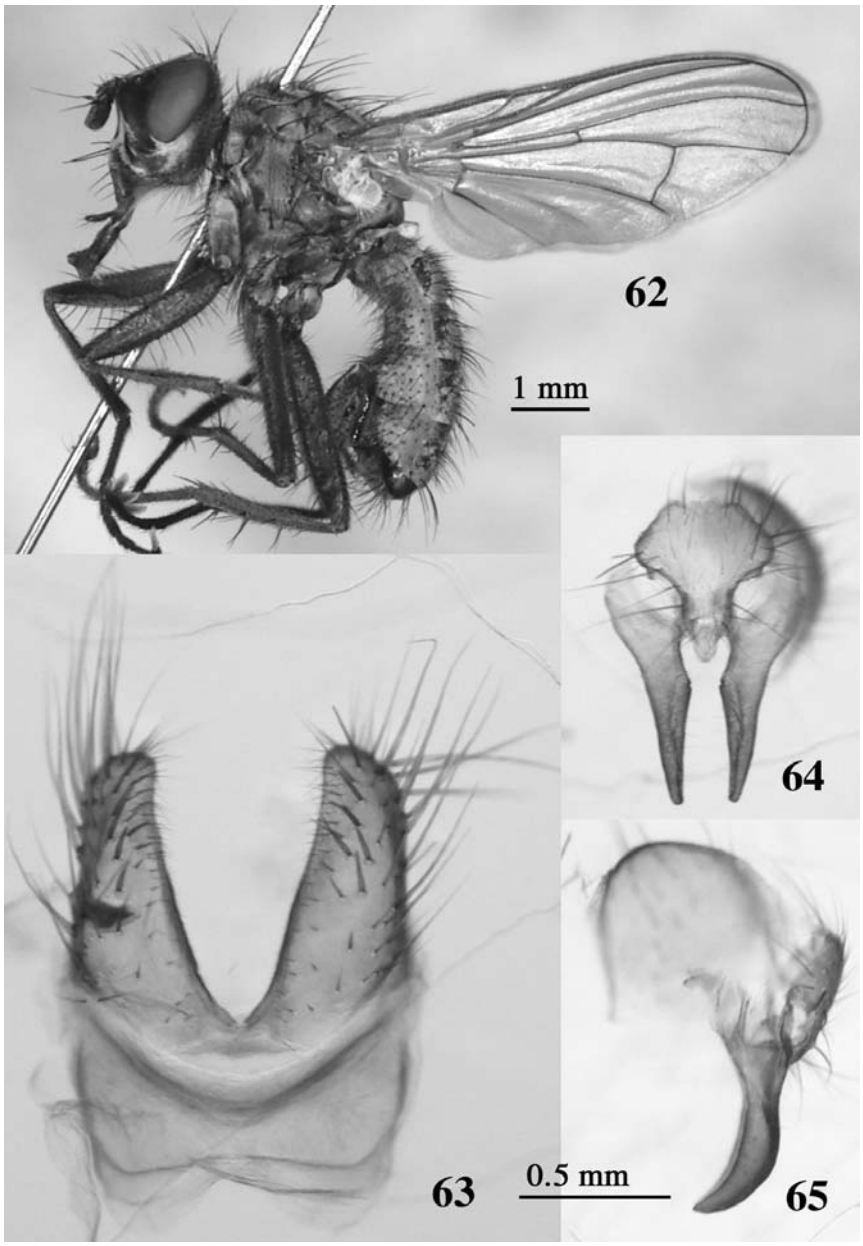
Pegohylemyia isikariana Suwa, 1974: 125.

Botanophila isikariana: Suwa, 1999: 209; Suwa et al., 2000: 165.

Material examined. Southern Sakhalin: Mouth of Bakhura River, 20 km east of Sokol, 1♂, 31.vii.2002; Prigorodnoye, 8 km east of Korsakov, 1♂, 15.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu); Kurils (Onekotan).

Remarks. This species is recorded as a rolled leaf feeder on *Lathyrus maritimus* in Hokkaido, Japan (Suwa, 1999). It may widely be distributed on seashores of the Far



Figs 62−65. *Botanophila gemmata* (Zetterstedt), ♂. 62, general features; 63, 5th sternite, ventral view; 64, hypopygium, dorsal view; 65, ditto, lateral view. Magnification same for Figs 63−65. NW of Mt. Chamga.

East.

*12. *Botanophila shirozui* (Suwa, 1981)
(Figs 66−68)

Pegohylemyia shirozui Suwa, 1981a: 104.
Botanophila shirozui: Suh et al., 1991a: 46; Wei et al., 1998: 695.

Material examined. Southern Sakhalin: Sokol, Field Station, 8 km south of Dolinsk, 1♂, 14.viii.2002.

Distribution. Sakhalin; Korea (Cheju-do, type locality; Hamgyongbukto, North Korea); NE China.

Remarks. *Botanophila shirozui* is now known from Korea, Northeast China and Sakhalin. In Japan (Hokkaido and Honshu) is found a very closely related species, *B. nitiditheca* (Suwa, 1974). This is clearly different from *B. shirozui* in the male 5th sternite with a prominent subapical outer-marginal seta on each process (Fig. 69). The state of the sternite in *B. shirozui* may be derived from loss of such setae.

13. *Botanophila sonchi* (Hardy, 1872)
(Fig. 70)

Pegohylemyia sonchi: Hennig, 1970: 415; Suwa, 1974: 116; Uffen and Chandler, 1978: 227; Suwa, 1981b: 12.
Botanophila sonchi: Suwa, 1986: 48; Wei et al., 1998: 695.

Material examined. Southern Sakhalin: Ichinosawa (= Pervaya Pad', 10 km north of Korsakov), 1♂, 15.viii.1923 (S. Matsumura); East side of Lake Busse, 20 km southeast of Ozerskiy, 1♂, 16.viii.2002. Central Sakhalin: Northwest of Mt. Chamga, alt. 450−500 m, 42 km east-southeast of Tymovskoye, 1♂, 8.viii.2002.

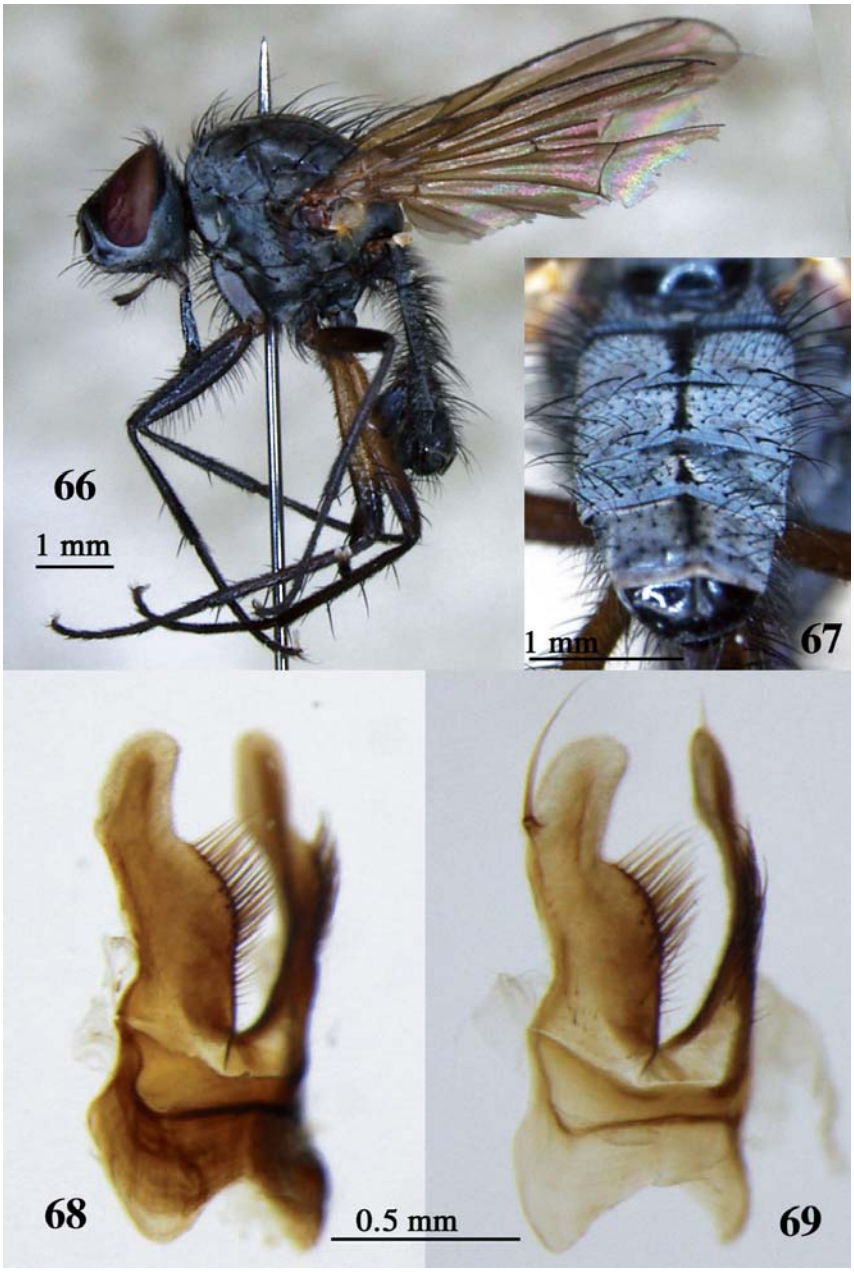
Distribution. Sakhalin; Japan (Hokkaido); China; Europe.

Remarks. In Europe this species is known to feed on flower-heads of *Sonchus oleraceus* L. and *Sonchus arvensis* L. in the larval stage (Hennig, 1970; Uffen and Chandler, 1978). It is not difficult to find *S. oleraceus* and other plants of *Sonchus* in eastern Asia, where *B. sonchi* may have a wide distribution.

*14. *Botanophila spinisternata* (Suwa, 1974)

Pegohylemyia spinisternata Suwa, 1974: 131.
Botanophila spinisternata: Suh and Kwon, 1985: 176; Wei et al., 1998: 696; Suwa, 1999: 212.

Material examined. Southern Sakhalin: Sokol, Field Station, 8 km south of Dolinsk, 31♂, 4.viii.2002, 22♂, 5.viii.2002, 12♂, 14.viii.2002; Riverside forest, near seashore, Bakhura River, 20 km east of Sokol, 18♀, 31.vii.2002; Mt. Zhdanko, alt. 100−250 m, 25 km north of Vzmor'ye, 1♀, 2.viii.2002; East side of Lake Busse, 20 km southeast of Ozerskiy, 1♀, 16.viii.2002. Central Sakhalin: Riverside, alt. 50 m, Pilenga River, 70 km east-northeast of Smirnykh, 3♂, 11.viii.2002; Gastello, riverside, alt. 100 m, 18 km southwest of Poronaysk, 1♂, 1♀, 13.viii.2002.



Figs 66–69. *Botanophila shirozui* (Suwa), ♂ (66−68) and *B. nitiditheca* (Suwa), ♂ (69). 66, general features; 67, abdomen, dorsocaudal view; 68–69, 5th sternite, ventrolateral view. Sokol (66–68); Rebun-to, Hokkaido, Japan (69).



Fig. 70. *Botanophila sonchi* (Hardy), ♂. Head, lateral and a little oblique view. East side of Lake Busse.



Fig. 71. *Trollius* sp. Adult flies of two *Chiastocheta* species were collected by net sweeping on flowers of the plant. Mt. Chamga.

Distribution. Sakhalin; Japan (Hokkaido; Honshu); Korea; NE China.

15. *Chiastocheta latispinigera* Fan, Chen and Jiang, 1982
(Figs 72−84)

Chiastocheta latispinigera Fan, Chen and Jiang in Fan et al., 1982: 223; Suwa, 1989: 7; Pellmyr, 1992: 346−348.

Chiastocheta I5: Pellmyr, 1992: 347−348.

Material examined. Central Sakhalin: Mt. Chamga, alt. 1000−1300 m, 45 km east-southeast of Tymovskoye, 1♂, 2♀, on flowers of *Trollius* sp. (Fig. 71), 7.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido); China; Siberia.

Remarks. The present specimens from Sakhalin agree well with a redescription of *C. latispinigera* by Suwa (1989) based on specimens from Hokkaido, Japan, and are referred to the species. According to Pellmyr (1992) who studied eggs of *Chiastocheta* species found on herbarium sheets of *Trollius* plants from various localities, *C. latispinigera* is widely distributed in Asia including Sakhalin, but the form (I5) of *Chiastocheta* utilizing *Trollius riederianus* in Hokkaido is regarded as a distinct species, differing from *C. latispinigera* in oviposition biology and egg morphology. On the other hand, Després et al. (2002), based on molecular data from adult male flies, gave a note as follows: "Although Japanese haplotypes [from Hokkaido] form a monophyletic clade, they are nested within Siberian *latispinigera* haplotypes: molecular data do not differentiate two monophyletic clades, so that according a species status to Japanese populations is problematic." More information on morphology and biology of immature stages linked with identified adult flies is needed for further discussion.

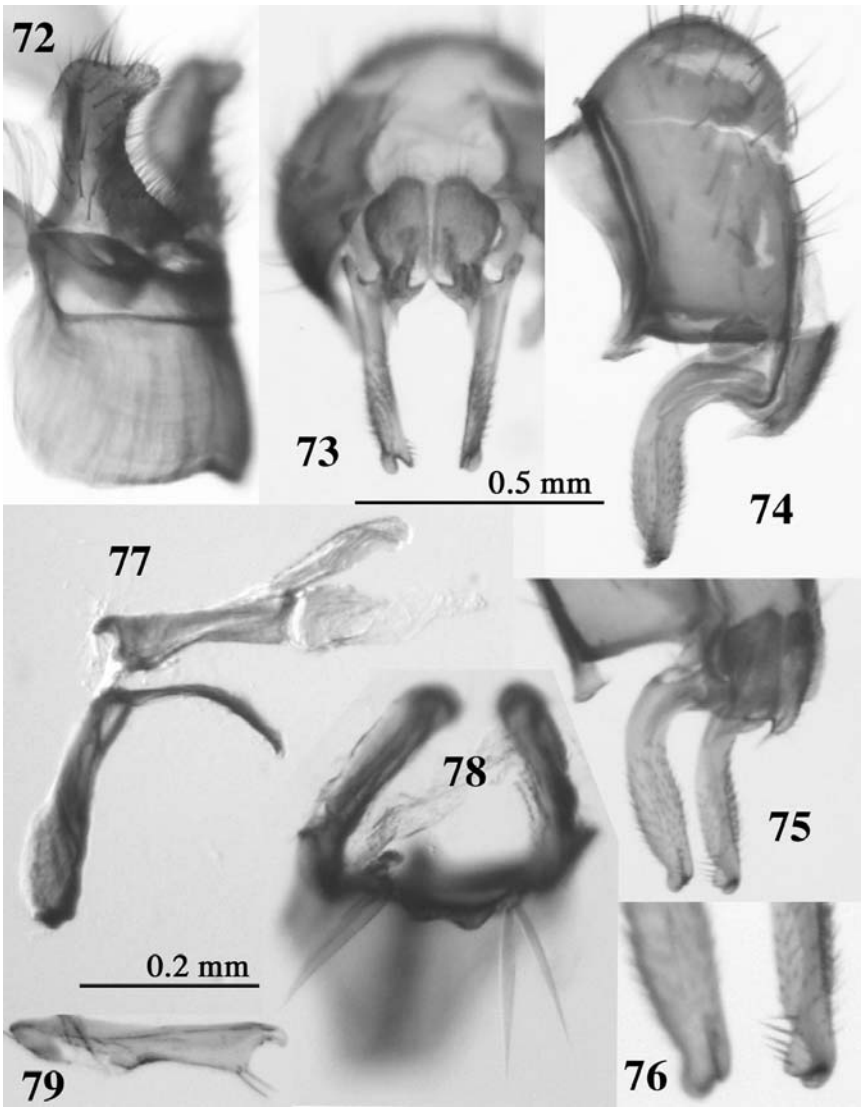
At least two species of *Chiastocheta*, the present *C. latispinigera* and the following *C. sachalinensis*, are now known to occur in Sakhalin. The cercal plate of male terminalia is usually observable even in dried specimens and useful for identification of the species without dissecting genitalia. In the females, however, I have failed to find any reliable differences between the two species except in their abdominal sternites and ovipositors (*latispinigera*: Figs 83−84; *sachalinensis*: Figs 101−102).

*16. *Chiastocheta sachalinensis* sp. nov.
(Figs 85−102)

Type material. Central Sakhalin: Mt. Chamga, alt. 1000−1300 m, 45 km east-southeast of Tymovskoye, 4♂ (one the holotype), 5♀, on flowers of *Trollius* sp. (Fig. 71), 7.viii.2002.

Distribution. Sakhalin.

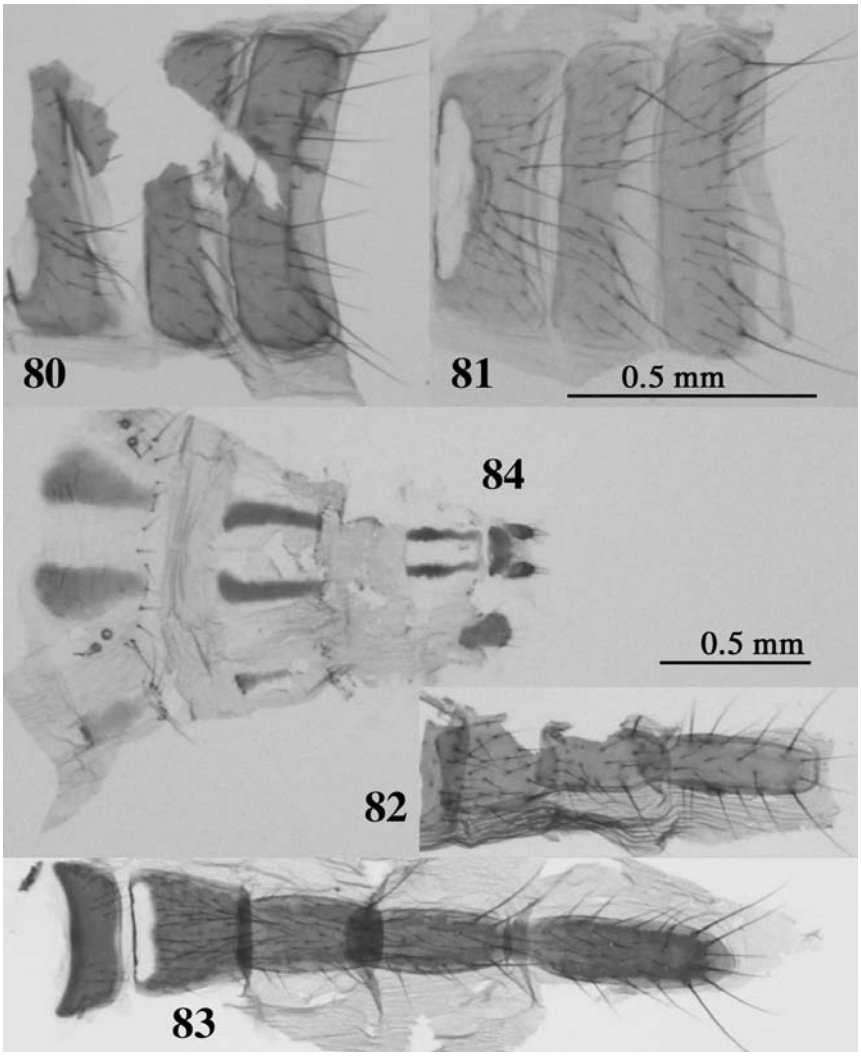
♂. Wing length 3.3−3.5 mm. Body including appendages mainly blackish in ground colour, with pollinosity pale grey or pale brownish grey and darker in part. Interfrontalia narrowly brownish near lunule (broadly brownish yellow in tenreal specimens); haustellar mentum well pollinose. Mesonotum mainly brownish grey pollinose, pale grey on humeral calli and notopleura, in caudal view with broad median black vitta and broad pre- and postsutural lateral black patches discernible. Abdomen rather thinly brownish grey pollinose, in caudal view almost wholly blackish; cercal plate brownish; 5th sternite black and polished. Wings slightly tinged with dark brown; calypteres slightly tinged with yellow; halteres yellow at knobs.



Figs 72−79. *Chiastocheta latispinigera* Fan, Chen and Jiang, ♂. 72, 5th sternite, ventrolateral view; 73, hypopygium, dorsal view; 74, ditto, lateral view; 75, ditto, dorsolateral view; 76, ditto, apical part of surstyli; 77, aedeagus; 78, hypandrium and associated parts, posteroventral view, showing pregonite setae; 79, postgonite. Magnification same for Figs 72−75, and for Figs 76−79. Mt. Chamga.

Frons gradually narrowing downward, in holotype 0.47 times as wide as head at level of anterior ocellus and 0.40 times near lunule; genae a little higher than palpus width.

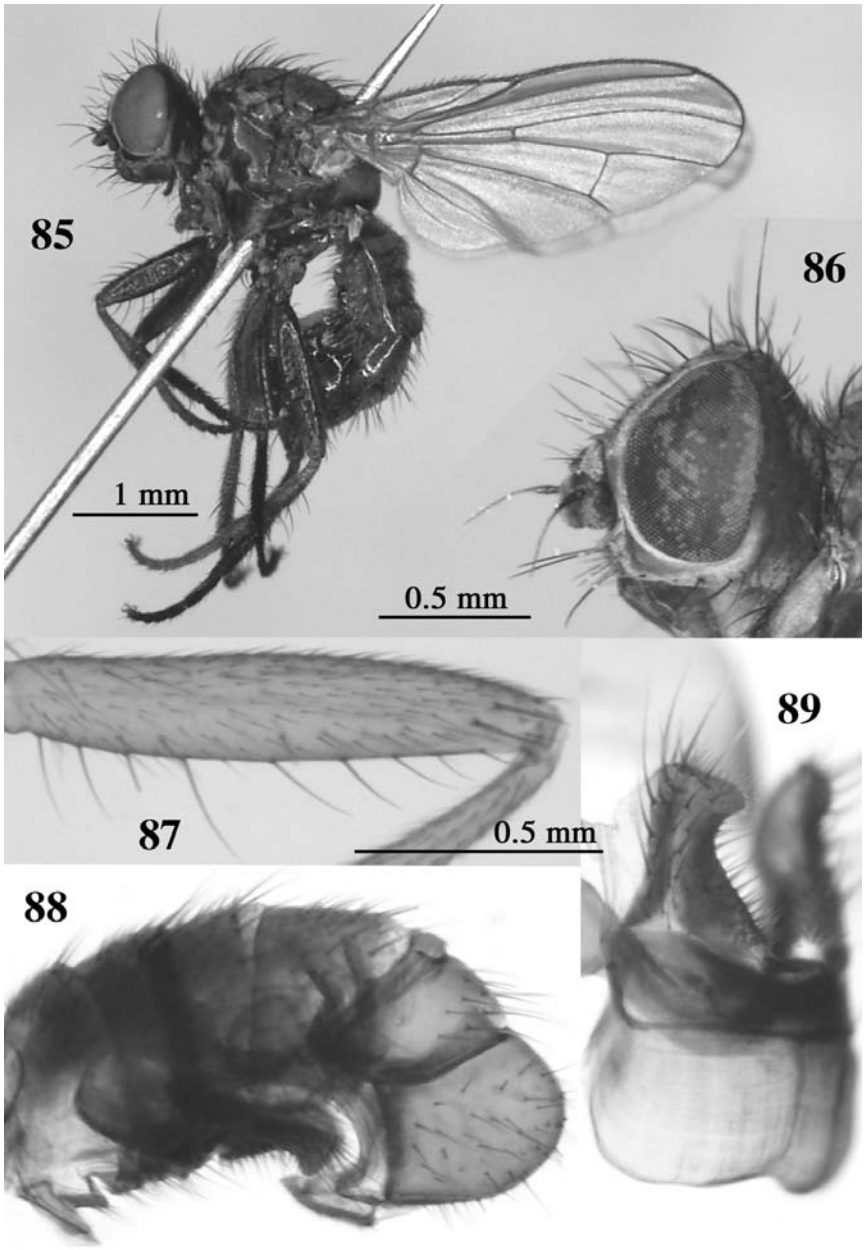
Mesonotum with 4–6 pairs of *pre-acr* and 5–6 accessory setulae between the rows of *pre-acr*, distance between the setae of strongest pair being as long as or a little shorter than that to adjacent *dc*-row; posterior *ph* only a little stronger than adjacent setulae; *pra*



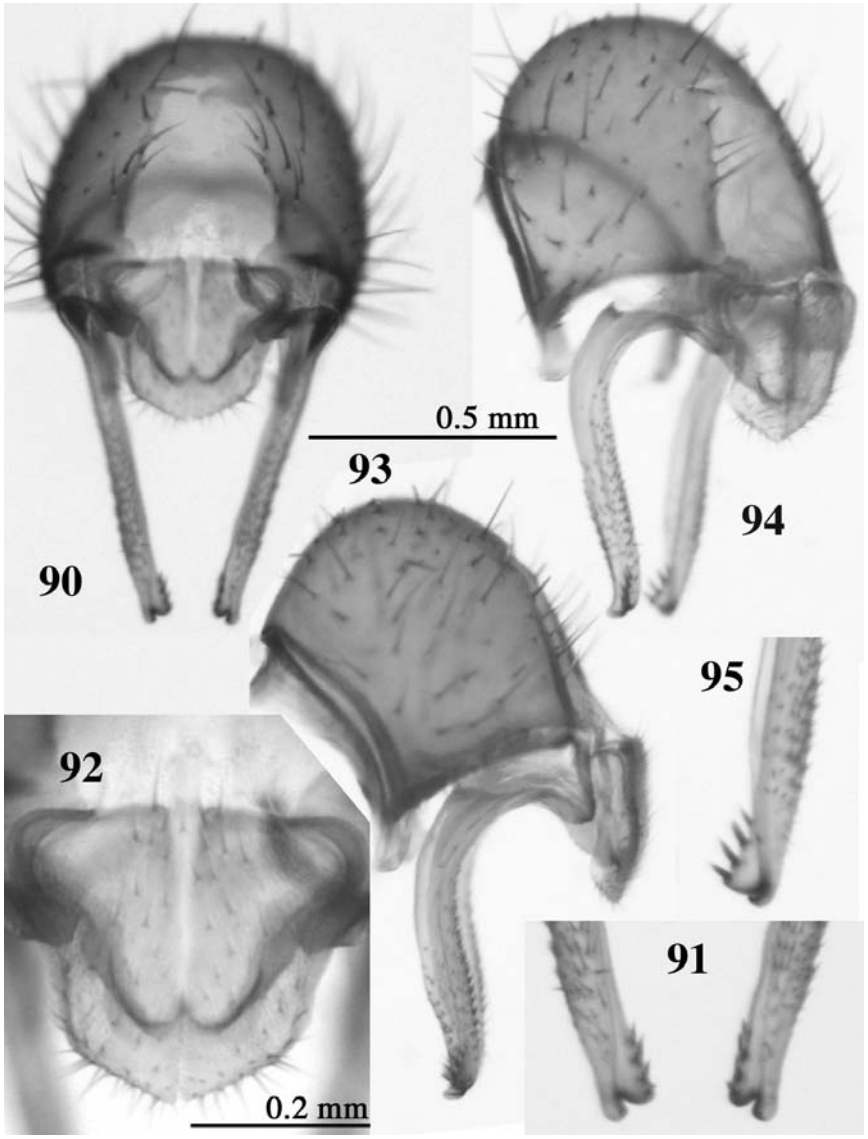
Figs 80−84. *Chiastocheta latispinigera* Fan, Chen and Jiang, ♂ (80−81) and ♀ (82−84). 80−81, 2nd (leftmost) to 4th sternites; 82, 3rd (leftmost) to 5th sternites; 83, 1st (leftmost) to 5th sternites; 84, ovipositor. Mt. Chamga (80; 82; 84); Mt. Daisetsu, Hokkaido, Japan (81); Mt. Shokambetsu, Hokkaido, Japan (83).

a little shorter to slightly longer than posterior *ntpl*; mesopleuron with a distinct anterior *mpl*; 1 strong and 1 weak *pstg*, no associated setulae; *stpl* 1:1, a weakly differentiated setula discernible below the anterior *stpl* and usually also below the posterior.

Mid femur (Fig. 87) with rows of *av* and *pv*, the longest *av* being slightly to distinctly shorter than height of the femur, and the longest *pv* as long as to a little longer than the femur height; f_3 with a row of 7–8 strong *av*, some on apical half being much longer than height of the femur, and with about 5 *pv* on basal two-thirds and 1 *pv* near apex, 2 or 3 *pv* on median third being stronger and the longest one as long as or a little



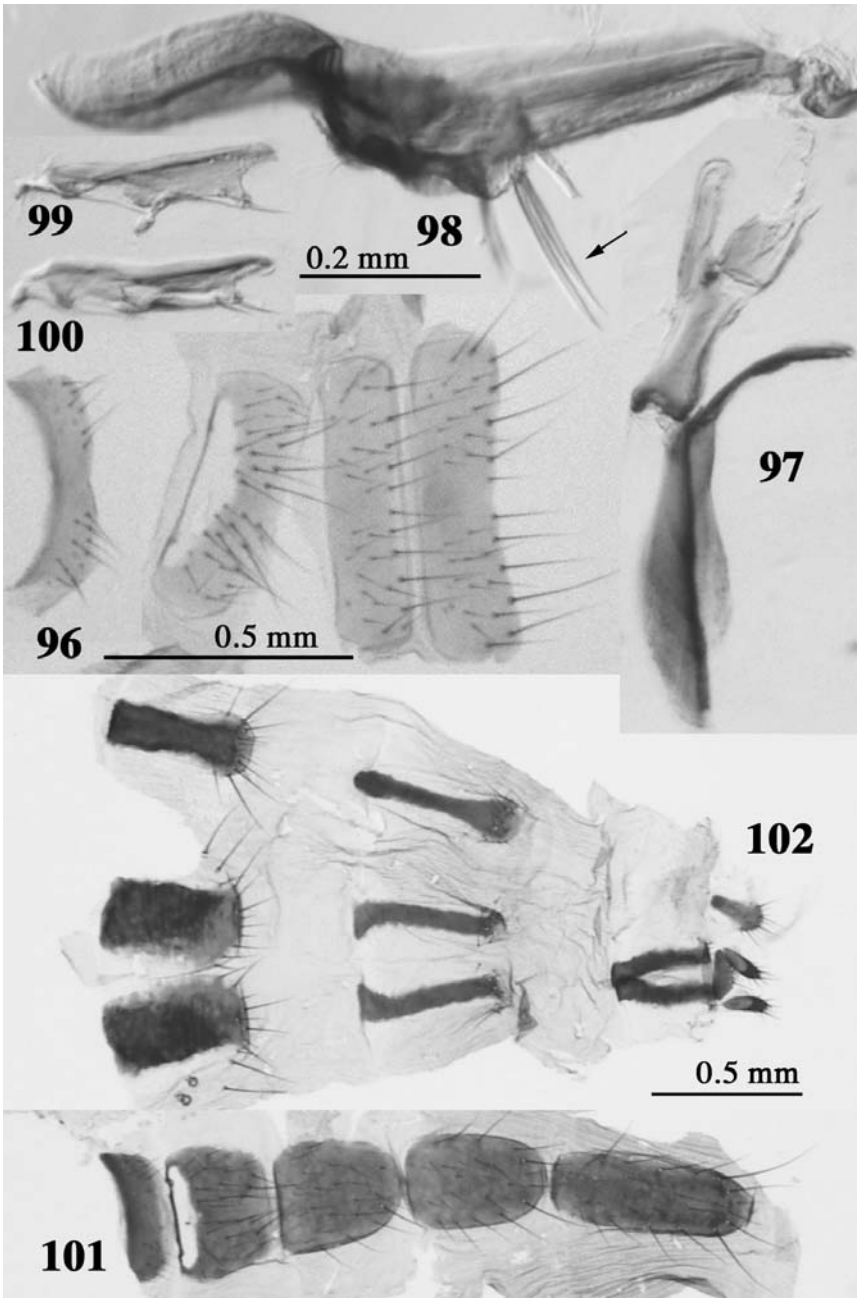
Figs 85−89. *Chiastocheta sachalinensis* sp. nov., ♂. 85, general features; 86, head, lateral view; 87, right mid femur, posterior view, showing *pv* setae; 88, abdomen; 89, 5th sternite, ventrolateral view. Magnification same for Figs 86 and 88, and for Figs 87 and 89. Mt. Chamga (85, holotye; 86; 87−89).



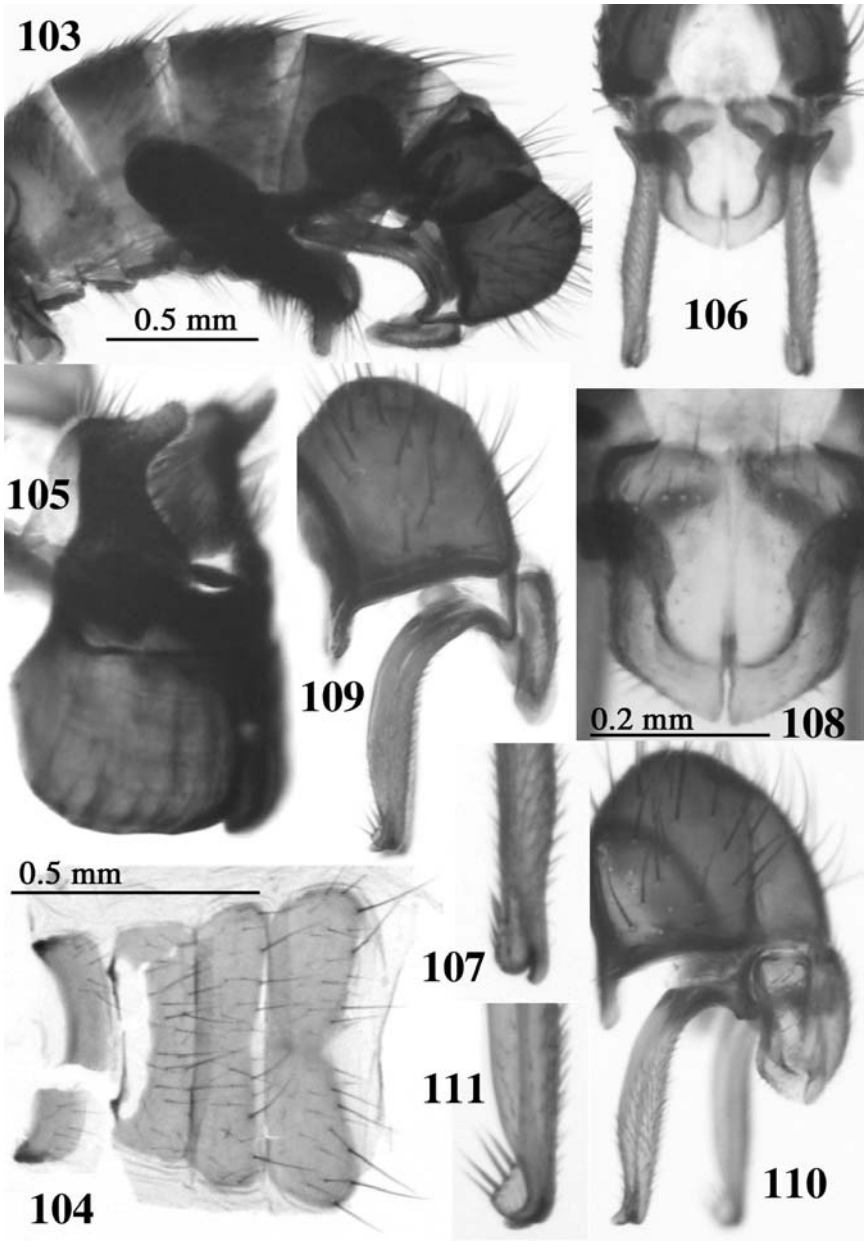
Figs 90−95. *Chiastocheta sachalinensis* sp. nov., ♂. 90, hypopygium, dorsal view; 91, ditto, apical part of surstyli; 92, ditto, cercal plate; 93, hypopygium, lateral view; 94, ditto, dorsolateral view; 95, ditto, apical part of right surstylus. Magnification same for Figs 90 and 93−94, and for Figs 91−92 and 95. Mt. Chamga.

shorter than height of the femur; t_1 with 1 *ad*, 1 *pd* and 1 *pv*, the *pd* sometimes hardly discernible; t_2 with 1 *ad*, 2 *pd* and usually 2 *pv*; t_3 with no or occasionally 1 *av*, 3–4 (5 on right t_3 in holotype) *ad*, 2–3 *pd* and no *pv* (2 fine *pv* discernible on left t_3 in a paratype). Wings with costal thorns shorter than *h* crossvein though stronger than costal spinules.

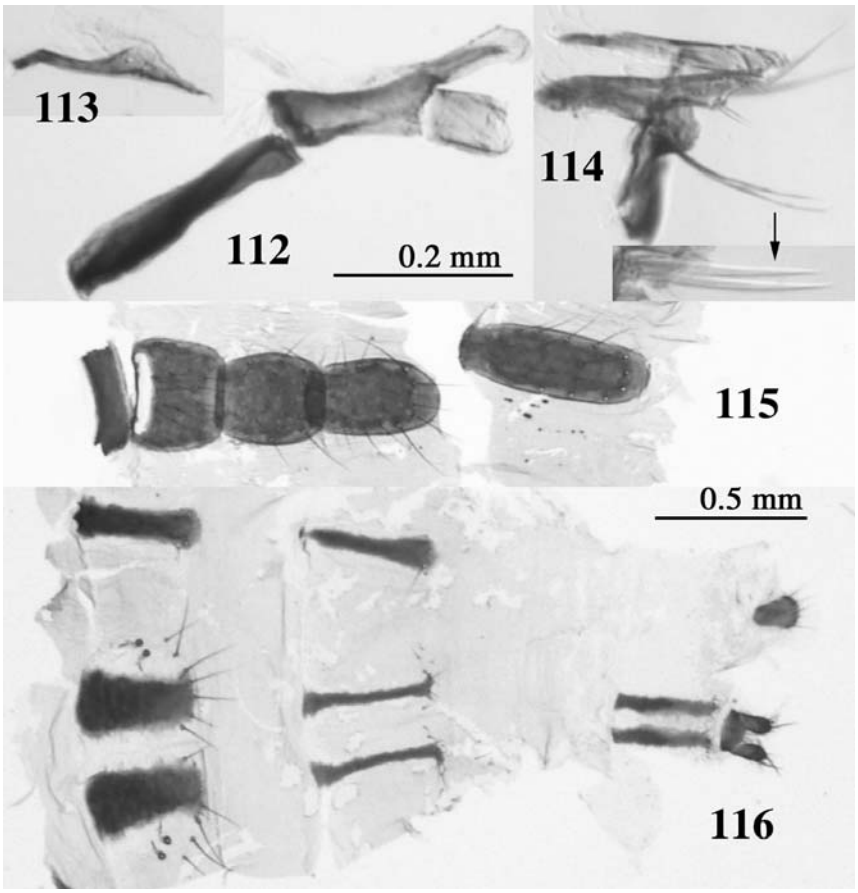
Abdomen with 1st sternite unsetulose medially (Fig. 96); 5th sternite (Fig. 89) with processes rather distinctly protruded innerapically; hypopygium (Figs 90−95) with cercal



Figs 96−102. *Chiastocheta sachalinensis* sp. nov., ♂ (96−100) and ♀ (101−102). 96, 1st (leftmost) to 4th sternites; 97, aedeagus; 98, hypandrium and associated parts, lateral view, arrow indicating pregonite setae; 99, postgonite; 100, ditto, slightly different angle of view; 101, 1st (leftmost) to 5th sternites; 102, ovipositor. Magnification same for Figs 97−100. Mt. Chamga (96; 97−100; 101−102).



Figs 103−111. *Chiastocheta dentifera* Hennig, ♂. 103, abdomen; 104, 1st (leftmost) to 4th sternites; 105, 5th sternite, ventrolateral view; 106, hypopygium, dorsal view; 107, ditto, apical part of right surstylus; 108, ditto, cercal plate; 109, hypopygium, lateral view; 110, ditto, dorsolateral view; 111, ditto, apical part of right surstylus. Magnification same for Figs 104−106 and 109−110, and for Figs 107−108 and 111. Oulanka, Finland.



Figs 112−114. *Chiastocheta dentifera* Hennig, ♂ (112−114) and ♀ (115−116). 112, aedeagus; 113, ejaculatory apodeme; 114, hypandrium and associated parts, lateral view; 115, 1st (leftmost) to 5th sternites; 116, ovipositor. Oulanka, Finland (112−114; 115−116).

plate shield-shaped, more or less expanded anterolaterally; surstylus shallowly incised apically, with 4 stout setae near apex innerventrally (2 paratypes dissected); aedeagus (Figs 97−100) with pregonite bearing 2 flattened setae; postgonite right- or acute-angled at posteroventral corner, with 2 setae discernible.

♀. Wing length 3.8−4.1 mm. Mid femur with *pv*-row interrupted around apical third to fourth; f_3 with 3–5 *pv* on basal third or two-thirds and 1 *pv* near apex; t_1 with 1 *ad*, 1 (rarely 0 or 2) *pd* and 0 or 1 *pv*; t_2 with 1 *ad*, 2 *pd* and 1 (rarely 0 or 2) *pv*; t_3 with 1–2 (rarely 3) *av*, 2–5 *ad*, 2–3 (rarely 4) *pd* and no *pv*.

Abdomen with 4th sternite (Fig. 101) much less than twice as long as wide; ovipositor (Fig. 102) with 7th sternite weakly attenuated medially and broadened posteriorly; 8th sternite indiscernible; hypoproct about twice as long as wide.

Remarks. A close relationship of the present species with *C. dentifera* Hennig, 1953 (Figs 103−116) is indicated by the male terminalia with shield-shaped cercal plate and with slender and recurved surstyli and by the female terminalia with elongated and

posteriorly broadened 7th sternite and without discernible 8th sternite. *Chiastocheta dentifera* is, however, clearly different from *C. sachalinensis*: in the male, 5th sternite (Figs 103 and 105) with processes prominently protruded innerapically, cercal plate (Figs 106 and 108) less expanded anterolaterally, surstylus (Fig. 111) with subapical setae less stout and much longer, and postgonite (Fig. 114) obtuse-angled at posteoventral corner; in the female, 7th sternite scarcely attenuated medially, and hypoproct broader, about 1.5 times as long as wide (Fig. 116).

Chiastocheta sachalinensis is likely to be found in the Littoral Siberia or further. According to Michelsen (2012) *C. dentifera* is distributed in Europe and also in the East Palaearctic region. The two species might be vicarious or overlap with each other in distribution in eastern Eurasia.

17. *Chirosia flavipennis* (Fallén, 1823)

Chirosia flavipennis: Hennig, 1966: 61; Suwa, 1974: 24; Suwa, 1981b: 5; Griffiths, 2004: 2590.

Material examined. Southern Sakhalin: Tonnai (= Okhotskoye), 2♀, 1.viii.1914 (Adachi and Isshiki).

Distribution. Sakhalin; Japan (Hokkaido; Honshu); Europe; N America.

Remarks. This is a leaf miner of the bracken fern, *Pteridium aquilinum* (L.), in the larval stage (Griffiths, 2004). The plant is poisonous to cattle and is a troublesome weed in pastureland.

18. *Delia antiqua* (Meigen, 1826)

Delia antiqua: Hennig, 1974: 739; Suwa, 1974: 146; Suwa, 1981b: 5; Suh and Kwon, 1985: 199; Griffiths, 1993: 1555; Wei et al., 1998: 713.

Material examined. Southern Sakhalin: Maoka-sandô (= mountain trail to Kholmsk), 2♂, 21.viii.1923 (S. Matsumura); Konuma (= Novoaleksandrovsk, 10 km north of Yuzhno-Sakhalinsk), 1♂, 31.viii.1927 (K. Tamanuki).

Distribution. Sakhalin; Japan (Hokkaido; Honshu; Kyushu); Holarctic region; S America (introduced).

Remarks. This is a well known species injurious to onion and other crops of *Allium*. Also in Sakhalin it is probably common in arable land.

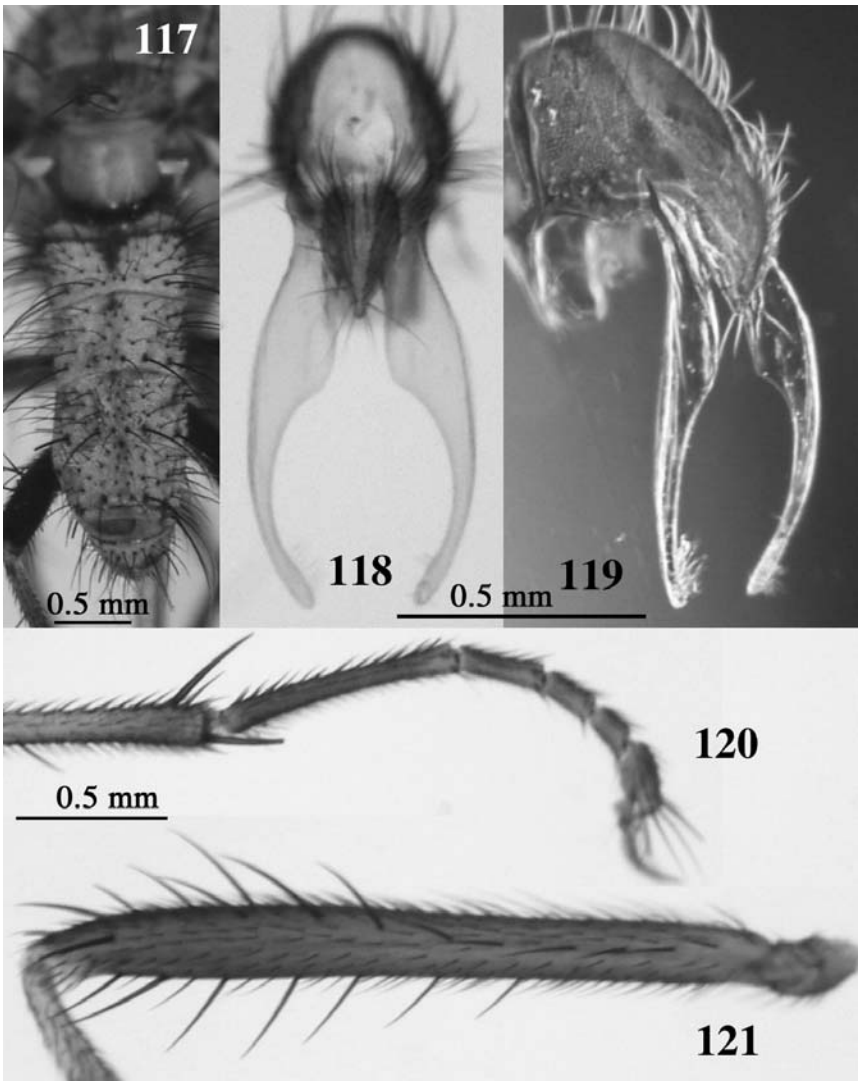
*19. *Delia coarctata* (Fallén, 1825)
(Figs 117−121)

Delia coarctata: Hennig, 1974: 772; Griffiths, 1991: 1238; Wei et al., 1998: 714.

Material examined. Southern Sakhalin: Sokol, Field Station, 8 km south of Dolinsk, 1♂, 14.viii.2002; Prigorodnoye, 8 km east of Korsakov, mouth of Mereya River, 2♂, 15.viii.2002. Central Sakhalin: Tym' River, alt. 200 m, 25 km east of Palevo, 1♂, 9.viii.2002.

Distribution. Sakhalin; China; Irkutsk; Europe; N America.

Remarks. Three males were dissected. The 6th tergite is bare in two of the three, but



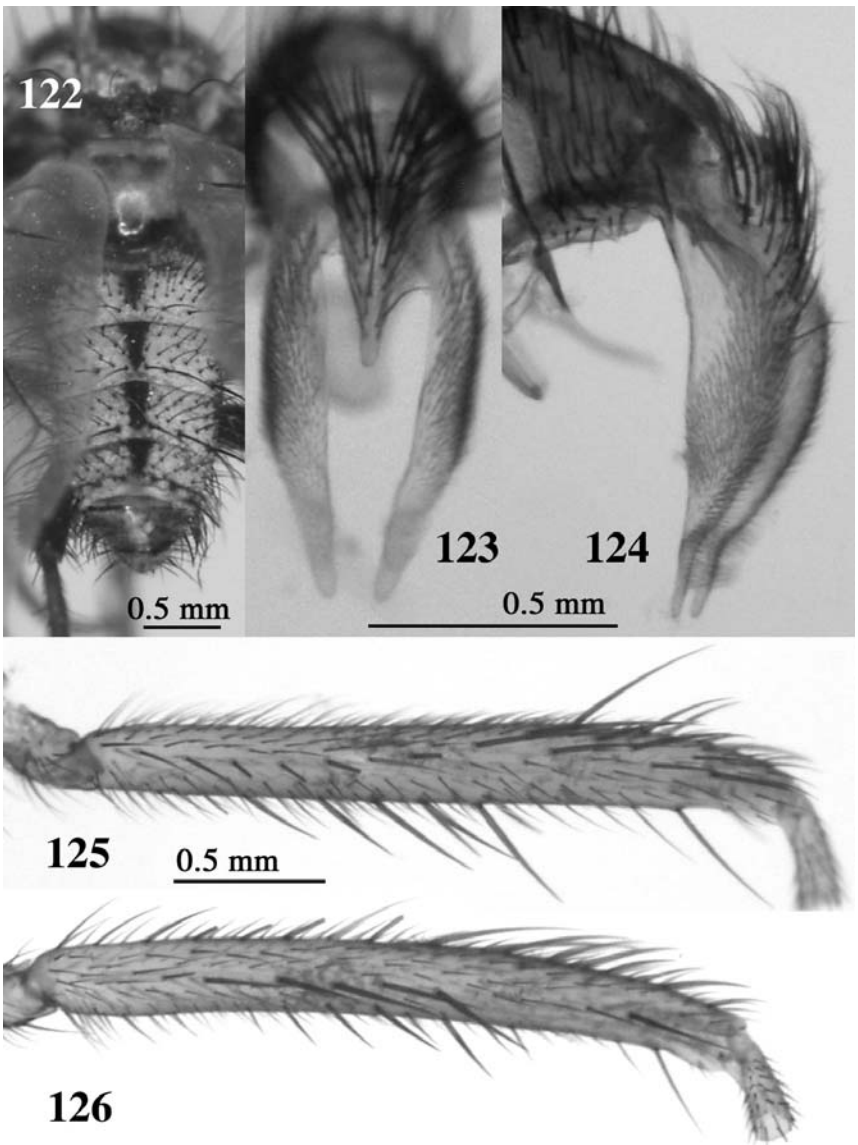
Figs 117−121. *Delia coarctata* (Fallén), ♂. 117, abdomen, dorsocaudal view; 118, hypopygium, dorsal view; 119, ditto, dorsolateral view; 120, right fore tibia (distal part) and tarsus, posterior view; 121, right hind femur, anterior and a little dorsal view. Sokol (117, 120−121); Prigorodnoye (118−119).

is armed with 5 setae along posterior margin in the other specimen.

This is a species known as the wheat bulb fly, causing serious damage to wheat, rye, barley, etc.

20. *Delia cuneata* Tiensuu, 1946
(Figs 122−126)

Delia cuneata: Hennig, 1974: 786; Suwa, 1981b: 6; Griffiths, 1992: 1298; Wei et al., 1998:



Figs 122−126. *Delia cuneata* Tiensuu, ♂. 122, abdomen, dorsocaudal view; 123, hypopygium, dorsal view; 124, ditto, lateral view; 125, left hind femur, anerodorsal view; 126, ditto, anteroventral view. Prigorodnoye (122); Shisuka (123−126).

714; Michelsen, 2012: http://www.faunaeur.org/.

Material examined. Southern Sakhalin: Prigorodnoye, 8 km east of Korsakov, mouth of Mereya River, 1♂, 15.viii.2002. Central Sakhalin: Shisuka (= Poronaysk), 1♂, 8.viii.1914 (Adachi and Isshiki), 1♂, 20.vii.1938 (H. Hasegawa).

Distribution. Sakhalin; China (Heilongjiang; Qinghai; Xinjiang); Europe

(Fennoscandia; Russia North); N America.

Remarks. The hind femora bear rows of *av* and *pv*, both interrupted around apical third or fourth of the femora (Figs 125−126), and this is useful for identification of the species.

*21. *Delia curvistylata* sp. nov.
(Figs 127−136)

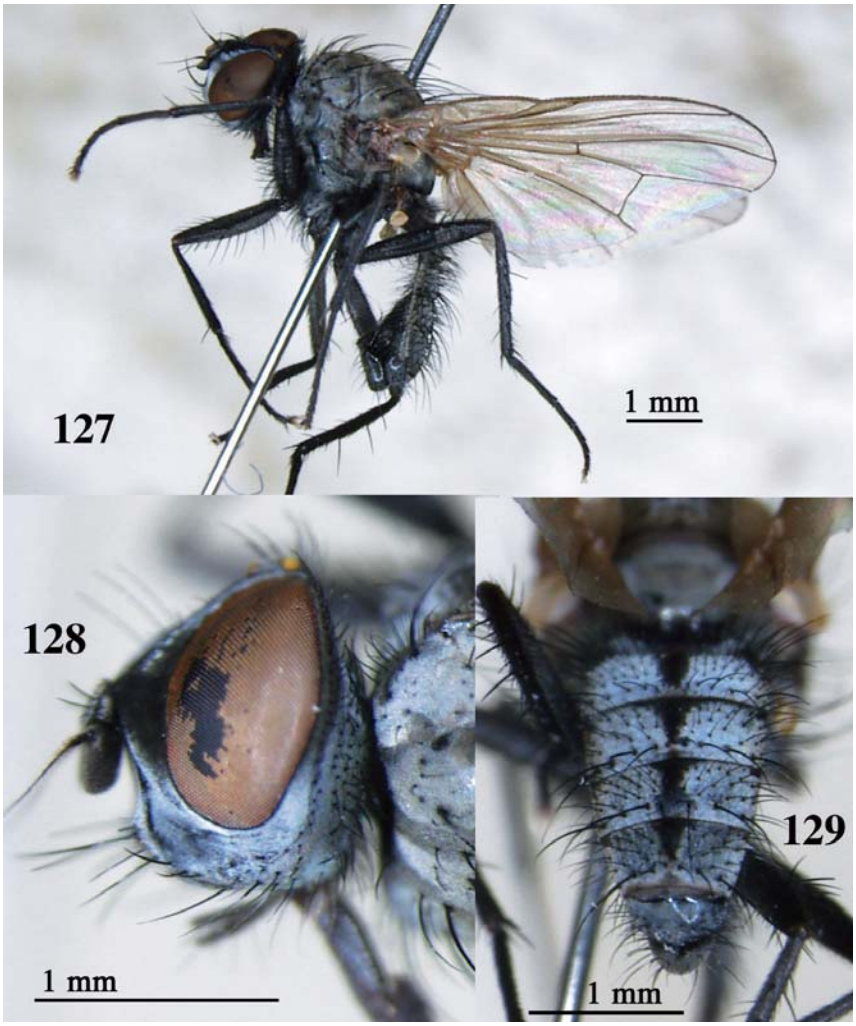
Type material. Central Sakhalin: Riverside, alt. 50 m, Pilenga River, 70 km east-northeast of Smirnykh, 1♂, 11.viii.2002; Gastello, riverside, alt. 100 m, 18 km southwest of Poronaysk, 1♂ (holotype), 13.viii.2002.

♂. Wing length 5.0−5.2 mm. Body including appendages blackish in ground colour, and densely whitish grey pollinose in main part. Head in pollinosity with a very faint brownish tinge in part on orbits, face and postocular plains; haustellar mentum pollinose. Mesonotum with pollinosity well discernible both in frontal and caudal angles of view and rather distinctly tinged with brown. Abdomen (Fig. 129) on each tergite with median vitta sharp, more or less wedge-shaped, wider than tibial diameter anteriorly and as wide as or narrower than the diameter posteriorly; fore-marginal bands well discernible on 2nd tergite, very narrowly on 3rd, and indicernible on the succeedings; these markings and caudal segments tinged with brown in pollinosity. Wings tinged with brown; calypteres pale brown, with yellowish margins; halteres yellow at knobs.

Head 1.32−1.35 times as high as long (Fig. 128); frons about 1.5 times as wide as anterior ocellus; interfrontalia about as wide as anterior ocellus, in holotype with a pair of *if* (right one strong) and an additional short setula above the pair, and in paratype with a single short *if*; parafrontals with 5–6 *ori* and no *ors*; A_3 about 1.7 times as long as wide; arista distinctly pubescent, with longest hairs longer than basal diameter of arista; orbits at parafrontal angle 1.3−1.4 times as wide as A_3; genae about 1.3 times as high as A_3-width, with 3–4 genal setae in a row; epistoma situated behind tip of parafrontal angle; occiput setulose on postocular plains.

Mesonotum with 3 (in paratype) or 4 (in holotype) pairs of *pre-acr* in close rows, and 0 (paratype) or 2 (holotype) accessory setulae discernible between the rows; posterior *ph* much weaker than the anterior though distinguishable from adjacent setulae; *pra* distinct though much shorter than posterior *ntpl*; notopleuron with no accessory setulae; mesopleuron with no distinct anterior *mpl*, only 1–2 ones barely distinguishable from adjacent setulae; 1 strong and 1 weaker *pstg*, associated with 2–4 setulae; *stpl* 1:3, the lowest posterior much weaker than the uppers; scutellum broadly bare on dorsal surface medially.

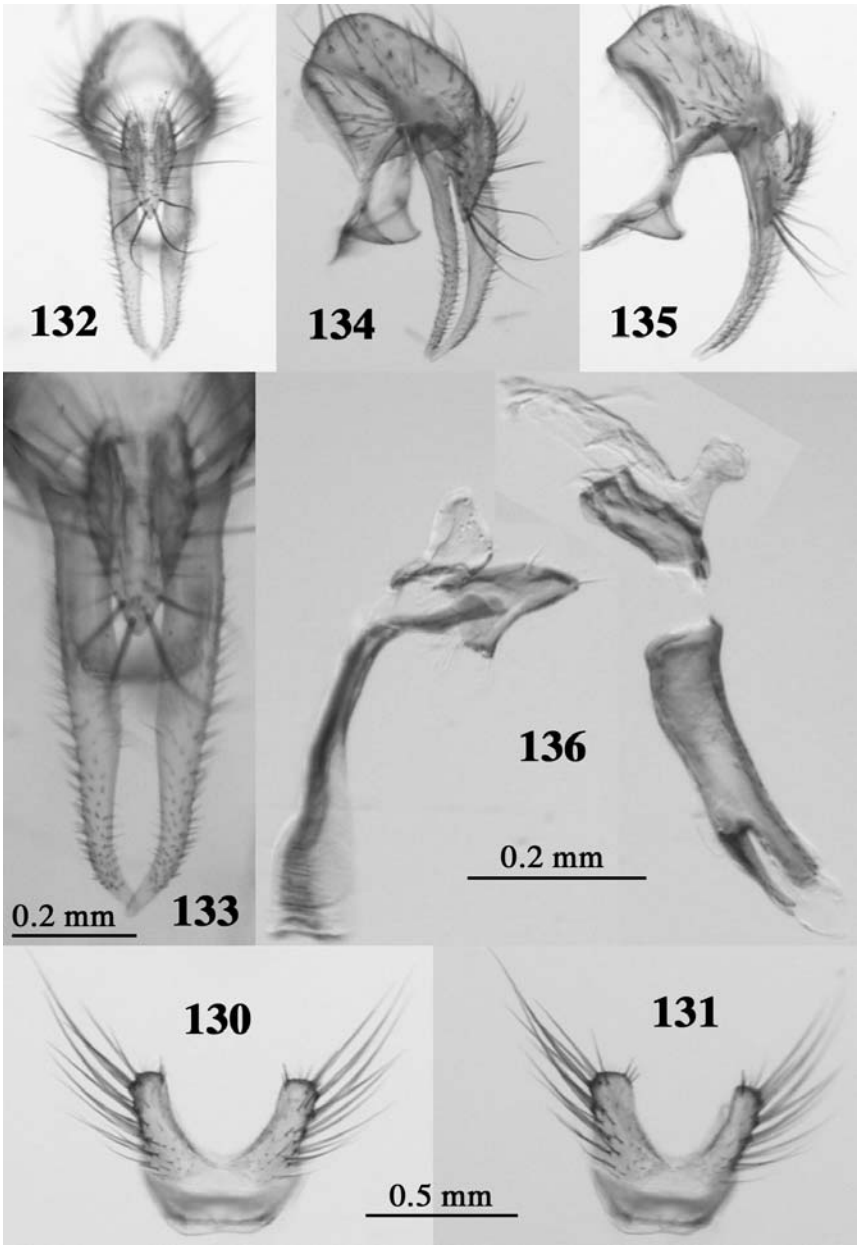
Mid femur with no *av* longer than height of the femur, with some *av* on basal half and a few *av* near apex more or less developed, of them one near base being the strongest (snapped in the present specimens and probably shorter than the femur height), and with 5–6 strong *pv* on basal half and a few distinct or rather strong *pv* near apex, the longest being at least a little longer than the femur height (most *pv* snapped in the present specimens); f_3 with a row of 8–10 *av*, the longest about 1.4 times as long as height of the femur, and with 0–1 weak *pv* near base, 3–5 *pv* on median third and 2–3 *pv* near apex, preapical one being the longest and as long as or a little shorter than the femur height; t_1 with no *ad* and 1 *pv*, and with apical *pv* (missing in holotype) strong and blunt on tip; t_2 with 1 *ad*, 1 (0 on left tibia in paratype) *pd* and 2 (in addition 1 short seta discernible on



Figs 127−129. *Delia curvistylata* sp. nov., ♂. 127, general features; 128, head, lateral view; 129, abdomen, dorsocaudal view. Gastello (holotype, 127, 129); Pilenga R., 70 km ENE of Smirnykh (128).

right tibia in paratype) *pv*; t_3 with 3–4 *av*, 4 strong and 2–3 weaker *ad*, 3 strong (distalmost the longest) and 1 weaker *pd* (in addition a few setulae near apex more or less developed and distinguishable from adjacent setulae), and 4–8 *pv*, and with apical *pd* weakly developed and about as long as tibial diameter; mid metatarsus with dorsal setulae not especially lengthened, and as long as or a little longer than diameter of the metatarsus. Wings with costal thorns shorter than *h* crossvein; *dm-cu* slightly oblique and only a little sinuate.

Abdomen depressed on basal half and half-depressed caudally, slightly more than twice as long as wide; 6th tergite bare. Terminalia (Figs 130−136): 5th sternite with outer marginal setae well developed and becoming longer distally, the longest distinctly longer



Figs 130−136. *Delia curvistylata* sp. nov., ♂. 130, 5th sternite, ventral view; 131, ditto, a little oblique view; 132, hypopygium, dorsal view; 133, ditto; 134, ditto, dorsolateral view; 135, ditto, lateral view; 136, aedeagus. Magnification same for Figs 130−132 and 134−135. Gastello (holotype, 130−135); Pilenga R., 70 km ENE of Smirnykh (136).

than the sternite, and with 3–4 blunt setae on inner apical corner of each process; cercal plate shield-shaped, about twice as long as wide, widest near middle, and narrowing apically, with 2–3 pairs of long lateral setae and with 4–5 long apical setae; surstylus in dorsal view with a weakly undulated inner margin and in lateral view gradually tapering apicad and gradually curved downward, armed with minute setulae on apical half dorsally and on apical two-thirds laterally, those on apical third being shorter and stiffened; distiphallus with paraphallic processes slightly longer than median sclerite; pregonite with 2 fine setulae; postgonite only with a minute setula discernible on ventral corner.

♀. Unknown.

Distribution. Sakhalin.

Remarks. This species is referred to the *Delia albula* section in the sense of Griffiths (1993) by the following aspects in the male: distiphallus not denticulate, with paraphalli well retained and acrophallus absent; 5th sternite with blunt setae on inner apical corners of processes. In having a long shield-shaped cercal plate with angulate apex and with some pairs of long lateral and apical setae and having gradually tapering surstyli with scattered minute setulae, *D. curvistylata* has a strong resemblance to the western Palaearctic *D. hirticrura* (Rondani, 1870) and also to the Holarctic *D. pilifemur* (Ringdahl, 1933). It is, however, easily distinguished from them by the following features: t_1 with blunt-tipped apical *pv*, t_3 with less numerous *pv*, 5th sternite with different pattern of setae, and surstyli more distinctly downcurved.

22. *Delia echinata* (Séguy, 1923)

Delia echinata: Hennig, 1974: 795; Suwa, 1974: 144; Suwa, 1981b: 9; Suh and Kwon, 1985: 201; Griffiths, 1991: 1024; Wei et al., 1998: 718; Suwa, 1999: 144.

Material examined. Southern Sakhalin: Ôtani (= Sokol), 1♀, 22.viii.1914 (Adachi and Isshiki); Mouth of Bakhura River, 20 km east of Sokol, 1♂, 31.vii.2002; Tonnai (= Okhotskoye), 1♂, 1.viii.1914 (Adachi and Isshiki). Central Sakhalin: Northwest of Mt. Chamga, alt. 450−500 m, 42 km east-southeast of Tymovskoye, 1♂, 8.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu; Shikoku; Kyushu); Kuriles (Etorofu); Holarctic region; India.

Remarks. The larvae of this species are injurious to spinach of Chenopodiaceae and to carnations and other plants of Caryophyllaceae as a leaf miner, stem borer, or shoot borer.

*23. *Delia fabricii* (Holmgren, 1872)

Delia fabricii: Hennig, 1974: 802; Suwa. 1977: 10; Griffiths, 1992: 1309; Suwa, 1999: 218; Suwa et al., 2000: 166.

Material examined. Central Sakhalin: Mouth of Chamgu River, 70 km east of Tymovskoye, 1♂, 8.viii.2002.

Distribution. Sakhalin; Japan (Honshu); Kurils (Shumshu; Kharimkotan); Kamchatka; Novaya Zemlya; Europe; N America; Greenland.

Remarks. Larvae of this species are known to infest Smooth Meadow-grass

(Kentucky Bluegrass), *Poa pratensis* L., in Europe (Griffiths, 1992).

24. *Delia floralis* (Fallén, 1824)

Delia floralis: Hennig, 1974: 816; Suwa, 1974: 146; Suwa, 1981b: 9; Suh and Kwon, 1985: 200; Griffiths, 1991: 994; Wei et al., 1998: 718; Suwa, 1999: 218; Suwa et al., 2000: 166.

Material examined. Southern Sakhalin: Ôtomari (= Korsakov), 2♂, 1♀, 28.viii.1914 (Adachi and Isshiki); Maoka-sandô (= mountain trail to Kholmsk), 1♀, 21.viii.1923 (S. Matsumura). Central Sakhalin: Chirie (= Kotikovo, 160 km east of Poronaysk), 1♀, 16.viii.1942 (H. Takahashi); Northwest of Mt. Chamga, alt. 450−500 m, 42 km east-southeast of Tymovskoye, 1♂, 8.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu); Kurils (Kunashiri; Etorofu); Kamchatka; Holarctic region.

Remarks. This is known as the turnip root fly, infesting various cruciferous crops.

*25. *Delia florilega* (Zetterstedt, 1845)
(Figs 137−145)

Delia florilega: Hennig, 1974: 823; Griffiths, 1993: 1568; Wei et al., 1998: 718; Suwa et al., 2000: 166.

Material examined. Southern Sakhalin: Sokol, Field Station, 8 km south of Dolinsk, 16♂, 29.vii.2002, 1♂, 30.vii.2002; Ugledarsk, quarry, alt. 400 m, 14 km north-northeast of Vostochnyy, 1♂, 3.viii.2002; Zaozernaya, grassland, mouth of Lazovaya River, 1♂, 3.viii.2002. Central Sakhalin: Northwest of Mt. Chamga, alt. 450−500 m, 42 km east-southeast of Tymovskoye, 1♂, 8.viii.2002; Riverside, alt. 50 m, Pilenga River, 70 km east-northeast of Smirnykh, 1♂, 11.viii.2002.

Distribution. Sakhalin; China; Kamchatka; Europe; N America.

Remarks. Larvae of this species frequently occur together with those of [*Delia*] *platura* as "seed maggots" on cultivated land, and many published studies include composite data referring to a mixture of both species (Griffiths, 1993: 1572). In the male adults it is easy to distinguish the two species by the chaetotaxy on the 5th sternite and legs without dissection of their terminalia.

Delia florilega is widely distributed in northern areas of Holarctic region, but has not been recorded from Japan or Korea.

*26. *Delia hirtitibia* (Stein, 1916)
(Figs 146−149)

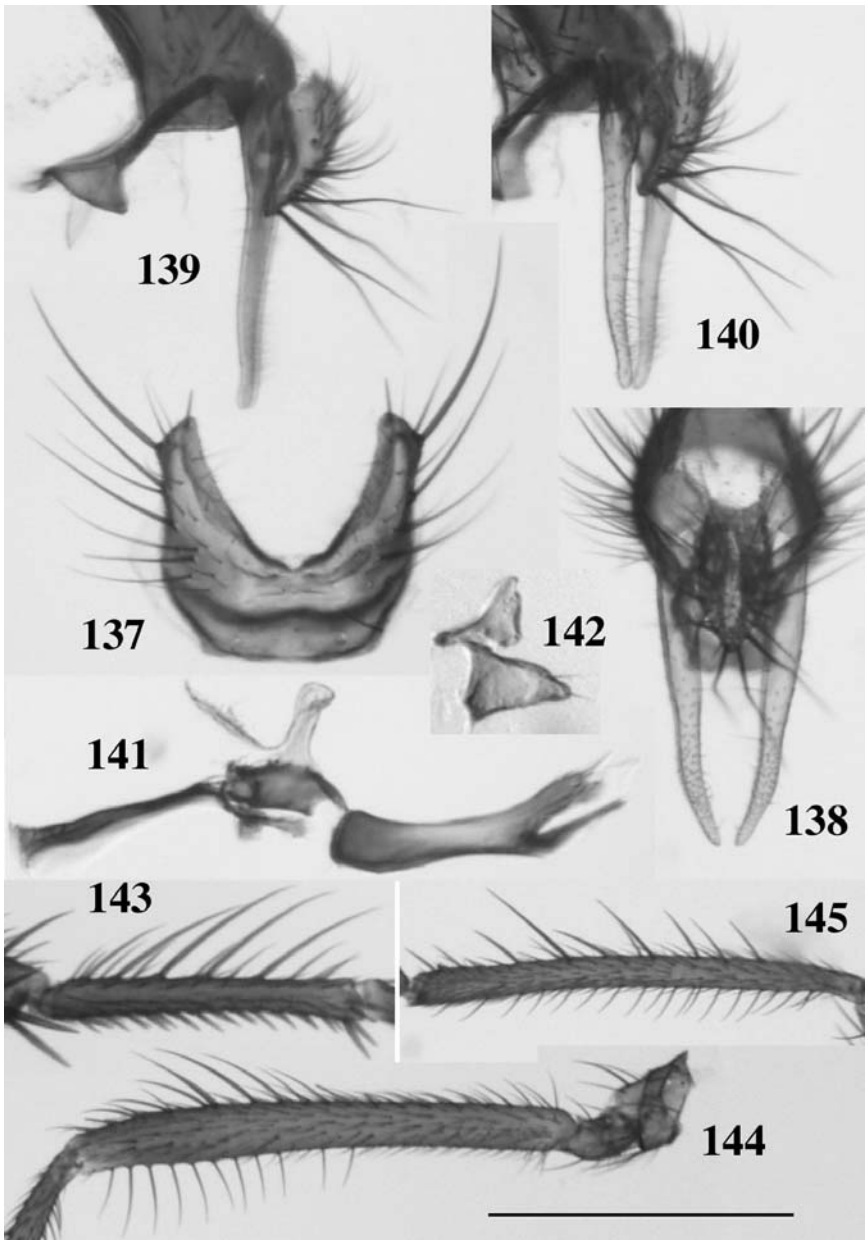
Delia hirtitibia: Hennig, 1974: 835; Griffiths, 1993: 1427; Wei et al., 1998: 719.

Material examined. Central Sakhalin: Gastello, riverside, alt. 100 m, 18 km southwest of Poronaysk, 2♂, 13.viii.2002.

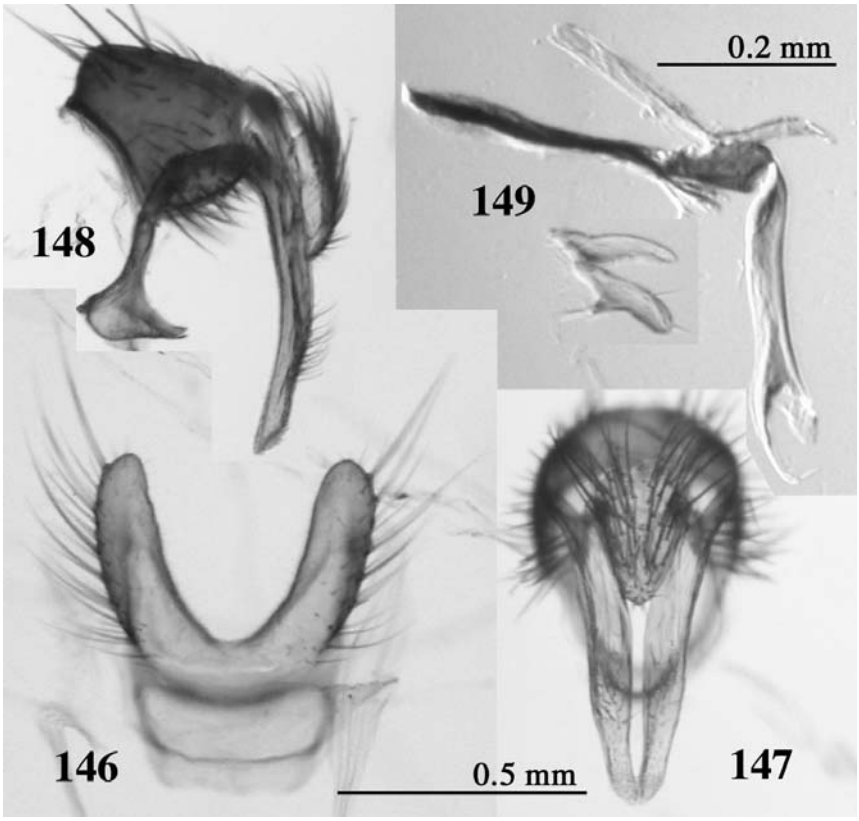
Distribution. Sakhalin; China; Europe; N America.

Remarks. The male of *D. hirtitibia* is readily distinguished from those of other members of the genus by the pale grey and dense pollinosity on the body, absence of *pra* on the mesonotum, and numerous *av*/*a* in 3−4 irregular rows on hind tibia.

In the Palaearctic region this species has been known from northern Europe and



Figs 137−145. *Delia florilega* (Zetterstedt), ♂. 137, 5th sternite, ventral view; 138, hypopygium, dorsal view; 139, ditto, lateral view; 140, ditto, lateral and a little dorsal view; 141, aedeagus; 142, pregonite and postgonite; 143, metatarsus of left mid tarsus, anterior view; 144, left hind femur, posterior and a little dorsal view; 145, left hind tibia, posterior and a little dorsal view. Scale 0.5 mm for Figs 137−140 and 143, 0.35 mm for Figs 141−142, and 1 mm for Figs 144−145. Sokol.



Figs 146−149. *Delia hirtitibia* (Stein), ♂. 146, 5th sternite, ventral view; 147, hypopygium, dorsal view; 148, ditto, lateral view; 149, aedeagus. Gastello (146; 147−149).

northwestern China. It may widely be distributed in areas with cool climate in the region.

*27. *Delia linearis* (Stein, 1898)

Delia tristriata: Suwa, 1974: 157.
Delia flabellifera: Hennig, 1974: 804; Suwa, 1981b: 9; Wei et al., 1998: 718.
Delia linearis: Griffiths, 1991: 1014; Suwa, 1999: 219; Suwa et al., 2000: 167.

Material examined. Southern Sakhalin: Mt. Zhdanko, alt. 100−250 m, 25 km north of Vzmor'ye, 1♀, 2.viii.2002. Central Sakhalin: Mt. Chamga, alt. 600−700 m, 45 km east-southeast of Tymovskoye, 1♂, 7.viii.2002; Northwest of Mt. Chamga, alt. 450−500 m, 42 km east-southeast of Tymovskoye, 5♂, 2♀, 8.viii.2002; Mouth of Chamgu River, 70 km east of Tymovskoye, 1♂, 8.viii.2002; Tym' River, alt. 200 m, 25 km east of Palevo, 2♂, 9.viii.2002; Mirnyy, riverside, alt. 50 m, Poronai River, 20 km north-northeast of Smirnykh, 3♀, 10.viii.2002; Riverside, alt. 50 m, Pilenga River, 70 km east-northeast of Smirnykh, 3♂, 1♀, 11.viii.2002; Lower reaches of Langeri River, alt. 100 m, 5 km west of seaside, 1♂, 11.viii.2002; Gastello, riverside, alt. 100 m, 18 km

southwest of Poronaysk, 1♀, 13.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido); Kurils (Shumshu; Paramushir; Kunashiri); Kamchatka; China; Europe; N America.

Remarks. This is the first record of *D. linearis* from Sakhalin. Suwa (1999) erroneously listed Sakhalin as a distribution area of the species. And the record "Etorofu" (South Kurils) in Suwa (1999) should be corrected to "Kunashiri". This species is also recorded from Shumshu and Paramushir Islands, North Kurils (Suwa et al., 2000).

*28. *Delia lineariventris* (Zetterstedt, 1845)

Delia lineariventris: Hennig, 1974: 845; Suwa, 1974: 150; Griffiths, 1991: 1218; Wei et al., 1998: 720; Suwa, 1999: 219; Suwa et al., 2000: 167.

Material examined. Central Sakhalin: Mt. Chamga, alt. 600−700 m, 45 km east-southeast of Tymovskoye, 1♂, 7.viii.2002; Northwest of Mt. Chamga, alt. 450−500 m, 42 km east-southeast of Tymovskoye, 1♀, 8.viii.2002.

Distribution. Sakhalin; Japan (Honshu); Kurils (Shumshu; Paramushir); Kamchatka; NE China; Europe; N America.

*29. *Delia planipalpis* (Stein, 1898)

Delia pilipyga: Suwa, 1974: 147.

Delia planipalpis: Hennig, 1974: 878; Suwa, 1981b: 10; Griffiths, 1991: 986; Wei et al., 1998: 722; Suwa, 1999: 220.

Material examined. Central Sakhalin: Shisuka (= Poronaysk), 1♂, 20.vii.1938 (H. Hasegawa).

Distribution. Sakhalin; Japan (Hokkaido); Kurils (Shikotan; Kunashiri; Etorofu); NE China; Europe; N America.

Remarks. This species is known as the radish root maggot and injurious to radish, turnip, and other cruciferous crops as in the case of *D. floralis*, from which it is distinguishable in the male adult by the hind femur without *av* on basal third and hind tibia with less than 10 *pv*.

30. *Delia platura* (Meigen, 1826)

Delia platura: Hennig, 1974: 881; Suwa, 1974: 144; Suwa, 1981b: 10; Suh and Kwon, 1985: 198; Griffiths, 1993: 1578; Wei et al., 1998: 722; Suwa, 1999: 220; Suwa et al., 2000: 167.

Material examined. Southern Sakhalin: Ôtani (= Sokol), 2♂, 1♀, 22.viii.1914 (Adachi and Isshiki); Sokol, Field Station, 8 km south of Dolinsk, 1♂, 3♀, 29.vii.2002, 4♂, 2♀, 4.viii.2002, 1♂, 5.viii.2002; Mouth of Bakhura River, 20 km east of Sokol, 2♂, 8♀, 31.vii.2002; Riverside forest, near seashore, Bakhura River, 20 km east of Sokol, 4♂, 2♀, 31.vii.2002; Zaozernaya, grassland, mouth of Lazovaya River, 3♂, 2♀, 3.viii.2002; Maoka (=Kholmsk), 1♀, 24.vii.1934 (C. Watanabe and T. Inoue); Maoka-sandô (= mountain trail to Kholmsk), 1♂, 21.viii.1923 (S. Matsumura); Kaiba-tô (= Moneron I.), 1♂, 30.vii−2.viii.1934 (C. Watanabe and T. Inoue). Central Sakhalin: Gastello, riverside, alt. 100 m, 18 km southwest of Poronaysk, 3♂, 13.viii.2002.

Distribution. Almost cosmopolitan.

Remarks. The larvae are almost omnivorous, feeding on organisms originated from plants and also from animals, and are injurious to various crops as “seed maggots”. The worldwide distribution of this species may be fostered by human activities in agriculture.

*31. *Delia radicum* (Linnaeus, 1758)

Delia brassicae: Hennig, 1974: 751.
Delia radicum: Griffiths, 1991: 969; Wei et al., 1998: 723.

Material examined. Southern Sakhalin: Sokol, Field Station, 8 km south of Dolinsk, 1♂, 14.viii.2002. Central Sakhalin: Smirnykh, riverside, alt. 70 m, Orlovka River, 1♂, 9.viii.2002.

Distribution. Sakhalin; Kamchatka; China; Europe; N America (introduced).

Remarks. This species is a notorious agricultural pest known as the cabbage maggot or cabbage root fly. It is assumed to have been introduced into North America from Europe during the 19th century (Griffiths, 1991; Biron et al., 2000).

32. *Delia tenuiformis* Suwa, 1977
(Figs 150−151, 153−154)

Delia tenuis Suwa, 1974: 163, preoccupied.
Delia tenuiformis Suwa, 1977: 10, new name for *tenuis* Suwa, 1974; Suwa, 1981b: 10; Suwa, 1999: 220.

Material examined. Southern Sakhalin: Toyohara (= Yuzhno-Sakhalinsk), 3♂, 29.vii.1914 (Adachi and Isshiki), 3♂, 24.viii.1914 (Adachi and Isshiki); Ôtani (= Sokol), 1♂, 22.viii.1914 (Adachi and Isshiki); Ôtomari (= Korsakov), 1♂, 28.vii.1914 (Adachi and Isshiki); East side of Lake Busse, 20 km southeast of Ozerskiy, 3♂, 16.viii.2002; Ugledarsk, near seashore, 14 km north-northeast of Vostochnyy, 1♂, 3.viii.2002. Central Sakhalin: Shisuka (= Poronaysk), 1♂, 20.vii.1938 (H. Hasegawa); Nakashisuka, 1♂, 21.vii.1938 (H. Hasegawa); Smirnykh, riverside, alt.70 m, Orlovka River, 1♂, 9.viii.2002; Riverside, alt. 50 m, Pilenga River, 70 km east-northeast of Smirnykh, 1♂, 11.viii.2002.

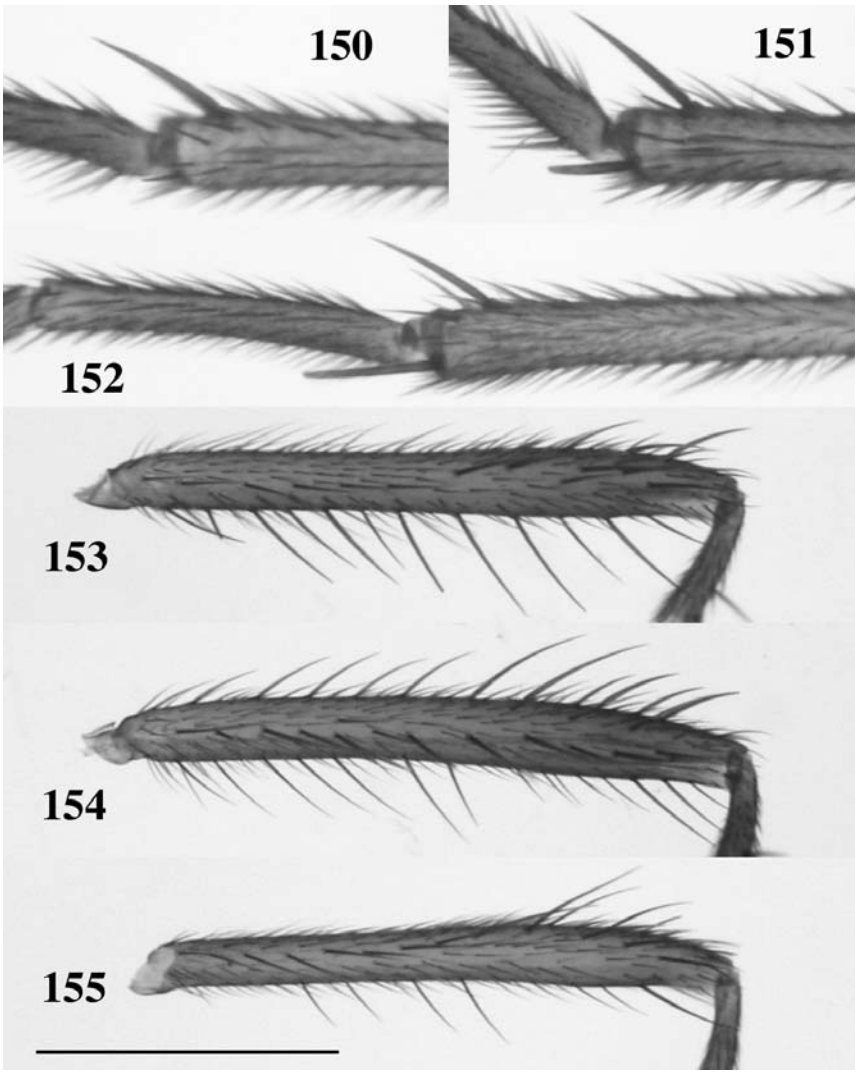
Distribution. Sakhalin; Japan (Hokkaido).

Remarks. In the male, the following characters are useful for identification of this species: t_1 with apical *pv* usually small (Fig. 150), rarely developed (Fig. 151); f_3 with row of *av* complete (Fig. 153), and with row of *pv* interrupted around apical third (Fig. 154).

33. *Delia tenuiventris* (Zetterstedt, 1860)
(Figs 152, 155)

Delia conversata: Suwa, 1974: 162; Suwa, 1981b: 5; Wei et al., 1998: 714.
Delia tenuiventris: Suh and Kwon, 1985: 197; Griffiths, 1992: 1271; Suwa, 1999: 221; Suwa et al., 2000: 168.

Material examined. Southern Sakhalin: Riverside forest, near seashore, Bakhura River, 20 km east of Sokol, 10♂, 31.vii.2002; Tonnai (= Okhotskoye), 1♂, 1.viii.1914 (Adachi and Isshiki); Mt. Zhdanko, 25 km north of Vzmor’ye, alt. 100−250 m, 2♂, alt. 450−600 m, 2♂, 2.viii.2002;



Figs150−155. *Delia tenuiformis* Suwa, ♂ (150−151, 153−154) and *D. tenuiventris* (Zetterstedt), ♂ (152, 155). 150−152, left fore tibia (distal part) and fore tarsus (basal part), posterior view; 153, left hind femur, anterodorsal view, showing continuous row of *av*; 154, ditto, anteroventral view, showing interrupted row of *pv*; 155, left hind femur, anterior view, showing interrupted row of *av*. Scale 0.5 mm for Figs 150−152 and 1 mm for Figs 153−155. Smirnykh (150, 153−154); Ugledarsk (151); Pilenga R., 70 km ENE of Smirnykh (152, 155).

Motodomari (= Vostochnyy), 1♂, 13.viii.1914 (Adachi and Isshiki); Ugledarsk, near seashore, 14 km north-northeast of Vostochnyy, 7♂, 3.viii.2002. Central Sakhalin: Shisuka (= Poronaysk), 1♂, 8.viii.1914 (Adachi and Isshiki); Chirie (= Kotikovo, 160 km east of Poronaysk), 1♂, 6.viii.1914 (Adachi and Isshiki); Northwest of Mt. Chamga, alt. 450−500 m, 42 km east-southeast of Tymovskoye, 3♂, 8.viii.2002; Tym' River, alt. 200 m, 25 km east of Palevo, 4♂, 9.viii.2002; Smirnykh, riverside, alt. 70 m, Orlovka River, 1♂, 9.viii.2002; Riverside, alt. 50 m, Pilenga River,

70 km east-northeast of Smirnykh, 4♂, 11.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu); Kurils (Shumshu; Rasshua; Paramushir; Onekotan; Matua; Urup); Kamchatka; Holarctic region.

Remarks. In the male, this species may be distinguished from allied species without dissecting terminalia by the following characters: t_1 with apical *pv* well developed and blunt apically (Fig. 152); f_3 with *av* often indiscernible near base and usually weakened around apical third (Fig. 155), and with no *pv* except for a few preapical ones.

*34. *Eutrichota longimana* (Pokorny, 1887)

Pegomyza longimana: Hennig, 1973: 468.
Eutrichota longimana: Suwa, 1974: 234; Griffiths, 1984: 577; Suwa, 1999: 224.

Material examined. Southern Sakhalin: Sokol, Field Station, 8 km south of Dolinsk, 1♂, 14.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido); Europe; N America.

Remarks. The male 6th tergite has a few setulae along its posterior margin in most specimens (but bare in an Oregon specimen) in the North American form (Griffiths, 1984) and some to about 10 (rarely 1 or a few) setulae in the Japanese (Suwa, 1974). The present male specimen has a row of 8 setulae on the tergite.

*35. *Eutrichota socculata* (Zetterstedt, 1845)
(Figs 156−157)

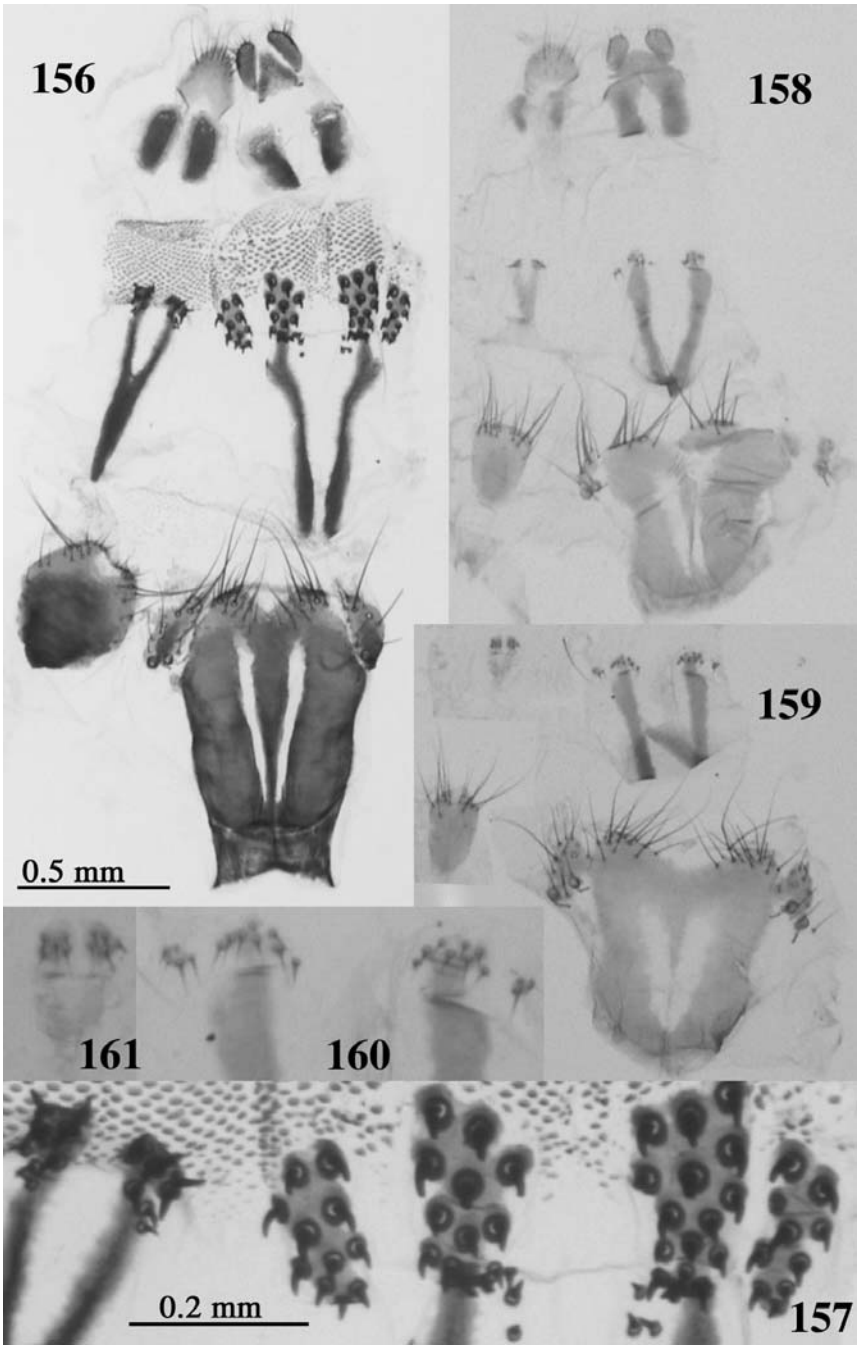
Pegomya consanguinea: Hennig, 1973: 506.
Eutrichota consanguinea: Suwa, 1974: 237.
Parapegomyia socculata socculata: Griffiths, 1984: 397.
Parapegomyia socculata: Suh and Kwon, 1985: 161.
Eutrichota socculata: Wei et al., 1998: 750; Suwa, 1999: 224.

Material examined. Central Sakhalin: Northwest of Mt. Chamga, alt. 450–500 m, 42 km east-southeast of Tymovskoye, 1♀, 8.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu; Kyushu); Korea; NE China; Urals; Europe; N America.

Remarks. The female of *E. socculata* is distinguished from that of the closely related *E. schineri* (Schnabl, 1911) distributed in the Palaearctic region by the following aspects: mesonotum with rows of *pre-acr* separated from each other by a distance nearly equal to that to adjacent *dc*-row (more widely separated in *schineri*); f_2 with 1 or sometimes 2 distinct *av* near base and usually also with 1 or a few distinct *av* near apical third (no distinct *av* in *schineri*); ovipositor with well developed spine-like setae on 7th segment posteriorly as in Figs 156−157 (weakly developed spine-like setae in *schineri* as in Figs 158−161).

Eutrichota schineri is widely distributed in Europe and is known from Korea and Japan (Hokkaido). It is likely to be found also in Sakhalin.



Figs 156−161. *Eutrichota socculata* (Zetterstedt), ♀ (156−157) and *E. schineri* (Schnabl), ♀ (158−161). 156, 158, ovipositor; 157, 7th segment, posterior part; 159, 6th and 7th segments; 160, 7th tergite, posterior part; 161, 7th sternite. Magnification same for Figs 156 and 158−159, and for 157 and 160−161. NW of Mt. Chamga (156−157); Hokkaido, Japan (158; 159−161).

36. *Fucellia fucorum* (Fallén, 1819)

Fucellia fucorum: Huckett, 1965: 26; Hennig, 1966: 11; Suwa, 1974: 18; Suwa, 1981b: 4; Suwa, 1999: 226; Suwa et al., 2000: 169.

Material examined. Southern Sakhalin: Mouth of Bakhura River, 20 km east of Sokol, 27♂, 46♀, 31.vii.2002; Prigorodnoye, 8km east of Korsakov, mouth of Mereya River, 15♂, 16♀, 15.viii.2002, 2♂, 16.viii.2002; Zaozernaya, grassland, mouth of Lazovaya River, 1♀, 3.viii.2002. Central Sakhalin: Shisuka (= Poronaysk), 1♀, 23.vii.1924 (Murase); Chirie (= Kotikovo, 160 km east of Poronaysk), 2♂, 2♀, 6.viii.1914 (Adachi and Isshiki); Mouth of Chamgu River, 70 km east of Tymovskoye, 1♀, 8.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido); Kurils (Shumshu; Paramushir; Onekotan; Kharimkotan; Rasshua; Ushishir; Simushir; Chirpoi; Urup; Etorofu); Kamchatka; Commander Islands; Europe; Iceland; Spitsbergen; N America; Greenland.

Remarks. This species is widely distributed from eastern Asia to Europe through North America.

*37. *Fucellia hypopygialis* Ringdahl, 1930

Fucellia hypopygialis: Huckett, 1965: 26; Hennig, 1966: 13; Suwa, 1974: 18; Suwa, 1981b: 4; Suwa, 1999: 226; Suwa et al., 2000: 169.

Material examined. Southern Sakhalin: Prigorodnoye, 8km east of Korsakov, mouth of Mereya River, 3♀, 15.viii.2002, 1♂, 1♀, 16.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu); Kurils (Shumshu; Paramushir; Urup); Kamchatka; Commander Islands; N America; Greenland.

38. *Fucellia kamtchatica* Ringdahl, 1930

Fucellia kamtchatica: Huckett, 1965: 26; Hennig, 1966: 14; Suwa, 1974: 18; Suwa, 1981b: 4; Suh and Kwon, 1985: 171; Wei et al., 1998: 701; Suwa, 1999: 226; Suwa et al., 2000: 169.

Material examined. Southern Sakhalin: Prigorodnoye, 8km east of Korsakov, mouth of Mereya River, 2♀, 15.viii.2002, 43♂, 25♀, 16.viii.2002; Kaitsuka (= Solov'evka, 20 km north of Korsakov), 1♂, 10.vii.1909 (Oguma); Tonnai (= Okhotskoye), 1♂, 1.viii.1914 (Adachi and Isshiki); Maoka (= Kholmsk), 1♂, 24.vii.1934 (C. Watanabe and T. Inoue); Kushunnai (= Il'inskiy), 1♂, 6.viii.1909 (Oguma); Mouth of Bakhura River, 20 km east of Sokol, 26♂, 7♀, 31.vii.2002; Sakaehama (= Starodubskoye), 1♂, 1♀, 19.viii.1914 (Adachi and Isshiki); Motodomari (= Vostochnyy), 4♂, 3♀, 16−17.viii.1914 (Adachi and Isshiki); Kashiho (= Zaozernaya), 1♂, 10.vii.1933 (Uchida, Okamoto and Sawamoto); Zaozernaya, grassland, mouth of Lazovaya River, 4♂, 2♀, 3.viii.2002; Niitoi (= Novoye), 2♂, 1♀, 11.viii.1914 (Adachi and Isshiki). Central Sakhalin: Chirie (= Kotikovo, 160 km east of Poronaysk), 2♂, 6.viii.1914 (Adachi and Isshiki); Mouth of Chamgu River, 70 km east of Tymovskoye, 151♂, 180♀, 8.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu); Kurils (Paramushir; Onekotan; Kunashiri; Shikotan); Korea; NE China; Kamchatka; Commander Islands; Aleutian Islands; Alaska.

*39. *Heterostylodes pilifera* (Zetterstedt, 1845)

Heterostylodes pilifera: Michelsen, 1985: 54; Griffiths, 1996: 1783; Suwa, 1998: 47; Wei et al., 1998: 734.

Material examined. Central Sakhalin: Mt. Chamga, 45 km east-southeast of Tymovskoye, alt. 700−1000 m, 1♂, alt. 1000−1300 m, 1♂, 7.viii.2002.

Distribution. Sakhalin; Japan (Honshu); NE China; Europe; N America.

Remarks. Griffiths (1996: 1787) gives a note "Niblett (1955) has reported that the larvae of "*pratensis*" feed in England in flowerheads of *Hypochoeris radicata* L. and *Leontodon hispidus* L. (both Compositae Cichorieae). …. Due to past confusion over the application of the name "*pratensis*", it is not clear whether these records refer to *pilifera* or *obscura*. However, these species are very close and doubtless have a similar life-history."

*40. *Hydrophoria montana* Suwa, 1970
(Figs 162−163, 166−167, 170)

Hydrophoria montana Suwa, 1970: 248; Suwa, 1974: 173; Suh and Kwon, 1985: 191; Suwa, 1985: 6; Wei et al., 1998: 673; Suwa, 1999: 226.

Material examined. Southern Sakhalin: Riverside forest, near seashore, Bakhura River, 20 km east of Sokol, 3♂, 4♀, 31.vii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu; Shikoku); Korea; China; Taiwan.

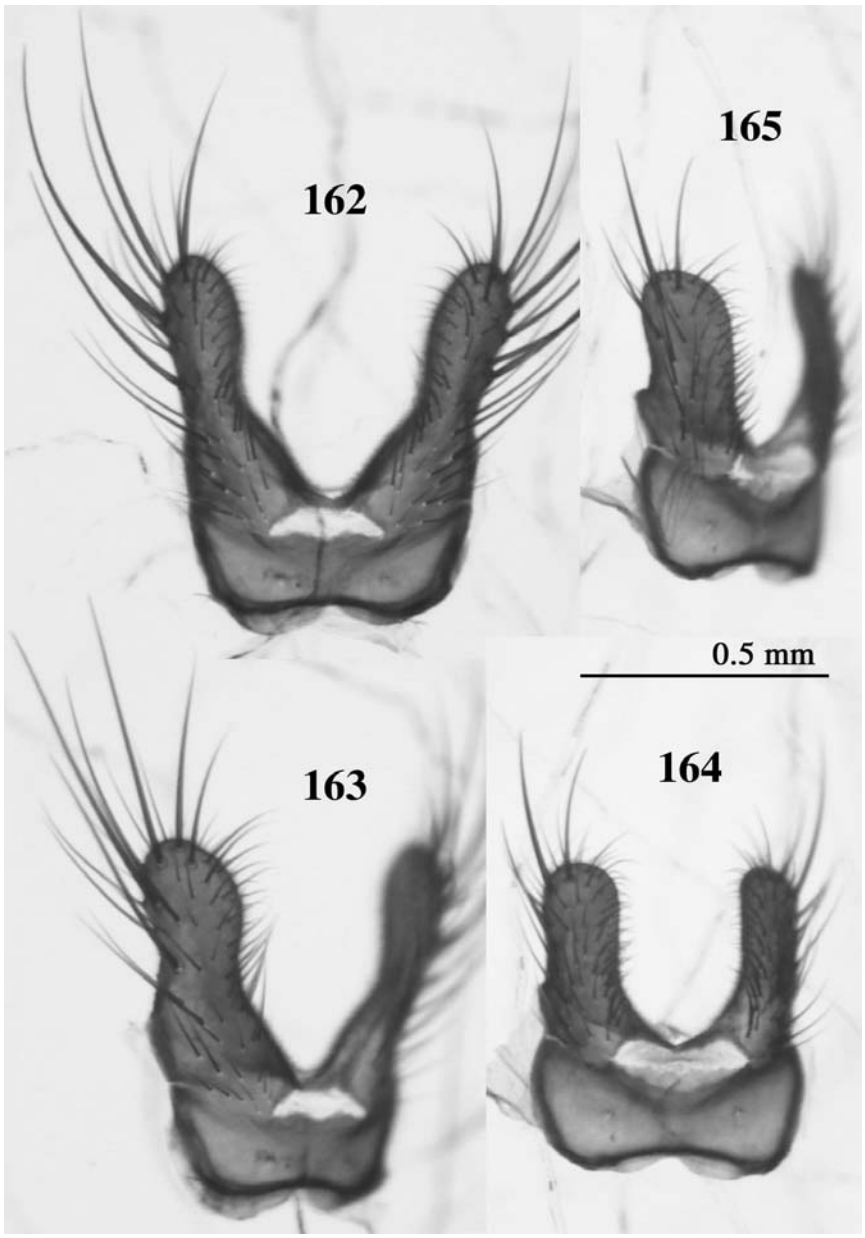
Remarks. In the males it is easy to distinguish *H. montana* from *H. ruralis* by the 5th sternite with processes constricted medially and bearing a row of inner short setae mainly on distal half. It is, however, not easy in the females unless their ovipositors are examined.

*41. *Hydrophoria ruralis* (Meigen, 1826)
(Figs 164−165, 168−169, 171)

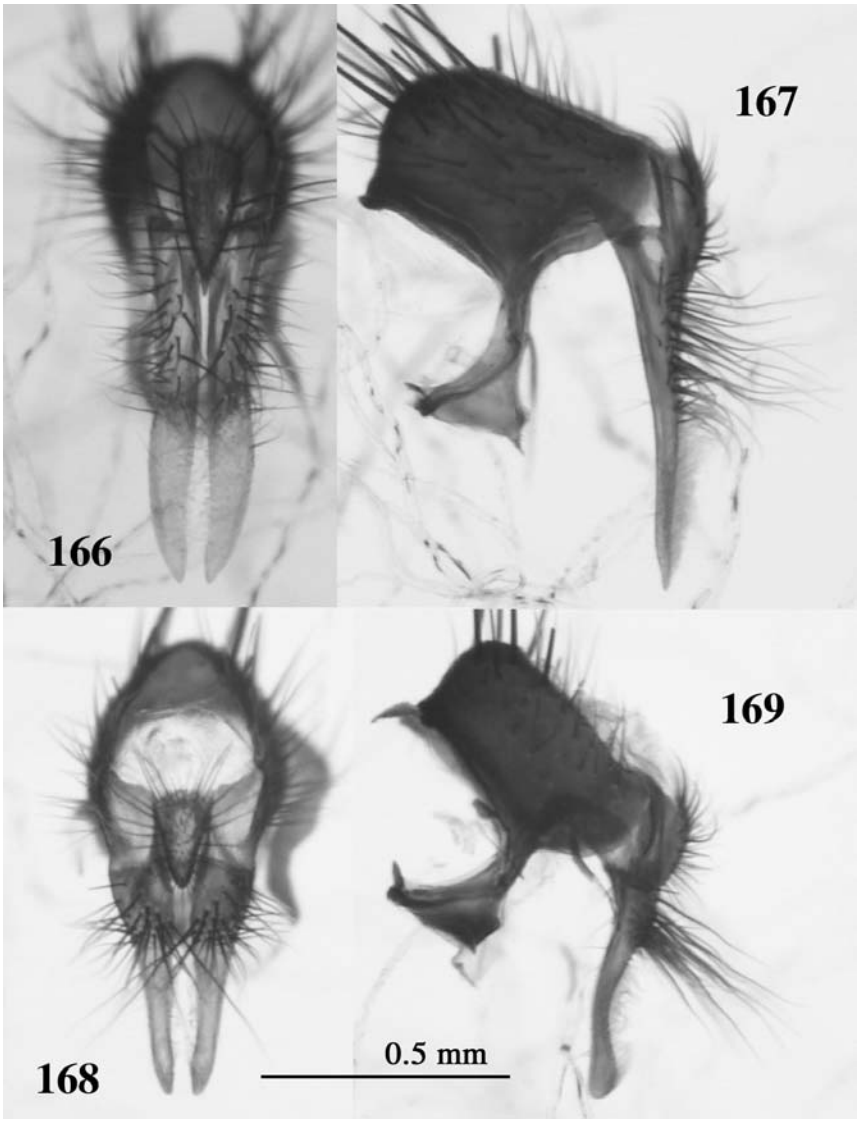
Hydrophoria ruralis: Hennig, 1969: 287; Suwa, 1970: 248; Suwa, 1974: 173; Suh and Kwon, 1985: 191; Wei et al., 1998: 673; Suwa, 1999: 227.

Material examined. Southern Sakhalin: Sokol, Field Station, 8 km south of Dolinsk, 1♀, 29.vii.2002, 14♂, 4.viii.2002, 7♂, 5.viii.2002, 6♂, 14.viii.2002; Riverside forest, near seashore, Bakhura River, 20 km east of Sokol, 26♂, 1♀, 31.vii.2002. Central Sakhalin: Gastello, riverside, alt. 100 m, 18 km southwest of Poronaysk, 3♂, 1♀, 13.viii.2002; Riverside, alt. 50 m, Pilenga River, 70 km east-northeast of Smirnykh, 3♂, 11.viii.2002; Smirnykh, riverside, alt. 70 m, Orlovka River, 5♂, 9.viii.2002; Northwest of Mt. Chamga, alt. 450−500 m, 42 km east-southeast of Tymovskoye, 4♂, 8.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu; Shikoku; Kyushu); China; Korea; Ussuri; Europe.



Figs 162−165. *Hydrophoria montana* Suwa, ♂ (162−163) and *H. ruralis* (Meigen), ♂ (164−165). 162, 164, 5th sternite, ventral view; 163, 165, ditto, ventrolateral view. Bakhura R., 20 km E of Sokol (162−163); NW of Mt. Chamga (164−165).



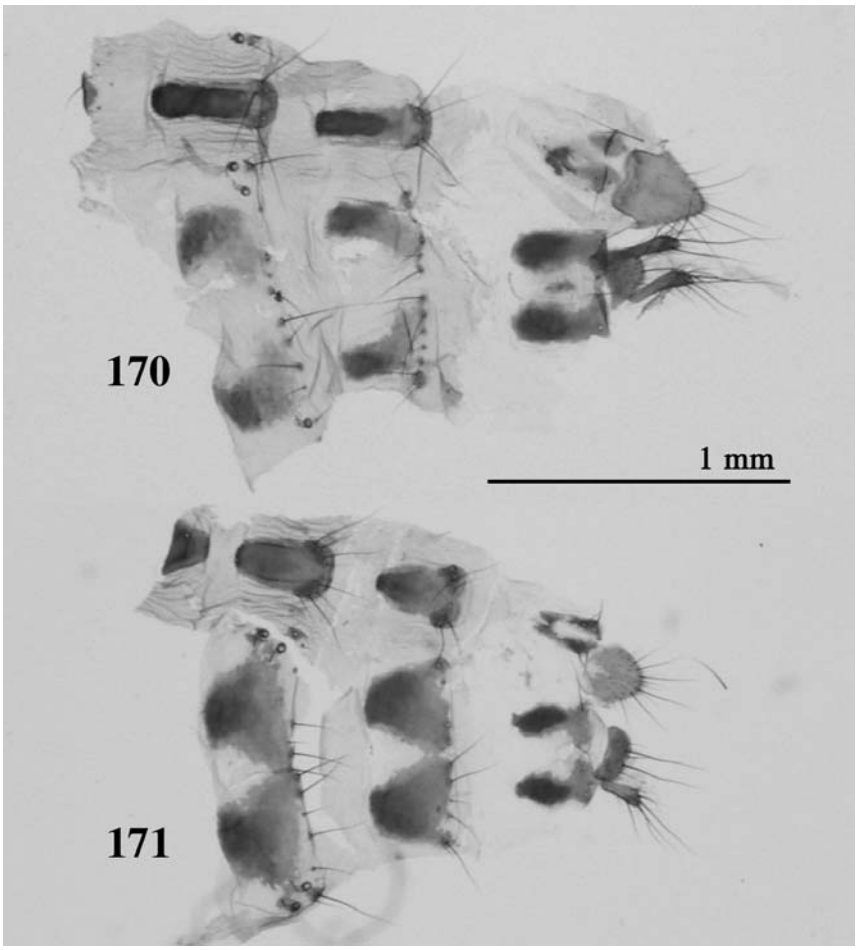
Figs 166−169. *Hydrophoria montana* Suwa, ♂ (166−167) and *H. ruralis* (Meigen), ♂ (168−169). 166, 168, hypopygium, dorsal view; 167, 169, ditto, lateral view. Bakhura R., 20 km E of Sokol (166−167); NW of Mt. Chamga (168−169).

*42. *Hylemya urbica* Van der Wulp, 1896

Hylemya latifrons: Hennig, 1969: 243; Suwa, 1974: 81; Suwa, 1983b: 12; Suh et al., 1991a: 45; Wei et al., 1998: 736.

Hylemya urbica: Suwa, 1999: 227; Suwa et al., 2000: 170; Griffiths, 2001: 2171.

Material examined. Southern Sakhalin: Riverside forest, near seashore, Bakhura River, 20



Figs 170−171. Ovipositor of *Hydrophoria* spp. 170, *H. montana* Suwa; 171, *H. ruralis* (Meigen). Bakhura R., 20 km E of Sokol (170); Sokol (171).

km east of Sokol, 5♂, 31.vii.2002; Ugledarsk, near seashore, 14 km north-northeast of Vostochnyy, 1♂, 3.viii.2002. Central Sakhalin: Smirnykh, riverside, alt. 70 m, Orlovka River, 1♂, 9.viii.2002; Mt. Chamga, alt. 600−700 m, 45 km east-southeast of Tymovskoye, 1♂, 7.viii.2002; Northwest of Mt. Chamga, alt. 450−500 m, 42 km east-southeast of Tymovskoye, 24♂, 1♀, 8.viii.2002; Mouth of Chamgu River, 70 km east of Tymovskoye, 5♂, 8.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu; Kyushu); Kurils (Shumshu; Onekotan; Kharimkotan); Kamchatka; Korea; China; Europe; Taiwan; N America.

*43. *Lasiomma morionellum* (Zetterstedt, 1845)

Lasiomma morionella: Hennig, 1967: 190; Suwa, 1971a: 33.
Lasiomma morionellum: Suwa, 1999: 228; Griffiths, 2003: 2473.

Material examined. Central Sakhalin: Mt. Chamga, alt. 1000−1300 m, 45 km east-southeast of Tymovskoye, 1♂, 7.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu); Siberia (Tobolsk); Fennoscandia; N America.

*44. *Lasiomma replicatum* (Huckett, 1929)
(Figs 172−176)

Acrostilpna replicata: Hennig, 1966: 51.
"*Acrostilpna flavipennis* (Walker, 1849)": Hennig, 1976: 930.
Acrostilpna montana Ma in Fan et al., 1988: 84; Wei et al., 1998: 653.
"*Lasiomma flavipenne* (Walker, 1849)": Suwa et al., 2000: 170.
Lasiomma replicatum: Griffiths, 2003: 2406.

Material examined. Central Sakhalin: Riverside, alt. 50 m, Pilenga River, 70 km east-northeast of Smirnykh, 1♂, 11.viii.2002.

Distribution. Sakhalin; Kamchatka; NE China; Urals; Fennoscandia; N America.

Remarks. The present male specimen dose not agree with the redescription of *L. replicatum* given by Griffiths (2003) in some aspects: t_3 with apical *pv* weak, about half as long as apical *pd*; 5th sternite with sparser band of inner setae. As no significant difference is found in other features the specimen is here identified with the species.

*45. *Myopina myopina* (Fallén, 1824)
(Figs 177−179)

Myopina myopina: Hennig, 1966: 27; Griffiths, 1986: 703.

Material examined. Central Sakhalin: Smirnykh, riverside, alt. 70 m, Orlovka River, 1♂, 9.viii.2002.

Distribution. Sakhalin; Kamchatka; Urals; Europe; N America.

Remarks. The flattened and anterobasally expanded hind metatarsi (Fig. 179) are characteristic to the male of *M. myopina*.

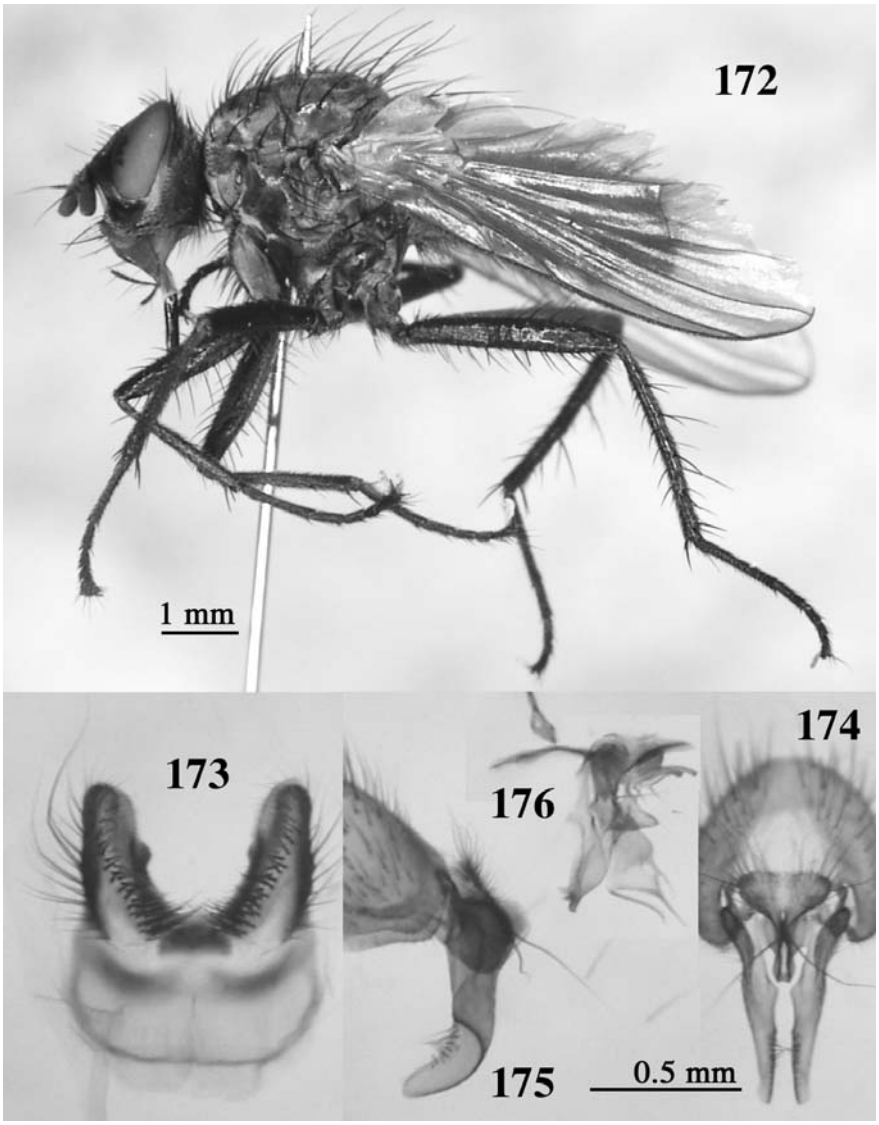
*46. *Paradelia brunneonigra* (Schnabl, 1911)

Pseudonupedia brunneonigra: Hennig, 1972: 435; Suwa, 1974: 168.
Paradelia brunneonigra: Griffiths, 1987: 781; Suwa, 1999: 230; Michelsen, 2007: 16.

Material examined. Central Sakhalin: Mt. Chamga, alt. 600−700 m, 45 km east-southeast of Tymovskoye, 1♂, 7.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu); Europe; N America.

Remarks. Michelsen (2007) tentatively identified some female specimens from Kashmir (2600−3000 m), India, with *P. brunneonigra*.

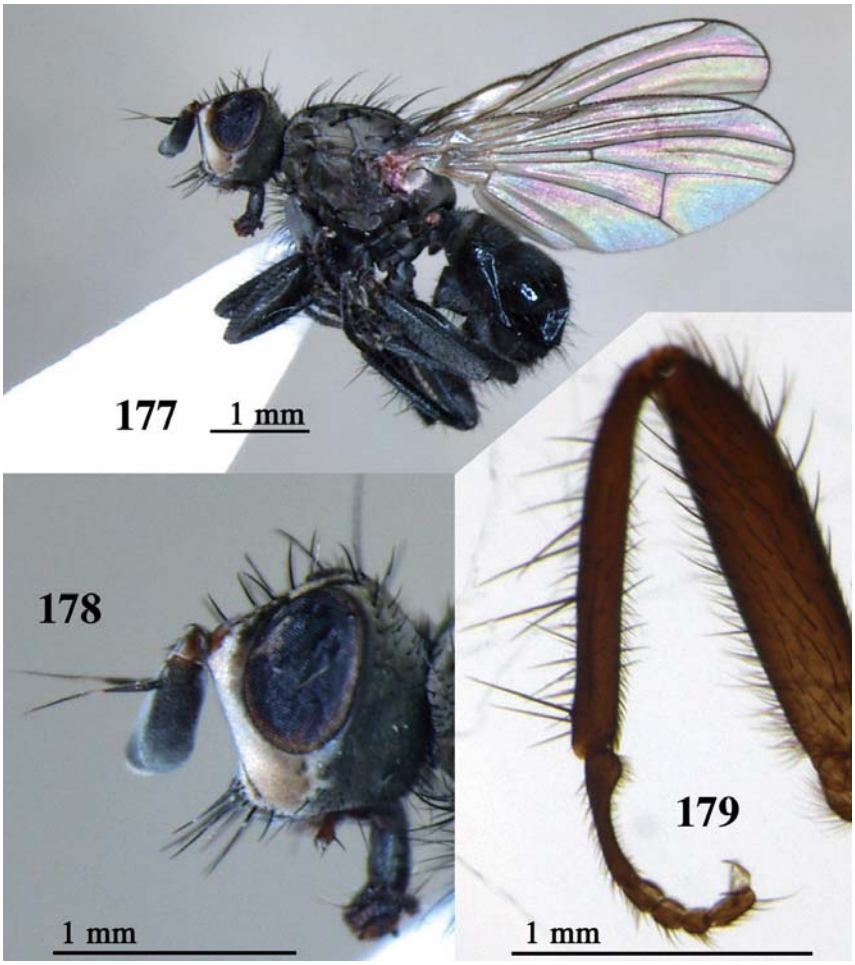


Figs 172−176. *Lasiomma replicatum* (Huckett), ♂. 172, general features; 173, 5th sternite, ventral view; 174, hypopygium, dorsal view; 175, ditto, lateral view; 176, aedeagus and adjacent structures, left lateral view. Magnification same for Figs 173−176. Pilenga R., 70 km ENE of Smirnykh.

*47. *Paregle audacula* (Harris, 1780)

"*Paregle radicum* (Linnaeus, 1758)": Hennig, 1967: 165; Suwa, 1974: 94.

Paregle audacula: Pont, 1981: 174; Suh et al., 1991a: 46; Wei et al., 1998: 705; Suwa et al., 2000: 171; Griffiths, 2001: 2123.



Figs 177−179. *Myopina myopina* (Fallén), ♂. 177, general features; 178, head, lateral view; 179, right hind leg, anterior view. Smirnykh.

Material examined. Southern Sakhalin: Prigorodnoye, 8 km east of Korsakov, mouth of Mereya River, 5♂, 3♀, 15.viii.2002. Central Sakhalin: Pervomayskoye, alt. 150 m, 40 km northeast of Smirnykh, 6♂, 3♀, 10.viii.2002; Smirnykh, riverside, alt. 70 m, Orlovka River, 2♂, 9.viii.2002; Tym' River, alt. 200 m, 25 km east of Palevo, 1♀, 9.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido); Kurils (Paramushir; Kharimkotan); Kamchatka; Korea; China; Holarctic region; Australia and Tasmania (introduced).

*48. *Pegomya bicolor* (Wiedemann, 1817)
(Fig. 180)

Pegomya bicolor: Suwa, 1971b: 262; Hennig, 1973: 531; Suwa, 1974: 195; Wei et al., 1998: 796; Suwa, 1999: 231; Suwa et al., 2000: 171.

Pegomya bicolor bicolor: Griffiths, 1982: 18.

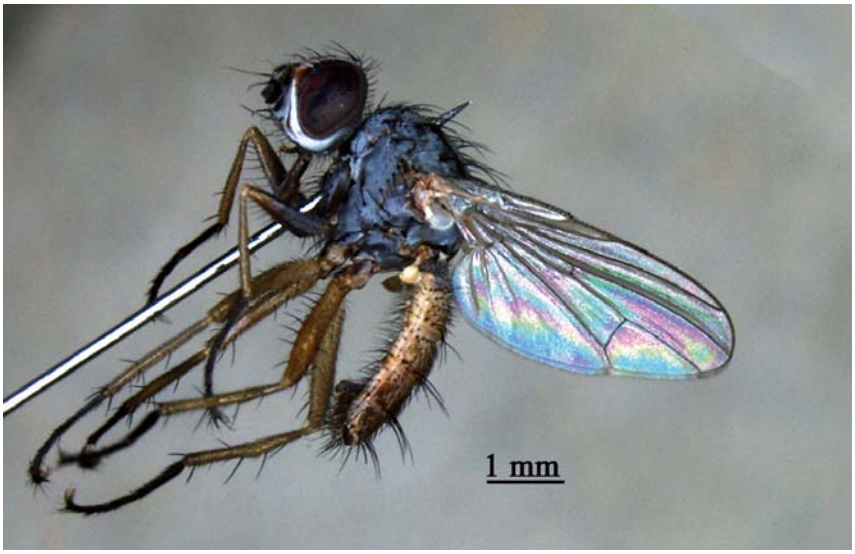


Fig. 180. *Pegomya bicolor* (Wiedemann), ♂. General features. Mt. Chamga.

Pegomya bicolor cinereorufa: Hennig, 1973: 535.
Pegomya bicolor jynx: Hennig, 1973: 535; Suh and Kwon, 1985: 159.

Material examined. Central Sakhalin: Mt. Chamga, alt. 700−1000 m, 45 km east-southeast of Tymovskoye, 7♂, 5♀, reared from larvae, 7.viii.2002, emerged from late August to early September, 2002, as a leaf miner on *Oxyria digyna* (Linnaeus).

Distribution. Sakhalin; Japan (Hokkaido; Honshu; Shikoku; Kyushu); Kurils (Paramushir; Matua; Urup); Kamchatka; Korea; China; Holarctic region.

Remarks. This is widespread in the Holarctic region. Hennig (1973) recognized three subspecies mainly on the basis of the colouration, *P. b. bicolor* from main part of the region, *P. b. cinereorufa* Ringdahl, 1930, from Iceland, and *P. b. jynx* (Séguy, 1926) from China and Japan. The present Sakhalin form is referred to the nominotypical subspecies in having the abdomen almost wholly yellow in ground colour.

*49. *Pegomya cunicularia* (Rondani, 1866)

Pegomya mixta: Suwa, 1974: 192.
Pegomya cunicularia: Michelsen, 1980: 301; Suh and Kwon, 1985: 159; Wei et al., 1998: 791; Suwa, 1999: 232.

Material examined. Southern Sakhalin: Seashore, south of Sovetskoye, 2♂, 2♀, reared from larvae, 1.viii.2002, emerged from late August to early September, 2002, as a leaf miner on *Chenopodium album* Linnaeus.

Distribution. Sakhalin; Japan (Hokkaido; Honshu; Kyushu); Korea; China; Europe; N Africa.

Remarks. This is known as a leaf miner of chenopodiaceous plants belonging to

Chenopodium, *Atriplex*, *Beta* and *Spinacia*.

*50. *Pegomya geniculata* (Bouché, 1834)

Pegomya geniculata: Hennig, 1973: 563; Suwa, 1974: 211; Suwa, 1981b: 13; Griffiths, 1984: 313; Wei et al., 1998: 794; Suwa, 1999: 233.

Material examined. Southern Sakhalin: Riverside forest, near seashore, Bakhura River, 20 km east of Sokol, 15♂, 31.vii.2002. Central Sakhalin: Smirnykh, riverside, alt. 70 m, Orlovka River, 4♂, 9.viii.2002; Riverside, alt. 50 m, Pilenga River, 70 km east-northeast of Smirnykh, 1♂, 11.viii.2002; Northwest of Mt. Chamga, alt. 450−500 m, 42 km east-southeast of Tymovskoye, 9♂, 8.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu); Kurils (Kunashiri); China; Europe; N America.

*51. *Pegomya incisiva* Stein, 1906
(Figs 181−185)

Pegomya incisiva: Hennig, 1973: 588; Griffiths, 1983: 248.

Material examined. Central Sakhalin: Smirnykh, riverside, alt. 70 m, Orlovka River, 2♂, 9.viii.2002.

Distribution. Sakhalin; Europe; N America.

Remarks. This species is here recorded from the Far East for the first time. It may widely be distributed in boreal and alpine areas of the Holarctic region.

*52. *Pegomya pulchripes* (Loew, 1857)

Pegomya pulchripes: Hennig, 1973: 617; Suwa, 1974: 213; Suwa, 1981b: 13; Suh and Kwon, 1986: 157; Suwa, 1999: 235.

Material examined. Southern Sakhalin: Riverside forest, near seashore, Bakhura River, 20 km east of Sokol, 2♂, 31.vii.2002; Mt. Zhdanko, alt. 250−450 m, 25 km north of Vzmor'ye, 1♂, 2.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu); Kurils (Kunashiri); Korea; Europe.

*53. *Pegomya transgressa* (Zetterstedt, 1846)

Pegomya transgressa: Hennig, 1973: 655; Griffiths, 1983: 219.

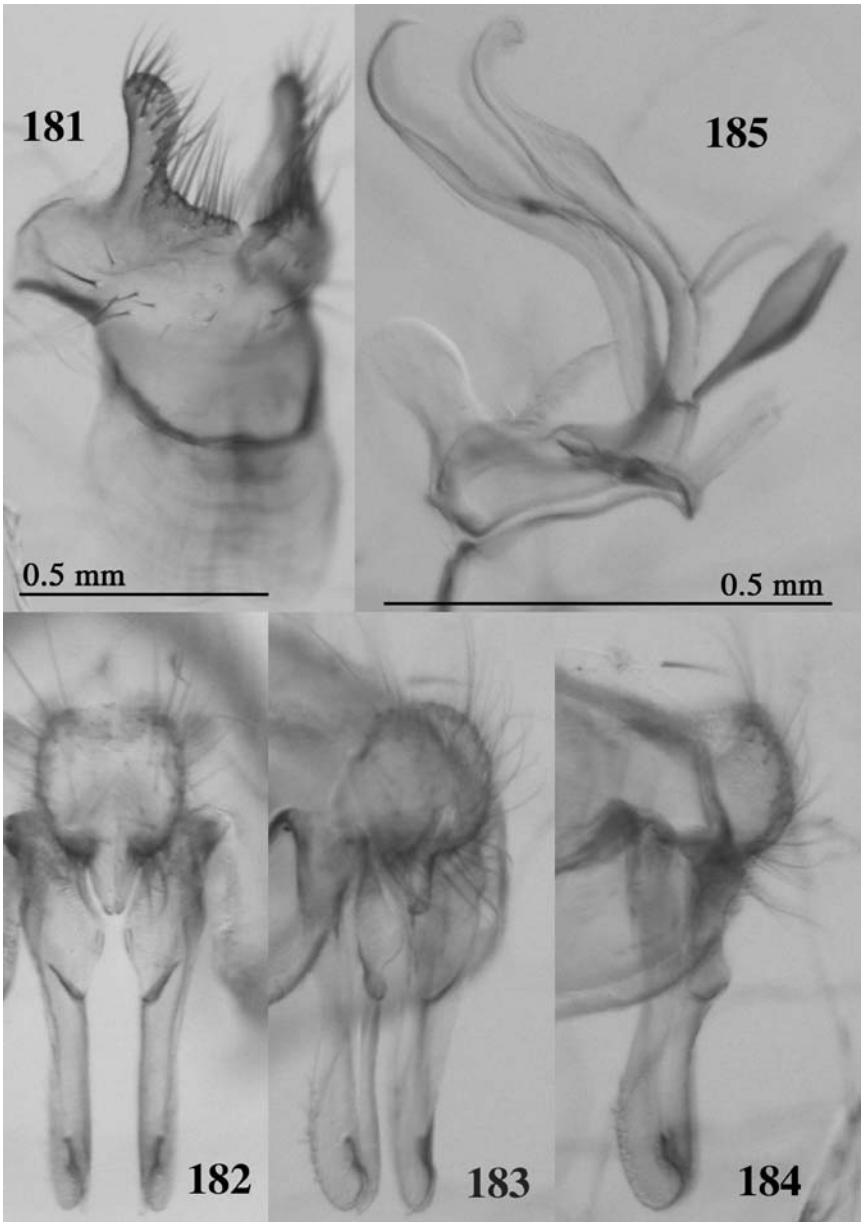
Material examined. Southern Sakhalin: Mt. Zhdanko, alt. 450−600 m, 25 km north of Vzmor'ye, 1♂, 2.viii.2002; Ugledarsk, quarry, alt. 400 m, 14 km north-northeast of Vostochnyy, 1♂, 3.viii.2002.

Distribution. Sakhalin; Europe; N America.

Remarks. *Pegomya transgressa* has been known from northern ranges of Europe and North America. It may be widespread in boreal areas of the Holarctic region.

*54. *Pegomya winthemi* (Meigen, 1826)

Pegomya winthemi: Hennig, 1973: 675; Suwa, 1974: 211; Griffiths, 1983: 198; Wei et al., 1998: 795; Suwa, 1999: 238.



Figs 181−185. *Pegomya incisiva* Stein, ♂. 181, 5th sternite, ventrolateral view; 182, hypopygium, dorsal view; 183, ditto, dorsolateral view; 184, ditto, lateral view; 185, aedeagus, left lateral view. Magnification same for Figs 182−185. Smirnykh.

Material examined. Southern Sakhalin: Sokol, Field Station, 8 km south of Dolinsk, 1♂, 14.viii.2002. Central Sakhalin: Tym' River, alt. 200 m, 25 km east of Palevo, 1♂, 9.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu; Kyushu); NE China; Europe; N America.

*55. *Pegoplata annulata* (Pandellé, 1899)

"*Pegoplata virginea* (Meigen, 1826)": Hennig, 1968: 239; Suwa, 1974: 172; Suh and Kwon, 1985: 166.

"*Pegoplata juvenilis* (Stein, 1898)": Wei et al., 1998: 768; Suwa, 1999: 238.

Pegoplata juvenilis nitidicauda: Griffiths, 1986: 623; Rozkošny, 1997: http://zoology.fns.uniba.sk/diptera/.

Pegoplata annulata: Barták et al., 1990: 448; Komzáková, 2006: http://zoology.fns.uniba.sk/diptera2006; Michelsen, 2012: http://www.faunaeur.org.

Material examined. Central Sakhalin: Smirnykh, riverside, alt. 70 m, Orlovka River, 1♂, 9.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu; Shikoku; Kyushu); Korea; China; Europe.

Remarks. The present species had been called "*Pegoplata virginea* (Meigen, 1826)". This name is, however, now recognized as a synonym of *Hydrophoria lancifer* (Harris, 1780) (Griffiths, 1986).

Griffiths (1986) regarded the species "*virginea* Meigen" auctt. as conspecific with the North American *Pegoplata juvenilis* (Stein, 1898), and recognized two subspecies, *P. j. juvenilis* (the North American form) and *P. j. nitidicauda* (the Palaearctic form). The name *nitidicauda* was given by Schnabl in Schnabl and Dziedziki (1911) for a "variety" of "*Pegomyia* (*Pegoplata*) *virginea* (Meigen)".

Anthomyia (*Hylemyia*) *annulata* Pandellé, 1899, had been regarded as a species of *Hydrophoria* now recognized as *Hydrophoria silvicola* (Robineau-Desvoidy, 1830). It has, however, recently been accepted as a species of *Pegoplata* conspecific with "*virginea* Meigen" auctt. and distinct from *P. juvenilis*.

*56. *Pegoplata infirma* (Meigen, 1826)

Nupedia infirma: Hennig, 1968: 232; Suwa, 1983a: 9; Wei et al., 1998: 767.

Pegoplata infirma: Griffiths, 1986: 639; Suwa, 1999: 238.

Material examined. Southern Sakhalin: Sokol, Field Station, 8 km south of Dolinsk, 1♂, 5.viii.2002, 4♂, 14.viii.2002.

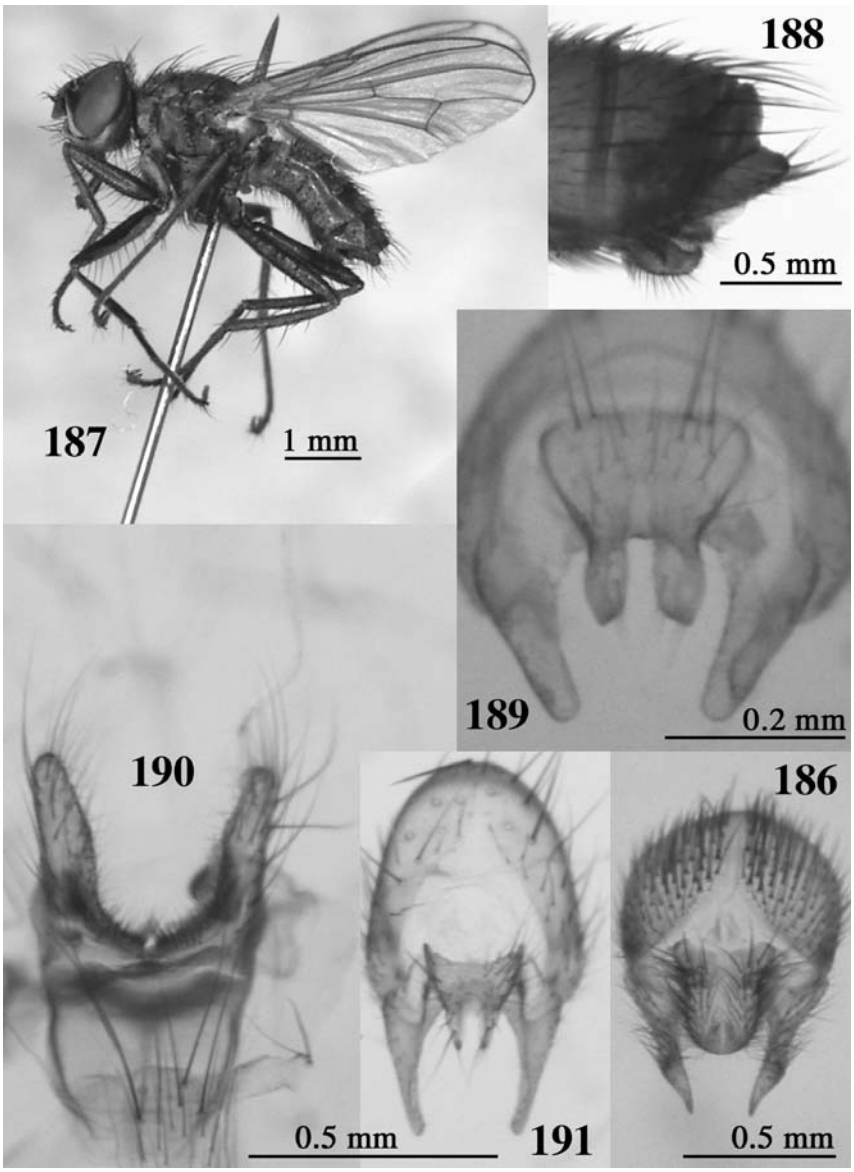
Distribution. Sakhalin; Japan (Hokkaido); Kamchatka; China; Europe; N America.

*57. *Zaphne ambigua* (Fallén, 1823)

Hydrophoria ambigua: Hennig, 1969: 265; Suwa, 1974: 175; Wei et al., 1998: 672.

Zaphne ambigua: Griffiths, 1998: 2064; Suwa, 1999: 241; Suwa et al., 2000: 172.

Material examined. Southern Sakhalin: Sokol, Field Station, 8 km south of Dolinsk, 2♂,



Figs 186−191. *Zaphne frontata* (Zetterstedt), ♂ (186), *Z. ignobilis* (Zetterstedt) , ♂ (187−189), and *Z. nuda* (Schnabl), ♂ (190−191). 186, 189, 191, hypopygium, dorsal view; 187, general features; 188, abdomen, caudal segments, left lateral view; 190, 4th (posterior half) and 5th sternites, ventral view. Mt. Chamga (186); Pilenga R., 70 km ENE of Smirnykh (187−189); Bakhura R., 20 km E of Sokol (190−191).

4.viii.2002, 1♂, 5.viii.2002; Riverside forest, near seashore, Bakhura River, 20 km east of Sokol, 4♂, 31.vii.2002. Central Sakhalin: Gastello, riverside, alt. 100 m, 18 km southwest of Poronaysk, 11♂, 13.viii.2002; Smirnykh, riverside, alt. 70 m, Orlovka River, 18♂, 9.viii.2002; Riverside, alt. 50 m, Pilenga River, 70 km east-northeast of Smirnykh, 1♂, 11.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido); Kurils (Shumshu); Kamchatka; NE China; Europe; N America.

*58. *Zaphne frontata* (Zetterstedt, 1838)
(Fig. 186)

Hydrophoria frontata: Hennig, 1969: 277; Suwa, 1977: 11.
Zaphne frontata: Griffiths, 1998: 1944; Suwa, 1999: 241.

Material examined. Central Sakhalin: Mt. Chamga, 45 km east-southeast of Tymovskoye, alt. 700−1000 m, 1♀, alt. 1000−1300 m, 2♂, 7.viii.2002.

Distribution. Sakhalin; Japan (Hokkaido; Honshu); Siberia; Europe; N America; Greenland.

*59. *Zaphne ignobilis* (Zetterstedt, 1845)
(Figs 187−189)

Hydrophoria ignobilis: Hennig, 1969: 280; Wei et al., 1998: 672.
Zaphne ignobilis: Griffiths, 1998: 2055.

Material examined. Central Sakhalin: Riverside, alt. 50 m, Pilenga River, 70 km east-northeast of Smirnykh, 1♂, 11.viii.2002.

Distribution. Sakhalin; Kamchatka; NE China; Europe; N America.

*60. *Zaphne nuda* (Schnabl, 1911)
(Figs 190−191)

Hydrophoria nuda: Hennig, 1969: 284; Wei et al., 1998: 673.
Zaphne nuda: Griffiths, 1998: 2098; Suwa et al., 2000: 172.

Material examined. Southern Sakhalin: Riverside forest, near seashore, Bakhura River, 20 km east of Sokol, 1♂, 1♀, 31.vii.2002.

Distribution. Sakhalin; Kurils (Shumshu); NE China; Europe; N America.

Notes on the anthomyiid faunas of Sakhalin and adjacent territories

The anthomyiid fauna of Sakhalin is now represented by 60 species (Table 1), though much more species are expected to be found there. In adjacent territories, so far as I am aware, 54 species are known from Kamchatka (Suwa et al., 2000), 169 species from Hokkaido, 228 species** from the whole of Japan (Suwa, 1999, 2011a, 2011b,

** According to Michelsen (2009) *Egle korpokkur* Suwa, 1974, and *Egle podulparia* Suh and Kwon, 1985, are conspecific with *Egle minuta* (Meigen, 1926). His opinion is adopted here.

Table 1. Check list of Anthomyiidae of Sakhalin and their distribution in other ranges.

Species	Hok	Hon	EP	EU	NA	DC
1. *Adia cinerella* (Fallén, 1825)	+	+	+	+	+	3
2. *Alliopsis lobata* sp. nov.	−	−	−	−	−	1
3. *Alliopsis silvatica* (Suwa, 1974)	+	+	+	−	−	1
4. *Alliopsis silvestris* (Fallén, 1824)	+	+	+	+	+	3
5. *Alliopsis tibialis* (Fan and Wang, 1982)	+	+	+	−	−	1
6. *Botanophila apiciseta* (Ringdahl, 1933)	−	−	−	+	+	3
7. *Botanophila biciliaris* (Pandellé, 1900)	+	−	+	+	+	3
8. *Botanophila cognata* Suwa, 2011	−	+	–	−	−	1
9. *Botanophila fugax* (Meigen, 1826)	+	−	+	+	+	3
10. *Botanophila gemmata* (Zetterstedt, 1860)	+	−	+	+	−	2
11. *Botanophila isikariana* (Suwa, 1974)	+	+	+	−	−	1
12. *Botanophila shirozui* (Suwa, 1981)	−	−	+	−	−	1
13. *Botanophila sonchi* (Hardy, 1872)	+	−	+	+	−	2
14. *Botanophila spinisternata* (Suwa, 1974)	+	+	+	−	−	1
15. *Chiastocheta latispinigera* Fan et al., 1982	+	−	+	−	−	1
16. *Chiastocheta sachalinensis* sp. nov.	−	−	−	−	−	1
17. *Chirosia flavipennis* (Fallén, 1823)	+	+	+	+	+	3
18. *Delia antiqua* (Meigen, 1826)	+	+	+	+	+	3
19. *Delia coarctata* (Fallén, 1825)	−	−	+	+	+	3
20. *Delia cuneata* Tiensuu, 1946	−	−	+	+	+	3
21. *Delia curvistylata* sp. nov.	−	−	−	−	−	1
22. *Delia echinata* (Séguy, 1923)	+	+	+	+	+	3
23. *Delia fabricii* (Holmgren, 1872)	−	+	+	+	+	3
24. *Delia floralis* (Fallén, 1824)	+	+	+	+	+	3
25. *Delia florilega* (Zetterstedt, 1845)	−	−	+	+	+	3
26. *Delia hirtitibia* (Stein, 1916)	−	−	+	+	+	3
27. *Delia linearis* (Stein, 1898)	+	−	+	+	+	3
28. *Delia lineariventris* (Zetterstedt, 1845)	−	+	+	+	+	3
29. *Delia planipalpis* (Stein, 1898)	+	−	+	+	+	3
30. *Delia platura* (Meigen, 1826)	+	+	+	+	+	3
31. *Delia radicum* (Linnaeus, 1758)	−	−	+	+	(+)	2
32. *Delia tenuiformis* Suwa, 1977	+	−	+	−	−	1
33. *Delia tenuiventris* (Zetterstedt, 1860)	+	+	+	+	+	3
34. *Eutrichota longimana* (Pokorny, 1887)	+	−	+	+	+	3
35. *Eutrichota socculata* (Zetterstedt, 1845)	+	+	+	+	+	3
36. *Fucellia fucorum* (Fallén, 1819)	+	−	+	+	+	3
37. *Fucellia hypopygialis* Ringdahl, 1930	+	+	+	−	+	4
38. *Fucellia kamtchatica* Ringdahl, 1930	+	+	+	−	+	4
39. *Heterostylodes pilifera* (Zetterstedt, 1845)	−	+	+	+	+	3
40. *Hydrophoria montana* Suwa, 1970	+	+	+	−	−	1
41. *Hydrophoria ruralis* (Meigen, 1826)	+	+	+	+	−	2
42. *Hylemya urbica* Van der Wulp, 1896	+	+	+	+	+	3
43. *Lasiomma morionellum* (Zetterstedt, 1845)	+	+	+	+	+	3
44. *Lasiomma replicatum* (Huckett, 1929)	−	−	+	+	+	3
45. *Myopina myopina* (Fallén, 1824)	−	−	+	+	+	3
46. *Paradelia brunneonigra* (Schnabl, 1911)	+	+	+	+	+	3
47. *Paregle audacula* (Harris, 1780)	+	−	+	+	+	3
48. *Pegomya bicolor* (Wiedemann, 1817)	+	+	+	+	+	3
49. *Pegomya cunicularia* (Rondani, 1866)	+	+	+	+	−	2
50. *Pegomya geniculata* (Bouché, 1834)	+	+	+	+	+	3
51. *Pegomya incisiva* Stein, 1906	−	−	−	+	+	3
52. *Pegomya pulchripes* (Loew, 1857)	+	+	+	+	−	2
53. *Pegomya transgressa* (Zetterstedt, 1846)	−	−	−	+	+	3
54. *Pegomya winthemi* (Meigen, 1826)	+	+	+	+	+	3
55. *Pegoplata annulata* (Pandellé, 1899)	+	+	+	+	−	2
56. *Pegoplata infirma* (Meigen, 1826)	+	−	+	+	+	3
57. *Zaphne ambigua* (Fallén, 1823)	+	−	+	+	+	3
58. *Zaphne frontata* (Zetterstedt, 1838)	+	+	+	+	+	3
59. *Zaphne ignobilis* (Zetterstedt, 1845)	−	−	+	+	+	3
60. *Zaphne nuda* (Schnabl, 1911)	−	−	+	+	+	3

+, occurring; (+), introduced; −, no record.

Hok, Hokkaido; Hon, Honshu; EP, East Palaearctic excluding Sakhalin; EU, Europe; NA, North America; DC, Distributional Category (see text).

Table 2. Distributional patterns of the anthomyiid species of Sakhalin and adjacent territories.

	Number of species in					
Distributional category	Kamchatka	Sakhalin	Hokkaido	Honshu	Japan whole	Korea
1. East Palaearctic	5 (9.3%)	12 (20.0%)	61 (36.1%)	72 (40.9%)	91 (39.9%)	44 (39.6%)
2. Transpalaearctic	7 (13.0%)	7 (11.7%)	45 (26.6%)	43 (24.4%)	59 (25.9%)	30 (27.0%)
3. Holarctic	36 (66.7%)	39 (65.0%)	58 (34.3%)	54 (30.7%)	70 (30.7%)	33 (29.7%)
4. East Palaearctic to Nearctic	6 (11.1%)	2 (3.3%)	5 (3.0%)	7 (4.0%)	8 (3.5%)	4 (3.6%)
Total	54	60	169	176	228	111

Table 3. Number of anthomyiid species of Sakhalin and adjacent territories common to other ranges.

	Number of species in					
Common to	Kamchatka	Sakhalin	Hokkaido	Honshu	Japan whole	Korea
Europe (Categ. 2+3)	43 (79.6 %)	46 (76.7%)	103 (60.6%)	97 (55.1%)	129 (56.6%)	63 (56.8%)
N Amer. (Categ. 3+4)	42 (77.8 %)	41 (68.3%)	63 (37.3%)	61 (34.7%)	78 (34.2%)	37 (33.3%)
Japan	34 (63.0%)	44 (73.3%)				86 (77.5%)
Hokkaido	29 (53.7%)	40 (66.7%)		120 (68.2%)		75 (67.6%)
Honshu	22 (40.7%)	31 (52.7%)	120 (71.0%)			77 (69.4%)
Total	54	60	169	176	228	111

2013a, 2013b, and others), and 111 species** from Korea (Suh and Kwon, 1985, 1986, 2001, 2008; Suh et al., 1991a, 1991b). These species are grouped into the following four categories based on their distribution (Table 2).

1. East Palaearctic. They are found in eastern Asia, but not known from Europe or North America.

2. Transpalaearctic. They are found in Europe, but not in North America. *Delia radicum* is assumed to have been introduced into North America from Europe, and is therefore referred to the present category.

3. Holarctic. These are found in Europe and North America. Most of them have no records in the vast area between Europe and the Far East. With the progress of investigation in future they will be found there. Some species, e.g. *Adia cinerella*, *Delia platura* and *Hylemya urbica*, are more widely distributed.

4. East Palaearctic to Nearctic. These are found in North America, but not in Europe.

The Tatar Strait between Sakhalin and the continent is narrow and shallow (4−20 m deep, and 7.3 km wide at the narrowest point, after Wikipedia, 2013: http://en.wikipedia.org/wiki/Strait_of_Tartary), and was established as a recent event in the geological time scale (less than ten thousand years ago, according to the figure 10-2 in Ono and Igarashi, 1995). It may be said that the Strait has achieved few results as a barrier, and that the anthomyiid fauna of Sakhalin is not much different from the Littoral Siberian fauna, though little information is available on the latter. The three species described as new to science in this paper are unlikely to be endemic to Sakhalin.

Table 2 clearly shows that the distributional pattern of species of Sakhalin is similar to that of Kamchatka in having a high percentage of Holarctic species (Category 3; 65.0 % in Sakhalin, 66.7 % in Kamchatka). For species distributed in high latitude ranges there may have been few serious barriers to obstruct their east-west dispersal and the

presence of Beringia was probably effective to expand their distribution into Holarctic. This may be a reason for the high percentage of Holarctic species in high latitude ranges.

On the other hand, the distributional pattern of the species of Hokkaido is very different from that of Sakhalin (Table 2). The percentage of the Category 3 in Hokkaido (34.3 %) is much lower than that in Sakhalin, and is similar to that in Honshu (30.7 %), and moreover to that in Korea (29.7 %). It may be said that the present anthomyiid fauna of Hokkaido has been established after the latest (namely the Würm) glacial age by adding a lot of southern elements to the former fauna mainly derived from Sakhalin during that glacial age. Meteorological influence, e.g. typhoon or barometric depression, might have been effective to bring southern elements to Hokkaido in addition to the ordinary northward dispersal of flies conforming the postglacial climate getting warmer.

Table 3 shows that many species (40 spp.) of Sakhalin are common to Hokkaido, reaching 66.7 %. This may be a reflection of the history of land connection of Sakhalin with Hokkaido during most of the latest glacial age. However, more numerous species are common to Europe (Categ. 2+3, 46 spp., 76.7%) than to Hokkaido. This may be explained by a supposition that east-west dispersal is expected during any period, but north to south dispersal is not easy during periods with the climate getting warmer, as in postglacial ages. It should be here pointed out that the present faunal data of Sakhalin is based on information from the southern half of Sakhalin. The statistic on the fauna will be more similar to that of Kamchatka when information from the norhern ranges is available.

Some of the species known from Sakhalin and not from Hokkaido, e.g. *Delia hirtitibia* and *Myopiina myopina*, might have come from the continent after the latest glacial age, and might have been given no chance to extend their distribution southward to Hokkaido.

Faunal information of anthomyiid flies is still insufficient in Japan, and much more so in Sakhalin. Further investigations are needed for a better understanding of the anthomiid dispersal in the Far East.

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References

Barták, M., Michelsen, V. and Rozkosny, R., 1990. New records of Anthomyiidae from Czechoslovakia, with a revised check list of Czechoslovak species (Diptera). Skripta Facultatis Scientiarium Naturalium Universitatis Purkyniensis Brunensis 20: 439–450.

Biron, D.G., Landry, B.S., Nénon, J.P., Coderre, D. and Boivin, G., 2000. Geographical origin of an introduced pest species, *Delia radicum* (Diptera: Anthomyiidae),

determined by RAPD analysis and egg micromorphology. Bulletin of Entomological Research 90: 23−32.
Després, L., Pettex, E., Plaisance, V. and Pompanon, F., 2002. Speciation in the globeflower fly *Chiastocheta* spp. (Diptera: Anthomyiidae) in relation to host plant species, biogeography, and morphology. Molecular phylogenetics and evolution 22: 258−268.
Fan, Z., Chen, Z., Ma, Z. and Ge, F., 1982. On some new species of Anthomyiidae from China (Diptera). Contributions from Shanghai Institute of Entomology 2 (1981): 221−239 (in Chinese, with an English summary).
Fan, Z., Sun, C., Chen, Z. et al., 1988. Diptera: Anthomyiidae. Economic insect fauna of China 37: 1−396, 10 plates (in Chinese, with an English summary). Science Press, Beijing.
Griffiths, G.C.D., 1982−2004 (1982−1984, 1986−1987, 1991−1993, 1996, 1998a, 2001, 2003−2004). Anthomyiidae. In G.C.D. Griffiths (ed.), Flies of the Nearctic region 8 (2): 1−2635.
Griffiths, G.C.D., 1998b. Further data on arctic anthomyiids (Diptera). Arctic insect news 9: 10−11.
Hennig, W., 1966–1976. 63a. Anthomyiidae. In Lindner, E. (ed.), Die fliegen der palaearktischen Region **7** (1): lxxviii + 974 pp., 114 plates. E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart.
Huckett, H.C., 1965. The Muscidae of Northern Canada, Alaska, and Greenland (Diptera). Memoirs of the entomological Society of Canada 42: 1−369.
Komzáková, O., 2006. Anthomyiidae Latreille, 1829. In Jedlička, L., Stloukalová, V. and Kúdela, M. (eds.), Checklist of Diptera of the Czech Republic and Slovakia. Electronic version 1. http://zoology.fns.uniba.sk/diptera2006.
Michelsen, V., 1980. A revision of the beet leaf-miner complex, *Pegomya hyoscyami* s.lat. (Diptera: Anthomyiidae). Entomologica scandinavica 11: 297−309.
Michelsen, V., 1985. A revision of the Anthomyiidae (Diptera) described by J.W. Zetterstedt. Steenstrupia 11: 37−65.
Michelsen, V., 2007. Taxonomic review of Eurasian *Paradelia* Ringdahl (Diptera: Anthomyiidae) with descriptions of two new species. Zootaxa 1592: 1−44.
Michelsen, V., 2009. Revision of the willow catkin flies, genus *Egle* Robineau-Desvoidy (Diptera: Anthomyiidae), in Europe and neighbouring areas. Zootaxa 2043: 1−76.
Michelsen, V., 2012. Anthomyiidae. In Pape, T. and Beuk, P. (eds.), Diptera Brachycera. Fauna Europaea version 2.5. http://www.faunaeur.org.
Niblett, M., 1955. Some further notes on bred Diptera. Entomologist's Record and Journal of Variation 67: 300−301.
Ono, Y. and Igarashi, Y., 1995. [Natural History of Hokkaido.] 219 pp. (in Japanese, 5th edition). Hokkaido University Press, Sapporo.
Pellmyr, O., 1992. The phylogeny of a mutualism: evolution and coadaptation between *Trollius* and its seed-parasitic pollinators. Biological Journal of the Linnean Society 47: 337−365.
Pont, A., 1981. The Linnaean species of the families Fanniidae, Anthomyiidae and Muscidae (Insecta: Diptera). Biological Journal of the Linnean Society 15: 165−175.
Rozkošny, R., 1997. Anthomyiidae. In Chvála, M. (ed.), Check List of Diptera (Insecta) of the Czech and Slovak Republics. 130 pp. Karolinum−Charles University Press, Prague (through http://zoology.fns.uniba.sk/diptera/).
Schnabl, J. and Dziedzicki, H., 1911. Die Anthomyiden. Abhandlungen der Kaiserlichen Leopoldinisch-Carolinischen Deutschen Akademie der Naturforscher 95: 53−358, plates 3−37.
Suh, S.J. and Kwon, Y.J., 1985. Taxonomic revision of the family Anthomyiidae from

Korea. Insecta Koreana 5: 143−221.
Suh, S.J. and Kwon, Y.J., 1986. Classification of the Anthomyiidae from Korea (V) (Diptera: Calypteratae). Korean Journal of Entomology 16: 157−162.
Suh, S.J. and Kwon, Y.J., 2001. Two unrecorded species of the family Anthomyiidae (Diptera: Calyptratae) from Korea. Korean Journal of Entomology 31: 165−168.
Suh, S.J. and Kwon, Y.J., 2008. A newly recorded species of the genus *Botanophila* (Insecta: Diptera: Anthomyiidae) in Korea. Korean Journal of systematic Zoology 24: 315−317 (only Abstract seen through http://www.dbpia.co.kr/Journal/ArticleDetail/1600103).
Suh, S.J., Kwon, Y.J. and Kozánek, M., 1991a. Taxonomic notes on the Anthomyiidae from North Korea (Diptera: Calyptratae). Korean Journal of applied Entomology 30: 42−49.
Suh, S.J., Kwon, Y.J., Park, S.H. and Jo, T.H., 1991b. Taxonomic notes on 6 unrecorded anthomyiid flies from Korea (Diptera: Calyptratae). Korean Journal of applied Entomology 30: 201−211.
Suwa, M., 1970. On the Japanese species of the genus *Hydrophoria* Robineau-Desvoidy, with description of a new species (Diptera: Anthomyiidae). Kontyû 38: 246−251.
Suwa, M., 1971a. Notes on the genus *Lasiomma* Stein in Japan, with descriptions of two new species (Diptera: Anthomyiidae). Kontyû 39: 28−36.
Suwa, M., 1971b. Notes on the Japanese leaf-miners of the genus *Pegomya* Robineau-Desvoidy, with descriptions of two new species (Diptera: Anthomyiidae). Kontyû 39: 262−272.
Suwa, M., 1974. Anthomyiidae of Japan (Diptera). Insecta matsumurana new series 4: 1−247.
Suwa, M., 1977. Supplementary notes on the family Anthomyiidae of Japan, I (Diptera). Insecta matsumurana new series 10: 1−16.
Suwa, M., 1981a. Notes on Amthomyiidae (Diptera) from Korea, with description of a new species. Kontyû 49: 102−108.
Suwa, M., 1981b. Notes on the Anthomyiidae from Sakhalin and the Kuriles (Diptera). Insecta matsumurana new series 22: 1–14.
Suwa, M., 1983a. Supplementary notes on the family Anthomyiidae of Japan (Diptera), II. Akitu new series 52: 1−20.
Suwa, M., 1983b. Notes on the genus *Hylemya* Robineau-Desvoidy in Taiwan (Diptera: Anthomyiidae). Akitu new series 53: 1−16.
Suwa, M., 1985. Redescription of *Hydrophoria aberrans* Stein from Taiwan (Diptera: Anthomyiidae). Akitu new series 74: 1−10.
Suwa, M., 1986. Supplementary notes on the family Anthomyiidae of Japan (Diptera), IV. Insecta matsumurana new series 34: 35–52.
Suwa, M., 1989. Notes on the genus *Chiastocheta* in Japan, with description of a new species (Diptera: Anthomyiidae). Akitu new series 110: 1−14.
Suwa, M., 1998. Supplementary notes on the family Anthomyiidae of Japan (Diptera), V. Insecta matsumurana new series 54: 33–50.
Suwa, M., 1999. Japanese records of anthomyiid flies (Diptera: Anthomyiidae). Insecta matsumurana new series 55: 203–244.
Suwa, M., 2011a. A new species closely related to *Botanophila fugax* (Meigen) from Japan (Diptera, Anthomyiidae). Japanese Journal of systematic Entomology 17: 77−81.
Suwa, M., 2011b. Supplementary notes on the family Anthomyiidae of Japan (Diptera), VII. Insecta matsumurana new series 67: 75–98.
Suwa, M., 2013a. *Chirosia sikisima* (Suwa, 1974) and its allied new species in Japan (Diptera: Anthomyiidae). Insecta matsumurana new series 69: 97−111.
Suwa, M., 2013b. Two species of *Chirosia* reared from the Ostrich fern, *Matteuccia*

struthiopteris (L.) Todaro, in Japan (Diptera: Anthomyiidae). Insecta matsumurana new series 69: 113−131.

Suwa, M. and Darvas, B., 1998. Family Anthomyiidae. In Papp, L. and Darvas, B. (eds.), Contributions to a manual of Palaearctic Diptera 3: 571−616. Science Herald, Budapest.

Suwa, M., Kuranishi, R.B. and Ôhara, M., 2000. Anthomyiid flies from Kamchatka and the Kuril Islands (Diptera: Anthomyiidae). Chiba Prefectural Museum Natural History Research, Special Issue 7: 163−177.

Thompson, F.C. and Pape, T., 2010. Systema Dipterorum, Version 1.0. http://www.diptera.org/.

Uffen, R. and Chandler, P., 1978. Higher plants, pp. 213−228, in Chapter 6 Associations with plants. In Stubbs, A. and Chandler, P. (eds.), A dipterist's handbook. 255 pp. The Amateur Entomologists' Society, Hanworth.

Wei, L., Xue, W. and Cui, C., 1998 ("1996"). Anthomyiidae. In Xue, W. and Chao, C. (eds.), Flies of China 1: 634–808 (in Chinese, with an English summary). Liaoning Science and Technology Press, Shenyang.

Wikipedia, 2013. Strait of Tartary. http://en.wikipedia.org/wiki/Strait_of_Tartary