

ORIGINAL ARTICLE

# Fungus gnats of the genera *Anatella*, *Allodia* and *Cordyla* in Japan (Diptera: Mycetophilidae)<sup>†</sup>

Mitsuhiro SASAKAWA<sup>1</sup> and Hironori ISHIZAKI<sup>2</sup>

<sup>1</sup>7-6-7 Korigaoka, Hirakata City, Osaka and <sup>2</sup>21-1 Teranomae-cho, Shishigatani, Sakyo-ku, Kyoto, Japan

## Abstract

Six new mycetophilid species from three genera belonging to the tribe Exechiini are described: *Anatella prominens* on a fungus of the Polyporaceae, *Allodia bipexa* and *Allodia conifera* on fungi of the Russulaceae, *Allodia quadrata* on fungi of the Hygrophoraceae, Tricholomataceae, Rhodophyllaceae, Russulaceae and Fistulinaceae, *Allodia laccariae* on a fungus of the Tricholomataceae, and *Cordyla bidenticulata* on a fungus of the Boletaceae. Their characteristic male genitalia are illustrated. *Cordyla flaviceps* Staeger, *Cordyla fusca* Meigen and *Cordyla pusilla* Edwards are newly recorded from Japan.

**Key words:** host fungus, Mycetophilinae, new record, new species.

## INTRODUCTION

The tribe Exechiini of the subfamily Mycetophilinae consists of 14 genera (Tuomikoski 1966), of which six, *Allodiopsis* Tuomikoski, 1966, *Brachypeza* Winnertz, 1863, *Exechia* Winnertz, 1863, *Exechiopsis* Tuomikoski, 1966, *Pseudexechia* Tuomikoski, 1966, and *Rhy-mosia* Winnertz, 1863, are known to occur in Japan (Okada 1939; Sasakawa 1992; Sasakawa & Ishizaki 1999). Although the genera *Anatella* Winnertz, 1863, *Allodia* Winnertz, 1863, and *Cordyla* Meigen, 1803 are widely distributed in the Holarctic Region, and *Russula* species (Russulaceae) are known mainly as the larval host fungi of *Allodia* and *Cordyla* species in Europe (Landrock 1926; Plassmann 1969; Hackman & Mein-ander 1979), no species of these three genera have hitherto been recorded from Japan.

In this paper, we present the first records of these genera in Japan: descriptions of one new species of *Anatella*, four new species of *Allodia* and one new species of *Cordyla*, with their larval host fungi. The other three species of *Cordyla*, *C. flaviceps* (Staeger), *C. fusca*

Meigen and *C. pusilla* Edwards, are new to Japan and their diagnostic characters are remarked upon.

## MATERIALS AND METHODS

Materials used in this study were dried specimens. The host fungi were collected by H. I. and a number of sporophores were kept at room temperature until the emergence of gnats. The male genitalia were macerated with 30% KOH and transferred to distilled water for dissection. The drawings of genitalia were made with the aid of an ocular grid and section paper, and were prepared by M. S.

The terminology follows Sasakawa and Ishizaki (1999). The holotypes of all the new species are deposited in the collection of the Osaka Museum of Natural History (OMNH; Nagai Park, Osaka), and some of the paratypes are deposited in the Laboratory of Entomology, Kyoto Prefectural University (Shimogamo, Kyoto) and in both authors' private collections.

## DESCRIPTION

### Genus *Anatella* Winnertz, 1863

*Anatella* is the only genus of Exechiini having the costa distinctly extended beyond the tip of  $R_5$ . Chandler (1977) drew attention to the distinctive mid-femoral chaetotaxy found in the male of some *Anatella* species

Correspondence: Dr Mitsuhiro Sasakawa, 7-6-7 Korigaoka, Hirakata City, Osaka, 573-0084 Japan.

<sup>†</sup>Japanese fungus gnats of the tribe Exechiini (Mycetophilidae) (II).

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and considered it to be a secondarily derived sexual character, as is the variation in the development of mid-tibial spurs mentioned by Tuomikoski (1966). Twenty-eight species of the genus have been recorded from Europe. In Japan, the genus is represented by only one species, described below.

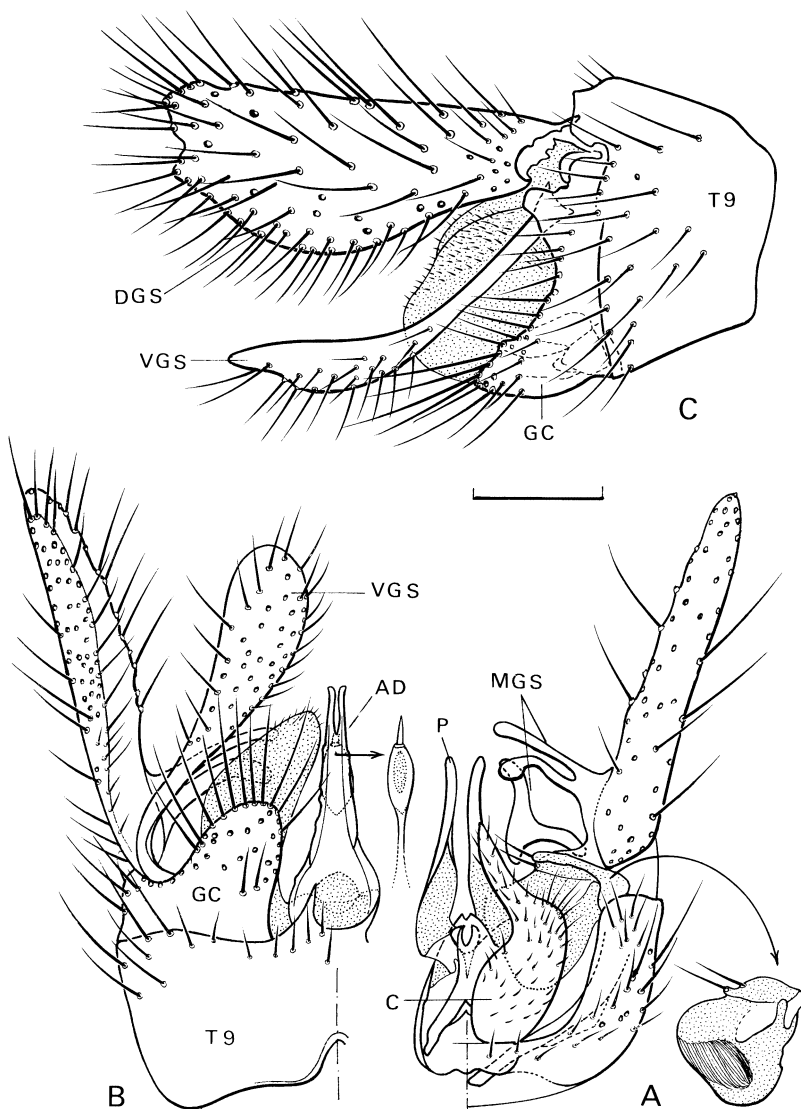
*Anatella prominens* Sasakawa sp. nov. (Fig. 1)

*Male.* Brown-black; head and thorax densely gray-dusted; antenna brown but pedicel pale testaceous and basal third of first flagellomere yellow; palpus yellow; pronotum, proepisternum, mesanepisternum and mesokatepisternum dark brown; gonocoxite and gonostylus testaceous. Wing hyaline, faintly tinged with

brown; halter yellow. Legs yellow; coxae slightly brown at bases; femora with apices brown; tibiae brown-tinged; tarsi and spurs pale brown.

Eye with whitish hairs; antenna with pedicel three-quarters length of scape, bearing a long dorsal seta and several short submarginal setae; flagellomeres in relative length of 32 (first; threefold as long as wide) : 26 (second to fifth; approximately 2.5-fold as long as wide) : 24–25 (sixth to tenth) : 23 (eleventh) : 21 (twelfth to thirteenth) : 22 (fourteenth); palpus with second to fourth palpomeres in relative length 15 : 20 : 53; second palpomere without distinct sensory pit.

Mesoscutum with dorso-central (dc) and lateral bristles short; scutellum with a pair of short marginal setae;



**Figure 1** Male genitalia of *Anatella prominens* Sasakawa sp. nov. (holotype). Gonocoxite, gonostylus, stylomeres, cercus and aedeagus from dorsal (A), ventral (B) and lateral (C) views. AD, aedeagus; C, cercus; DGS, dorsal stylomere of gonostylus; GC, gonocoxite; MGS, mesal stylomere of gonostylus; P, proctiger; T9, ninth tergite; VGS, ventral stylomere of gonostylus. Scale line: 0.1 mm.

pronotum and proepisternum each with a seta. Wing: Sc very short, colorless, ending at base of R; M-petiole slightly longer than r-m (10 : 8); base of cubital fork beyond that of medial fork. Legs: hind coxa with a pale distal bristle; mid-femur with dark postero-ventral fringe which is slightly longer on distal half of femur than on basal half, approximately half as long as width of the femur at middle and longer than pale antero-ventral fringe; tibiae without distinct setae, mid-tibia with outer spur almost half the length of the inner, hind tibia with outer spur three-quarters the length of the inner.

Gonocoxite projected posteriorly on ventral margin (Fig. 1B); gonostylus with dorsal stylomere large and somewhat lobate, ventral stylomere spatulate and narrowed basally (Fig. 1C), and mesal stylomere composed of three projections, which are directed mesally and a membranous lobe (Fig. 1A); proctiger distinctly projected; aedeagus bifurcated distally, with a spine-like process before apex (Fig. 1B).

Body length 3.0 mm, wing length 2.7 mm.

*Female.* Unknown.

*Holotype.* ♂, Asume-cho, Aichi Pref., emergence date (emerg.) 8.ii.1993, H. Ishizaki (OMNH-TI no. 162), host fungus, *Lenzites betulina* (L. Fr.) Fr. (Polyporaceae), collected on (coll.) 23.i.1993; left antenna and palpus mounted on a small slide, abdomen and genitalia in a polyethylene tubule with glycerol, and pinned with the specimen.

*Distribution.* Japan (Honshu).

*Remarks.* This new species is similar to European *Anatella ciliata* Winnertz, 1863, and *Anatella setigera* Edwards, 1921, in body color and lengths of mid-femoral fringe and mid-tibial spurs, but the dorsal and ventral stylomeres of gonostylus are quite different from each another in the shape and chaetation (genitalia of *A. ciliata* and *A. setigera* by Chandler (1977): figs 10 and 4, respectively, dorsal stylomere of the former with many spine-like setae on tip and of the latter with claw-like and bare apex, and the ventral one of each species with a long seta or spine-like seta on truncated apex). In the shape of the gonocoxite with apical projections in ventral side, it is quite similar to the European *Anatella gibba* Winnertz, 1863 (fig. 11 from Chandler (1977)) and *Anatella pseudogibba* Plassmann, 1977 (Fig. 3), but its dorsal stylomere is simple, thus differing from the related species with furcate apical processes. A dark basal bristle on hind coxa characteristic of all other Exechiini is absent in this new species as in *A. ciliata* Winnertz and *Anatella turi* Dziedzicki, 1923 (Chandler 1977).

*Etymology.* The specific name refers to 'prominent' proctiger and aedeagus.

### Genus *Allodia* Winnertz, 1863

This genus is characterized by an elliptical clypeus, presence of a long apical bristle on the male ninth tergite (T9) and absence of posterior bristles on the hind tibia. It is divided into two subgenera: *Brachycampta* Winnertz, 1863, and *Allodia* s. str. by the length of dc on the mesoscutum; that is, distinctly longer than in the former and almost equal to acrostichals in the latter (Tuomikoski 1966).

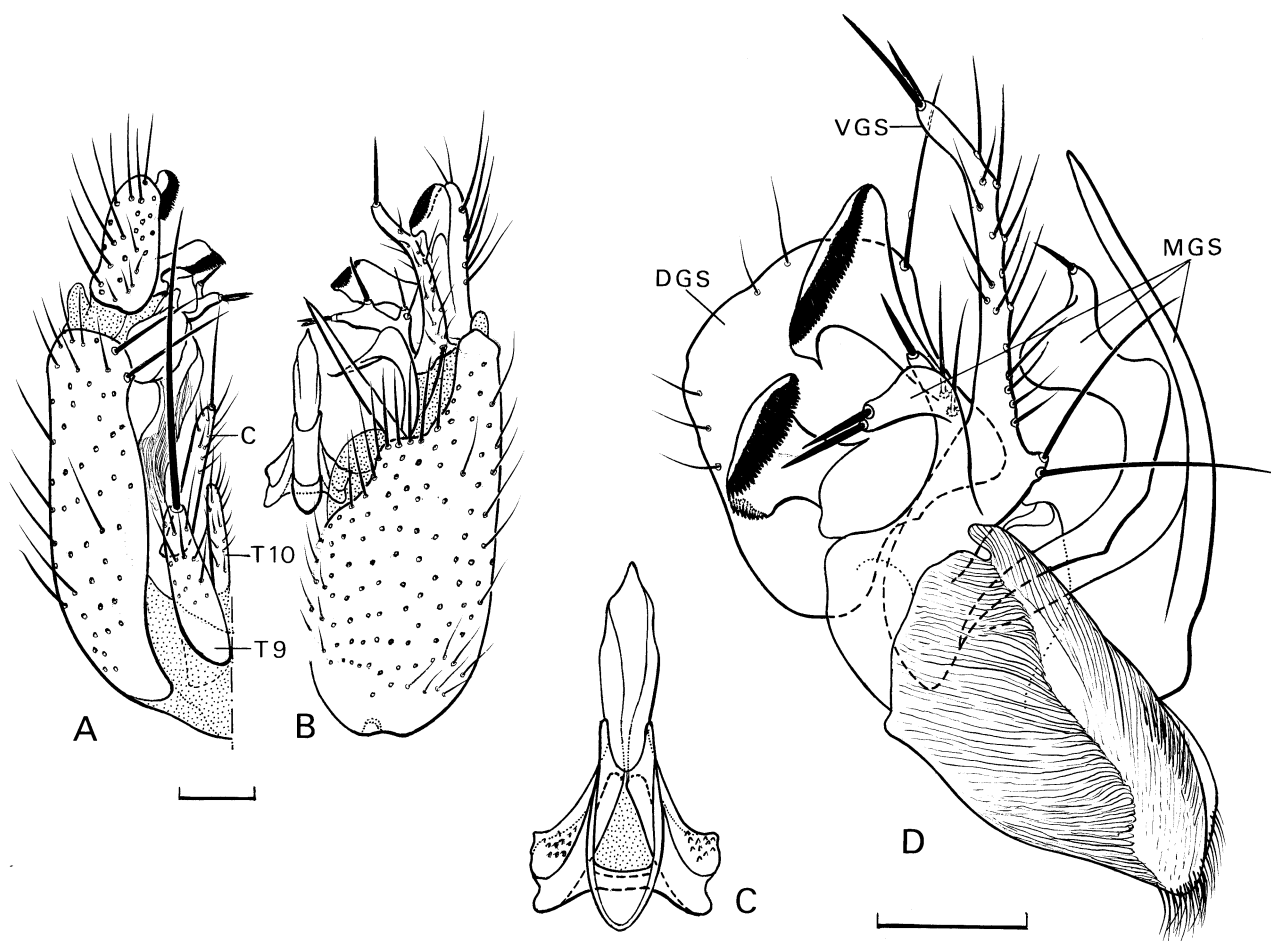
Three species belonging to the subgenus *Brachycampta* and one to the subgenus *Allodia* are described below as new to science. Reliable separation of species cannot be achieved from external characteristics such as coloration and venation, but male genitalia are highly specific in contrast to the close similarity between the species of the subgenus *Brachycampta*.

### *Allodia (Brachycampta) bipexa* Sasakawa sp. nov (Fig. 2)

*Diagnosis.* This testaceous species is unique in having two combs (derivation of specific name) of black spinulae on inner side of dorsal lobate stylomere.

*Male.* Head testaceous; frons sparsely grayish pollinose; face and clypeus yellow or brown, the latter silvery-white pruinose; antenna with scape, pedicel and first to third (to fourth) flagellomeres yellow, but other flagellomeres pale yellow-brown; palpus yellow. Mesoscutum testaceous, with anterior lateral side yellow and silvery pruinose, and with brownish vittae indistinctly just laterad of dc rows, extending to bases of apical scutellar bristles; pleura yellow, but anterior dorsal corner of mesanepisternum and ventral margin of pleurotergite faintly brown-tinged, mediotergite pale brown centrally and gray-dusted. Wing hyaline, faintly tinged with brown-yellow; halter yellow. Legs yellow, tibiae faintly brown-tinged, tarsi and spurs pale brown. Abdomen testaceous, tergites T1–5 each with a median brown triangle, distinctly extending to posterior lateral margins on T5, T6 brown on anterior two-fifths to two-thirds.

Head with clypeus almost twice as high as face; eye with minute hairs; antenna almost equal to thorax in length, scape with one dorsal and one ventral setae, pedicel with a dorsal seta longer than the other marginals, flagellomeres in relative length of 35 (first) : 22–25 (second to tenth) : 20–23 (eleventh to thirteenth) : 39 (fourteenth), fourth flagellomere approximately 1.3-fold as wide as long; palpus with three distal palpomeres in



**Figure 2** Male genitalia of *Allodia (Brachycampta) bipexa* Sasakawa sp. nov. (paratype, on *Russula emetica*). Gonocoxite, gonostylus, stylomeres, ninth and tenth tergites, cercus and aedeagus from dorsal (A) and ventral (B) views. (C) Aedeagus, ventral view. (D) Stylomeres, inner view. T10, tenth tergite. For other abbreviations, see Figure 1. Scale lines: 0.1 mm.

relative length 3 : 4.5 : 10.5, second palpomere with approximately 30 minute sensillae in a group.

Mesoscutum with distinct dc, particularly anterior pairs and prescutellar ones long; propleural bristles two, posterior one shorter than the anterior. Wing:  $M_1$  and  $M_2$  colorless on apices; Sc very short;  $R_1$  slightly shorter than R; r-m slightly longer than M-petiole; base of cubital fork distinctly before that of medial fork; anal vein distinct. Leg: hind tibia with 12 (10–13) ad, eight to nine (rarely five to seven) d and four (rarely five to six) apical pd.

Cercus almost equal to T9 in length; gonocoxites united with (or indistinctly separated from) each other on ventral side, with two or three pairs of strong setae at inner dorso-apical corners and four or five pairs of strong setae along postero-mesal margins before ven-

tral apices (Fig. 2A,B); gonostylus with dorsal stylo-  
mere lobate and with two combs of black spinulae on its inner apical and basal projections, ventral stylo-  
mere long, setose and with two long setae at base and two stout setae on tip, and mesal stylo-  
mere composed of three processes, of which the basal one is long and bare, the middle one sinuate apically and with an apical seta, and the distal one shortest, bifurcated apically, each process with apical stout seta(e) (Fig. 2D); aedeagus 240–250  $\mu$ m long; parameres united with aedeagus at base (Fig. 2C).

Body length 3.1 (2.8–3.2; 3.2 in holotype) mm; wing length 2.4 (2.1–2.5; 2.3 in holotype) mm.

*Female.* Similar to male, but T5 with brown triangle smallest, T6 entirely testaceous; body length 3.5 (3.2–3.7) mm, wing length 2.5 (2.4–3.1) mm.

*Holotype*. ♂, Nagoya University Campus, Nagoya, emerg. 20.vii.1993, H. Ishizaki (OMNH-TI no. 163), host fungus, *Russula emetica* (Schaeff. Fr.) S. F. Gray (Russulaceae), coll. 15.vii.1993.

*Paratypes*. 14♂, 8♀, same data as in holotype except for emerg. 20–21.vii.1993 (H. I.); 8♂, 4♀, same locality as holotype, emerg. 24.vii.1993 (H. I.), on *Russula subnigricans* Hongo, coll. 19.vii.1993; 1♂, same locality as holotype, emerg. 14.viii.1994 (H. I.), on *Russula japonica* Hongo, coll. 4.viii.1994; 3♂, 1♀, Mt Tanakamiyama, Shiga Pref., emerg. 4–5.x.1999 (K. Tsuda), on *Russula sanguinea* (Bull.) Fr., coll. 28.ix.1999; 2♂, 2♀, Mt Tanakami-yama, emerg. 23.x.1999 (K. T.), on *Lactarius hatsudake* Tanaka (Russulaceae), coll. 13.x.1999.

*Distribution*. Japan (Honshu).

*Remarks*. This new species belongs to the *alternans* group judging from the position of the cubital forking point and number of propleural bristles (Landrock 1926). The well-projected aedeagus is particularly similar to that of European *Allodia barbata* Lundström, 1909, of the group, although the coloration of head and thorax in this new species is quite different from that of *A. barbata*. There are two color forms in the face and clypeus of this new species: brown form was seen in ten males reared from *Russula emetica* and four males reared from *R. subnigricans*, while yellow form was seen in six females reared from *R. emetica* and two females reared from *R. subnigricans*.

***Allodia (Brachycampta) comifera* Sasakawa  
sp. nov.** (Fig. 3)

*Diagnosis*. This testaceous species is unique in having a comb of black spines on the inner side of the dorsal conical stylomere (derivation of specific name) of the gonostylus and well-sclerotized parameres beside the aedeagus.

*Male*. Testaceous; frons slightly brown-tinged when viewed from above, sparsely grayish pollinose; face usually pale brown; clypeus yellowish ventrally, densely silvery-white pruinose; antenna with scape and pedicel testaceous, flagellomeres pale yellow–brown but basal four to six flagellomeres testaceous yellow; palpus yellow to testaceous; mesoscutum with yellow lateral side and narrow central line (at posterior one-fifth to one-third length of the notum) between prescutellar dc extending to apical margin of scutellum, which is slightly brown-tinged; pleura except for dorsal margin of mesanepisternum, ventral margin of pleurotergite and dorso-median part of mediotergite yellow; T1–5 each with a dark brown triangle posteriorly (anterior one-quarter to one-half testaceous), distinctly extending

to lateral side on T5, T6 with brown marking on anterior half of lateral side; gonocoxite testaceous yellow, gonostylus black–brown apically. Wing hyaline, faintly tinged with brown–yellow; halter yellow. Legs yellow, tibiae testaceous apically, tarsi and spurs yellow–brown.

Head with clypeus approximately twice as high as face; eye hairy; antenna 1.2–1.3-fold as long as thorax, scape and pedicel each with a strong dorsal seta, which is longer than others, flagellomeres in relative length of 45 (first) : 27–28 (second, fourth to fifth) : 29–30 (third) : 25–26 (sixth to twelfth) : 25 (thirteenth) : 38 (fourteenth), fourth flagellomere approximately 1.3-fold as long as wide; palpus four-segmented, with relative length of second to fourth palpomeres 2 : 3 : 5.6, second palpomere with sensory area on basal half.

Mesoscutum with distinct dc and prescutellar bristles which are slightly longer than others; scutellum with two pairs of distinct setulae before bases of long apical bristles; propleural bristles two, subequal in length. Wing: M<sub>1</sub> and M<sub>2</sub> colorless on apices; Sc very short; R<sub>1</sub> slightly shorter than R; r-m slightly longer than M-petiole; base of cubital fork distinctly before that of medial fork; anal vein distinct. Leg: hind tibia with 11–12 (rarely 10 or 13–14) ad, seven to eight (rarely six or nine) d and three to four (rarely two or five) apical pd.

Ninth tergite slightly longer than cercus and narrow; T10 distinct. Gonocoxites separated narrowly on ventral side, with two pairs of strong setae at inner dorso-apical corners and four or five pairs of strong setae before ventral apices (Fig. 3A,B); gonostylus with dorsal stylomere conical in lateral view, distinctly narrowed ventrally, densely setose but hairy along inner caudal margin (Fig. 3C), and with a ventral comb of 35–38 black spines before inner apex (Fig. 3D), ventral stylomere narrow and long, and with long setae at base and near tip, and mesal stylomere composed of two processes, of which basal one is long and bare, and distal one is lobate with four stout setae; aedeagus 200 µm long; parameres well sclerotized and only a little shorter than aedeagus (Fig. 3E).

Body length 2.9 (2.3–3.3; 3.2 in holotype) mm, wing length 2.2 (1.8–2.5; 2.4 in holotype) mm.

*Female*. Similar to male, but T5 with a dark brown triangle almost as large as that on T2–4, T6 usually testaceous entirely; ovipositor testaceous; tibiae entirely yellow; body length 2.7 (2.3–3.2) mm, wing length 2.1 (1.9–2.5) mm.

*Holotype*. ♂, Nagoya University Campus, Nagoya, emerg. 11.viii.1994, H. Ishizaki (OMNH-TI no. 164), host fungus, *Russula japonica* Hongo (Russulaceae), coll. 4.viii.1994.



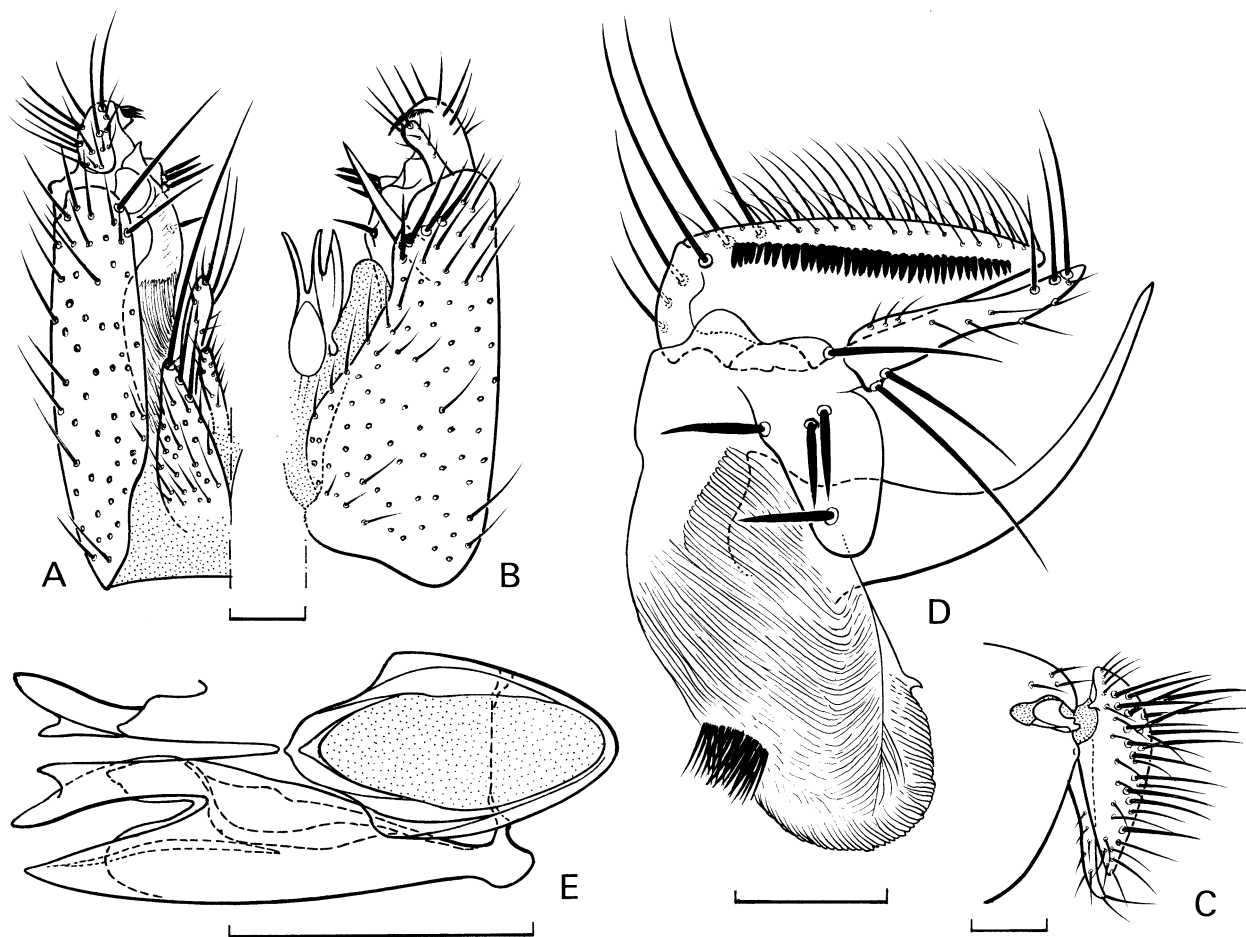


Figure 3 Male genitalia of *Allodia (Brachycampta) conifera* Sasakawa sp. nov. (paratype). Gonocoxite, gonostylus, stylomeres, ninth and tenth tergites, cercus and aedeagus from dorsal (A) and ventral (B) views. (C) Gonostylus, lateral view. (D) Stylomeres, inner view. (E) Aedeagus, ventral view. Scale lines: 0.1 mm.

*Paratypes.* 23♂, 16♀, same data as in holotype except for emerg. 11 and 14.viii.1994 (H. I.).

*Distribution.* Japan (Honshu).

*Remarks.* This species also belongs to the *alternans* group, and is distinguishable from *A. bipexa* sp. nov. by the structure of the gonostylus. The furcate aedeagus of this species is similar to that of British *Allodia foliata* Edwards, 1924, but the gonostyli of the two are entirely distinct (fig. 31 from Landrock 1926) and *A. foliata* has three propleural bristles (two in *A. conifera* sp. nov.).

***Allodia (Brachycampta) quadrata* Sasakawa sp. nov.** (Fig. 4)

*Diagnosis.* This new species is easily recognized by the brown median fasciae on abdominal tergites. The male genitalia are distinctive in the shape of the gonostylus, differing much from those of all the known species.

*Male.* Head pale brown, face and clypeus darker; frons sparsely grayish-dusted; antenna with scape and pedicel testaceous, first to second (to fourth) flagellomeres testaceous yellow, other flagellomeres yellowish to pale brown; palpus yellow to pale testaceous. Thorax testaceous, but paler on pleura except for brownish ventral margin of pleurotergite; mesoscutum indistinctly with a pair of brownish vittae laterad of dc rows on posterior three-fifths of scutal length, and with lateral margin yellow; scutellum brown-tinged, with antero-lateral corner yellow; mediotergite brown mesally and subshining. Wing hyaline, faintly tinged with brown-yellow. Legs yellow, mid- and hind femora each with a minute brown spot on outer ventral apex, mid- and hind tibiae brown-tinged apically, all tarsi except for bases of metatarsi and spurs pale brown. Abdomen testaceous, T1–6 brown at middle longitudinally except for yellowish posterior

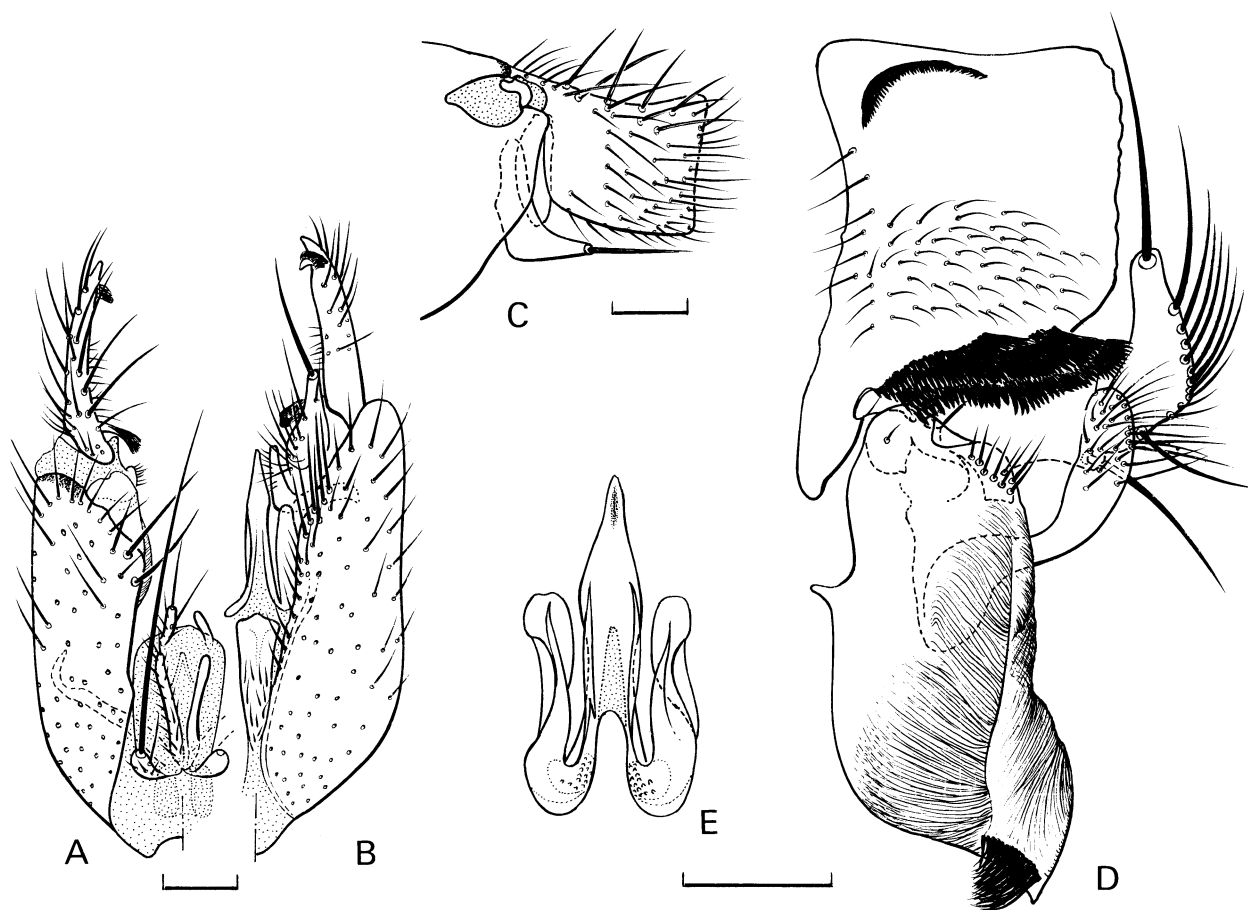


Figure 4 Male genitalia of *Allodia (Brachycampta) quadrata* Sasakawa sp. nov. (paratype, on *Fistulina hepatica*). Gonocoxite, gonostylus, stylomeres, ninth and tenth tergites, cercus and aedeagus from dorsal (A) and ventral (B) views. (C) Gonostylus, lateral view. (D) Stylomeres, inner view. (E) Aedeagus, ventral view. Scale lines: 0.1 mm.

margins (one-fifth to one-third of length of the tergite); T4–6 each with a pair of brown spots laterad of median fascia; gonocoxite and gonostylus testaceous, but dorsal apices of coxites dark brown and shining.

Head with clypeus elliptic, nearly twice as high as face; eye with minute hairs; antenna 1.7-fold as long as thorax, scape and pedicel each with a dorsal seta longer than the marginals, flagellomeres in relative length of 50 (first): 35 (second to seventh): 33 (eighth to ninth): 31–32 (tenth to thirteenth): 42 (fourteenth), fourth flagellomere approximately 1.6-fold as long as wide; palpus with four palpomeres in relative length 2 : 2.3 : 3.5 : 6.5, second palpomere with many sensillae in a large pit, which is only a little shorter than length of the segment in long axis.

Mesoscutum with anterior pairs and prescutellar pairs of dc longer than others; scutellum with one or

two pairs of distinct setulae before bases of long apical bristles; propleural bristles two, posterior one shorter than the anterior. Wing quite similar to that of *A. conifera* sp. nov. Leg: hind tibia with nine to 10 a, eight to nine (rarely seven, 10–11) ad, four (rarely three, five to six) d and one (rarely two) apical pd.

Ninth tergite very small; T10 and cercus very narrow. Gonocoxites separated narrowly on ventral side, with two pairs of strong setae at inner dorso-apical corners and five or six pairs of distinct setae before inner ventral apices (Fig. 4A,B); gonostylus with dorsal stylomere subquadrate in lateral view, slightly projected dorso-apically, with strong setae along dorsal margin and two combs of dark brown spinulae at inner dorso-distal corner and inner base (spinulae arranged in three to four rows), and ventral stylomere L-shaped and with a strong seta on tip (Fig. 4C,D); aedeagus 200  $\mu$ m long,

with parameres weakly sclerotized and clavate (Fig. 4E).

Body length 3.1 (2.9–3.7; 3.0 in holotype) mm, wing length 2.7 (2.2–3.1; 2.2 in holotype) mm.

*Female*. Similar to male; brown lateral spots on T4–6 indistinct or absent; ovipositor testaceous yellow; body length 3.1 (2.6–3.6) mm, wing length 2.7 (2.1–3.2) mm.

*Holotype*. ♂, Sanageyama, Aichi Pref., emerg. 12.vii.1993, H. Ishizaki (OMNH-TI no. 165), host fungus, *Fistulina hepatica* Schaeff. Fr. (Fistulinaceae), coll. July 1993.

*Paratypes*. 3♂, 1♀, Asuke-cho, Aichi Pref., emerg. 15.v.1992 (H. I.), on *Hygrophorus purpurascens* (Alb. & Schw. Fr.) Fr. (Hygrophoraceae), coll. 10.v.1992; 23♂, 3♀, Nagoya University Campus, emerg. 5–7.xii.1996 (H. I.), on *Tricholoma ustale* (Fr. Fr.) Kummer (Tricholomataceae), coll. 11.xi.1996; 1♂, 5♀, same locality as holotype, emerg. 20.v.1990 (H. I.), on *Rhodophyllus staurosporus* (Bres.) J. Lange (Rhodophyllaceae), coll. 8.v.1990; 6♂, 6♀, Nagoya University Campus, emerg. 31.vii.1985 and 31.x.1985 (H. I.), on *Russula* sp. (Russulaceae), coll. 19.vii.1985 and 19.x.1985; 5♂, 11♀, same data as in holotype except emerg. 9–13.vii.1993 (H. I.).

*Distribution*. Japan (Honshu).

*Remarks*. The abdominal coloration is variable: typical coloration as an intermediate form in the male described above is seen in gnats reared from fungi of the genera *Fistulina*, *Hygrophorus* and *Russula*. The dark coloration of the abdomen found in gnats reared from the *Tricholoma* fungus (probably caused by emergence in winter) is as follows: T4–6 in male almost entirely dark brown, with postero-lateral margins of T4 and T6, and antero-lateral margin of T4 or ventral margin of T4 sometimes testaceous indistinctly, and T4 and T5 (rarely T3 to T5) in female each with a pair of large brown spots laterad of broad median fascia; while in pale one from *Rhodophyllus* fungus T4–6 in both sexes without brown lateral spots.

*Etymology*. The specific name refers to the ‘quadrate’ dorsal stylomere of the gonostylus.

### *Allodia (Allodia) laccariae* Sasakawa sp. nov.

(Fig. 5)

*Diagnosis*. This new species differs distinctly from all the new species described above in its dark body and absence of distinct dc. The distinctive characteristics of this species are the presence of silvery-pruinose patches on the anterior part of the mesoscutum and macrotrichiae on cross vein r-m, which immediately distinguishes

it from the other dark European species of *Allodia* sensu stricto.

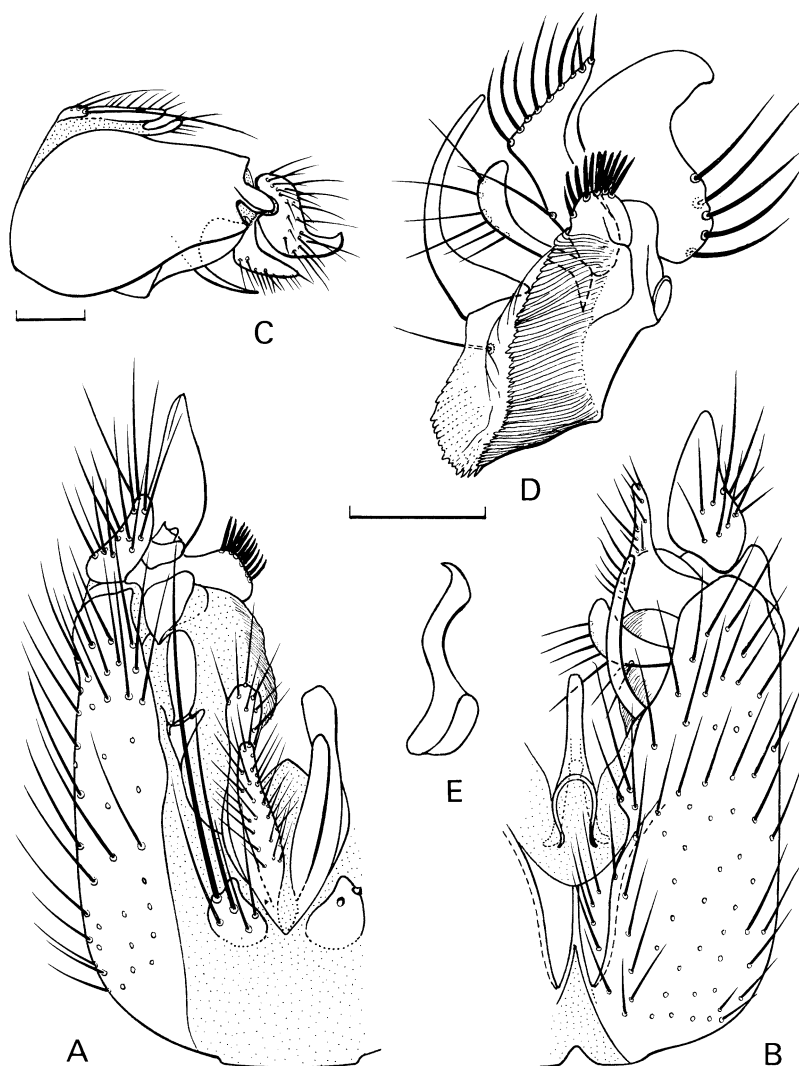
*Male*. Head black, but clypeus brown to black–brown; antenna with scape, pedicel and base of first flagellomere testaceous yellow, flagellomeres pale brown but first to third flagellomeres sometimes faintly tinged with yellow; palpus testaceous yellow. Thorax brown; mesoscutum blackish, with a pair of silvery-pruinose oval patches, which are extended almost on anterior lateral half of the scutum; pleura sparsely grayish pruinose; pronotum yellow dorsally; proepisternum, mesanepisternum and mesokatepisternum yellow–brown; scutellum sparsely silver-gray pruinose. Wing hyaline, tinged with brown–yellow; halter yellow. Legs yellow; tarsi and spurs brownish. Abdominal tergites brown–black, sparsely grayish pollinose; T3 and T4 each with a pair of yellowish triangular patches, which are broadened laterally (in broadest lateral margin approximately two-thirds to three-quarters length of the segment), on postero-lateral sides; T2 sometimes with lateral margin narrowly bordered with yellow; T5 sometimes with a small yellowish triangular patch at postero-lateral corner; sternites testaceous yellow, but fifth sternite (S5) and S6 infuscated except for posterior margins; gonocoxite testaceous, gonostylus brownish apically.

Head with fronto-orbital bristles usually five, long; eye hairy; antenna longer than thorax (50:35), scape and pedicel each with a dorsal seta longer than others, flagellomeres in relative length of 27–29 (first) : 16–17 (second to fourth) : 15–16 (fifth to eighth) : 14–15 (ninth to eleventh) : 13–15 (twelfth to thirteenth) : 21–23 (fourteenth); fourth flagellomere 1.2–1.4-fold as long as wide; palpus with distal three palpomeres in relative length 16–20 : 21–24 : 53–54, second palpomere broadest, setose and with approximately 47 sensillae in a group.

Mesoscutum without long dc, but supra-alar and post-alar bristles long; scutellum with two pairs of setulae before bases of long apical bristles; propleural bristles two (posterior one shorter than the anterior). Wing with Sc very short, R<sub>1</sub> almost equal to R (1 : 1.07–1.15), r-m equal to or a little longer than stem of M-fork (1–1.5 : 1), with two to four macrotrichiae on distal part, base of cubital fork usually before that of M-fork. Legs: fore tibia only a little shorter than basitarsus (1 : 1.14–1.15); hind tibia with eight to nine (rarely seven or ten) ad, four to five (rarely three or six) d, two (rarely one or three) apical pd, and with a row of 15–16 close-set bristles along inner apical margin.

Ninth tergite very small, with two long apical bristles; T10 long. Gonocoxites slightly united with each other





**Figure 5** Male genitalia of *Allodia* (*Allo-dia*) *laccariae* Sasakawa sp. nov. (paratype, on *Laccaria laccata*). Gonocoxite, gonostylus, stylomeres, ninth and tenth tergites, cercus and aedeagus from dorsal (A) and ventral (B) views. (C) Gonocoxite and gonostylus, lateral view. (D) Stylomeres, inner view. (E) Aedeagus, lateral view. Scale lines: 0.1 mm.

on ventral side (Fig. 5A,B); gonostylus with dorsal and ventral stylomeres somewhat L-shaped in lateral view, ventral one setose along ventral margin (Fig. 5C,D); mesal stylomere composed of three processes, of which distal one with approximately 11 spine-like setae, middle one clavate and setose apically, and basal one curved and bare; aedeagus simple, 125–140  $\mu\text{m}$  long (Fig. 5B,E).

Body length 3.0 (2.8–3.2; 3.1 in holotype) mm, wing length 2.4 (2.3–2.5; 2.5 in holotype) mm.

*Female*. Similar to male, but antenna slightly shorter than that of male (1.2 mm in female, 1.4 mm in male; wing length : antennal length is 1 : 0.47 in female, 1 : 0.54 in male); T2 and T5 each usually with a pair of

yellow, small triangular patches at postero-lateral corners, the latter rarely entirely yellow along posterior margin; T6 with posterior margin (approximately one-third length of the segment) and T7 entirely yellow; sternites and ovipositor entirely testaceous yellow; S5 and S6 sometimes faintly brown on basal third; body length 3.0 (2.7–3.2) mm, wing length 2.7 (2.4–2.9) mm. *Holotype*.  $\sigma^7$ , Nagoya University Campus, Nagoya, emerg. 22.iv.1990, H. Ishizaki (OMNH-TI no. 166), host fungus, *Laccaria laccata* (Scop. Fr.) Berk. et Br. (Tricholomataceae), coll. 10.iv.1990.

*Paratypes*. 20 $\sigma^7$ , 9 $\text{f}$ , same locality as the holotype, emerg. 19–24.iv.1990 (H. I.); 9 $\sigma^7$ , 7 $\text{f}$ , Mt Tanakamiyama, Shiga Pref., emerg. 4.xi.1999, K. Tsuda, host

fungus, *Laccaria amethystea* (Bull.) Marr., coll. 26.x.1999.

*Distribution.* Japan (Honshu).

*Remarks.* Male genitalia of this new species indicate a close relationship with European *Allodia ornatcollis* (Meigen, 1818) (host fungus: *Russula* sp.) and *Allodia lundstroemi* Edwards, 1921. They have the L-shaped dorsal and ventral stylomeres, but in *Allodia laccariae* sp. nov. the distal part of the dorsal stylomere is substantially longer, and the distal lobe of the mesal stylomere is distinctly setose.

The position of the cubital fork varies considerably across individuals; that is, its forking point is situated slightly before (52.4% of males and 63.6% of females examined), under (28.6% of males and 36.4% of females examined), and slightly beyond (19.0% of males examined) the base of the medial fork. This characteristic cannot therefore be used for reliable separation of the species.

### Genus *Cordyla* Meigen, 1803

The genus *Cordyla* is characterized by a short antenna with a reduced number of flagellomeres and greatly swollen second palpomere. Kurina (2001) attempted to classify the Palaearctic species into several groups by the color of the second palpomere and structures of male genitalia, in addition to the number of flagellomeres (Landrock 1926).

Three species, *Cordyla flaviceps* (Staeger, 1840), *Cordyla fusca* Meigen, 1803; and *Cordyla pusilla* Edwards, 1925, are recorded from Japan for the first time. A new species, *Cordyla bidenticulata*, is described below.

#### *Cordyla flaviceps* (Staeger)

*Mycetophila flaviceps* Staeger, 1840: 240.

*Cordyla flaviceps*: Landrock (1926): 130.

This species belongs to the same group as *C. fusca* Meigen and *C. bidenticulata* sp. nov. in having 12 flagellomeres in the male. Females of this species and *C. bidenticulata* have nine flagellomeres, while *C. fusca* has 10.

This species exhibits variations in coloration as follows: second palpomere usually yellow, but sometimes brown–yellow or more or less darker than the third and fourth in male and testaceous in female; mesoscutum usually testaceous, but sometimes darkened centrally in female; T1–3 testaceous and each with a small brown marking centrally and T4–6 entirely dark brown in male, while T1–6 in female testaceous and slightly brownish on central part.

Body length 2.3 (2.0–2.5) mm in male and 2.5 (2.3–2.6) mm in female; wing length 1.7 (1.4–1.7) mm in male and 1.8 (1.7–1.8) mm in female.

*Remarks.* Male genitalia are distinctive in the structure of the gonostylus: dorsal stylomere somewhat truncated on tip in lateral view and with dense rows of black spinulae as a brush along inner apical margin, ventral stylomere bifurcated shortly on tip and with a serration of minute teeth on ventral side, and mesal stylomere with a group of many black, needle-like spines in addition to setae on inner side. Some species of *Russula* are known as larval host fungi in Finland and Estonia (Hackman & Meinander 1979; Kurina 1991).

*Specimens examined.* 15♂, 4♀, Mt Sanage-yama, Aichi Pref., emerg. 13–19.vi.1985 (H. I.), on *Russula cyanoxantha* (Schaeff.) Fr. (Russulaceae), coll. 9.vi.1985.

*Distribution.* Europe, Japan. New to Japan.

#### *Cordyla fusca* Meigen

*Cordyla fusca* Meigen, 1803: 263.

This species differs from *C. flaviceps* in the following points: second palpomere yellow–brown to pale brown (rarely testaceous yellow); male T1–4 each mesally with a brown triangular marking (markings on T3 and T4 much larger than those on other tergites), and T5 and T6 entirely dark brown; hind femur distinctly brown on apex in male, but faintly brown-tinged in female; gonostylus with dorsal stylomere conical, ventral stylomere protruded shortly on dorso-apical end, and mesal stylomere with five short spine-like projections and several setae on inner side.

*Host.* *Russula* spp. (Hackman & Meinander 1979; Kurina 1991).

*Specimens examined.* 4♂, 6♀, Mt Sanage-yama, Aichi Pref., emerg. 15–24.x.1989 (H. I.), host fungus, *Armillariella mellea* (Vahl. Fr.) Karst. (Tricholomataceae), coll. 15.x.1989; 10♂, 10♀, Goshō, Kyoto, emerg. 8–10.i.1991 (H. I.), on *Flammulina velutipes* (Curt. Fr.) Sing. (Tricholomataceae), coll. 24.xii.1990; 4♂, 5♀, Nagoya University Campus, emerg. 6–7.vi.1985 (H. I.), on *Lyophyllum* sp. (Tricholomataceae), coll. 30.v.1985; 7♂, 9♀, Mt Sanage-yama, emerg. 22–23.v.1985 (H. I.), on *Amanita vaginata* (Bull. Fr.) Vitt. (Amanitaceae), coll. 16.v.1985; 4♂, 14♀, Nagoya University Campus, emerg. 5–7.vi.1985 (H. I.), on *Russula japonica* Hongo (Russulaceae), coll. 30.v.1985; 3♂, Mt Sanage-yama, emerg. 13.vi.1985 (H. I.), on *Russula cyanoxantha* (Schaeff.) Fr., coll. 9.vi.1985; 5♂, 5♀, Nagoya University Campus, emerg. 23.vi.1992 (H. I.), on *Russula alboareolata* Hongo, coll. 18.vi.1992; 1♀, Hiedaira,

Shiga Pref., emerg. 29.xi.1990 (H. I.), on *Hygrocybe flavescens* (Kauffm.) Sing. (Hygrophoraceae), coll. 11.xi.1990.

*Distribution.* Europe, Japan. New to Japan.

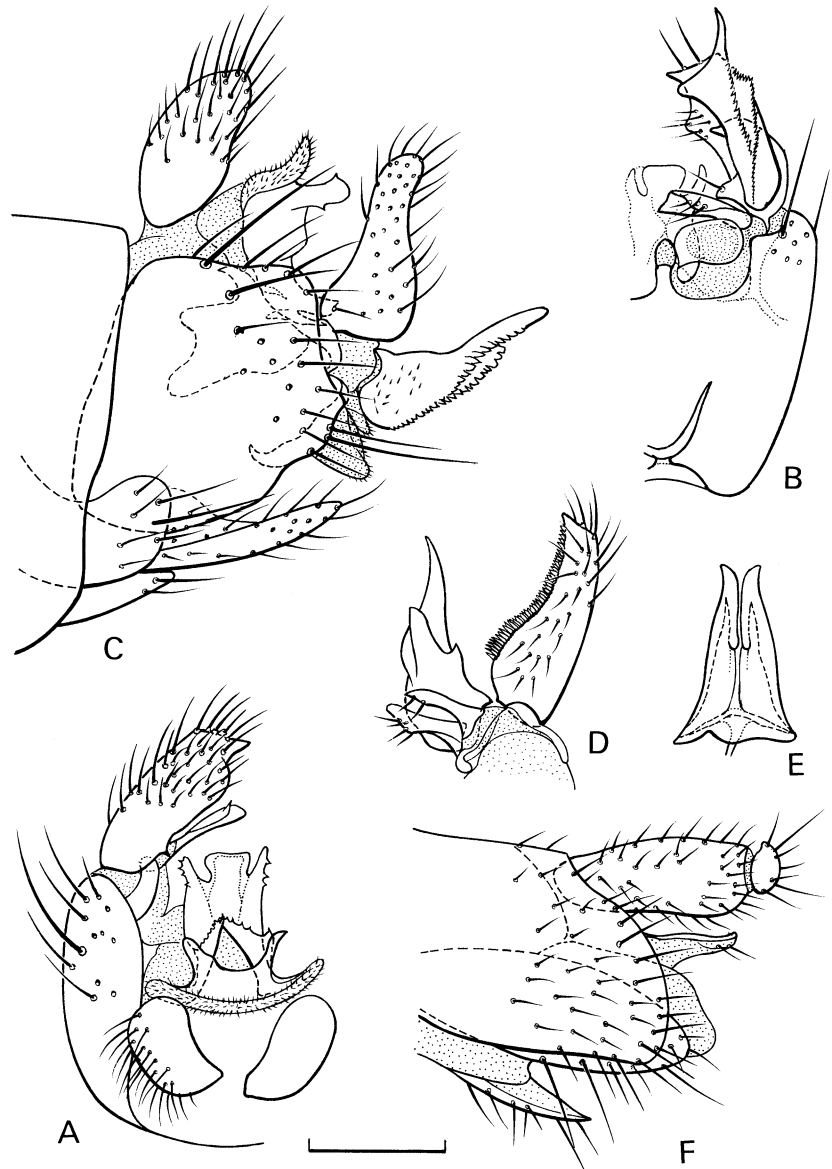
***Cordyla bidenticulata* Sasakawa sp. nov.** (Fig. 6)

*Diagnosis.* This new species is distinctive in having 12 flagellomeres in the male and nine in the female, gray-dusted head and thorax, and serrulations on ventral stylomere of male genitalia.

*Male.* Black; frons and vertex grayish pruinose; antenna with scape and pedicel testaceous, flagellomeres pale brown; palpus with first, third and fourth palpomeres

testaceous yellow but second black; thorax grayish-dusted; mesoscutum mat, brownish along lateral margin; pleura brown; T1–3 more or less brownish on lateral side, with pale posterior margins indistinctly; gonocoxite brown, gonostylus blackish; cercus yellow. Wing hyaline, faintly tinged with yellow–brown; halter yellow. Legs testaceous yellow; fore femur ventroproximally, and mid- and hind femora distally more or less brownish; all tibiae slightly brown-tinged distally; all tarsi and spurs pale brown.

Frons and vertex covered with minute setulae except for fronto-orbital setae; antenna 2 + 12-segmented, with relative length of scape and pedicel 2.5 : 1.1 (paratype),



**Figure 6** Male genitalia and ovipositor of *Cordyla bidenticulata* Sasakawa sp. nov. (paratype). Gonocoxite, gonostylus, stylomeres, cercus and aedeagus from dorsal (A), ventral (B) and lateral (C) views. (D) Stylomeres, inner view. (E) Aedeagus, ventral view. (F) Ovipositor, lateral view. Scale line: 0.1 mm.

flagellomeres 0.4 mm in length and with relative length of each basal flagellomere and terminal flagellomere 0.6–0.7 : 1.4, fourth flagellomere twice as wide as long; palpomeres in relative length 1 : 4.5 : 3.3 : 4.5, second palpomere fourfold as wide as third.

Mesoscutum without distinct dc except for one posterior-most pair; scutellum with two pairs of setae apically, of which subapical one half to three-fifths length of the apical; pleurotergite with an irregular row of four to six setae. Wing: Sc indistinct except for base; r-m approximately one-third length of M-petiole; M<sub>2</sub> ending before wing margin.

Gonocoxite only setose posteriorly, with an ill-sclerotized plate which is projected posteriorly on dorsal and ventral ends (Fig. 6A–C); gonostylus with dorsal stylomere subconical, more or less pointed mesally on tip and with a serration of minute teeth, ventral stylomere serrated ventrally in two rows before apex and more or less pointed apically, mesal stylomere composed of two short, apically setose clubs (Fig. 6D); aedeagus 130 µm in length (Fig. 6E).

Body length 2.6 (2.4–2.8; 2.7 in holotype) mm, wing length 2.2 (2.0–2.2; 2.2 in holotype) mm.

*Female.* Similar to male, but antenna 2 + 9-segmented, scape and pedicel in relative length 3.0 : 1.5, flagellomeres 0.3 mm in length and with relative length of each basal flagellomere and terminal flagellomere 0.4–0.5 : 1.3; first and second palpomeres in relative length 1 : 4; ovipositor dark testaceous, cercus two-segmented, second segment nearly one-sixth of the length of first (Fig. 6F); body length 2.5 (2.2–2.8) mm, wing length 2.4 (2.1–2.6) mm.

*Holotype.* ♂, Nagoya University Campus, Nagoya, emerg. 17.i.1990, H. Ishizaki (OMNH-TI no. 167), host fungus, *Suillus luteus* (L. Fr.) S. F. Gray (Boletaceae), coll. 9.xii.1989.

*Paratypes.* 10♂, 14♀, same data as in holotype except for emerg. 15–17.i.1990; 1♂, same locality as holotype, emerg. 12.i.1993 (H. I.), fungus coll. 7.i.1993.

*Distribution.* Japan (Honshu).

*Remarks.* This new species is similar to European *Cordyla murina* Winnertz, 1863, with 12 flagellomeres in the male, and blackish second palpomere and gray-dusted black mesoscutum, but can be distinguished from that species by the venation (forking point of Cu distinctly before M-forking point in *C. murina*), structures of male genitalia (both dorsal and ventral stylomeres not tapered in *C. murina*) and number of female flagellomeres (10 in *C. murina*).

The position of the forking point of Cu is variable among the specimens of both sexes; that is, it is situated

before, at, and beyond the level of the M-forking point in 33.3, 16.7 and 50.0% of the males examined, respectively, and in 43.8, 12.4 and 43.8% of the females examined, respectively.

*Etymology.* The specific name refers to ‘two rows of serration’ on ventral stylomere.

### *Cordyla pusilla* Edwards

*Cordyla pusilla* Edwards, 1925: 615.

The male of this blackish species is characterized by having 10 flagellomeres, a brown–black second palpomere, ventrally brownish T1–3, and a peculiar gonostylus: dorsal stylomere narrowed apically; ventral stylomere truncated irregularly on apex, protruded bluntly on dorso-apical end in lateral view and serrated ventrally; mesal stylomere with four conical projections apically and seven setae at middle.

*Host.* Unknown.

*Specimen examined.* 1♂, Mt Bukkyou, Hikawa, Shimane Pref., 25.iii.1998, N. Sugiura and K. Minagi, on flower of *Asarum asperum* F. Maek. (Aristolochiaceae) (Sugiura *et al.* 1999).

*Distribution.* Europe, Japan. New to Japan.

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