

## Two new species of the genus *Phronia* Winnertz (Diptera: Mycetophilidae) from Finland and Russian Karelia

Jevgeni Jakovlev & Alexei Polevoi

Jakovlev, J. & Polevoi, A. 2008: Two new species of the genus *Phronia* Winnertz (Diptera: Mycetophilidae) from Finland and Russian Karelia. — Entomol. Fennica 19: 199–206.

*Phronia avidoides* sp.n. and *Phronia fennica* sp.n. are described based on several adult males collected by Malaise trapping, sweep-netting and rearing from decaying wood in Finland and Russian Karelia in the period 1989–2005. Detailed illustrations of male terminalia are also presented for three further closely related but poorly known species, *Phronia avida* Gagne, 1975, *Phronia petulans* Dziedzicki, 1889 and *Phronia subsilvatica* Hackman, 1970.

J. Jakovlev, Finnish Forest Research Institute, Vantaa Research Centre. P.O. Box 18, FI-01301, Vantaa, Finland; E-mail: jevgeni.jakovlev@metla.fi

A. Polevoi, Forest Research Institute, RU-185910, Pushkinskaya 11, Petrozavodsk, Russia; E-mail: alexei.polevoi@krc.karelia.ru

Received 10 July 2007, accepted 1 November 2007

### 1. Introduction

The genus *Phronia* Winnertz, 1863 is one of the largest genera of Mycetophilidae. It is best known in the Holarctic region, including nearly 85 Palearctic and 50 Nearctic species, while rather few species are known from the other biogeographic regions (Bechev 2000). The recognition of the first species of the genus dates back to the middle of the 1800s. H. Dziedzicki (1889) published the first comprehensive monograph on *Phronia*. This excellently illustrated work included 51 European species (some of them are now transferred to the genus *Trichonta* Winnertz, 1863), of which 33 were described as new. Gagné (1975) presented a revision of the Nearctic species of *Phronia*, and Plassmann (1977) revised the European fauna. After these comprehensive studies only a few species have been described from Europe (Chandler 1992, Chandler & Ribeiro 1995, Zaitzev & Polevoi 1995, Plassmann

1999), increasing the number of recognized species known from Europe to 65 (Chandler 2005). Altogether 60 species are recorded from the Nordic region where the fauna of *Phronia* is fairly well known. The level of faunal knowledge of *Phronia* is particularly good in Finland owing to the contribution made by Lundström (1906, 1909, 1911, 1914) and especially Hackman (1970), who recognized 54 species of *Phronia*, including eleven newly described species. Two further species, *P. gagnei* Chandler, 1992 and *P. coritanica* Chandler, 1992 were added to the Finnish fauna by Polevoi (1995) and Kurina (2003), respectively. Including the two new species presented here, 58 species are currently recorded from Finland, 49 from Sweden (Kjærandsen *et al.* 2007), 39 from Russian Karelia (Polevoi 2000) and 39 from Norway (Gammelmo & Søli 2006).

Larval biology of *Phronia* is poorly known. Generally, the larvae are saproxylic, associated

with dead wood and wood-growing fungi. Since *Phronia* larvae are not common inhabitants of fungal fruiting bodies, fungal hosts have been recorded for few species only (Chandler 1978, Jakovlev 1994). Unlike most other Mycetophilinae that usually develop inside fungal fruiting bodies or under bark, *Phronia* species have case-bearing larvae which are protected by slime and able to live on the surface of encrusting fungi growing on decaying wood, or on moulds growing on fallen, wet and barkless branches.

## 2. Material and methods

During the treatment of a large material of ca. 100,000 specimens of fungus gnats collected in Finland and Russian Karelia in the years 1989–2005 (for details see Polevoi *et al.* 2006, Jakovlev *et al.* 2006) we have found two new species of *Phronia*. Additional records of species new to Finland were obtained by reviewing selected parts of the collections of the Zoological Museum of Helsinki University (*Museum Zoologicum Helsingiensis*, MZH) and Forest Research Institute of Karelian Scientific Centre, Petrozavodsk, Russia (FRIP).

The holotypes and paratypes of the new species are dry-pinned. Terminalia were treated in a standard way (heating in a solution of KOH, neutralization in acetic acid, washing in distilled water) and preserved as glycerine preparations in small vials on the same pin as the rest of the body. Other specimens studied are kept pinned or in ethanol. Material is stored in MZH, in FRIP, in Finnish Forest Research Institute, Vantaa, Finland (METLA), in Natural History Museum of Central Finland (NHMCF) and in personal collection of Jouni Penttinen (JP).

The structure of the records presented below is: number of males studied, code for biogeographical province (Heikinheimo & Raatikainen 1971), municipality, location, date and collector. For new records from Finland we present coordinates according to the Finnish national grid coordinate system. Collecting method (if not specified elsewhere) is Malaise trapping. Detailed information on the collecting localities for each species is given separately. The morphological terminology follows Söli (1997).

## 3. Description of species

### 3.1. *Phronia avidoides* sp. n. (Fig. 1)

*Type material.* Holotype ♂, Finland, *Ta*: Lammi, Kotinen strict nature reserve, 6794400: 3396400, 28.VIII.–4.X.2004, Jakovlev leg. (MZH). Paratypes: Finland: ♂, *Ta*: Padasjoki, Vesijako strict nature reserve, 6806100: 3398800, 28.VIII.–4.X.2004, Jakovlev leg. (MZH); ♂, *Ta*: Lammi, Sudenpesänkangas, 6790212: 3403382, 28.IV.–27.V.2004, Jakovlev leg. (METLA); ♂, *Kb*: Ilomantsi, Kotavaara, 6998000: 3721000, 25.VIII.–2.IX.1998, Tietäväinen leg. (FRIP); ♂, *Kb*: Ilomantsi, Pirhu, 6993000: 3723000, 31.V.–3.VI.1994, Polevoi leg. (FRIP).

*Additional material examined.* Finland: ♂, *Kb*: Ilomantsi, Tapionaho, 6982000: 3729300, 19.–20.VIII.1993, Polevoi leg. (FRIP); 2 ♂♂, same place, 19.–25.VIII.1994, Polevoi leg. (FRIP); ♂, *Kb*: Ilomantsi, Pirhu, 6993000: 3723000, 31.V.–3.VI.1994, Polevoi leg. (FRIP); 2 ♂♂, *Kb*: Ilomantsi, Kotavaara, 6998000: 3721000, 25.VIII.–8.IX.1998, Tietäväinen leg. (FRIP); ♂, *Tb*: Keuruu, Kummunmäki, 6908519: 3390002, 15.–29.V.2005, Penttinen leg. (JP); ♂, *Tb*: Petäjavesi, Liisalanperä, 6911430: 3418872, 15.–29.V.2005, Penttinen leg. (JP); 10 ♂♂, *Tb*: Laukaa, Punavuori, 6928425: 3432699, 14.–28.V.2005, Penttinen leg. (JP); ♂, *Tb*: Laukaa, Pöykynmäki, 6929388: 3434446, 14.–28.V.2005, Penttinen leg. (JP); 4 ♂♂, *Tb*: Toivakka, Mansikkamäki, 6883081: 3450755, 14.–28.V.2005, Penttinen leg. (JP); ♂, *Tb*: Toivakka, Rantomäki, 6898755: 3455372, 14.–28.V.2005, Penttinen leg. (JP); 2 ♂♂, *Tb*: Toivakka, Vuorilampi, 6885707:3455772, 14.–28.V.2005, Penttinen leg. (JP); ♂, *Tb*: Toivakka, Huhtalampi, 6883884: 3461804, 14.–28.V.2005, Penttinen leg. (NHMCF). Russian Karelia: ♂, *Kb*: Tolvajärvi, 29.VIII.–11.IX.1998, Tietäväinen leg. (FRIP); 6 ♂♂, same place, 2.VI.–13.IX.1999, Tietäväinen leg. (FRIP); ♂, *Kpoc*: Kostomuksa strict nature reserve, Kamennoe lake, 8.–12.VII.1996, Polevoi leg. (FRIP); ♂, *Kon*: Kivach strict nature reserve, 8.VIII.–6.IX.1990, Polevoi leg. (FRIP); 2 ♂♂, same place, 5.VII.2001, Polevoi leg. (FRIP). Collecting sites are coniferous, *Myrtillus*-type, old-growth and managed forests, usually with a plenty of coarse and

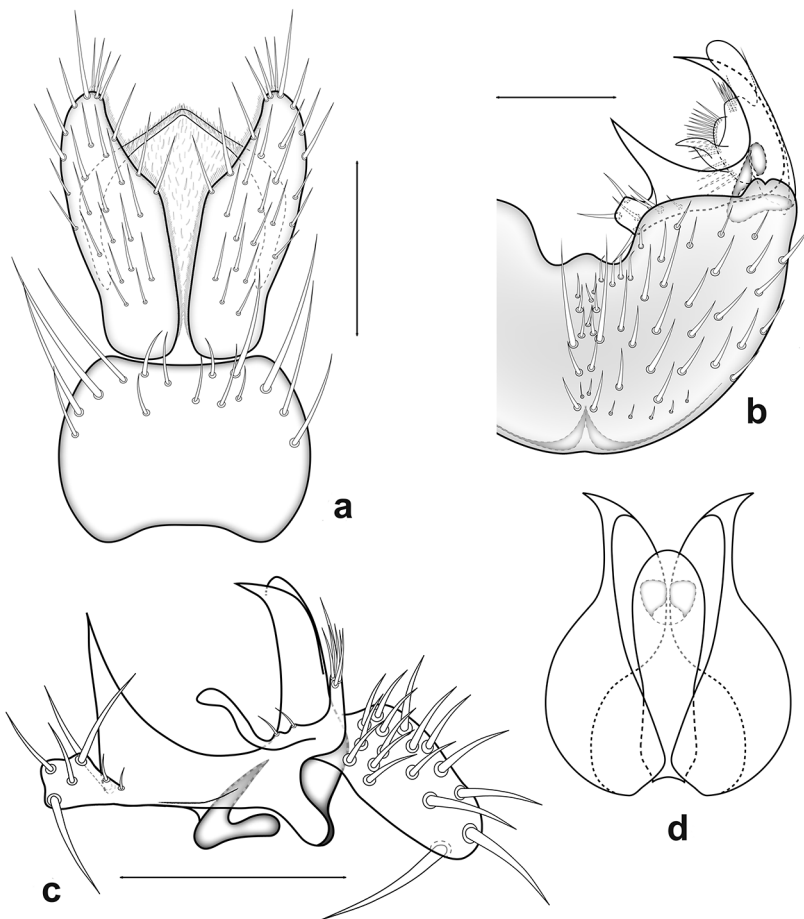


Fig. 1. *Phronia avidoides* sp. n., male terminalia. – a. Tergite IX and cerci. – b. Gonocoxite and gonostylus, ventral view. – c. Gonostylus, internal view. – d. Aedeagal complex, ventral view. Scale bar 0.1 mm.

fine woody debris. In Pirhu (*Kb*: Ilomantsi) specimens were collected in young forest on the abandoned agriculture lands.

**Description.** Male ( $n=5$ ). Head dark brown. Mouthparts light brown, palp yellow, the third palpal segment slightly darkened at the apical half. Antenna uniformly dark brown, but in some specimens pedicel and the basal half of the first flagellomere lighter. Sixth flagellomere 1.5 times as long as wide.

**Thorax.** Mesonotum brown covered with dense yellowish hairs and scattered yellowish bristles. Pleuron brown. Pale specimens have more or less developed yellow humeral spots and yellowish propleuron. Propleuron with two strong pale bristles. Scutellum with four bristles, two strong ones medially and two smaller ones along the edges.

**Wings.** Wing length 2.3–2.7 mm. Hyaline,

veins yellow. Sc short, ending free. C very slightly extending beyond the tip of  $R_5$ . Stem of M-fork 1.3 times as long as *ta*. The vein *ta* with 3–5 macrotrichia. Haltere pale yellow.

**Legs.** Yellow, hind femur darkened apically and mid femur slightly infuscated on the very tip. Mid tibia with 4–5 *a*, 3–4 *d*, 4–6 *p* and 5–7 *v*. Hind tibia with 7–8 *a*, 7–10 *d* and 2–4 *p*. Ratio of tibia to first tarsomere for front, mid and hind legs: 1.10–1.12 [mean value 1,11]; 1.19–1.26 [1,23]; 1.52–1.56 [1,53].

**Abdomen.** Brown, darkened caudally, tergites 2–3 with small to large yellowish lateral spots (obscure in darker specimens). Terminalia (Fig. 1) brown. The apicoventral margin of the gonocoxite have distinct, stepped emargination (occupying about 1/4 of its total width) with almost abrupt lateral margins and small elevation in the bottom. Ventral lobe of gonostylus with elon-

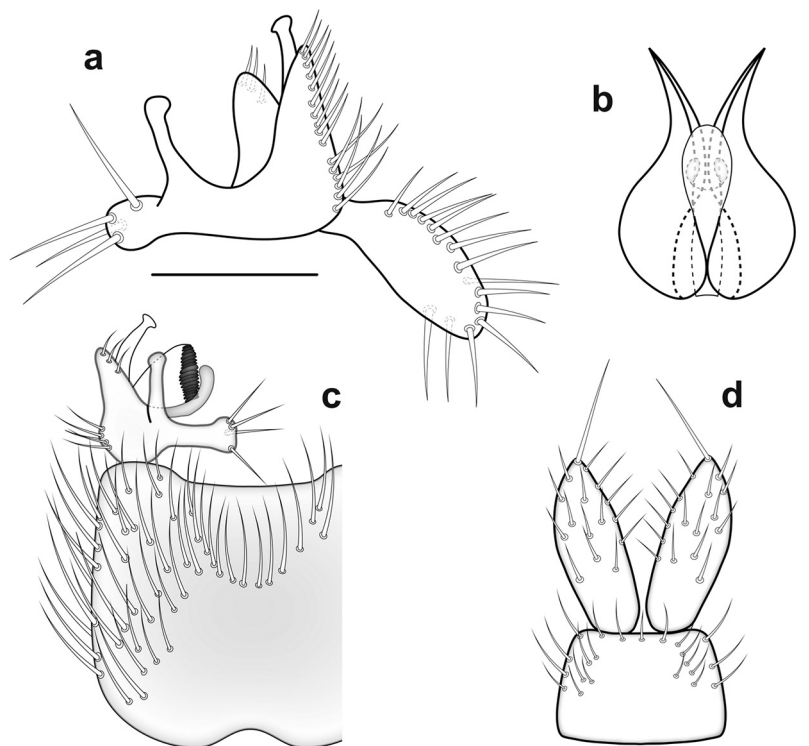


Fig. 2. *Phronia avida* Gagné, 1975, male terminalia. – a. Gonostylus, external view. – b. Aedeagal complex, ventral view. – c. Gonocoxite and gonostylus, ventral view. – d. Tergite IX and cerci. Scale bar 0.1 mm.

gated basoventral projection bearing strong bristles and with two bare elongated processes. One of these processes, near the middle of the ventral lobe is apically pointed. The other one, near the caudal edge of the ventral lobe has an apex forked into two branches of which one is apically pointed and the other rounded.

*Female.* Unknown.

*Larval biology.* Unknown.

*Etymology:* The species' name indicates its resemblance to *P. avida* Gagné, 1975.

*Diagnostic characters.* The new species, *P. avidoides*, resembles *P. avida*, but differs clearly by the following characters of the male terminalia. The apicoventral margin of the gonocoxite is narrowly and deeply excised in *P. avidoides*, while it is wide and shallowly concave in *P. avida* (Fig. 1b, 2c). The two elongated, bare processes on the ventral lobe of the gonostylus have pointed apices in *P. avidoides* (Fig. 1c), while they are rounded and apically spatulated in *P. avida* (Fig. 2a). In *P. avidoides* the apex of the paramere is wide, abruptly pointed (Fig. 1d), while it is more elongated and stretched in *P. avida* (Fig. 2b). The inner edge of the cercus is slightly excised along

the apical third in *P. avidoides* (Fig. 1a), while it is almost straight, smoothly pointed apically in *P. avida* (Fig. 2d). Another related species is *P. strenua* Winnertz, 1863, which clearly differs in having a weakly developed basoventral process of the ventral lobe of gonostylus (see Gagné 1975, p. 313, fig. 78; Zaitzev 2003, p. 324, fig. 97, 4).

### 3.2. *Phronia fennica* sp. n. (Fig. 3)

*Type material.* Holotype ♂: Finland, *Ta*: Padasjoki, Vesijako strict nature reserve, 6806100: 3398800, 27.VII.–27.VIII.2004, Jakovlev leg. (MZH). Collecting locality is a Norway spruce dominated *Myrtillus*-type old-growth forest. Paratypes: Finland: ♂, *Ta*: Lammi, Lapinjärvi, 6793704: 3397492, 28.VIII.–4.X.2004, Jakovlev leg. (MZH); ♂, *Ta*: Lammi, Leipäsuonaho 6789920: 3395865, 28.VIII.–4.X.2004, Jakovlev leg. (METLA). Collecting areas are clear-cuts with retention trees treated with prescribed burning.

*Additional material examined.* Finland: ♂ *Ta*: Lammi, Kotinen, 6794400: 3396400, reared from

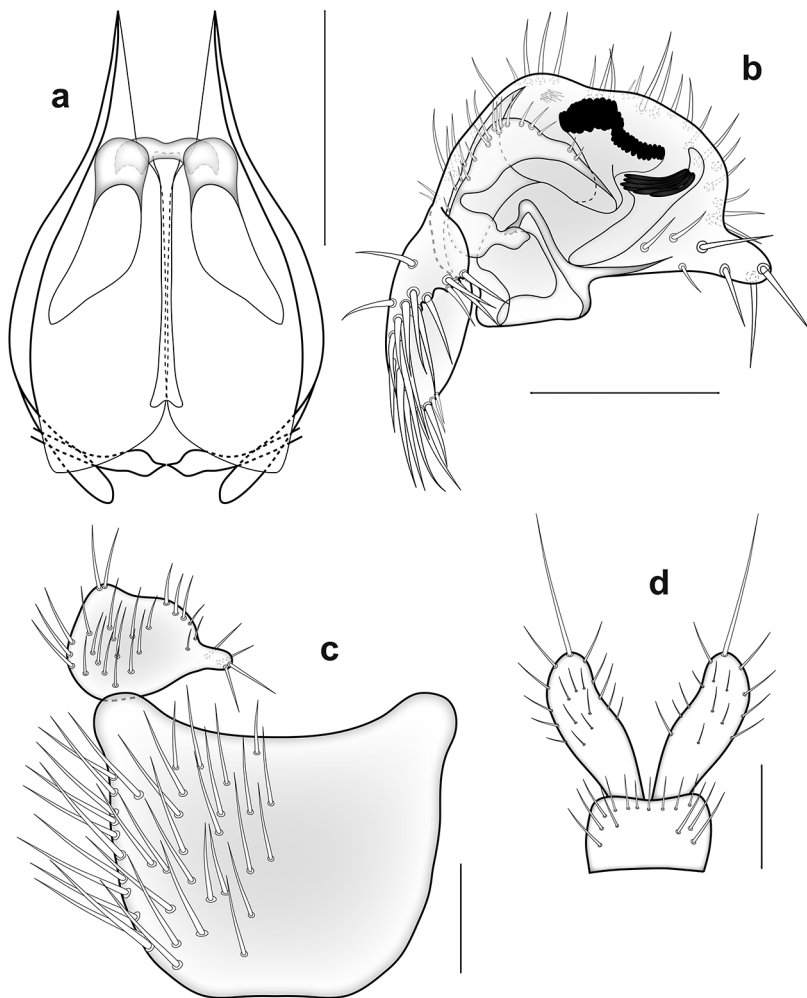


Fig. 3. *Phronia fennica* sp. n., male terminalia. – a. Aedeagal complex, ventral view. – b. Gonostylus, internal view. – c. Gonocoxite and gonostylus, ventral view. – d. Tergite IX and cerci. Scale bar 0.1 mm.

decaying spruce log, 27.VII.2005, emergence 27.IX.2005, Jakovlev leg. (METLA); ♂ *Ta*: Lammi, Niemisjärvi, 6791324: 3394263, 27.IV.–27.V.2004, Jakovlev leg. (METLA). Russian Karelia: ♂, *Kroc*: Kostomuksha strict nature reserve, 10 km SSW of Kostomuksha, 23.–26.VIII.1995, Polevoi leg. (FRIP). Collecting localities are old-growth *Myrtillus* and *Vaccinium*-type coniferous forests.

*Description.* Male (n=5). Head brown, Mouthparts and palp light brown. Antenna brown, scape, pedicel and the basal half of the first flagellomere light brown to pale. Sixth flagellomere twice as long as wide.

Thorax. Mesonotum brown, covered with fine dense yellowish hairs and strong scattered yellowish bristles. Pale specimens with yellow

lateral spots and propleuron. Pleuron brown. Scutellum with four bristles, two strong ones medially and two smaller ones along the edges. Propleuron with two strong, pale bristles.

Legs. Pale yellow to dark brown, hind femur and tibia sometimes slightly darkened apically. Mid tibia with 3–5 *a*, 2–3 *d*, 3 *p* and 7 *v*. Hind tibia with 6 *a*, 7–8 *d* and 3 *p*. Ratio of tibia to first tarsomere of front, mid and hind legs: 1.03–1.09 [mean value 1,06]; 1.23–1.32 [1,27]; 1.47–1.53 [1,51].

Wings. Wing length 2.5–3 mm. Wings hyaline, yellowish, veins yellow. Sc short, ending free. C very slightly extending beyond the tip  $R_5$ . Stem of M-fork 1.2 times as long as *ta*. The vein *ta* with 3–5 macrotrichia. Haltere pale yellow.

Abdomen. Brown, darkened caudally. Ter-



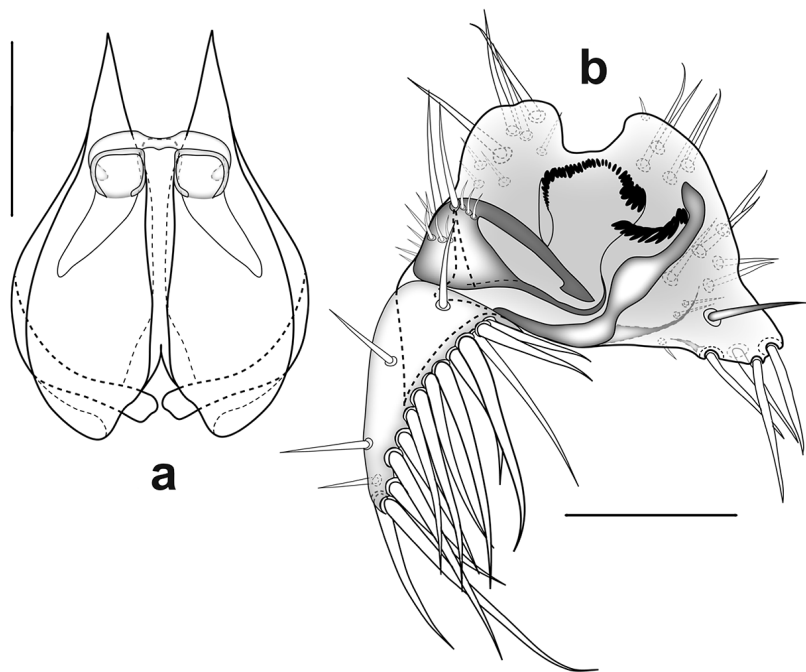


Fig. 4. *Phronia subsilvatica* Hackman, 1970, male terminalia. – a. Aedeagal complex, ventral view. – b. Gonostylus, internal view. Scale bar 0.1 mm.

gites 1–3 with big, yellowish lateral spots. Terminalia (Fig. 3) brown. Apicoventral margin of gonocoxite almost straight. Ventral lobe of gonostylus humpbacked with short basoventral projection bearing 2 apical bristles and several smaller bristles near the apex.

*Female.* Unknown.

*Larval biology.* One male has been reared from decaying spruce log bearing fruiting bodies of *Antrodia serialis*.

*Etymology.* The species' name indicates the first records being from Finland.

*Diagnostic characters.* The new species most closely resembles *P. subsilvatica* Hackman, but differs by the almost straight apical edge of the ventral lobe of gonostylus (Fig. 3b), which has a distinct rectangular excavation in *P. subsilvatica* (Fig. 4b). Other related species are *P. petulans* Dziedzicki, 1889 and *P. cupida* Gagné, 1975. *P. petulans* differs by more rounded ventral lobe of the gonostylus, presence of small curved spines near the apical edge on inner surface of the gonostylus, and different structure of basal parts of the aedeagal complex (Fig. 5). *P. cupida* has the same type of aedeagal complex, but the ventral lobe of gonostylus has a distinct apical depression (though not so distinctly excavated as *P.*

*subsilvatica*) and some strong elongated setae along the apical edge (see Gagné 1975, p. 313, figs 74–77).

#### 4. Other related species of *Phronia* studied

##### 4.1. *Phronia avida* Gagné, 1975 (Fig. 2)

*Material examined.* ♂, (Paratype, Smithsonian Institution, National Museum of Natural History, Washington, USA, dry-pinned, terminalia preserved as glycerine preparation in small vial on the same pin as the rest of the body), USA, Alaska, Matanuska, rotary trap, 5.–16.VI.1944, J.C. Chamberlin leg.

##### 4.2. *Phronia subsilvatica* Hackman, 1970 (Fig. 4)

*Material examined.* Holotype ♂ (No. 14254, pinned with terminalia in balsam preparation on slide) Finland, Ks: Kuusamo, Kiutaköngäs 21.VIII.1964, Tuomikoski & Mikkola leg. (MZH). Paratype ♂ (N<sup>o</sup> 14248, pinned with ter-

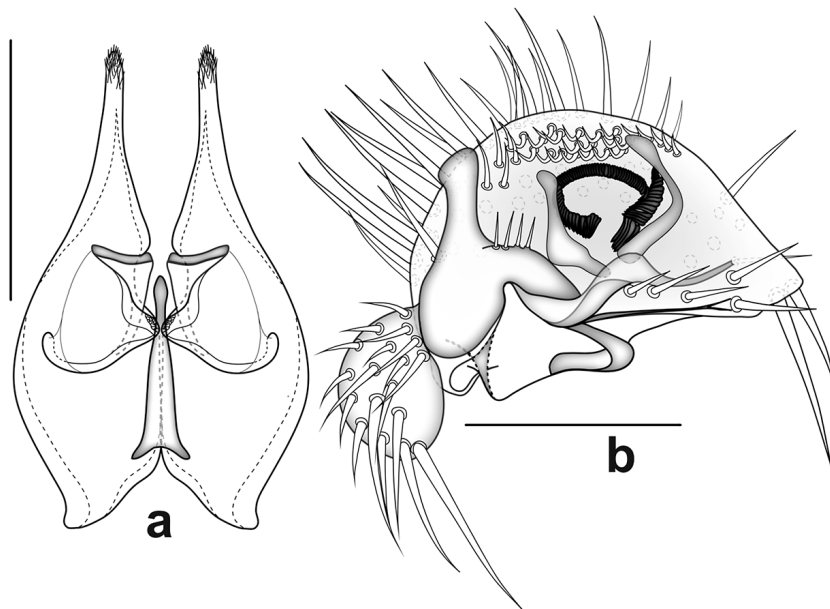


Fig. 5. *Phronia petulans* Dziedzicki, 1889, male terminalia. – a. Aedeagal complex, ventral view. – b. Gonostylus, internal view. Scale bar 0.1 mm.

minalia in balsam preparation on slide), *Ks*: Kuusamo, Juuma 21.VIII.1964, Tuomikoski & Mikkola leg. (MZH): ♂ (dry-pinned, terminalia preserved as glycerine preparation in small vial on the same pin as the rest of the body). Russian Karelia: Kon: Kivach strict nature reserve, a herb-rich spruce dominated forest with aspen, 27.V.2003, Polevoi leg. (FRIP).

#### 4.3. *Phronia petulans* Dziedzicki, 1889 (Fig. 5)

Since Hackman (1970) has provided the most detailed figures of the male terminalia of *P. petulans*, we follow his interpretation of this species. However, Hackman (1980) marked *P. petulans* with a question mark in the checklist of the Finnish Diptera.

*Material examined.* Finland: ♂, *N*: Nordsjö, 10.V.1963, Tuomikoski leg. (MZH, pinned with terminalia in balsam preparation on slide); ♂ *Kb*: Koli, 18.V.1964, Tuomikoski leg. (MZH, marked with ?), pinned with terminalia in balsam preparation on slide, hardly visible); Russian Karelia: ♂, *Kon*, Kivach strict nature reserve, a herb-rich spruce dominated forest with aspen, 31.V.–4.VI.1989, Jakovlev leg. (FRIP); ♂, same place, sweep netting 5.VII.2001, Polevoi leg. (FRIP).

*Acknowledgements.* Authors are grateful to Dr. F. Christian Thompson and Dr. David G. Furth, Smithsonian Institution, National Museum of Natural History, Department of Entomology, Washington, USA for the loan of type material on *Phronia avida* Gagné. We are indebted to Dr. Jostein Kjärandsen (Zoological Museum of Lund University, Sweden), Jouni Penttinen (University of Jyväskylä, Finland) for the help during preparation of the manuscript and to the referees for the valuable comments on the manuscript. This paper is a part of the project “Finnish fungus gnats (Diptera, Mycetophilidae, etc.) and log midges (Diptera, Porricondylinae): faunistics, habitat requirements and threat status”. The financial support from the Finnish Ministry of Environment is hereby acknowledged.

#### References

- Bechev, D. 2000: World distribution of the genera of fungus gnats (Diptera: Sciaroidea, excluding Sciaridae). — *Studia Dipterol.* 7 (2): 543–552.
- Chandler, P.J. 1978: Associations with plants. Fungi. — In: Stubbs, A & Chandler, P.I. (eds), *A Dipterist's Handbook*. Amateur Entomologist 15:199–211. The Amateur Entomologist's Society, Middlesex. 255 pp.
- Chandler, P.J. 1992: A review of the British *Phronia* Winnertz and *Trichonta* Winnertz (Dipt., Mycetophilidae). — *Entomologist's Monthly Magazine*, 128: 237–254.
- Chandler, P. J. 2005: Fauna Europaea: Mycetophilidae. — In: de Jong, H. (ed.), *Fauna Europaea: Diptera, Nematocera*. Fauna Europaea, version 1.2. [www document] URL <http://www.faunaeur.org> (accessed 7 March 2005).

- Chandler, P. & Ribeiro, E. 1995: The Sciaroidea (Diptera) (excluding Sciaridae) of the Atlantic Islands (Canary Islands, Madeira and the Azores). — *Boletim Mus. Municip. Funchal (Hist.Nat)*. Suppl. 3: 1–110.
- Dziedzicki, H. 1889: Revue des espèces européennes du genre *Phronia* Winnertz avec la description des deux genres nouveaux: *Macrobrachius* et *Megophthalmidia*. — *Horae Soc. Ent. Ross.* 23: 404–532.
- Gagné, R. J. 1975: A revision of the Nearctic species of the genus *Phronia* (Diptera, Mycetophilidae). — *Trans. Amer. Entomol. Soc.* 101: 227–318.
- Gammelmo, Ø. & Søli, G. E. E. 2006: Norwegian fungus gnats of the family Mycetophilidae (Diptera, Nematocera). — *Norw. J. Entomol.* 53: 57–69.
- Hackman, W. 1970: New species of the genus *Phronia* Winnertz (Diptera, Mycetophilidae) from Eastern Fennoscandia and notes on the synonymies in this genus. — *Notul. Entomol.* 50: 41–60.
- Hackman, W. 1980: A check list of the Finnish Diptera I. Nematocera and Brachycera (s.str.). — *Notul. Entomol.* 60: 17–48.
- Heikinheimo, O. & Raatikainen, M. 1971: The recording of locations of biological finds in Finland. — *Ann. Entomol. Fennici* 37 (1a): 1–27.
- Jakovlev J. 1994: Palaearctic Diptera associated with fungi and myxomycetes. — Karel'ian Research Centre, Russian Academy of Sciences, Petrozavodsk. 127p. [In Russian with English abstract].
- Jakovlev, J., Kjærandsen, J. & Polevoi, A. 2006: Seventy species of fungus gnats new to Finland (Diptera: Mycetophilidae). — *Sahlbergia* 11: 22–39
- Kjærandsen, J., Hedmark, K., Kurina, O., Polevoi, A., Økland, B. & Götmark, F. 2007: Annotated checklist of fungus gnats from Sweden (Diptera: Bolitophilidae, Diadocidiidae, Ditomyiidae, Keroplatidae and Mycetophilidae). — *Insect Syst. Evol. Suppl.* 65: 1–128.
- Kurina, O. 2003: Notes on fungus gnats from the Lemmenlaakso area in southern Finland, including six species new to the Finnish list (Diptera: Sciaroidea excl. Sciaridae). — *Sahlbergia* 8: 84–88.
- Lundström, C. 1906: Beiträge zur Kenntnis der Dipteren Finlands. I. Mycetophilidae. — *Acta Soc. Fauna Flora Fenn.* 29: 1–50.
- Lundström, C. 1909: Beiträge zur Kenntnis der Dipteren Finnland. 4 Supplement: Mycetophilidae. — *Acta Soc. Fauna Flora Fenn.* 32: 1–63.
- Lundström, C. 1911: Neue oder wenig bekannte Europäische Mycetophiliden. — *Ann. Mus. Natio. Hung.* 9: 390–419.
- Lundström, C. 1914: Beiträge zur Kenntnis der Dipteren Finlands. IX. Supplement 3. Mycetophilidae. — *Acta Soc. Fauna Flora Fenn.* 39: 1–26.
- Plassmann, E. 1977: Revision der europäischen Arten der Pilzmückengattung *Phronia* (Diptera: Mycetophilidae). — *Deutsch. Entomol. Zeitschr. N.F.* 24: 305–344.
- Plassmann, E. 1999: Neue bayerische und schwedische Pilzmücken (Diptera, Nematocera, Sciaroidea, Mycetophilidae). — *Mitt. Münch. Entomol. Ges.* 89: 5–9.
- Polevoi, A. V. 1995: Fungus gnats (Diptera, Mycetophilidae) in Pirhu and Tapionaho (Ilomantsi, Finland). — In: Hokkanen, T. J. & Ieshko, E. (eds), Karel'ian biosphere reserve studies: 159–166. North Karel'ian Biosphere Reserve, Joensuu.
- Polevoi, A. V. 2000: Fungus gnats (Diptera: Bolitophilidae, Ditomyiidae, Keroplatidae, Diadocidiidae, Mycetophilidae) in Karelia. — Karel'ian Research Centre, Russian Academy of Sciences, Petrozavodsk. 84 pp. [In Russian with English abstract].
- Polevoi, A. V., Jakovlev, J. & Zaitzev, A. I. 2006: Fungus gnats (Bolitophilidae, Keroplatidae and Mycetophilidae) new to Finland. — *Entomol. Fennica* 17: 161–169.
- Søli, G. E. E. 1997: The adult morphology of Mycetophilidae (s.str.), with a tentative phylogeny of the family (Diptera, Sciaroidea). — *Entomol. Scand. Suppl.* 50: 5–55.
- Zaitzev, A. I. 2003: Fungus gnats (Diptera, Sciaroidea) of the fauna of Russia and adjacent regions. Part 2. — *Int. J. Dipterol. Res.* 14: 77–386.
- Zaitzev, A. & Polevoi, A. 1995: New species of fungus gnats (Diptera, Mycetophilidae) from the Kivach Nature Reserve, Russian Karelia. — *Entomol. Fennica* 6: 185–195.