

## On the systematics and distribution of some poorly known species of *Boletina* (Diptera: Mycetophilidae) in northern Europe, with the description of a new species

### К систематике и распространению некоторых малоизвестных видов рода *Boletina* (Diptera: Mycetophilidae) в северной Европе, с описанием нового вида

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A new Palaearctic species, *Boletina palmata* sp. nov., is described, and three other species, *B. kurilensis* Zaitzev, *B. jamalensis* Zaitzev and *B. pinusia* Maximova, are redescribed. It is demonstrated that many specimens from Fennoscandia formerly identified as *B. kurilensis* belong to *B. palmata*, while true *B. kurilensis* occurs only in northern parts of Murmansk Province in Russia, northern Norway and northern Finland. European specimens previously identified as *B. jamalensis* are proved to belong to *B. pinusia*, while another closely-related species, *B. struthioides* Polevoi et Hedmark, is found to be a junior synonym of *B. jamalensis*.

Описан новый для науки вид – *Boletina palmata* sp. nov., и переописаны три других палеарктических вида: *B. kurilensis* Zaitzev, *B. jamalensis* Zaitzev и *B. pinusia* Максимова. Установлено, что вид *B. kurilensis* достоверно зарегистрирован только в северных частях Мурманской области, северной Норвегии и северной Финляндии, в то время как многие экземпляры, ранее отнесенные к этому виду, на самом деле принадлежат к описанному здесь виду *B. palmata*. Европейские экземпляры, ранее отнесенные к виду *B. jamalensis*, на самом деле идентичны *B. pinusia*, а еще один близкий вид – *B. struthioides* Polevoi et Hedmark – является новым младшим синонимом *B. jamalensis*.

**Key words:** fungus gnats, distribution, the Palaearctic, Diptera, Mycetophilidae, *Boletina*, new species, new synonymy

**Ключевые слова:** грибные комары, распространение, Палеарктика, Diptera, Mycetophilidae, *Boletina*, новый вид, новый синоним

## INTRODUCTION

*Boletina* Staeger, 1840 is a highly diverse genus with 143 species described worldwide (Pape & Thompson, 2011) and 69 species known from Europe (Chandler, 2004). Though the reviews of some species groups as well as phylogenetic works were recently published (Zaitzev & Polevoi, 2001; Zaitzev et al., 2005; Martinsson et al., 2011; Martinsson & Kjærandsen, 2013), a full revision of the genus is much needed.

*Boletina kurilensis* Zaitzev, 1994 and *B. jamalensis* Zaitzev, 1994 were described in the first part of the monograph on Mycetophilidae of Russia (Zaitzev, 1994). Approximately at the same time, closely-related species were found in the Republic of Karelia (Jakovlev & Polevoi, 1991, 1997; Polevoi, 2000), which were associated with eastern species newly described by A. Zaitzev. With more materials becoming available, it was noted that the former identification might be incorrect (Polevoi, 2010),

that was confirmed after re-examination of the type materials. It was revealed that some specimens from Fennoscandia formerly identified as *B. kurilensis* belong to a different undescribed species, while true *B. kurilensis* was discovered only in northern parts of Murmansk Province in Russia, northern Finland and northern Norway. The second species previously associated with *B. jamalensis* is proved to be identical to *B. pinusia* Maximova, 2001 described from West Siberia, while true *B. jamalensis* is indistinguishable from *B. struthioides* Polevoi et Hedmark, 2004. This paper is aimed to revise the available materials and published records of these species and to provide the redescriptions with detailed illustrations of the male terminalia.

## MATERIAL AND METHODS

The material was obtained from the museum collections and field projects carried out in Finland, Murmansk Province and the Republic of Karelia, Russia. It is deposited in the following collections: Forest Research Institute, Petrozavodsk, Russia (FRIP); Pasvik Nature Reserve, Rajakoski, Russia (PNR); A.N. Severtsov Institute of Ecology and Evolution, Moscow, Russia (SIEE); Tomsk State University, Russia (TSU); Zoological Institute, St Petersburg, Russia (ZIN); Finnish Forest Research Institute, Helsinki, Finland (METLA); Zoological Museum, Helsinki University, Finland (ZMUH); Natural History Museum, Oslo, Norway (NHMO); Kjell Hedmark private collection, Orsa, Sweden (KHPC). Some other material was not examined but included according to the information received from Finnish, Norwegian and Swedish colleagues. The records of species published under different names are included on the basis of personal communications of the authors.

Specimens initially collected in ethanol were dried, by carefully being transferred to a sheet of paper, and then pinned. The terminalia were heated in a solution of KOH,

then cleared in distilled water and placed in glycerol for detailed examination. Afterwards the terminalia were kept in microvials with glycerol and pinned together with the rest of the body. Images of terminalia were captured with a Leica DM1000 microscope equipped with a Leica DFC290 digital camera. Photographs were used as templates to produce digital illustrations with Inkscape vector drawing editor (<http://inkscape.org>). The morphological terminology follows Söli (1997); the arrangement of tibial setae and spurs is indicated by use of abbreviations according to McAlpine (1981). The measurements are given as ranges, followed by the mean value in parentheses.

## TAXONOMIC ACCOUNT

Order **DIPTERA**

Family **MYCETOPHILIDAE**

Subfamily **GNORISTINAE**

*Boletina* Staeger, 1840

*Boletina jamalensis* Zaitzev, 1994  
(Figs 1–6)

= *Boletina struthioides* Polevoi et Hedmark, 2004,  
**syn. nov.**

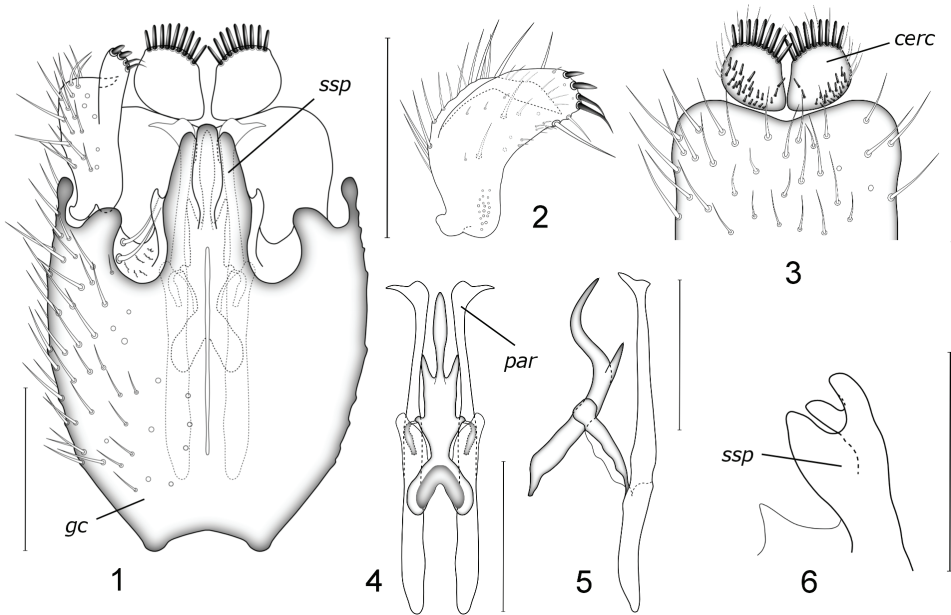
*Holotype* of *B. jamalensis*. Male; **Russia**, Yamal Peninsula, V. Shchuch'e, Sopkey, 11 Aug. – 21 Sept. 1980, leg. Veselova (SIEE).

*Holotype* of *B. struthioides*. Male; **Russia**, Karelia, Kaleval'skiy National Park, Ladvozero, 220 m above sea level, 11 July 1996, leg. A. Polevoi (ZIN).

*Paratypes* of *B. struthioides*. **Russia**, Karelia: 5 males, same data as for holotype (ZIN); 1 male, same data but 10–15 July 1996 (ZIN); Kartesh, 24–27 July 1996, leg. A. Polevoi (ZIN). **Finland**: 1 male, Kilpisjärvi, 16 Aug. 1970, leg. L. Tiensuu (ZMUH).

*Other material (not examined)*. **Sweden** (K. Hedmark, pers. comm.): 1 male, Vuollerim, Lagnäs, Lövbäcken, 2 July 1995, leg. K. Hedmark (KHPC).

*Description*. *Male* (n = 6). Head black. Mouthparts dark brown; palpi dark brown with two apical segments yellowish. Clypeus black. Antenna dark brown. Sixth flagellomere about twice as long as wide.



**Figs 1–6.** *Boletina jamalensis*, male: 1, genitalia, ventral view; 2, gonostylus; 3, cerci with apical part of tergite IX; 4, aedeagus, ventral view; 5, aedeagus, lateral view; 6, sternal submedian processus, lateral view. Scale bars: 0.2 mm. Abbreviations: *cerc*, cercus; *gc*, gonocoxite; *par*, paramere; *ssp*, sternal submedian processus.

**Thorax.** Mesonotum black, grey dusted with three more or less shining longitudinal stripes. Pleurae black. Laterotergite bare.

Wing length 3.25–3.72 (3.58) mm. Wing hyaline; veins yellow, except *C* and *R* brownish. *C* extending beyond tip of *R*<sub>5</sub>, almost up to middle of distance between *R*<sub>5</sub> and *M*<sub>1</sub>, *Sc* bare, ending in *C* opposite to or slightly before base of *Rs*. *Sc*<sub>2</sub> located slightly beyond middle of *Sc*. Stem of *M* fork 0.95–1.51 (1.19) times as long as *ta*. Base of *Cu* fork under base of *ta*. Haltere yellow.

Legs yellow; trochanters brown; in some specimens, hind coxa faintly darkened basally. Fore tibia with 2–4 *v*, 1–3 *pd* and 0–1 *p*. Mid tibia with 4–7 *ad*, 3–4 *pd*, 3–5 *p*, 3–5 *av* and 6–8 *pv*. Hind tibia with 5–8 *ad*, 5–7 *pd*, 3–5 *av* and 12–14 *p*. Ratios of tibia to first tarsomere for fore, mid and hind legs as: 1.41–1.52 (1.46); 1.55–1.70 (1.62); 1.82–2.00 (1.88). Fore tibia with one spur, mid and hind tibia each with two spurs (*av* spur about 0.75 times as long as *pv* spur).

**Abdomen black.** Terminalia (Figs 1–6) black. Gonostylus wide, distinctly bent in lateral view, bearing two short and two longer spines apically. Cerci with apical comb of 7–9 blunt-tipped spines and a group of scattered spinules at base. Gonocoxites ventrally with a trace of median cleft in the middle. Sternal submedian processes fused, with three apical lobes (best visible in lateral view) and complementary appendices closer to base. Parameres with apices shaped like a “bird head”, slightly protruding beyond sternal submedian processes.

*Female unknown.*

**Remarks.** The type series of *B. jamalensis* includes three different species. Among the eight paratypes, all with same data as the holotype, there are six males of *B. pinusia* Maximova, 2001, and two males of *B. tiro-lensis* Plassmann, 1980. The holotype and paratypes of *B. struthioides* have been found to be identical with the holotype of *B. jamalensis*, so *B. struthioides* is treated here as a junior synonym.

After the original description, the species was recorded by Hedmark (1998) as *B. jamalensis* and by Polevoi & Hedmark (2004) as *B. struthioides*.

**Biology.** The Karelian specimens were collected with a Malaise trap and sweep net in mixed forests and on adjacent meadows.

**Distribution.** North-West European: Sweden, North and North-West Russia.

***Boletina pinusia* Maximova, 2001**  
(Figs 7–11)

**Holotype** of *B. pinusia*. Male; **Russia, Kemerovo Prov.**, Kuznetskiy Alatau Nature Reserve, Kiya River, 22 June 2000, leg. Yu. Maximova (TSU).

**Paratypes** of *B. jamalensis*. **Russia, Yamal Peninsula**: 6 males, V. Shchuch'e, Sopkey, 11 Aug. – 21 Sept. 1980, leg. Veselova (SIEE).

**Other material (examined).** **Russia, Karelia**: 5 males, Paanajärvi National Park, Valkojärvi Lake, 21–30 June 1998, leg. A. Polevoi (FRIP); 2 males, Gridina River, 3 km SW of Gridino, 4 July 2007, leg. A. Polevoi (FRIP); 1 male, Kizhi skerries, Ernitskiy I., 24–27 June 2003, leg. A. Polevoi (FRIP); 1 male, Kivach Nature Reserve, 26 Sept. – 2 Oct. 1990, leg. A. Polevoi (FRIP); 3 males, Kaleval'skiy National Park, Ladvozero, 11 July 1996, leg. A. Polevoi (FRIP); 2 males, Pelusozero, 19–22 June 1996, leg. A. Polevoi (FRIP); 3 males, Tolvajärvi, 11–27 Sept. 1998, leg. M. Tietäväinen (FRIP). **Murmansk Prov.**: 11 males, Pasvik Nature Reserve, 1 km SE of Varlama (Niilansaari) I., 6 June – 10 Oct. 2007, leg. A. Bulychev (PNR); 8 males, Pasvik Nature Reserve, Kalkupya Mt., 7 June – 11 Oct. 2007, leg. A. Bulychev (PNR); 73 males, Pasvik Nature Reserve, Menikkajoki, 5 June – 10 Oct. 2007, leg. A. Bulychev (PNR). **Finland**: 2 males, Ilomantsi, Kotavaara, 15–29 Sept. 1997, 2–8 Sept. 1998, leg. M. Tietäväinen (METLA); 1 male, Kuhmo, Luhtavaara, 17–30 June 1997, leg. M. Kuussaari (METLA); 2 males, Ikaalinen, Lymylampi, 26 May – 12 June 1998, leg. M. Kuussaari (METLA); 2 males, Vehkalahti, 5 June and 9 Oct. 1971, leg. L. Tiensuu (ZMUH); 10 males, Evo, 3 Sept. and 3–15 Oct. 2003, leg. J. Jakovlev (METLA).

**Other material (not examined).** **Sweden** (K. Hedmark, pers. comm.): 3 males, Vuollerim, Mats's garden, 2–8 Oct. 2004, 10–16 and 24–30 Sept. 2005, leg. K. Hedmark (KHPC).

**Description.** **Male** (n = 8). Head black. Mouthparts dark brown; palpi with two

basal segments dark brown and two apical segments yellow. Clypeus black. Antenna dark brown; in some specimens first flagellomere yellow basally. Sixth flagellomere about twice as long as wide.

Thorax. Mesonotum black, grey dusted with three more or less shining longitudinal stripes. Pleurae black. Laterotergite bare.

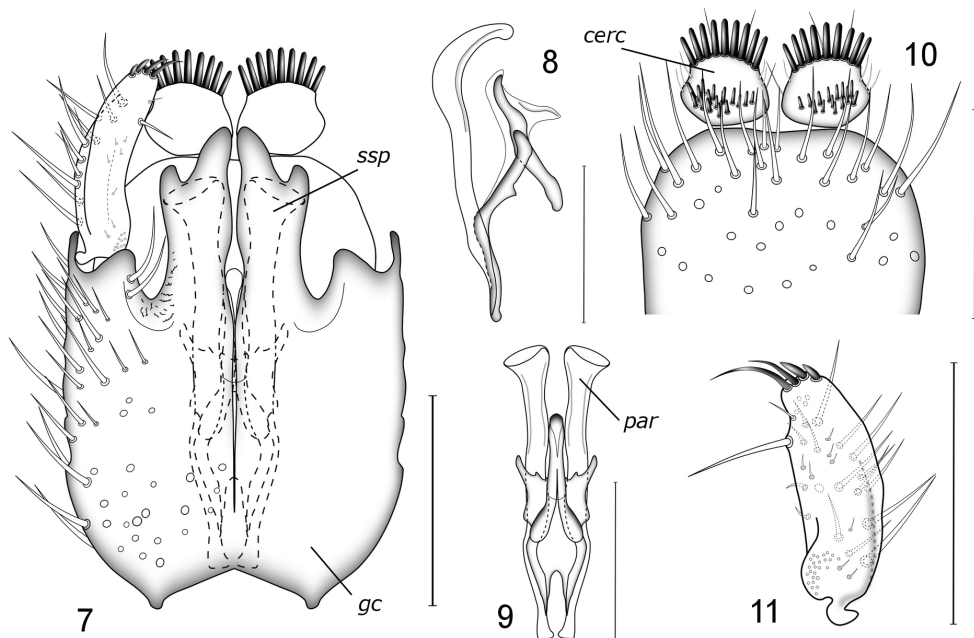
Wing length 3.01–3.87 (3.28) mm. Wing hyaline; veins yellow, except *C* and *R* brownish. *C* extending beyond tip of *R*<sub>5</sub> up to middle of distance between *R*<sub>5</sub> and *M*<sub>1</sub>. *Sc* bare, ending in *C* opposite to base of *Rs*. *Sc*<sub>2</sub> located slightly beyond middle of *Sc*. Stem of *M* fork 1.22–1.60 (1.44) times as long as *ta*. Base of *Cu* fork under base of *ta*. Haltere yellow.

Legs yellow; trochanters brown; in some specimens hind coxa darkened basally. Fore tibia with 1 *pd* and 1 *pv*. Mid tibia with 2–3 *ad*, 1–4 *pd*, 2–3 *p*, 2–3 *av* and 3–6 *pv*. Hind tibia with 5–6 *ad*, 6–8 *pd*, 2–4 *av* and 3–15 *p*. Ratios of tibia to first tarsomere for fore, mid and hind legs as: 1.29–1.41 (1.36); 1.45–1.69 (1.58); 1.82–1.95 (1.90). Fore tibia with one spur, mid and hind tibia each with two spurs (*av* spur about 0.75 times as long as *pv* spur).

Abdomen black. Terminalia (Figs 7–11) black. Gonostylus rather narrow, almost straight in lateral view, bearing 2–3 short and 2 longer spines apically. Cerci with apical comb of blunt-tipped spines and a basal group of spinules arranged in 2–3 irregular rows. Gonocoxites divided by deep median cleft. Sternal submedian processes long, with complementary appendices closer to apex. Parameres with rounded apices, not protruding beyond sternal submedian processes.

**Female** unknown.

**Remarks.** *Boletina pinusia* differs from *B. jamalensis* in the following characters of the male genitalia: gonostylus slenderer and straight, sternal submedian processes with complementary appendices closer to apex, and the details of the aedeagal complex. Kurina (2008) reported *B. jamalensis* from Italy, but according to his figures of the male terminalia, the species is undoubtedly identical to *B. pinusia*.



**Figs 7–11.** *Boletina pinusia*, male: 7, genitalia, ventral view; 8, aedeagus, lateral view; 9, aedeagus, ventral view; 10, cerci with apical part of tergite IX; 11, gonostylus. Scale bars: 0.2 mm.

The species has been recorded in many papers, but mostly as *B. jamalensis* (Jakovlev & Polevoi, 1991, 1997; Økland, 1996; Økland & Zaitzev, 1997; Polevoi, 2000, 2010; Jakovlev et al., 2000; Jakovlev, 2002; Polevoi et al., 2005, 2006; Gammelmo & Søli, 2006; Kjærandsen et al., 2007; Kurina, 2008; Humala & Polevoi, 2009), and only in three papers, as *B. pinusia* (Maximova, 2001, 2002; Søli & Rindal, 2012).

**Biology.** The specimens were collected with a Malaise trap and sweep net in various habitats (mostly coniferous and mixed forests).

**Distribution.** Euro-Siberian: West Siberia, North-West Russia, Finland, Norway, Sweden and Italy.

***Boletina kurilensis* Zaitzev, 1994**  
(Figs 12–15)

**Holotype.** Male; **Russia**, Kuril Is.: Kunashir I., Mendeleevo, 27 July 1977, leg. A. Zaitzev (SIEE).

**Other material examined.** Three males, **Russia**, *Murmansk Prov.*, Pasvik Nature Reserve, Kalkupya Mt., 30 July – 11 Oct. 2007, leg. A.

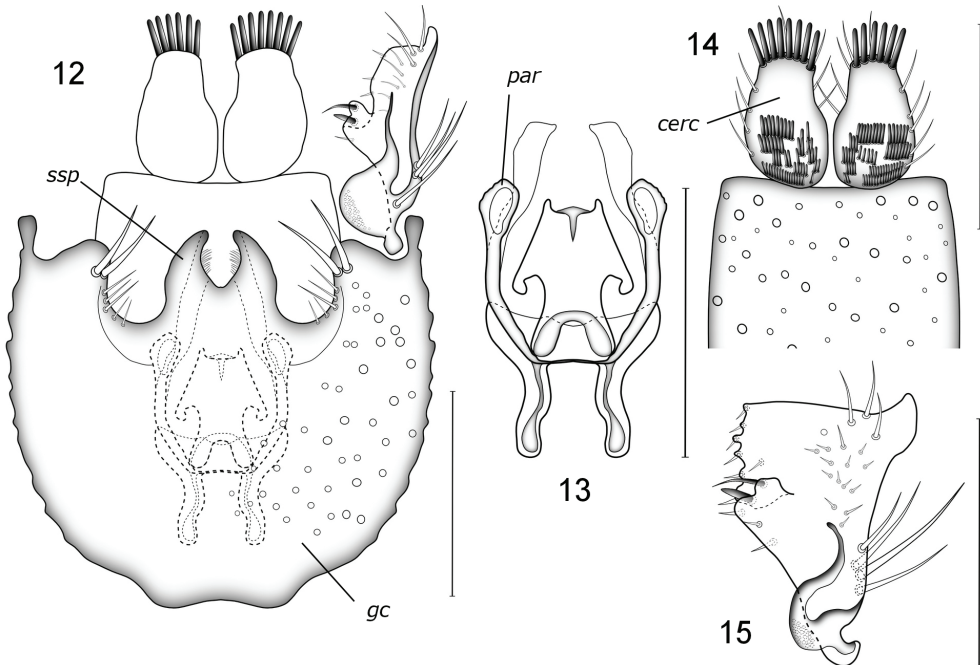
Bulychev (FRIP). **Finland:** 1 male, Kilpisjärvi, Saana Mt., 1–16 July 2006, leg. J. Jakovlev & J. Pentinen (METLA); 3 males, same data but 15–31 Aug. 2006 (METLA).

**Description.** Male (n = 4). Head black. Mouthparts brown; palpi yellow. Clypeus brown. Antenna brown with first flagellomere yellowish at base. Sixth flagellomere about 3 times as long as wide.

**Thorax.** Mesonotum brown, finely grey dusted with three more or less shining longitudinal stripes. Pleurae brown. Laterotergite bare.

Wing length 3.40–3.80 (3.60) mm. Wing hyaline; veins yellow, except *C* and *R* brownish. *C* extending beyond tip of *R*<sub>5</sub> up to middle of distance between *R*<sub>5</sub> and *M*<sub>1</sub>. *Sc* bare, ending in *C* opposite to base of *Rs*. *Sc*<sub>2</sub> located approximately at middle of *Sc*. Stem of *M* fork 1.10–1.27 (1.17) times as long as *ta*. Base of *Cu* fork under base of *ta*. Haltere yellow.

Legs yellow; trochanters brown; hind coxa darkened basally. Fore tibia with 0–1 *a*, 1–4 *v* and 0–1 *p*. Mid tibia with 4 *ad*, 4 *pd*, 3 *p*, 1 *av* and 5–7 *v*. Hind tibia with 5–7 *ad*,



**Figs 12–15.** *Boletina kurilensis*, male: 12, genitalia, ventral view; 13, aedeagus, ventral view; 14, cerci with apical part of tergite IX; 15, gonostylus. Scale bars: 0.2 mm.

5–6 *pd*, 4–6 *av* and 2–6 *p*. Ratios of tibia to first tarsomere for fore, mid and hind legs as: 1.37–1.42 (1.39); 1.49–1.52 (1.51); 1.93–1.97 (1.95). Fore tibia with one spur, mid and hind tibia each with two spurs (*av* spur about 0.75 times as long as *pv* spur).

Abdomen dark brown. Terminalia (Figs 12–15) dark brown. Gonostylus subrectangular in lateral view, with short basal process bearing two apical spines. Cerci with one apical comb of blunt-tipped spines and four irregular rows of spinules at base. Gonocoxites sternally fused, with a cleft dividing only apical parts of sternal submedian processes. Parameres short, not protruding outside apical margin of gonocoxites.

**Colour variations.** In specimens from Murmansk Province, thorax and abdomen uniformly black. First flagellomere varying from completely yellow to entirely black.

**Female unknown.**

**Remarks.** The species was recorded by Zaitzev (1994), Gammelmo & Söli (2006), Polevoi (2010), and Söli & Rindal (2012); all records were as *B. kurilensis*.

**Biology.** All specimens were collected with a Malaise trap; those from Murmansk Province and Finland were taken in mountain birch forests.

**Distribution.** Palaearctic: Kuril Islands, Murmansk Province, Finland and Norway.

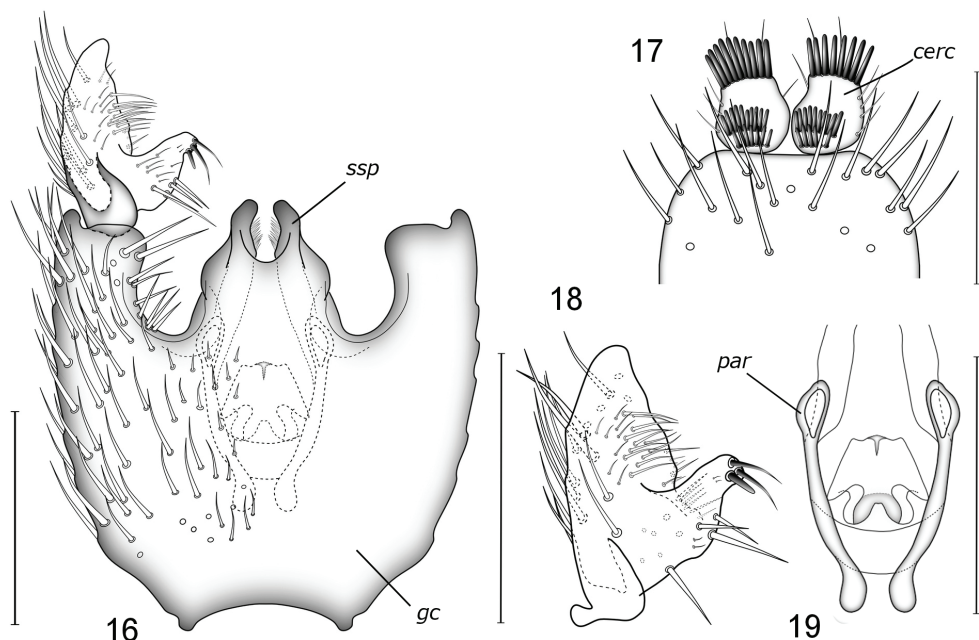
***Boletina palmata* sp. nov.**  
(Figs 16–19)

**Holotype.** Male; **Russia**, *Murmansk Prov.*, Pasvik Nature Reserve, Menikkajoki, 21 m above sea level, 5 June – 6 July 2007, leg. A. Bulychev (ZIN).

**Paratypes.** **Russia**, *Karelia*: 2 males, Kivach Nature Reserve, 70 m above sea level, 29–31 May 1989, leg. A. Polevoi (ZIN); 1 male, same data but 9–20 Oct. 1990, leg. A. Polevoi (ZIN).

**Other material (examined).** One male, **Russia**, *Karelia*, Tolvojarvi, 11–22 June 1999, leg. A. Polevoi (FRIP); 1 male, **Finland**, Utsjoki, leg. R. Frey, “#2024” (ZMUH).

**Other material (not examined).** **Norway** (G. Söli, pers. comm.): 1 male, Alta, Eiby, Valsetmoen, 8 Aug. – 10 Sept. 1995, leg. L.O. Hansen & H. Rinden (NHMO); 3 males, Alta, Mattisdalen S, 4 Aug. – 26 Sept. 1996, leg. L.O. Hansen &



**Figs 16–19.** *Boletina palmata* sp. nov., male: 16, genitalia, ventral view; 17, cerci with apical part of tergite IX; 18, gonostylus; 19, aedeagus, ventral view. Scale bars: 0.2 mm.

H. Rinden (NHMO); 2 males, Porsanger, Stabursdalen, Rørkulpén, 26 Jul. – 25 Aug. 2010, leg. Finnmarksprosjektet/G. Söli (NHMO). **Sweden** (K. Hedmark, pers. comm.): 1 male, Jokkmokk, Porsitjärn/Porsi VVO, 1.5 km SE of Vuollerim, 20 Sept. 2000, leg. K. Hedmark (KHPC); 1 male, Vuollerim, 25 Sept. – 1 Oct. 2004, leg. K. Hedmark & M. Karström (KHPC).

**Description.** *Male* ( $n = 4$ ). Head black. Mouthparts brown; palpi yellow. Clypeus dark brown. Antenna brown; first and base of second flagellomere yellow. Sixth flagellomere about 3 times as long as wide.

**Thorax.** Mesonotum dark brown to black, finely grey dusted with three more or less shining longitudinal stripes. Pleurae brown. Laterotergite bare.

Wing length 3.33–3.50 (3.43) mm. Wing hyaline; veins yellow, except *C* and *R* brownish. *C* extending beyond tip of  $R_5$  up to middle of distance between  $R_5$  and  $M_1$ . *Sc* bare, ending in *C* opposite to base of *R\_s*.  $Sc_2$  located behind middle of *Sc*.  $R_2$  slightly bent. Stem of *M* fork 1.55–1.74 (1.58) times as long as *ta*. Base of *Cu* fork under base of *ta*. Haltere yellow.

Legs yellow; trochanters brown; hind coxa sometimes darkened at base. Fore tibia with 1 *v* and 1 *pv*. Mid tibia with 3 *ad*, 3–4 *pd*, 2–3 *p*, 2–3 *av* and 3–6 *pv*. Hind tibia with 6–8 *ad*, 9–10 *pd*, 2–4 *av* and 5–10 *p*. Ratios of tibia to first tarsomere for fore, mid and hind legs as: 1.34–1.40 (1.37); 1.50–1.62 (1.56); 1.80–1.97 (1.90). Fore tibia with one spur, mid and hind tibia each with two spurs (*av* spur about 0.75 times as long as *pv* spur).

Abdomen dark brown. Terminalia (Figs 16–19) dark brown. Gonostylus in lateral view somewhat conical, with rather long basal process bearing two apical spines. Cerci with one apical comb of blunt-tipped spines and two basal rows of spinules. Gonocoxites sternally fused, with cleft dividing only apical parts of sternal submedian processes. Parameres short, not protruding outside apical margin of gonocoxites.

*Female* unknown.

**Comparison.** The new species appears to be closely related to *B. kurilensis* Zaitzev, but differs from it clearly in the outline of

the male genitalia, particularly in the shape of the gonostylus.

*Etymology.* Adjective from the Latin “palma” (palm), pointing to the shape of the gonostylus resembling a palm with bulged thumb.

*Remarks.* *Boletina palmata* was recorded under other species names, i.e. as *B. kurilensis* by Jakovlev & Polevoi (1991, 1997), Polevoi (2000, 2003), Jakovlev et al. (2006), Kjærandsen et al. (2007) and as *Boletina* sp. 2 by Polevoi (2010).

*Biology.* The Karelian specimens were collected with a Malaise trap in coniferous forests.

*Distribution.* North European: North-West Russia, Finland, Norway and Sweden.

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The author is indebted to the following persons for sharing materials and information on specimens in the collections as well as for fruitful discussion on the species in question: J. Jakovlev (Helsinki, Finland), G. Søli (Oslo, Norway), B. Økland (Ås, Norway), K. Hedmark (Orsa, Sweden), A. Zaitzev (Moscow, Russia), Yu. Maximova and E. Subbotina (Tomsk, Russia). Valuable comments on the manuscript by G. Søli and an anonymous referee are gratefully acknowledged. The possibility to work with the collections of SIEE and ZIN was kindly provided by N.P. Krivosheina and L.A. Kuznetsova, respectively. The examination of the material in ZMUH was possible due to support by the Finnish Academy of Sciences and the assistance of P. Vilkamaa and J. Kahanpää. This study was also supported by the Presidium of the Russian Academy of Sciences: Program “Living Nature: Modern State and Development Problems”.

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