Cylindropygus ferox gen. n., sp. n.: A new member of the Cryptopygus complex (Collembola, Isotomidae) from central France

L. DEHARVENG¹, M. POTAPOV², & A. BEDOS¹

¹UMR 5202 du CNRS “Origine, Structure et Evolution de la Biodiversité”, Muséum National d’Histoire Naturelle, Paris, France, and ²Moscow State Pedagogical University, Zoology Department, Moscow, Russia

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Abstract
Cylindropygus, a new genus of isotomid Collembola, is described. It differs from all other genera of Isotomidae by a unique combination of characters (abdominal segments V and VI fused, eyes absent, postantennal organ present and elongate, S-chaetotaxy, and absence of foil chaetae) and two remarkable features: a modified labium, with papillae A, B, D bearing strong spines; and a swollen, globular accp3 chaeta on Abd.V. Cylindropygus ferox sp. n. is common in forest soils of central France.

Keywords: Collembola, Cryptopygus complex, Cylindropygus ferox

Introduction
Cryptopygus Willem, 1902 is a large genus of about 80 species distributed worldwide. As currently understood, it comes near another speciose and poorly defined genus, Proisotoma Boerner, from which it differs only by the fusion of abdominal tergites V and VI. Different isotomid genera (Hemisotoma Bagnall, Proisotomodes Bagnall and Isotomina Boerner) have been synonymized with Cryptopygus on the basis of this single feature, though they clearly differ in a number of important characters. The heterogeneity of the genus was stressed by Potapov (2001), who chose not to subdivide it due to a lack of data on most species.

In a recent paper entitled “Do we have Cryptopygus … in Europe?”, Rusek (2002) returned to the original concept of the genus that he considers as restricted to southern hemisphere species. He restored for European species the genera Hemisotoma Bagnall, and Proisotomodes Bagnall, unduly synonymized with Cryptopygus in his opinion. Rusek’s work provides a good starting point for reconsidering the whole Cryptopygus complex in the light of modern systematics and from an evolutionary perspective. In this first contribution, we describe a new genus, Cylindropygus, which has abdominal tergites V and VI fused, but does...
not fit any genus of the Cryptopygus complex (Hemisotoma, Cryptopygus, or Proisotomodes) in other important characters.

Abbreviations in the text follow Potapov (2001): Abd.I, III, V, VI, first, third, fifth, sixth abdominal segment; Ant.I, II, IV, first, second, fourth antennal segment; accp, posterior S-chaetae; ap, frontal chaeta on head; as, anterior S-chaeta; guard, guard chaeta; ms, S-microchaeta; PAO, postantennal organ; pc, posterior chaeta on head; T-chaetae, subdistal chaetae of tibiotarsus (Potapov 2001, p 9); Th.II, III, second, third thoracic segment; Tita, tibiotarsus.

Cylindropygus gen. n.

Diagnosis

Body cylindrical, elongate; Abd.V and VI fused, separated from Abd.IV; anal spines absent; integument covered with elementary hexagonal grains; no pigment, no eyes; PAO present, elongate. Ant. IV without apical bulb and with some moderately thickened sensilla. Labrum: 4/554. Outer maxillary lobe with four sublobal hairs, palp bifurcate. Labium modified, with three proximal and four baso-median chaetae, full set of guards and papillae, and papillate chaetae A, B, D tooth-like. S-chaetotaxy: 4,3/2,2,2,3,4 (s), 1,0/0,0,0 (ms). S-chaetae on Abd.I–III in mid-tergal position. Abd.V: lateral S-chaeta (accp3) globular, no anterior S-chaetae (as). Tita with full set of chaetae, apical ring with seven pointed chaetae (no T-chaetae sensu Potapov 2001, p 9). Empodial appendage present. All parts of furcal complex present. Manubrium with one pair of antero-distal chaetae in the adult. Dens of normal shape and middle size for the family, slightly crenulated. Mucro tridentate.

Type species. Cylindropygus ferox sp. n.

Comments

Cylindropygus belongs to the Cryptopygus complex of genera by the fusion of Abd.V and VI, presence of PAO, absence of anal spines and lack of morphological modification of Abd.V–VI. It differs in the following features:

1. The absence of foil chaetae on Abd.VI.
2. Mid-tergal position of S-chaetae on Abd.I–III.
3. Postero-lateral S-chaetae of Th.II and III present.
4. Three S-chaetae on Abd.IV.
5. One S-chaeta (accp3) of Abd.V strongly differentiated and globular.
6. Anterior S-chaetae (as) absent on Abd.V.

From Hemisotoma Bagnall, the new genus differs in characters 1, 3 and 6; from Proisotomodes Bagnall, in 2 and 3; from Appendisotoma Stach, in 2 and 5; from Cryptopygus sensu stricto Willem, in 5 and 6; from Dagamaea Yosii, in 3, 4 and 5. Summarizing, Cylindropygus combines the characters of different genera and the phylogenetic position of C. ferox sp. n. in the Cryptopygus complex is obscure. It also does not exhibit strong similarities with any Proisotoma sensu lato species either. Whereas S-chaetae pattern of Cylindropygus body (4,3/2,2,2,3,4) looks similar to that of most species of
the subfamily Anurophorinae, the combination of three S-chaetae on Abd.IV with four on Abd.V is unusual. Almost all species of the Proisotoma complex have two and four, and all species of the Cryptopygus complex have three and five. Detailed study of both complexes will be given in further publications. In our opinion, Cylindropygus is closest to the large genus Cryptopygus s. str. distributed in the Southern Hemisphere with only a few members penetrating to the Northern Hemisphere.

In addition, the type species of the new genus shows two unusual features that are probably adaptive, a cylindrical habitus and a strongly modified labial palp, unknown so far for the family.

Cylindropygus is the only endemic Collembolan genus of the Massif Central in France. It was unexpected to find such a phylogenetically isolated taxon in this mountain range, which has a soil fauna notoriously lacking endemic elements, especially in lowland forest.

*Cylindropygus ferox* sp. n. (Figures 1–13)

**Type material**

Holotype male and four paratypes on slide, 35 paratypes in alcohol. France, Cantal, Le Peyrot, commune Cros-de-Montvert, oak litter and soil, 3 November 1996, M. C. Souqual leg. (sample 15–007), 2.1551°E, 45.0563°N.

**Other material**

France, Corrèze, commune Hautefage, La Maronne valley, oak litter and soil, 1 April 1981, Deharveng leg. (sample 19–002), two specimens, 2.0001°E, 45.0892°N.

France, Creuse, commune Boussac, litter and soil in mixed broadleaf forest, Rougerie leg. (sample 23–001), one specimen, 2.2229°E, 46.3492°N.

France, Creuse, commune Saint-Martin-Château, soil in mixed broadleaf forest, Rougerie leg. (sample 23–002), one specimen, 1.8107°E, 45.8478°N.

France, Haute-Vienne, commune Saint-Sylvestre, Monts d’Ambazac, chestnut litter, Bedos and Deharveng leg. (sample 87–03), two specimens, 1.3704°E, 45.9965°N.

**Type deposit**

Holotype and three paratypes mounted in Marc-André II and 30 paratypes in alcohol deposited in the Muséum national d’Histoire naturelle de Paris. One paratype mounted in Marc-André II and five paratypes in alcohol deposited in the collection of Moscow State Pedagogical University.

**Description**

Body length 0.65–0.80 mm. Habitus perfectly cylindrical, elongate (Figure 1). Abd.V–VI fused, rounded, V+VI slightly shorter than III. Antennae shorter than head. Entirely white. Integument covered with small elementary hexagonal grains, larger on head.

Dorsal mesochaetae slightly curved, acuminate, smooth; longer on Abd.IV–V where they are weakly but distinctly serrated on one side; not shortened in axial part of tergites. Macrochaetae straight, thin, long and acuminate. S-chaetae thin and rather long, but shorter than nearby mesochaetae.
Mandible slightly asymmetrical, with four teeth, the distal much smaller than the antedistal. Outer maxillary lobe with four sublobal hairs, palp bifurcate (Figure 2). Labral formula 4/5,5,4, with chaetae of the two anterior rows thickened (Figure 3). Labium with three proximal and four baso-median chaetae, full set of guards and papillae. Labial palp

Figures 1–5. (1) Habitus in lateral view showing macrochaetae; because of obliquity, lateral macrochaetae appear shorter than true length (see Figure 10 for real relative size). (2) External lobe of maxilla. (3) Labrum. (4) Labium, with papillae A–E. (5) Abdominal tergite (V+VI).
Figures 6–13. (6) Postantennal organ; vertical arrow, anterior, horizontal arrow, axis. (7) Dorsal S-chaetae of Ant.IV; other chaetae represented by their sockets; dotted line around Ant.IV organ. (8) Third thoracic tergite, lateral part. (9) Second thoracic tergite, lateral part; ms, S-microchaeta. (10) Dorsal S-chaetotaxy and macrochaetaxy; ordinary mesochaetae represented by sockets. (11) Distal part of manubrium and mucrodens, anterior view. (12) Mucrodens, posterior view. (13) Mucro, lateral view.
papillae A, B, D armed with strong teeth; C with a weaker one, and E with a normal hair (Figure 4).

Eyes absent. PAO long, curved and sclerotized (Figure 6).

Antennae: Ant.I with two rather short ventro-external S-chaetae of equal length, one thicker; 11 ordinary chaetae; and two basal microchaetae. Ant.II with one thin ventro-external S-chaeta, 17 ordinary chaetae and three basal microchaetae. Ant.III organ like usual, with five S-chaetae. Ant.IV with a rather large organite with its guard chaeta short. Several clearly recognizable S-chaetae on Ant.IV, four or five rather strongly thickened, three or four lesser thickened and several thin (Figure 7).

Five or six chaetae between axis and pc3-chaeta on head. Frontal chaeta ap present.

Chaetae on body tergites not very abundant (Figures 5, 10). Axial chaetotaxy 12,8/6,6,6,8,4. Macrochaetae rather short on head, but well differentiated on tergites. Macrochaetotaxy: 1,1/3,3,3,4, numerous on Abd.VI (Figure 10). S-chaetotaxy: 4,3/2,2,2,3,4 (s), 1,0/0,0,0 (ms) (Figures 8–10). S-microchaeta on Th.II (ms) nearly as long as closest S-chaeta (Figure 9). S-chaetae of Abd.V: two medial (accp1 and accp2) rather long and thin, one lateral (accp3) globular, one ventro-lateral (accp4) thin and of medium size (Figure 5). Sternite of Th.II without chaetae, of Th.III with 2+2 chaetae.

Ventral tube with 4+4 latero-distal and 1+1 postero-basal chaetae. Coxa I with one external chaeta. Tita with 21, 21, 26–27 chaetae, without elongate or clavate tenent hairs. No modified chaetae on male Tita. Claw stout, without inner, lateral or external teeth. Empodial appendage about as long as inner edge of claw.

Retinaculum with 4+4 teeth and one chaeta. Anterior furcal subcoxa with six chaetae, posterior one with five chaetae (two specimens observed). Manubrium with 1+1 antero-distal chaetae and 9+9 posterior chaetae. Dens of normal shape, rather short (dens: claw III=2.8; manubrium: dens=1), slightly crenulated on posterior side. Each dens with 9–10 anterior and five posterior chaetae, including a distal microchaeta (Figures 11, 12). Mucro tridentate (Figure 13).

Etymology

The species name refers to the strong teeth of the labium.

Comments

Due to habitus, C. ferox sp. n. is readily recognizable among European Isotomidae.

Ecology

The species is widespread, though not abundant, in forest soils of the mid-part of the Massif Central, France.

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