III. ENTOMOLOGISCHE BIJDRAGEN

III.1. A NEW CAVE SPECIES OF THE GENUS ONCOPODURA CARL & LEBEDINSKY, 1905 FROM BELGIUM (COLLEMBOLA : ONCOPODURIDAE)

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Abstract

An undescribed species of Oncopodura was found by Leruth (1939) while making his inventory of the fauna of Belgian caves. The 'lost' collection of Collembola specimens of 1932-1934 of Leruth was backtracked by Michel Dethier and eventually recovered from the Museo Nacional de Ciencias Naturales of Madrid in Spain. In the Delhez collection of Belgian cave fauna, inventorised by Michel Dethier, some Oncopodura specimens were tentatively identified as *Oncopodura reyersdorfensis*. During a more recent exploration of Belgian caves (1999-2001), Michel Dethier recovered new specimens of an undescribed Oncopodura, with a post-antennal organ similar to that of *Oncopodura reyersdorfensis*, which was tentatively published as a new undescribed species. The new species, *Oncopodura dethieri sp. nov.*, is here described as a new species to science.

Abstract

Leruth (1939) ontdekte een nog niet beschreven soort Oncopodura gedurende het opstellen van een inventaris van de Belgische grotten fauna. Leruth's verloren gewaande verzameling van Collembola specimens van 1932-1934 werd opgespoord door Michel Dethier en teruggevonden in het Museo Nacional de Ciencias Naturales te Madrid in Spanje. In de Delhez verzameling van de Belgische grotten fauna, geïnventariseerd door Michel Dethier, werden enkele Oncopodura specimens onder voorbehoud geïdentificeerd als *Oncopodura reyersdorfensis.* In de loop van een meer recente exploratie van Belgische grotten (1999-2001) vond Michel Dethier nieuwe specimens van een nog niet beschreven soort Oncopodura met een post-antennaal orgaan gelijkende op dat van *Oncopodura reyersdorfensis,* die voorlopig gepubliceerd werden als een nieuwe soort. De nieuwe soort, *Oncopodura dethieri sp. nov.*, wordt hier beschreven als een nieuwe soort voor de wetenschap.

Keywords

cave species, post-antennal organ, 3D reconstruction, confocal laser scanning microscopy.

Introduction

During his inventarisation of the Belgian cave fauna, in 1932-1934, Leruth collected some specimens of an undescribed species of **Oncopodura** CARL and LEBEDINSKY, 1905. Leruth sent his collection to Bonet in Spain, who identified the specimens as ***Oncopodura sp. nov.* (LERUTH, 1939)**.
Michel Dethier was able to retrieve the supposedly lost collection of the Collembola of Leruth in the Museo Nacional de Ciencias Naturales, Lab. de Entomol., Madrid, Spain.

An unspecified number of specimens, collected by Delhez from the cave Abîme du Fourneau in Somme-Leuze, Namur, were identified as ***Oncopodura reyersdorfensis* STACH, 1936** by da Gama, Gisin and Stomp (DELHEZ et al., 1999; HUBART & DETHIER, 1999). (These specimens were not recovered.)

Additional **Oncopodura** specimens were found in the material collected by Michel Dethier during collecting trips in several caves from Belgium, between 1999 and 2001 (DETHIER & HUBART, 2003). Deharveng identified these specimens as ***Oncopodura cf. reyersdorfensis*** and ***Oncopodura nov. sp.*** (HUBART & DETHIER, 1999). A closer examination of the specimens revealed that the shape and number of the fingerlike lobes of the tubercles of the post-antennal organ (PAO) were more variable than in ***O. reyersdorfensis***.

During a revision of the Collembola collection of F. Delhez several specimens of **Oncopodura** were encountered that did not fit any of the known **Oncopodura** species described until now (DETHIER & HUBART, 2000; JANSSENS & DETHIER, 2005).

The genus **Oncopodura** and/or the family Oncopoduridae have been studied by a number of authors, including ABSOLON & KSENEMAN, 1932; STACH, 1936; GISIN, 1960; LOKSA, 1961; PALISSA, 1964; SZEPTYCKI, 1977; MARI MUTT, 1984; CHRISTIANSEN & REDDELL, 1986; DEHARVENG, 1988; CHRISTIANSEN & BELLINGER, 1996 and CHRISTIAN, 1998.

Materials and Methods

It is not known how the specimens in 1933-1934 have been collected. The specimens are mounted on slides in an unknown medium, using a round cover glass. The cover glass has not been sealed. Therefore some mounts are in bad condition. Because of the extreme fragility of specimens and the deciduous nature of the diagnostic scales and spines, many specimens are unsuitable for description. Nevertheless, sufficient specimens of Leruth are well preserved despite being slide mounted for more than 70 years.

The specimens of 1999-2001 have been collected from the caves using barber traps. The collected specimens were preserved in ethanol. The specimens were previewed using a stereomicroscope (magnification max. 50x). All specimens were mounted in a drop of Hoyer medium on standard object slides and covered with a square cover glass of 18x18 mm. After drying for a week at room temperature, the cover glasses were 'ringed' with transparant nail polish to seal the Hoyer medium. Final determination was done using a binocular phase-contrast compound microscope at 10x100 magnification with immersion oil.

3D reconstruction microscopy studies of one Leruth specimen were carried out on a confocal laser scanning microscope.

Oncopodura dethieri sp. nov. Figs 1-2

Oncopodura sp. nov. LERUTH, 1939:201
Oncopodura sp. MARLIER, 1942:10
Oncopodura DELHEZ et al., 1999:44
Oncopodura sp. HUBART & DETHIER, 1999:168
Oncopodura reyersdorfensis DELHEZ et al., 1999:35
Oncopodura reyersdorfensis HUBART & DETHIER, 1999:168
Oncopodura DETHIER & HUBART, 2000:29
Oncopodura DETHIER & HUBART, 2003:52
Oncopodura sp. nov. JANSSENS & DETHIER, 2005:154

Etymology

This species is dedicated to Michel Dethier of the Faculté universitaire des Sciences agronomiques of Gembloux, who did a thorough inventarisation of the Delhez collection, who collected several additional specimens of the new species and who traced and recovered the lost collection of R. Leruth.

Material examined

Type locality
The Grande Caverne d'Engihoul in the Valleé de la Meuse in the province Liége of Belgium. The type specimens were found at the “étage inférieur, sur le limon humide et à la surface des petites flaques d'eau, sur le sol” (LERUTH, 1939:201).

Type series specimens
1933.06.08 slide 60
1934.02.04 slide 58, 59
1934.02.22 slide 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74
Legit: Leruth, R.
Deposited in the collection of the Museo de Madrid Lab. de Entomol.

Inventarylines

p = patria **t** = territorium **leg** = legit
r = regio (L = Liége; N = Namur) **d** = data **det** = determinator
c = commune **q** = quantum

Other material examined

p	r	c	t	d	q	leg	det	
BE	L	Comblain-au-Pont	Abîme	1999.02.18	2e	Hubart JM & Dethier M	Janssens F	slide SI-121
BE	L	Comblain-au-Pont	Steinlein Gr	1999.04.22	3e	Hubart JM & Dethier M	Janssens F	slide 6-9-2
BE	L	Comblain-au-Pont	Steinlein Gr	1999.04.22	1e	Hubart JM & Dethier M	Janssens F	slide 6-7-2
BE	N	Jemelle	Grotte du Fayt	2000.12.02	1e	Rochez G	Janssens F	slide 3-1-4
BE	L	Huy	Trou Manto	2000.12.09	1e	Rochez G	Janssens F	slide 1-11-4
BE	N	Jemelle	Grotte du Fayt	2001.05.19	1e	Hubart JM & Rochez G	Janssens F	slide 3-2-6

This material is deposited in the collection of the University of Antwerp, Belgium and in the private collection of Michel Dethier.

Additional location data recorded as ***Oncopodura sp.***

p	r	c	t	d	q	leg	det
BE	L	Comblain	Abîme	1998.10.08	1e	Dethier M	Deharveng L & Thibaud JM
BE	L	Flémalle	Ramioul cave	1999.04.17	1e	Dethier M	Deharveng L & Thibaud JM
BE	N	Jemelle	Grotte du Fayt	2001.07.07	2e	Rochez G	Janssens F
BE	L	Engis	Rosée	2002.08.08	?e	Dethier M & Hubart JM	Deharveng L

Description

Both SZEPTYCKI, 1977 and DEHARVENG, 1988 give a good general discussion on the taxonomic features of the genus. In general we follow the model of DEHARVENG, 1988 for the description of the new species using a number of antennal types of setae from the description of ***O. pelissei* DEHARVENG, 1988** which can be recognized in this new species. For a semidiagrammatic illustration of these antennal seta types see CHRISTIANSEN and BELLINGER, 1996:50,Fig. 85. The genus level identification is based on BELLINGER et al., 1999-2010, the nomenclature on BELLINGER et al., 1996-2010.

Habitus typical of genus (Fig. 1). Length 0.6-0.9 mm. Colour white without any trace of pigment.

Antennae without apical bulb or scales.

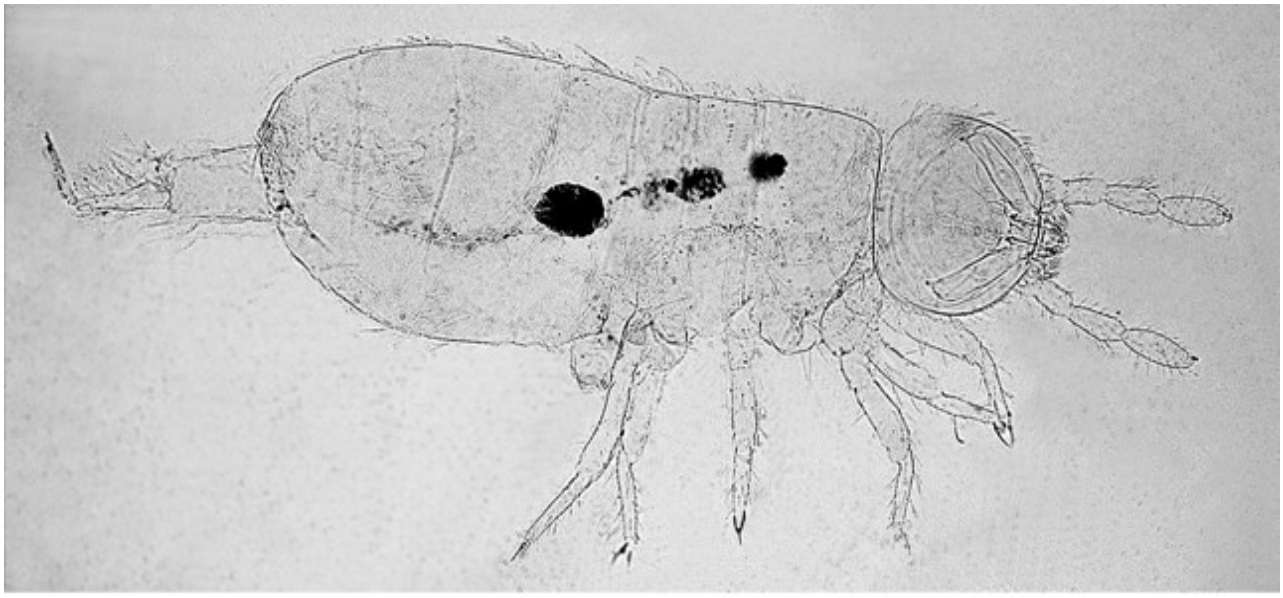

Fig. 1. ***Oncopodura dethieri sp. nov.*** **general habitus.**

Fourth antennal segment (Fig. 2B,4) with four type 8 setae (sensilla), evenly spaced, all in a line, length about 6 µm; almost all other setae are of type 1A. Third antennal segment with 2 subapical large type 13 setae (sensilla), length about 11 µm (Fig. 2A,4); one smaller type 8 seta; other setae (at least 5) are thick type 1A. Second antennal segment with 2 type 13 setae; others are type 1A, of varying thickness and length; some (at least 4) distinctly thick. First antennal segment with two small type 8 setae, and type 1A setae of varying sizes.

PAO present, distinct and large, diameter about 28 µm, with 6 large radiating tubercles of subequal lengths (Fig. 2C-D); each tubercle variably split in 2 to 3 fingerlike lobes.

Unguis slender (less broad than unguiculus), length about 25 µm. Lateral tooth on the unguis is absent; pretarsal setae equal in length, about 1/2 length of unguis (Fig. 2F). Unguiculus acuminate, with distinct basal swelling.

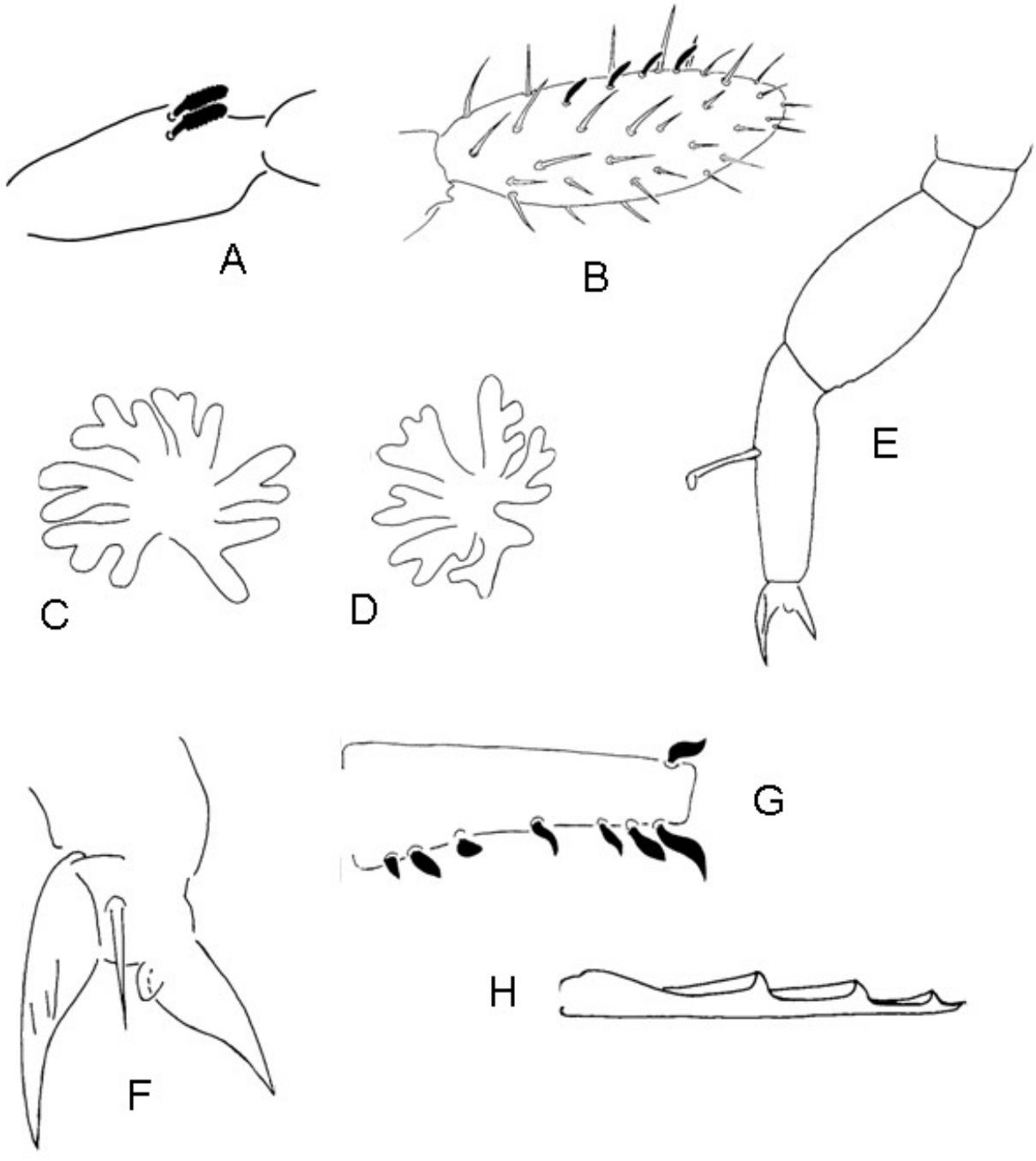

Fig. 2. ***Oncopodura dethieri sp. nov.*** **A. Third antennal segment with two subapical large type 13 setae; B. Fourth antennal segment with four type 8 setae; C-D. Post-antennal organ; E. Mesoleg with large spatulate seta on tibiotarsus; F. Footcomplex of metaleg; G. Dens with dental spines; H. Mucro.**

Most tibiotarsal setae are large, acuminate. Conspicious spoonshaped macroseta on mesotibiotarsus, length about 28 µm (Fig. 2E). Note: absent in ***O. reyersdorfensis*** (see PALISSA, 1964:237 although STACH, 1936:133 is more tentative). Tenent hair slender and acuminate.
Ventral tube without prominent papillae; with 2+2 type 1A setae on distolateral lobes and 1+1 on posterior face.
Tenaculum with 4+4 teeth. Furca short and stout. Manubrial chaetotaxy on posterior face : 10 type 1A setae. Dens distoventrally with 2-3 type 12 setae; external face suprabasally with one type 14 macroseta and strong short spinelike acuminate seta, medially with one very large type 1B seta, and distally with one strong curved spine; internally with 7 curved, deeply serrate spines, increasing in size distally, arranged in a basal group of 3, a medial one and a distal group of 3 (Fig. 2G).
Mucro with 4 teeth (Fig. 2H).
Fourth abdominal segment with posterior row of 4+4 and 4+4 anterior row.
Fifth abdominal segment with 4+4 mediolateral mesosetae in medial row, 2+2 small type 14 setae anteriorly.
Sixth segment with 5 macrosetae.

Discussion

The number of PAO tubercles is constantly 6 which places the species in the crassicornis species-group as defined by DEHARVENG, 1988. Although the PAO resembles that of ***O. egerszoegensis* LOKSA, 1961** (based on the description of PALISSA, 1964), it is very characteristic. The variability in the lobes of the tubercles of the PAO distinguishes it from all other members of the *crassicornis* group. While ***O. crassicornis* SHOEBOTHAM, 1911** has PAO tubercles of one lobe, ***O. reyersdorfensis*** has PAO tubercles with 2 lobes and ***O. egerszoegensis*** typically has PAO tubercles with 3 lobes. The PAO of ***O. dethieri sp. nov.*** is variable with respect to the number of lobes of the PAO tubercles (2 to 3 lobes) and with respect to the length of the lobes. There are long and short lobes on one and the same tubercle. There are tubercles with 2 lobes and 3 lobes on one and the same PAO (Fig 2C-D). In this respect it resembles ***O. egerszoegensis***, an Hungarian troglobite which is much larger and otherwise very different (LOKSA, 1961). Loksa recorded among his 30 specimens of ***O. egerszoegensis*** 11 ones with a PAO tubercle having 2 long fingerlike lobes in stead of the typical 3 short lobes.

O. dethieri sp. nov. (0.6 - 0.9 mm) is a rather small **Oncopodura** species (more like ***O. crassicornis***).
The closely related ***O. egerszoegensis*** (1.5 - 2 mm) and ***O. reyersdorfensis*** (1.6 mm) are about twice as large (STACH, 1936).

	crassicornis	reyersdorfensis	egerszoegensis	dethieri
size (mm)	0.6-0.8	1.6	1.5-2.0	0.6-0.9
number of fingerlike lobes of any PAO tubercle	1	2	3*	2-3
length of fingerlike lobes of one particular PAO tubercle	short	long equal in length	short* equal in length	short and long variable in length

Table 1. Differential characters of the closely related species of the crassicornis group
*** some specimens have a PAO tubercle with 2 long fingerlike lobes i.s.o. the typical 3 short lobes**

CHRISTIAN, 1998:51 recorded a new ***Oncopodura sp.*** for Austria. The lobed PAO tubercles relate to those of ***O. reyersdorfensis***. Christian suggests that ***reyersdorfensis*** should be revised. Note that SZEPTYCKI, 1977 does not list ***O. egerszoegensis*** in his key. Both ***O. reyersdorfensis*** and ***O. egerszoegensis*** may be considered as species inquirenda. The first is based on only one specimen; the latter requires redescription.

The total length of the collected animals ranges between 485 and 900 µm (Fig. 3). Three specimens are however clearly smaller than the other and are probably juveniles. If we exclude these specimens, length varies between 616 and 900 µm. We also want to point out that the adult specimens collected in 1930 (795 ± 24 µm, n = 15) were significantly ($t = 3.33$, $df = 22$, $p = 0.003$) larger than those collected in 2000 (681 ± 20 µm, n = 9).

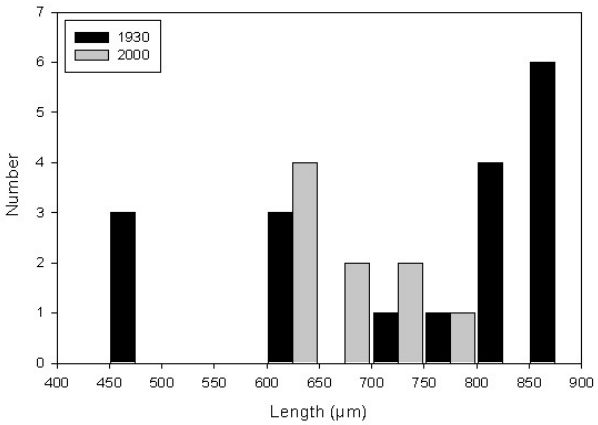

Fig. 3. ***Oncopodura dethieri sp. nov.*** **Size distribution of the specimens examined.**

O. dethieri is a cavernicolous species. Many **Oncopodura** species are cave adapted. That is probably why these **Oncopodura** species are remarkably uncommon in collections, usually only represented by very few specimens. Another reason may be that **Oncopodura** specimens very seldom deliver good slides.

3D reconstruction microscopy

3D reconstruction microscopy studies of one Leruth specimen were carried out on a confocal laser scanning microscope (Laser Scanning Systems LSM 510 Meta; Carl Zeiss) with appropriate excitation (wavelength 488 nm 1%) and emission filter sets, making use of the natural fluorescency of the slide preparations. The 3D reconstructions are visualised on screen by the LSM Image Browser Version 4.2.0.121 (Carl Zeiss MicroImaging GmbH 1997-2006).

The figures 4A-D are images saved with the LSM Image Browser. This technique proofed to be useful in visualising on screen in 3D the slide mounted almost completely transparent specimen of the Leruth collection of 1933-1934 without any additional specimen preparation.

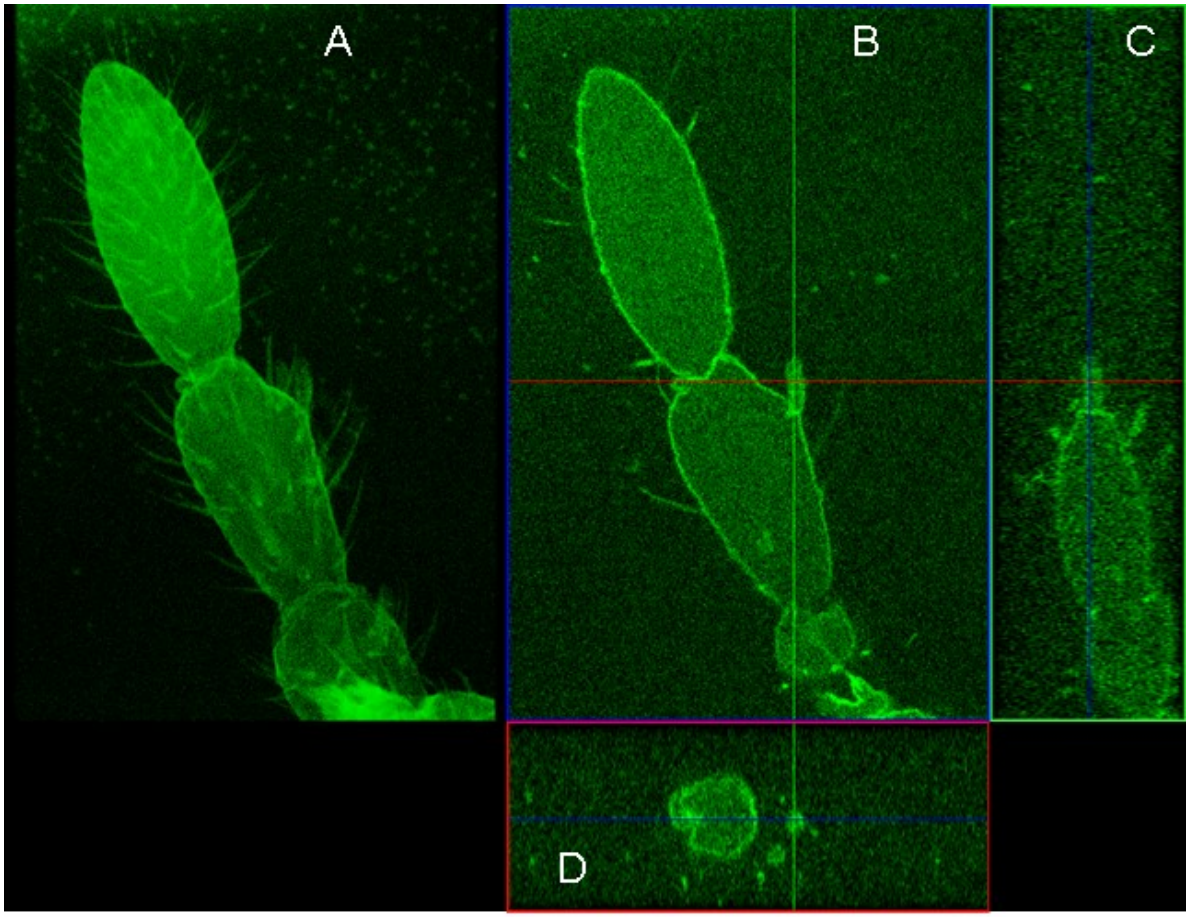

Fig. 4. ***Oncopodura dethieri sp. nov.*** **A. 3D reconstruction of the third and fourth antennal segments based on 32 slices of 360/32 degrees panoramic rotation, Orthogonal sections through the antenna at the location of a sensillum of the sensorial organ of the third antennal segment (based 65 slices of 65 µm); B. Longitudinal section, lateral aspect; C. Longitudinal section, ventral aspect; D. Cross section.**

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