静岡県の山地渓流沿いの河床間隙から得られたCernosvitoviella minor（ヒメミミズ科）の日本初記録

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New record of *Cernosvitoviella minor* (Annelida: Clitellata: Enchytraeidae) from hyporheic habitat in a Japanese stream

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**Abstract** An enchytraeid oligochaete, *Cernosvitoviella minor* Dözsá-Farkas, 1990, is recorded here for the first time in Japan, and redescribed based on the new material. Morphological characteristics of the present material agree well with previous descriptions of this species except for two types of coelomocytes present. This species was collected from the hyporheic zone along the edge of freshwater stream.

**Key words:** *Cernosvitoviella minor*, Clitellata, Enchytraeidae, Japan, oligochaetes

Members of the enchytraeid genus *Cernosvitoviella* Nielsen and Christensen, 1959 are amphibiotic oligochaetes and include some species originally described under the genera *Marionina* Michaelsen, 1889 or *Enchytraeoides* Roule, 1888 (Martínez-Ansemil and Collado, 1996). Although more than 20 valid *Cernosvitoviella* species have so far been recognized in the world (Dumnicka, 2004), there has been no record of the genus in Japan.

In this paper, I record and describe *Cernosvitoviella minor* Dözsá-Farkas, 1990, from Japan for the first time.

**Materials and methods**

The study was carried out in winter-early spring 2008 and 2010 in Seto and Asahina River, Shizuoka Prefecture, central Japan. Three different sites were sampled for this study; one study site was on headwater tributaries of the Asahina River and the other two study sites were on urban downstream of the Seto and Asahina River respectively. Samples used in the present study were collected from the sandbar along a stream. The Karaman-Chappuis method (Chappuis, 1942) was used to collect the sample. Each sample was treated separately divided into surface layer (0-10 cm depth) and hyporheic layer (10-30 cm depth), repeatedly stirred in water in a tray or bucket, and the suspensions including worms were sieved with a 0.25 mm screen, after which the sieved material was brought into the laboratory. Living and fixed specimens were examined. A part of specimens were fixed either in 10 % formalin or in 70 % ethanol, with or without anaesthetization in low concentrations of ethanol. The fixed specimens were dehydrated in a graded ethanol series, cleared in methyl salicylate, and mounted whole on slides in Canada balsam. All measurements are based on whole-mounted specimens. One specimen examined in this study has been deposited in the National Museum of Nature and Science, Tokyo, Japan (NSMT-An-412) and other specimens have been deposited in author's collection.

**Abbreviations in the figures**

- b: brain
- c: coelomocyte
- cc: collar of sperm funnel
- dv: dorsal blood vessel
- ecd: spermathecal ectal duct
- mp: male pore
- ne: nephridium
- oe: oesophagus
- ph: pharyngeal pad
- pg: pharyngeal glands
- ppb: postpharyngeal bulb
- sa: spermathecal ampulla
- sf: sperm funnel
- vd: vas deferens

**Cernosvitoviella Nielsen and Christensen, 1959**

*Japanese name: Mijin-himemimizu-zoku, new*

*Cernosvitoviella* Nielsen and Christensen, 1959: 37-38.


**Type species:** *Marionina atrata* Bretscher, 1903.

**Diagnosis:** See Nielsen and Christensen (1959) and Semelz and Collado (2010).

**Remarks:** This is the first record of the genus *Cernosvitoviella* from Japan. Chaetae with sigmoid and nodulus are present in four genera in Enchytraeidae, *Cernosvitoviella, Mesenchytraeus* Eisen, 1878, *Stercutus* Michaelsen, 1888 and *Sinenchytraeus* Liang and Hsü, 1979. The differences are as following combination of taxonomic characters: slender chaetae and conspicuous nodulus in *Cernosvitoviella,* not
slender or stout chaetae and the nodulus may be not more than an abrupt proximal thickening of the chaetae in other three genera; lobed testes present, no spermatheca in only \textit{Sinenchytraeus}; very tall chloragocytes filling out entire coelomic cavity from IV, robust chaetae present, head pore and coelomocytes absent in only \textit{Stercutus}; nephridial postseptal with conspicuous and folded canal, interstitial tissue practically absent in only \textit{Mesenchytraeus}.

\textit{Cernosvitoviella minor} Dózsa-Farkas, 1990

[Japanese name: Mijin-hinemimizu, new]

(Fig. 1)

\textit{Cernosvitoviella minor} Dózsa-Farkas, 1990: 271-272, figs. 11-14; Rota and Healy 1999: 34-35, fig. 1; Dumnicka 2004: 135-136, tab. 1, fig. 3.


Description of new material: Very small worm. Live length 3-5 mm, fixed length 2-3 mm. Width at clitellum ca. 100 \textmu m. Body mostly transparent, partially opaque, white spots caused by accumulations of coelomocytes. Prostomium (Fig. 1a) rounded. Head pore at the tip of the prostomium. Number of segments 20-24. Chaetae (Fig. 1b, c) sigmoid, with nodulus, preclitellar chaetae 22.5-25.0 \textmu m long (most often 23.0-24.0 \textmu m), 1.5-1.7 \textmu m wide, postclitellar chaetae 27.5-33.0 \textmu m long (most often 28-31 \textmu m), 1.5-1.7 \textmu m wide. Chaetal formula (2,3,4,5,2,3,4,5,6; 4,5,6,7,8,9,2,3,4,5,6). Precitellar ventral chaetae (Fig. 1b) nearly equal length in bundles and intersegment. Postclitellar chaetae (Fig. 1c) slightly thinner and shorter than precitellar ones. Chaetae equal-sized in a bundle (Fig. 1b, c).

Clitellum over 1/2XI–1/2XIII, epithelial cells not tall, with slightly irregular shape. Brain (Fig. 1a) in I-II, dorsoventrally compressed and narrow, anterior part convex, posterior part deeply incised, approximately 1.5 times as wide as anterior part, length 70-90 \textmu m, posterior width 50-65 \textmu m. Dorsal blood vessel originating near 13/14. Pharyngeal pad slightly thickened.

No oesophageal appendages. Pharyngeal glands (Fig. 1a) 4 pairs; two primary pairs dorsally at IV and V, two secondary pairs ventrally at V and VI. One paired postpharyngeal bulbs (Fig. 1a) in III. Transition of oesophagus to intestine gradual, no oesophageal or intestinal diverticula.

Two types of coelomocytes (Fig. 1f) present: (1) spindle-shaped, with or without fine points, nucleate, their granular cytoplasm appears whitish under top light, ca. 14-18 \textmu m long in living state, ca. 1.5 times as long as wide. (2) round or oval, filled with distinct, globular vesicles, but showing a granulated cytoplasm after fixation. Chloragocytes (Fig. 1a) dense from V or VI, slightly smaller than coelomocytes. Precitellar nephridia (Fig. 1a) at 6/7 – 9/10, 70-90 \textmu m long, sometimes absent or only one side in 8/9 and 9/10. Anteseptal part of nephridium funnel only. Whole anteseptal about one-fourth or one-sixth total length of nephridium. Postseptal without a distinct transition to efferent duct. Postclitellar nephridia from 16/17.

Testis paired in XI (10/11). No seminal vesicle. Sperm funnel (Fig. 1d) length 35-45 \textmu m, 3-4 times as long as wide, width 10-12.5 \textmu m. Collar (Fig. 1d) as wide as funnel body, pronounced longer than wide, 10-12.5 \textmu m long. Vas deferens (Fig. 1d) ca. 85-100 \textmu m long, moderately short; loose or straight in XII, about 2.5-3.0 times as long as the funnel, in fixed specimens, vas deferens ca. 50-75 \textmu m long, about 1.5-2.0 times as long as the funnel. No distal dilatation in vas deferens. Male pore (Fig. 1d) surrounded by gland cells. Thin bundles of filiform spermatozoa present in front of sperm funnel. One or two oocytes in XII.

Paired spermathecal pores midlateral at 4/5, not attached to oesophaagus. Ampulla (Fig. 1e) more or less oval without gland. Ectal duct 20-28 \textmu m long in living state, ca. 2.5-3.0 times as long as ampullar width. Sperm arranged crosswise in spermathecal ampullae.

Remarks: This is the first record of the \textit{C. minor} from Japan.

The morphology of the present material almost agrees well with the original description by Dózsa-Farkas (1990) and the redescription by Rota and Healy (1999). There have been some differences in the morphologies of \textit{C. minor} between previous and the present descriptions as follows: two types of coelomocytes (spindle and round or oval shaped) present in Japanese specimens and in Rota and Healy (1999), only one type of coelomocytes (spindle shaped) present in Dózsa-Farkas (1990), vas deferens about 2.5-3.0 times as long as the funnel in Japanese specimens and in Dózsa-Farkas (1990), about 5.0 times as long as the funnel in Rota and Healy (1999), vas deferens with no swelling in Japanese specimens and in Dózsa-Farkas (1990), but with a distal swelling in Rota and Healy (1999).

Habitat: The specimens were collected at 10-30 cm depth in wet sandy substrate (hyporheic layer) in the sandbar along the
edge of a mountain stream, covered with tree canopy. Particle size of substrate ca. 0.5-5 cm in diameter. No specimens were collected from the surface of substrate of the locality, nor any layer of the other two study sites in urban downstream. The following macroinvertebrates were collected together with C. minor at the locality: Lumbriculidae sp. (same species as Torii and Ohtaka, 2007); Fridericia perrieri (Vejdovsky, 1878) (Clitellata, Oligochaeta); Mackinia japonica japonica Matsumoto, 1956 (Asellota, Janiroidea); Hydriaea sp. (Insecta, Coleoptera).

**Distribution:** Hungary (Dözsa-Farkas, 1990), Sweden (Rota and Healy, 1999), Japan (present study).

**Discussion**

The members of *Cernosvitoviella* are widely distributed and found in various types of water bodies; limnic or to some extent in marine surroundings, or in permanently wet soil (Nielsen and Christensen, 1959), moist and wet soils, frequent in bogs and moorlands, also oxygen-rich freshwater sediment (Scmelz and Collado, 2010). *C. atrata* (Bretschner, 1903) and *C. carpatica* Nielsen & Christensen, 1959 are common and sometimes abundant in the hyporheic zone of streams in Europe (Lafont and Malard, 2001; Lencioni et al., 2004; Malard et al., 2001). Additionally, *C. atrata* is regarded as indicator of active hydrologic exchanges between surface water and groundwater and intolerant to water pollution (Lafont et al., 2006). The importance of the hyporheic zone as a key component of running water systems has been emphasized repeatedly (e.g., Feris et al., 2003; Kasahara and Hill, 2006; Lafont and Malard, 2001; Lafont et al., 2006). *C. minor* has been found from saturated plant litter and moss in swamps, at the edge of freshwater lakes, and some macroinvertebrates collected together with *C. minor* belong to groundwater animals; Lumbriculidae sp. (many congeners of Lumbriculidae are restricted to groundwater or montane habitat in Kathman and Brinkhurst, 1998); Mackinia japonica japonica (described as subterranean species in Matsumoto, 1976). Though the habitat of the Japanese specimens differed from that of Sweden and Hungary, no specimens were found in urban downstream in this study. In addition, because *C. minor* has not been found from polluted and silted site in Europe, *C. minor* could be a good representative in the same manner as *C. atrata*.

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New record of *Cernosvitoviella minor* from Japan

Figure 1. *Cernosvitoviella minor* from Shizuoka, Japan (NSMT-An-412). (a) Anterior body region (8 segments) of a mature specimen, body interior, dorsal view. (b) Chaeta, bundle of IV, whole mount, side view. (c) Chaeta, bundle of XVI, whole mount, side view. (d) Male pore, Vas deferens, Sperm funnel. (e) Spermatheca. (f) Coelomocytes. All figures from living specimen.