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***Apatania vepsica* IVANOV, 1991 (Trichoptera, Apataniidae): Records from Estonia with taxonomic notes**

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Abstract. *Apatania vepsica*, IVANOV 1991, is reported as a new species to the Estonian fauna. The morphological characters of the last abdominal segments as well as the DNA barcodes were studied. The relationship of *A. vepsica* to the western *Apatania muliebris* MCLACHLAN 1866 species group is discussed.

A. vepsica, new to the Estonian fauna

Three species of the genus *Apatania* (KOLENATI 1847) are known from Estonia (VIIDALEPP et al 2010): *A. wallengreni* MCLACHLAN 1871, *A. stigmatella* (ZETTERSTEDT 1840), and *A. dalecarlica* (FORSSLUND 1942). The fourth species, *A. vepsica*, IVANOV 1991, is now reported as a new species to the Estonian fauna.

One *A. vepsica* female was collected by sweep-netting along the Oostriku stream (Jõgeva, N58.886, E26.047) 2 July 2010 (J. Salokannel leg.). In addition, two females were collected by sweep-netting the springs of Simuna church (Jõgeva, N59.042, E26.403) 2 June 2011 (J. Salokannel & K. Mattila leg.).

Morphological notes

A. vepsica is related to the *A. muliebris* group (IVANOV & GRIGORENKO, 1991) which is composed of several very closely related parthenogenetic taxa in northern Europe: *A. muliebris* MCLACHLAN 1866, *A. cimbrica* (NIELSEN 1950), *A. intermedia* NIELSEN 1950, *A. nielseni* SCHMID 1954, *A. jemlandica* NIELSEN 1969, and *A. kolteriana* NIELSEN 1968 (MALICKY 2004). These taxa are often treated as a group, or even as one species "*A. muliebris*", due to the problems of practical determination.

The structures of the last abdominal segments of the Estonian specimens are associated with *A. vepsica* (IVANOV & GRIGORENKO, 1991). However, the female from the Oostriku stream is somewhat different. The tip of its abdomen is rounded and blunt (Fig 1) while the type specimen has a triangular tip (Fig. 2).

DNA barcodes

The DNA barcodes (HEBERT et al. 2003) of the Estonian specimens were compared with those of *A. vepsica* specimen from the type locality in Russia. The type locality (Novaya Burya) is about 200 km east of the Estonian sites. Also, two specimens of *A. cimbrica* from northern Finland were included in the DNA barcode comparison. The list of DNA-analyzed specimens is presented in Table 1. The sequencing work was a success, the length of each sequence is maximum or close.

The DNA barcode sequences were stored in TRIFL project in the Barcode of Life Database (BOLD; <http://www.barcodinglife.org/>) and analyzed using BOLD's Barcode Gap Analysis tool with BOLD aligner option. The Barcode Gap Analysis showed max 0.31% intra-species distance for the three *A. vepsica* specimens. The distance between *A. vepsica* and *A. cimbrica* was 2.03%. The results are shown in a cladogram (Fig 3).

Discussion

Morphological variation of the tip of abdomen as well as some variation of the DNA barcodes of *A. vepsica* specimens were recognized. All variation may be "permanent" and such forms could be seen as new species or subspecies as these taxa are parthenogenetic and able to clone themselves. It is a human task to define the borders of a species in such cases. Due to scarce material and relatively small variation, we suggest that the specimen from Oostriku is part of the intra-species variation of *A. vepsica*.

Another question is, if *A. vepsica* is a distinct species or a subspecies of the varying *A. muliebris*. In this limited study, the Finnish *A. cimbrica* specimens represented alone the *A. muliebris* group. The DNA barcode distance of about 2% suggests that at least *A. cimbrica* and *A. vepsica* are reasonably well separated. In *Apatania zonella* (ZETTERSTEDT, 1840) group sensu lato, the inter-species distances were 1.4-2.4% (SALOKANNEL et al 2010). However, a wider genetic study of the *A. muliebris* group should be done to clarify its essence.

The Estonian specimens have been reported as *Apatania muliebris* into the DAET project (<http://project.freshwaterbiodiversity.eu/index.php/georeferenced-site-scale-data-of-european-trichoptera-daet>).

Acknowledgements

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References

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Species	Site	Coll. year	Voucher code	Sequence Length
<i>Apatania vepsica</i>	RUS Novaya Burya	2011	JSIk-2013F051	657
<i>Apatania vepsica</i>	EST Simuna	2011	JSIk-2013F072	657
<i>Apatania vepsica</i>	EST Oostriku	2010	JSIk-2015F195	612
<i>Apatania cimbrica</i>	FIN Karigasniemi	2007	ME053	658
<i>Apatania cimbrica</i>	FIN Saana	2002	ME078	658

Table 1. List of specimens in the DNA analysis

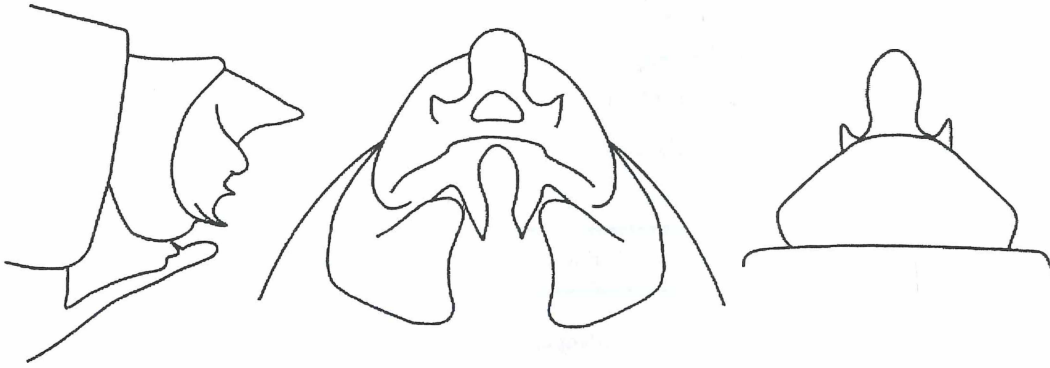


Figure 1. A variation of *A. vepsica* from Oostriku, Estonia (JSIk-2015F195). Lateral, ventral and dorsal view.



Figure 2. *A. vepsica* as in Ivanov & Grigorenko (1991). Lateral, ventral and dorsal view.

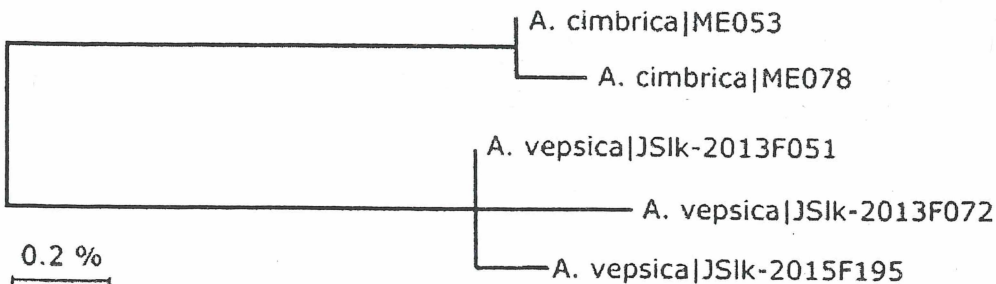


Figure 3. Cladogram of the analyzed *A. vepsica* and *A. cimbrica* specimens.

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