Zootaxa 3937 (3): 564–576
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.3937.3.8
http://zoobank.org/urn:lsid:zoobank.org:pub:F80059F1-A064-44F1-A018-DE94FB7E2081

A new species and a new record of *Trischistoma* Cobb, 1913 (Nematoda: Enoplida: Trischistomatidae) from Shanxi Province, China

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Abstract

This paper describes a new species and gives a new record and a re-description of a known species of *Trischistoma* Cobb, 1913. *Trischistoma taiguensis* sp. nov. is characterized by having one pair of caudal setae on the tail; female body length of 562–699 µm, a = 35–42, b = 4.1–4.7, c = 11–14, c' = 3.9–4.6 and V = 79–82%. For the first time, *Trischistoma pellucidum* Cobb, 1913 is recorded from Shanxi Province, China. The phylogenetic relationships among species in the genus *Trischistoma* were analyzed using data from the SSU (small subunit) and D2/D3 expansion segments of the LSU (large subunit) rDNA sequences. These analyses confirmed that *T. taiguensis* sp. nov. and *T. pellucidum* differ from other known members of the genus for which sequences are available in GenBank.

Keywords: SSU, LSU, morphology, morphometrics, phylogeny, taxonomy, *Trischistoma taiguensis* sp. nov., *T. pellucidum*

Introduction

The genus *Trischistoma* Cobb, 1913 was originally placed in the family Tripylidae, attributed to the order Triplonchida (De Ley & Blaxter 2004; Zullini 2006). Recently, *Trischistoma* was assigned to the family Trischistomatidae and the order Enoplida (Andrássy 2007; Zhao 2011).

Trischistoma is characterized by having the body bent dorsad in the posterior part, six longer outer labial setae and four shorter cephalic setae separated in two circles, a prodelphic female genital tract, vulva located far posterior, very large spermatozoa, spicules not completely surrounded by a muscle layer, and few or no supplements (Andrássy 2006).

Since Andrássy (1985) recognised *Trischistoma* as a valid genus, 12 species have been included in the genus, from all continents except Australia and Antarctica. They are: the type species *Trischistoma pellucidum* Cobb, 1913, *T. monohystera* (de Man, 1880) Schuurmans Stekhoven, 1951, *T. gracile* Andrássy, 1985, *T. equatoriale* Andrássy, 2006, *T. veracruzense* Cid del Prado-Vera, Ferris & Nadler, 2010, *T. minor* Tahseen & Nusrat, 2010, *T. triregius* Zhao, 2011, *T. otaika* Zhao, 2011, *T. waiotama* Zhao, 2011, *T. tukoreha* Zhao, 2011, *T. subtilissimum* Andrássy, 2011 and *T. tenuissimum* Andrássy, 2011.

To date, *Trischistoma monohystera* is the only species reported for the genus *Trischistoma* from China (Zhao 2011). Here, descriptions and illustrations are given for a new species, *T. taiguensis* sp. nov., and a new record of *T. pellucidum* Cobb, 1913. In addition, two molecular phylogenetic analyses, based on partial SSU and D2/D3 sequences, are presented.

 Accepted by K. Davies: 17 Mar. 2015; published: 26 Mar. 2015

Acknowledgements

The research was supported by the Shanxi Province University Key Discipline Construction Program and Shanxi Province Hundred Talents Program.

References

Andrássy, I. (1985) A dozen new nematode species from Hungary. *Opuscula Zoologica, Budapest,* 19, 3–39.

Andrássy, I. (2006) Three new species of the family Tripylidae (Penetrantia: Enoplida) from South America. *International Journal of Nematology*, 16, 208–216.

Andrássy, I. (2007) *Free-living nematodes of Hungary, II (*Nematoda errantia*)*. In *Pedozoologica Hungarica,* No. 4, eds C. Csuzdi & S. Mahunka, Hungarian Natural History Museum and Systematic Zoology Research Group of the Hungarian Academy of Sciences, Budapest, Hungary, 496 pp.

Andrássy, I. (2011) Two unusually slender nematode species of *Trischistoma* Cobb, 1913 (Enoplida: Tripylidae). *Nematology*, 13, 561–567.
http://dx.doi.org/10.1163/138855410x533635

Cid del Prado-Vera, I., Ferris, H. & Nadler, S.A. (2010) Soil inhabiting nematodes of the genera *Trischistoma, Tripylina* and *Tripyla* from Mexico and the USA with descriptions of new species. *Journal of Nematode Morphology and Systematics*, 13, 29–49.

Cobb, N.A. (1913) New nematode genera found inhabiting fresh water and non-brackish soils. *Journal of the Washington Academy of Science,* 3, 432–444.

Darriba D., Taboada G.L., Doallo R. & Posada D. (2012) jModelTest 2: more models, new heuristics and parallel computing. *Nature Methods*, 9, 772.
http://dx.doi.org/10.1038/nmeth.2109

Davies, K.A. & Giblin-Davis, R.M. (2004) The biology and association of *Fergusobia* (Nematoda) from the *Melaleuca leucadendra*-complex in eastern Australia. *Invertebrate Systematics*, 18, 291–319.
http://dx.doi.org/10.1071/is02034

De Ley, I.T., De Ley, P., Vierstraete, A., Karssen, G., Moens, M. & Vanfleteren, J. (2002) Phylogenetic analysis of *Meloidogyne* small subunit rDNA. *Journal of Nematology*, 34, 319–327.

De Ley, P. & Blaxter, M. (2004) A new system for Nematoda: combining morphological characters with molecular trees, and translating clades into ranks and taxa. In *Proceedings of the Fourth International Congress of Nematology*, *8–13 June 2002*, *Tenerife*, *Spain*. *Nematology Monographs and Perspectives* 2, eds R. Cook & D.J. Hunt, Brill, Leiden, The Netherlands, pp. 633–653.

De Man, J.G. (1880) Die einheimischen, frei in der reinen Erde und im süssen Wasser lebende Nematoden, monographisch bearbeitet. Vorläufiger Bericht und descriptiv- systematischer Theil. *Tijdschrift der Nederlandsche Dierkundige Vereeniging,* 5, 1–104.

Dorris, M., Viney, M.E. & Blaxter, M.L. (2002) Molecular phylogenetic analysis of the genus Strongyloides and related nematodes. *International Journal of Parasitology*, 32, 1507–1517.
http://dx.doi.org/10.1016/s0020-7519(02)00156-x

Guindon S. & Gascuel O. (2003) A simple, fast and accurate method to estimate large phylogenies by maximum-likelihood. *Systematic Biology*, 52, 696–704.
http://dx.doi.org/10.1080/10635150390235520

Hooper, D.J. (1986) Handling, fixing, staining and mounting nematodes. *In:* Southey, J.F. (Ed.) *Laboratory Methods for Work with Plant and Soil nematodes*. Reference Book 402, Ministry of Agriculture, Fisheries and Food, London, U.K. pp 59–80.

Larget, B. & Simon, D.L. (1999) Markov chain Monte Carlo algorithms for the Bayesian analysis of phylogenetic trees. *Molecular Biology and Evolution,* 16, 750–759.
http://dx.doi.org/10.1093/oxfordjournals.molbev.a026160

Lluch, J. (1996). Nematodos edáficos del suborden *Tripylina* Andrássy, 1974 hallados en el Parque Natural del Montgó (Alicante, España). *Miscel lània Zoològica,* 19, 93–103.

Nunn, G.B. (1992) Nematode Molecular Evolution. Ph.D. thesis. University of Nottingham, U.K.

Ronquist, F. & Huelsenbeck, J.P. (2003) MR BAYES: Bayesian inference of phylogenetic trees. *Bioinformatics,* 19, 1572–1574.
http://dx.doi.org/10.1093/bioinformatics/btg180

Seinhorst, W. (1959) A rapid method for the transfer of nematodes from fixative to anhydrous glycerine. *Nematologica*, 4, 67–69.
http://dx.doi.org/10.1163/187529259x00381

Tahseen, Q. & Nusrat, T. (2010) Some new and known species of genera *Tripylina* Brzeski and *Trischistoma* Cobb, 1913 (Nematoda) with a discussion on their relationships. *Journal of Nematology,* 42, 128–138.

Thompson, J.D., Gibson, T.J., Plewniak, F., Jeanmougin, F. & Higgins, D.G. (1997) The ClustalX windows interface: flexible

strategies for multiple sequence alignment aided by quality analysis tools. *Nucleic Acids Research*, 25, 4876–4882. http://dx.doi.org/10.1093/nar/25.24.4876

Whitehead, A.G. & Hemming, J.R. (1965) A comparison of some quantitative methods for extracting small vermiform nematodes from soil. *Annals of Applied Biology*, 55, 25–38. http://dx.doi.org/10.1111/j.1744-7348.1965.tb07864.x

Williams, B.D., Schrank, B., Huynh, C., Shownkeen, R. & Waterston, R.H. (1992) A genetic mapping system in *Caenorhabditis elegans* based on polymorphic sequence-tagged sites. *Genetics,* 131, 609–624.

Xu, Y.M., Zhao, Z.Q., Wang, J.M. & Zheng, J.W. (2013) A new species of the genus *Tripylina* Brzeski, 1963 (Nematoda: Enoplida: Trischistomatidae) from Shanxi province, China. *Zootaxa*, 3630 (3), 561–570. http://dx.doi.org/10.11646/zootaxa.3630.3.10

Zhao, Z.Q. (2011) A review of *Trischistoma* Cobb, 1913 (Nematoda: Enoplida), with descriptions of four new species from New Zealand. *Zootaxa*, 3045, 1–25.

Zheng, J.W., Subbotin, S.A., He, S.S., Gu, J.F. & Moens, M. (2002) Molecular characterisation of some Asian isolates of *Bursaphenlenchus xylophilus* and *B. mucronatus* using PCR-RFLPs and sequences of ribosomal DNA. *Russian Journal of Nematology*, 11, 17–22.

Zullini, A. (2006) Order Triplonchida. *In: Freshwater nematodes: ecology and taxonomy*, eds A. Eyualem, I. Andrássy & W. Traunspurger, CABI Publishing, Wallingford, UK, pp. 293–325.