

## **UNIONICOLA (WOLCOTTATA) WENI N. SP. AND U. (WOLCOTTATA) ARCUATOIDES VIDRINE (ACARI: UNIONICOLIDAE) FROM FRESHWATER MUSSELS IN CHINA**

**Malcolm F. Vidrine,<sup>1</sup> Dustin Joubert,<sup>1</sup> Lindsey B. Thomas,<sup>1</sup> Arthur E. Bogan<sup>2</sup> and Wu Xiao Ping<sup>3</sup>**

*1. Division of Sciences, Louisiana State University at Eunice, Eunice, LA 70535, USA (E-mail: mvidrine@lsue.edu);*

*2. North Carolina State Museum of Natural Sciences, Research Laboratory, 4301 Reedy Creek Road, Raleigh, NC 27607, USA (E-mail: arthur.bogan@ncmail.net); 3. Department of Biological Science and Technology, Nanchang University, Nanchang 330047, China.*

**ABSTRACT** - *Unionicola (Wolcottata) weni* n. sp. (Acari: Hydrachnidia: Unionicolidae) is described from freshwater mussels *Arconaia lanceolata* from Nanchang, Jiangxi Province, China. The new mite resembles *U. fengchengensis* Wen and Zhu, 1996, but it can be distinguished by the number of genital acetabula and the morphology of the tarsus of the fourth walking legs. Both species are readily distinguished from *U. arcuata* (Wolcott, 1898) and *U. arcuatoides* Vidrine, 1986 by the shape of the tarsal claws and the morphology of the walking legs. *Unionicola arcuatoides*, previously known only from Japan, is reported from *Acuticosta chinensis* from Nanchang, Jiangxi Province, China.

**Key words** - Acari, Hydrachnidia, Unionicolidae, freshwater mussels, biogeography, China.

### INTRODUCTION

Water mites of the genus *Unionicola* Haldeman (Acari: Hydrachnidia: Unionicolidae) represent a diverse collection of more than 200 species distributed in freshwater habitats on all continents except Antarctica. More than half of the known species are parasites of freshwater mollusks, especially freshwater mussels (Bivalvia: Unionoida) (Vidrine, 1986a, 1996). The mites oviposit in different regions of the mussels, e.g., gills, mantle, and/or foot and this correlates with their current phylogeny (Edwards and Vidrine, 2006).

This paper describes a new species of gill mites in the subgenus *Wolcottata* Vidrine, 1992. There are currently three species in the subgenus: *U. arcuata* (Wolcott, 1898), *U. arcuatoides* Vidrine, 1986b, and *U. fengchengensis* Wen and Zhu, 1996. *Unionicola arcuatoides*, previously known only from Japan (Imamura, 1953), is reported from a new host in China.

The identification and classification of *Unionicola* from tropical parts of the world are poorly studied, and there remains a dire need for study of mussels from Asia. However, recent work on Chinese mites (Wen and Zhu, 1996, 1998, 1999 and Wen *et al.*, 1998, 2005, 2006) revealed new species and host records. There are now 56

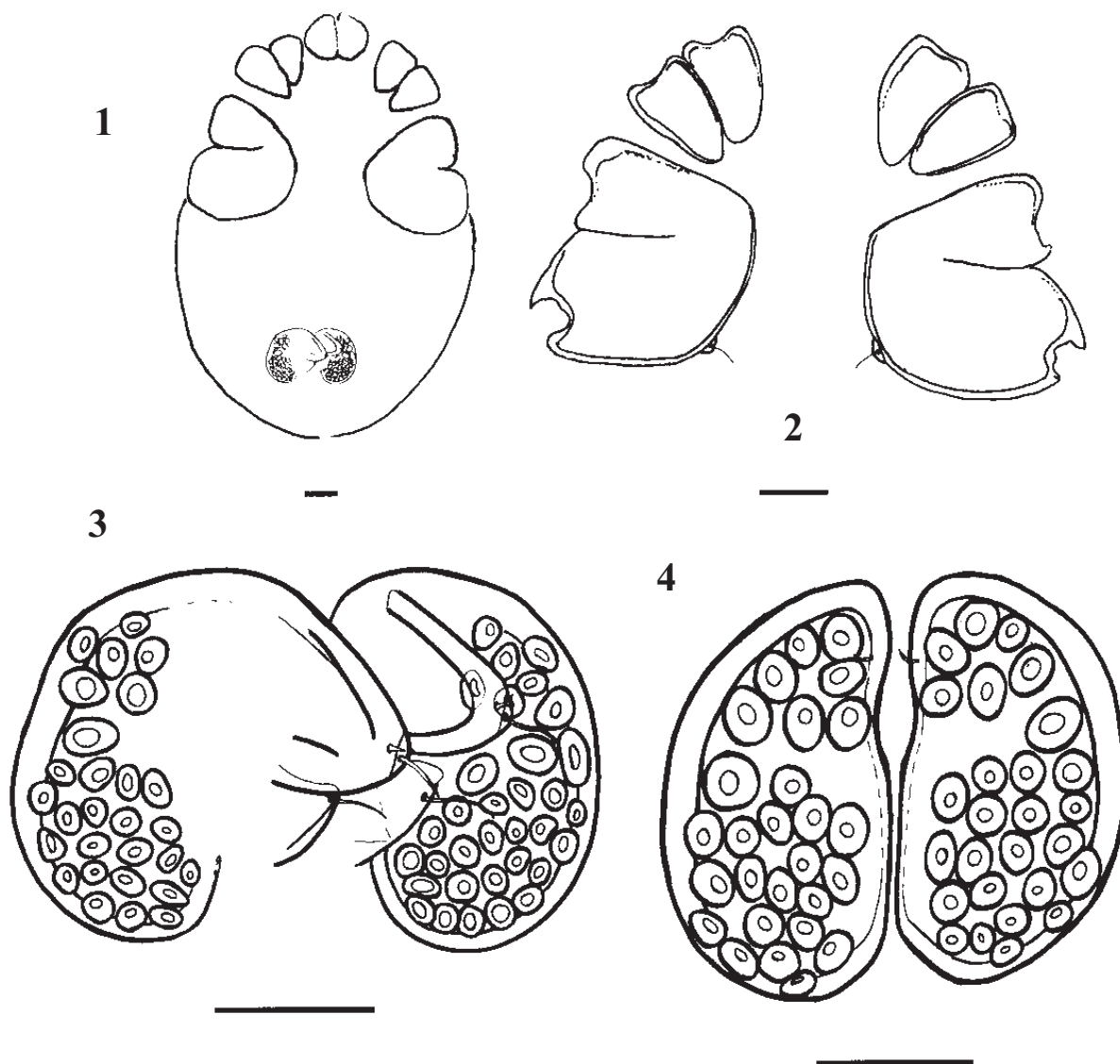
subgenera in *Unionicola* (Smit, 2008). This paper continues the global effort to discover new species in new hosts.

### MATERIALS AND METHODS

Host mussels were collected and examined for mites under a stereomicroscope. Mites were stored in ethyl alcohol. Pencil drawings of the mites were prepared using microscopic views. Descriptions follow that of Vidrine (1996). All measurements are given in micrometers ( $\mu\text{m}$ ). Single specimens of each sex and locale were measured and designated as types.

#### *Unionicola (Wolcottata) weni* n. sp. (Figs. 1-8)

**Diagnosis** - Dorsum apparently lacking a dorsal sclerite and obvious apodemes; venter sclerotized (Fig. 1); coxal plates III and IV with incomplete suture (Fig. 2); female genital field with 27-33 acetabula on each plate, with a pair that is somewhat enlarged (Fig. 3); female genital plates with inner, elongate flaps as is typical for the subgenus (Fig. 3); male genital plate bearing 27 acetabula per side, with a pair that is somewhat enlarged (Fig. 4); pedipalps distinctly cylindrical to subcylindrical



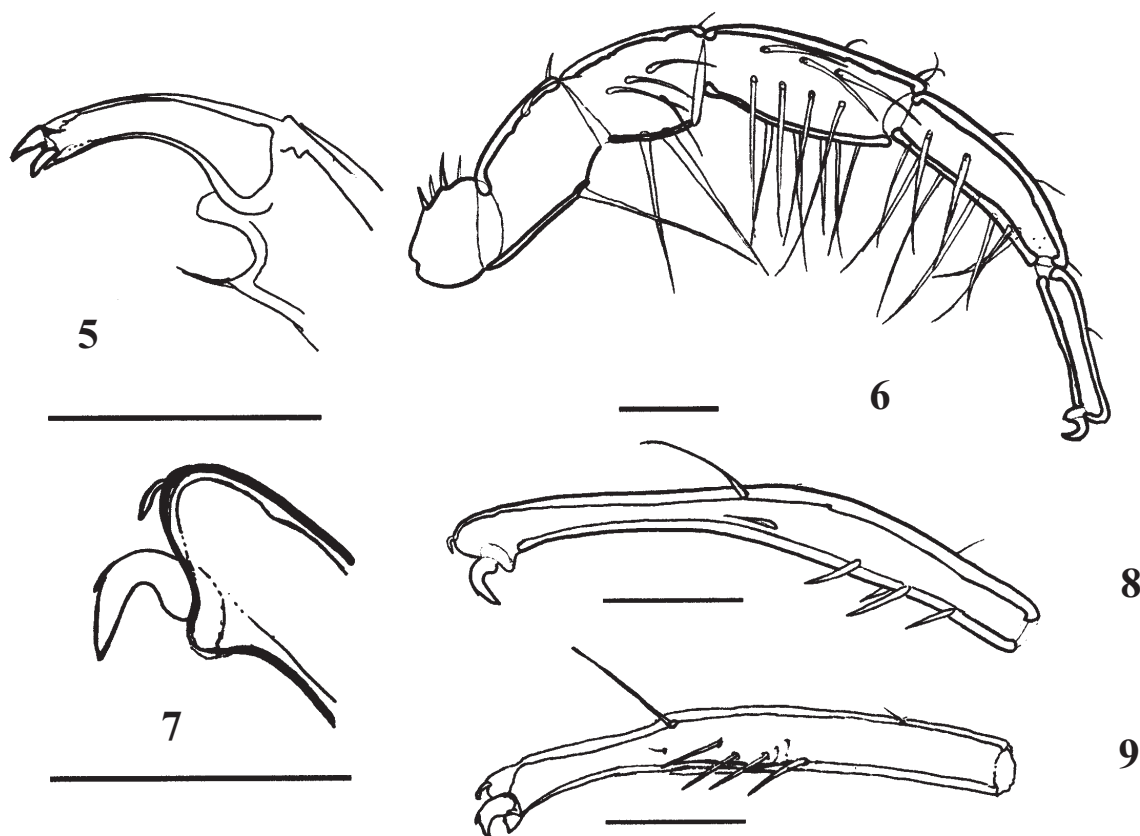
Figs. 1-4 *Unionicola (Wolcottatax) weni* n. sp.- 1. female venter; 2. male coxal plates; 3. female genital field; 4. male genital field (all scales on drawings measure 100µm).

and well-sclerotized both dorsally and ventrally (Fig. 5); pedipalps with two distinctive tarsal clawlets (Fig. 5); male and female walking legs similar to other members of subgenus; first walking leg setose with long setae (Fig. 6); tarsal claws of walking legs vaguely appearing bifid with the dorsal prong reduced to a minute spur (Fig. 7); fourth walking leg setose with long setae; tarsus of fourth walking leg arcuate and resembles that of *U. fengchengensis*, but with setae located nearer the proximal part of the tarsal segment (compare Figs. 8 and 9); small but obvious distal, dorsal, expanded, spoonlike setae above tarsal claws of walking legs (Figs. 7 and 8).

**MALE** (holotype) - Length of body 1278; length of coxal plates III-IV 371; dorsal lengths of pedipalp seg-

ments: P-1 16, P-2 143, P-3 108, P-4 155, P-5 85; length of genital field 253; dorsal lengths of leg segments: I-leg-1 103, I-leg-2 135, I-leg-3 150, I-leg-4 215, I-leg-5 210, I-leg-6 153; IV-leg-1 163, IV-leg-2 160, IV-leg-3 250, IV-leg-4 340, IV-leg-5 485, IV-leg-6 387.

**FEMALE** (paratype) - Length of body 1363; length of coxal plate III-IV 390; dorsal lengths of pedipalp segments: P-1 21, P-2 130, P-3 110, P-4 151, P-5 88; length of genital field 240; dorsal lengths of leg segments: I-leg-1 103, I-leg-2 128, I-leg-3 155, I-leg-4 220, I-leg-5 190, I-leg-6 158; IV-leg-1 190, IV-leg-2 160, IV-leg-3 280, IV-leg-4 390, IV-leg-5 540, IV-leg-6 400.



Figs. 5-8. *Unionicola (Wolcottatax) weni* n. sp. - 5. tarsus of female pedipalp; 6. female first walking leg; 7. distal tip of tarsus of fourth walking leg with spoonlike setae evident over tarsal claws; 8. tarsus of female fourth walking leg. Fig. 9. *U. (Wolcottatax) fengchengensis* Wen and Zhu - tarsus of female fourth walking leg (all scales on drawings measure 100 $\mu$ m).

**Type locality** - Gan Jiang River, 40-45 km downstream from Nanchang, Jiangxi Province, China, April 10-14, 2001, coll. Wu Xiao Ping.

**Hosts** - *Arconaia lanceolata* (Lea, 1856) (Unionoidea: Unionoidea: Unionacea: Unionidae) (North Carolina State Museum (NCSM) catalog number NCSM 26893).

**Etymology** - The species is named after Chungwen Wen, Department of Biological Science and Engineering, Nanchang University, Nanchang 330047, China, to honor him for his work on unionicolid mites.

**Types** - Holotype male is in Department of Entomology, Smithsonian Institution, United States National Museum of Natural History, USNMNH gift # 2046207. Paratype female is in the Canadian National Collections (CNC) in Systematic Acarology, Invertebrate Biodiversity, Environmental Health Program, Agriculture and Agri-food Canada, K.W. Neatby Building, 960 Carling Avenue, Ottawa, Ontario, Canada, CNC type # 23593.

**Remarks** - The new species closely resembles *U. fengchengensis*, which was found in *Unio douglasiae*

Gray in Griffith and Pidgeon, 1834 and *Novaculina chinensis* Liu and Zhang, 1979 (Unionoidea: Unionoidea: Unionacea: Unionidae) (C. Wen, personal communication, 2007). *Unionicola weni* was found in a different host and can be distinguished from *U. fengchengensis*. The obvious difference is that *U. weni* has about half as many genital acetabula per plate as that of *U. fengchengensis*, although the two species are nearly identical in size. Another difference is the arrangement and location of setae on the tarsi of the fourth walking legs (Figs. 8, 9). The tarsal claws of the walking legs of *U. weni* and *U. fengchengensis* possess each a small spur on the dorsal surface rather than an obvious prong. The tarsus of the fourth walking leg is similar to that of *U. fengchengensis* in that it is noticeably shorter and less arcuate than those of *U. arcuata* and *U. arcuatoides*. Thus, *U. weni* can be distinguished from other members of the subgenus by a unique combination of characters including the tarsal claw morphology of the walking legs, the number of genital acetabula, and the morphology of the walking legs.

*Unionicola (Wolcottatax) arcuatooides* Vidrine, 1986b

A single male was provided for examination. The measurements of the leg segments are sufficient to verify its identity.

**MALE** - Length of body 1128; length of coxal plate III-IV 320; dorsal lengths of pedipalp segments: P-1 24, P-2 110, P-3 85, P-4 108, P-5 70; length of genital field 240; acetabula number: 40 in right, 44 in left; dorsal lengths of leg segments: I-leg-1 90, I-leg-2 112, I-leg-3 126, I-leg-4 177, I-leg-5 166, I-leg-6 133; IV-leg-1 179, IV-leg-2 148, IV-leg-3 231, IV-leg-4 350, IV-leg-5 582, IV-leg-6 397.

**Remarks** - *Unionicola arcuatooides*, previously only known from Japan, is reported from *Acuticosta chinensis* (Lea, 1868) (Unionidae) from Gan Jiang River, 40-45 km downstream from Nanchang, Jiangxi Province, China (NCSM 26892) (April 10-14, 2001, coll. Wu Xiao Ping). Imamura (1953) reported this mite from 'freshwater mussels' in Japan and named no specific mussels.

**DISCUSSION**

New host and geographic records for *U. weni* and *U. arcuatooides* extend our knowledge of host and geographic distributions for two members of the subgenus *Wolcottatax*. Wen and Zhu (1999) and Wen *et al.* (2006) extended our knowledge of the host and geographic distributions of *U. arcuata*, the type of the subgenus. They report this mite from *Anodonta* (= *Sinanodonta*) *woodiana* (Rea, 1834) and *Hyriopsis cumingii* (Lea, 1852) in Jiangxi, China and *Cristaria plicata* (Leach, 1815) in Poyang Lake in eastern China, respectively. Previously, *U. arcuata* was known only from North America.

**ACKNOWLEDGEMENTS**

The authors are grateful to North Carolina State Museum (NCSM) for the sharing of specimens. The study was conducted as part of the Undergraduate Research Summer Institute (URSI) at LSUE (Louisiana State University at Eunice) - a program funded by the LSUE Foundation. Van Reed assisted with the preparation of plates. Dr. Chungwen Wen, Nanchang, China provided a drawing of the tarsus of *U. fengchengensis* and additional information from his research (supported partly by his project No. 30571434 from the National Natural Science Foundation of China) for inclusion in the manuscript which is appreciated.

**REFERENCES**

- Edwards, D. D. and M. F. Vidrine. 2006. Host specificity among *Unionicola* spp. (Acari: Unionicolidae) parasitizing freshwater mussels. *J. Parasitol.* 92(5): 977-983.
- Imamura, T. 1953. Water-mites from Gifu Prefecture. *J. Fac. Sci., Hokkaido Univ., Ser. VI, Zool.* 11: 411-471.
- Smit, H. 2008. Australian *Unionicola* (Acari: Hydrachnida: Unionicolidae), with the description of two new subgenera and eight new species. *Zootaxa* 1674: 1-26.
- Vidrine, M. F. 1986a. Revision of the Unionicolinae (Acari: Unionicolidae). *Internat. J. Acarol.* 12(4): 233-243.
- Vidrine, M. F. 1986b. Five new species in the subgenus *Parasitatax* (Acari: Unionicolidae: *Unionicola*) from North America and Asia, with a re-evaluation of related species. *Internat. J. Acarol.* 12(3): 141-153.
- Vidrine, M. F. 1992. Revision of the subgenus *Parasitatax* (Acari: Unionicolidae: *Unionicola*). *Proc. Louisiana Acad. Sci.* 55: 26-30.
- Vidrine, M. F. 1996. *Najadicola* and *Unionicola*: I. Diagnoses of Genera and Subgenera. II. Key. III. List of Reported Hosts. Gail Q. Vidrine Collectables (Eunice, LA). vi + 180 pp.
- Wen, C. and Z. Zhu. 1996. One new species and one unrecorded species of water mites from China (Acari: Hydrachnellae: Unionicolidae). *Acta Arach. Sin.* 5 (2): 92-95 (in Chinese with English summary).
- Wen, C. and Z. Zhu. 1998. A new species of the genus *Unionicola* from China (Acari: Unionicolidae). *Syst. Appl. Acarol.* 3: 171-174.
- Wen, C. and Z. Zhu. 1999. Seven species of water mites in the genus *Unionicola* from Jiangxi (Acari: Unionicolidae). *Acta Zootax. Sin.* 24(1): 30-37 (in Chinese with English summary).
- Wen, C., Z. Zhu and B. Xia. 1998. Description of a new species of the genus *Unionicola* from China (Acari: Unionicolidae). *Acta Arach. Sin.* 7(1): 19-21.
- Wen, C., Q. Gao and Z. Zhu. 2005. One new species of water mites in the genus *Unionicola* (Acari, Unionicolidae) from China. *Acta Zootax. Sin.* 30(3): 535-537 (in Chinese with English summary).
- Wen, C., P. Nie and Z. Zhu. 2006. Population dynamics of the water mite *Unionicola arcuata* (Unionicolidae) in freshwater bivalve *Cristaria plicata* (Unionidae) in Poyang Lake of east China. *Diseases of Aquatic Organisms* 70: 123-127.
- Wolcott, R. 1898. New American species of the genus *Atax* (Fab.) Bruz. *Zool. Bull.* 1: 279-285.