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# North American members of the *reticulata*-like species group of the water mite genus *Kongsbergia* (Acari: Hydrachnidiae: Aturidae)

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## Abstract

Fifteen North American species of the water mite genus *Kongsbergia*, 11 of which are new to science, are described and allocated to the newly proposed *reticulata*-like species group. This group is characterized by synapomorphic contours of the dorsal shield in males in the form of symmetrical ridges, an elevated hump anteromedially and a marked depression posteromedially that bears a medial ridge with the excretory pore at its posterior end. These species are further assigned to six subgroups diagnosed by various shared derived character states of males. Adults of *K. reticulata* Habeeb, 1956, *K.*

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*reticulata labyrintha* Habeeb, 1957, and *K. cyanea* Habeeb, 1981 are redescribed based on examination of types and additional specimens, and all are recognized as full species. The description of adults of *K. robisoni* Radwell and Smith, 2011, is revised slightly based on observations on specimens from recently discovered populations. Adults of 11 new species are described including *K. appalachiana* **sp. nov.**, *K. atkinsonae* **sp. nov.**, *K. cooki* **sp. nov**., *K.crista* **sp. nov.**, *K. crumpae* **sp. nov.**, *K. humeralis* **sp. nov.**, *K. floridana* **sp. nov.**, *K. laurentiana* **sp. nov.**, *K. setosa* **sp. nov.**, *K. texana* **sp. nov.**, and *K. transversa* **sp. nov.**. Distributional data and a key to males for these species are presented.

**Key words:** water mites, new species, stream fauna

## Introduction

The water mite genus *Kongsbergia* is a moderately diverse clade including numerous described species known from streams and interstitial habitats in temperate areas of the Northern Hemisphere and Africa (Cook 1974; Viets 1987). Most described species have been assigned to the subgenus *Kongsbergia* (Viets 1987) and the other four currently recognized subgenera contain one or a few closely related species with highly modified males and do not adequately reflect phylogeny within the genus (see Cook 1974).

Eleven nominate species of *Kongsbergia* have been described previously from North America north of Mexico (Viets 1987; Radwell *et al*. 2011, Radwell & Smith 2012). In this paper, we propose and provide diagnoses for the *reticulata*-like species group with six constituent subgroups to accommodate 15 closely related species of *Kongsbergia* from the United States and Canada. The diagnoses of the *reticulata*-like species group and the subgroups within it are based on synapomorphic contours of the dorsal shield in males. We redescribe the three previously known species of this group based on study of the types and additional specimens, modify the description of one recently described species based on new information, and describe 11 species that are new to science. Species descriptions are based largely on shape, contours, and setation of the dorsal shield in males since these characters proved to be the most useful for distinguishing species. Distributional records are included for all species and a key to males is provided.

This paper is the third of five planned publications revising the North American species of the water mite genus *Kongsbergia* (see Radwell *et al*. 2011 and Radwell & Smith 2012). Future contributions will deal with members of the *semiornata* and *suturata* species groups.

## Methods

Samples were collected by digging and stirring substrata in rocky riffles and gravel bars in streams of depths ranging from 25 to 50 cm using spades, collecting dislodged organisms and detritus in 250 µm nets, and recovering specimens with pipettes as they moved about in shallow trays of water (see Smith *et al.* 2010). Specimens were preserved in modified Koenike's solution, also known as GAW (Smith *et al.* 2010), and representative specimens were cleared in 10% KOH and slide mounted in glycerin jelly. Line drawings were made with a drawing tube and were completed digitally with Adobe© Illustrator CS3. Measurements for all illustrated structures are expressed as ranges in micrometers (µm) with measurements of holotypes following in brackets where appropriate. The terminology follows Smith *et al.* (2010). The following abbreviations are used for the segments of the appendages: Tr, trochanter; Fe, femur; BFe, basifemur; TFe, telofemur; Ge, genu; Ti, tibia; and Ta, tarsus. Width of the dorsal shield is measured at the pair of medial glandularia posterior to the postocular setae and width of the ventral shield includes projections covering insertions of fourth legs. Height of the segments of the pedipalp does not include ventral projections.

Color micrographs were produced with a Leica Z16 APO macroscope and a Leica DFC425 C camera using Leica Application Suite© imaging software. Photographic enhancement was done using Adobe© Photoshop CS3.

In the lists of type specimens and specimens examined the names of certain collectors are abbreviated as follows: David R. Cook as DRC, Herbert Habeeb as HH, Rodger D. Mitchell as RDM, Andrea J. Radwell as AJR and Ian M. Smith as IMS. Specimens are deposited in the Canadian National Collection of Insects and Arachnids (CNC), K.W. Neatby Building, Central Experimental Farm, Agriculture and Agri-food Canada, Ottawa, Ontario, Canada unless stated otherwise. Specimens from the Habeeb Collection are housed in the New Brunswick Museum (NBM) and are currently on loan to the CNC.