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DISTRIBUTION OF CROTALOMORPHIDAE AND PODAPOLIPIDAE (ACARI: HETEROSTIGMATA), ECTOPARASITES OF STENOLOPHUS (COLEOPTERA: CARABIDAE) IN NORTH AMERICA

Robert W. Husband and David O. Husband

ABSTRACT

Eutarsopolipus elzingai Husband (Tarsonemoidae: Podapolipidae), parasitic on Stenolophus comma (Fabricius) and S. lecontei (Chaudoir) (Coleoptera: Carabidae) is reported from southern Canada and the United States from Oregon to Maine and from Michigan to North Carolina. Eutarsopolipus brevichelus Husband and Husband is distributed east of the Rocky Mountains in southern Canada and in the United States from Colorado to Virginia and from Michigan to Louisiana. Crotalomorpha camini Lindquist and Krantz is reported from Kansas and Nebraska east to Massachusetts and from Michigan to Arkansas. Hosts for E. brevichelus and C. camini are S. lecontei and S. comma. Stenolophus fuliginosus (Dejean) is a new host for E. brevichelus in New Brunswick, Canada. S. maculatus (Leconte) in Oregon and S. lineola (Fabricius) in southern California, U.S.A. are newly reported hosts of E. elzingai.

Mites in the family Podapolipidae (Acari: Heterostigmata) are parasites of insects, particularly Coleoptera. Most of the 200 described species are known from relatively few hosts and relatively small areas.

Two exceptions to the limited knowledge of distributions of podapolipid species are illustrated by Locustacarus (Bombacarus) buchneri Stammer (Stammer 1951) and Chrysomelobia labidomerae Eickwort (Eickwort 1975). L. buchneri is found in tracheae of 25 species of bumble bees (Hymenoptera: Apidae; Bombinae) in the northern hemisphere (Husband and Husband 1997). C. labidomerae, a parasite of Labidomera clivicollis (Kirby), Leptinotarsa decemlineata (Say), L. signaticollis (Stal.), L. undecemlineata (Stal.) and L. cacica Stal. (Coleoptera: Chrysomelidae) is widely distributed in North America (Eickwort 1975, Baker and Eickwort 1975, Drummond et al. 1984, Houck 1992, Abbot and Dill 2001).

The first parasitic mite species noted from Stenolophus, (Coleoptera: Carabidae) Crotalomorphidae (Acari: Heterostigmata), was illustrated by Krantz (1970) based on an unpublished drawing by Joseph Camin. The species was later described as Crotalomorpha camini Lindquist and Krantz (Lindquist and Krantz 2002) from Stenolophus (Agonodorus) lecontei (Chaudoir) and Stenolophus sp. collected in eastern Kansas and Nebraska. The second species described from S. lecontei and S. comma (Fabricius) was Eutarsopolipus elzingai Husband (Acari: Prostigmata: Heterostigmata) (Husband 1998) from Arkansas, Indiana, Michigan, Missouri and Texas. Husband and Husband (2004) discussed the distribution of podapolipid parasites of Michigan Stenolophus and summarized previous studies of these parasites. The purpose of this paper is to report additional Stenolophus species as hosts for subelytral acarine parasites and observations on the occurrence of these parasites in southern Canada and the U.S.A.
METHODS AND MATERIALS

More than 2500 Stenolophus were borrowed from the collections of the following institutions: University of Alberta, Canada, University of Arkansas, California Academy of Sciences, Florida Department of Agriculture, Harvard University, Illinois Natural History Survey, Iowa State University, Kansas State University, Los Angeles County Museum of Natural History, Michigan State University, University of Michigan, University of Missouri, Ohio State University, Oklahoma State University, Oregon State University, Purdue University, Texas A. & M. University, and Texas Tech. University. Twenty-two species of Stenolophus from Canada and the United States from these collections were examined for subelytral parasitic mites using the technique described in Husband and Husband (2004). Mites were studied with the aid of a Zeiss phase contrast microscope with an ocular micrometer. The terminology for mite structures used here follows Lindquist (1986).

RESULTS

Three species of Heterostigmatina were recovered from the examined collections of Stenolophus: Eutarsopolipus elzingai, and E. brevichelus Husband and Husband (Tarsonemoida: Podapolipidae) and Crotalomorpha camini (Dolichoxyboidea: Crotalomorphidae).

Characteristics of the three species of mites are discussed in Husband and Husband (2003, 2004). Figures of adult females are reproduced here with their distribution patterns in North America (Figs. 1-3). Specific records of localities in Michigan are found in Husband and Husband (2004).

Figure 1. Distribution of Eutarsopolipus elzingai, a parasite of Stenolophus comma, S. lecontei, S. lineola and S. maculatus.
Figure 2. Distribution of *Eutarsopolipus brevichelus*, a parasite of *Stenolophus comma*, *S. fuliginosus* and *S. lecontei*.

Figure 3. Distribution of *Crotalomorpha camini*, a parasite of *Stenolophus comma* and *S. lecontei*. 
Distribution of *Eutarsopolipus elzingai*. All records cited here are from *Stenolophus comma* unless otherwise noted.

New distribution records in Canada are: **Alberta**: Lethbridge, 25 July 1956 and 8 July 1972; **British Columbia**: Boundary Bay, 46°00'N, 123°03'W, 1 June 1958; **Quebec**: Como, July-August 1933; **Saskatchewan**: 9 km. NE Robsart, 21 May 1976 (Fig. 1).


Distribution of *Eutarsopolipus brevichelus*. All records in Canada and U.S.A. are from *Stenolophus comma* unless otherwise noted. New distribution records for Canada are: **Alberta**: Lethbridge, 8 July 1972, Medicine Hat, 21 July 1956, near Ralston- 50°16'N, 111°34'W, 10 May 1955; **Saskatchewan**: 9 km, NE Robsart, 21 May 1976, 16 mi. S. Cypress Hill Park, Route 21, 28 June 1955, 2 July 1967; **New Brunswick**: Penobsquis, 29 July 1926, host *S. fuliginosus* (Dejean) (Fig. 2).

Co., host *S. lecontei*, Falls Church, 12-15 July, no year, host *S. lecontei*; Wyoming: Platte Co., 11.5 mi. SW Fort Laramie, 29 July 1964 (Fig. 2).

Male, female and larval instars of *E. elzingai* and *E. brevichelus* were removed from under the elytra of one host *S. comma* or *S. lecontei* from Alberta and Saskatchewan, Canada and Michigan, New Mexico, Ohio and Wyoming, U.S.A. Less than 10% of infested *Stenolophus* were parasitized by both *E. elzingai* and *E. brevichelus*.

**Distribution of Crotalomorpha camini.** Previous records are from *S. lecontei* or *Stenolophus* species from eastern Kansas and Nebraska (Lindquist and Krantz 2002), from *S. lecontei* from northern Oklahoma and western Arkansas (Husband and Husband 2003), and from *S. lecontei* and *S. comma* in Michigan (Husband and Husband 2004).

New distribution and host records from *S. comma* are: Illinois: Champaign Co., Urbana, Oct. 1925 and 31 March 1917; Indiana, Lake Co., Hammond (Osborn), 4 June 1911 and Porter Co., Dune Park, 1 May 1927; Massachusetts: Nantucket Co., Nantucket; North Carolina: Haywood Co., Lake Junaluska, 30 June, 1959; Ohio: Licking Co., Hebron, 10 June 1954 (Fig. 3). The number of *C. camini* per beetle varied from 1-4. No larval instars or nonphysogastric females were found. No individual *Stenolophus* had both *C. camini* and *Eutarsopolipus* mites.

To determine if species other than *Stenolophus lecontei* and *S. comma* may have carried *Eutarsopolipus* or *Crotalomorpha* parasites, we examined the following species of *Stenolophus*: *S. aniceps* LeConte (24), *S. binotatus* Casey (10), *S. carbo* Bousquet and Larochelle (5), *S. cincticollis* Leconte (2), *S. dissimilis* Dejean (6), *S. flavipes* Leconte (2), *S. fuliginosus* (Dejean) (32), *S. fuscatus* Dejean (9), *S. humidus* Hamilton (3), *S. incultus* Casey (1), *S. infuscatus* Dejean (29), *S. limbalis* Leconte (16), *S. lineola* (Fabricius) (157), *S. maculatus* LeConte (18), *S. ochraceus* (Say) (5), *S. peregrinus* Casey (4), *S. plebejus* Dejean (12), *S. rugicollis* Leconte (4), *S. seminatans* Casey (2), *S. spetus* Dejean (2). In addition to *S. comma* and *S. lecontei* hosts, we found *E. brevichelus* on *S. fuliginosus* (1) and *E. elzingai* on *S. lineola* (1) and *S. maculatus* (1).

**DISCUSSION**

Ball and Bousquet, in American Beetles, Volumn 1 (Arnett and Thomas 2001), stated the range of Nearctic *Stenolophus* is transcontinental from southern Canada to the Mexican border and Gulf Coast. They recorded the habitat for *Stenolophus* as damp meadows, near borders of lakes and ponds with night flying adults often seen at lights. Parasites of *Stenolophus* would be expected to have similar distribution.

Studies of distribution of crotalomorphid and podapolipid mite parasites of *Stenolophus* beetles were previously restricted to investigations of relatively few specimens and relatively few species of *Stenolophus* (Lindquist and Krantz 2002 and Husband and Husband 2003). Our survey allows us to make conclusions on the hosts and distribution of these mites with some confidence. *Eutarsopolipus elzingai* is distributed from the Pacific to Atlantic coasts of southern regions of Canadian provinces adjacent to the U.S.A. and as far south as North Carolina, north Texas and New Mexico and southern California (Fig. 1). *E. brevichelus* is distributed east of the continental divide in the Rocky Mountains from southern Alberta to New Brunswick, Canada, in eastern Montana and Wyoming, central Colorado and New Mexico and as far south as Louisiana, U.S.A. (Fig. 2). Records of *Crotalomorpha camini* from Nantucket Island, Massachusetts and the upper peninsula of Michigan indicate that *C. camini* may be found throughout the eastern United States on at least 2 species of *Stenolophus*. 

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The percent of beetles from museums which carried either *E. elzingai* or *E. brevichelus* varied from 0% (2) to more than 10% (5) with the majority of museums 3-8% (11). *Eutarsopolipus* species were collected from late April to early October. Fourteen of more than 2500 *Stenolophus* specimens collected from March to October were found to carry *C. camini* parasites and only one *S. fuliginosus*, one *S. lineola* and one *S. maculatus* were infested by *Eutarsopolipus* species. None of the examined *Stenolophus* represents a preferred host for *C. camini*. We conclude that *C. camini* is rare and that *S. comma* and *S. lecontei* are the major hosts for *Eutarsopolipus* and Crotalomorpha.

We shall continue to examine *Stenolophus* species from different areas of North America for crotalomorphid and podapolipid mites to attempt to understand why *S. lecontei* and one of its parasites, *E. brevichelus*, is found only east of the continental divide and why *E. elzingai* has not been collected in wide areas adjacent to the Gulf of Mexico. A host beetle, *S. lecontei*, is common in the southern U. S. A. and appropriate wet meadow habitats are abundant. It is probable that species of *Eutarsopolipus* from other genera of Carabidae are also more widespread than current reports indicate.

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**LITERATURE CITED**


