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**ECOLOGY AND HOST ASSOCIATIONS OF  
*HISTIOGASTER ARBORSIGNIS* (ACARI: ACARIDAE)  
IN THE GREAT LAKES REGION, PARTICULARLY IN THE  
HURON MOUNTAINS OF NORTHERN MICHIGAN**

Barry M. OConnor<sup>1</sup>

ABSTRACT

*Histiogaster arborsignis* is recorded from subcortical habitats and fungal fruiting bodies in the Huron Mountains of northern Michigan. Deutonymphs were collected from 15 species of Coleoptera, Hymenoptera and Diptera. Additional host and locality records for this species are provided from other areas in the Great Lakes region.

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Woodring (1963) described *Histiogaster arborsignum* (sic) based upon adults and deutonymphs collected from the galleries of the southern pine beetle, *Dendroctonus frontalis*, in loblolly pine, *Pinus taeda*, from eastern Texas. Woodring (1966) correctly emended the specific name to *arborsignis* and reported new specimens associated with the galleries or bodies of 14 species of Scolytidae (8 species of *Ips*, 5 species of *Dendroctonus*, and *Orthotomicus coelatus*) as well as a gallery of the woodwasp, *Sirex* sp. These insects and galleries were taken from 8 species of *Pinus* and "fir". The geographic range of the species was extended to include Quebec, Ontario and Saskatchewan in Canada; California, Colorado, South Dakota, Michigan, Ohio, Louisiana, North Carolina, and Georgia in the United States; Sonora, Durango and Puebla in Mexico, and Honduras. A single specimen was reported from brazilnut husks from Brazil intercepted in plant quarantine in Louisiana. Woodring (1969) provided life-history information on this species based on laboratory cultures. Moser and Roton (1971) reported that deutonymphs of *H. arborsignis* would attach to a variety of insect species in the laboratory. Chmielewski (1977) reported *H. arborsignis* from Poland on *Silvanus unidentatus* (Cucujidae) from "bark of exotic trees".

During studies of the astigmatid mite fauna of the Huron Mountains in northern Michigan, *H. arborsignis* was one of the most commonly collected species. In this paper I provide new information on the natural habitats and phoretic hosts of this species.

MATERIALS AND METHODS

Mites were collected on the property of the Huron Mountain Club, Marquette Co., Michigan, during the period 22-28 June 1986 (OConnor and Houck, 1989).

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Detailed descriptions of the habitats are included in Wells and Thompson (1976) and Gosling (1986). Feeding stages of astigmatid mites were recovered from habitat samples examined under a dissecting microscope. Phoretic deutonymphs were recovered from insect hosts which were collected by sweep nets, Malaise traps and pitfall traps. Cultures were attempted by placing live mites in culture dishes with small amounts of the substrate in which they were found (for feeding stages) or brewer's yeast, oatmeal or pieces of freshly killed insect (for deutonymphs). Insect hosts were identified and vouchered with labels reading "Mites removed, B.M. O'Connor" followed by a catalog number. Insect and mite specimens are deposited in the University of Michigan Museum of Zoology.

## RESULTS

*Histiogaster arborsignis* was the only species of *Histiogaster* collected in the Huron Mountains. "*Histiogaster*" *cyclopis* Woodring, 1966, and two undescribed related species were also collected, but these species should not be placed in the genus *Histiogaster* and will be considered in a separate paper. Colonies containing all ontogenetic stages of *H. arborsignis* were recovered from three microhabitat samples as follows.

*Acer saccharum* (sugar maple), subcortical space in fallen log, 24 June 1986, (BMOC #86-0624-1). Mites were observed feeding on two (unidentified) species of fungi on the underside of the bark. Mites were observed in colonies of a black fungus throughout the subcortical area and in colonies of a green fungus occurring in old cerambycid or buprestid galleries. Active and pharate deutonymphs were observed in the latter colonies.

*Acer saccharum* subcortical space in fallen log, 27 June 1986, (BMOC #86-0627-3).

*Pinus resinosa* (jack pine) subcortical space in fallen log, 24 June 1986, (BMOC #86-0624-16). Mites were collected from old cerambycid galleries.

Active deutonymphs but no feeding stages were recovered from the following microhabitats:

*Betula alleghaniensis* (yellow birch), subcortical space in fallen log, 24 June 1986, 2 DN, (BMOC #86-0627-4).

*Piptoporus betulinus* (birch polypore) on *Betula papyrifera* (paper birch), 23 June 1986, 1 DN, (BMOC #86-0623-3).

*Pleurotis ostreatus* (oyster mushroom) on *Acer saccharum* (sugar maple), 23 June 1986, 1 DN, (BMOC #86-0623-47).

Phoretic deutonymphs (DN) were recovered from the following insect hosts:

### COLEOPTERA: BUPRESTIDAE

*Buprestis striata impedita* Say, 23 June 1986, 107 DN, (BMOC #86-0623-14).

*Chalcophora* sp., 22 June 1986, 13 DN, (BMOC #86-0622-3).

### COLEOPTERA: CERAMBYCIDAE

*Acmaeops proteus* (Kirby), 23 June 1986, 22 DN, (BMOC #86-0623-18); 24 June 1986, 4 DN, (BMOC #86-0624-9).

*Monoctonus scutellatus* (Say), 26 June 1986, 1 DN, (BMOC #86-0626-6).

*Physocnemum brevilineum* (Say), 24 June 1986, 4 DN, (BMOC #86-0624-5).

## COLEOPTERA: OSTOMATIDAE

*Grynocharis quadrilineata* (Melshimer), in *Pleurotis ostreatus* (see above, BMOG #86-0623-47), 23 June 1986, 1 DN, (BMOG #86-0623-48); 24 June 1986, 1 DN, (BMOG #86-0624-6).

## COLEOPTERA: SALPINGIDAE

*Pytho americanus* Kirby, 24 June 1986, 26 DN, (BMOG #86-0624-4).

## COLEOPTERA: SCOLYTIDAE

*Ips pini* (Say), in *Pinus banksiana*, 24 June 1986, 1 DN, (BMOG #86-0624-10).

## HYMENOPTERA: BRACONIDAE

*Atanycolous ulmicola* (Viereck), 24 June 1986, 13 DN, (BMOG #86-0624-11); 5 DN, (BMOG #86-0624-12).

## HYMENOPTERA: ICHNEUMONIDAE

*Dolichomitus imperator* (Kreichbaumer), 25 June 1986, 2 DN, (BMOG #86-0625-12).

*Megarhyssa macrurus* (Linnaeus), 26 June 1986, 1 DN, (BMOG #86-0626-15).

*Neoxorides pillulus* Townes, 24 June 1986, 1 DN, (BMOG #86-0624-13).

*Xylophylax macrocephala* (Provancher), 23 June 1986, 1 DN, (BMOG #86-0633-20).

## DIPTERA: ASILIDAE

*Laphria janus* McAtee, 26 June 1986, 1 DN, (BMOG #86-0626-26).

*Laphria postica* Say, 23 June 1986, 1 DN, (BMOG #86-0623-7).

Additional specimens of *H. arborsignis* in the collections of the University of Michigan Museum of Zoology (UMMZ) further extend the known host and habitat associations of the species. Insect hosts have been vouchered with labels "Mites removed, B.M. OConnor" and the collection number as above. Host insects are housed in the UMMZ and the Cornell University Insect Collection, Ithaca, New York (CUIC).

**ILLINOIS:** Pope Co., Bell Smith Springs Recreation Area, 23 October 1982, B.M. OConnor, ex *Phellinus gilvus* (Polyporaceae), 1 DN, (BMOG #82-1023-10). **MICHIGAN:** Berrien Co., Warren Woods State Park, 18 July 1982, B.M. OConnor, ex *Coriolus versicolor* (Polyporaceae), all feeding stages, (BMOG #82-0718-4); Saginaw Co., 13 June 1943, R. R. Dreisbach, ex *Somula decora* (Diptera: Syrphidae) (UMMZ), 20 DN, (BMOG #89-0113-44); Washtenaw Co., Ann Arbor, 21 June 1927, N.K. Bigelow, ex *Somula decora* (Diptera: Syrphidae) (UMMZ), 6 DN, (BMOG #89-0113-45). **NEW JERSEY:** Burlington Co., near Atsion, 23 July 1980, W.L. Brown et al., ex *Enoclerus nigripes* (Coleoptera: Cleridae) (CUIC), 1 DN, (BMOG #80-0808-7). **NEW YORK:** Cortland Co., McLean Reserve, 6 May 1980, B.M. OConnor, ex *Fomes fomentarius* (Polyporaceae) on *Fagus grandifolia* (American beech), 1 DN, (BMOG #80-0506-4); Essex Co., Whiteface Mountain, 24 August

1916, ex *Dolichomitus tuberculatus* (Hymenoptera: Ichneumonidae) (CUIC), 2 DN, (BMOC #78-0927-11); Nassau Co., Plainview, 10 June 1978, M. Huybensz, ex *Glischrochilus quadrisignatus* (Coleoptera: Nitidulidae), 11 DN, (BMOC #79-0612-2); Tompkins Co., Ringwood Preserve, 6 May 1978, B.M. O'Connor, ex unidentified polypore fungus, 1 male, (BMOC #78-0516-1); Tompkins Co., Taughannock Falls State Park, 3 May 1980, B.M. O'Connor, ex *Xyloterinus politus* (Coleoptera: Scolytidae) (CUIC), 4 DN, (BMOC #80-0503-3). **CANADA:** **ONTARIO:** Parry Sound Co., Humphrey Twp., Mogridge Lake, 24 km south of Parry Sound, 28 September 1986, B.M. O'Connor, *Acer saccharum* subcortical space, all feeding stages and deutonymphs, (BMOC #'s 86-0928-1, 4, 5). **QUEBEC:** Montreal, ex *Dolichomitus irratator* (Hymenoptera: Ichneumonidae) (CUIC), 1 DN, (BMOC #78-0927-4).

### DISCUSSION

Although previous literature records suggest that *H. arborsignis* is primarily associated with active galleries of scolytid beetles, these new observations indicate that the species actually has a much broader habitat and host range. The species appears to normally inhabit subcortical spaces in both angiosperms and conifers, and can also colonize fungal fruiting bodies growing on wood. Phoretic associations are also broad, with the common factor among most of the above listed hosts being an attraction to or development in wood. The hosts from which the highest numbers of deutonymphs of *H. arborsignis* were recovered are all beetles whose adult habitat (Cleridae, Ostomatidae, Scolytidae, Salpingidae) or larval habitat (Buprestidae, Cerambycidae) is subcortical. The Hymenoptera used as hosts are all parasitoids of subcortical insects, either Cerambycidae (*D. imperator*, *N. pillulus*, *X. macrocephala*, *A. ulmicola*) or Siricidae (*M. macrurus*). It is interesting to note that the individual *M. macrurus* which carried *H. arborsignis* was a male, one of few male ichneumonids from which astigmatid mites of any species was recovered during this study. This association correlates with the behavior of male *Megarhyssa* which are unusual in being attracted to female oviposition sites on logs (Crankshaw and Matthews, 1981). Of the two genera of Diptera used, *Laphria* species perch on tree trunks from which they pursue prey, while *Somula* females are attracted to moist decaying woody substrates as oviposition sites.

Field observations confirm Woodring's (1969) supposition that *H. arborsignis* is primarily a fungivore. Woodring was able to culture this species successfully using both yeast and powdered mushrooms as food. My cultures maintained separately on yeast and small pieces of polypore fungi survived and reproduced extensively. I also cultured this species for a long period using oatmeal as the only food. In contrast to Woodring's failure to maintain *H. arborsignis* on mealworm tissue, I was also able to culture this species using only freshly killed insects as food.

The natural history of *H. arborsignis* appears to be that of a species primarily restricted to subcortical spaces and primarily fungivorous, although other types of food can be utilized. Mites may also leave the subcortical space and colonize relatively long-lived fungal fruiting bodies on the bark surface. Long distance dispersal to new habitats is achieved through phoretic association with essentially any insect that develops in or visits the subcortical space. Dispersing deutonymphs may also migrate to the bark surface through insect emergence holes where they may encounter other potential phoretic hosts. This pattern of relative habitat specificity but little specificity for phoretic hosts is common in most genera in the acarid subfamily Rhizoglyphinae related to *Histiogaster*. The species is widely distributed in temperate and tropical North America and has also been reported from Brazil and Poland although the association of the latter record with "exotic trees" may indicate an introduction.

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