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**TWO NEW GENERA OF HEMISARCOPTIDAE  
(ACARI: ASTIGMATA) FROM THE HURON MOUNTAINS OF  
NORTHERN MICHIGAN**

Barry M. OConnor<sup>1</sup> and Marilyn A. Houck<sup>2</sup>

ABSTRACT

Two new genera and species of Hemisarcoptidae, *Superioropus huronmontanus* and *Huronopus michiganensis* are described from deutonymphs phoretic on ichneumonid wasps from the Huron Mountains, Marquette County, Michigan.

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The family Hemisarcoptidae is a poorly known group of astigmatid mites associated with a wide variety of insects. OConnor (1982) diagnosed the family and recognized 5 genera: *Hemisarcoptes*, species of which are predators of diaspidid scale-insects with deutonymphs phoretic on coccinellid beetles of the genus *Chilocorus*; *Linobia*, the single species of which is an ectoparasite of the chrysomelid beetle, *Chrysomela populi* in Europe; *Congovidia*, most species of which are known only from deutonymphs phoretic on a variety of insect groups from Europe, Africa and South America; *Nanacarus*, a Holarctic genus known from polypore fungi and synanthropic habitats; and *Divilia*, with a single described species from ants in the Soviet Union.

Volgin and Mironov (1979) described the genus *Nanacaroides* from a single species from a polypore fungus from Siberia. OConnor (1984) regarded this genus as a synonym of *Congovidia*, however, this synonymy was based upon ancestral character states retained in both genera. We now believe *Nanacaroides* should be regarded as a valid genus. Finally, Fain (1987) added a seventh genus, *Espletiacarus*, described from a deutonymph collected from flowers of *Espletia incana* (Asteraceae) in Colombia. Fain (1988) has given additional information on character states in some of these genera.

To date, only 2 species of Hemisarcoptidae have been described from the Nearctic region, *Hemisarcoptes malus* (Shimer 1868) and *H. cooremani* (Thomas 1964). As part of a systematic revision of the family, we have collected free living stages and phoretic deutonymphs representing a number of new species in North America.

MATERIALS AND METHODS

Insects were collected on the property of the Huron Mountain Club by sweep net, Malaise traps and pitfall traps during the summers of 1986 and 1987. The site consists of mixed deciduous and coniferous forest, and attempts were made to collect in as many habitat types as possible. Detailed descriptions of the habitats are included in Wells and Thompson (1976) and Gosling (1986). Whenever possible, insects were collected and

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stored in individual vials to prevent contamination. Mites were mounted in Hoyer's medium; insect hosts were labelled with voucher numbers and identified by specialists.

## RESULTS

From our extensive collections from the Huron Mountains, we have identified 16 species of Hemisarcoptidae, all previously undescribed. Species in the genera *Congovidia*, *Nanacarus* and *Divilia* will be treated separately. Due to the presence of combinations of ancestral and derived character states, two species could not be included within the named genera without seriously altering generic concepts. These new taxa are described below. In the descriptions, all lengths are given in micrometers ( $\mu\text{m}$ ).

### *Superioropus* New Genus

This genus is known only from the deutonymph.

**Diagnosis:** hemisarcoptid mites with deutonymphs retaining the following ancestral character states: propodosomal and hysterosomal sclerites with linear sculpturing; dorsal hysterosomal chaetotaxy complete, including setae  $d_1$ ; gnathosoma with subcapitulum, separate palps and palpal solenidia; anterior coxal apodemes II not connected to sternum by surface sclerotization; posterior median apodeme free anteriorly, simple posteriorly; tibiae I-II with apical triangular projections; leg setation: tarsi 6-6-4-6, tibiae 1-1-1-0, genua 2-2-0-0, femora 1-1-0-1, trochanters 1-1-1-0, Solenidion  $\omega$ -3 of tarsus I subapical; solenidion  $\sigma$  II present. Derived character states of the known species include the loss of solenidia  $\omega$ -2 from tarsus I and  $\phi$  from tibia III, and the loss of the famulus from tarsus I.

**Type-species:** *Superioropus huronmontanus* n. sp. by original designation.

### *Superioropus huronmontanus* New Species

**Deutonymph** (figs. 1-7). Body ovoid, length and width of holotype  $202 \times 145$ , of two paratypes  $200 \times 150$  and  $205 \times 139$ . Gnathosoma with subcapitulum and palps well-developed; palpal solenidia long, gnathosomal setae absent.

Venter (fig. 1). Coxal fields unsclerotized. Anterior apodemes of coxal fields I fused to form sternum; posterior apodemes I fused to anterior apodemes II; anterior apodemes II with surface sclerotization directed laterally from medial apices; posterior apodemes II with surface sclerotization along  $3/4$  of length; apodemes III directed antero-medially, medial apices not closely associated with posterior median apodeme; anterior apodemes IV fused with median apodeme; posterior apodemes IV underlying anterior margin of attachment organ; median apodeme ending simply. Setae of coxal fields I and III absent, represented by vestigial alveoli; setae of coxal fields IV filiform. Genital opening posterior to coxal fields IV; anterior genital setae long and filiform, positioned at junction of apodemes IV and median apodeme; posterior genital setae filiform, flanking anterior end of genital opening; genital papillae two segmented, elongate and pointed medially. Attachment organ broadly oval, with raised margin; anterior suckers stalked, median suckers relatively small, similar in size to anterior suckers; lateral conoidal setae slightly posterior to a plane connecting centers of median suckers; posterior conoidal setae with bases almost contiguous; anterior, lateral and posterior median cuticular suckers well developed.

Dorsum (fig. 2). Dorsum largely covered by propodosomal and hysterosomal sclerites; sejugal furrow well developed, separating sclerites. Propodosomal and hysterosomal sclerites with a pattern of coarse furrows and smaller pits. Ocelli present near apex of propodosomal sclerite, overlying single pigment spot. Dorsal setation complete for family (ve absent from ancestral astigmatid mite pattern), setae  $d_1$  present but shorter than most

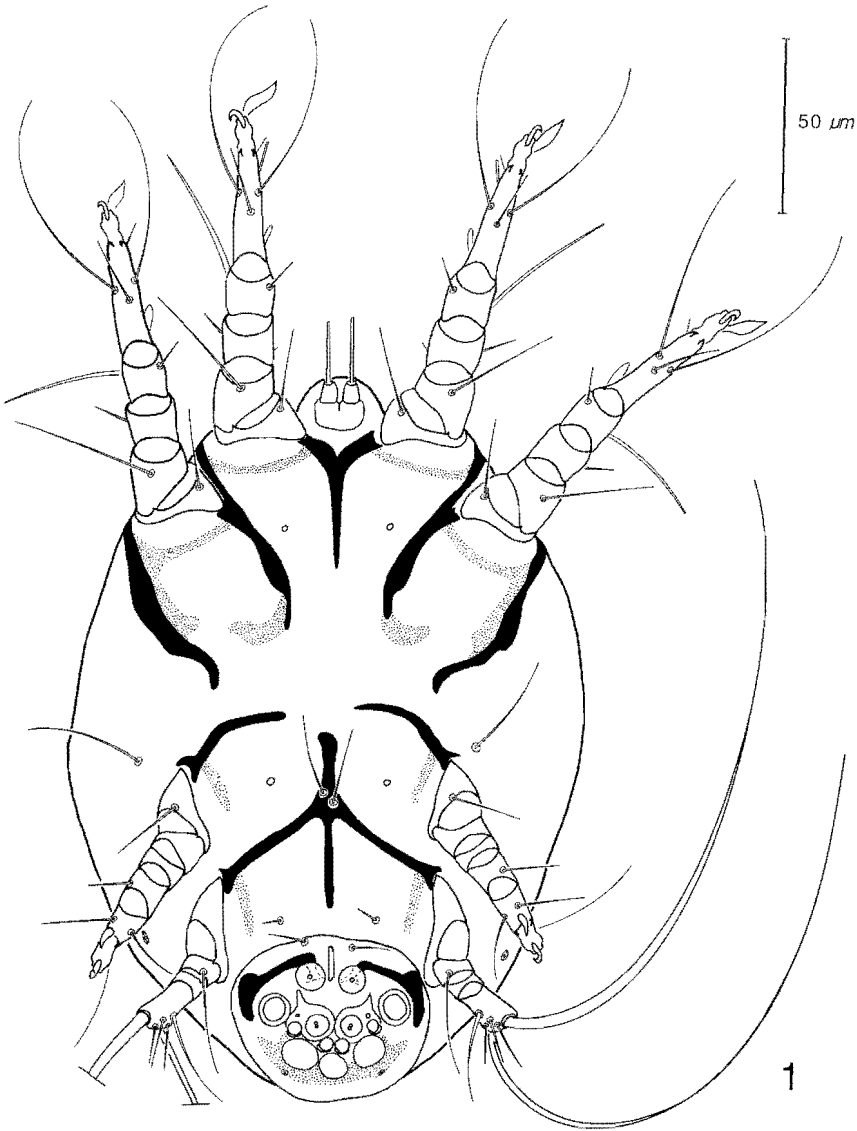


Figure 1. *Superioropus huronmontanus* n. sp. deutonymph, venter.

other dorsal setae. All dorsal setae filiform, supracoxal setae of legs I slightly inflated basally. Cupules *ia* between bases of setae *l1* and *h*; *im* ventral to setae *l3*; *ip* not observed; *ih* ventral, near postero-lateral margins of attachment organ. Opisthotal gland openings between setae *l2* and *l3*.

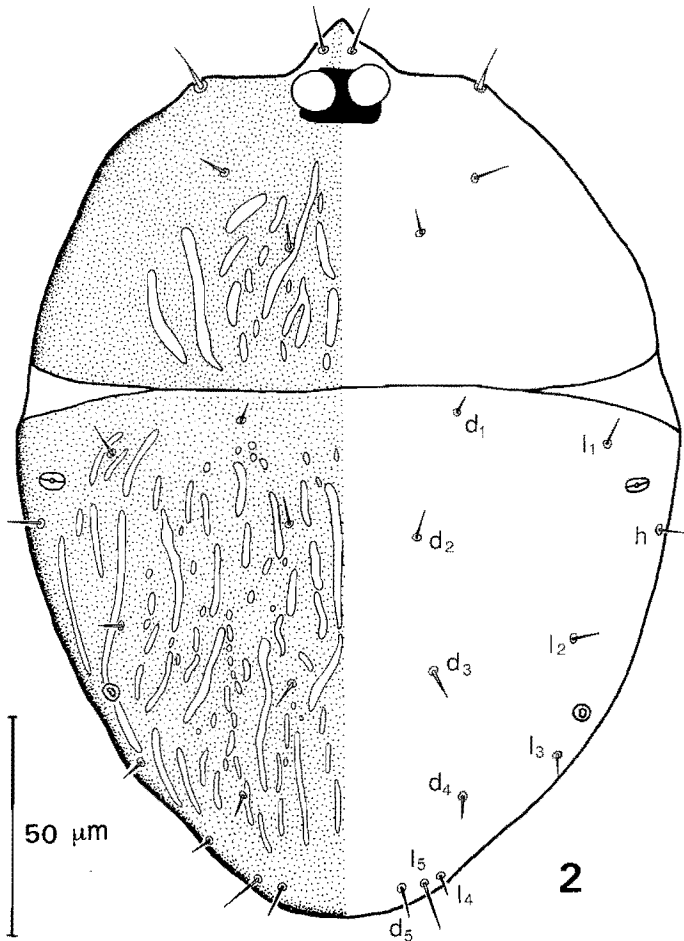


Figure 2. *Superioropus huronmontanus* n. sp., deutonymph, dorsum.

Legs (figs. 3–7, figured from femur-tarsus). Legs similar in structure to other Hemisarcoptidae, all segments free except tibia-tarsus IV fused. Tibiae I–II bear triangular sclerotized processes at their apices. Setation: trochanters 1-1-1-0, all setae filiform; femora 1-1-0-1, all setae filiform, seta *wF* IV extending beyond the apex of leg IV; genua 2-2-0-0, setae *cG*, *mG* filiform; tibiae 1-1-1-0, all setae filiform; tarsi 6-6-4-6, tarsi I–II with ventral setae *la*, *wa*, and *ra* filiform, *la* and *ra* very long, dorsal setae *d* and *e* coupled, setae *d* and *f* short and filiform, *e* foliate; tarsus III with setae *d*, *r* and *w* filiform and ventral seta *s* a heavy spine; tarsus IV with 6 filiform setae: *w* and *d* very long and apical, with *w* (length 211) longer than *d* (length 160), three thin filiform setae (*s*, *p* and *q*, lengths 10–12) more proximo-ventral, and a final, longer filiform seta (*r*, length 23) even more proximal.

Solenidiotaxy: tarsi 2-1-0-0, tarsus I with  $\omega$ -1 basal,  $\omega$ -3 positioned slightly more than

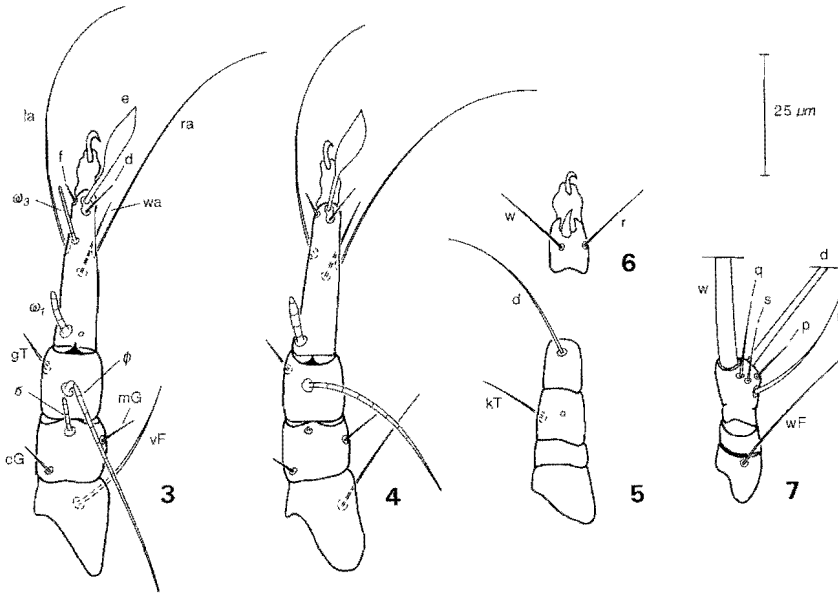


Figure 3-7. *Superioropus huronmontanus* n. sp., deutonymph. 3. Leg I dorsal. 4. Leg II dorsal. 5. Leg III dorsal. 6. Tarsus III ventral. 7. Leg IV ventral.

2/3 the distance from base to apex of tarsus,  $\omega$ -2 absent, position marked by a thin spot in the cuticle; tarsus II with  $\omega$  basal, more spindle shaped than  $\omega$ -1 of tarsus I. Tibiae 1-1-0-0;  $\phi$  I distinctly longer than  $\phi$  II,  $\phi$  III absent, position marked by a thin spot in the cuticle. Genua 1-1-0-0,  $\sigma$  II very short. Famulus not observed on tarsus I. Pretarsi I-III consisting of empodial claw and membranous ambulacrum; condylophores not apparent; pretarsus IV absent.

**Etymology.** The generic name *Superioropus* is derived from Lake Superior, largest of the North American great lakes, and the old generic name *Hypopus* used for astigmatid mite deutonymphs. The specific name *huronmontanus* refers to the Huron Mountains where the specimens were collected.

**Material examined.** Holotype and two paratype deutonymphs from *Exeristes comstockii* (Cresson, 1880) (Hymenoptera: Ichneumonidae): USA, Michigan, Marquette Co., Huron Mountain Club; 26 June 1986; B.M. OConnor (BMOC #86-0626-18). Host wasp deposited in the University of Michigan Museum of Zoology (UMMZ), labelled "Mites removed, B.M. OConnor #86-0626-18". This host also harbored 14 individuals of an undescribed species of *Nanacarus*.

**Type deposition.** Holotype and two paratypes in the University of Michigan Museum of Zoology, Ann Arbor, Michigan.

**Systematic position.** *Superioropus* exhibits the most plesiomorphic morphology of any known hemisarcoptid deutonymph. The retention of 6 setae on tarsus IV is unique in the family (all other taxa have 5 or fewer) and suggests that the genus may be the sister group of all the remaining taxa. Retention of hysterosomal seta *d*<sub>1</sub> is shared only with *Divilia*; all other hemisarcoptid deutonymphs have lost this pair of setae. On the other hand, *Superioropus* shares the loss of solenidion  $\omega$ -2 and the famulus from tarsus I with

*Huronopus* n. gen., *Divilia*, and some but not all *Hemisarcoptes* species. These structures are retained in other hemisarcoptid deutonymphs.

### *Huronopus* New Genus

This genus is known only from the deutonymph.

**Diagnosis:** hemisarcoptid mites retaining the following ancestral character states: gnathosoma with subcapitulum, separate palps and palpal solenidia; anterior coxal apodemes not connected to sternum by surface sclerotization; posterior median apodeme not bifurcate posteriorly; tibiae I-II with triangular apical projections; leg setation: tarsi 6-6-4-5, tibiae 1-1-1-0; genua 2-2-0-0; femora 1-1-0-1, trochanters 1-1-1-0. Apico-dorsal seta *d* of tarsus IV longer than anterior apico-ventral seta *w*; solenidion  $\omega$ -3 of tarsus I subapical, not apical; solenidion  $\sigma$  II present. Derived character states of the known species include the lack of sculpture on the propodosomal sclerite and anterior portion of the hysterosomal sclerite, the loss of dorsal hysterosomal setae *d*1, and the connection of coxal apodemes III to the anterior end of the posterior median apodeme by surface sclerotization, the loss of solenidion  $\omega$ -2 and the famulus from tarsus I, and the reduction to 5 setae on tarsus IV.

**Type-species:** *Huronopus michiganensis* n. sp. by original designation.

### *Huronopus michiganensis* New Species

**Deutonymph** (figs. 8-14). Body elongate-ovoid, length and width of holotype 229  $\times$  154, of one paratype 225  $\times$  150. Gnathosoma as in previous species but palps and palpal solenidia slightly longer.

Venter (fig. 8). Coxal fields largely sclerotized, with an area of striate cuticle extending between posterior apodemes II. Otherwise, coxal fields and apodemes generally as in previous species except coxal apodemes III connected to median apodeme by surface sclerotization. Posterior apodemes IV almost triangular, with a distinct anterior extension. Coxal field setae IV filiform, coxal field III setae represented by vestigial alveoli, no alveoli visible on coxal fields I; genital and subhumeral setae as in previous species. Genital papillae and attachment organ as in previous species.

Dorsum (fig. 9). Dorsum entirely sclerotized except in sejugal region. Sejugal furrow, ocelli, cupules and gland openings as in previous species. Propodosomal sclerite without sculpture, hysterosomal sclerite with sculpture in the form of small, thin furrows and pits restricted to posterior median and lateral regions. Dorsal setae positioned as in previous species, but setae longer and dorsal setae *d*1 absent, represented by refractile spots.

Legs (figs 10-14, figured from femur-tarsus). Legs and leg setation generally similar to previous species with the following differences. On tarsus I, solenidion  $\omega$ -3 is positioned more basally, arising more basal than the ventral position of seta *wa*. Tibia III retains solenidion  $\phi$ . Tarsus IV bears only 5 setae, two very long apical setae, with the dorsal seta (*d*, length 237) longer than the anterior-ventral seta (*w*, length 150); two short filiform setae (*q*, length 17, *s*, length 18) more proximo-ventral and the final seta (*r*, length 24) more proximal, more elongate and thickened basally.

**Etymology.** The generic name *Huronopus* is derived from Lake Huron, the second largest of the great lakes, and the old generic name *Hypopus*. The specific name *michiganensis* refers to the state of Michigan.

**Material examined.** Holotype and one paratype deutonymph from *Neoxorides pillulus* Townes, 1960 (Hymenoptera: Ichneumonidae): USA, Michigan, Marquette Co., Huron Mountain Club; 24 June 1986; B.M. OConnor (BMOC #86-0624-13). Host wasp deposited in UMMZ labelled "Mites removed, B.M. OConnor #86-0624-13". This host also harbored 1 deutonymph of *Histiogaster arborsignis* Woodring (family Acaridae), 1 deutonymph of an undescribed *Nanacarus* species and 4 deutonymphs of an undescribed *Divilia* species.

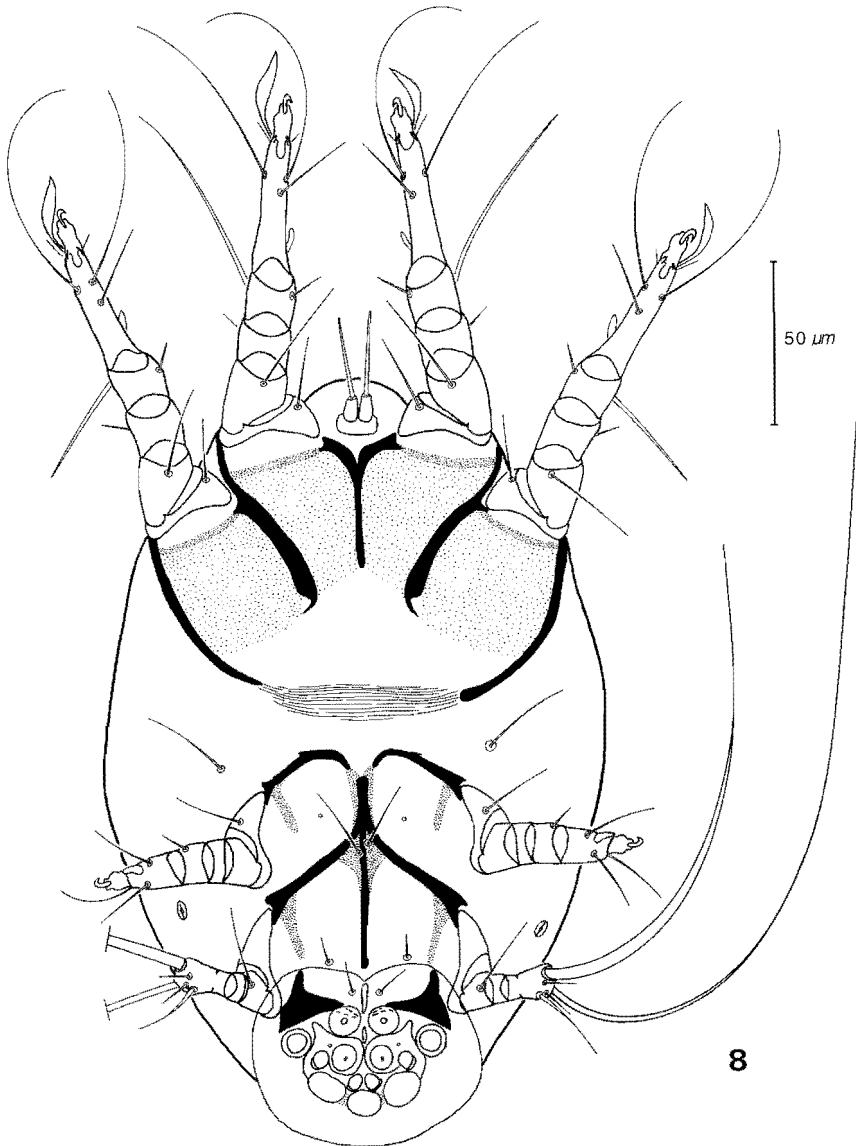


Figure 8. *Huronopus michiganensis* n. sp., deutonymph, venter.

**Type deposition.** Holotype and paratype deposited in UMMZ.

**Systematic position.** *Huronopus* shares with *Divilia* the absence of ornamentation on the propodosomal sclerite, partial fusion of the apodemes of coxal fields III to the



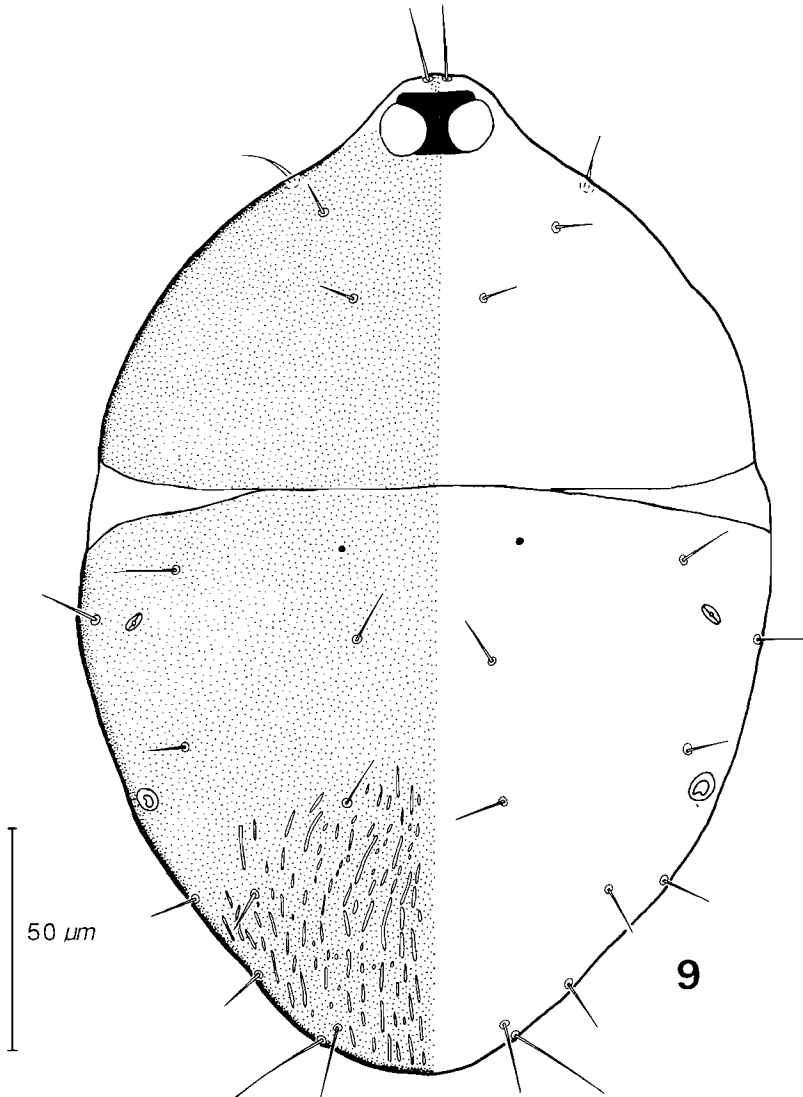
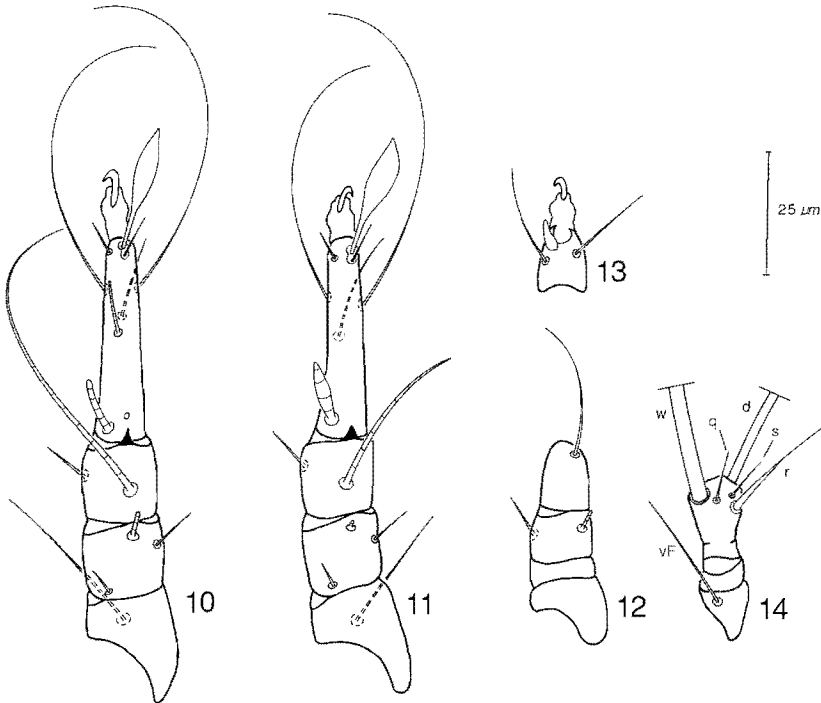


Figure 9. *Huronopus michiganensis* n. sp., deutonymph, dorsum.

posterior median apodeme, relatively long dorsal setae, and seta *d* longer than *w* on tarsus IV, conditions we regard as derived. With respect to the other genera of Hemisarcoptidae (except *Superioropus*), *Huronopus* and *Divilia* retain the more ancestral condition of 5 setae on tarsus IV. The new genus differs from *Divilia* in retaining setae on trochanters I-III and seta *wF* on femur IV and in lacking dorsal hysterosomal setae *d1*. The latter state



Figures 10-14. *Huronopus michiganensis* n. sp., deutonymph. 10. Leg I dorsal. 11. Leg II dorsal. 12. Leg III dorsal. 13. Tarsus III ventral. 14. Leg IV ventral.

is shared with *Hemisarcoptes*, *Congovidia*, *Nanacarus*, *Nanacaroides* and *Espletiacarus*. As noted above, *Huronopus* shares the loss of solenidion  $\omega$ -2 and the famulus from tarsus I with *Superioropus*, *Divilia* and some *Hemisarcoptes*.

#### ACKNOWLEDGMENTS

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