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A NEW SUBFAMILY OF ACARIDAE, THE NAiADACARINAE, FROM WATER-FILLED TREEHOLES (ACARINA: ACARIDAE) ¹

BY

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Lawrence, Kansas 66044

ABSTRACT

A new subfamily of Acaridae, the Naiadacarinae, is established on the basis of a new genus. This genus, \textit{Naiadacarus}, is comprised of two new species from North America: \textit{N. arboricola} from the eastern deciduous forest and \textit{N. oregonensis} from the West coast of the United States. Both species inhabit water-filled treeholes.


The mite family Acaridae consists of two major subfamilies which can be separated on ecological as well as morphological grounds. The Acarinae typically inhabit situations of medium relative humidity such as stored grain or dried fruit, whereas the Rhizoglyphinae are found in quite humid habitats such as leaf litter, rotting bulbs or mold (INESBITT, 1945; KRANTZ, 1960). The present paper describes a new subfamily, the Naiadacarinae, based on two new species of a new genus which inhabits water-filled treeholes.

In the interest of brevity, many features that are clearly illustrated in the figures are not included in written descriptions (e. g., the relative lengths and location of the setae). The chaetotactic nomenclature for the idiosoma is taken from ZARKYATKIN (1941) and that for the legs from GRANDJEAN (1939).

NAIADACARINAE, new subfamily

Acarid mites of medium size (approximately 400 to 600 µ) which inhabit water and feed on decomposing organic matter. Dispersal is through a facultative, mobile hypopus. Sexual

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*Acarologia*, t. XVI, fasc. 1, 1974.
dimorphism well defined, with differences occurring in idiosomal and leg shape as well as chaetotaxy. Anal and tarsal copulatory suckers well developed in male; tarsal copulatory suckers displaced to distal end of tarsus. Females with tubular bursa copulatrix (figs. 8 and 27), and with anal cleft located at posterior margin of idiosoma. Propodosomal shield present in both males and females; opisthosomal shield present in males and also in females of some species. Lateral sclerite and Grandjean’s organ absent; supra-coxal setae present in some species. Setae smooth, never pectinate. Idiosomal setae relatively long, reduced in number, and with setal bases swollen (fig. 1). Legs relatively long and slender; ambulacrum and claws intermediate between those of the Acarinae and Rhizoglyphinae. Setae ra and la located at distal end of tarsus; many tarsal setae spine-like. Famulus, when present, arises from same cushion as solenidion omega₁. Solenidion phi arises one-fourth to one-third of the way back from the distal end of tibia. Sensory rod on distal pedipalpal segment curved inward (fig. 3).

**Naiadacarus**, new genus

The name *Naiadacarus* is compounded from the Greek words *naiados*, meaning water-nymph, and *akari*, meaning mite. Acarid mites which inhabit water-filled treeholes. Dorsal chaetotaxy reduced, with setae v.e., sc.i., h.i., d₁, d₂, sa.i., and sometimes the supra-coxal setae absent. Anal setae absent; three pairs postanal setae present in male and one pair in female. Idiosoma of male relatively broad and narrowing posteriorly; seta d₄ displaced to extreme margin of idiosoma. Spermatheca of female constricted centrally by a sclerotized band with two laterally projecting, funnel-shaped sclerites (figs. 9 and 28). Tarsus with five ventral spine-shaped setae on distal end; seta spine-shaped. Solenidion omega₄ distally placed, arising on preaxial side of claw and arching ventrally. Tarsal seta ba arises from same cushion as solenidion omega₁. Tarsal seta aa absent; famulus absent in some species. Seta nG of leg III absent. Solenidion phi of leg IV of male spine-like, displaced laterally and arching ventrally.

Type species: *Naiadacarus arboricola*, new species.

**Naiadacarus arboricola**, new species

The specific name is compounded from the Latin words *arbor*, meaning tree, and -cola, meaning dweller.

**GENERAL FEATURES** — Chelicerae (fig. 2) possess a pointed mandibular spine (sm); posterior to sm is a forked process which could be the conical appendage. Maxillary spine absent from hypostome (fig. 3), but a pair of setae longer than pedipalps found on ventral surface. Pedipalps with two pairs of setae present on first segment, one pair on second segment, and a curved sense organ (s) located on tip.

Sexual dimorphism pronounced; streamlined idiosoma of male (fig. 4) quite different from oval-shaped female (fig. 6). Male legs longer than those of female; leg III of male extremely long and more massive than in female. In male, seta e of leg III, seta kT of legs III and IV, and seta w of leg IV much larger than in female. Seta w of leg III hairlike in male, not spine-like.
Figs. 1-5: *Naiadacarus arboricola*. 1) seta v.i.; 2) chelicera of male; 3) hypostome of male, ventral view; 4) dorsal view of male; 5) ventral view of male.
as in female. Solenidion phi of leg IV of male a ventral-curving, spinelike structure; not long and whiplike as in female. Setae e and d of tarsus IV of male modified into tarsal copulatory suckers.

**TABLE I.** — Lengths of dorsal setae expressed as a percentage of the idiosomal length.

<table>
<thead>
<tr>
<th>SETA</th>
<th>v.i.</th>
<th>sc.e.</th>
<th>h.e.</th>
<th>la</th>
<th>lp</th>
<th>d3</th>
<th>d4</th>
<th>sa.e.</th>
<th>P2</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>N. arboricola</em> � disadv</td>
<td>20</td>
<td>48</td>
<td>39</td>
<td>29</td>
<td>26</td>
<td>11</td>
<td>28</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td><em>N. arboricola</em> ♀</td>
<td>20</td>
<td>53</td>
<td>38</td>
<td>29</td>
<td>32</td>
<td>15</td>
<td>16</td>
<td>34</td>
<td>47</td>
</tr>
<tr>
<td><em>N. oregonensis</em> ☭</td>
<td>24</td>
<td>54</td>
<td>46</td>
<td>48</td>
<td>43</td>
<td>29</td>
<td>21</td>
<td>28</td>
<td>35</td>
</tr>
<tr>
<td><em>N. oregonensis</em> ♂</td>
<td>21</td>
<td>49</td>
<td>42</td>
<td>44</td>
<td>39</td>
<td>23</td>
<td>14</td>
<td>30</td>
<td>36</td>
</tr>
</tbody>
</table>

**MALE** — (figs. 4 and 5) Mean length of idiosoma of ten males, 521 µ (488-581); width at level of coxae III, 272 µ (250-294). Idiosoma widest at level of setae h.e., gradually narrowing toward posterior end where it is truncate; the posterior portion of idiosoma resembling an elongate trapezoid.

**Dorsal surface:** Lyriform prodorsal shield present, extending from a point slightly anterior to setae sc.e. to bases of setae v.i.; irregular-shaped opisthosomal shield present. Idiosoma with eight pairs of setae; Table I gives their lengths as a percentage of the idiosomal length. Supra-coxal setae absent. Setae d4 displaced to extreme posterior edge of idiosoma, located only slightly anterior to setae sa.e. Three pairs of circular "pores" present on hysterosoma; one pair mesiad and posteriad of seta lp, one pair laterad and posteriad of seta la, and one pair mesiad and posteriad of seta h.e. A pair of lateroabdominal glands (oil glands) present; their openings located midway between setae la and lp.

**Ventral surface:** Two pairs of hairlike coxal setae (c) located on coxae I and III. Genital aperture located between coxae IV and surrounded by three pairs of hairlike genital setae (g). Anus a longitudinal slit considerably removed from posterior edge of idiosoma; an inverted "V-shaped" sclerite at its anterior end and flanked by a pair of well developed anal suckers at its posterior end. Three pairs of postanal setae (pa) present: pa1 and pa3 short, hairlike, and located laterad and posteriad respectively of anal suckers; pa2 long (26% of idiosomal length) and located on a sclerotized ridge near posterior end of idiosoma. A pair of circular "pores" located anteriad and laterad to anal suckers.

Apodemes of legs I fused at midline to form a "Y-shaped" sternum: apodemes of legs II, III, and IV free. Irregular patches of sclerotization over apodemes.

**FEMALE** — (figs. 6, 7, 8 and 9) Mean length of idiosoma of ten ungravid females, 446 µ (415-513); width at level of coxae III, 265 µ (219-296). Idiosoma oval; a ventrally directed, tubular bursa copulatrix at posterior end (fig. 8). Spermatheca (fig. 9) a two chambered structure constricted centrally by a weakly sclerotized band, from which project two small sclerotized "rods".
Figs. 6-9: *Naiadacarus arboricola* female.

6) dorsal view; 7) ventral view; 8) lateral view of posterior portion of idiosoma; 9) spermatheca.
Dorsal surface: Propopodosomal shield as in male; opisthosomal shield absent. Setae d₄ not located on posterior margin of idiosoma as in male, but mesiad and slightly posteriad to seta lp.

Ventral surface: Similar to male, except differs in location of genital apparatus and anus, number of postanal setae, and absence of anal suckers.

Genital aperture located centrally between coxae III and IV and surrounded by three pairs of hairlike genital setae (g). Anal opening a longitudinal slit located at posterior margin of idiosoma. One pair of long (47% of idiosomal length) postanal setae (pa₂) located laterad to the posterior end of anus. A circular "pore" located laterad to anal slit on each side.

LARVA — Similar to female, except dorsal setae d₄ and genital setae (g) absent. Genital suckers absent, but a pair of coxal rods (Bruststiele) located on coxal fields I.

PROTONYMPH — Similar to female, except only one pair of genital setae and one pair of genital suckers present.

TRITONYMPH — Similar to female except for secondary sex structures.

DEUTONYMPH (Hypopus) — (figs. 16, 17 and 18) Mean length of idiosoma of ten hypopi, 246 µ (233-263); width at widest point, 189 µ (174-203). Idiosoma broadly oval; pinkish-beige in living specimens.

Dorsal surface: Dorsum convex and sculptured. Fifteen pairs of short, hairlike setae present; setae pa longest. Opisthosomal glands present but difficult to locate.

Ventral surface: Shape and reduction of gnathosoma typical of acarid hypopi; however, only one pair of setae present on gnathosomal base. Gnathosomal base extending beyond anterior margin of idiosoma.

Apodemes I joined at midline to form a "Y-shaped" sternum; apodemes II free. Apodemes III curve posteriorly to join apodemes IV and enclose coxal fields III. Sternumlike structure formed by fusion of elements of apodemes IV; extending posteriorly to genital slit. A pair of hairlike coxal setae (c) located on coxal fields I and III. Two pairs of genital suckers present. Two pairs of genital setae flank the genital opening; inner pair hairlike and outer pair with stout bases and variable in shape (fig. 18).

Sucker plate (fig. 18) relatively small, consisting of a pair of large sucker surrounded by three pairs of smaller peripheral suckers. The four posterior suckers about equal in size but smaller than the anterior two suckers.

Leg chaetotaxy of all stages — The chaetotactic formula for each leg is given in Table II.

Female (figs. 10-13), Male (figs. 14 and 15) and Tritonymph: Chaetotaxy of female and tritonymph identical except for location of solenidion omega₄. Chaetotaxy of legs I and II similar in male and female, but legs III and IV differ as pointed out in following descriptions.

Trochanter I and femur I each bear a single hairlike seta, pR and vF respectively. Genu I setae (cG and mG) spinelike. Two solenidia, sigma₁ (σ¹) and sigma₂ (σ²), project from same depression on dorsal margin of genu; sigma₂ about twice as long as sigma₁.

Tibia I setae (gT and hT) spinelike. Solenidion phi (φ) long, whiplike, and arising dorsally about one third of the way back from distal margin of tibia I.

Distal end of tarsus I encircled by six spinelike setae: ventrally and laterally by p, u, s,
TABLE 2. — Chaetotactic formulae for the legs of all stages of *Naiadacarus arboricola*. Numbers refer to tarsus, tibia, genu, femur and trochanter respectively.

<table>
<thead>
<tr>
<th>Leg</th>
<th>Setae</th>
<th>Solenidia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Leg I</td>
<td>Leg II</td>
</tr>
<tr>
<td>Adult</td>
<td>12-2-2-1-1</td>
<td>12-2-2-1-1</td>
</tr>
<tr>
<td>Adult</td>
<td>12-2-2-1-1</td>
<td>12-2-2-1-1</td>
</tr>
<tr>
<td>Tritonymph</td>
<td>12-2-2-1-1</td>
<td>12-2-2-1-1</td>
</tr>
<tr>
<td>Hypopus</td>
<td>8-2-2-1-1</td>
<td>9-2-2-1-1</td>
</tr>
<tr>
<td>Protonymph</td>
<td>12-2-2-1-0</td>
<td>12-2-2-1-0</td>
</tr>
<tr>
<td>Larva</td>
<td>12-2-2-1-0</td>
<td>12-2-2-1-0</td>
</tr>
</tbody>
</table>

v and q, and dorsally by e; p and q small and difficult to locate. Four long setae located on distal end of tarsus: seta d longest, whiplike, and located dorsally behind setae e; seta f whiplike, about three-fifths the length of d, and located on the preaxial side of e; setae la and ra hairlike and located on preaxial and postaxial face respectively. Solenidion omega₃ (ω₃) arching ventrally and located on preaxial side of claw in both male and female; larger in male than female. Omega₃ of tritonymph not on extreme distal end of tarsus, but located posterior to seta d by a distance approximately the width of tarsus.

Midregion of tarsus I bears two setae and two solenidia: seta wa spinelike and located ventrally; seta ba a conical spine located on preaxial side of solenidion omega₁ (ω₁) and arising from the same cushion; solenidion omega₁ a long, anteriorly-tapering rod located dorsally; solenidion omega₂ (ω₂) located on postaxial side of omega₁ and arising from the same cushion or posterior to it. Famulus (ε) absent.

Leg II (fig. 11) similar to leg I except for absence of one sigma, omega₆, and omega₃.

Leg III (fig. 12 for female and 14 for male) much reduced in number of setae and solenidia from leg I. Hairlike seta sR present on trochanter; no setae on femur. Genu without setae; a short solenidion sigma present dorsally. Tibia with a long solenidion phi and spinelike seta KT; KT twice as large in male than in female. Tarsus with spinelike setae p, u, s, v and q similar in position to tarsus I, but larger. Seta f of male and female and seta e of female similar in size and position to tarsus I; seta e of male similar in position but much larger. Seta d long, whiplike and arising approximately one third of the way back from distal end of tarsus. Laterad to seta d are located setae r and w which are preaxial and postaxial respectively; seta r hairlike in both male and female; seta w spinelike in female and hairlike in male.

Leg IV (fig. 13 for female and 15 for male) with no seta on trochanter, but a hairlike seta wF on femur; genu with no setae or solenidia. Tibia with spinelike seta KT similar to that of leg III for corresponding sexes. Solenidion phi of female long, whiplike and located dorsally; soleni-
Figs. 10-15: *Naiadacarus arboricola*, postaxial view of tarsus and preaxial view of tarsus, tibia and genu respectively. 10) female, leg I; 11) female, leg II; 12) female, leg III; 13) female, leg IV; 14) male, leg III; 15) male, leg IV.

Dion phi of male located on preaxial face and modified into a stout, downward-curved, spinelike structure. Tarsus of female similar to that of leg III, except seta r spinelike. Tarsus of male similar to leg III, except setae d and e modified into tarsal copulatory suckers located on preaxial side; seta r a small spine and seta w a large spine.

*Larva and protonymph*: The larva and protonymph demonstrate the progressive simplification of chaetotaxy found in the free-living Acaridei. The chaetotactic formula for each leg is given in Table 2. The position and shape of the setae present are, in general, similar to the corresponding setae of the female.
Fig. 16-22: *Naiadacarus arboricola*, hypopus. Scale refers to figs. 16 and 17 only. 16) dorsal view; 17) ventral view; 18) sucker plate region; 19) tarsus I, postaxial view; 20) tarsus II, postaxial view; 21) tarsus III, preaxial view; 22) tarsus IV, preaxial view.
Deutonymph (Hypopus) : (figs. 16-17 and 19-22) Several setae appear for the first time in the hypopial stage: seta pR on trochanters I and II; seta sR on trochanter III; setae wF on femur IV; seta kT on tibia IV; setae e and f on tarsus IV; and solenidion phi on tibia IV.

The hypopus lacks one of the two sigma solenidia present on genu I in all other stages, and possibly seta ba on tarsus I. The distal ventral spine complex (setae p, u, s, v and q) of the tarsi is modified into two long, stout setae (vsc) similar to that found in Acarus siro (A. M. Hughes, personal communication). The famulus is absent in the hypopus as in the other stages.

The chaetotaxy of the hypopus also includes setae l on legs III and IV; this is a additional seta found in no other stage. On tarsus I a third solenidion, omega ?, arises from the same cushion as omega 1 . It could be homologous to omega 3 of the adult, however Hughes (1963) states that omega 3 does not arise until the tritonymphal stage. Since ba is found on tarsus II but not on tarsus I, it is also possible that ba has been modified into or replaced by a solenidion.

The hypopial chaetotaxy also differs from other stages in the shape of many setae; on the tarsus, only wa is spine-shaped. Seta e of tarsus I is expanded distally into a suckerlike structure; and setae f, la and ra of tarsus I and II and setae l, w, and e of tarsi III and IV are expanded at their distal ends into leaflike structures.

HABITAT AND DISTRIBUTION — N. arboricola inhabits water-filled treeholes and utilizes only members of the crystalline syrphid fly genus Mallopa as its dispersal agents. I have collected N. arboricola in the following localities: University of Kansas Sunflower Entomological Reserve, Johnson Co., and University of Kansas Natural History Reservation, Douglas Co., Kansas; University of Michigan Biological Station, Cheboygan Co., Michigan; Cook Forest, Forest Co., Pennsylvania; Anoka, Anoka Co., Minnesota; Devils Den State Park, Washington Co., Arkansas; 0.5 miles north of Williamsburg, York Co., Virginia. Hypopi have been taken from living specimens of Mallopa posticata and M. bautus collected at Sunflower Reserve, from pinned specimens of these flies collected at Raquette Lake, Hamilton Co., New York, and from pinned specimens collected by G. P. Waldbauer at Allerton Park, near Monticello, Illinois, and Masson State Forest, near Forest City, Illinois.

LOCATION OF TYPES — Holotype (male), allotype (female), and male, female, tritonymphal, deutonymphal and larval paratypes will be deposited in the acarine collection of the University of Kansas Snow Entomological Museum, Lawrence, Kansas. Paratypes will be deposited with the following: U. S. Snow Museum, Washington, D. C.; Institute of Acarology, Ohio State University, Columbus, Ohio; Department of Entomology, Oregon State University, Corvallis, Oregon; Canadian National Collection, Ottawa; British Museum (Natural History), London; Laboratoire de Zoologie Medicale, Institut de Medicine Tropicale, Anvers, Belgium; and Zoological Institute of the Academy of Sciences of the USSR, Leningrad.

Naiadacarus oregonensis, new species

The specific name refers to the state of Oregon, the locality from which the mite was collected.

GENERAL FEATURES — Chelicerae and hypostome similar to that found in N. arboricola; dorsal idiosomal setae heavier basally and longer than in N. arboricola.

Sexual dimorphism well defined; idiosoma of male different in shape than that of female. Legs of male longer and more massive than female; leg chaetotaxy differences like those found
Figs. 23-24: *Naiadacarus oregonensis* male. 23) dorsal view; 24) ventral view.
in males and females of *N. arboricola* also occur in this species. Tarsal claw of leg III of male massive, not connected to tarsus by sclerites, and with ambulacrum absent. Tarsi of legs III and IV of male shorter than those of female.

**MALE** — (figs. 23 and 24) Mean length of ten males, 457 \(\mu\) (431-505); width at level of coxae III, 244 \(\mu\) (231-275). Idiosoma egg-shaped; widest at level of coxae III and tapering posteriorly where it is rounded.

**Dorsal surface:** Pyriform propodosomal shield present, extending from setae sc.e. to v.i. Opisthosomal shield beginning at level of setae d₄ and strongly arching anteriorly. Idiosoma bearing nine pairs of setae including a small, peglike, supra-coxal seta (sc); lengths of setae given in Table 1. Seta d₄ displaced to extreme edge of idiosoma and at approximately the same level as the anal copulatory suckers. Setae sa.e. located slightly ventrad and posterior to setae d₄. Location of circular “pores” similar to *N. arboricola*; openings of lateroabdominal glands anteriad and mesiad of seta lp.

**Ventral surface:** Similar to male of *N. arboricola*, however, a few differences occur. Sclerite at anterior end of anal cleft “crescent-shaped”, not “V-shaped”. Setae pa₁ and pa₃ short and spinelike; pa₁ located anteriad and slightly mesiad of anal suckers, pa₃ posteriad to anal suckers. Setae pa₄ long (35% of idiosomal length), located ventrally on the posterior margin of the opisthosomal shield.

**FEMALE** — (figs. 25-28) Mean length of seven ungravid females, 485 \(\mu\) (427-552); width at level of coxae III, 256 \(\mu\) (229-286). Idiosomal shape and bursa copulatrix similar to *N. arboricola*. Spermatheca similar to *N. arboricola* except larger.

**Dorsal surface:** Propodosomal shield as in male; sculptured opisthosomal shield present, but not as heavily sclerotized as in male making it difficult to delimit. Location of setae d₄ as in *N. arboricola*.

**Ventral surface:** Similar to *N. arboricola* except setae pa₂ 36% of idiosomal length.

**LEG CHAETOTAXY OF MALE AND FEMALE** — (figs. 29-34) Similar to that found in *N. arboricola* with a few exceptions. Legs shorter and stouter in comparison to body size than in *N. arboricola*; setae e and the ventral spine complex larger. Seta f of tarsus I short and hairlike, about one-fourth the length of d. Solenidion omega₁ of approximately uniform diameter throughout. Famulus present on tarsus I. Seta d on legs III and IV located only slightly posterior to setae e. Setae r and w of leg III of male long; claw a sessile structure not connected to tarsus by sclerites.

**IMMATURE STAGES** — Unknown.

**HABITAT AND DISTRIBUTION** — The 17 specimens of *N. oregonensis* on which the species description is based were collected from water-filled treeholes near Corvallis, Oregon, by F. Lewis.

**LOCATION OF TYPES** — The holotype male and allotype female are on a single slide along with three male and two female paratypes. They will be deposited in the acarine collection of the University of Kansas Snow Entomological Museum, Lawrence, Kansas. The holotype is the uppermost mite on the left side of the slide and is circled in ink. The allotype is the speci-
Figs. 25-28: *Naiadacarus oregonensis* female. 25) dorsal view; 26) ventral view; 27) lateral view of posterior portion of idiosoma; 28) spermatheca.
Figs. 29-30: *Naiadacarus oregonensis*, postaxial view of genu, tibia and tarsus and preaxial view of tarsus respectively. 29) female, leg I; 30) female, leg II.

Figs. 31-34: *Naiadacarus oregonensis*, preaxial view of genu, tibia and tarsus and postaxial view of tarsus respectively. 31) female, leg III; 32) female, leg IV; 33) male, leg III; 34) male, leg IV.

...men closest to and mesiad and posteriad to the holotype. A slide containing four male and two female paratypes will be deposited in the U. S. National Museum, Washington, D. C.; a slide containing one male and two female paratypes in the collection of the Department of Entomology, Oregon State University, Corvallis, Oregon; and a male paratype in the Institute of Acarology, The Ohio State University, Columbus, Ohio.

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Systematic Position

The genus *Naiadacarus* has many characters which justify its inclusion in the family Acaridae. The integument is thin and smooth, and the idiosoma is divided by a transverse groove into the propodosoma and hysterosoma. A dorsal propodosomal shield is present, and the genital suckers are well developed and finger-shaped. The female lacks an epigynium, and the male possesses both anal and tarsal copulatory suckers. None of the leg setae are pectinate or comb-like. The claws are connected to the tarsi by paired sclerites and surrounded by a wide, fleshy ambulacrum.

Within the Acaridae, *Naiadacarus* has its closest affinity with the subfamily Rhizoglyphinae, but differs from it sufficiently to warrant the formation of a new subfamily. Both the Rhizoglyphinae and the Naiadacarinae demonstrate well-defined sexual dimorphism, reduction in the number of idiosomal setae, smooth dorsal setae which are swollen at the base, and similar tarsal chaetotaxy (e.g., some tarsal setae modified as stout spines, tarsal setae la and ra distally placed, etc.). Both also are characterized by the formation of facultative mobile hypopi. In the Naiadacarinae, however, the length of the dorsal setae; the shape and length of the legs; and the ambulacrum are intermediate between those found in the Acarinae and the Rhizoglyphinae. In addition the Naiadacarinae are smaller in size than the Rhizoglyphinae, possess a tubular bursa copulatrix, have solenidion phi arising one-fourth to one-third of the way back from the distal end of the tibia, and are aquatic. It should be noted, however, that one of the species of the Rhizoglyphinae, *Schweiba cavernicola* Vitzthum, has been collected from aquatic habitats and reared in an aquatic medium (Vitzthum, 1932), although it is also found in leaf litter and decaying trees (Turk and Turk, 1957).

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