

Najadicola (Najadicola) ingens (Koenike 1895)

Genus ***Najadicola*** Piersig 1897

Synonymy-- *Atax* Fabricius 1805 (in part) Wolcott 1899 *Najadicola* Piersig 1897

Etymology-- The term Najades (Naiades) historically referred to "freshwater mussels," and icola means "to dwell within," thus *Najadicola* means "to dwell within freshwater mussels."

Diagnosis-- Body weakly sclerotized with white vermiculate lines visible through the integument; no obvious dorsal plates--dorsum apparently soft; coxae in four groups; suture between third and fourth coxae incomplete; posterior apodemes of first coxa short; posterior apodemes of fourth coxa not apparent; genital acetabula numerous, usually 90-120 per plate; genital plates triangular and wing-like in shape in both sexes; genital plates nearly twice as wide as long and rather closely appressed to the fourth coxae; a pair of larger acetabula occur on each plate about two-thirds of the distance from the median line and approximately in same relative position on the body as the nymphal pair of acetabula; no heavy setae associated with the genital plates in either sex; chelicera separated medially; capitulum with distinct anchoral process; pedipalp with reduced chaetotaxy and no spines or tubercles ventrally on the pedipalp Ti, but a single peg-like seta is present distally and laterally on the Ti; legs with no swimming hairs; legs comparatively short and stocky with peg-like setae, sometimes serrated at their tips; larvae with reddish tinge possessing a wider than long anal plate (typical of the Pionidae and different from the Unionicolidae); claws thick and simple.

Distribution-- North America and southeast Asia (Vidrine and Lieux 1980b).

Notes-- This is the only genus (monobasic) in the subfamily Najadicolinae in the family Pionidae (Simmons and Smith 1984). A single species is currently recognized in this genus; however, a thorough study of this mite species from varied hosts from two continents would probably reveal several species, e. g., the specimens from southeast Asia (Thailand) appear to be a different species. The paucity of searching of mussels for mites in Asia is unfortunate; and the pollution of streams throughout Asia is quickly reducing the opportunity for the discovery of these mites. Simmons and Smith (1984) reported the larvae as parasites on chironomids.

Najadicola ingens (Koenike 1895)

Plates 1-3 in Vidrine (1996a)

Synonymy--

Atax ingens Koenike 1895

Atax (*Najadicola*) *ingens* Koenike 1895 in Piersig (1897), Wolcott (1899), and Utterback (1916)

Najadicola ingens (Koenike 1895), Simmons and Smith 1984, Vidrine 1980a, Piersig (1901), Viets (1936), Wolcott (1905), Humes and Jamnback (1950), Humes and Russell (1951), Humes and Harris (1952), Viets and Plate (1954), Viets (1956), Mitchell (1954, 1955, and 1965), Crowell (1961), Habeeb (1967), Cook (1974), Vidrine (1974a, 1974b, and 1977a), Vidrine et al. (1976), Vidrine and Bereza (1980), Vidrine and Lieux (1980b), Baker (1982), and Smith and Cook (1991).

Recent review: Edwards and Vidrine (2013).

Museum type number(s) and location-- Koenike's collection.

Type locality and host-- Meach Lake, Gatineau Park, Quebec, Canada

Etymology-- The term *ingens* means "large and remarkable." The name *Najadicola ingens* means "large and remarkable mite dwelling within mussels." The species is appropriately named.

Diagnosis-- Character states of the genus.

Male (5 specimens)--Dorsal lengths of pedipalp segments: Ge 140 (110-160); Ti 209 (175-240); Ta 78 (65-90); length of posterior coxal group 414 (290-500); dorsal lengths of segments of walking legs: leg I: TFe 158 (130-180); Ge 208 (180-220); Ti 230 (200-250); Ta 205 (190-215); leg IV: TFe 212 (190-240); Ge 346 (320-370); Ti 378 (360-400); Ta 302 (280-320).

Female (3 specimens)--Dorsal lengths of pedipalp segments: Ge 163 (140-170); Ti 247 (200-280); Ta 97 (80-110); length of posterior coxal group 417 (370-480); dorsal lengths of segments of walking legs: leg I: TFe 197 (180-220); Ge 247 (240-260); Ti 267 (250-290); Ta 230 (220-240); leg IV: TFe 273 (270-280); Ge 423 (420-430); Ti 457 (440-480); Ta 347 (330-360).

Notes-- This species is also known from the Mekong River in Thailand (Vidrine and Lieux 1980b). Females in North American mussels reach sizes to 6.0 mm in length, while females from Asia reach sizes to 7.5 mm in length. These huge mites are found inside the gills of their hosts where they have been reported to physically tear the support structures of the gills and hamper the use of the mussel gill as brood chamber (marsupium). Baker (1982) reported these mites within the pericardial sac of mussel hosts. *Najadicola ingens* has such a wide host range and extensive distribution that it is very possible that several sibling species (an *Artenkreis*), which are currently unrecognized, exist.

Najadicola occurs in large number of species of mussels within several divergent groups. It appears to lack host specificity among these hosts; however, it can become locally abundant in one or two host species within a single locality. This behavior is currently unexplained. While *N. ingens* and *Unionicola* spp. commonly occupy the same hosts, no apparent competition between these mites was observed. Apparently, each species is limited to a specific habitat within their mussel hosts.

Hosts:

- *Alasmidonta heterodon* (Lea 1829): Massachusetts.
- *Alasmidonta undulata* (Say): New York (Baker 1982).
- *Amblema plicata plicata* Say: *Amblema perplicata* (Conrad), Louisiana (Vidrine et al. 1976 and Vidrine 1980a) (included *Amblema plicata perplicata* (Conrad)).
- *Anodonta* sp.: Ontario, Canada (Marshall 1929).
- *Elliptio complanata* (Lightfoot): *Unio complanatus* Lightfoot, Ottawa, Canada (Koenike, 1895, original description); *Unio complanatus* Solander, Michigan (Wolcott 1899) and *Elliptio violaceus* Spengler in Viets and Plate 1954; *Elliptio complanata* Solander, Quebec and New Brunswick, Canada, and Maine, Vermont, New Hampshire, Massachusetts, and Rhode Island (Humes and Jamnback (1950), Humes and Russell (1951), Humes and Harris (1952)); South Carolina and Rhode Island (Vidrine 1980a).

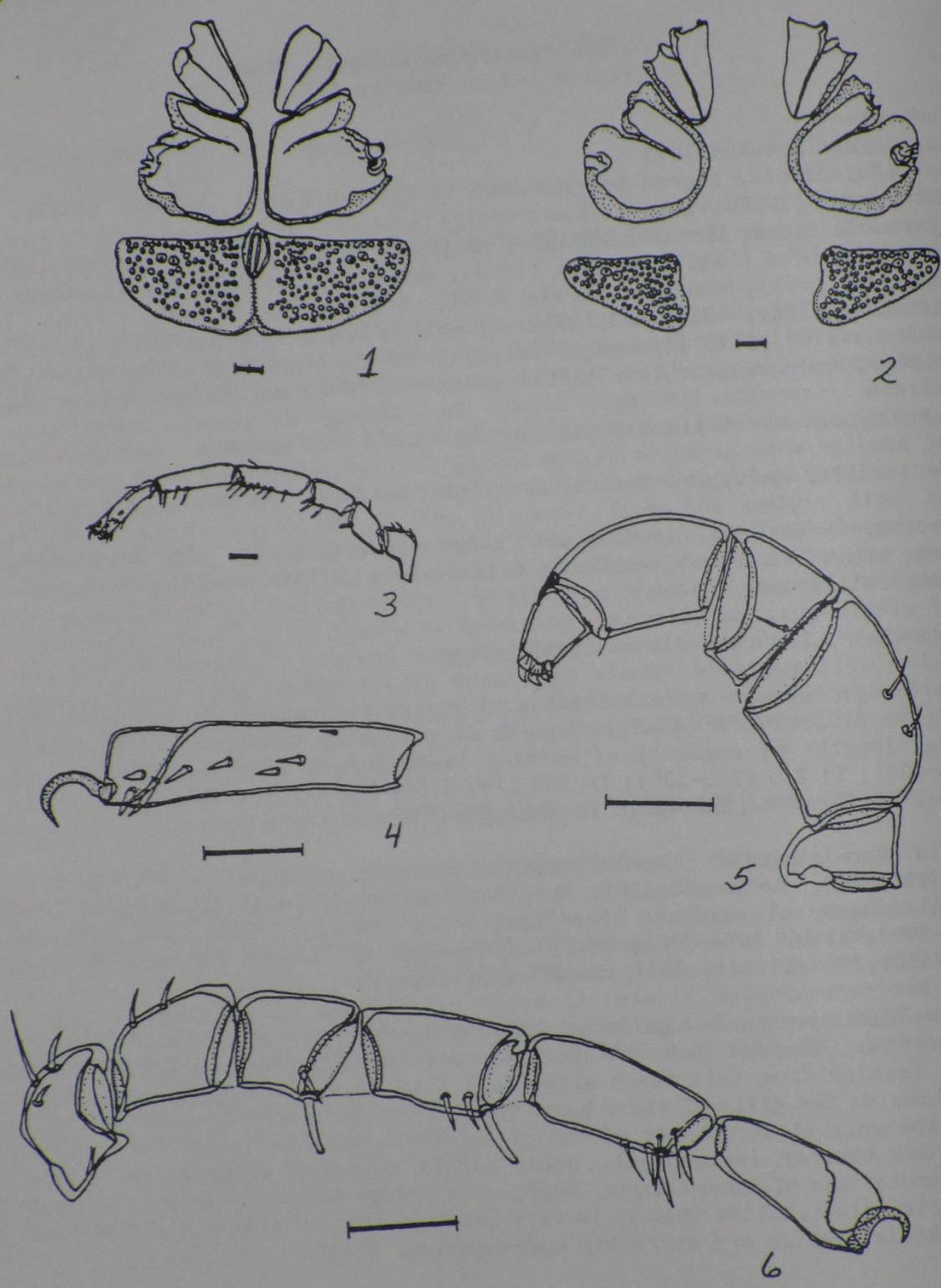
- *Elliptio dilatata* Rafinesque: *Unio gibbosus* Barnes, Michigan (Wolcott 1899 and in Viets and Plate 1954).
- *Fusconaia askewi* (Marsh): *Fusconaia lananensis* (Frierson), Texas (Vidrine 1980a) and Louisiana.
- *Fusconaia cerina* (Conrad): *Fusconaia* sp., Mississippi (Vidrine 1980a).
- *Fusconaia flava* (Rafinesque): *Fusconaia* sp., Louisiana and Ohio (Vidrine 1974a, Vidrine 1977a, Vidrine et al. 1976 and Vidrine 1980a).
- *Lampsilis cardium* Rafinesque: *Lampsilis ovata* (Say), Arkansas (Vidrine 1977a and 1980a).
- *Lampsilis hydiana* (Lea): *Lampsilis radiata* complex, Louisiana and Texas (Vidrine et al. 1976 and Vidrine 1980a).
- *Lampsilis radiata radiata* (Gmelin): *Unio luteolus* Lamarck (some of these specimens may have been confused with *Lampsilis siliquoidea*), Michigan (Wolcott 1899) and *Ligumia fasciata* Rafinesque in Viets and Plate 1954; Quebec and New Brunswick, Canada, and Maine, Vermont, New Hampshire, Massachusetts, and Rhode Island (Humes and Jamnback (1950), Humes and Russell (1951), Humes and Harris (1952)); New York (Simmons and Smith 1984), and Massachusetts.
- *Lampsilis siliquoidea* (Barnes): *Lampsilis radiata siliquoidea* (Barnes) (Vidrine 1980); Michigan (Mitchell 1955).
- *Lampsilis straminea claibornensis* (Lea): *Lampsilis claibornensis* (Lea), Mississippi and Louisiana (Vidrine 1980a).
- *Nephronaias coyensis* (Pilsbry): Mexico.
- *Pleurobema beadleanum* (Lea): *Elliptio beadliana* (Lea), Louisiana (Vidrine 1980a).
- *Pleurobema riddelli* (Lea): Louisiana.
- *Popenaias* sp.: Mexico.
- *Popenaias* sp.: *Popenaias* ?sp. nov., Panuco River system, Mexico (Vidrine 1980a).
- *Popenaias popei* (Lea): Rio Grande, Mexico (Vidrine 1980a).
- *Pyganodon cataracta* (Say): Quebec and New Brunswick, Canada, and Maine, Vermont, New Hampshire, and Massachusetts (Humes and Jamnback (1950), Humes and Russell (1951), Humes and Harris (1952)); *Anodonta marginata* Say (Viets and Plate 1954).
- *Pyganodon fragilis* (Lamarck): *Anodonta fragilis*, Ottawa, Canada (Koenike 1895, original description); Michigan (Wolcott 1899); *Anodonta marginata* Say (Viets and Plate 1954).
- *Pyganodon grandis* (Say): *Anodonta footiana* Lea, Michigan (Wolcott 1899); *Pyganodon grandis footiana* Lea in Viets and Plate 1954; and *Anodonta grandis* Say in Vidrine 1980a.
- *Quadrula pustulosa mortoni* (Conrad): *Quadrula pustulosa* group variable, San Jacinto River, Texas, and Sabine River, Louisiana (Vidrine 1980a).
- *Strophitus undulatus* (Say): *Strophitus edentulus*, Ohio (Kankakee River) (Wilson and Clark 1912).
- *Toxolasma parvus* (Barnes): *Carunculina parva* (Barnes), Louisiana (Vidrine et al. 1976 and Vidrine 1980a).
- *Tritogonia verrucosa* (Rafinesque): Louisiana and Mississippi (Vidrine 1980a).
- *Unio merus declivus* (Say): *Unio merus tetralasmus* (Say) (in part), Louisiana (Vidrine 1977a), Texas and Louisiana (Vidrine 1980a).
- *Unio merus tetralasmus* (Say): Louisiana (Vidrine 1977a), Texas and Louisiana (Vidrine 1980a).

- *Villosa amygdala* (Lea): Kissimmee River, Florida (Vidrine 1980a).
- *Villosa villosa* (Wright): Florida (Vidrine 1980a).

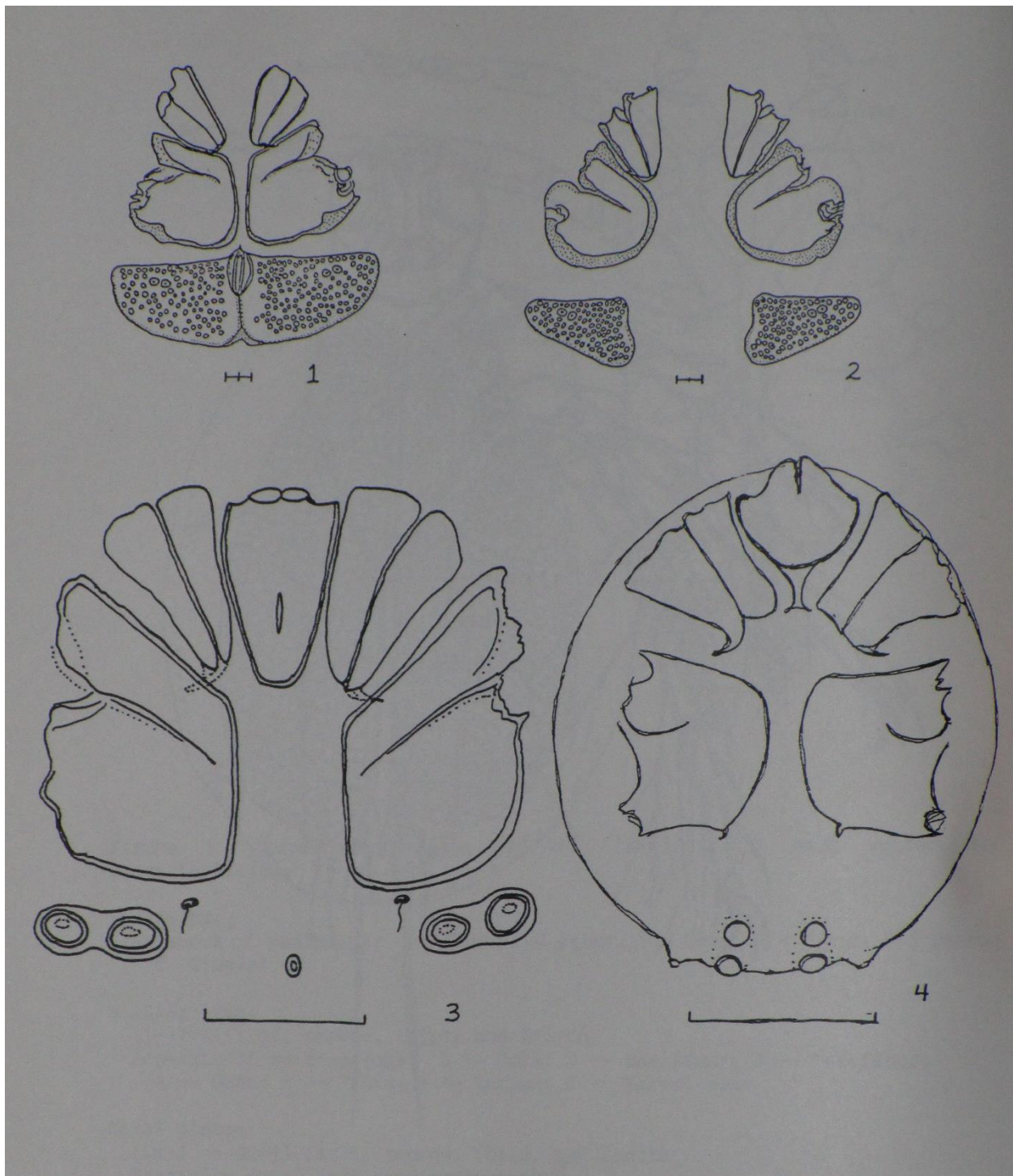


Figure 1. *Najadicola ingens* (Koenike 1895). Larva. Scale equals 100 micrometers.

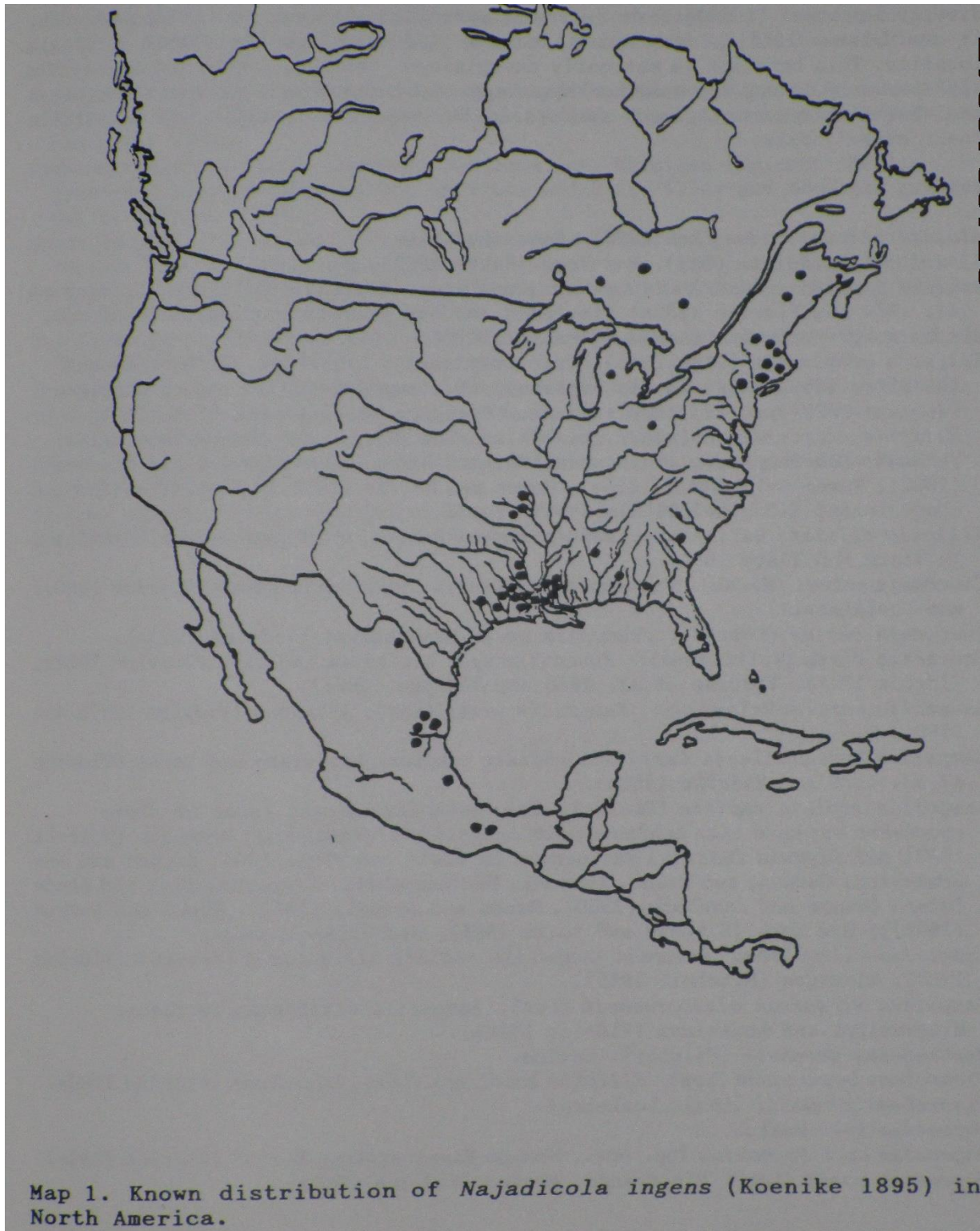
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Figures 1-6. *Najadicola ingens* (Koenike 1895). 1. Male venter. 2. Female venter. 3. Fourth walking leg. 4. Tarsus of fourth walking leg. 5. Pedipalp. 6. First walking leg. Scale equals 100 micrometers.



Figures 1-4. *Najadicola ingens* (Koenike). 1. Male venter. 2. Female venter. 3. Venter of nymph. *Unionicola laurentiana* Crowell and Davids. 4. Venter of nymph. Scales equal 100 micrometers.



Najadicola ingens from North America (Plates from Vidrine 1996).

Plate 1: Top left: male pedipalp. Top right: female venter. Upper middle left: male venter. Upper middle right: female posterior venter. Lower middle left: male venter. Lower middle right: female venter. Bottom left: deutonymph venter. Bottom right: first and second walking legs.

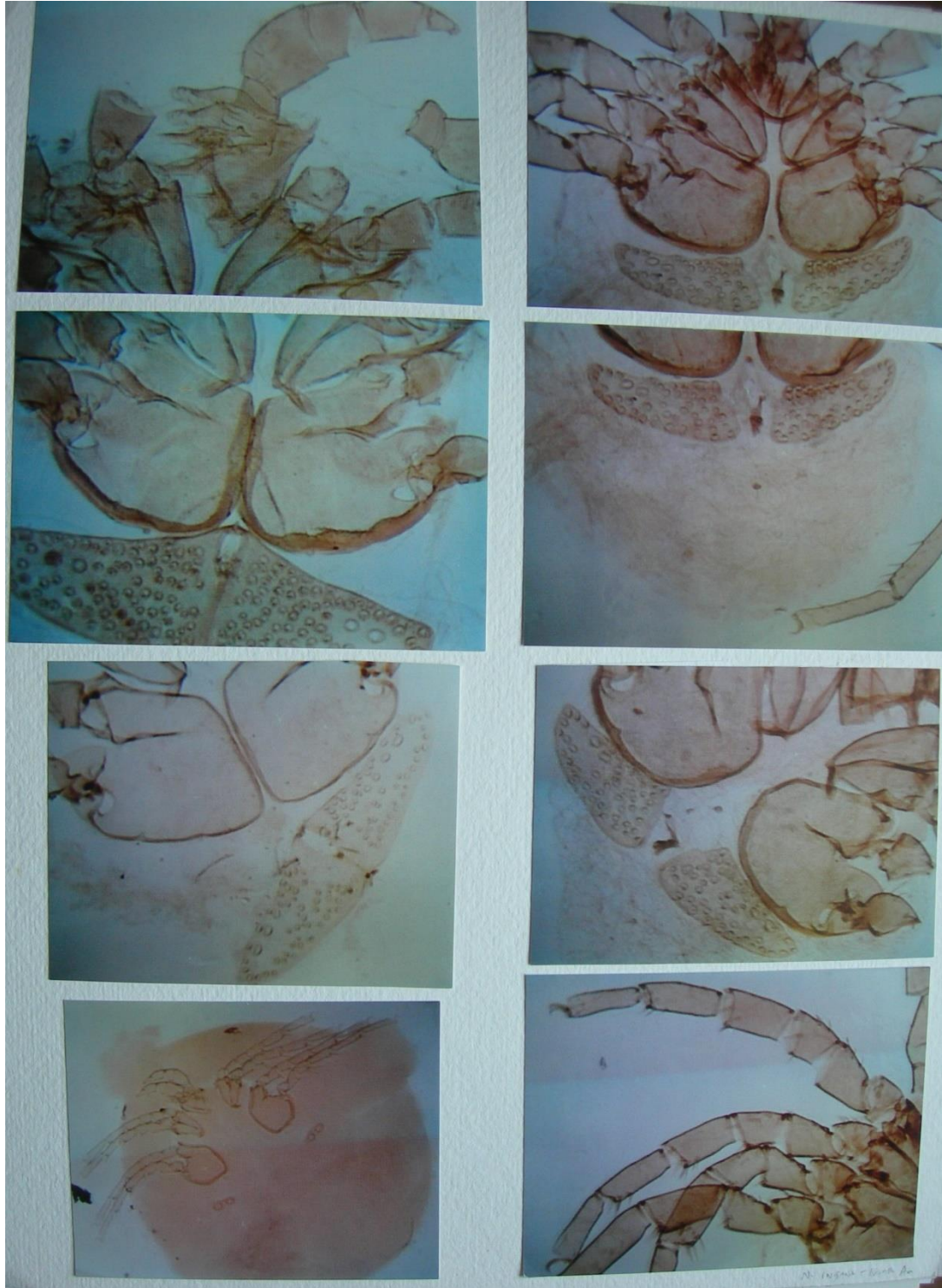


Plate 2: Top right: female pedipalp. Top right: female coxal plates. Middle left: venter of larva. Middle right: female genital plate. Bottom left: anal plate of larva. Bottom right: venter of deutonymph.



Plate 3: Top left: first walking leg. Top right: pedipalp. Middle: composite view of third and fourth walking legs. Bottom left: tarsus of pedipalp. Bottom center: tarsal claw of first walking leg. Bottom right: tarsal claw of fourth walking leg.



Najadicola ingens from Asia.

The Asian mites currently assigned to this species were reported originally by Vidrine and Lieux (1980. *Najadicolinae: an ancient and distinctive clade?* ***Association of Southeastern Biologists (ASB) Bulletin 27*** (2): 68.) **Plates 4 & 5** illustrate *Najadicola ingens* from *Trapezoideus exolegens* Gould (ANSP A4432 (3 of 24 mussels with *Najadicola*) & ANSP A5061) from Mun River (isles at mouth of river) at Mekong River, Ban Dan, Ubon Province, Thailand, April 18, 1973 (George M. Davis, collector) and March 14, 1972 (George M. Davis and Temchareon, collectors)—mussels located in the Academy of Natural Sciences of Philadelphia (ANSP), Philadelphia, Pennsylvania. Another population was discovered by Arthur Bogan in *Conradens Conradens* Lea from Thailand in 2003—only larvae were found (see photo in previous blog note). Mites preserved both in Koenike's fluid and on glass slides in Vidrine's collection.

Plate 4: Top left: male venter. Top right: female venter. Middle left: larva. Middle center: pedipalp. Middle right and lower middle center: enlargements of the tarsus of the pedipalp. Bottom left: enlargement of anal plate of larva. Bottom right upper and lower: last segment of fourth walking leg and tarsal claw of walking leg.



Plate 5: Top left: female venter. Top right: coxal plates and fourth walking leg. Middle left: anterior with pedipalps and first walking legs. Middle right: third and fourth walking legs. Bottom left upper: close-up of tip of fourth walking leg and tarsal claw. Bottom left lower: first walking leg. Bottom middle: tibia of fourth walking leg. Bottom right: tarsus of fourth walking leg.

