

TWO NEW WATER MITE SPECIES OF THE GENUS *NEUMANIA* LEBERT (ACARIFORMES, HYDRACHNIDIA, UNIONICOLIDAE) FROM VIETNAM

P. V. Tuzovsky

Institute for Biology of Inland Waters of the Russian Academy of Sciences, Borok, Yaroslavl Province, 152742 Russia. E-mail: tuz@ibiw.yaroslavl.ru

ABSTRACT: An illustrated description of two new water mite species, *Neumania disetoides* sp. nov. (female, male, deutonymph) and *N. vietnamica* sp. nov. (female, male), from the standing waters of Vietnam are presented.

KEY WORDS: water mites; Unionicolidae, Neumaniinae, new species, morphology; standing waters, Vietnam

INTRODUCTION

The following species of water mites are known for the fauna of Vietnam: *Hygrobates forcipifer* Goldschmidt et Koehler, 2007, *Acucapito vietnamensis* Tuzovskij, 2009, *Monatractides vietnamensis* Tuzovskij, 2009, *Torrenticola vietnamica* Tuzovskij, 2013, *Limnesia vietnamensis* Tuzovskij, 2013, *Hygrobates gusakovi* Tuzovskij, 2013 and *Albaxona gusevi* Tuzovskij, 2013 (Goldschmidt and Koehler 2007; Tuzovsky 2009a, 2009b, 2013). All these species are found in running waters. The purpose of this paper is to describe two new species, *Neumania disetoides* sp. nov. and *N. vietnamica* sp. nov. inhabiting standing waters of Vietnam.

MATERIALS AND METHODS

Mite specimens collected by Gusakov in 2010 and in 2012 in the standing waters of Vietnam. Meiobenthos samples were collected with a microbenthometer S-1 with corer diameter 34 mm (about 9 cm²) (for methods see Gusakov et al. 2011). Each sample included three columns of sediment and near-bottom water (5–10 cm each) and was fixed in 4% formalin. In the laboratory, the samples were filtered through a sieve with a mesh size of 82×82 μm and stained with Rose Bengal by the known method (Williams and Williams 1974). All mites were mounted in Hoyer's medium.

Idiosomal setae and lyriform organs follow Tuzovsky (1987): *Fch* — frontales chelicerae, *Fp* — frontales pedipalporum, *Vi* — verticales internae, *Ve* — verticales externae, *Oi* — occipitales internae, *Oe* — occipitales externae, *Hi* — humerales internae, *He* — humerales externae, *Hv* — humerales ventralia, *Sci* — scapulares internae, *Sce* — scapulares externae, *Li* — lumbales internae, *Le* — lumbales externae, *Si* — sacrales internae, *Se* — sacrales externae, *Ci* — caudales internae, *Pi* — praeanales internae, *Pe* — praeanales externae.

The following abbreviations are used: P–1–5, pedipalp segments (trochanter, femur, genu, tibia and tarsus); I–Leg-1–6, first leg, segments 1–6 (trochanter, basifemur, telofemur, genu, tibia and tarsus) i.e. III–Leg-4 = genu of third leg; ac. 1–2 — genital acetabula 1–2, *gs* — genital seta, L, length, W, width; n = number of specimens measured. All measurements are given in μm; length of appendage segments is dorsal length.

The type material is deposited in the collection of the Institute for Biology of Inland Waters (Borok, Russia).

Family Unionicolidae Oudemans, 1909

Subfamily Neumaniinae Thor, 1923

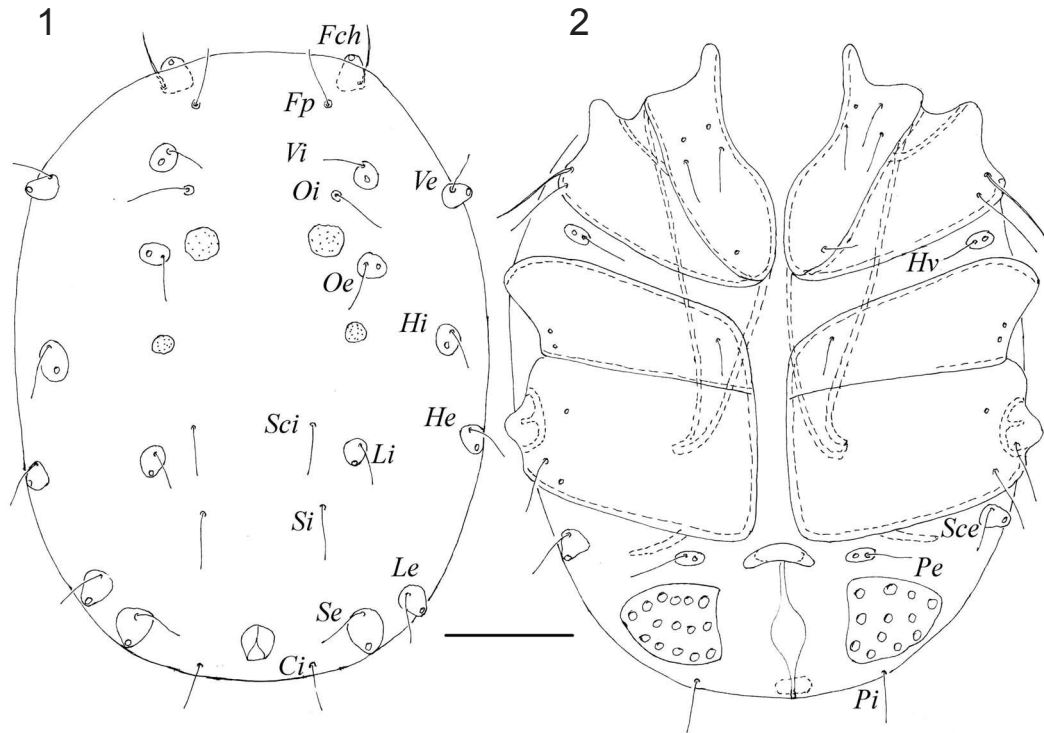
Genus *Neumania* Lebert, 1879

***Neumania disetoides* Tuzovskij, sp. n.**

Figs 1–16

Material examined. Holotype: female, slide 9701, Vietnam, Khanh Hoa (Khánh Hòa) Province, Cam Ranh Peninsula, Lake Con Ho (Con Hồ), altitude 33 m, littoral, two stations (N 11°54.137, E 109°14.166 and N 11°54.049, E 109°14.312), depth 0.7–2.0 m, substrate: sand with plant residues and sand with clay and a thin layer of silt, water temperature 30.5°C, pH 6.6, conductivity 114 μS/sm, transparency 3.2 m, 7 October 2010 (leg. V.A. Gusakov). Paratypes: 3 females, 6 males, 1 deutonymph, same data as holotype.

Diagnosis. Adults. Integument soft, covered by very short spines; dorsum with two pairs of small platelets; six setae (*Fp*, *Oi*, *Sci*, *Si*, *Ci*, *Pi*) without glandularia; other idiosomal setae associated with glandularia; suture line between coxal plates III and IV complete; capitulum with moderately long anchoral process, P-2 with long distolateral seta. **Female.** Acetabular plates nearly as long as wide; each acetabular plate with 9–12 acetabula and 7 (4 short and 3 long) thin setae; acetabula situated over entire surface of plates. **Male.**



Figs 1–2. *Neumania disetoides* sp. n., female: 1 — idiosoma, dorsal view; 2 — idiosoma, ventral view. Scale bar = 100 μ m.

Acetabular plate much wider than long, with 9–15 acetabula; 5 short anterior and 3–4 long posterior setae on each side; no sexual dimorphism in morphology of IV–Legs, IV–Leg-6 with single thick ventral seta.

Description, female. Number of idiosomal setae typical for the genus *Neumania* (Tuzovsky 1987). Dorsum (Fig. 1) with two pairs of unequal anterior platelets; setae *Fp*, *Oi*, *Sci*, *Si*, *Ci* and *Pi* without glandularia, other idiosomal setae associated with glandularia; setae *Fch*, *Ve*, *He*, *Li* and *Le* situated on tubercles; excretory pore free, surrounded by sclerotized ring and opens on tubercle caudally.

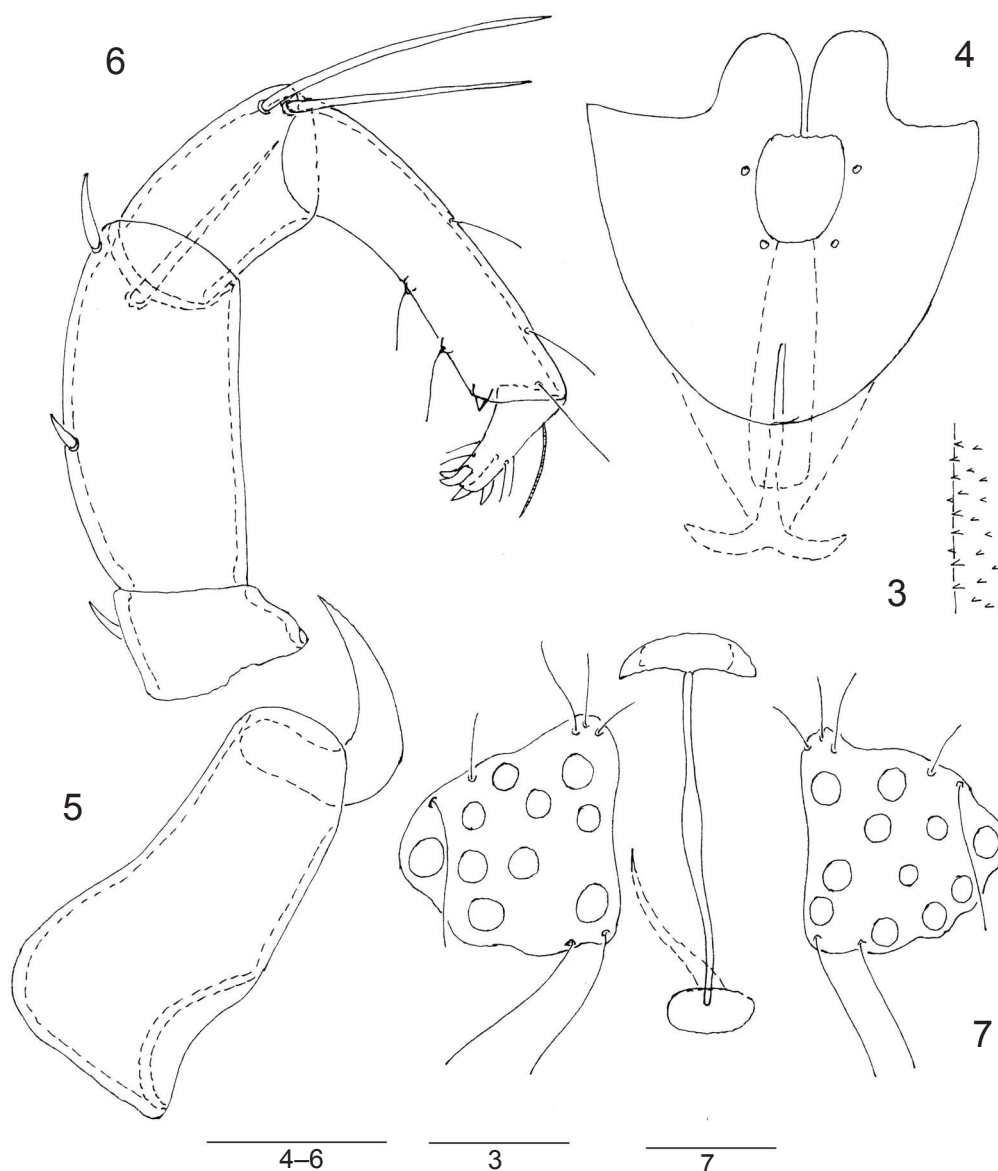
Coxal plates in four groups (Fig. 2); posterior apodemes of coxal plates I–II long, reaching or slightly extending to middle of coxal plates IV; posterior margin of coxal plates IV straight, posterior projections of coxal plates IV very short and narrow; suture line between coxal plate III and IV complete; setae *Sce* located on tubercles.

Integument soft, covered by very short spines (Fig. 3); capitulum (Fig. 4) compact, with moderately long anchoral process; chelicera (Fig. 5) short and with strong claw; pedipalp (Fig. 6) slender: P–1 short with single short dorsal seta; P–2 large, with one short proximal seta and two unequal distal setae (lateral seta much longer than dorsal one); P–3 relatively short, with two long dorsodistal setae, proximal seta slightly longer

than distal one, P–4 thin, with two ventral setae, single distolateral peg-like seta and 3–4 dorsal thin setae; P–5 with long dorsoproximal solenidion, four short, thick spines and five thin distal setae; genital field very wide, acetabular plates (Fig. 7) well distant from each other, shorter than genital opening, nearly as long as wide (L/W ratio 0.8–1.2), straight or slightly concave medially and more or less rounded laterally, 9–12 genital acetabula and 6–7 setae on each side, anterolateral seta and 1–2 posteromedial setae longer than anterior setae; all acetabula and genital setae situated only on acetabular plates.

Shape and arrangement of setae on leg I and IV as shown in Figs 8–9; distal end of IV–Leg-3 with two long swimming setae, distal end of IV–Leg-4 with five long swimming setae and distal end of IV–Leg-5 with three long swimming setae; IV–Leg-3 with one small and one large (distal) ventral pectinate setae, IV–Leg-4 with 3–4 small and 1 large (distal) ventral pectinate setae, IV–Leg-5 with 5–6 small and 1 large (distal) ventral pectinate setae, IV–Leg-6 with single thick ventral seta; leg claws I–II (Fig. 10) smaller than leg claws III–IV (Fig. 11).

Measurements (n=4). Idiosoma L 510–550; acetabular plate L 60–80, W 60–75; capitulum, including anchoral process L 105–120; basal segment of chelicera L 95, cheliceral claw L 42; pedipalpal segments (P–1–5) L: 24–30, 75–85, 42–55,



Figs 3–7. *Neumania disetoides* sp. n., female: 3 — fragment of integument, lateral view; 4 — capitulum, ventral view; 5 — chelicera, lateral view; 6 — pedipalp lateral view; 7 — genital field, ventral view. Scale bars: 3 = 20 μ m; 4–7 = 50 μ m.

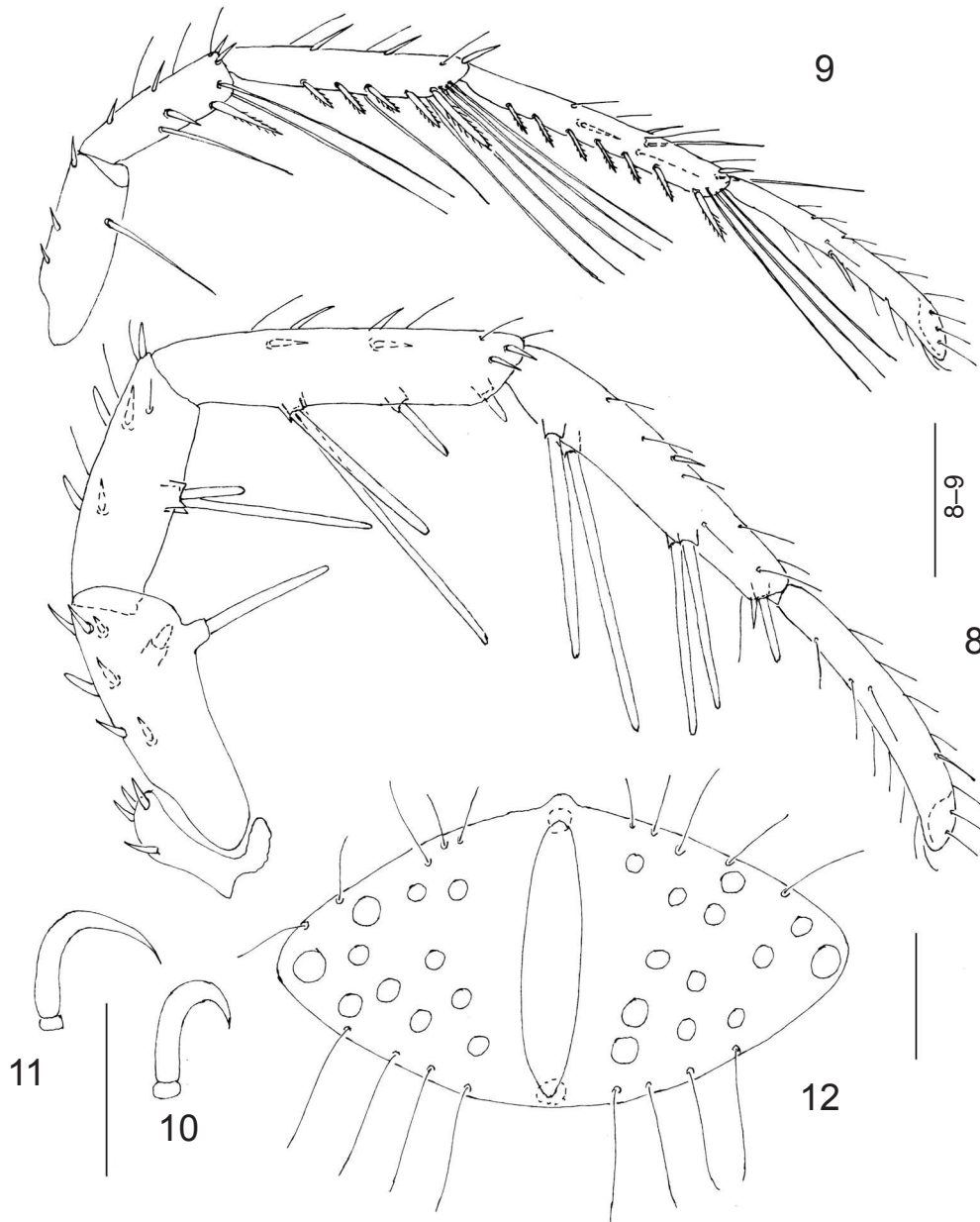
85–90, 21–25; lengths of leg segments: I–Leg-1–6: 54–60, 120–135, 120–135, 185–210, 160–180, 125–140; II–Leg-1–6: 55–65, 105–115, 120–125, 185–200, 180–200, 140–150; III–Leg-1–6: 60–65, 95–95, 90–105, 150–170, 175–185, 160–175; IV–Leg-1–6: 70–85, 95–105, 110–135, 160–175, 185–205, 165–180.

Male. Similar to female; acetabular plate (Fig. 12) wider than long, L/W ratio 0.48–0.57, with convex anterior and posterior margin; 9–15 acetabula and 8–9 thin setae on each side; posterior setae longer than anterior ones.

Measurements (n=6). Idiosoma L 450–540; genital field L 90–115, W 155–235; capitulum, including anchoral process L 90–115; basal segment of chelicera L 75–80, cheliceral claw L 40–45; pe-

dipalpal segments (P-1–5) L: 20–30, 60–72, 30–42, 65–78, 20–24; lengths of leg segments: I–Leg-1–6: 50–55, 105–110, 105–115, 155–180, 150–170, 125–145; II–Leg-1–6: 50–55, 95–105, 90–110, 150–165, 155–165, 140–150; III–Leg-1–6: 55–60, 85–100, 75–90, 135–150, 145–180, 155–195; IV–Leg-1–6: 65–80, 90–105, 90–115, 135–165, 150–190, 155–200.

Deutonymph. Idiosoma similar to adults, but coxal plates with smaller number of setae (Fig. 13); posterior apodemes of coxal plates I–II long, reaching or slightly extending to suture line between coxal plates III–IV; acetabular plates close to each other, with 2 acetabula and 3 setae each; lateral acetabulum slightly larger than medial one, distance between medial and lateral acetabulum shorter than



Figs 8–12. *Neumania disetoides* sp. n., adults: 8 — I-Leg-1–6; 9 — IV-Leg-2–6; 10 — claw of leg I; 11 — claw of leg IV; 12 — acetabular plate of male; 8–11 — female. Scale bars: 8–9 = 100 µm, 10–12 = 50 µm.

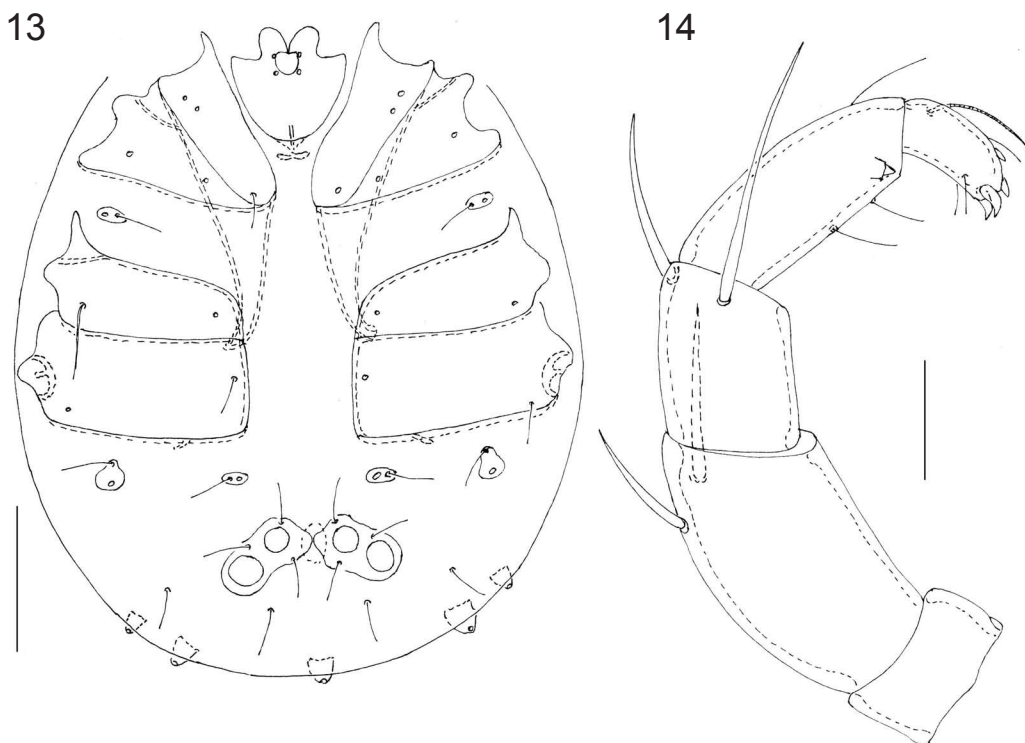
diameter of anterior acetabulum on each side; excretory pore located caudally.

Pedipalp (Fig. 14) slender: P-1 short, without seta; P-2 large, with two unequal dorsodistal setae; P-3 with two unequal distal setae, lateral seta much longer than dorsal seta; P-4 long, with two ventral setae, very small ventrodistal peg-like seta and two dorsodistal setae, ventral setae located on very small subequal tubercles distally to middle of segment; P-5 with proximal solenidion, four thick spines and tree thin setae.

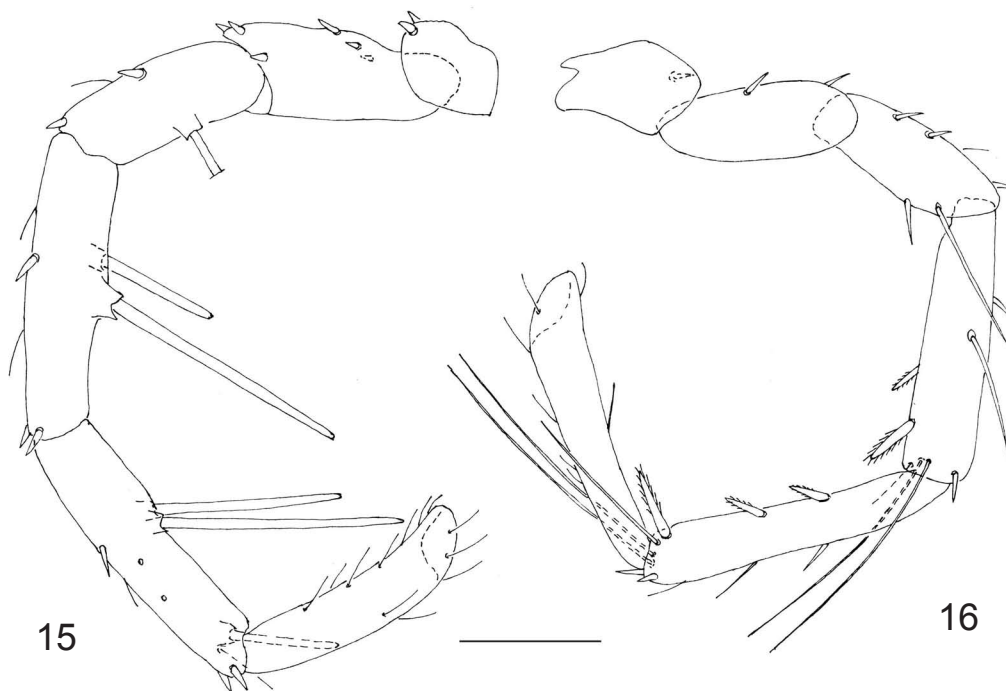
Shape and arrangement of setae on leg I and IV as shown in Figs 15–16. Distal end of IV-Leg-3 with three long swimming setae, distal end of IV-

Leg-4 with two long swimming setae and distal end of IV-Leg-5 with two long swimming setae and 1 short swimming seta; IV-Leg-3 with one (distal) ventral pectinate seta, IV-Leg-4 with one small and one large (distal) ventral pectinate setae, IV-Leg-5 with two small and one large (distal) ventral pectinate setae, IV-Leg-6 with single thick ventral seta.

Measurements (n=1). Idiosoma L 435; genital plate L 50, W 26; genital acetabulum (ac. 1–2) L 15, 18; capitulum, including anchoral process L 72; basal segment of chelicera L 65, cheliceral stylet L 30; pedipalpal segments (P-1–5) L: 18, 48, 36, 48, 20; lengths of leg segments: I-Leg-1–6:



Figs 13–14. *Neumania disetoides* sp. n., deutonymph: 13 — idiosoma ventral view; 14 — pedipalp medial view. Scale bars: 13 = 100 μ m, 14 = 20 μ m.

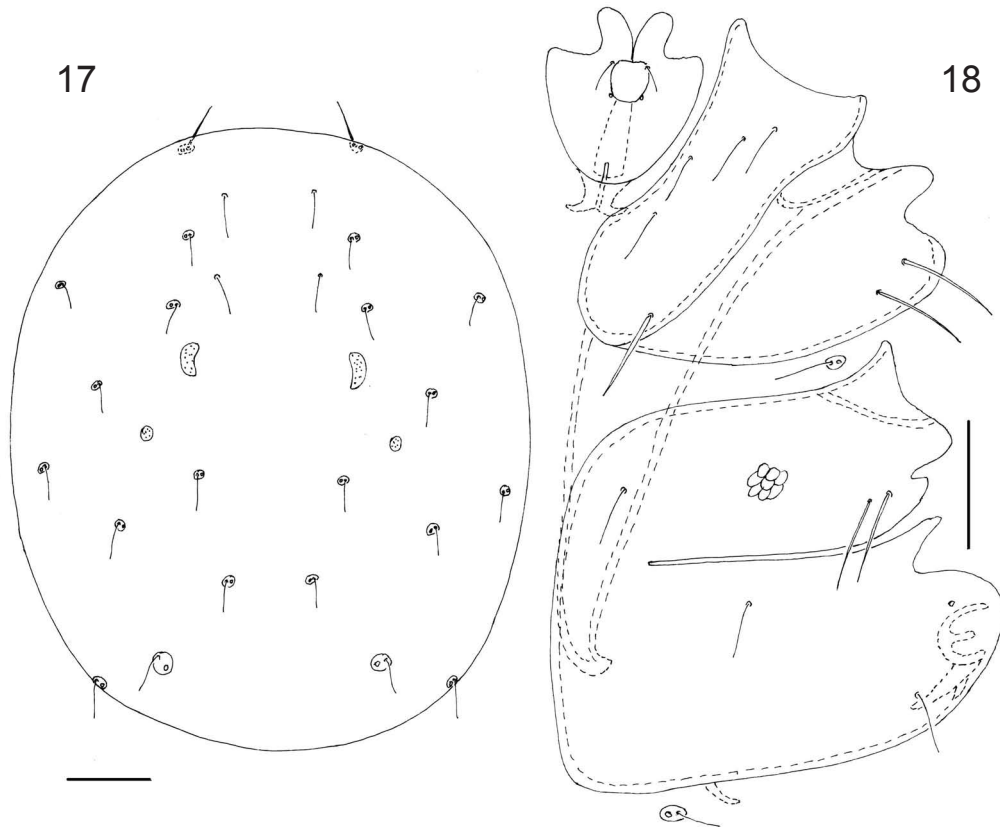


Figs 15–16. *Neumania disetoides* sp. n., deutonymph: 15 — I-Leg-1-6; 16 — IV-Leg-1-6. Scale bar = 50 μ m.

40, 65, 70, 110, 100, 85; II-Leg-1-6: 40, 65, 60, 102, 100, 90; III-Leg-1-6: 45, 60, 55, 90, 100, 100; IV-Leg-1-6: 55, 50, 60, 95, 100, 100.

Differential diagnosis. The new species is similar to *Neumania disetus* Jin, 1997. The adults of *N. disetoides* sp. n. differs from *N. disetus* by the following characters (character states of *N.*

disetus follow Jin 1997 and are indicated in parentheses). Adults — six idiosomal setae not associated with glandularia, Figs 1–2 (eight setae), the dorsum with two pairs of platelets (with a single pair of platelets), the suture line between coxal plates III and IV complete (incomplete medially); P-2 with a long distolateral seta, Fig. 6 (with a



Figs 17–18. *Neumania vietnamica* sp. n., female: 17 — idiosoma, dorsal view; 18 — capitulum and coxal plates, ventral view. Scale bar = 100 μ m.

short distolateral seta); P-3 with two dorsodistal setae (with one dorsodistal seta). Female — the genital acetabula arranged over the entire surface of the acetabular plates, Fig. 7 (the genital acetabula are shifted far away from the medial margin of the acetabular plates), the acetabular plate with two long posteromedial setae (with four short posteromedial setae). Male — IV–Leg-6 with a single thick ventral setae, Fig. 9 (with two thick ventral setae).

Etymology. The species epithet, *disetoides*, is derived from the name of the Chinese species, *Neumania disetus*.

Habitat. Standing waters.

Distribution. Asia (Vietnam: Khanh Hoa Province).

***Neumania vietnamica* sp. n.**

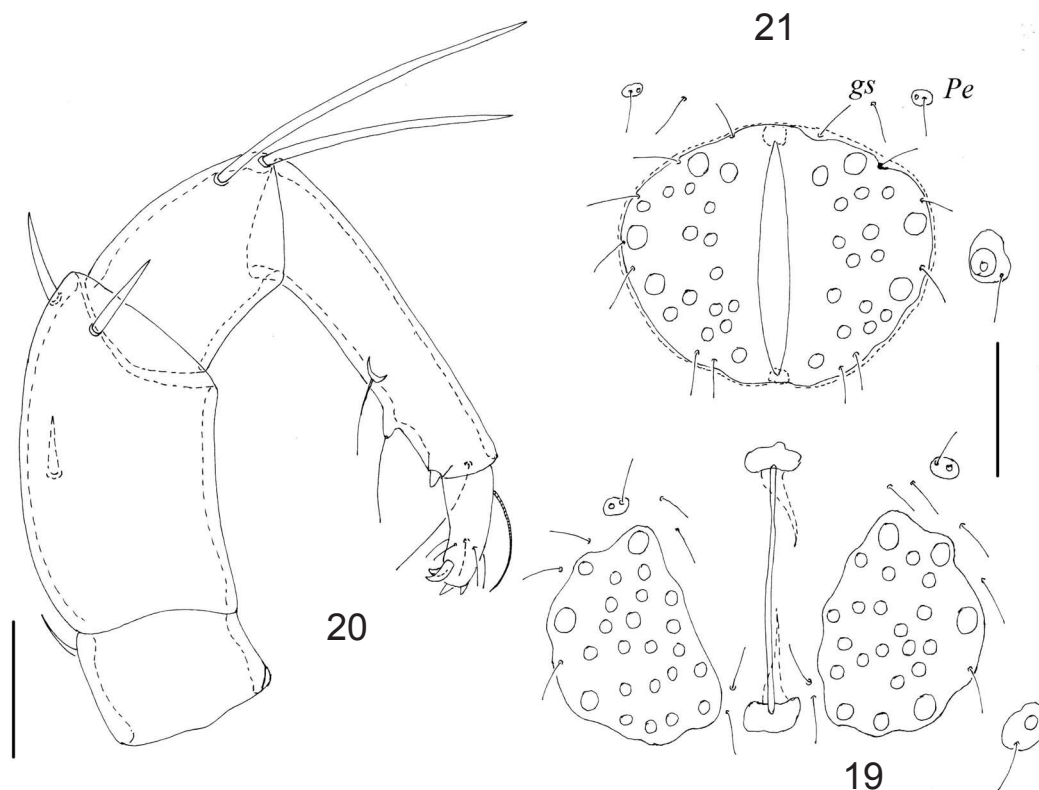
Figs 17–26

Material examined. Holotype: female, slide 9698, Vietnam, Dong Nai (Đồng Nai) Province, Cat Tien (Cát Tiên) National Park, small shallow forest lake Nai Cap (N 11°27.354, E 107°20.072), altitude 140 m, depth 0.2 m, substrate white clay with plant residues, water temperature 27.0°C, dissolved oxygen 1.6 mg/l, pH 6.1, conductivity

42 μ S/sm, 12 May 2012 (leg. V.A. Gusakov). Paratype: one male, same data.

Diagnosis. Both sexes. Integument soft and smooth, suture line between coxal plates III and IV incomplete, three setae (*Fp*, *Oi*, *Pi*) without glandularia, other idiosomal setae associated with glandularia, three to four genital acetabula larger than others on each side, capitulum with short anchoral process, P-2 with two short subequal distal setae, IV–Leg-6 with four thick ventral setae. **Female.** Acetabular plate longer than wide, with 24 acetabula and single lateral seta, additionally, six genital setae located on soft integument around each plate, IV–Leg-3–5 with long swimming setae. **Male.** Genital field wider than long, with 17–18 acetabula and 7 thin subequal setae on each side; additionally, one genital seta situated on soft integument between posterior margin of coxal plate IV and anterior margin of genital plate on each side, IV–Leg-3–5 with short swimming setae.

Description, female. Number of idiosomal setae typical for the genus *Neumania* (Tuzovsky 1987). Setae *Fp*, *Oi* and *Pi* without glandularia, other idiosomal setae associated with glandularia; setae *Ci* and *Le* situated on large sclerites and oth-



Figs 19–21. *Neumania vietnamica* sp. n., adults: 19 — genital field of female; 20 — pedipalp, medial view; 21 — genital field of male; 19–20 — female. Scale bars: 19–21 = 100 μ m, 20 = 50 μ m.

er setae situated on very small sclerites; dorsum (Fig. 17) with two pairs of small anterior platelets, anterior pair of platelets elongate and larger than posterior ones; excretory pore free, surrounded by sclerotized ring and located caudally.

Coxal plates arranged in four groups, posterior apodemes of coxal plates I–II long, reaching to middle of coxal plates IV; posterior projections of coxal plates IV very short and narrow; suture line between coxal plate III and IV incomplete medially (Fig. 18); capitulum compact, with relatively short anchorage process.

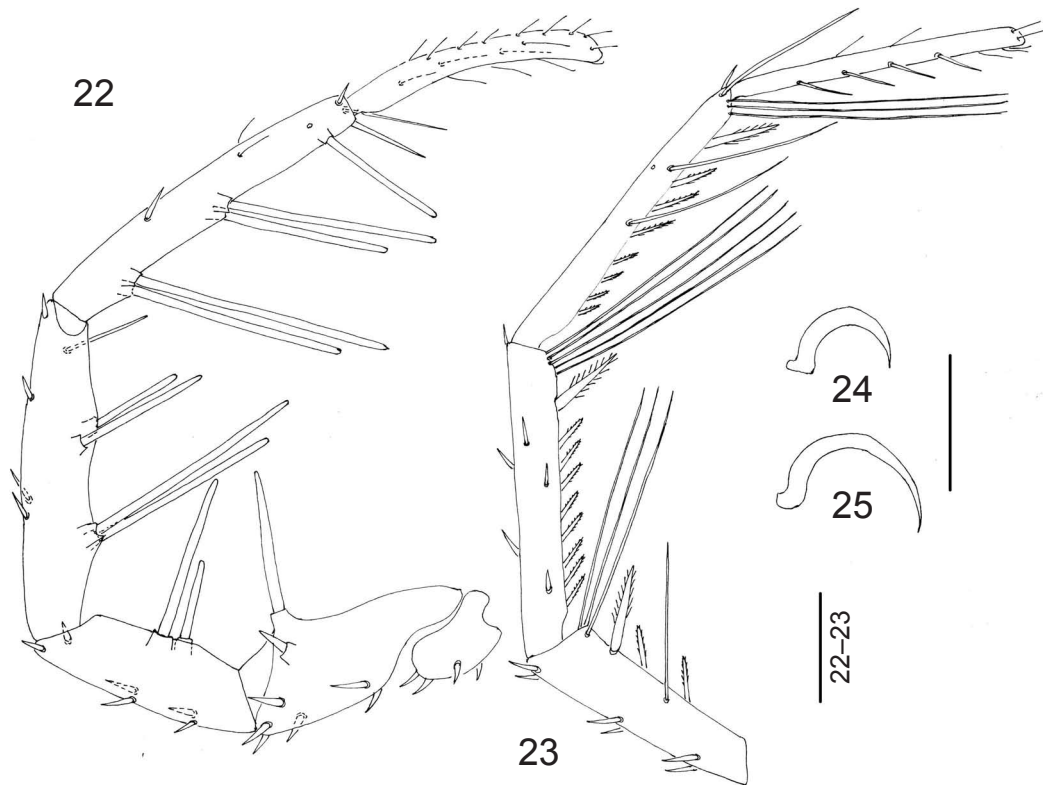
Acetabular plates (Fig. 19) longer than wide (L/W ratio 1.3–1.5), straight or slightly convex medially and rounded laterally; 24 genital acetabula on each side, three to four pairs of which larger than others; all acetabula and one lateral seta located on plates; additionally, six genital setae situated on soft integument around each plate.

Pedipalps (Fig. 20) moderately slender: P–1 short with single short dorsal setae; P–2 large, with one short proximal seta and two distal subequal setae; P–3 relatively short, with two long, almost subequal dorsodistal setae; P–4 thin, with two ventral setae, single distolateral peg-like seta and three to four dorsal thin setae; P–5 with long dorsoproximal solenidion, four short, thick spines and five thin distal setae.

Shape and arrangement of setae on leg I and IV shown on Figs 22–23; distal end of IV–Leg-3 with two to three long swimming setae, distal end of IV–Leg-4 with five long swimming setae and distal end of IV–Leg-5 with three long swimming setae; IV–Leg-3 with two small and one large (distal) ventral pectinate setae, IV–Leg-4 with seven to eight small and one large (distal) ventral pectinate setae, IV–Leg-5 with seven small and one large (distal) ventral pectinate setae, IV–Leg-6 with four thick ventral setae; leg claws I–II (Fig. 24) smaller than leg claws III–IV (Fig. 25).

Measurements (n=1). Idiosoma L 810; genital plate L 125–139, W 90–95; capitulum, including anchorage process L 140; basal segment of chelicera L 96, cheliceral claw L 60; pedipalpal segments (P-1–5) L: 36, 115, 72, 120, 42; lengths of leg segments: I–Leg-1–6: 85, 175, 210, 325, 325, 235; II–Leg-1–6: 85, 160, 200, 310, 350, 235; III–Leg-1–6: 100, 160, 175, 260, 285, 260; IV–Leg-1–6: 135, 150, 250, 300, 325, 285.

Male. Idiosoma similar to female, it differs by genital field and in number and size of swimming and pectinate setae on IV–Leg; acetabular plate (Fig. 21) wider than long, L/W ratio 0.83, with convex anterior and posterior margins, 17–18 acetabula, three to four of which larger than others, and six to seven thin subequal setae on each



Figs 22–25. *Neumania vietnamica* sp. n., female: 22 — I-Leg-1–6; 23 — IV-Leg-3–6; 24 — claw of leg I; 25 — claw of leg IV. Scale bars: 22–23 = 100 μ m, 24–25 = 50 μ m.

side; additionally, there is one pair of genital setae (*gs*) situated on soft integument between posterior margin of coxal plate IV and anterior margin of genital plate medially to setae *Pe*; excretory pore free, surrounded by narrow sclerotized ring.

Shape and arrangement of setae on leg IV as on Fig. 26; distal end of IV-Leg-3 with two short swimming setae, distal end of IV-Leg-4 and IV-Leg-5 with three short swimming setae; IV-Leg-3 with two small and one large (distal) ventral pectinate setae, IV-Leg-4 with seven small and one large (distal) ventral pectinate setae, IV-Leg-5 with four to five small and one large (distal) ventral pectinate setae, IV-Leg-6 with four thick ventral setae.

Measurements (n=1). Idiosoma L 685; genital field L 175, W 210; lengths of leg segments: I-Leg-1–6: 75, 135, 180, 240, 285, 270; II-Leg-1–6: 85, 140, 180, 260, 285, 260; III-Leg-1–6: 80, 125, 150, 210, 225, 235; IV-Leg-1–6: 100, 135, 235, 210, 310, 275.

Differential diagnosis. The new species is similar to *Neumania deltoides* Piersig, 1894. Adults of *N. vietnamica* sp. n. differ from *N. deltoides* in the following characters (character states of *N. deltoides* from European and Asian populations are indicated in parentheses). Adults — the

suture between coxal plates III and IV incomplete, Fig. 18 (complete), the integument smooth (with small spines, Fig. 27). Female — the acetabular plate with 24 acetabula and a single lateral seta, six genital setae situated on soft integument around each plate, Fig. 19 (with 28 to 40 acetabula and six to seven setae, three to five genital setae situated on soft integument, Fig. 28). Male — the acetabular plate with 18 acetabula and six to seven setae on each side, one pair of genital seta situated on soft integument, Fig. 21 (with 23 to 35 acetabula and six to seven setae, all acetabula and genital setae situated on the acetabular plates only); IV-Leg-3–5 with short swimming setae, Fig. 26 (IV-Leg-3–5 with long swimming setae, Fig. 29).

Etymology. The species is named after the country where it was collected (Vietnam).

Habitat. Standing waters.

Distribution. Asia (Vietnam: Dong Nai Province).

ACKNOWLEDGEMENTS

The author expresses sincere gratitude to Vladimir Gusakov for specimens. This work was conducted as part of the research program Ekolan 3.2 of the Russian-Vietnamese Tropical Research and Technological Center.

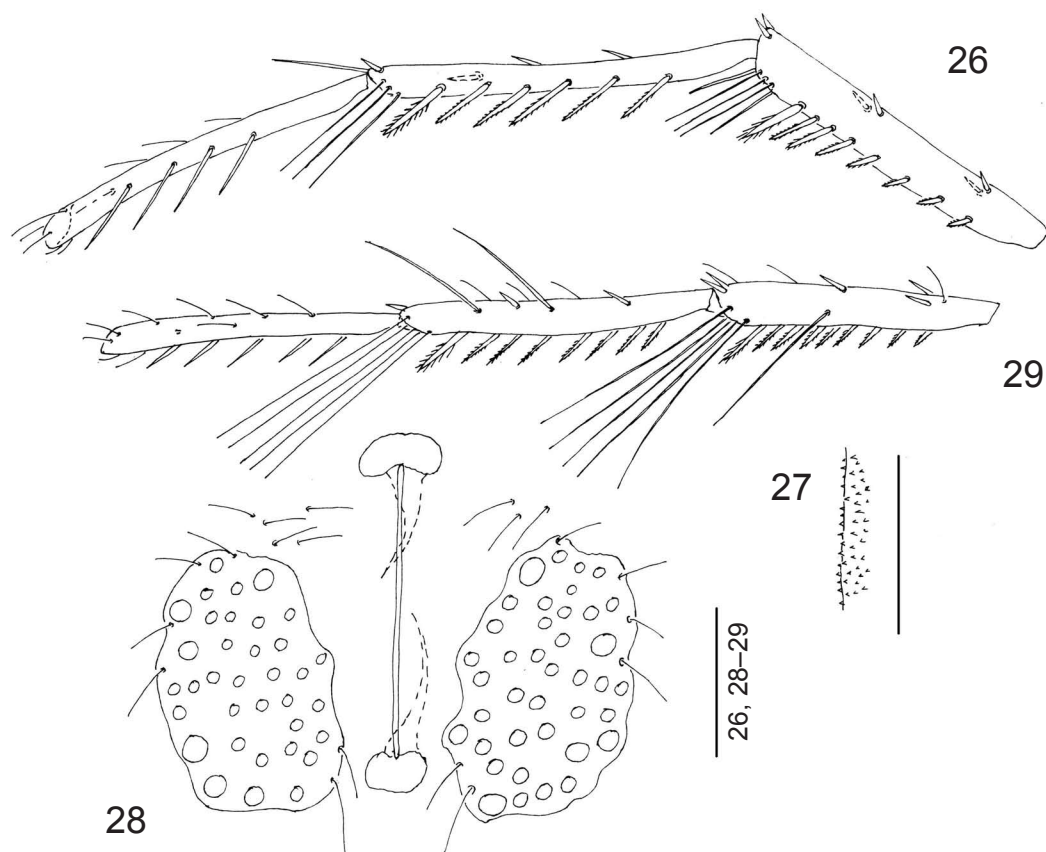


Fig. 26. *Neumania vietnamica* sp. n., male: IV-Leg-4-6. Scale bar = 100 μ m.

Figs 27-29. *Neumania deltooides* (Piersig, 1894), adults (collected in Rybinsk reservoir, Yaroslavl Province): 27 — fragment of integument, lateral view; 28 — genital field, ventral view; 29 — IV-Leg-4-6; 27-28 — female; 29 — male. Scale bars: 27 = 50 μ m; 26, 28-29 = 100 μ m.

REFERENCES

- Goldshmidt, T. and Koehler, G. 2007. New species of the *Hygrobatas salamandarum*-group (Acari, Hydrachnidia, Hygrobatidae) from Southeast Asia. *Zoologischer Anzeiger*, 246: 73-89.
- Gusakov, V.A., Gagarin, V.G. and Gusev, E.S. 2011. [The first results of meiobenthos study in the Cai River (Central Vietnam)]. *Biologiya vnutrennikh vod*, 3: 62-71. [In Russian]
- Jin, D. 1997. *Hydrachnellae — Morphology, Systematics. A primary study of Chinese fauna*. Guizhou science and technology publishing house, Peking. 356 pp.
- Tuzovsky, P.V. 1987. *Morfologiya i postembrional'noye razvitiye vodyanykh kleshchey* [Morphology and Postembryonic Development in Water Mites]. Moscow: Nauka. 172 pp. [In Russian]
- Tuzovsky, P.V. 2009a. A new water mite species of the genus *Acucapito* (Acariformes: Acucapitidae) from Vietnam. *Zoosystematica Rossica*, 18 (2): 212-217.
- Tuzovsky, P.V. 2009b. A new water mite species of the genus *Monatractides* (Acariformes: Torrenticolidae) from Vietnam. *Acarologia*, 49 (3-4): 179-183.
- Tuzovsky, P.V. 2013. New water mite species (Acari, Hydrachnidia) from Vietnam. *Zootaxa*, 3700 (4): 547-560.
- Williams, D.D. and Williams, N.E. 1974. A counterstaining technique for use in sorting benthic samples. *Limnology and Oceanography*, 19: 152-154.