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Two New Species and a New Subgenus of Tarsonemid Mites (Acari: Heterostigmatina: Tarsonemidae) from Ferns in Poland

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Wojciech Ł. Magowski (2012) Two new species and a new subgenus of tarsonemid mites (Acari: Heterostigmatina: Tarsonemidae) from ferns in Poland. *Zoological Studies* **51**(4): 512-525. *Hemitarsonemus ganeo* sp. nov. and *Dendroptus helluo* sp. nov. are described and illustrated based on material collected from ferns in Poland. For the latter species, *Hemidendroptus* subgen. nov. of the genus *Dendroptus* was erected. A tentative key to species of *Hemitarsonemus* is supplied. Systematics and distributions of the new tarsonemids living on ferns are briefly discussed. http://zoolstud.sinica.edu.tw/Journals/51.4/512.pdf

Key words: Mites, Herbivores, *Hemitarsonemus*, *Dendroptus*, Pteridiophyta.

Until recently, 2 genera and 4 species of tarsonemid mites were exclusively collected from ferns. The genus *Hemitarsonemus* Ewing, 1939 rediagnosed by Lindquist (1986) comprises only 3 species to date: *H. tepidariorum* (Warburton, 1904), *H. biconvexa* Lin et Zhang, 1994, and *H. furcalis* Lin et Zhang, 1995. Basic data on the biology of *H. tepidariorum* were given in Cameron (1923). This species is known from a variety of indoor locations in Europe and North America, and it is estimated that most cases are pests of greenhouse ornamental fern cultivation. A useful summary of the economic importance of the role *H. tepidariorum* plays as a pest in agriculture can be found in Zhang (2003). Lin and Zhang found only males of *H. biconvexa* on *Cibotium barometzi* (L.) (Dickinsoniaceae) in mountainous region of Sichuan Province, China, while females and males of *H. furcalis* were found on *Pteris esquirolii* Crist., Datian County, Fujian Province, China.

The genus *Eotarsonemus* De Leon, 1966 has only 1 species described: *E. rugosus* De Leon, 1966 (redescribed and illustrated by Lindquist 1986). It was described from undetermined species of *Polypodium* found in Trinidad, West Indies. Thus, to date it is apparent that both specialized genera of fern-associated tarsonemids occur in warm climate regions.

In the course of a series of studies on Polish fauna of the Tarsonemidae, a new species of *Hemitarsonemus* was discovered that occurred outdoors in uplands of Central Poland. Yet another, apparently rare, new tarsonemid was found in the Pieniny Mt. range in southern Poland, and displays an interesting mixture of features characteristic of both *Dendroptus* Kramer, 1876 and *Hemitarsonemus* Ewing, 1939 (both *sensu* Lindquist 1986). As this discovery was only briefly announced (Magowski 1990), the present work is intended to give the proper systematic descriptions of the new specific taxa.

MATERIALS AND METHODS

All samples were originally collected at the site and subsequently transferred to the laboratory, where they were extracted with Tulgren-Berlese

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funnels. Mites were mounted in Swan medium on microscopic slide preparations. Examination, measurements, and drawings were completed with Zeiss (Jena, Germany) and Olympus (Tokyo, Japan) phase-contrast microscopes supplied with a drawing attachment. The morphological nomenclature is based on Lindquist (1986) with some minor changes. All measurements are given in micrometers (μm). The length and width of the pharynx of all instars are expressed by their maxima, including those of the posterior glandular bodies. The length of the male idiosoma includes the copulatory complex proper without the hyaline distal fringe. Comparisons of the lengths and proportions of the legs exclude the pretarsi and trochanters. Abbreviations used in the descriptions are as follows: PrS, prodorsal shield; C, D, CD, EF, H, HPs, Ps, tergites, and shields; MtP, metapodosomal ventral plate; PrP, propodosomal ventral plate; ap. 1-1 and ap. 2-2, distances between the anterolateral ends of apodemes 1-1 and 2-2, respectively; Fe, femur; Fege, femorogenu; Ge, genu; Ta, tarsus; Tb, tibia; Tbt, tibiotarsus. Counts of the leg chaetotaxy give the number of non-solenidial setae; numbers of solenidia are given in parentheses; "+" indicates a fusion of segments. Setae flanking the pretarsi, namely Ta I *u'-u"* and Ta II and III *u"* and *p'* (the latter only in males) are excluded from the count; however spine-like, well-discernible setae Ta I *s* and Ta II-III *u'* are included in the counts (also in *Hemitarsonemus* females). Diagnostic characters for other *Hemitarsonemus* species are derived from original papers and a monograph by Lindquist (1986).

TAXONOMY

Hemitarsonemus ganeo Magowski sp. nov.
(Figs. 1-17)

Hemitarsonemus Ewing 1939 sensu Lindquist 1986

Material examined: Holotype ♀: Poland, Małopolska Province (Prov.), Kielce District (Dist.); Świętokrzyskie Mt. range, east side of clearing on northern slope of "Święty Krzyż" Mt. by track from Święty Krzyż to Nowa Słupia, elev. ca. 575 m, in mixed forest; ex large fronds and small pieces of rhizomes of *Athyrium filix-femina* (L.) Roth, 31 Aug. 1989, coll. W. Magowski (WM-153; GS4).

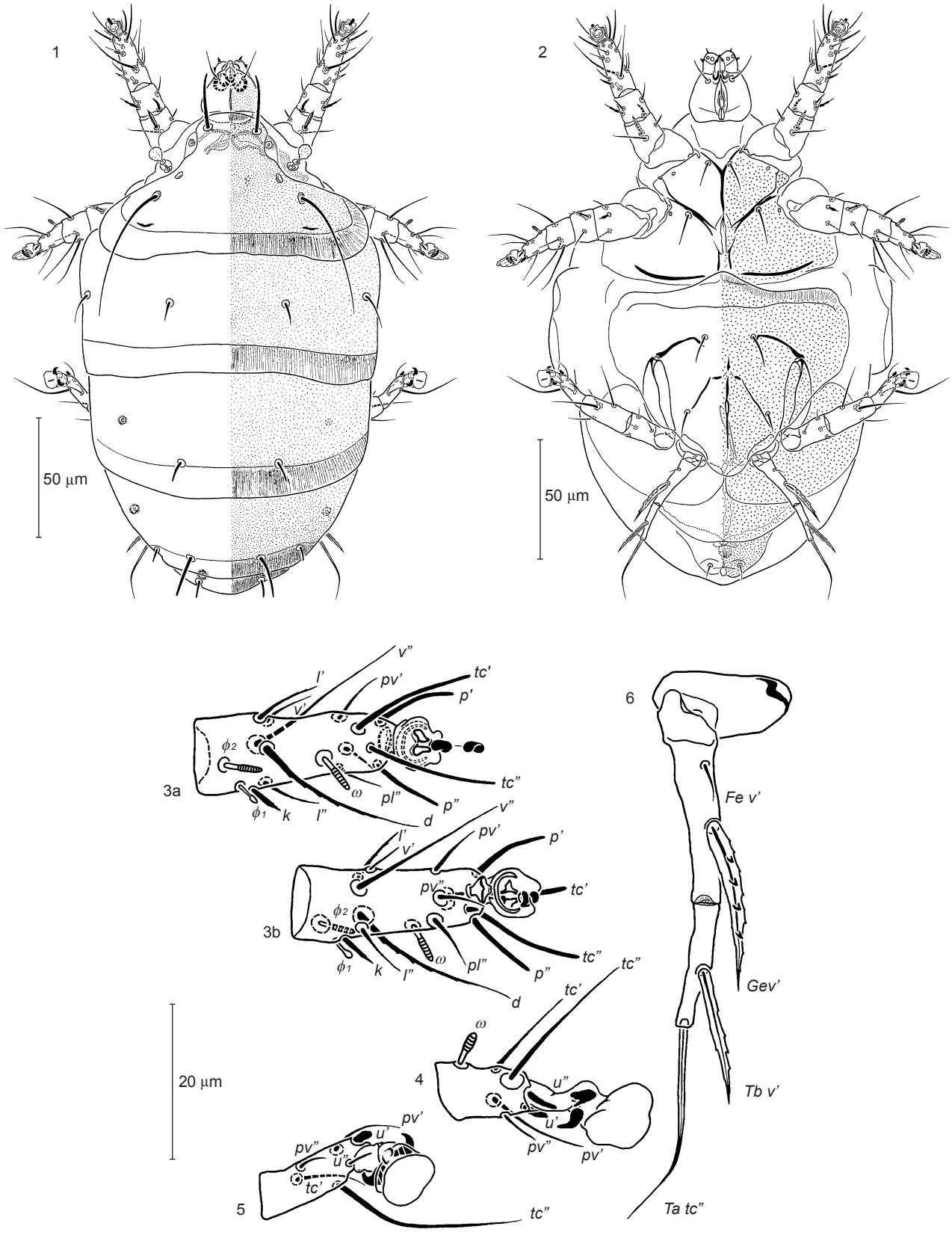
Paratypes: 14 ♀♀, 4 ♂♂, 1 larva; collection data same as for holotype (type locality); 25 ♀♀, 9 ♂♂, 3 larvae: Poland, Małopolska Prov., Kielce Dist.; Świętokrzyskie Mt. range, "Święty Krzyż" Mt., "Łysiec" Nature Reserve, stable part of deforested rock debris, ex fronds and rhizomes of *Dryopteris dilatata* (Hoffm.) A. Gray, 7 July 1987, coll. W. Magowski (WM-060; 1f); 1 ♂: Zachodniopomorskie Prov. (Western Pomerania), about 2 km south of town of Police near Szczecin, in moist mixed beech forest (*Fagus silvatica*) with Scots pines (*P. silvestris*); ex whole plant of *Dryopteris filix-mas* (L.) Schott, 13 June 1990, coll. B. Magowski (WM-180).

Type material: Holotype female mounted on slide GS4/25 together with 2 ♀♀ and a larva of *Tarsonemus* sp. indet. Allotype male mounted on slide GS4/10 along with 3 paratype ♀♀ of *H. ganeo* sp. nov. and 1 ♀ of *Tarsonemus* sp. indet. Deposition of type material at Department of Animal Taxonomy and Ecology, A. Mickiewicz Univ., Poznań, Poland and Canadian National Collection of Insects and Arachnids, Ottawa, Ontario, Canada.

Etymology: The specific name "*ganeo*" (eng. "glutton") refers to large amounts of brownish-green matter inside the mite idiosoma, indicating most probably digested food of vegetable origin.

Diagnosis: *Female*: Dorsal opisthosomal setae *f* ca. 4x longer than *e* and over 3x longer than *h*; solenidia Ta I ω, Ti I ϕ_2, and Ta II ω all subequal in length, more clavate than elongate-rod-like; genual seta *v'* of leg IV nearly 3x longer than femoral one. *Male*: Dorsal opisthosomal setae v_1 ca. 2x longer than v_2; *f* longer than 1/2 length of *d*, solenidion Ti IV ϕ clavate; femorogenu IV with subtriangular adaxial lobe. Larvae: Dorsal opisthosomal setae *d* as long as 0.7x of distance between their bases; setae *f* ca. 2.5x longer than h_2, and nearly 2x longer than h_1.

Description: *Female* (Figs. 1-6). Gnathosoma round-trapezoidal, not obviously beak-like. Pharynx as wide as 0.2x basal width of gnathosoma, and as long as 0.5x ventral length of gnathosomal capsule; with small, elongated indistinct glandular bodies. Outer walls sclerotized, external musculature developed, internal part well-sclerotized. Postpalpal (*pp*) setae indiscernible, most probably absent. Setae *dgs* apparently longer than *vgs*, former extending well beyond apices of palpi while latter at most reaching them. Cheliceral stylets and esp. levers strong, obvious, well-developed. Palpi short, only slightly longer than wide at base, directed parallel, reaching apex of capsule anteriorly. Each palpus with 2 minute rounded processes and 2 small setae: proximal one short, spine-like, distal one obviously longer; palptibial claw tiny, barely discernible.



Figs. 1-6. *Hemitarsonemus ganeo* sp. nov. **1.** Female, dorsum. **2.** Female, venter. Female legs, **3.** Tibiotarsus I (a) dorsal aspect, (b) ventral aspect; **4.** Tarsus II (dorsal aspect); **5.** Tarsus III (ventral aspect); **6.** Trochanter, femorogenu, and tibiotarsus IV (ventral aspect).

Idiosomal dorsum (length= 1.5x width): relative lengths of dorsal setae (v_1: sc_1: sc_2: c_2: c_1: *d*: *e*: *f*: *h*): 1: 0.5: 2.3: 0.7: 0.3: 0.4: 0.2: 0.9: 0.3. Rostral shieldlet indistinct, with weakly convex front edge, 2.5-3x wider than long. Setae v_1 stiff, bluntly pointed, barbed, separated by distance ca. equal to their lengths. Prodorsal shield (PrS) with slightly concave, weakly undulate posterior edge, slightly < 2x wider posteriorly than long medially; prodorsomedial apodeme absent, prodorsolateral ones thin, short lines. Sensilli sc_1 clavate with globular head, ca. twice as long as their width, very sparsely pilose. Stigmae located just posterolaterally of bases of setae v_1. Tracheal tubes each with wider, elongate atrial segments and paired postatrial sacs. Pits v_2 each located somewhat mediad of a line between setae sc_2 and v_1 on either side. Setae sc_2 slender, smooth, located slightly posteriad of midlength of prodorsal shield, extending over 1/2 its length beyond posterior edge of shield; separated by a distance shorter than their lengths. Setae c_2 slender, pointed, located somewhat anteriad of level of c_1, latter not reaching 1/2 its distance to posterior edge of tergite C and separated by a distance of ca. 5-6x their lengths. Tips of setae *d* not reaching posterior edge of tergite D, their bases separated by a distance of ca. 4-5.5x their lengths. Setae *f* ca. 3.3-5.4x (4.3x on average) longer than *e*; separated by distance of ca. 1.4x their lengths, inserted slightly posteriad to transverse line of *e*. Setae *h* separated by a distance usually longer than 4x their lengths; subequal to or slightly longer than *e* and obviously shorter than *f*. Dorsal opisthosomal setae c_1 through *h* weakly tapering, bluntly pointed, and more or less sparsely barbed.

Idiosomal venter: apodemes 1 well-sclerotized, joining anteromedial apodeme; latter weakened at level of apodemes 2, further posteriorly diffusing into broad indistinct area of breast platelet. Apodemes 2 not connected to anteromedial one. Sejugal apodeme defined as sclerotized lateral segments only, forming wide medial discontinuity. Setae *1a* located contiguously immediately posteriad of apodemes 1, separated by a distance of ca. 1.2-1.8x their lengths. Setae *2a* posterior to and contiguous with apodemes 2, at distance of 2-2.3x their lengths; both pairs very slender, pointed. Propodosomal plate with concave anterior edge and weakly defined lateral edges between trochanters I and II. Apodemes 3 somewhat weakened anteromedially; apodemes 4 well-sclerotized, continuing posterolaterally beyond bases of setae *3b* to edges of metapodosomal plate. Posteromedial apodeme lacking frontal segment (usually bifurcated), joining apodemes 4, retained in form of thin straight line protruding beyond (sometimes far) anteromedial ends of apodemes 4. Setae *3a* inserted at a distance of ca. 2.5x their lengths from bases of *3b* and spaced by distance smaller (0.6x) than that between *3b*. Setae *3b* shorter (ca. 0.2-0.3x) than distance between their bases; distinctly shorter (0.5-0.7x) than *3a*; both pairs slender, attenuate, pointed. Anterior edge of metapodosomal plate with broad convex medial flap protruding anteriorly; posterolateral edges undulating between trochanters III and IV on each side. Tegula broadly rounded, over 2x wider than long. Trochanters IV separated by interval of ca. 1.5x their widths. Setae *ps* thin, sharp, slender, separated by distance of over 2x their lengths. Surface of dorsal and ventral sclerites covered with uniform, fine but distinct dimples.

Proportions of free segments of legs: (I: II: III: IV) 1: 1: 1.1: 0.8. Leg I chaetotaxy: 3-4-6(2ϕ) +8(1ω). Claw pointed, strongly bent, distal part at about straight angle relative to longitudinal axis of segment.

Spine-like seta *s* somewhat crescent-shaped, with very short and wide basal stalk, dissimilar to setae *u'* of legs II and III. Tarsal I seta *u'* indiscernible; *u"* flanking pretarsus adaxially in form of tiny spine. Pretarsus sessile, with semicircular sclerotized ridge ventrally. Tibiotarsus subcylindrical, ca. 2.5x longer than wide at base. Eupathidium *p'* same length as *p"*, both located apically; eupathidium *tc'* subequal and located proximally to *tc"*, latter located subapically. Solenidion ω clavate, pedicel shorter than head, slightly larger than Ta ω II. Solenidion ϕ_2 similar in size to ω, located in separation between ϕ_1 and *k*; ϕ_1 small, without striations, famulus *k* larger than ϕ_1; located somewhat distally. Seta *l'* on genu stiff; tapering, sharply pointed, smooth. Femur I cylindrical; seta *d* on femur somewhat leaf-like, with pilose edges; *l'* tapering and pointed, *l"* missing. Leg II chaetotaxy: 3-3-4-5(1ω). Claws medium-sized, empodial pad large, round, sucker-like; ca. length of basal stalk. Tarsal seta *pl"* absent; seta *tc"* obviously longer than *tc'* and *pv'* (and even more so than *pv"*), reaching somewhat beyond tip of empodium. Tibia cylindrical with setae *v'*, *v"*, and *d* ≥ 2x longer than *l'*; seta *l'* on genu stiff, pointed, with a few barbs. Femur without ventral lobe; setae *d* and *l'* stiff, pointed, needle-like. Leg III chaetotaxy: 1+3-4-5. Claws and empodium about as strong as in leg II. Seta

tc" markedly (ca. 3x) longer than *tc'* on same segment. Femoral seta *v'* small, obviously shorter than setae (esp. *l'*) on genual part of segment. Free segments of leg IV slightly longer than combined length of femorogenu and tibia III. Femorogenu ca. 1.8x longer than tibiotarsus. Tarsal seta *tc"* smooth, slender, ca. as long as femorogenu of leg IV. Seta Tb *v'* at least slightly longer than tibiotarsus, although still shorter than femorogenu; strong, obviously serrated although somewhat smaller than genual *v'*. Femoral seta *v'* simple, weak, nearly 3x shorter than genual *v'*. Latter very strong, roughly serrated, its tip reaching beyond base of tibial *v'*.

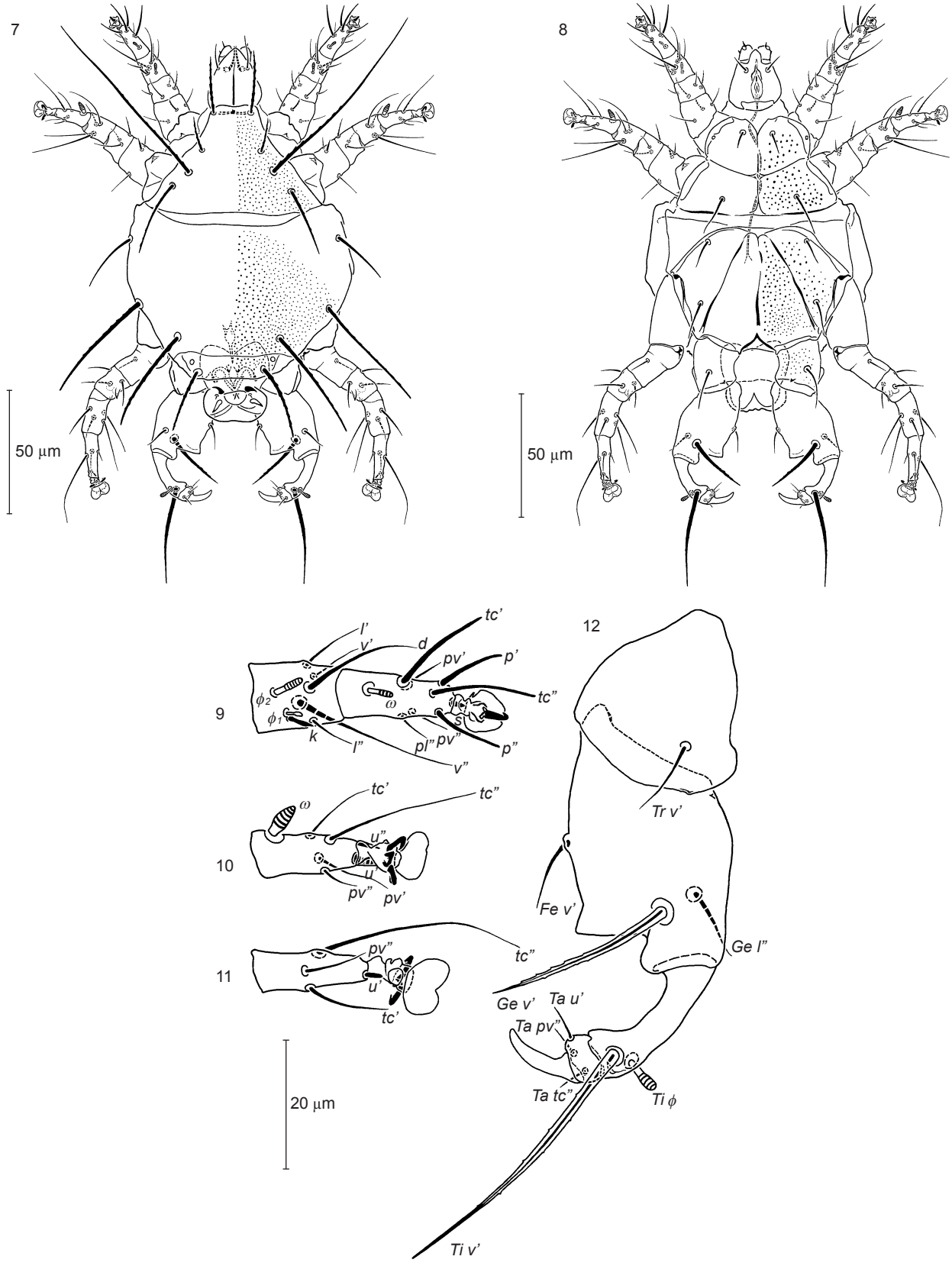
Measurements (holotype, followed by range of 8 female paratypes from type location): Body and tagmata: length of body 270 (211-276); length of idiosoma 223 (174-230); width of idiosoma 142 (122-153); length of gnathosoma 31 (30-34); width of gnathosoma 33 (29-35); length of pharynx 15 (14-16); width of pharynx 5 (5-6); *dgs* 13 (13-15); *vgs* 11 (9-11). Dorsum: length of PrS 69 (65-77); width of PrS 135 (122-141). Lengths of setae: v_1 26 (21-30); sc_1 13 (11-14); sc_2 58 (55-65); c_2 18 (15-19); c_1 9 (8-11); *d* 9 (8-12); *e* 5 (5-6); *f* 22 (20-27); *h* 7 (6-9). Distances between setae and stigmae: v_1-v_1 25 (24-28); *sti-sti* 37 (36-40); sc_1-sc_1 65 (58-67); sc_2-sc_2 71 (64-72); c_2-c_2 130 (120-138); c_1-c_1 55 (49-57); c_1-c_2 38 (35-41); *d-d* 46 (39-54); *e-e* 72 (61-73); *f-f* 31 (29-39); *e-f* 23 (16-21); *h-h* 31 (26-33). Venter: lengths of setae: *1a* 7 (6-8); *2a* 15 (14-16); *3a* 13 (11-16); *3b* 7 (6-10); *ps* 4 (4-6). Distances between setae: *1a-1a* 12 (8-11); *2a-2a* 34 (30-34); *3a-3a* 20 (20-24); *3b-3b* 36 (34-37); *ps-ps* 11 (11-13). Length of PrP 50 (49-55); width of PrP 100 (99-107); ap. 1-1 21 (19-25); ap. 2-2 50 (45-50); length of tegula 9 (6-10); width of tegula 20 (18-23). Leg segments and leg setae (lengths): Tbt I: 28 (24-28); Ta I ω 5 (5-6); Tb I ϕ_2 5 (4.5-6); Tb I ϕ_1 3 (3-4); Tb I *k* 5 (4-5); Ta II ω 5 (4-5); Fege+Tb III 46 (42-45); Tbt IV 16 (15-17); Ta IV *tc"* 28 (26-29); Tb IV *v'* 18 (16-20); Fege IV 29 (27-30); Ge IV *v'* 19 (18-20); Fe IV *v'* 7 (6-7).

Male (Figs. 7-12): Gnathosoma shape similar to that of female, although slenderer. Pharynx as wide as ca. 0.2x basal width and as long as 0.5x ventral length of gnathosomal capsule; with small, barely discernible, elongated glandular bodies. Postpalpal (*pp*) setae indiscernible. Setae *dgs* slightly longer than *vgs*, extending slightly beyond apices of palpi. Cheliceral stylets and levers obvious but less so than those in female. Palpi built similarly to those of female but smaller.

Idiosomal dorsum (length= 1.2x width): relative length of dorsal setae (v_1: v_2: sc_1: sc_2: c_2: c_1: *d*: *f*) 1: 0.5: 3.5: 1.1: 1.1: 1.9: 1.9: 1.2. Prodorsal shield (PrS) subtrapezoidal, with truncated anterior and straight posterior edges. Prodorsal setae tapering, pointed, although v_1 more-robust and blunt; distance between v_1 bases somewhat longer than 1/2 their lengths. Setae v_2 located ca. in line with sc_1 and sc_2. Setae sc_1 located just behind midlength of prodorsal shield; about 3/4 of their lengths extending beyond posterior edge, separated by a distance of ca. 0.4x their lengths. Setae sc_2 located in posterior 1/4 of PrS. Tips of setae c_2 reaching near bases of c_1. Setae c_1 and *d* subequal in length, extending far beyond posterior edge of shield CD; former pair separated from each other by a distance of ca. 1.8x their lengths, and ca. 0.5x their lengths from bases of *d*. Setae *d* separated by distance slightly shorter than their lengths; setae *f* separated by distance roughly equal to their lengths and ca. 0.6x shorter than c_1 and *d*. Setae *h* tiny, very short. Genital capsule ca. 0.8x as long as wide; with relatively broad, well-developed hyaline rim. Accessory stylets prominent, supported with well-discernible motivators; occupying well over 1/2 length of genital capsule when protracted. Cupule *ia* indiscernible; cupule *im* located anterolaterally (but not contiguous) to bases of *f*. All dorsal opisthosomal setae barbed (larger ones distinctly). Surface of dorsal sclerites covered with uniform, very fine dimpled ornamentation.

Idiosomal venter: apodemes 1 sclerotized, anteromedial apodeme disappearing behind level of posteromedial extremities of apodemes 2, indistinctly joining with them. Sejugal apodeme indiscernible or very weakly defined in some specimens. Setae *1a* separated by a distance of ca. 1.5x their lengths. Setae *2a* ca. 1.5x as long as former, separated by a distance of ca. 2x their lengths. Ventral propodosomal plate with slightly convex posterior extremity and uniform, very fine, dimpled ornamentation. Setae *3a* similar in length to *3b*, separated by distance of ca. 2-2.5x their lengths from bases of *3b*, and by distance of ca. 3x their lengths from each another, but smaller than that between *3b*. Setae *3b* separated by interval of ca. 4x their lengths. All podosomal setae slender, pointed. Apodemes 3 and 4 and posteromedial one all relatively well-developed, with very pronounced anterior edges uniting somewhat less clearly. Ornamentation of coxal fields IV and III and lateral fields of ventral metapodosomal plate uniformly and very finely dimpled.

Legs: proportions of free segments of legs (I:



Figs. 7-12. *Hemitarsonemus ganeo* sp. nov. **7.** Male, dorsum. **8.** Male, venter. Male legs, **9.** Tibia and tarsus I (dorsal aspect); **10.** Tarsus II (dorsal aspect); **11.** Tarsus III (ventral aspect); **12.** Trochanter, femorogenu, tibia, and tarsus IV (ventral aspect).

II: III: IV) 1: 1: 1.3: 1.2. Leg I chaetotaxy: 3-4-6(1ϕ)-8(1ω). Claw typically hooked (in contrast to that in female), similar to those of tarsi II and III. Seta *s* typically spine-like, somewhat smaller than setae *u'* of tarsi II and III. Tarsus ca. 2.5x longer than wide at base. Eupathidium *p'* equal in length to *p"*, both located subapically; eupathidium *tc'* subequal to *tc"*, located slightly more distally to transverse midline of tarsus. Solenidion ω with somewhat elongate head, smaller than Ta II ω; both tarsal eupathidia *ft'* and *ft"* absent. Tibial I solenidion ϕ_2 similar to Ta I ω; Ti I ϕ_1 small, with smooth head; eupathidium *k* pointed, almost twice as long as ϕ_1. Seta *l'* on genu similar to others on its segment, with sparse barbs. Seta *l'* of femur I slender and pointed; seta *d* shorter, slightly stiffer, both barbed. Leg II chaetotaxy: 3-3-4-5(1ω). Claws moderate, empodium large, sucker-like, often incised apically. Seta *u'* spine-like, *u"* thin, stiff, barely discernible. Seta *tc"* at least 2x longer than other setae on segment, extending far beyond tip of empodium. Solenidion ω obviously larger than that on tarsus I, with somewhat more cone-shaped appearance. Tibial setal complement similar to that of female. Genual seta *l'* barbed, slender; seta *l'* on femur slender shorter, *d* longer, weakly barbed. Leg III chaetotaxy: 1-3-4-4. Claws and empodium as those of leg II. Seta *tc"* markedly (over 2x) longer than *tc'*. All setae on tibia, genu, and femur slender, pointed. Femoral seta *v'* similar in form and length to genual *l'*. Genu also with small, spur-like process on segment wall, projecting posteriorly (antaxially). Free segments of leg IV about as long as those of leg III. Tarsal claw weakly curved, with rounded tip, almost 3x longer than wide at base and 3x longer than tarsus alone. Tarsus with 3 smaller setae, similar in length to each other. Tibia elongate in outline, constricted along its midsegment; solenidion ϕ medium-sized, with weakly expanded, striated head. Tibial seta *v'* slender but not excessively attenuated, sparsely barbed, blunt-ended, ca. as long as femorogenu of leg IV. Femorogenu IV nearly 2x longer than wide at base, with roughly triangular posteromedial lobe, usually evident, although in some specimens weakly expressed; seta Ge *v'* robust, barbed, longest on femorogenu, as long as ca. 0.6x length of Tb *v'*. Seta Tr *v'* slightly longer than Fe *v'* on femorogenu.

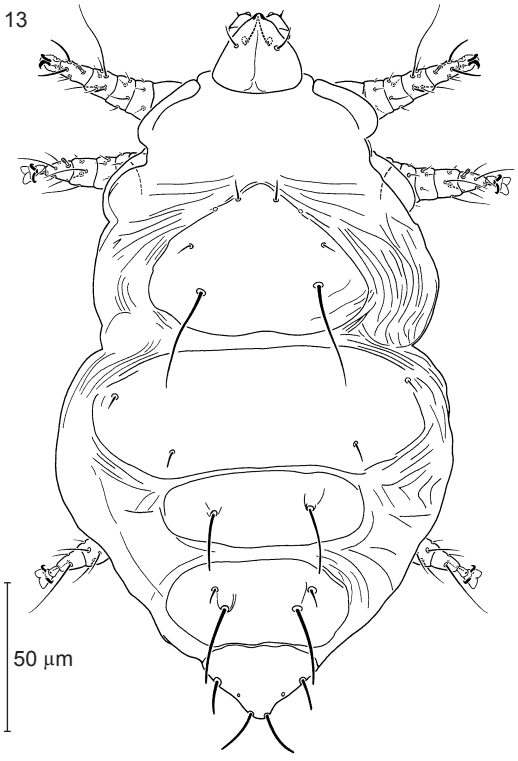
Measurements (range of 4 male paratypes): Body and tagmata: length of body 172-196; length of idiosoma 143-152; width of idiosoma 101-105; length of gnathosoma 26-29; width of gnathosoma 24-30; length of pharynx 12-14; width of pharynx 5; *dgs* 11-12; *vgs* 8-11. Dorsum: length of PrS 51-54; width of PrS 74-80. Lengths of setae: v_1 22-27; v_2 10-14; sc_1 73-94; sc_2 23-32; c_2 21-30; c_1 40-52; *d* 39-48; *f* 25-31; *h* 4-6. Distances between setae: v_1-v_1 14-15; v_2-v_2 24-26; sc_1-sc_1 25-37; sc_2-sc_2 51-55; c_2-c_2 85-95; c_1-c_1 73-88; c_1-c_2 27-30; c_1-*d* 21-26; *d*-*d* 37-45; *f*-*f* 27-29; *h*-*h* 10-12. Venter: lengths of setae: *1a* 8-10; *2a* 12-16; *3a* 11-14; *3b* 10-15. Distances between setae: *1a*-*1a* 13-16; *2a*-*2a* 29-34; *3a*-*3a* 40-43; *3b*-*3b* 49-53. Length of PrP 44-47; width of PrP 78-84; ap. 1-1 15-23; ap. 2-2 47-53, length of genital capsule 27-30; width of genital capsule 31-36. Leg segments and leg setae (lengths): Ta I 16-17; Ta I ω 4-4,5; Tb I ϕ_2 4-5; Tb I ϕ_1 2-3; Tb I *k* 4-5; Ta II ω 5-6; claw IV length 11-13; claw IV width 4-5; Tb+Ta IV 21-25; Tb IV *v'* 41-49; Tb IV ϕ 5-6; Fege IV 30-32; Ge IV *v'* 24-27; Ge IV *l"* 6-10; Fe IV *v'* 8-13.

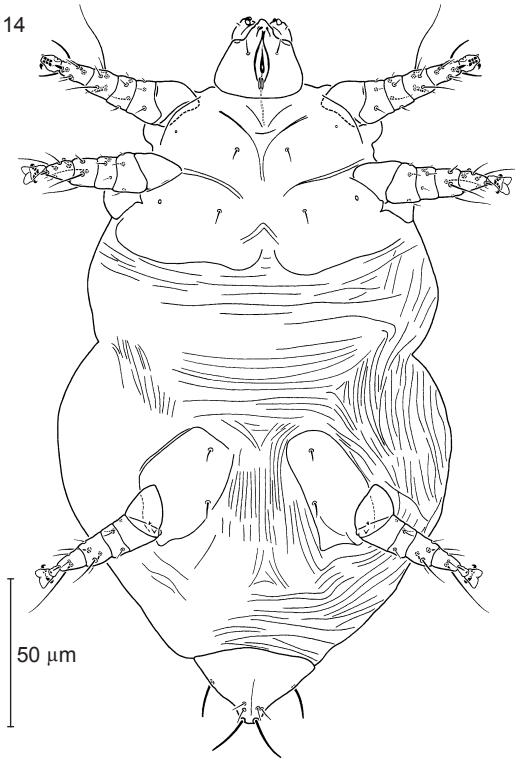
Larva (Figs. 13-17): Gnathosoma subtriangular, shorter than that in adults, slightly wider than long. Pharynx as wide as ca. 0.2x basal width, and 1/2 as long as ventral length of gnathosoma; built similarly to that in adults, but slenderer and less-sclerotized. Glandular bodies very small, difficult to discern; postpalpal (*pp*) setae indiscernible. Setae *dgs* longer than *vgs*, none reaching apices of palpi. Cheliceral stylets and levers weak. Palpi short, somewhat converging, each with 2 minute processes and seta apically. Palptibial claw weakly discernible.

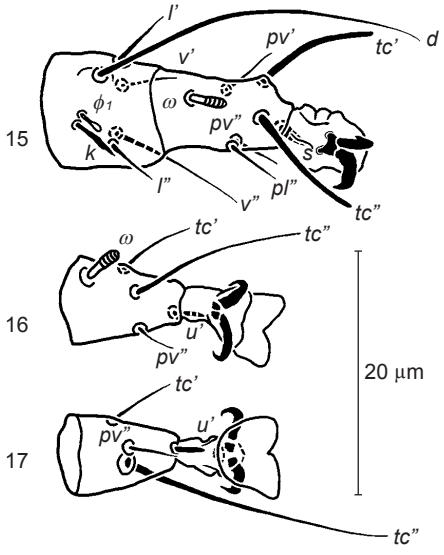
Idiosomal dorsum (length = 1.7x width): relative length of setae (v_1: sc_1: sc_2: c_2: c_1: *d*: *e*: *f*: h_2: h_1) 1: 0.9: 5.6: 0.9: 1.2: 3.2: 1.0: 4.0: 1.6: 2.2. Setae v_1 and sc_1 tiny, slender, pointed, smooth; sc_2 located on posterior 1/3 of prodorsal shield, extending 2/3 of their length beyond posterior edge of prodorsal shield, at a distance to each other subequal to their length. Setae c_2 tiny, short; c_1 subequal to at most 1.5x length of c_2; separated by 5-9x their lengths; both pairs weakly tapering, barbed. Setae *d*, *f*, h_1, and h_2 moderately stiff, bluntly ended, obviously barbed; *d* and *f* obviously longer than remaining ones on opisthosomal dorsum. Cupuli *ia* indiscernible, setae *d* extending 1/2 their length beyond posterior edge of tergite D; arranged in a reciprocal distance of 1.5x their lengths; setae *e* located at a distance from *f* similar to or smaller than their lengths; *f* 3-5x longer than former, at a reciprocal distance of about their lengths. Cupuli *im* indiscernible. Setae h_2 separated by a distance of ca. 3x their lengths; setae h_1 ca. 1.4x as long as h_2 and ca. 3x as long as distance between own bases. Cupuli *ih* barely discernible, located posteriad of line of h_2. Dorsal

shields smooth.

Idiosomal venter: apodemes 1 and 2 very weakly expressed, anteromedial apodeme barely discernible beyond connection with apodemes 2. All ventral podosomal setae short, semi-stiff, pointed; *1a* located well posterior of apodemes 1, at a distance of ca. 3-4.5x their lengths from each other. Setae *2a* located posteriad of proximal parts of apodemes 2, at a reciprocal distance of ca. 5-6x their lengths. Propodosomal plate incised anteriorly between apodemes 1 and convex on each side at its posterior limits. Setae *3a* subequal to *3b*, at a distance of ca. 3-5x of their length from bases of *3b.* Two pairs of minute setae *ps*







Figs. 13-17. *Hemitarsonemus ganeo* sp. nov. **13.** Larva, dorsum. **14.** Larva, venter. Larva legs, **15.** Tibia and tarsus I (dorsal aspect); **16.** Tarsus II (dorsal aspect); **17.** Tarsus III (ventral aspect).

symmetrically arranged anteriorly near bases of h_1 on HPs segment. Propodosomal plate and coxal fields III without ornamentation.

Legs: proportions of free segments of legs (I: II: III) 1: 0.9: 1. Leg I chaetotaxy: 3-4-6(1ϕ)-6(1ω). Claws similar or slightly stronger than those of legs II and III. Subunguinal seta *s* spine-like as unguinal setae *u'* II and III. Tarsus ca. 1.7x as long as wide at base. Eupathidium *tc'* subequal in length to *tc"*, both located subapically. Solenidion ω with slightly swollen head, as large as Ta II ω; both obviously less elongated than those in female. Tibial solenidion ϕ*1* with smooth head, clearly shorter than famulus *k*. Seta *l'* on genu shorter than *l"* and as long as *v'* and *v"*. Femoral seta *l'* tiny, pointed, *d* longer, slender. Leg II chaetotaxy: 3-3-4-4(1ω). Claws medium-sized, thin; empodium, large, pad-like, bilobate. Tarsal setae *pl"* and *pv'* lacking. Seta *tc"* ca. 2x longer than *tc'*, extending slightly beyond distal edge of empodium. Genual seta *l'* about as short as other setae on segment. Seta *l'* on femur tiny, *d* almost 2x longer. Leg III chaetotaxy: 1-3-4-4. Claws as large as those on leg II. Empodial pad bilobate. Tarsal seta *tc"* over 4x longer than *tc'*, extending far beyond distal edge of empodium. Tibial setae *d*, *v'*, and *v"* attenuated, slender; *l'* obviously shorter than former ones.

Measurements (range among 3 larval paratypes): Body and tagmata: length of body 175-265; length of idiosoma 134-230; width of idiosoma 85-135; length of gnathosoma 25-28; width of gnathosoma 28-32; length of pharynx 12-13; width of pharynx 5-6; *dgs* 8-9; *vgs* 6-7. Dorsum: length of PrS 42-44; width of PrS 74-76. Lengths of setae: v_1 6-8; sc_1 4-8; sc_2 34-46; c_2 5-8; c_1 7-12; *d* 22-23; *e* 6-9; *f* 27-30; h_2 10-12; h_1 15-16. Distances between setae: v_1-v_1 13-15; sc_1-sc_1 47-48; sc_2-sc_2 41-43; c_2-c_2 84-105; c_1-c_1 61-65; c_1-c_2 23-29; *d*-*d* 33-34; *e*-*e* 31-34; *f*-*f* 23-25; *e*-*f* 8-9; h_2-h_2 27-32; h_1-h_1 5-6. Venter: lengths of setae: *1a* 4-5; *2a* 5-6; *3a* 4-5; *3b* 4-5; *ps* 4-6. Distances between setae: *1a*-*1a* 16-18; *2a*-*2a* 28-31; *3a*-*3b* 14-20; *ps*-*ps* 3-6. Length of PrP 29-32; width of PrP 80-92; ap. 1-1 22-24; ap. 2-2 41-45; length of HPs 24-25; width of HPs 35-42. Leg segments and leg setae (lengths): Ta I 11-12; Ta I ω 3-3; Tb I ϕ_1 2.5-3; Tb I *k* 4-5.5; Ta II ω 3-4.

Distribution: Central Europe (Poland).

Differential diagnosis: Females of the new species are most similar to *H. tepidariorum* (Warburton, 1904) from which they differ by dorsal setae *f* over 4x longer than *e* (vs. 2x) and over 3x longer than *h* (vs. 1.5x). Also, tarsal I eupathidia *p'* and *p"* are ca. 2x longer than tarsal I solenidion ω, while they are about as long as Ta I ω in *H. tepidariorum*. Dorsal setae v_1 of males of *H. ganeo* only 2x longer than v_2 (vs. 6x in *H. tepidariorum*) and tibial IV seta *v'* less than 2x longer than genual *v'* (vs. obviously 2x longer than genual *v'*). Dorsal setae *f* of larvae of the new species obviously longer than h_2 and h_1, while in *H. tepidariorum* setae *f* are ca. as long as h_2, and the latter 2 are slightly shorter than h_1.

Hemidendroptus **Magowski subgen. nov.**

Dendroptus Kramer 1876 sensu Lindquist 1986

Etymology: The new subgeneric name is a combination of prefix "*Hemi-*" derived from "*Hemitarsonemus*" and its genus-level name "*Dendroptus*".

Type species: *Hemidendroptus helluo* Magowski sp. nov.

Diagnosis (apomorphic character states preceded by an asterisk): Females of the new subgenus are similar to both *Dendroptus sensu* lato and *Acaronemus* Lindquist & Smiley, 1978 by loss of femoral I seta *l"*, tibial I solenidion ϕ_1, and tarsal II seta *pl"*. In contrast to some other species of *Dendroptus* sensu stricto, and *Eudendroptus* (*) sejugal apodeme is absent and (*) posteromedial one is rudimentary; tarsal I seta *pl"* is retained. Reduction of sejugal and posteromedial apodemes (and the lack of postpalpal setae) can also be found in *Acaronemus*; however, the new subgenus has differently shaped subpraetarsal setae *u'* of legs II and III (spine-like rather than setiform) and leg ambulacra (discoidal sucker-like vs. elongate pad-like). Unique among all its congeners and species of *Acaronemus* (*), setae sc_1 are formed as short spines rather than capitate sensilli, and none of the dorsal opisthosomal or ventral podosomal setae (esp. *3a*) are particularly attenuated. Females of *Hemidendroptus* are also somewhat similar to *Hemitarsonemus* by the shape of the anterior edge of the ventral metapodosomal plate which extends medially forward in a form of a biconvex projection, and the ambulacrum of leg I and empodia of tarsi II and III which form distally as large, subcircular lobes. They differ from them; however, by the missing sejugal apodeme, tarsal I seta *l"*, and tibial I solenidion ϕ_1, the rudimentary posteromedial ventral apodeme, tarsal subunguinal seta *s* being spine-like rather than crescent-shaped, similar to subpretarsals *u'* of legs II and III, and genual IV seta *v'* being simple, slender, and

smooth rather than enlarged and serrated.

Males and larvae are unknown.

Dendroptus (*Hemidendroptus*) *helluo* Magowski sp. nov.

(Figs. 18-23)

Material examined: Holotype ♀: Poland, Małopolska Prov., Nowy Sącz Dist., Pieniny Mt. range, Sokolica Mt., NE slope, approx. 710 m, ca. 100 m north from top, in mixed forest with *Fagus silvatica*, *Picea excelsa*, *Abies alba*, *Coryllus avellana*, *Impatiens nolitangere*, *Asperula odorata*, *Geranium* sp., *Phyllitis scolopendroides;* ex fronds of large *Dryopteris filix-mas* (L.) Schott fern, 29 Aug. 1989, coll. W. Magowski (WM-149).

Paratypes: 1 paratype ♀ with same data as for holotype (type locality).

Type material: holotype and paratype specimens each mounted singularly on separate slides (primary slide designations PF5/6 and PF5/7, respectively). Deposition of type material in the Department of Animal Taxonomy and Ecology, A. Mickiewicz Univ., Poznań, Poland.

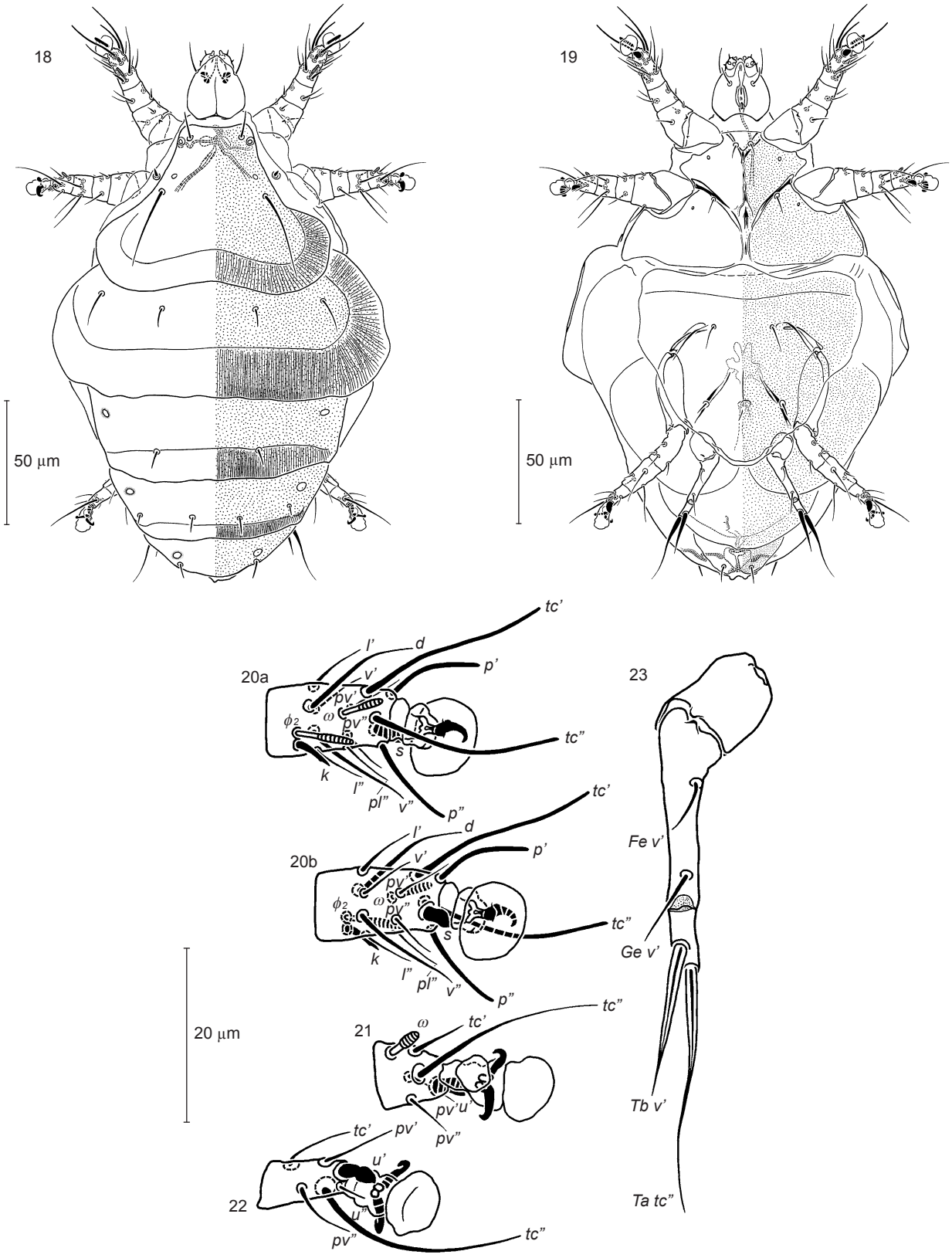
Etymology: The specific name "*helluo*" (Eng. "gormandizer") refers to the relatively rounded appearance of the animal compared to other species of its genus, probably indicating a larger amount of food ingested.

Diagnosis: as for the subgenus.

Description: *Female*: Gnathosoma: capsule rounded short-triangular, not obviously beak-like. Pharynx as wide as 0.2x basal width of gnathosoma, and as long as 0.4x ventral length of gnathosomal capsule. External walls and musculature relatively well-developed, internal part moderately sclerotized. Minute, indistinct glandular bodies adjacent posteriorly to walls of pharynx. Postpalpal (*pp*) setae indiscernible. Setae *dgs* 1.3x as long as *vgs*, former extending somewhat beyond apices of palpi. Cheliceral stylets and levers moderate in size. Palpi medium-sized, about 2x as long as wide at base, arranged parallel, somewhat converging, weakly protruding beyond apex of capsule. Each palpus with minute rounded process ventrally, similarly shaped palptarsus and 2 tiny setae, distal one obviously longer than proximal one. Palptibial claw indiscernible, instead tip of palpus with small lobate process protruding forward.

Idiosomal dorsum (length = 1.7x width): relative lengths of dorsal setae (v_1: sc_1: sc_2: c_2: c_1: *d*: *e*: *f*: *h*) 1: 0.3: 2.8: 1.3: 0.7: 0.7: 0.4: 0.6: 0.6. Prodorsal shield (PrS) with concave posterior edge, ca. 1.4x as wide posteriorly as long medially; prodorsomedial apodeme absent. Rostral shieldlet subrectangular, with shallow-convex front edge, over 4x wider than long. Setae v_1 weakly tapering, with blunt end, separated by a distance of ca. 2x their lengths. Sensilli sc_1 atypically very short, spiniform, smooth. Tracheal tubes with weakly expanded atrial segments, without postatrial sacs or expansions. Pits v_2 located in line between setae sc_2 and v_1 on either side roughly at level with sc_1. Setae sc_2 located anteriorly to midlength of prodorsal shield, separated by a distance of 1.4-1.5x their lengths, their tips not reaching posterior edge of PrS. Tips of setae c_2 reaching 1/2 distance to bases of c_1. Latter pair separated by a distance of ca. 5x their lengths, reaching at most 1/5 distance to posterior edge of tergite C; only slightly posteriad of level of c_2. Tips of setae *d* not reaching posterior edge of tergite D, separated by a distance of 5-6x their lengths. Setae *e* apparently shorter than *f*; latter separated by distance of ca. 3x their lengths, both pairs inserted almost in a transverse line. Setae *h* separated by distance of approximately 4.5x their lengths; subequal in length to *f* but longer than *e*. All dorsal opisthosomal setae (except c_2) semi-stiff, smooth, tapering but bluntly pointed. Surface of dorsal sclerites covered with uniform, very fine, dimpled ornamentation.

Idiosomal venter: apodemes 1 sclerotized, joined with anterior part of anteromedial apodeme. Latter visible only to level of posteromedial extremities of apodemes 2; partly reduced at midlength and entire further posterior to level of apodemes 2. Apodemes 2 diffusing toward medial line of propodosomal plate. Sejugal apodeme absent. Setae *1a* located on apodemes 1, separated by a distance of ca. 1.6x their lengths. Setae *2a* placed on posterior edges of apodemes 2, at a distance between their bases of ca. 4x their lengths; both pairs very slender, pointed. Anterior edge of propodosomal plate concave between distal ends of apodemes 1; without additional lateral ridges between trochanters I and II. Apodemes 3 and 4 weak at their anteromedial extremities; apodemes 4 extending posterolaterally beyond insertions of setae *3b*, posteromedial apodeme reduced except for vestigial short segment and knot-like protuberance. Setae *3a* inserted at a distance of ca. 2.5x their lengths from each other, and ca. 3x their lengths from bases of *3b*, separated by a distance slightly smaller than that between *3b*. Setae *3b* separated by a distance of over 6x their lengths; distinctly (ca.



Figs. 18-23. *Dendroptus helluo* sp. nov. **18.** Female, dorsum. **19.** Female, venter. Female legs, **20.** Tibiotarsus I (a) dorsal aspect, (b) ventral aspect; **21.** Tarsus II (dorsal aspect); **22.** Tarsus III (ventral aspect); **23.** Trochanter, femorogenu, and tibiotarsus IV (ventral aspect).

2x) shorter than *3a*; both pairs tapering, slender, pointed. Anterior edge of metapodosomal plate laterally concave with convex medial flap similar to that of *Hemitarsonemus* female; plate weakly undulate posterolaterally between trochanters III and IV. Tegula broadly rounded, ca. 3x wider than long with truncated posteromedial edge. Trochanters IV separated by interval of ca. 3x their widths. Setae *ps* slender, thin, sharply ended, smooth; separated by a distance roughly equal to 2x their lengths.

Proportions of free segments of legs: (I: II: III: IV) 1: 0.9: 1: 0.7. Leg I chaetotaxy: 3-4-6(1ϕ) +8(1ω). Claw hooked, almost sickle-shaped, similar in size to those of tarsi II. Pretarsus with very short basal stalk, projecting distally into large, discoidal expansion. Spine-like seta *s* thick, pointed, somewhat bent distally and slightly constricted at midlength, similar to setae *u'* on tarsi II and III. Setae *u'* and *u"* usually flanking pretarsus indiscernible. Tibiotarsus nearly 2x longer than wide at base. Among four tarsal eupathidia, *p'* subequal in length to *p"*, both inserted apically; *tc'* subequal to *tc"*, located subapically, latter located slightly proximad of former. Solenidion ω slim, head slightly longer than pedicel. Solenidion ϕ_2 slim, somewhat clavate, obviously longer than famulus *k* and solenidion ω; located contiguously with *k*. Solenidion ϕ_1 absent. Seta *l'* on genu slightly lanceolate, somewhat stouter than others on segment, smooth. Femur I subcylindrical; seta *l"* missing from segment, *l'* short, *d* slightly longer, both weakly tapering and pointed. Leg II chaetotaxy: 3-3-4-5(1ω). Claws medium-sized, hook-like, empodium in form of subcircular pad; pretarsal stalk expanded at bases of claws. Seta *u'* shaped as *s* on Ta I; *u"* indiscernible. Tarsal solenidion ω similar in length to that on tarsus I, although somewhat stouter. Seta *pl"* absent; seta *tc"* ca. 4x longer than other setae of segment, obviously extending beyond tip of empodium. Setae *v'* and *v"* of tibia longest, *l'* shortest, *d* intermediate. Genual seta *l'* smooth, stiff, but not stronger than *v'* and *l"*. Femur without ventral lobe; with minute seta *d*, and *l'* only slightly longer, pointed. Leg III chaetotaxy: 1+3-4-5. Claws slightly less-stout than those of tarsus II, empodium similar in form and size to those of leg II. Seta *tc"* obviously (almost 3x) longer than other setae on segment. Femoral seta *v'* weak and short, barely discernible; out of 3 setae on genual part of segment, *l'* shorter than *v'* and *l"* subequal. Free segments of leg IV slightly shorter than combined length of femorogenu and tibia III. Femorogenu ca. 2.5x as long as tibiotarsus. Tarsal seta *tc"* ca. as long as free segments of leg IV. Tibial seta *v'* shorter than length of femorogenu, but longer than tibiotarsus; similar in form to tarsal *tc"* although not as attenuate. Tip of genual seta *v'* reaching base of tibial *v'*. Femoral seta *v'* somewhat shorter and thinner than genual *v'*. All setae of leg IV attenuate, pointed, smooth.

Measurements (holotype followed by 1 female paratype in parentheses): Body and tagmata: length of body 216 (277); length of idiosoma 194 (239); width of idiosoma 120 (135); length of gnathosoma 27 (29); width of gnathosoma 25 (28); length of pharynx 11 (11); width of pharynx 5 (6); *dgs* 10 (13); *vgs* 8 (10). Dorsum: length of PrS 77 (73); width of PrS 96 (107). Lengths of setae: v_1 12 (11); sc_1 3 (3); sc_2 32 (32); c_2 15 (16); c_1 7.5 (8); *d* 7 (8); *e* 5 (5); *f* 7 (7); *h* 7 (7). Distances between setae and stigmae: v_1-v_1 22 (22); *sti-sti* 29 (30); sc_1-sc_1 50 (52); sc_2-sc_2 44 (49); c_2-c_2 93 (99); c_1-c_1 39 (39); c_1-c_2 29 (29); *d-d* 42 (40); *e-e* 63 (68); *f-f* 20 (24); *e-f* 22 (20); *h-h* 32 (31). Venter: lengths of setae: *1a* 4 (5); *2a* 7 (7); *3a* 11 (10); *3b* 5 (5); *ps* 7 (6). Distances between setae: *1a-1a* 7 (7); *2a-2a* 26 (28); *3a-3a* 24 (28); *3b-3b* 32 (32); *ps-ps* 12 (13). Length of PrP 58 (56); width of PrP 93 (116); ap. 1-1 11 (14); ap. 2-2 38 (46); length of tegula 5 (7); width of tegula 19 (21). Leg segments and leg setae (lengths): Tbt I 16 (18); Ta I ω 4 (5); Tb I ϕ_1 7 (8); Tb I *k* 6 (6); Ta II ω 5 (4.5); Tbt IV 8 (9); Ta IV *tc"* 27 (31); Tb IV *v'* 20 (19); Fege IV 21 (22); Ge IV *v'* 9 (11); Fe IV *v'* 6 (6).

Males and larvae unknown.

Distribution: Central Europe (Poland).

Differential diagnosis: The new species is unique among all other known species of *Dendroptus* by setae sc_1 being formed as short spines. Other characters diagnostic for the new subgeneric taxon and new species are also not known to occur in combination in any known species of *Dendroptus*.

DISCUSSION

Significance of the discovery of *Hemitarsonemus ganeo* sp. nov.

Until recently the genus was represented by 3 species, of which 2 (*H. biconvexa* and *H. furcalis*) were described outdoor from south-central and southeastern China, and 3rd (*H. tepidariorum*) from various locations in the United States and England. Fern species recorded as being infested

by *H. tepidariorum* include *Asplenium bulbiferum* (Kent, UK; Cameron 1925; Warburton 1904 did not specify either a location or fern species), *Pteris cretica* cultivars "alexandrae", "mayii", "ouvardii", "parkeri", "wilsonii", and "wimsettii", *P. argyraea*, *P. ensiformis* "victoriae" (all in the San Francisco Bay area, CA; Pritchard 1951; cultivar names were erroneously written as specific names in the original reference), *Polystichum* sp. (Minnesota; Ewing 1939, Pritchard 1951, Beer 1954) *Rumohra adiantiformis* (Costa Rica; Ochoa 2005) *Athyrium procumbens* (plant material originating from Malaya), and *Diplazium procorum* (originating from Sri Lanka, the latter 2 at the Kew Botanic Gardens propagating facility, UK; Lindquist 1986). Although rarely explicitly stated, most (if not all) plant material must have been from indoor cultivation (Cameron 1925, Lindquist 1986), which is known to be the standard method of commercial fern cultivation and propagation. Therefore, as almost none of the above listed plants are native to regions where infestations by *H. tepidariorum* were spotted (with the possible exception of *R. adiantiformis*), it seems that the pest was an unintended foreign import. Moreover, as a majority of recorded host plants primarily inhabit various tropical and subtropical areas of the Old World, it can be speculated that *H. tepidariorum* shares a similar origin. Regions like southern India, Southeast Asia, and eastern Australia may contain elements of its primary geographic distribution. Thus, *Hemitarsonemus ganeo* sp. nov. is the first species of the genus recorded outdoors in a temperate climate zone, as well as the 1st one in Europe described in its natural habitat.

Systematic position of *Hemidendroptus* subgen. nov. and *Dendroptus* (*H.*) *helluo* sp. nov.

After its introduction by Kramer in 1876, the genus *Dendroptus* went unnoticed in the acarological literature until the 2nd half of the 20th century. It was aptly revived by Lindquist in 1986, who gave a modern diagnosis and description of this taxon and setting it within his new systematic context of the subfamily Tarsoneminae and tribe Steneotarsonemini. In the same year, Sharonov and Mitrofanov (1986) described the subgenus *Eudendroptus* and rediagnosed the nominative subgenus. Their new subgenus was established to accommodate 2 species, *D. fennicum* (Oudemans, 1903) and *D. fagi* Sharonov and Mitrofanov, 1986, and was originally based on the presence of spine-like seta *pl"* on Ta II of both sexes; a "needle-like" form of setae *ps* in females, and a spine-like form of seta Ti III *l'* in males.

Out of 3 main diagnostic characters, only the latter 2 are synapomorphies for *Eudendroptus*, but their distribution among other species of the genus remains uncertain. As some species were only provisionally included in *Dendroptus* by Lindquist, and, on the other hand, a number of undescribed species were reported by Ripka et al. (1997), the genus is in need of more thorough subgeneric and specific revisions.

The systematic position of *Hemidendroptus* remains unsure. While it keys out within *Dendroptus* quite well according to Lindquist's diagnosis (1986), it also differs from 2 other subgenera by a number of characters. In addition to those listed in the above diagnosis, *D.* (*H.*) *helluo* sp. nov. also has shorter legs, and somewhat more rounded and less protruding gnathosoma with shorter palpi. Also the form of tarsal setae *s* and *u'* (located at the bases of pretarsi I-III) which are thick, bent, slightly constricted, and pointed is, at least, atypical for *Dendroptus*, and even more so for *Acaronemus*. Similarities in the formation of ventral apodemes (sejugal and posteromedial ones) and some other character states shared between the new genus and *Acaronemus* cannot be unambiguously interpreted as synapomorphies or merely homoplasies at present. Thus, the current position of the new subgenus has to be considered provisional, until more data (especially on males and larvae) become available.

Key for determination of species of the genus *Hemitarsonemus*:

Females:

1. Stigmae located behind setae v_1; solenidion ϕ_2 longer than ϕ_1 2
- Stigmae located at level of v_1; solenidion ϕ_2 shorter than ϕ_1. ..... *H. furcalis* Lin et Zhang, 1995
2. Seta *f* ca. 2x longer than *e* and 1.5x longer than *h*, solenidion Ta I ω approaching eupathidia *p'* in length .... *H. tepidariorum* (Warburton, 1904)
- Seta *f* over 4x longer than *e* and over 3x longer than *h*, solenidion Ta I ω nearly 2x shorter than eupathidia *p'- p"* .... *H. ganeo* sp. nov.

Males:

1. Setae c_2 and *d* obviously (2-3x) longer than sc_2, inner flap on femorogenu IV with angulated protrusion 2
- Setae c_2 and *d* approximately same length as sc_2, inner flap on femorogenu IV without angulated protrusion .... *H. furcalis* Lin et Zhang, 1995
2. Seta v_2 approximately same length as v_1, seta c_2 only somewhat shorter than c_1 .... *H. biconvexa* Lin et Zhang, 1994
- Seta v_2 obviously (at least 2x) shorter than v_1, seta c_2 at least 2x shorter than c_1 3

3. Seta v_1 ca. 6x longer than v_2; seta Ti IV *v'* over 2x longer than Ge IV *v'* ..... *H. tepidariorum* (Warburton, 1904)
- Seta v_1 ca. 2x longer than v_2; seta Ti IV *v'* ca. 1.7x longer than Ge IV *v'* ..... *H. ganeo* sp. nov.

Larvae:

1. Dorsal setae *f* and h_2 subequal in length, h_1 slightly longer ..... *H. tepidariorum* (Warburton, 1904)
- Dorsal seta *f* obviously longer than h_1 and esp. h_2 .... *H. ganeo* sp. nov.

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