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Taxonomic significance of microlepides on subimaginal tarsi of Ephemeroptera

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Abstract

In each mayfly individual, the surface of the subimaginal cuticle significantly differs both from imaginal and larval cuticles, being different on different parts of the body. Most of the subimaginal body, including femora and tibiae, is covered with microtrichia. Tarsal segments are either also covered with microtrichia, or their microtrichia are transformed into microlepides of various shapes. The most usual forms of microlepides are the pointed and the blunt ones. Arrangements of microtrichia, pointed microlepides, blunt microlepides and other forms of microlepides on certain tarsomeres represent good taxonomic characters, which in some cases allow characterization of high level taxa, and in some cases distinguish closely related species. Arrangement of microlepides and microtrichia on subimaginal tarsi of examined mayfly species is given. The following new synonyms are proposed: *Afroptilum boettgeri* (Kopelke 1980) = *Xyrodromeus africanus* Lugo-Ortiz & McCafferty 1997, **syn. n.**; *Labiobaetis vinosus* (Barnard 1932) = *L. tenuicrinitus* (Kopelke 1980), **syn. n.**; *Baetis parvulus* Crass 1947 = *Baetis permultus* Kopelke 1980, **syn. n.**; *Epeorus gilliesi* Braasch 1981 = *Epeorus petersi* Sivaruban *et al*. 2013, **syn. n.**; *Dicercomyzon femorale* Demoulin 1954 = *Dicercomyzon costale* Kimmins 1957, **syn. n.**

Key words: mayflies, systematics

Introduction

In the past, systematics of Ephemeroptera was based on larval and imaginal characters only, while subimagines were accepted as incompletely developed imagines; they were used only for examination of some imaginal characters in the cases when imagines were unavailable. Actually the stage of subimago, besides the imaginal features, possesses its own, subimaginal characters, which are absent in the imaginal stage. Some of the special subimaginal characters are useful for phylogenetic reconstruction, and some are useful for species diagnostic.

Many useful subimaginal characters are connected with pattern of pigmented and non-pigmented areas on cuticle of pterothorax. While in the imaginal stage the sclerotized area of pterothorax is either evenly pigmented, or have diffusive lighter and darker areas, in the subimaginal stage the cuticle of pterothorax has sharply differentiated light and dark areas, some of which have nothing in common with the general pterothoracic structure (which is the same in the imaginal and the subimaginal stages). The pattern of light and dark areas on subimaginal cuticle gives useful taxonomic characters, which have no adoptive significance and because of this are important for systematics (Darwin 1971: 374–375). In this case, important is the pattern of boundaries between the pigmented and the non-pigmented areas, while intensity of the pigmentation has less taxonomic significance. Characters connected with pattern of subimaginal cuticle pigmentation are used in diagnoses of the high level taxa Prosopistoma/f1=g2, Baetisca/f2=g1, Siphlonurus/fg1, Ameletus/fg1, Tetramerotarsata, Turbanoculata, Nesameletus/f2=Metamonius/g2, Vetulata, Ameletopsis/fg1, Coloburiscus/fg2, Isonychia/fg1, Pseudoligoneuria/f1=Chromarcys/g1, Heptagennota, Fimbriatotergaliae, Afromera/g1, Ephemerella/fg1, Teloganodes/fg1, Tricoryptera, Leptophlebia/fg1 (Kluge 2004), Hermanellonota (Kluge 2008) and in diagnoses of certain species and genera. Special terms connected with pattern of subimaginal cuticle pigmentation on leptophlebiid mesonotum are introduced (Kluge 2020b: p. 16, fig. 94a).

The term «microlepides» was introduced by Kluge & Novikova (2011) for the relief formations which substitute microtrichia on tarsi of mayfly subimagines. Microlepides of two types (the pointed and the blunt ones) are either uniform on all subimaginal tarsi, or differ on different tarsomeres, on different leg pairs and/or in different

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sexes; in many cases, arrangement of microlepides is either a good species-specific character, or a good character of supra-species taxa. Some mayfly taxa have microlepides different from these two types; in some mayflies tarsi are covered not with microlepides, but with the usual microtrichia, like other parts of the legs. At present, the arrangement of microtrichia and microlepides is used for diagnoses of selected taxa belonging to Baetidae (Kluge & Novikova 2011, Kluge 2012a, 2012b, Kluge & Novikova 2014; Kluge *et al*. 2014; Kluge 2015a; Kluge 2016a; Kluge 2016c; Kluge & Novikova 2016; Kluge 2017; Kluge & Novikova 2017a; Kluge *et al*. 2017; Kluge *et al*. 2018; Kluge 2018; Kluge & Bernal-Vega 2018; Kluge 2019a; Kluge 2019b; Kluge 2020a; Kluge 2020c; Kluge 2020d; Kluge & Suttinun 2020; Kluge *et al*. 2020), Leptophlebiidae (Kluge 2012c; Kluge 2014a; Kluge 2014b; Kluge 2014c; Kluge 2015c; Kluge 2020b), Heptageniidae (Kluge 2015b), Tricorythidae (Kluge & Novikova 2017b) and Neoephemeridae (Ma & Zhou 2021).

This paper represents a review of the subimaginal tarsal texture in all examined mayflies, which belong to 681 known species and a number of undescribed species. This allows to add this character to diagnoses of some supra-species taxa, to reveal the taxa in which the subimaginal tarsal texture is useful for species diagnostic and to make some speculations concerning evolution of this character.

Material and methods

Part of material used in this study, was collected by the author in the former USSR, Mongolia, India, Sri Lanka, Thailand, Indonesia, Uganda, Tanzania, Zambia, South Africa, USA, Cuba, Panama, Peru and Chile. Besides this, specimens collected by other collectors from various parts of the world are used. In many cases subimagines and subimaginal exuviae were associated with larvae and/or imagines by rearing. For this purpose subimagines were reared from larvae either in cages placed in natural current water, or in small individual containers with stagnant water; than imago was reared from subimago in a wide tube closed by wet cotton and protected from direct sun light. Slides are made in Canadian balsam. Material used for this paper, is permanently deposited in the Zoological Institute of the Russian Academy of Sciences (Saint Petersburg, Russia), but most its part is temporarily located in the Department of Entomology of Saint Petersburg State University. Mayfly classification used in this paper is based on the monograph (Kluge 2004) and subsequent publications by the author (Kluge 2009 and the papers referred in the Introduction). References for taxonomic names are not always in the Literature Cited, in order to conserve space. In the lists of species examined, only described species are reported; data on tarsal texture of the species which remain undescribed, will be published together with their descriptions.

In the lists of material examined given in the division «New synonymy», the following arbitrary signs are used: **L**—larva; **S**—subimago; **I**—imago; **L-S-I**♂—male imago reared from larva, with larval and subimaginal exuviae; **L-S**♂—male subimago reared from larva, with larval exuviae; **S-I**♂—male subimago reared from subimago, with subimaginal exuviae.

New synonymy

***Afroptilum boettgeri* = *Xyrodromeus africanus*, syn. n.** The Afrotropical species under the name *Centroptilum boettgeri* Kopelke 1980 was originally described as male and female imagines (Kopelke 1980a) and eggs (Kopelke 1980b) from Zaire (recently DR Congo). Subsequently, Gillies (1990) moved this species in the newly established genus *Afroptilum* Gillies 1990. The species *Xyrodromeus africanus* Lugo-Ortiz & McCafferty 1997a (the type species of *Xyrodromeus* Lugo-Ortiz & McCafferty 1997) was originally described as larvae from Kenya; according to the original description, it corresponds to the larvae described from Kenya and Uganda as «*Centroptilum* sp. 2» by Demoulin (1964a). Imagines corresponding to the description of *Afroptilum boettgeri* were reared from larvae corresponding to the description of *Xyrodromeus africanus*; this allows to conclude that these two names belong to one and the same species. **Material examined:** UGANDA: Kasese District, Rwenzori Mountains, basin of Mubuku River, Ruboni camp, 28.VII–6.VIII .2007, coll. N. Kluge: 3 L-S-I♂, 1 L-S-I♀, 1 L-S♀, 1 I♂, 17 L; Kasese District., Rwenzori Mountains, Kilembe and Ibanda, 14–20.VIII.2007, coll. N. Kluge: 5 L; Bundibugyo District, Rwenzori Mountains, 23.VIII.2007, coll. N. Kluge: 5 L; Kapchorwa District, Elgon Mount, Sipi Falls, 25–31.VIII.2007, coll. N. Kluge: 8 L.

***Labiobaetis vinosus* = *L. tenuicrinitus*, syn. n.** The Afrotropical species under the name *Pseudocloeon vinosum* Barnard 1932 was originally described as male and female imagines and larvae from South Africa and then moved in the genus *Labiobaetis* by Lugo-Ortiz and McCafferty (1997b). The species under the name *Pseudocloeon tenuicrinitum* Kopelke 1980 was originally described as male and female imagines (Kopelke 1980a) and eggs (Kopelke 1980b) from Zaire (recently DR Congo); nobody compared *P. tenuicrinitum* with *P. vinosum*. Based on imagines reared from larvae in Uganda, Kluge and Novikova (2016) moved *P. tenuicrinitum* in the genus *Labiobaetis*, redescribed its larvae, subimagines, imagines and eggs and established its synonymy with the species originally described from Tanzania as *Baetis spatulatus* Gillies 1994. At present, examination of larvae, reared imagines and eggs from Tanzania and South Africa allows to conclude that the names *vinosum* [*Pseudocloeon*], *tenuicrinitum* [*Pseudocloeon*] and *spatulatus* [*Baetis*] belong to one and the same species. **Material examined:** UGANDA: Kasese District, Kiburara, river Nyamagasan, 8–13.VIII.2007, coll. N. Kluge: 5 L-S-I♂, 12 L-S-I♀, 2 L-S♂, 33 L. TANZANIA: tributary of river Little Ruaha 10 km upstream Iringa, 22–24.VII.2016, coll. N. Kluge & L. Sheyko: L-S-I♀, 9 L; Njombe region, Great Ruaha river above Mfumbi, 26.VII–3.VIII.2016, coll. N. Kluge & L. Sheyko: 3 L-S-I♂, 4 L; Mbeya Region, river Lufurio 15 km NW Matema, Tapio bridge, 13.VIII.2016, coll. N. Kluge: L-S-I♂, 1 larva; Tanga, Amboni, river Mkulumusi, 18.VIII.2016, coll. N. Kluge & L. Sheyko: L-S-I♂; Tanga region, Usambara Mountains, Amani, basin of Sigi River, 19.VIII–2.IX.2016, coll. N. Kluge & L.Sheyko: 8 L-S-I♂, 3 L-S♂, 5 L-S-I♀; Uluguru Mountains, river Mgeta between Mgeta and Bunduki, 22–25.VII.2017, coll. N. Kluge & L. Sheyko: 2 L-S-I♂, 2 L-S-I♀; Uszungwa Mountains, river Msosa (tributary of river Great Ruaha), Msosa Camp 9 km S Mbuyuni, 5–10.VIII.2017, coll. N. Kluge & L.Sheyko: 6 L-S-I♂, 2 L-S-I♀. SOUTH AFRICA, Western Cape Province: Wolwekloof river near falling in Witte river (Bain's Kloof), Tweede Tol campsite, 20–22.I.2019,. N. Kluge & L. Sheyko: L-S-I♂, 4 L-S♂, 2 L-S-I♀, L-S♀; Wolfkloof, Keurbooms River (8 km WNW Swellendam), 25–26.I.2019, coll. N. Kluge & L. Sheyko: L-S-I♂, 2 L-S♂, L-S♀, 1 larva.

***Baetis parvulus* = *B. permultus* syn. n.** The Afrotropical species *Baetis parvulus* Crass 1947 was originally described as male imagines from South Africa. The species *Baetis permultus* Kopelke 1980 was originally described as male and female imagines (Kopelke 1980a) and eggs (Kopelke 1980b) from Zaire (recently DR Congo). Larvae of the both species have not been described. Examination of larvae and winged stages associated by rearing from South Africa and Tanzania suggest that they belong to one and the same species. **Material examined:** SOUTH AFRICA, Garden Route district, basin of Grobbelaars River 18 km N Oudshoorn, 33°25'S 22°16'E, 28–30.I.2019, coll. N. Kluge & L. Sheyko: 1 L-S♂, 1 L-S♀, 8 larvae. TANZANIA, Mbeya Region, Matema, river Mwalalo (tributary of lake Nyasa), 9°29'S, 34°02'E, 6–14.VIII.2016, coll. N. Kluge & L. Sheyko: 8 L-S-I♂, 9 L-S-I♀, 18 larvae.

***Epeorus gilliesi* = *E. petersi*, syn. n.** The Indian species *Epeorus gilliesi* Braasch 1981 was originally described as larvae from the state of Maharashtra in India. The species *Epeorus petersi* Sivaruban, Venkataraman & Sivaramakrishnan (in Sivaruban *et al*.) 2013 was originally described as imagines and larvae, from the state of Tamilnadu in India. Type localities of the both species are located in mountains of Western Ghats. Both descriptions are very inaccurate. Judging by these descriptions, coloration of larvae looks different (Braasch 1981: figs 1, 3; Sivaruban *et al*. 2013: figs 7 and 12, 13 and 14). The reason of this difference is that the drawings of *E. gillisi* made by Braasch show the cuticular coloration, and the drawings of *E. petersi* show the hypodermal coloration. Sivaruban *et al*. (2013) compared *E. petersi* with the original description of *E. gilliesi*, but not with its specimens. Besides the coloration, they reported difference in «shape of posterior edge of the lamellate portion of gill 1». Differences in shape of tergalii (so called «gills») were caused by the fact that the Braasch's drawings of *E. gilliesi* were reproduced with distorted proportions (compare Braasch 1981: fig. 5r with Sivaruban *et al*. 2013: fig.10), and Braasch's drawing of «Kieme VII» actually belongs to tergalius VI. Examination of reared specimens testifies that the both descriptions are based on one and the same species. **Material examined:** INDIA: Karnataka State, Shivamogga/Udupi districts near Agumbe, 11–31.I.2013, coll. N. Kluge & L. Sheyko: L-S♂, L-S-I♀, 43 larvae; Tamilnadu State, Tirunelveli District., Courtallam, Chittar Rriver near Peraruvi (= Main Falls) 3–7.II.2013, coll. N. Kluge & L. Sheyko: 33 larvae; Tamilnadu State,Theni District, Megamalai, Chinna Suruli waterfalls, 24–25.2016, coll. N. Kluge & L. Sheyko: 9 larvae.

***Dicercomyzon femorale* = *D. costale*, syn. n.** The Afrotropical species *Dicercomyzon femorale* Demoulin 1954a (the type species of *Dicercomyzon* Demoulin 1954) was originally described as larvae and reared female subimago from Congo. The species *Dicercomyzon costale* Kimmins 1957 was originally described as imagines, subimagines and larvae from Gold Coast (recently Ghana), Tanganyika Territory (recently Tanzania) and Nyasaland (recently Malawy). It was separated from *D. femorale* by the dark band along the costal margin of the wing, which is absent on the subimaginal wing of the holotype of *D. femorale*. The reason of this difference is that the dark band on the costal margin of the wing is visible on yellowish background of the larval protopteron, than becomes invisible on brown background of the subimaginal wing, and than becomes visible again at later period of subimaginal development, when the imaginal cuticle gets its intensive pigmentation and becomes visible through the brown subimaginal cuticle; in imago this band is dark brown, in contrast to colorless rest part of the wing (Kimmins 1957: fig. 1). Demoulin (1954) examined only the female subimago which died just after emergence and had uniformly brown wings. Kimmins (1957) was able to examine only immature larvae, late subimagines and imagines, in all of which the dark band was visible. These authors suggested to separate larvae of *D. femorale* and *D. costale* by shape of the small paired protuberances between fore protoptera, which Kimmins (1957) reported as «processes of the wing-pads» and Demoulin (1964b) reported as «calus du mésonotum». Actually, these protuberances are projected dorsally, and their visible shape depends on angle of view and/or compression of the slide. **Material examined:** UGANDA: Kanungu District: river Ishasha, 15.VII.2007, coll. N.Kluge: 1 larva; ibid., river Munyaga below Bwindi National Park, 21–25.VII.2007, coll. N. Kluge: 1 L/S♂, 1 L/S♀, 53 larvae; Kasese District, Kiburara, river Nyamagasan, 8–13.VIII.2007, coll. N. Kluge: 2 L-S-I♂, 29 larvae. ZAMBIA: Mwinilunga, rivers West Lunga and Mudanyama, 4–17.VIII.2014, coll. N. Kluge & L. Sheyko: L-S-I♀, 24 larvae. TANZANIA: Njombe Region, Great Ruaha river above Mfumbi, 26.VII–3.VIII.2016, coll. N. Kluge & L. Sheyko: L-S-I♂, L-S/I♂, 2 larvae; ibid., 13–15.VIII.2017: 4 larvae; river Msosa (tributary of Great Ruaha), Msosa Camp 9 km S Mbuyuni 5–10.VIII.2017, N. Kluge & L. Sheyko: L-S-I♂; Uluguru Mountains, basin of river Ruvu, Kinole, 27–30.VII.2017, coll. N. Kluge & L. Sheyko: L/S♂.

Microtrichia and microlepides of mayfly subimagines

The term «microtrichia» was introduced by Tillyard (1917a, 1917b, 1917c, 1918) for minute hairs which are arranged upon the whole wing surface of Mecoptera and related taxa. The term «microtrichium», or «microtrichion» is singular for the plural «microtrichia». Originally, the term «microtrichia» was opposed to «macrotrichia» (also termed «setae», or «chaetae»), which are sensory organs, whose cuticle is produced by the trichogenous cell—one of enveloping cells surrounding the sensory cell. In contrast to the setae, microtrichia are not connected with sensory cells and are simple outgrowths of cuticle produced by regular hypodermal cells. According to the original definition (Tillyard 1918: 626), «Microtrichia (Gr. *μικρός*, small; and *θριξ*, *τριχός*, a hair) are minute hairs, generally much curved or hooked, which are developed in connection with every unspecialized hypoderm-cell of both upper and under surface of the wing». Each hypodermal cell of the wing produces one microtrichion, that provides regular arrangement of microtrichia on the wing surface in Mecoptera, subimaginal Ephemeroptera and some other insects. Some other body parts (e.g. intersegmental membranes) bear smaller hair-like cuticular outgrowths, which are arranged more densely, since each hypodermal cell produces several such outgrowths. Richards & Richards (1979) introduced the term «acanthae» and classified different spines, bristles, hairs, etc. of insects «into 4 major types: (1) multicellular with cells similar to those of the general epidermis (spines); (2) multicellular with differentiation of a segregated trichoid complex (setae); (3) unicellular (acanthae); and (4) subcellular in the sense of several or many per cell (microtrichia)». This definition of microtrichia directly contradicts the original definition of this term and should be regarded as wrong, because originally this term was applied to the microtrichia of wings, which are unicellular.

Most part of subimaginal cuticle is covered with regular, hooked microtrichia (as in Fig. 7): they cover the entire surface of the wings (both dorsal and ventral sides), certain areas of the thorax and most part of the abdomen (except small, paired spots on each segment). On the subimaginal legs, at least femora and tibiae are usually densely covered with regular microtrichia directed distally. In some mayflies subimaginal tarsi are covered with microtrichia of the same kind as the microtrichia on other parts of the leg, but in the majority of mayflies all or most tarsal segments are covered with microlepides, which are arranged in the same way as the microtrichia. Microlepides can be pointed

(Fig. 5) or blunt (Fig. 1); the pointed microlepide can be apically stretched into a slender spine (Fig. 6), so that it represents a structure intermediate between the microtrichion and the blunt microlepide.

Imaginal tarsus has texture different from the subimaginal one; often imaginal texture is poorly expressed.

Texture of subimaginal cuticle can be examined either from subimago, or from subimaginal exuviae, or from mature larva ready to molt to subimago. Microtrichia and microlepides are well-sclerotized, so their shape is well visible in light microscope in any medium—air, water, alcohol, glycerol, Canadian balsam (Figs 14–17) or other; in species with pigmented cuticle they are more contrasting, in species with colorless cuticle—less contrasting.

In the Tables 1–17, following arbitrary signs are used.

Microtrichia are indicated as «**I**»; microtrichion can be thicker or thinner, but it always differs from microlepide by absence of transverse widening of its base (Fig. 7).

Pointed microlepides of various kinds are indicated as «**Y**». As well as other microlepides, pointed microlepides differs from microtrichia by widened bases; typical pointed microlepide is armed with a single longitudinal ridge stretching from base to tip, has more or less concave margins and more or less pointed tip (Figs 5–6). Pointed microlepides vary from nearly triangular, with margins slightly concave or nearly straight (Fig. 5) to sharply pointed, with margins concave so deeply, that microlepide resembles letter T with seta-like longitudinal portion and stripe-like transverse base (Fig. 6).

Formations intermediate between microtrichia and pointed microlepides are indicated here as «**T**» (Figs 12–13); in contrast to microtrichia, their bases are widened, but less wide than it typical pointed microlepides.

Blunt microlepides of various kinds are indicated as «**U**»; typical blunt microlepide has rounded margin without stretched tip and has no central longitudinal ridge; longitudinal ridges are either absent, or multiple and poorly expressed (Fig. 1). In various taxa and on various tarsomeres, blunt microlepides are either semicircular, or transverse; either full-size (Fig. 1), or diminished (Fig. 2); either all directed perpendicular to the surface (Fig. 1), or stretched distally (Figs 3–4). Distal margin of blunt microlepide can be either smooth (Fig. 1), or serrate, that is indicated here as «**W**» (Fig. 11).

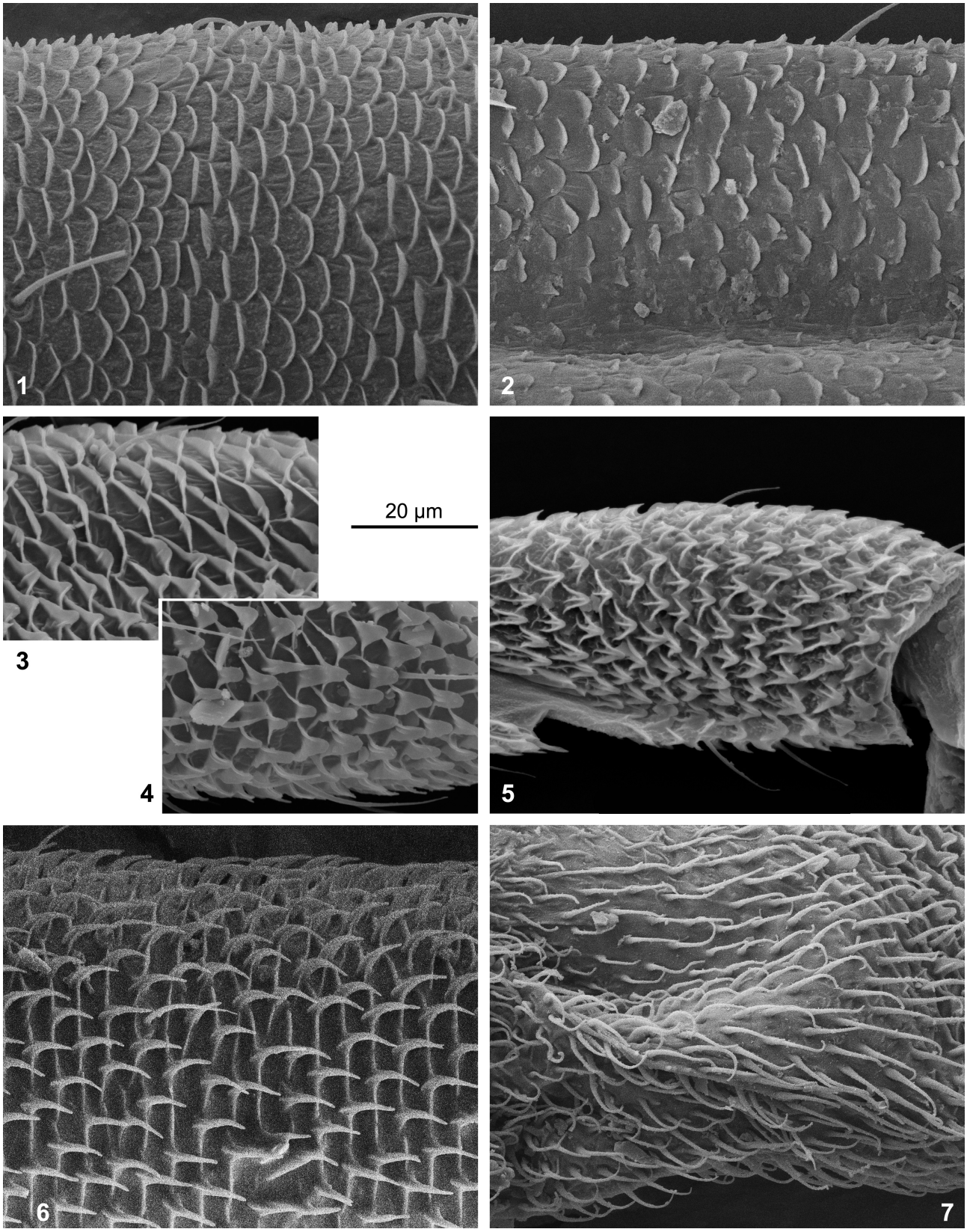
Some microlepides can be characterized as intermediate between pointed and blunt ones. They can be triangular, with margins varying from concave to convex, apex varying from pointed to blunt or serrate, with one or several supporting ridges; such microlepides can be indicated as «**V**» (Fig. 10). In some cases proximal part of microlepide resembles that of blunt microlepide (semicitcular, without central ridge), but distal part is narrow and armed with central ridge; such microlepides can be indicated as «**Ψ**» (Fig. 9).

General rules

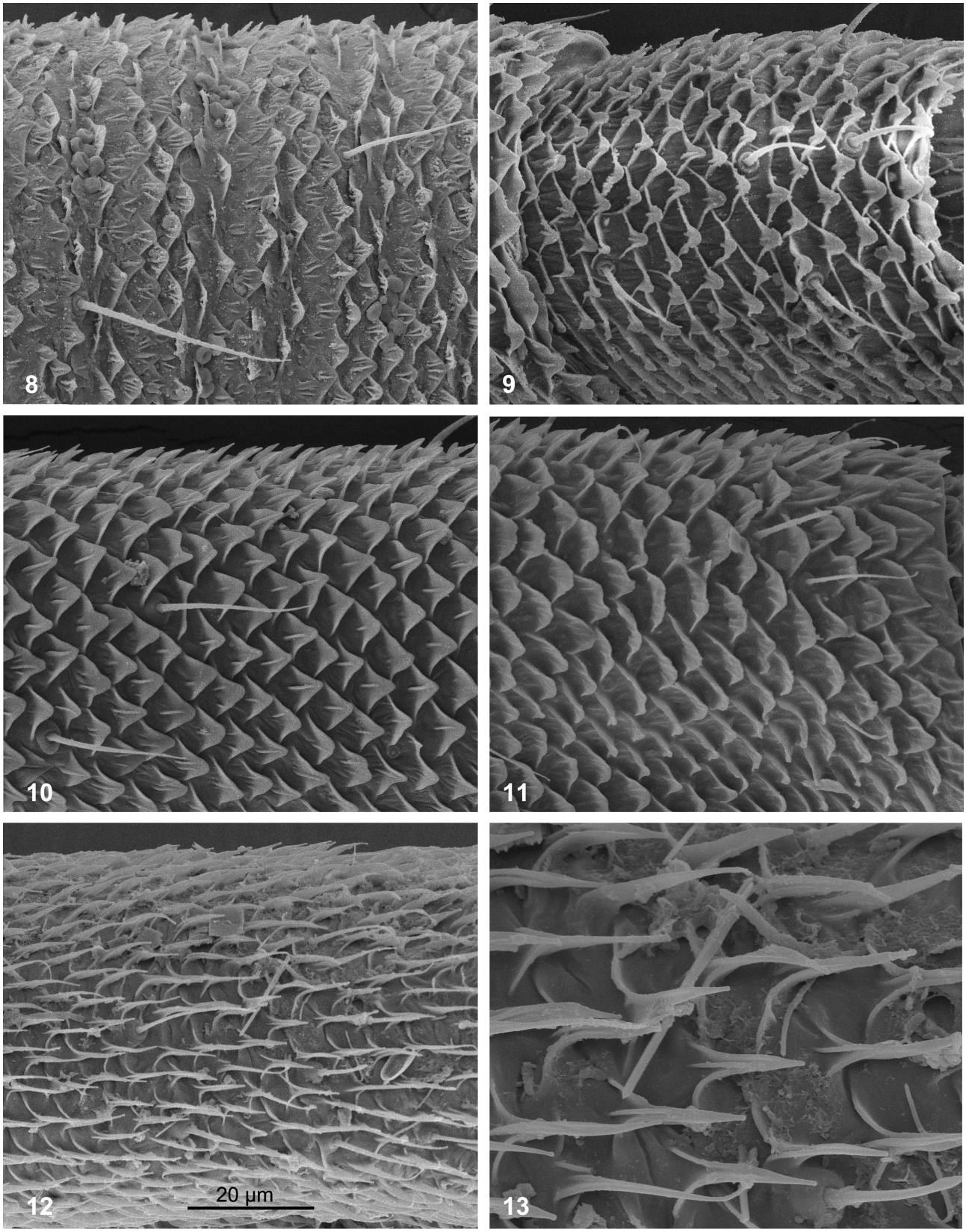
Texture, i.e. arrangement of the microlepides and/or the microtrichia on subimaginal tarsus falls under the following general rules. Texture of middle and hind tarsi is identical and usually identical in males and females of the same species; texture of fore tarsi can be either the same, or differs from that of middle and hind tarsi; it can be different in male and female. Due to this, here all tables contain tree columns: (1) fore tarsus of male, (2) fore tarsus of female and (3) middle and hind tarsi of both sexes. In all cases when texture of fore tarsus of male differs from texture of its middle and hind tarsi, it differs toward greater development of blunt microlepides. That means that in some species, where certain tarsomeres of the middle and hind legs are covered with pointed microlepides, the homologous tarsomeres of the fore legs are covered with blunt microlepides, but never vice versa. In female, texture of fore tarsus either repeats the texture of middle and hind tarsi, or repeats the texture of fore tarsus of male, or is intermediate between them.

Systematic account

1. Posteritorna Kluge *et al*. 1995. On all leg pairs, all tarsomeres are covered with microtrichia (like tibiae) (Table 1). Species examined: ♂ *Baetisca rogersi* Berner 1940, ♂ *Prosopistoma foliaceum* Fourcroy 1785. Among Posteritorna (or Baetisca/f1=Prosopistoma/g1), Baetiscidae retain functional imaginal legs, while imaginal legs of Prosopistomatidae are vestigial; in spite of this great difference, both have microtrichia on tarsi.



FIGURES 1–7. Usual kinds of microlepides and microtrichia on subimaginal tarsi (at the same magnification). 1, Blunt microlepides of *Siphlonurus lacustris* («**U**» on Table 1); 2, vestigial blunt microlepides of *Ametropus fragilis* («**U**» on Table 1); 3–4, blunt microlepides on dorsal and ventral parts of middle tarsus of *Cinygmula joosti* («**U**» on Table 8); 5, pointed microlepides on last tarsomere of *Indobaetis costai* («**Y**» on Table 4); 6, pointed microlepides of *Cloeon dipterum* («**Y**» on Table 2); 7, microtrichia on base of first tarsomere of *Cinygmila hirasana* («**I**» on Table 8).



FIGURES 8–13. Peculiar kinds of microlepides on subimaginal tarsi (7–11, at the same magnification). 8, alternating microlepides on male fore tarsus of Kimminsula/g **gen. sp. n.** from Sri Lanka («**[V]**» on Table 14); 9–10, microlepides intermediate between pointed and blunt: 9, *Cinygmila hirasana* («**Ψ**» on Table 8); 10, *Adenophlebia dislocans* («**V**» on Table 17); 11, microlepides with serrate margin on tarsus of *Adenophlebia burgeoni* («**W**» on Table 17); 12, formations intermediate between microtrichia and pointed microlepides on tarsus of *Thraulus bellus* («**T**» on Table 14); 13, the same, enlarged.

2. Anteritorna Kluge 1993:

2.1. Plesiomorphon Tridentiseta Kluge *et al*. 1995:

2.1.1. Siphlonurus/fg (incl. *Parameletus*). In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides (Fig. 1) (Table 1). Species examined: ♂ & ♀ *Siphlonurus alternatus* (Say 1824), ♂ *S. aestivalis* Eaton 1903, ♂ & ♀ *S. chankae* Tshernova 1952, ♀ *S. croaticus* Ulmer 1920, ♂ & ♀ *S. flavidus* (Pictet 1865), ♀ *S. hispanicus* Demoulin 1958, ♂ & ♀ *S. immanis* Kluge 1985, ♂ & ♀ *S. lacustris* Eaton 1870, ♂ & ♀ *S. lusoensis* Puthz 1977, ♂ & ♀ *S. montanus* Studemann 1992, ♂ & ♀ *S. palaearcticus* (Tshernova 1930), ♂ & ♀ *S. zhelochovtsevi* Tshernova 1952, ♂ & ♀ *Parameletus chelifer* Bengtsson 1908, ♂ & ♀ *P. minor* Bengtsson 1909, ♂ & ♀ *Siphlonisca aerodromia* Needham 1909.

2.1.2. Dipteromimus/fg. At least in female, on all leg pairs, all tarsomeres are covered with blunt microlepides (Table 1). Species examined: ♀ *Dipteromimus tipuliformis* McLachlan 1875.

2.1.3. Ameletus/fg (incl. *Metreletus*). In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides (Table 1). Species examined: ♂ & ♀ *Ameletus alexandrae* Brodsky 1930, ♂ & ♀ *A. altaicus* Kluge 2007, ♂ & ♀ *A. camtshaticus* Ulmer 1927, ♂ & ♀ *A. cedrensis* Sinitshenkova 1977, ♂ *A. longulus* Sinitshenkova 1981, ♂ *A. montanus montanus* Imanishi 1930, ♂ *A. montanus rossicus* Kluge 1907, ♂ & ♀ *A. montanus arlechino* Kluge 1907, ♂ & ♀ *A. inopinatus inopinatus* Eaton 1997, ♂ *A. inopinatus labiatus* Sinitshenkova 1981, ♂ & ♀ *A. parvus* Kluge 1979, ♂ & ♀ *Metreletus balcanicus* Ulmer 1920.

2.1.4. Metretopus/fg (incl. *Siphloplecton*). In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides (Table 1). Species examined: ♂ & ♀ *Metretopus borealis* (Eaton 1971), ♂ & ♀ *M. alter* Bengtsson 1930, ♂ & ♀ *M. tertius* Tiunova 1999, ♂ & ♀ *Metreplecton macronyx* Kluge 1996, ♂ *Siphlplecton basale* (Walker 1853).

2.1.5. Acanthametropus/fg. In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides (Table 1). Species examined: ♂ & ♀ *Acanthametropus nikolskyi* Tshernova 1948.

2.1.6. Ametropus/fg1. In both sexes, on all leg pairs, all tarsomeres are covered with very small, blunt microlepides (Fig. 2) (Table 1). Species examined: ♂ & ♀ *Ametropus fragilis* Albarda 1878.

2.1.7. Nesameletus/f=Metamonius/g. In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides (Table 1). Species examined: ♀ *Nesameletus* sp., ♂ *Metamonius anceps* (Eaton 1883).

TABLE 1. Texture of subimaginal tarsomeres in Posteritorna and Tridentiseta other than Tetramerotarsata

	♂ fore leg					♀ fore leg					middle & hind legs				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1. Posteritorna (2 spp.)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
2. Anteritorna:															
2.1. Tridentiseta:															
2.1.1. Siphlonurus/fg (15 spp.) (Fig. 1)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.1.2. *Dipteromimus tipuliformis*	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.1.3. Ameletus/fg (13 spp.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.1.4. Metretopus/fg (5 spp.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.1.5. *Acanthametropus nikolskyi*	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.1.6. *Ametropus fragilis* (Fig. 2)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.1.7. Nesameletus/f=Metamonius/g (2 spp.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.1.8. Vetulata, or Oniscigaster/fg (3 spp.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.1.9. Ameletopsis/fg (3 spp.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.1.10. Tetramerotarsata, or Baetoidea—see **Table 2**															
2.2. Bidentiseta—see **Table 7**															

2.1.8. Vetulata McCafferty 1991, or Oniscigaster/fg (incl. *Tasmanophlebia*). In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides (Table 1). Species examined: ♂ *Oniscigaster distans* Eaton

1899, ♂ & ♀ *Tasmanophlebia lacuscoerulei* Tillyard 1933, ♂ & ♀ *Tasmanophlebia ventilans* (Needham & Murphy 1924).

2.1.9. Ameletopsis/fg (incl. *Chiloporter*, *Chaquihua*). In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides (Table 1). Species examined: ♀ *Ameletopsis perscitus* (Eaton 1899), ♂ & ♀ *Chiloporter eatoni* Lestage 1931, ♂ & ♀ *Chaquihua bullocki* (Navás 1930).

2.1.10. Teramerotarsata Kluge 1997, or Baetoidea:

2.1.10.1. Siphlaenigma/fg. On middle and hind legs of male and on all legs of female, basal (initial 1st+2nd) tarsomere is covered with microtrichia (like tibia), other 3 tarsomeres are covered with pointed microlepides; on fore legs of male, all 5 tarsomeres are covered with pointed microlepides (Table 2). Species examined: ♂ & ♀ *Siphleanigma janae* Penniket 1962.

TABLE 2. Texture of subimaginal tarsomeres in Tetramerotarsata other than Baetovectata

	♂ fore leg					♀ fore leg					middle & hind legs			
	1	2	3	4	5	1	2	3	4	5	1+2	3	4	5
2.1.10. Tetramerotarsata, or Baetoidea:														
2.1.10.1. *Siphleanigma janae*	**Y**	**Y**	**Y**	**Y**	**Y**	**I**		**Y**	**Y**	**Y**	**I**	**Y**	**Y**	**Y**
2.1.10.2. Liberevenata-Turbanoculata:														
2.1.10.2.1. plesiomorphon Protopatellata:														
2.1.10.2.1.1. Indocloeon/g (> 4 spp.)	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.1.2. Anafroptilum/g:														
Anafroptilum orthostylus	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**I-Y**	**Y**	**Y**	**Y**
A. kazlauskasi, A. odontostylus, A. bifircatum	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.1.3. Rhithrocloeoninae (> 8 spp.)	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.1.4. Crassabwa/g (5 spp.)	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.1.5. *Monocentroptilum badium*	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.1.6. Potamocloeon/g (2 spp.)	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.1.7. *Demoulinia crassi*	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.1.8. Dabulamanzia/g (> 2 spp.)	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.1.9. Afroptilum/g (4 spp.)	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.1.10. Afroptiloides/g (> 1 spp.)	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.1.11. *Platycloeon erepens*	**Ψ**	**Ψ**	**Ψ**	**Ψ**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.1.12. Centroptiloides/g (> 1 sp.)	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.1.13. Dicentroptilum/g:														
Dicentroptilum decipiens	**U**	**U**	**U**	**U**	**U**	**U**	**U**	**U**	**U**	**U**	**U**	**U**	**U**	**U**
Dicentroptilum sp. (Kilimanjaro)	**U**	**U**	**U**	**U**	**U**	**U**	**U**	**U**	**U**	**U**	**U**	**U**	**U**	**U**
Dicentroptilum sp. (Zambezi)	**U**	**U**	**U**	**U**	**Y**	**U**	**U**	**U**	**U**	**Y**	**U**	**U**	**U**	**Y**
2.1.10.2.2. Anteropatellata:														
2.1.10.2.2.1. Cloeon/fg (33 spp.) (Fig. 6)	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.2.2. *Centroptilum luteolum*	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.2.3. Baetopus/g (2 spp.)	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.2.4. Cheleocloeon/g (> 6 spp.)	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.2.5. *Afrobaetodes berneri*	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
2.1.10.2.2.6. Baetovectata—see **Table 3**														

2.1.10.2. Liberevenata-Turbanoculata Kluge 1997, or Baetidae s. str.:

2.1.10.2.1. Plesiomorphon Protopatellata:

2.1.10.2.1.1. Indocloeon/g. In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides; microtrichia, if present, occupy only a small proximal-dorsal area on the 1st tarsomere (Table 2) (Kluge & Suttinun 2020). Species examined: ♂ & ♀ *Indocloeon* (s.str.) *primum* Müller-Liebenau 1982, ♂ & ♀ *I.* (s.str.) *secundum* Kluge & Suttinun 2020, ♂ & ♀ *I.* (*Hindocloeon*) *continentale* Kluge & Suttinun 2020, ♂ & ♀ *I.* (*H.*) *indonesiae* Kluge 2012 and some other species.

2.1.10.2.1.2. Anafroptilum/g. On fore legs of both sexes, all tarsomeres are covered with pointed microlepides. On middle and hid legs, 1st tarsomere is proximally covered with microtrichia, distally covered with pointed microlepides; 2nd–5th tarsomeres are entirely covered with pointed microlepides; microtrichia on first tarsomere either occupy a small proximal-dorsal area, or (in *A. orthostylus*) occupy about a half of the tarsomere (Table 2) (Kluge & Novikova 2017a). Species examined: ♂ & ♀ *Anafroptilum bifurcatum* (McDunnough 1924), ♂ & ♀ *A. kazlauskasi* (Kluge 1983), ♂ *A. odontostylus* Kluge & Novikova 2017, ♂ & ♀ *A. orthostylus* Kluge & Novikova 2017.

2.1.10.2.1.3. Rhithrocloeoninae. In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides; microtrichia, if present, occupy only a small proximal-dorsal area on the 1st tarsomere (Table 2) (Kluge 2015a). Species examined: ♂ & ♀ *Thraulobaetodes cumminsorum* Elouard & Hideux 1991, ♂ & ♀ *Bugilliesia grisea* (Gillies 1990), ♂ *B. notabile* Kimmins 1956, ♂ & ♀ *Rhithrocloeon* (s.str.) *permirum* (Kopelke 1980), ♂ *Rh.* (s.str.) *indicator* Gillies 1985, ♂ & ♀ *Rhithrocloeon* (*Kivuiops*) *insuetum* (Kopelke 1980), ♂ & ♀ *Rh.* (*K.*) *elgonensis* Kluge 2012, ♂ & ♀ *Rh.* (*K.*) *munyagae* Kluge 2012 and some undescribed species.

2.1.10.2.1.4. Crassabwa/g (incl. *Susua*). In both sexes, on all leg pairs, all tarsomeres are entirely covered with pointed microlepides (Table 2) (Kluge *et al*. 2017, Kluge *et al*. 2018: fig. 46). Species examined: ♂ & ♀ *Crassabwa flava* (Crass 1947), ♂ & ♀ *C. ludmilae* Kluge *et al*. 2017, ♂ *C. ameliae* Kluge *et al*. 2017, ♂ & ♀ *Susua niandanenses* (Wuillot 1993), ♂ & ♀ *S. sigiense* (Gillies 2001).

2.1.10.2.1.5. Monocentroptilum/g. In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides (Table 2) (Kluge 2018: fig. 39). Species examined: ♂ & ♀ *Monocentroptilum badium* (Kopelke 1980).

2.1.10.2.1.6. Potamocloeon/g. In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides; on each leg a small proximal part of first tarsomere is covered with microtrichia (like tibia) (Table 2) (Kluge 2019b: fig. 63–64). Species examined: ♂ *Potamocloeon dentatum* (Kimmins 1956), ♂ & ♀ *P. edentatum* Kluge 2019.

2.1.10.2.1.7. Demoulinia/g. In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides; on each leg a small proximal part of first tarsomere is covered with microtrichia (like tibia) (Table 2) (Kluge 2020d: figs 67–70). Species examined: ♂ & ♀ *Demoulinia crassi* (Demoulin 1971).

2.1.10.2.1.8. Dabulamanzia/g. In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides (Table 2). Species examined: ♂ & ♀ *Dabulamanzia indusii* (Crass 1947), ♂ & ♀ *D. tarsale* Gillies 1990 and some undescribed species.

2.1.10.2.1.9. Afroptilum/g (incl. *Xyrodromeus*, *Peuhlella*). In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides (Table 2). Species examined: ♂ & ♀ *Afroptilum sudafricanum* (Lestage 1924), ♂ & ♀ *A. montanum* (Kimmins 1960), ♂ & ♀ *A. boettgeri* (Kopelke 1980) (= *Xyrodromeus africanus* Lugo-Ortiz & McCafferty 1997 **syn. n.**, see above), ♂ & ♀ *A. christinae* Wuillot 1993.

2.1.10.2.1.10. Afroptiloides/g. In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides (Table 2). Species examined: ♂ & ♀ *Afroptiloides variegatum* (Gillies 1991) and some undescribed species.

2.1.10.2.1.11. Platycloeon/g. On fore leg of male, 1st–4th tarsomeres are covered with microlepides intermediate between pointed and blunt; other tarsomeres of male and all tarsomeres of female are covered with pointed microlepides (Table 2). Species examined: ♂ & ♀ *Platycloeon erepens* (Gillies 1990).

2.1.10.2.1.12. Centroptiloides/g. In both sexes, on all leg pairs, all tarsomeres are entirely covered with pointed microlepides (Table 2). Species examined: ♂ & ♀ *Centroptiloides* c.f. *bifasciatum* Esben-Petersen 1913 and some undescribed species.

2.1.10.2.1.13. Dicentroptilum/g. Among three examines species of *Dicentroptilum* Wuillot & Gillies, in *D. decipiens* (Gillies 1990) and in an undescribed species from Kilimanjaro all tarsomeres of all leg pairs in both sexes are covered with blunt microlepides (with few pointed microlepids on apices of tarsomeres); an undescribed species from Zambezi differs from them by having the terminal tarsomere of all leg pairs covered with pointed microlepides (Table 2).

2.1.10.2.2. Anteropatellata Kluge 1997:

2.1.10.2.2.1. Cloeon/fg (incl. *Procloeon*). In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides (Fig. 6) (Table 2); microtrichia, if present, occupy only a small proximal or/and dorsal area on the 1st tarsomere (Kluge *et al*., 2014, Kluge 2016c, 2020a, 2020c). Species examined: ♂ & ♀ *Cloeon dipterum* (Linnaeus 1761), ♂ *C. cognatum* Stephens 1835, ♂ & ♀ *C. inscriptum* Bengtsson 1914, ♂ & ♀ *C. tadjikistanicus* Brodsky 1930, ♂ & ♀ *C. bimaculatum* Eaton 1885, ♂ & ♀ *C. bicolor* Kimmins 1947, ♂ & ♀ *C. perkinsi* Barnard 1932, ♂ *C. smaeleni* Lestage 1924, ♀ *C. virgiliae* Barnard 1932, ♂ & ♀ *Similicloeon simile* (Eaton 1870), ♀ *S. praetextum* (Bengtsson 1914), ♀ *S. schoenemundi* (Bengtsson 1936), ♂ & ♀ *S. spiniventre* (Kluge & Novikova 1992), ♂ & ♀ *S. petropolitanum* (Kluge & Novikova 1992), ♂ & ♀ *Pseudocentroptilum unguiculatum* (Tshernova 1941) (= *P. motasi* Bogoescu 1947), ♂ & ♀ *Procloeon* (s.str.) *bifidum* Bengtsson 1912, ♂ & ♀ *P.* (s.str.) *pennulatum* (Eaton 1870), ♂ & ♀ *P.* (s.str.) *pulchrum* (Eaton 1885), ♂ & ♀ *P.* (s.str.) *albisternum* (Novikova 1986), ♂ & ♀ *P.* (s.str.) *heterophyllum* (Kluge & Novikova 1992), ♂ & ♀ *P.* (s.str.) *macronyx* (Kluge & Novikova 1992), ♂ & ♀ *P.* (s.str.) *maritimus* (Kluge 1983), ♂ *P.* (s.str.) *narumonae* Tungpairojwong & Bae 2015, *Procloeon* (*Monilistylus*) *monilistylus* Kluge *et al*. 2014, ♂ *P.* (*M.*) *ornatipennis* Kluge 2020, ♂ & ♀ *Procloeon* (*Oculogasters*) *cylindroculum* Kimmins 1956, ♂ & ♀ *P.* (*O.*) *barnardi* Kluge 2020, ♂ & ♀ *P.* (*O.*) *niger* Kluge 2020, ♂ & ♀ *P.* (*O.*) *album* Kluge 2020, ♂ & ♀ *P.* (*O.*) *regularum* Müller-Liebenau & Hubbard 2985, ♂ & ♀ *P.* (*O.*) *malabarensis* Kluge 2020, ♂ & ♀ *Procloeon* (*Securiops*) *macafertiorum* (Lugo-Ortiz 1996), ♂ & ♀ *Procloeon* (*Pseudocentroptiloides*) *nana* (Bogoescu 1951) (= *Pseudocentroptilum shadini* Kazlauskas 1964) and some undescribed species.

2.1.10.2.2.2. Centroptilum/g. In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides (Table 2). Species examined: ♂ & ♀ *Centroptilum luteolum* (Müller 1776).

2.1.10.2.2.3. Baetopus/g. In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides (Table 2). Species examined: ♂ & ♀ *Baetopus* (*Baetopus*) *wartensis* Keffermuller 1960, ♂ *Baetopus* (*Raptobaetopus*) *tenellus* (Albarda 1878).

2.1.10.2.2.4. Cheleocloeon/g. In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides (Table 2) (Kluge 2016a). Species examined: ♂ & ♀ *Cheleocloeon clavifolium* Kluge 2016, ♂ & ♀ *C. excisum* (Barnard 1932), ♂ & ♀ *C. lancetofolium* Kluge 2016, ♂ *C. soldani* Gattolliat & Sartori 2008, ♂ & ♀ *C. truncifolium* Kluge 2016, ♀ *C. yolandae* Wuillot 1993 and some undescribed species.

2.1.10.2.2.5. Afrobaetodes/g. In both sexes, on all leg pairs, all tarsomeres are entirely covered with pointed microlepides (Table 2). Species examined: ♂ & ♀ *Afrobaetodes berneri* Demoulin 1970.

2.1.10.2.2.6. Baetovectata Kluge & Novikova 2011:

2.1.10.2.2.6.1. Callibaetis/fg (incl. *Callibaetoides*). In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides, except for proximal part of the most proximal (initial 1st+2nd) tarsomere of middle and hind legs, which is covered with microtrichia (like tibia) (Table 3); length of the proximal portion covered with microtrichia varies among species, being either very short (e.g. in *C. cruentus*), or much longer than the portion covered with microlepides (e.g. in *C. ferrugineus*). Species examined: ♀ *Callibaetoides caaigua* Cruz *et al*. 2013, ♂ *Callibaetis ferrugineus* (Walsh 1862), ♂ & ♀ *C. floridanus* Banks 1900, ♂ & ♀ *C. gonzalezi* (Navás 1934), ♂ & ♀ *C. cruentus* Cruz *et al*. 2014, ♀ *C. capixaba* Cruz *et al*. 2009 and some undescribed species.

2.1.10.2.2.6.2. Centroptella/g (incl. *Crassolus*, *Chopralla*). In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides (Table 3) (Kluge 2021). Species examined: ♂ & ♀ *C.* (s.str.) *longisetosa* Braasch & Soldan 1980, ♂ *C. femorata* (s.str.) Kluge 2021, ♀ *C.* (s.str.) *soldani* Müller-Liebenau 1983, ♂ & ♀ *C.* (s.str.) *ornatipes* Kluge 2021, ♀ *C.* (s.str.) *breviseta* Kluge 2021, *C.* (s.str.) *illiesi* (Lugo-Ortiz & McCafferty 1998), ♂ & ♀ *C.* (*Crassolus*) *saxophila* (Agnew 1961), ♂ & ♀ *C.* (*Cr.*) *ludmilae* Kluge 2021, ♂ & ♀ *C.* (*Cr.*) *ingridae* Kluge *et al*. 2020, *C.* (*Cr.*) *pontica* (Sroka *et al*. 2019), ♂ & ♀ *C.* (*Chopralla*) *ceylonensis* Müller-Liebenau 1983, ♂ & ♀ *C.* (*Ch.*) *ghatensis* Kluge 2021, ♂ & ♀ *C.* (*Ch.*) *rufostriata* Kluge 2021, ♂ & ♀ *C.* (*Ch.*) *papuanica* Kluge 2021, *C.* (*Ch.*) *pusilla* Müller-Liebenau 1984, *C.* (*Ch.*) *kangi* Kluge 2021.

2.1.10.2.2.6.3. Cloeodes/g. In both sexes, on all leg pairs, at least terminal tarsomere is covered with pointed microlepides; in the Cuban species other tarsomeres are also covered with pointed microlepides; in the examined continental species other tarsomeres are covered with blunt microlepides.

***Cuban species*:** In both sexes, on all leg pairs, all tarsomeres are entirely covered with pointed microlepides (Table 3) (Kluge 2017). Species examined: ♂ & ♀ *Cloeodes superior* Kluge 1991, ♂ & ♀ *C. inferior* Kluge 1991.

TABLE 3. Texture of subimaginal tarsomeres in Baetovectata other than Baetungulata

	♂ fore leg					♀ fore leg					middle & hind legs			
	1	2	3	4	5	1	2	3	4	5	1+2	3	4	5
2.1.10.2.2.6. Baetovectata:														
2.1.10.2.2.6.1. Callibaetis/fg (> 6 spp.)	Y	Y	Y	Y	Y	I-Y	Y	Y	Y	Y	I-Y	Y	Y	Y
2.1.10.2.2.6.2. Centroptella/g (16 spp.)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2.1.10.2.2.6.3. Cloeodes/g:														
Cuban species (2 species)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
continental species (> 4 spp.)	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
2.1.10.2.2.6.4. Paracloeodes/g (> 2 spp.)	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
2.1.10.2.2.6.5. Apobaetis/g:														
Apobaetis niger	U	U	U	U	Y	?	?	?	?	?	Y	Y	Y	Y
Apobaetis spp. (2 spp.)	U	U	U	U	Y	U	U	U	U	U	U	U	U	Y
2.1.10.2.2.6.6. *Waltzoyphius roberti*	Y	U	U	U	Y	I	Y	Y	Y	Y	I-Y	Y	Y	Y
2.1.10.2.2.6.7. Aturbina/g (2 spp.)	Y	U	U	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2.1.10.2.2.6.8. Baetungulata—see **Table 4**														

TABLE 4. Texture of subimaginal tarsomeres in Baetungulata

	♂ fore leg					♀ fore leg					middle & hind legs			
	1	2	3	4	5	1	2	3	4	5	1+2	3	4	5
2.1.10.2.2.6.8.1. Nigrobaetis/g—see **Table 5**														
2.1.10.2.2.6.8.2. Labiobaetini—see **Table 6**														
2.1.10.2.2.6.8.3. Camelobaetidius/g:														
Camelobaetidius kondratieffi	Y	U	U	U	Y	I	U	U	U	Y	I-U	U	U	Y
Camelobaetidius musseri	U	U	U	U	Y	U	U	U	U	Y	I-U	U	U	Y
Camelobaetidius ortizi	U	U	U	U	Y	?	?	?	?	?	I-U	U	U	Y
Camelobaetidius spp. (Panama)	U	U	U	U	Y	U	U	U	U	Y	I-Y	Y	Y	Y
2.1.10.2.2.6.8.4. *Acerpenna pygmaea* ? ?	U	U	U	U	Y	?	?	?	?	?	Y	Y	Y	Y
2.1.10.2.2.6.8.5. Fallceon/g (> 5 spp.):														
Fallceon quilleri	?	?	?	?	?	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fallceon longifolius	U	U	U	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fallceon poeyi	U	U	U	U	Y	Y	U	U	U	Y	UY	Y	Y	Y
Fallceon sextus	U	U	U	U	Y	U	U	U	U	Y	UY	UY	UY	Y
Fallceon testudineus	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
2.1.10.2.2.6.8.6. Caribaetis/g (2 spp.)	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
2.1.10.2.2.6.8.7. Americabaetis/g (3 spp.)	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
2.1.10.2.2.6.8.8. Nanomis/g (> 1 sp.)	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
2.1.10.2.2.6.8.9. *Zelusia principalis*	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
2.1.10.2.2.6.8.10. *Offadens soror*	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
2.1.10.2.2.6.8.11. *Guajirolus ektrapeloglossa*	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
2.1.10.2.2.6.8.12. Indobaetis/g (2 spp.)	Y	U	U	U	Y	U		U	U	Y	U	U	U	Y
2.1.10.2.2.6.8.13. Baetodes/g (> 3 spp.)	U	U	U	U	U	U		U	U	U	U	U	U	U
2.1.10.2.2.6.8.14. *Edmundsiops baddamsae*	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.1.10.2.2.6.8.15. Andesiops/g (> 3 spp.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.1.10.2.2.6.8.16. Moribaetis/g (2 spp.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.1.10.2.2.6.8.17. *Mayobaetis ellenae*	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.1.10.2.2.6.8.18. Baetofemorata (> 47 spp.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U

***Continental species*:** In both sexes, on all leg pairs, terminal tarsomere is covered with pointed microlepides, other tarsomeres are covered with blunt microlepides (with few pointed microlepides near apices of tarsomeres) (see Table 3) (Kluge 2017). Species examined: ♂ & ♀ *C. vibratorius* Kluge 2017, ♂ & ♀ *C. redactus* Waltz & McCafferty 1987, ♂ & ♀ *C. nigrohumeris* Kluge 2017, ♂ & ♀ *C. auwe* Salles & Batista 2004 and some undescribed species.

2.1.10.2.2.6.4. Paracloeodes/g. In both sexes, on all leg pairs, terminal tarsomere is covered with pointed microlepides, other tarsomeres with blunt microlepides (with few pointed microlepides near apices of tarsomeres) (Table 3). Species examined: ♂ & ♀ *Paracloeodes minutum* Daggy 1945, ♀ *P. lilliputian* Kluge 1991 and some undescribed species.

2.1.10.2.2.6.5. Apobaetis/g. In both sexes, on all leg pairs, at least terminal tarsomere is covered with pointed microlepides; on fore leg of male other tarsomeres (1st–4th) are covered with blunt microlepides; 1st–4th tarsomeres of other legs are either entirely covered with pointed microlepides (in *A. niger*), or with blunt microlepides on proximal part of tarsomere and with pointed microlepides on distal part of tarsomere (Table 3). Species examined: ♂ *Apobaetis niger* Nieto 2006 and two undescribed species.

2.1.10.2.2.6.6. Waltzoyphius/g. In both sexes, on all leg pairs, at least terminal tarsomere is covered with pointed microlepides; on middle and hind legs other tarsomeres on are also covered with pointed microlepides, except for proximal part of proximal (inital 1st+2nd) tarsomere, which is covered with microtrichia (like tibia); on fore legs of male 1st and 5th tarsomeres are covered with pointed microlepides, 2nd–4th tarsomeres are covered with blunt microlepides (with few pointed microlepides near apices of tarsomeres); on fore legs of female 1st tarsomere is covered with microtrichia, 2nd–5th tarsomeres are covered with pointed microlepides (Table 3). Species examined: ♂ & ♀ *Waltzoyphius roberti* Thomas & Peru 2003.

2.1.10.2.2.6.7. Aturbina/g. On fore legs of male, 1st and 5th tarsomeres are covered with pointed microlepides, 2nd–4th tarsomeres—with blunt microlepides; on middle and hind legs of male and on all legs of female all tarsomeres are covered with pointed microlepides (Table 3). Species examined: ♂ & ♀ *Aturbina beatrixae* Gillies 2001, ♂ & ♀ *A. nigra* Salles *et al*. 2011.

2.1.10.2.2.6.8. Baetungulata Kluge & Novikova 2011:

2.1.10.2.2.6.8.1. Nigrobaetis/g (incl. *Takobia*). In both sexes, on all leg pairs, at least terminal tarsomere is covered with pointed microlepides; in various species other tarsomeres are covered either mostly with pointed microlepides with some blunt microlepides near bases of tarsomeres (Table 5: Y), or mostly with blunt microlepides with some pointed microlepides near apices of tarsomeres (Table 5: U). Species examined: ♀ *Nigrobaetis* (s.str.) *niger* (Linnaeus 1761), *N.* (s.str.) *hageni* Eaton 1884, ♂ & ♀ *N.* (s.str.) *digitatus* Bengtsson 1912, ♂ & ♀ *N.* (s.str.) *acinaciger* Kluge 1983, ♂ & ♀ *N.* (*Margobaetis*) *bacillus* Kluge 1983, ♂ & ♀ *N.* (*Margobaetis*) *gracilis* Bogoescu & Tabacaru 1957, ♂ & ♀ *N.* (*Margobaetis*) *minutus* Müller-Liebenau 1984, ♂ & ♀*N.* (*Margobaetis*) *klugei* Sivaruban *et al*. 2022, ♂ & ♀ *N.* (*Takobia*) *muticus* (Linnaeus 1758), ♂ & ♀ *N.* (*Takobia*) *talasi* Novikova & Kluge 1994, ♂ & ♀ *N.* (*Takobia*) *laetificus* Müller-Liebenau 1984, ♂ & ♀ *N.* (*Takobia*) *maxillaris* Braasch & Soldan 1983, ♂ & ♀ *N.* (*Takobia*) *kars* Thomas & Kazanci 1989, ♂ & ♀ *N.* (*Takobia*) *kogistani* Novikova & Kluge 1994 and some undescribed species.

2.1.10.2.2.6.8.2. Labiobaetini, or Labiobaetis/f1=Pseudopannota/g1 (incl. *Echinobaetis*, *Mystaxiops*):

2.1.10.2.2.6.8.2.1. Labiobaetis/f2=g1. In both sexes, on all leg pairs, terminal tarsomere is covered either with pointed, or with blunt microlepides; other tarsomeres are either covered mostly with pointed microlepides with some blunt microlepides near bases of tarsomeres (Table 6: Y), or mostly with blunt microlepides with some pointed microlepides near apices of tarsomeres (Table 6: U) (Kluge & Novikova 2016, Kaltenbach *et al*. 2021). Species examined: ♂ & ♀ *Labiobaetis academicus* Kaltenbach *et al*. 2021, ♂ & ♀ *L. atrebatinus* (Eaton 1870), ♂ &♀ *L. bellus* (Barnard 1932), ♂ & ♀ *L. calcaratus* (Keffermuller 1972), ♂ & ♀ *L. desertus* (Novikova & Kluge 1987), ♂ & ♀ *L. geminatus* (Müller-Liebenau & Hubbard 1985), ♂ & ♀ *L. latus* (Agnew 1961), ♂ & ♀ *L. mtonis* (Gillies 1994), ♂ *L. ordinatus* (Müller-Liebenau & Hubbard 1985), ♂ & ♀ *L. propinquus* (Walsh 1863), ♂ & ♀ *L. pulchellus* (Müller-Liebenau & Hubbard 1985), ♂ & ♀ *L. tricolor* (Tshernova 1928), ♂ & ♀ *L. tripunctatus* (Gillies 1994), ♂ & ♀ *L. vinosus* (Barnard 1932) (= *L. tenuicrinitus* Kopelke 1980 **syn. n.**, see above), *L. werneri* Kaltenbach & Gattolliat 2021 and some undescribed species.

2.1.10.2.2.6.8.2.2. Pseudopannota/g2. In both sexes, on all leg pairs, at least terminal tarsomere is covered with pointed microlepides; other tarsomeres are covered either also with pointed microlepides, or with blunt microlepides (with few pointed microlepides near apices of tarsomeres) (Table 6) (Kluge & Novikova 2016). Species

examined: ♂ & ♀ *Pseudopannota pannota* Kluge & Novikova 2016, ♂ & ♀ *P. fusca* Kluge & Novikova 2016, ♂ & ♀ *P. camerunense* (Ulmer 1920) and some undescribed species.

2.1.10.2.2.6.8.2.3. Echinobaetis/g. On all leg pairs, all tarsomeres are covered with blunt microlepides (Table 6). Species examined: ♂ *Echinobaetis phagas* Mol 1989.

TABLE 5. Texture of subimaginal tarsomeres in *Nigrobaetis*

	♂ fore leg					♀ fore leg					middle & hind legs			
	1	2	3	4	5	1	2	3	4	5	1+2	3	4	5
Nigrobaetis (s.str.) *niger*	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Nigrobaetis (s.str.) *hageni*	?	?	?	?	?	?	?	?	?	?	U	U	U	Y
Nigrobaetis (s.str.) *digitatus*	U	U	U	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nigrobaetis (s.str.) *acinaciger*	U	U	U	U	Y	Y	UY	Y	Y	Y	Y	Y	Y	Y
Nigrobaetis (*Margobaetis*) *bacillus*	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Nigrobaetis (*Margobaetis*) *gracilis*	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Nigrobaetis (*Margobaetis*) *klugei*	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Nigrobaetis (*Margobaetis*) *minutus*	U	U	U	U	Y	U	UY	Y	Y	Y	UY	Y	Y	Y
Nigrobaetis (*Takobia*) *muticus*	W	W	W	W	W	W	W	W	W	W	W	W	W	W
Nigrobaetis (*Takobia*) *talasi*	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Nigrobaetis (*Takobia*) *laetificus*	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Nigrobaetis (*Takobia*) *maxillaris*	U	U	U	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nigrobaetis (*Takobia*) *kars*	Y	U	U	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nigrobaetis (*Takobia*) *kogistani*	Y	U	U	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

TABLE 6. Texture of subimaginal tarsomeres in Labiobaetini, or Labiobaetis/f=Pseudopannota/g

	♂ fore leg					♀ fore leg					middle & hind legs			
	1	2	3	4	5	1	2	3	4	5	1+2	3	4	5
Labiobaetis latus	UY	UY	UY	UY	Y	UY	UY	UY	UY	Y	Y	Y	Y	Y
Labiobaetis bellus	U	U	U	U	Y	Ψ	Ψ	Ψ	Ψ	Y	Y	Y	Y	Y
Labiobaetis tripunctatus	U	U	U	U	Y	U	U	U	U	Y	Y	Y	Y	Y
Labiobaetis atrebatinus	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Labiobaetis desertus	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Labiobaetis geminatus	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Labiobaetis mtonis	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Labiobaetis ordinatus	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Labiobaetis pulchellus	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Labiobaetis calcaratus	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Labiobaetis tricolor	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Labiobaetis propinquus	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Labiobaetis vinosus = *L. tenuicrinitus*	U	U	U	U	Y	I	U	U	U	Y	I-U	U	U	Y
Labiobaetis werneri	U	U	U	U	Ψ	U	U	U	U	Ψ	U	U	U	Ψ
Labiobaetis academicus	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Pseudopannota pannota	U	U	U	U	Y	U	U	U	U	Y	U	U	U	Y
Pseudopannota fusca	U	U	U	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pseudopannota camerunense	U	U	U	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Echinobaetis phagas	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Mystaxiops venatoris	U	U	U	U	U	U	U	U	U	U	U	U	U	U

2.1.10.2.2.6.8.2.4. Mystaxiops/g. In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides (Table 6). Species examined: ♂ & ♀ *Mystaxiops venatoris* McCafferty & Sun 2005.

2.1.10.2.2.6.8.3. Camelobaetidius/g. In both sexes, on all leg pairs, at least terminal tarsomere is covered with pointed microlepides. On fore leg of male and female 2nd–4th tarsomeres are covered with blunt microlepides; 1st tarsomere—either also with blunt microlepides, or with pointed microlepides (in male *C. kondratieffi*), or mainly with microtrichia with few pointed microlepides near apex (in female of *C. kondratieffi*). On middle and hind legs, proximal part of the most proximal (initial 1st+2nd) tarsomere is covered with microtrichia (like tibia), other its part and next two tarsomeres (initial 3rd–4th tarsomeres) are either covered with blunt microlepides (with few pointed microlepides near apices of tarsomeres), or entirely covered with pointed microlepides, like the terminal tarsomere (in two undescribed species from Panama) (Table 4). Species examined: ♂ & ♀ *Camelobaetidius kondratieffi* Lugo-Ortiz & McCafferty 1995, ♂ & ♀ *C. musseri* Traver & Edmunds 1968, ♂ *C. ortizi* Dominique & Thomas 2001 and some undescribed species.

2.1.10.2.2.6.8.4. Acerpenna/g. On all leg pairs, at least terminal tarsomere is covered with pointed microlepides; on fore legs of male, other tarsomeres are covered with blunt microlepides (with few pointed microlepides near apices of tarsomeres); on middle and hind legs all tarsomeres are covered with pointed microlepides (Table 4). Species examined: ♂ *Acerpenna pygmaea* (Hagen 1861).

2.1.10.2.2.6.8.5. Fallceon/g. In both sexes, on all leg pairs, at least terminal tarsomere is covered with pointed microlepides; other tarsomeres are covered either also with pointed microlepides, or with blunt microlepides, or with blunt microlepides at proximal part of tarsomere and pointed microlepides at distal part of tarsomere (Table 4). Species examined: ♀ *Fallceon quilleri* (Dodds 1923), ♂ & ♀ *Fallceon poeyi* (Eaton 1885), ♂ & ♀ *F. longifolius* (Kluge 1992), ♂ & ♀ *F. sextus* (Kluge 1992), ♂ & ♀ *F. testudineus* (Kluge 1992) and some undescribed species.

2.1.10.2.2.6.8.6. Caribaetis/g. In both sexes, on all leg pairs, terminal tarsomere is covered with pointed microlepides; other tarsomeres are covered with blunt microlepides, with or without few pointed microlepides near apices of tarsomeres (Table 4). Species examined: ♂ & ♀ *Caribaetis planifrons* (Kluge 1992), ♂ & ♀ *C. alcarrazae* (Kluge 1992).

2.1.10.2.2.6.8.7. Americabaetis/g. In both sexes, on all leg pairs, terminal tarsomere is covered with pointed microlepides; other tarsomeres are covered with blunt microlepides (with few pointed microlepides near apices of tarsomeres) (Table 4). Species examined: ♂ & ♀ *Americabaetis naranjoi* (Kluge 1992), ♂ & ♀ *A. pletura* (Lugo-Ortiz & McCafferty 1994), ♂ & ♀ *A. robacki* (Lugo-Ortiz & McCafferty 1994).

2.1.10.2.2.6.8.8. Nanomis/g. In both sexes, on all leg pairs, terminal tarsomere is covered with pointed microlepides, other tarsomeres are covered with blunt microlepides (Table 4). Species examined: ♂ *Nanomis galera* Lugo-Ortiz & McCafferty 1999 and some undescribed species.

2.1.10.2.2.6.8.9. Zelusia/g. In both sexes, on all leg pairs, terminal tarsomere is covered with pointed microlepides, other tarsomeres are covered with blunt microlepides (Table 4). Species examined: ♂ & ♀ *Zelusia principalis* Lugo-Ortiz & McCafferty 1998.

2.1.10.2.2.6.8.10. Offadens/g. In both sexes, on all leg pairs, terminal tarsomere is covered with pointed microlepides; other tarsomeres are covered with blunt microlepides (with few pointed microlepides near apices of tarsomeres) (Table 4). Species examined: ♂ & ♀ *Offadens soror* (Ulmer 1908).

2.1.10.2.2.6.8.11. Guajirolus/g. In both sexes, on all leg pairs, terminal tarsomere is covered with pointed microlepides; other tarsomeres are covered mainly with blunt microlepides, with pointed microlepides near apex (Table 4) (Kluge 2019a). Species examined: ♂ & ♀ *Guajirolus ektrapeloglossa* Flowers 1985.

2.1.10.2.2.6.8.12. Indobaetis/g. In both sexes, on all leg pairs, at least terminal tarsomere is covered with pointed microlepides (Fig. 5); on fore legs of male 1st tarsomere is covered with pointed microlepides; other tarsomeres are covered with blunt microlepides (with few pointed microlepides near apices of tarsomeres) (Table 4) (Kluge & Novikova 2014: figs 5–8). Species examined: ♂ & ♀ *Indobaetis costai* Müller-Liebenau & Morihara 1982, ♂ & ♀ *I. microfolius* Kluge & Novikova 2014.

2.1.10.2.2.6.8.13. Baetodes/g (incl. *Prebaetodes*). In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides (Table 4). Species examined: ♂ & ♀ *Prebaetodes sitesi* Lugo-Ortiz & McCafferty 1996, ♂ & ♀ *Baetodes traverae* Mayo 1972, ♀ *B. velmae* Cohen & Allen 1978 and some other species.

2.1.10.2.2.6.8.14. Edmundsiops/g. On all legs pairs, all tarsomeres are covered with blunt microlepides (Table 4). Species examined: ♂ *Edmundsiops baddamsae* (Harker 1950).

2.1.10.2.2.6.8.15. Andesiops/g (incl. *Deceptivosa*). Either all tarsomeres of all leg pairs in both sexes are cov-

ered with blunt microlepides (with or without few pointed microlepides near apices of tarsomeres) (table 4), or apical tarsomere is covered with microlepides intermediate between blunt and pointed (in some undescribed species). Species examined: ♂ & ♀ *Andesiops peruvianus* (Ulmer 1920), ♂ & ♀ *Deceptivosa torrens* Lugo-Ortiz & McCafferty 1999, ♀ *D. ardua* Lugo-Ortiz & McCafferty 1999 and some undescribed species.

2.1.10.2.2.6.8.16. Moribaetis/g. In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides (Table 4) (Kluge & Bernal 2018). Species examined: ♂ & ♀ *Moribaetis maculipennis* Flowers 1979, ♂ *M. latipennis* Kluge & Bernal 2018.

2.1.10.2.2.6.8.17. Mayobaetis/g. In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides (Table 4). Species examined: ♂ & ♀ *Mayobaetis ellenae* (Mayo 1973).

2.1.10.2.2.6.8.18. Baetofemorata Kluge & Novikova 2011. In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides; pointed microlepides, if present, occupy only a short distal part of tarsomere (Table 4) (Kluge & Novikova 2011). Species examined: ♂ & ♀ *Baetis* (s.str.) *fuscatus* (Linnaeus 1761), ♂ *B.* (s.str.) *scambus* Eaton 1870, ♂ & ♀ *B.* (s.str.) *ussuricus* Kluge 1983, ♂ & ♀ *B.* (s.str.) *vernus* Curtis 1834, ♂ & ♀ *B.* (s.str.) *macani* Kimmins 1957, ♂ & ♀ *B* (s.str.). *tracheatus* Keffermuller & Machel 1967, ♂ & ♀ *B.* (s.str.) *feles* Kluge 1980, ♂ & ♀ *B.* (s.str.) *transiliensis* Brodsky 1930, ♂ & ♀ *B.* (s.str.) *parvulus* Crass 1947 (= *B. permultus* Kopelke 1980 **syn. n.**, see above), ♂ & ♀ *B. buceratus* Eaton 1870, ♂ & ♀ *B. acceptus* Müller-Liebenau & Hubbard 1985, ♂ & ♀ *Baetis* (*Rhodobaetis*) *rhodani* (Pictet 1843), ♂ & ♀ *B.* (*Rh.*) *braaschi* Zimmermann 1980, ♂ & ♀ *B.* (*Rh.*) *oreophilus* Kluge 1982, ♂ & ♀ *B.* (*Rh.*) *pseudothermicus* Kluge 1983, ♂ *B.* (*Rh.*) *silvaticus* Kluge 1983, ♂ & ♀ *B.* (*Rh.*) *harrisoni* Barnard 1932, ♂ & ♀ *B.* (*Rh.*) *monikae* Kopelke 1980, ♂ *B.* (*Rh.*) *magnus* McCafferty & Waltz 1986, ♂ & ♀ *Baetis* (*Tenuibaetis*) *frequentus* Müller-Liebenau & Hubbard 1985, ♂ & ♀ *B.* (*T.*) *fujitanii* Kaltenbach & Gattolliat 2019, ♂ & ♀ *B.* (*T.*) *hissaricus* Novikova 1991, ♂ & ♀ *B.* (*T.*) *ursinus* Kazlauskas 1963, ♂ & ♀ *Baetis* (*Patites*) *alpinus* (Pictet 1843), ♂ & ♀ *Glossidion mysticum* Lugo-Ortiz & McCafferty 1998, ♂ & ♀ *Baetiella tuberculata* Kazlauskas 1963, ♂ & ♀ *B. muchei* (Braasch 1978), ♀ *B. narumonae* Boonsong *et al*. 2002, ♂ & ♀ *Acentrella* (s.str.) *lapponica* Bengtsson 2012, ♂ & ♀ *A.* (s.str.) *chantauensis* (Kluge 1981), ♂ & ♀ *A.* (s.str.) *charadra* Sroka & Arnekliev 2010, ♂ & ♀ *A.* (s.str.) *diptera* Kluge & Novikova 2011, ♂ & ♀ *A.* (s.str.) *fenestrata* (Kazlauskas 1963), ♂ *A.* (s.str.) *feropagus* Alba-Tercedor & McCafferty 2000, ♂ & ♀ *A.* (s.str.) *gnom* (Kluge 1983), ♂ & ♀ *A.* (s.str.) *inexpectata* (Tshernova 1928), ♂ & ♀ *A.* (s.str.) *joosti* (Zimmermann & Braasch 1979), ♂ & ♀ *A.* (s.str.) *scabriventris* Kluge & Novikova 2011, ♂ & ♀ *A.* (s.str.) *sibirica* (Kazlauskas 1963), ♂ & ♀ *Acentrella* (*Tanzaniops*) *lunamontana* Kluge & Novikova 2011, ♂ & ♀ *Acentrella* (*Leibebiella*) *orientale* (Müller-Liebenau 1982), ♂ & ♀ *A.* (*L.*) *vera* (Müller-Liebenau 1982), ♂ & ♀ *A.* (*L.*) *proxima* (Müller-Liebenau 1984), ♂ & ♀ *A.* (*L.*) *bispinosa* Kluge & Novikova 2011, ♂ & ♀ *A.* (*L.*) *cylindroculata* Kluge & Novikova 2011, ♂ & ♀ *Platybaetis wallacei* Tong & Dudgeon 1999, ♂ *P. mamasae* Kluge & Novikova 2011, *Baetis javanicus* Ulmer 1913 and other species.

2.2. Bidentiseta Kluge 1993:

2.2.1. Branchitergaliae Kluge 1998:

2.2.1.1. Eusetisura Kluge 1998, or Oligoneurioidea:

2.2.1.1.1. Coloburiscus/fg (incl. *Coloburiscoides*, *Murpyella*). On all leg pairs, all tarsomeres are covered with blunt microlepides (Table 7). Species examined: ♂ & ♀ *Coloburiscus humeralis* (Walker 1853), ♀ *Coloburiscoides giganteus* (Tillyard 1933), ♂ & ♀ *Murphyella needhami* Lestage 1930.

2.2.1.1.2. Isonychia/fg. In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides (Table 7); microtrichia either absent, or occupy only a small proximal part of first tarsomere. Species examined: ♂ & ♀ *Isonychia ignota* (Walker 1835), ♂ & ♀ *I. vshivkovae* Tiunova *et al*. 2004, ♂ & ♀ *I. ussurica* Bajkova 1970, ♂& ♀ *I. bicolor* (Walker 1835), ♂ & ♀ *I. crassiuscula* Tiunova *et al*. 2004, ♂ *I. sicca* (Walsh 1862).

2.2.1.1.3. Discoglossata Kluge 2004:

2.2.1.1.3.1. Pseudoligoneuria/f=Chromarcys/g. At least in male, on all leg pairs, all tarsomeres are covered with microtrichia (like tibiae) (Table 7). Species examined: ♂ *Chromarcys magnifica* Navás 1932.

2.2.1.1.3.2. Geminovenata Kluge 2004. On all leg pairs, all tarsomeres lack microlepides and have the same texture as tibia: either both bear microtrichia, or both are smooth (Table 7). In contrast to other mayflies, with molt from subimago to imago subimaginal cuticle is retained on imaginal legs, being detached from the subimaginal exuviae. Among species examined, the subimaginal/imaginal legs retain microtrichia on tibiae and tarsi in males of *Oligoneurisca borysthenica* (Tshernova 1937) and *Oligoneuriopsis dobbsi* (Eaton 1912). Subimaginal/imaginal

legs are entirely smooth or bear few microtrichia on apex of the terminal tarsomere in males of *Oligoneuriella pallida* (Hagen 1855), *O. tskhomelidzei* Sowa & Zosidze 1973, *Spaniophlebia trailae* Eaton 1881, *Oligoneuria itayana* Kluge 2007 and *Elassoneuria* sp.

TABLE 7. Texture of subimaginal tarsomeres in Bidentiseta-Branchitergaliae

	♂ fore leg					♀ fore leg					middle & hind legs				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
2.2. Bidentiseta:															
2.2.1. Branchitergaliae:															
2.2.1.1. Eusetisura, or Oligoneurioidea:															
2.2.1.1.1. Coloburiscus/fg (3 spp.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.2.1.1.2. Isonychia/fg (6 spp.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.2.1.1.3. Discoglossata (8 spp.)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
2.2.1.2. Heptagennota, or Heptagenioidea:															
2.2.1.2.1. *Pseudiron centralis*	U	U	U	U	U	?	?	?	?	?	U	U	U	U	U
2.2.1.2.2. Pentamerotarsata:															
2.2.1.2.2.1. Arthroplea/fg (2 spp.)	U	U	U	U	U-V	V	V	V	V	V	V	V	V	V	V
2.2.1.2.2.2. Radulapalpata:															
2.2.1.2.2.2.1. Heptagenia/f5=g4:															
2.2.1.2.2.2.1.1. Heptagenia/f6=g5:															
2.2.1.2.2.2.1.1.1. Kageronia/fg:															
Kageronia fuscogrisea	U	U	U	U	U	U	U	U	U	U	Y	U Y	U Y	UY	U
Kageronia orbiticola	U	U	U	U	U	U	U	U	U	U	Y	Y	Y	Y	Y
2.2.1.2.2.2.1.1.2. Heptagenia/f7=g6 (12 spp.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.2.1.2.2.2.1.2. Ecdyonurus/fg (> 30 spp.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.2.1.2.2.2.2. *Cinygma lyriformis*	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.2.1.2.2.2.3. Rhithrogena/fg1:															
2.2.1.2.2.2.3.1. *Paegniodes cupulatus*	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.2.1.2.2.2.3.2. Rhithrogena/fg2:															
2.2.1.2.2.2.3.2.1. Cinygmula/g—see **Table 8**															
2.2.1.2.2.2.3.2.2. Rhithrogena/fg3—see **Table 9**															
2.2.1.2.2.2.3.3. Epeorus/fg (> 28 spp.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.2.2. Furcatergaliae—see **Table 10**															

2.2.1.2. Heptagennota Kluge 2000, or Heptagenioidea:

2.2.1.2.1. Pseudiron/fg. On all leg pairs, all tarsomeres are covered with blunt microlepides (Table 7). Species examined: ♂ *Pseudiron centralis* McDunnough 1931.

2.2.1.2.2. Pentamerotarsata Kluge 2000:

2.2.1.2.2.1. Arthroplea/fg. On fore leg of male, tarsus is covered mostly with blunt microlepides, with small area of microtrichia near base of first tarsomere and somewhat pointed microlepides on distal part of last tarsomere; on other legs all tarsomeres are covered with microlepides intermediate between blunt and pointed, with small area of microtrichia near base of first tarsomere (Table 7). Species examined: ♂ & ♀ *Arthroplea congener* Bengtsson 1908, ♂ & ♀ *A. bipunctata* McDunnough 1924.

2.2.1.2.2.2. Radulapalpata Kluge 2000:

2.2.1.2.2.2.1. Heptagenia/f5=g4 (sine *Cinygma*, *Rhithrogena*; incl. *Ecdyonurus*):

2.2.1.2.2.2.1.1. Heptagenia/f6=g5 (sine *Ecdyonurus*; incl. *Kageronia*):

2.2.1.2.2.2.1.1.1. Kageronia/fg. On all legs of both sexes, tarsi are covered with blunt and pointed microlepides;

only a part of first tarsomere is covered with microtrichia. Fore tarsi of male and female have similar texture—in *K. fuscogrisea* with all microlepides blunt, in *K. orbiticola* with most microlepides blunt and fewer microlepides pointed. Middle and hind tarsi of both sexes have greater areas covered with pointed microlepides: in *K. fuscogrisea* large ventral areas of 1st–4th tarsomeres are covered with pointed microlepides; in *K. orbiticola* all tarsomeres are covered mostly with pointed microlepides (Table 7). Species examined: ♂ & ♀ *Kageronia fuscogrisea* (Retzius 1983), ♂ & ♀ *K. orbiticola* (Kluge 1987).

2.2.1.2.2.2.1.1.2. Heptagenia/f7=g6 (incl. *Stenonema*): In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides (Table 7); microtrichia are either absent, or occupy only a small ventral-proximal part of first tarsomere. Species examined: ♂ & ♀ *Heptagenia* (s.str.) *flava* (Rostock 1878), ♂ & ♀ *H.* (s.str.) *sulphurea* (Müller 1776), ♂ & ♀ *H.* (s.str.) *perflava* Brodsky 1930, ♂ & ♀ *H.* (s.str.) *longicauda* Stephens 1835, ♂ & ♀ *H.* (s.str.) *samochai* Demoulin 1973, ♂ & ♀ *H.* (s.str.) *chinensis* Ulmer 1920, ♀ *H.* (s.str.) *guranica* Belov 1981, ♂ *H.* (s.str.) *flavata* Navas 1922, ♂ *H.* (s.str.) *quadripunctata* Kluge 1989, ♂ & ♀ *Heptagenia* (*Dacnogenia*) *coerulans* Rostock 1878, ♀ *Stenonema femorata* (Say 1823), ♂ & ♀ *Stenacron interpunctatum* (Say 1839).

2.2.1.2.2.2.1.2. Ecdyonurus/fg (incl. *Afghanurus*, *Atopopus*, *Afronurus et al.*). In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides (Table 7); microtricha are either absent, or occupy only a ventral-proximal part of first tarsomere. Species examined: ♀ *E.* (s.str.) *venosus* (Fabricius 1775), ♂ & ♀ *E.* (s.str.) *aurantiacus* (Burmeister 1839), ♂ *E.* (s.str.) *autumnalis* Braasch 1980, ♂ & ♀ *E.* (s.str.) *ornatipennis* Tshernova 1938, ♂ *E.* (*Helvetoraeticus*) *helveticus* Eaton 1887, ♂ *E.* (*H.*) *picteti* (Meyer-Dür 1864), ♂ *E.* (*H.*) *zelleri* Eaton 1885, ♂ & ♀ *E.* (*Afghanurus*) *vicinus* (Demoulin 1964), ♂ & ♀ *E.* (*A.*) *rubrofasciatus* Brodsky 1930, ♂ & ♀ *E.* (*A.*) *joernensis* Bengtsson 1909, ♂ *E.* (*A.*) *simplicioides* (McDunnough 1924), ♂ & ♀ *E.* (*A.*) *bajkovae* Kluge 1986, ♂ & ♀ *E.* (*Rhithrogenella*) *tonkinensis* (Soldán & Braasch 1986), ♂ *E.* (*Compsoneuriella*) *bequaerti* (Navás 1930), ♀ *E.* (*Compsoneuriella*) *braaschi* (Boonsoong & Sartori 2015), ♂ & ♀ *E.* (*Ecdyogymnurus*) *kibunensis* Imanishi 1936, ♂ & ♀ *E.* (*E.*) *aspersus* Kluge 1980, ♂ & ♀ *E.* (*E.*) *inversus* Kluge 1980, ♂ & ♀ *E.* (*E.*) *scalaris* Kluge 1983, ♂ & ♀ *E.* (*Thamnodontus*) *aurarius* Kluge 1983, ♂ & ♀ *E.* (*Th.*) *dracon* Kluge 1983, ♂ *E.* (*Notacanthurus*) *baei* (Braasch & Boonsoong 2009), ♂ & ♀ *E.* (*Ecdyonuroides*) *flowersi* (Venkataraman & Sivaramakrishnan 1987), ♂ & ♀ *E.* (*Electrogena*) *affinis* Eaton 1885, ♂ & ♀ *E.* (*E.*) *squamatus* Braasch 1978, ♂ *E.* (*E.*) *zebrata* Hagen 1864, ♂ & ♀ *E.* (*Afronurus*) *abracadabrus* Kluge 1983, ♂ & ♀ *E.* (*A.*) *levis* (Navás 1912), ♂ & ♀ *E.* (*A.*) *rubromaculata* (You *et al*. 1981), ♂ & ♀ *E.* (*A.*) *kumbakkaraiensis* (Venkataraman & Sivaramakrishnan 1989), ♂ & ♀ *E.* (*A.*) *barnardi* (Schoonbee 1968), ♂ *E.* (*A.*) *negi* (Corbet 1960), ♂ *E.* (*A.*) *collarti* (Navás 1930) and some undescribed species.

2.2.1.2.2.2.2. Cinygma/fg. In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides; only ventral-proximal part of first tarsomere of fore leg of female and middle and hind legs of both sexes is covered with microtrichia (Table 7). Species examined: ♂ & ♀ *Cinygma lyriformis* (McDunnough 1924).

2.2.1.2.2.2.3. Rhithrogena/fg1 (incl. *Paegniodes*):

2.2.1.2.2.2.3.1. Paegniodes/g. In both sexes, on all leg pairs, all tarsomeres are covered with small, blunt microlepides; on middle and hind legs of both sexes and on fore led of female, a small ventral-proximal area of first tarsomere is covered with microtrichia (Table 7). Species examined: ♂ & ♀ *Paegniodes cupulatus* (Eaton 1861).

2.2.1.2.2.2.3.2. Rhithrogena/fg2 (incl. *Cinygmula*):

2.2.1.2.2.2.3.2.1. Cinygmula/g. Various tarsomeres (1st, 2nd–4th and 5th ones) on fore leg of male, on fore leg of female, and on middle and hind legs of both sexes, demonstrate various species-specific combinations of blunt microlepides, pointed microlepides, intermediate microlepides and microtrichia (Figs 3–4, 7, 9) (Table 8). Species examined: ♂ *C. autumnalis* Tiunova & Gorovaya 2012, ♂ *C. brunnea* Tiunova 1990, ♂ & ♀ *C. cava* (Ulmer 1927), ♂ & ♀ *C. hirasana* (Imanishi 1935), ♂ & ♀ *C. hutchinsoni* (Traver 1939) (Kluge 2015b: figs 16–22), ♂ & ♀ *C. joosti* Braasch 1977 (Kluge 2015b: figs 37–43), ♂ & ♀ *C. kurenzovi* (Bajkova 1965), ♂ & ♀ *C. levanidovi* Tshernova & Belov 1982, ♂ *C. par* (Eaton 1885), ♂ & ♀ *C. putoranica* Kluge 1980, ♂ & ♀ *C. sapporensis* (Matsumura 1904) (= C. *grandifolia* Tshernova 1952).

2.2.1.2.2.2.3.2.2. Rhithrogena/fg3. In both sexes, on all leg pairs, 2nd–5th tarsomeres are entirely covered with blunt microlepides (Table 9). The 1st tarsomere is partly covered with blunt microlepides (on dorsal and/or distal part), partly covered with microtrichia (on ventral and/or proximal part); on male fore leg, the area covered with microtrichia is smallest (either occupying only a small ventral-proximal area, or absent); on female fore leg, the area of microtrichia is larger; on middle and hind legs of both sexes the area covered with microtrichia is largest (either smaller, or larger than the area covered with blunt microlepides) (Kluge 2015b). Species examined: ♂ & ♀ *Rh*. (s.str.) *semicolorata* (Curtis 1834), ♂ & ♀ *Rh*. (s.str.) *alpestris* Eaton 1885, ♂ & ♀ *Rh*. (s.str.) *caucasica* Braasch

1979, ♂ & ♀ *Rh*. (s.str.) *expectata* Braasch 1979, ♂ & ♀ *Rh*. (s.str.) *joostiana* Sowa & Zimmermann 1978, ♂ & ♀ *Rh*. (s.str.) *lepnevae* Brodsky 1930, ♂ & ♀ *Rh*. (s.str.) *bajkovae* Sowa 1973, ♂ & ♀ *Rh.* (*Himalogena*) *tianshanica* Brodsky 1930, ♀ *Rh.* (*H.*) *carnivora* Kluge 2015, ♂ & ♀ *Rh.* (*H.*) *pamirica* Kluge 2015, ♂ *Rh.* (*H.*) *semicarnivora* Kluge 2015, ♂ & ♀ *Rh.* (*H.*) *gunti* Kluge 2015, ♂ & ♀ *Rh.* (*H.*) *stackelbergi* Sinitshenkova 1973, ♀ *Rh.* (*H.*) *nepalensis* Braasch 1984, ♂ & ♀ *Rh.* (*Sibirigena*) *sibirica* Brodsky 1930, ♂ & ♀ *Rh.* (*Epeiron*) *znojkoi* (Tshernova 1938), ♂ & ♀ *Rh.* (*E.*) *uzbekistanica* (Braasch & Soldán 1982), ♂ & ♀ *Rh.* (*E.*) *eugeniae* Kluge 1983, ♂ *Rh.* (*E.*) *binerve* Kluge 1987.

TABLE 8. Texture of subimaginal tarsomeres in *Cinygmula* (Figs 3–4, 7, 9)

	♂ fore leg					♀ fore leg					middle & hind legs				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Cinygmula autumnalis	U	U	U	U	U	?	?	?	?	?	I-U	U	U	U	U
Cinygmula cava	U	U	U	U	U	I-U	U	U	U	U	I-U	U	U	U	U
Cinygmula joosti	U	U	U	U	U	I-U	U	U	U	U	I-U	U	U	U	U
Cinygmula par	U	U	U	U	U	?	?	?	?	?	I-U	U	U	U	U
Cinygmula putoranica	U	U	U	U	U	I-U	U	U	U	U	I-U	U	U	U	U
Cinygmula brunnea	U	U	U	U	U	?	?	?	?	?	I-U	I-U	U	U	U
Cinygmula kurenzovi	U	U	U	U	U	U	U	U	U	U	I-Ψ	U Ψ	U Ψ	U Ψ	Ψ
Cinygmula levanidovi	U	U	U	U	U	U	U	U	U	U	I-Ψ	Ψ	Ψ	Ψ	Ψ
Cinygmula hirasana	U	U	U	U	U	I-Ψ	Ψ	Ψ	Ψ	Ψ	I-Ψ	Ψ	Ψ	Ψ	Ψ
Cinygmula sapporensis (= *C. grandifolia*)	I-U	U	U	U	Y U	Y+I U	Y+I U	Y+I U	Y+I U	Y U	I	Y+I U	Y+I U	Y+I U	Y U
Cinygmula hutchinsoni	U	Y	Y	Y	Y	I	I	I	I	Y	I	I	I	I	Y

2.2.1.2.2.2.3.3. Epeorus/fg (incl. *Bleptus*). In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides; in some species, larger or smaller ventral-proximal area of first tarsomere is covered with microtrichia (Table 7) (Kluge 2015b). Species examined: ♂ & ♀ *Bleptus fasciatus* Eaton 1885, ♂ & ♀ *Epeorus* (*Proepeorus*) *anatolii* Sinitshenkova 1981, ♂ *E.* (*P.*) *vitreus* (Walker 1853), ♀ *E.* (*P.*) *nipponicus* (Ueno 1931), ♂ & ♀ *Epeorus* (s. str.) *sylvicola* (Pictet 1865), ♂ & ♀ *E*. (s. str.) *zaitzevi* Tshernova 1981, ♂ & ♀ *E*. (s. str.) *aculeatus* Braasch 1990, ♂ & ♀ *E*. (s. str.) *bispinosus* Braasch 1980, ♂ & ♀ *E*. (s. str.) *gilliesi* Braasch 1981 (= *E. petersi* Sivaruban *et al*. 2013 **syn. n.,** see above), ♂ & ♀ *E.* (*Belovius*) *pellucidus* (Brodsky 1930), ♂ & ♀ *E.* (*B.*) *gornostajevi* Tshernova 1981, ♂ *E.* (*B.*) *rubeus* Tiunova 1991, ♂ & ♀ *E.* (*Iron*) *longimanus* (Eaton 1883), ♂ & ♀ *E.* (*I.*) *aesculus* Imanishi 1934, ♂ & ♀ *E.* (*I.*) *maculatus* Tshernova 1949, ♂ & ♀ *E.* (*I.*) *alexandri* Kluge & Tiunova 1989, ♂ & ♀ *E.* (*I.*) *montanus* (Brodsky 1930), ♂ & ♀ *E.* (*I.*) *inaequalis* Braasch & Soldán 1980, ♂ & ♀ *E*. (*Ironopsis*) *permagnus* (Traver 1935), ♀ *E*. (*I.*) *alpicola* (Eaton 1871), ♂ & ♀ *E*. (*I.*) *rheophilus* (Brodsky 1930), ♂ & ♀ *E*. (*Caucasiron*) *caucasicus* (Tshernova 1938), ♂ & ♀ *E*. (*C.*) *guttatus* (Braasch & Soldán 1979), ♂ & ♀ *E*. (*C.*) *magnus* (Braasch 1978), ♂ & ♀ *E*. (*C.*) *znojkoi* (Tshernova 1938), ♂ & ♀ *E*. (*C.*) *soldani* (Braasch 1979), ♂ & ♀ *E*. (*C.*) *alpestris* (Braasch 1979), ♂ *E*. (*C.*) *psi* Eaton 1885 and some undescribed species.

2.2.2. Furcatergaliae Kluge 1998:

2.2.2.1. Fimbriatotergaliae Kluge 2004:

2.2.2.1.1. Potamanthus/fg (incl. *Rhoenanthus*). In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides; only on middle and hind legs, ventral part of first tarsomere (fused with tibia) is covered with microtrichia (as tibia) (Table 10). Species examined: ♂ & ♀ *Potamanthus luteus* (Linnaeus 1767), ♂ & ♀ *Potamanthodes formosus* (Eaton 1892), ♂ *Rhoenanthus magnificus* Ulmer 1920.

TABLE 9. Texture of subimaginal tarsomeres in *Rhithrogena*

	♂ fore leg					♀ fore leg					middle & hind legs				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Rhithrogena (s.str.) *alpestris*	U	U	U	U	U	I\U	I\U	I\U	I\U	U	I\U	I\U	I\U	I\U	U
Rhithrogena (s.str.) *joostiana*	U	U	U	U	U	I\U	I\U	I\U	I\U	U	I\U	I\U	I\U	I\U	U
Rhithrogena (s.str.) *expectata*	U	U	U	U	U	I\U	U	U	U	U	I\U	I\U	I\U	U	U
Rhithrogena (s.str.) *caucasica*	U	U	U	U	U	I\U	U	U	U	U	I\U	I\U	U	U	U
Rhithrogena (s.str.) *semicolorata*	U	U	U	U	U	I\U	U	U	U	U	I\U	U	U	U	U
Rhithrogena (s.str.) *lepnevae*	U	U	U	U	U	I\U	U	U	U	U	I\U	U	U	U	U
Rhithrogena (*Himalogena*) *tianshanica*	U	U	U	U	U	U	U	U	U	U	I\U	U	U	U	U
Rhithrogena (*Himalogena*) *pamirica*	U	U	U	U	U	U	U	U	U	U	I\U	U	U	U	U
Rhithrogena (*Himalogena*) *nepalensis*	?	?	?	?	?	U	U	U	U	U	I\U	U	U	U	U
Rhithrogena (*Himalogena*) *semicarnivora*	U	U	U	U	U	?	?	?	?	?	I\U	U	U	U	U
Rhithrogena (*Himalogena*) *carnivora*	U	U	U	U	U	I\U	U	U	U	U	I\U	U	U	U	U
Rhithrogena (*Himalogena*) *gunti*	U	U	U	U	U	I\U		U	U	U	I\U	U	U	U	U
Rhithrogena (*Himalogena*) *stackelbergi*	U	U	U	U	U	I\U	U	U	U	U	I\U	U	U	U	U
Rhithrogena (*Sibirigena*) *sibirica*	U	U	U	U	U	I\U	U	U	U	U	I\U	U	U	U	U
Rhithrogena (*Epeiron*) *znojkoi*	U	U	U	U	U	I\U	U	U	U	U	I\U	U	U	U	U
Rhithrogena (*Epeiron*) *uzbekistanica*	U	U	U	U	U	I\U	U	U	U	U	I\U	U	U	U	U
Rhithrogena (*Epeiron*) *binerve*	U	U	U	U	U	?	?	?	?	?	I\U	U	U	U	U
Rhithrogena (*Epeiron*) *eugeniae*	U	U	U	U	U	I\U	U	U	U	U	I\U	U	U	U	U

2.2.2.1.2. Fossoriae Kluge 2000:

2.2.2.1.2.1. Ichthybotus/fg. On all leg pairs, all tarsomeres are covered with small blunt microlepides (Table 10). Species examined: ♀ *Ichthybotus hudsoni* (McLachlan 1894).

2.2.2.1.2.2. Ephemera/fg9 (incl. *Hexagenia*):

2.2.2.1.2.2.1. Ephemera/fg10 (sine *Hexagenia*; incl. *Sinephemera*, *Afromera*). In both sexes, on all leg pairs, 2nd–5th tarsomeres are covered with blunt microlepides; on fore leg of male 1st tarsomere is also covered with blunt microlepides (only in *E. vulgata* and *E. transbaicalica* its significant part is covered with microtrichia); on fore leg of female and middle and hind legs of both sexes, 1st tarsomere is covered with microtrichia (as tibia) (Table 10). Species examined: ♂ & ♀ (*Ephemera* (*Sinephemera*) *strigata* Eaton 1892, ♂ & ♀ (*Ephemera* (*S.*) *japonica* Eaton 1892, ♂ & ♀ (*E.* (*S.*) *hasalakensis* Hubbard 1983, ♂ & ♀ (*E.* (*S.*) *shengmi* Hsu 1937, ♂ & ♀ *E.* (*A.*) *siamensis* Ueno 1969, ♂ & ♀ *Ephemera* (s.str.) *vulgata* Linnaeus 1758, ♂ *E.* (s.str.) *romantzovi* Kluge 1988, ♂ & ♀ *E.* (s.str.) *transbajkalica* Tshernova 1973, ♂ & ♀ *E.* (s.str.) *sachalinensis* Matsumura 1911, ♂ & ♀ *E.* (s.str.) *danica* Müller 1764, ♂ & ♀ *E.* (s.str.) *orientalis* McLachlan 1875, ♂ *E.* (s.str.) *spilosa* Navás 1936.

2.2.2.1.2.2.2. Hexagenia/fg (incl. *Eatonica*). In both sexes, on all leg pairs, all tarsomeres are covered with blunt microlepides; only on middle and hind legs, ventral part of 1st tarsomere (fused with tibia) is covered with microtrichia (as tibia) (Table 10). Species examined: ♂ & ♀ *Hexagenia limbata* (Serville 1829), ♂ *Eatonica schoutedeni* Navás 1911, ♀ *Eatonica crassi* McCafferty 1971.

2.2.2.1.2.3. Cryptoprosternata Kluge 2000:

2.2.2.1.2.3.1. Palingenia/f2=g1 (incl. *Pentagenia*):

2.2.2.1.2.3.1.1. Pentagenia/fg. At least in male on all leg pairs, all tarsomeres are covered with small, blunt microlepides (Table 10). Species examined: ♂ *Pentagenia vittigera* (Walsh 1862).

2.2.2.1.2.3.1.2. Palingenia/f3=g2 (incl. *Anagenesia*). In male, on all leg pairs, all tarsomeres are covered with fine transverse striation representing vestiges of blunt microlepides. Female have no molt from subimago to imago; legs of the single winged stage are vestigial, bear only vestiges of microtrichia (Table 10). Species examined: ♂ & ♀ *Palingenia longicauda* (Olivier 1791), ♂ *Anagenesia paradoxa* Buldovsky 1935.

2.2.2.1.2.3.2. Polymitarcys/f=Ephoron/g (incl. *Campsurus*). On fore legs of male, all tarsomeres lack microlepides or microtrichia; they are either smooth, or have fine cross striation. Fore tarsi of female and middle and hind tarsi of both sexes (if present) are entirely covered with microtrichia (as tibia) (Table 10). Species examined: ♂ & ♀ *Eopolymitarsys nigridorsum* Tshernova 1934, ♀ *Ephoron alba* (Say 1823), ♂ & ♀ *E. shigae* (Takahashi 1924), ♀ *E. savignyi* (Pictet 1843), ♂ *Asthenopus heardi* (Hubbard 1984), ♂ *Campsurus violaceus* Needham & Murphy 1924, ♀ *Tortopus* sp.

2.2.2.1. Caenotergaliae Kluge 2000, or Caenoidea:

2.2.2.1.1. Neoephemera/fg1:

2.2.2.1.1.1. Potamanthellus/g (incl. *Neoephemeropsis*). On fore legs of male, all tarsomeres are coved with blunt microlepides; on fore legs of female and on middle and hind legs of both sexes, several most distal tarsomeres are also covered with blunt microlepides, remainder tarsomeres are covered with microtrichia (like tibiae) (Table 10). Species examined: ♂ & ♀ *Potamanthellus edmundsi* Bae & McCafferty, *P. chinensis* Hsu 1936.

TABLE 10. Texture of subimaginal tarsomeres in Furcatergaliae-Fimbriatotergaliae

	♂ fore leg					♀ fore leg					middle & hind legs				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
2.2.2. Furcatergaliae:															
2.2.2.1. Fimbriatotergaliae:															
2.2.2.1.1. Potamanthus/fg (3 spp.)	U	U	U	U	U	U	U	U	U	U	I\U	U	U	U	U
2.2.2.1.2. Fossoriae:															
2.2.2.1.2.1. *Ichthybotus hudsoni*	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2.2.2.1.2.2. Ephemera/fg9:															
2.2.2.1.2.2.1. Ephemera/fg10:															
2.2.2.1.2.2.1. *E. vulgata*, *E. transbaicalica*	I/U	U	U	U	U	I	U	U	U	U	I	U	U	U	U
2.2.2.1.2.2.1. other *Ephemera* s.l. (10 spp)	U	U	U	U	U	I	U	U	U	U	I	U	U	U	U
2.2.2.1.2.2.2. Hexagenia/fg (3 spp.)	U	U	U	U	U	U	U	U	U	U	I\U	U	U	U	U
2.2.2.1.2.3.1. Palingenia/f2=g1 (3 spp)	U	U	U	U	U	–	–	–	–	–	U	U	U	U	U
2.2.2.1.2.3.2. Polymitarcys/f=Ephoron/g (> 6 spp)	–	–	–	–	–	I	I	I	I	I	I	I	I	I	I
2.2.2.1. Caenotergaliae, or Caenoidea:															
2.2.2.1.1. Neoephemera/fg1:															
2.2.2.1.1.1. Potamanthellus/g:															
Potamanthellus edmundsi	U	U	U	U	U	I	I	I\U	U	U	I	I	I	I\U	U
Potamanthellus chinensis	?	?	?	?	?	?	?	?	?	?	I	I	I	I	U
2.2.2.1.1.2. *Neoephemera youngi*	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
2.2.2.1.1.3. *Ochernova tshernovae*	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
2.2.2.1.1.4. *Leucorhoenanthus maximus*	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
2.2.2.1.1.5. *Pulchephemera projecta*	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
2.2.2.1.2. Caenoptera (> 24 spp.)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
2.2.2.2. Ephemerella/fg1, or Ephemerelloidea—see **Table 11**															
2.2.2.3. Leptophlebia/fg1, or Leptophlebiidae—see **Table 13**															

2.2.2.1.1.2. Neoephemera/fg2. On all leg pairs, all tarsomeres are covered with microtrichia (like tibiae) (Table 10). Species examined: ♂ *Neoephemera youngi* Berner 1953.

2.2.2.1.1.3. Ochernova/g. In both sexes, on all leg pairs, all tarsomeres are covered with microtrichia (like tibiae) (Table 10). Species examined: ♂ & ♀ *Ochernova tshernovae* (Kazlauskas 1963).

2.2.2.1.1.4. Leucorhoenanthus/g. In both sexes, on all leg pairs, all tarsomeres are covered with microtrichia (like tibiae) (Table 10). Species examined: *Leucorhoenanthus maximus* (Joly 1871).

2.2.2.1.1.5. Pulchephemera/g. In both sexes, on all leg pairs, all tarsomeres are covered with microtrichia (like tibiae) (Table 10). Data about *Pulchephemera projecta* (Zhou & Zheng 2000) taken from Ma & Zhou (2021: 3, figs 10A–G).

2.2.2.1.2. Caenoptera Kluge 2000. In both sexes, on all leg pairs, all tarsomeres are covered with microtrichia (like tibiae) (Table 10); the microtrichae are either well developed on all legs, or vestigial, or partly absent (on male fore tarsi of some species). Species examined: ♂ & ♀ *Brachycercus harrisella* Curtis 1834, ♂ & ♀ *B. corniger* Kluge 1991, ♂ *B. europaeus* Kluge 1991, ♂ *B. minutus* Tshernova 1952, ♂ & ♀ *B. peruanicus* (Soldán 1986), ♂ *Caenis* (*Tillyardocaeni*s) *tillyardi* Lestage 1938, ♂ & ♀ *Caenis* (s. str.) *macrura* Stephens 1935, ♂ *C. amurensis* Kluge 1986, ♂ *C. beskidensis* Sowa 1973, ♀ *C. cornuta* Tshernova 1952, ♂ *C. cubensis* Malzacher *et al*. 2007, ♀ *C. deani* (Suter 1999), ♂ & ♀ *C. hissari* Kluge 1985, ♂ *C. horaria* (Linnaeus 1758), ♂ *C. jinjana* (Kimmins 1956), ♂ & ♀ *C. kopetdagi* Kluge 1985, ♂ C. *macronyx* Kluge 1986, ♀ C. *maculata* Tshernova 1952, ♂ *C. miliaria* Tshernova 1952, ♂ *C. punctata* McDunnough 1931, ♂ & ♀ *C. rivulorum* Eaton 1884, ♂ & ♀ *C. robusta* Eaton 1884, ♂ *C. tardata* McDunnough 1931, ♂ *C. tonnoiri* (Lestage 1931) and some undescribed species.

2.2.2.2. Ephemerella/fg1, or Ephemerelloidea (Table 11):

2.2.2.2.1. Ephemerella/fg2:

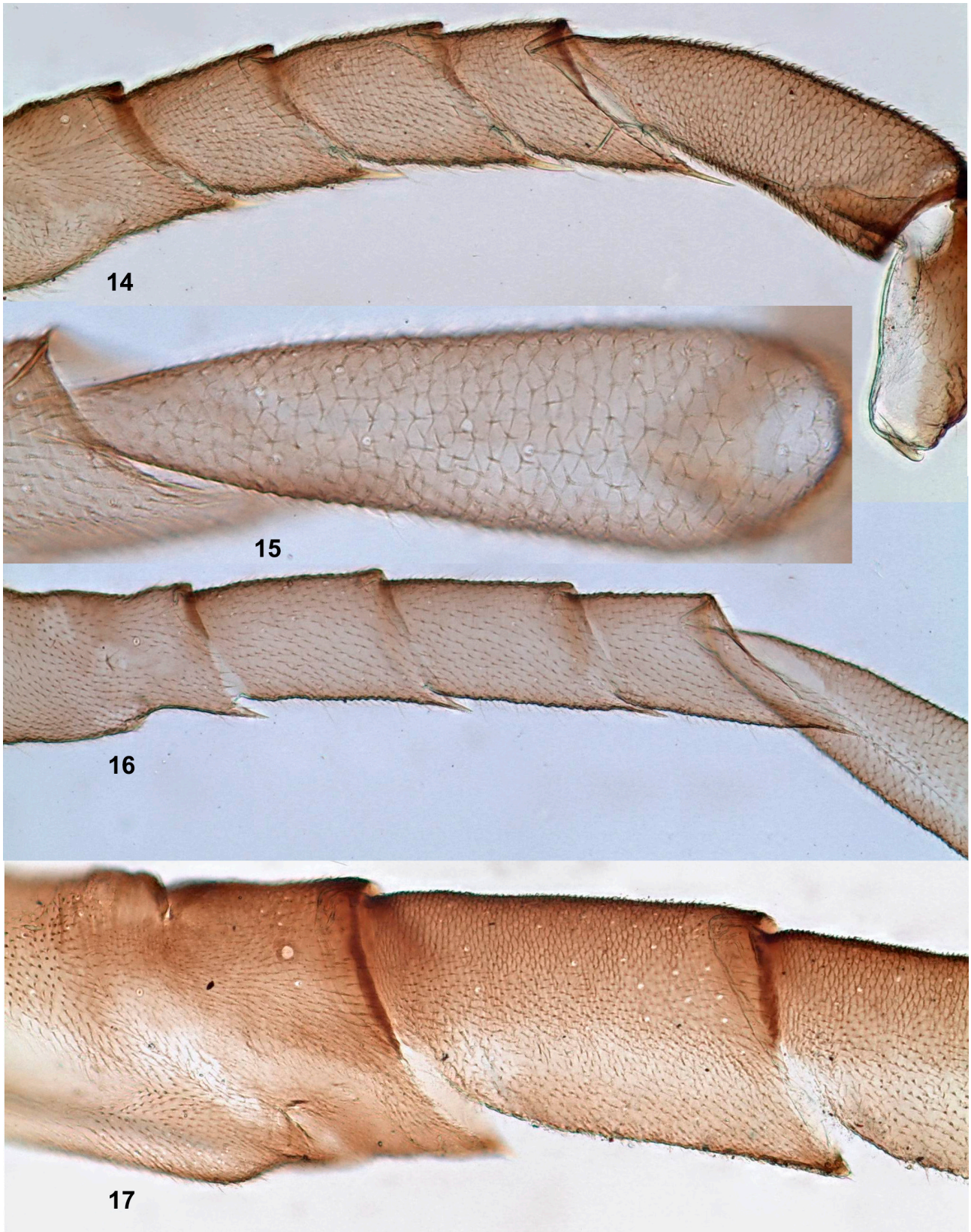
2.2.2.2.1.1. Timpanoga/fg1. In the single examined species, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), other tarsomeres are covered mainly with blunt microlepides. Species examined: ♀ *Eurylophella karelica* Tiensuu 1935.

2.2.2.2.1.2. Ephemerella/fg3. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae); other tarsomeres have various species-specific combinations of microtrichia, pointed microlepides and blunt microlepides (Figs 14–17), approximately indicated by corresponding symbols on the Table 12. Species examined: ♂ & ♀ *Ephemerella* (*Serratella*) *ignita* (Poda 1761), ♂ *E.* (*S.*) *serratoides* McDunnough 1931, ♂ & ♀ *E.* (*S.*) *zapekinae* Bajkova 1967, ♂ & ♀ *E.* (*S.*) *setigera* Bajkova 1965, ♂ & ♀ *E.* (*S.*) *nuda* Tshernova 1949 (incl. *E. nuda thymalli* Tshernova 1952, *E. nuda verrucosa* Kluge 1980) (Fig. 14), ♂ & ♀ *E.* (*S.*) *maculocaudata* Ikonomov 1961 (Figs 15–16), ♂ *E.* (*S.*) *paradinasi* (Gonzalez-del-Tanago & Garcia-de-Jalon 1981), ♂ & ♀ *Ephemerella* (*Torleya*) *major* Klapálek 1905, ♂ *E.* (*T.*) *padunica* Kazlauskas 1963, ♂ *Ephemerella* (*Uracantella*) *albai* (Gonzalez-del-Tanago & Garcia-de-Jalon 1984), ♂ *E.* (*U.*) *deficiens* Morgan 1911, ♂ & ♀ *E.* (*U.*) *lenoki* Tshernova 1952, ♂ *E.* (*U.*) *oriens* Jacobus & McCafferty 2006, ♂ *Ephemerella* (*Amurella*) *gracilis* Tshernova 1952, ♀ *Ephemerella* (*Teloganopsis*) *media* (Ulmer 1939), ♂ *E.* (*T.*) *puigae* (Ubero-Pascal & Sartori 190), ♂ *Ephemerella* (*Hyrtanella*) *christineae* (Allen & Edmunds 1976), ♂ *Ephemerella* (*Crinitella*) *coheri* Allen & Edmunds 1963, ♂ & ♀ *Ephemerella* (s.str.) *aurivillii* (Bengtsson 1908), ♂ & ♀ *E.* (s.str.) *kozhovi* Bajkova 1967, ♂ & ♀ *E.* (*Drunella*) *submontana* Brodsky 1930 (Fig. 17), ♂ & ♀ *E.* (*D.*) *aculea* Allen 1971, ♂ & ♀ *E.* (*D.*) *cryptomeria* Imanishi 1937 (= *E. latipes* Tshernova 1952), ♂ & ♀ *E.* (*D.*) *lepnevae* Tshernova 1949, ♂ & ♀ *E.* (*D.*) *solida* Bajkova 1980, ♂ & ♀ *E.* (*D.*) *triacantha* Tshernova 1949, ♂ *Ephemerella* (*Cincticostella*) *levanidovae* Tshernova 1952, ♂ *E.* (*C.*) *tshernovae* Bajkova 1962 and some undescribed species.

2.2.2.2.2. Pantricorythi Kluge 2004:

2.2.2.2.2.1. Vietnamella/g. In the single species examined, microtrichia of tibiae and tarsi are reduced, i.e. partly diminished, partly absent; 2nd–5th tarsomeres with minute blunt microlepides (similar to Fig. 2) (Table 11). Species examined: *Vietnamella ornata* (Tshernova 1972).

2.2.2.2.2.2. Ephemerellina/g (incl. *Lithogloea*, *Lestagella*). In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 5th tarsomere is covered with blunt microlepides; on fore leg of male other 2nd–4th tarsomeres are also covered with blunt microlepides; on fore leg of female and middle and hind legs of both sexes outer-proximal areas of 2nd–4th tarsomeres are covered with blunt microlepides, their remainder areas are covered with microtrichia (Table 11). Species examined: ♂ & ♀ *Lithogloea harrisoni* Barnard 1932, ♀ *Lestagella penicillata* (Barnard 1940).



FIGURES 14–17. Subimaginal tarsi of Ephemerellidae (Table 12). 14, hind leg of *Ephemerella nuda* (microtrichia on 1st–4th tarsomeres and pointed microlepides on 5th tarsomere); 15–16, female fore leg of *Ephemerella maculocaudata* (pointed microlepides on dorsal side of 5th tarsomere and microtrichae on other parts) 17, female fore leg of *Ephemerella submontana* (blunt microlepides on dorsal half of 2nd tarsomere and microtrichia on its ventral half).

TABLE 11. Texture of subimaginal tarsomeres in Ephemerelloidea

	♂ fore leg					♀ fore leg					middle & hind legs				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
2.2.2.2. Ephemerella/fg1, or Ephemerelloidea:															
2.2.2.2.1. Ephemerella/fg2, or Ephemerellidae:															
2.2.2.2.1.1. Timpanoga/fg: *Eurylophella karelica*	?	?	?	?	?	I	U	U	U	U	I	U	U	I\U	U
2.2.2.2.1.2. Ephemerella/fg3—see **Table 12**															
2.2.2.2.2. Pantricorythi:															
2.2.2.2.2.1. *Vietnamella ornata*		U	U	U	U	?	?	?	?	?	I	U I	U I	U I	U
2.2.2.2.2.2. Ephemerellina/g (2 spp.)	I	U	U	U	U	I	UI I	UI I	UI I	U	I	UI I	UI I	UI I	U
2.2.2.2.2.3. Teloganella/fg (2 spp.)	I	U	U	U	U	I	U	U	U	U	I	U	U	U	U
2.2.2.2.2.4. Teloganodes/fg (> 9 spp.)	I	U	U	U	U	I	I	I	I	U	I	I	I	I	U
2.2.2.2.2.5. Tricoryptera:															
2.2.2.2.2.5.1. Leptohyphes/fg1 (10 spp.)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
2.2.2.2.2.5.2. Afrotricorythi:															
2.2.2.2.2.5.2.1. Tricorygnatha (> 9 spp.)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
2.2.2.2.2.5.2.2. *Machadorythus maculatus*	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
2.2.2.2.2.5.2.3. Ephemerythus/fg (4 spp.)	I	I	I	I	Y	I	I	I	I	Y	I	I	I	I	Y
2.2.2.2.2.5.2.4. Dicercomyzon/fg (2 spp.)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

2.2.2.2.2.3. Teloganella/fg. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with blunt microlepides (Table 11). Species examined: ♂ & ♀ *Teloganella umbrata* Ulmer 1939, ♂ *T. indica* (Selvakumar *et al*. 2014).

2.2.2.2.2.4. Teloganodes/fg (incl. *Dudgeodes*, *Derlethina*). On fore leg of male, 1st tarsomere (fused with tibia) is covered with microtrichae (as tibia), 2nd–5th tarsomeres are covered with blunt microlepides; on fore leg of female and middle and hind legs of both sexes, 1st–4th tarsomeres are covered with microtrichia (as tibia), 5th tarsomere is covered with blunt microlepides (Table 11). Species examined (with names in basic format, since current generic classification is obscure): ♂ & ♀ *celebensis* Sartori 2008 [*Dudgeodes*], ♂ & ♀ *eloisae* Sartori 2008 [*Derlethina*], ♂ & ♀ *jacobusi* Sartori 2008 [*Teloganodes*], ♀ *kodai* Sartori 2008 [*Teloganodes*], ♂ *palnius* Selvakumar *et al*. 2014 [*Dudgeodes*], ♂ & ♀ *sartorii* Selvakumar *et al*. 2014 [*Teloganodes*], ♂ & ♀ *stephani* Sartori 2008 [*Dudgeodes*], ♂ *tamiraparaniae* Selvakumar *et al*. 2014 [*Derlethina*], ♀ *tuberculatus* Sartori 2008 [*Teloganodes*] and some undescribed species.

2.2.2.2.2.5. Tricoryptera Kluge 2004:

2.2.2.2.2.5.1. Leptohyphes/fg1 (incl. *Tricorythodes*, Haplohyphes). In both sexes, on all leg pairs, all tarsomeres are covered with microtrichia (like tibiae) (Table 11). Species examined: ♂ & ♀ *Leptohyphes eximius* Eaton 1882, ♂ *Haplohyphes huallaga* Allen 1966, ♂ *Lumahyphes pijcha* Molineri 2004, ♂ *Tricorythodes explicatus* Eaton 1892, ♂ & ♀ *T. grallator* Kluge & Naranjo 1990, ♂ & ♀ *T. cubensis* Kluge & Naranjo 1990, ♂ & ♀ *T. montanus* Kluge & Naranjo 1990, ♂ & ♀ *T. sacculobranchis* Kluge & Naranjo 1990, ♂ & ♀ *T. sierramaestrae* Kluge & Naranjo 1990, ♂ *T. hiemalis* Molineri 2001 and some undescribed species.

2.2.2.2.2.5.2. Afrotricorythi Kluge 2004:

2.2.2.2.2.5.2.1. Tricorygnatha Kluge 2004. In both sexes, on all leg pairs, all tarsomeres are covered with microtrichia (like tibiae) (Table 11). Female has no molt from subimago to imago, so its subimaginal cuticle is the final one (Kluge 2010, 2016b). Species examined: ♂ & ♀ *Tricorythus* (s.str.) *varicauda* (Picte 1843t), ♂ & ♀ *T.* (s.str.) *discolor* (Burmeister 1939), ♂ & ♀ *T.* (s.str.) *tener* Kluge 2016, ♂ & ♀ *T.* (s.str.) *furcifer* Kluge 2016, ♂ *T.* (s.str.)

exophthalmus Kluge 2010, ♂ *T*. (s.str.) *tinctus* Kimmins 1956, ♂ & ♀ *Tricorythus* (*Sparsorythus*) *celebensis* Kluge 2010, ♂ & ♀ *T.* (*S.*) *jacobsoni* Ulmer 1913, ♀ *Tricorythus* (*Spinirythus*) *martini* (Oliarinony & Elouard 1998) and some undescribed species.

2.2.2.2.2.5.2.2. Machadorythus/fg. In both sexes, on all leg pairs, all tarsomeres are covered with microtrichia (like tibiae) (Table 11). Species examined: ♂ & ♀ *Machadorythus maculatus* (Kimmins 1949).

2.2.2.2.2.5.2.3. Ephemerythus/fg. In both sexes, on all leg pairs, 1st–4th tarsomeres are covered with microtrichia (like tibiae), 5th tarsomere is covered with pointed microlepides (Table 11) (Kluge& Novikova 2017b). Species examined: ♂ & ♀ *Ephemerythus niger* Gillies 1960, ♂ & ♀ *E. nigricolor* Kluge & Novikova 2017, ♂ & ♀ *E. pictus* Gillies 1960, ♀ *E. gilliesi* Kluge & Novikova 2017.

2.2.2.2.2.5.2.4. Dicercomyzon/fg. In both sexes, on all leg pairs, all tarsomeres are covered with pointed microlepides; in *D. sjostedti* similar pointed microlepides cover also a small outer-apical area on tibia (Table 11). Species examined: ♂ & ♀ *Dicercomyzon femorale* Demoulin 1954 (= *D. costale* Kimmins 1957 **syn. n.**, see above), ♂ & ♀ *D. sjostedti* (Ulmer 1910) (= *D. marginatum* Kimmins 1957).

2.2.2.3. Leptophlebia/fg1, or Leptophlebiidae:

2.2.2.3.1. Leptophlebiinae. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 13). Species examined: ♂ & ♀ *Leptophlebia vespertina* (Linnaeus 1758), ♂ & ♀ *L. marginata* (Linnaeus 1767), ♂ & ♀ *L. nebulosa* (Walker 1853), ♂ *Paraleptophlebia cincta* (Retzius 1783), ♂ & ♀ *P. strandii* (Eaton 1901), ♂ & ♀ *P. submarginata* (Stephens 1835), ♂ *P. werneri* Ulmer 1920, ♀ *P. packii* (Needham 1827), ♂ *P. guttata* (McDunnough 1924), ♂ & ♀ *Neoleptophlebia japonica* (Matsumura 1931) [= *N. chocolata* (Imanishi 1937)], ♂ & ♀ *N. vladivostokica* (Kluge 1982), ♂ *N. adoptiva* (McDunnough 1929), ♂ & ♀ *N. mollis* (Eaton 1871), ♂ & ♀ *Habrophlebiodes zijinensis* Gui *et al*. 1996 and some undescribed species.

2.2.2.3.2. Atalophleboadentata Kluge 2009:

2.2.2.3.2.1. Calliarcyinae. At least in female, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 13). Species examined: ♀ *Calliarcys humilis* Eaton 1881.

2.2.2.3.2.2. Atalophlebopectinata Kluge 2009:

2.2.2.3.2.2.1. Habrophlebiinae. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 13). Species examined: ♂ & ♀ *Habroleptoides caucasica* Tshernova 1930, ♂ & ♀ *H. pontica* Kluge 1994, ♂ *H. assefae* Sartori & Thomas 1986, ♀ *Habrophlebia fusca* (Curtis 1834), ♂ & ♀ *H. lauta* McLachlan 1884.

2.2.2.3.2.2.2. Atalophleboculata Kluge 2009:

2.2.2.3.2.2.2.1. Terpidinae. On all legs of both sexes, 2nd–5th tarsomeres are covered with blunt microlepides, with few pointed microlepides near apical margins of 2nd–4th tarsomeres; at least on fore leg of male and on middle and hind legs of both sexes 1st tarsomere is covered with microtrichia (like tibia). 1st tarsomere of fore leg of male is either covered with microtrichia (as 1st tarsomere of other legs), or covered with blunt microlepides (as 2nd–5th tarsomeres). In a previous paper (Kluge 2015c) I regarded this difference to be a taxonomic character separating *Terpides* s.str. (whose 1st tarsomere of male fore leg is covered with blunt microlepides) from *Fittkaulus* and *Tikuna* (whose 1st tarsomere of male fore leg is covered with microtrichia) (Table 13). However, among species examined, in *Terpides jessiae* and *T. contamanensis* the 1st tarsomere of male fore leg is mostly smooth, with few poorly developed blunt microlepides ventrally-distally and sometimes with few poorly developed microtrichia dorsally-distally. Species examined: ♂ & ♀ *Terpides jessiae* Peters & Harrison 1974, ♂ & ♀ *T. contamanensis* Kluge 2015, ♀ *T. diadema* Lugo-Ortiz & McCafferty 1996, ♂ & ♀ *T. ornatodermis* Kluge 2015, ♂ & ♀ *T. echinovaris* Kluge 2015, ♀ *T. iguapoga* Molineri *et al*. 2015, ♂ & ♀ *Fittkaulus amazonicus* (Kluge 2009), ♀ *Tikuna bilineata* (Needham & Murphy 1924), ♂ *T. fusconotum* (Kluge 2009), ♂ *T. nigrobulla* (Kluge).

2.2.2.3.2.2.2.2. Atalophlebomaxillata Kluge 2009:

2.2.2.3.2.2.2.2.1. Castanophlebiinae. On fore leg of male, all tarsomeres are covered with blunt microlepides; on fore leg of female and on middle and hind legs of both sexes 1st tarsomere (fused with tibia) is covered with microtrichia (like tibia), 2nd–5th tarsomeres are covered with blunt microlepides (Table 13). Species examined: ♂ & ♀ *Castanophlebia calida* Barnard 1932.

TABLE 12. Texture of subimaginal tarsomeres in Ephemerella/fg3 (Figs 14–17).

	♂ fore leg					♀ fore leg					middle & hind legs				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Ephemerella (*Serratella*) *ignita*	I	U	U	U	U	I	U-I	U-I	U-I	U	I	U-I	U-I	U-I	U
Ephemerella (*Serratella*) *zapekinae*	I	U	U	U	U	I	U-I	U-I	U-I	U	I	U-I	U-I	U-I	U
Ephemerella (*Serratella*) *setigera*	I	U	U	U	U	I	U-I	U-I	U-I	U	I	U-I	U-I	U-I	U
Ephemerella (*Serratella*) *michineri*	I	U	U	U	U	?	?	?	?	?	I	I	I	I	U
Ephemerella (*Serratella*) *paradinasi*	I	U	U	U	U	?	?	?	?	?	I	I	I	I	U
Ephemerella (*Serratella*) *serratoides*	I	U-I	U-I	U-I	U	I	I	I	I	U	I	I	I	I	U
Ephemerella (*Serratella*) *nuda*	I	U-I	U-I	U-I	U	I	I	I	I	Y	I	I	I	I	Y
Ephemerella (*Serratella*) *maculocaudata*	I	U I	U I	U I	U I	I	I	I	I	Y I	I	I	I	I	Y I
Ephemerella (*Torleya*) *major*	I	U	U	U	U	I	I	I	U I	U	I	I	I	U I	U
Ephemerella (*Torleya*) *padunica*	I	U	U	U	U	I	U	U	U	U	I	U	U	U	U
Ephemerella (*Torleya*) *mikhaili*	I	U	U	U	U	I	I	I	I	U	I	I	I	I	U
Ephemerella (*Uracantella*) *oriens*	I	U	U	U	U	?	?	?	?	?	I	I	I	I	U
Ephemerella (*Uracantella*) *hispanica*	I	U	U	U	U	I	I	I	I	YU	I	I	I	I	YU
Ephemerella (*Uracantella*) *albai*	I	U	U	U	Y	I	I	I	I	I-Y	I	I	I	I	I-Y
Ephemerella (*Uracantella*) *lenoki*	I	U	U	U	Y	I	I	I	I	I-Y	I	I	I	I	I-Y
Ephemerella (*Uracantella*) *deficiens*	I	I-U	I-U	I-U	I	I	I	I	I	I	I	I	I	I	I
Ephemerella (*Uracantella*) *orbicularis*	I	I-U	I-U	I-U	I	?	?	?	?	?	I	I	I	I	I
Ephemerella (*Amurella*) *gracilis*	I	U	U	U	I	I	I	I	I	I	I	I	I	I	I
Ephemerella (*Teloganopsis*) *media*	?	?	?	?	?	I	I	I	I	I	I	I	I	I	I
Ephemerella (*Teloganopsis*) *puigae*	I	I-U	I-U	I-U	I	I	I	I	I	I	I	I	I	I	I
Ephemerella (*Teloganopsis*) sp. (Vietnam)	I	I-U	I-U	I-U	I-Y	I	I	I	I	I-Y	I	I	I	I	I-Y
Ephemerella (*Hyrtanella*) *christineae*	I	U	U	U	U	I	U	U	U	U	I	I	I	I	U
Ephemerella (*Crinitella*) *coheri*	?	?	?	?	?	I	U-I	U-I	U-I	U	I	I	I	I	U
Ephemerella/fg4:															
Ephemerella (s. str.) *aurivillii*	I	U	U	U	U	I	U	U	U	U	I	UYI	UYI	UYI	U
Ephemerella (s. str.) *kozhovi*	I	U	U	U	U	I	U-I	U-I	U-I	U	I	U	U	U	U
Ephemerella (*Drunella*) *aculea*	I	U	U	U	U	I	I- U-I	U-I	U-I	U	I	U I	U I	U I	U
Ephemerella (*Drunella*) *submontana*	I	U	U	U	U	I	U I	U I	U I	U	I	U I	U I	U I	U
Ephemerella (*Drunella*) *lepnevae*	I	U	U	U	U	I	U I	U I	U I	U	I	U I	U I	U I	U
Ephemerella (*Drunella*) *coloradensis*	?	?	?	?	?	I	U I	U I	U I	U	I	U I	U I	U I	U
Ephemerella (*Drunella*) *cryptomeria*	I	U	U	U	U	I	U I	U	U	U	I	I	U I	U I	U
Ephemerella (*Drunella*) *solida*	I	U	U	U	U	I	U I	U I	U I	U	I	I	U I	U I	U
Ephemerella (*Drunella*) *spinifera*	I	U	U	U	U	?	?	?	?	?	I	I	I	U I	U
Ephemerella (*Drunella*) *triacantha*	I	U	U	U	U	I	U I	U I	U I	U	I	I	I	I	U
Ephemerella (*Cincticostella*) *tshernovae*	I	U	U	U	U	?	?	?	?	?	I	U I	U I	U I	U
Ephemerella (*Cincticostella*) *levanidovae*	I	U	U	U	U	?	?	?	?	?	I	I	I	I	U

TABLE 13. Texture of subimaginal tarsomeres in Leptophlebiidae

	♂ fore leg					♀ fore leg					middle & hind legs				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
2.2.2.3. Leptophlebia/fg1, or Leptophlebiidae:															
2.2.2.3.1. Leptophlebiinae (> 14 spp.)	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2. Atalophleboadentata:															
2.2.2.3.2.1. *Calliarcys humilis*	?	?	?	?	?	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2. Atalophlebopectinata:															
2.2.2.3.2.2.1. Habrophlebiinae (5 spp.)	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2. Atalophleboculata:															
2.2.2.3.2.2.2.1. Terpidinae:															
Terpides jessiae	I U	U	U	U	U	I	U	U	U	U	I	U	U	U	U
Terpides contamanensis	I U	U	U	U	U	I	U	U	U	U	I	U	U	U	U
Terpides diadema	?	U	U	U	U	I	U	U	U	U	I	U	U	U	U
Terpides ornatodermis	U	U	U	U	U	I	U	U	U	U	I	U	U	U	U
Terpides echinovaris	U	U	U	U	U	I	U	U	U	U	I	U	U	U	U
Terpides iguapoga	?	U	U	U	U	I	U	U	U	U	I	U	U	U	U
Fittkaulus amazonicus	I	U	U	U	U	I	U	U	U	U	I	U	U	U	U
Tikuna bilineata	I	U	U	U	U	I	U	U	U	U	I	U	U	U	U
Tikuna fusconotum	I	U	U	U	U	I	U	U	U	U	I	U	U	U	U
Tikuna nigrobulla	I	U	U	U	U	I	U	U	U	U	I	U	U	U	U
2.2.2.3.2.2.2.2. Atalophlebomaxillata:															
2.2.2.3.2.2.2.2.1. *Castanophlebia calida*	U	U	U	U	U	I	U	U	U	U	I	U	U	U	U
2.2.2.3.2.2.2.2.2. Atalophlebolinguata—see **Table 14**															

2.2.2.3.2.2.2.2.2. Atalophlebolinguata Kluge 2009, or Atalophlebiinae:

2.2.2.3.2.2.2.2.2.A. Hagenulini:

2.2.2.3.2.2.2.2.2.A.1. Hagenulus/fg (incl. *Borinquena*, *Turquinophlebia*, *Poecilophlebia*, *Careospina*, *Traverina*, *Hagenulopsis*). In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with bunt microlepides, whose apices are more or less stretched distally and/or serrate (Table 14). Species examined: ♂ & ♀ *Hagenulus caligatus* (Eaton 1882), ♂ & ♀ *H. morrisonae* Peters & Alayo 1971, ♂ & ♀ *Borinquena sexta* (Kluge 1994), ♂ *Turquinophlebia grandis* (Kluge 1994), ♂ & ♀ *Poecilophlebia pacoi* (Kluge 1994), ♂ & ♀ *Careospina hespera hespera* Peters & Alayo 1971, ♂ & ♀ *C. hespera sierramaestrae* (Kluge 1994), ♂ & ♀ *C. baconaoi* (Kluge 1994), ♂ & ♀ *C. evanescens* (Kluge 1994), ♂ & ♀ *Traverina cubensis* Peters & Alayo 1971, ♂ & ♀ *T. oriente* (Kluge 1994), ♂ & ♀ *Hagenulopsis minutus* Spieth 1943, ♂ *H. ramosa* Lugo-Ortiz & McCafferty 1996, ♂ *H. guadeloupensis* Hofmann & Peters 1999 and some undescribed species.

2.2.2.3.2.2.2.2.2.A.2. Hermanellandria Kluge 2020, or Hermanella/f=Thraulodes/g (incl. *Farrodes*, *Simothraulopsis*). In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with blunt microlepides with serrate margins; few pointed microlepides or microtrichia are present near apical margins of 2nd–4th tarsomeres of middle and hind legs and fore legs of female (Kluge 2020b: fig. 473) (Table 14). Species examined: ♂ *Thraulodes ludmilae* Kluge 2020, ♂ & ♀ *Th. sinuosus* Mariano & Flowers 2011, ♂ & ♀ *Th. telegraphicus* Needham & Murphy 1924, ♂ & ♀ *Th. panamensis* Kluge 2020, ♂ & ♀ *Th. viviparus* Kluge 2020, ♂ & ♀ *Th. schlingeri* Traver & Edmunds 1967, ♂ & ♀ *Th. marreroi* Chacon *et al*.1999, ♂ & ♀ *Th. quevedoensis* Flowers 2009, ♂ & ♀ *Th. fascipennis* Kluge 2020, ♂ & ♀ *Th. zonalis* Traver & Edmunds 1967, ♂ *Th. flavus* Kluge 2020, ♂ & ♀ *Th. spangleri* Traver & Edmunds 1967, ♂ & ♀ *Th. niger* Kluge 2020, ♂ *Th.*

nigrabdominalis Kluge 2020, ♂ & ♀ *Th. nigripes* Kluge 2020, ♂ & ♀ *Th. nigrotibialis* Kluge 2020, ♂ & ♀ *Th. alboniger* Kluge 2020, ♂ *Th. lepidus* (Eaton 1884), ♂ *Th. consortis* Dominguez 1987, ♂ & ♀ *Simothraulopsis plesius* Kluge 2008, ♂ & ♀ *S. sabalo* Kluge 2008, ♂ *Farrodes hyalinus* Peters 1971, ♂ & ♀ *F. bimaculatus* Peters & Alayo 1971, ♂ & ♀ *F. pakitza* Dominguez & Molineri 1996, ♂ & ♀ *F. savagei* Dominguez 1999, ♂ & ♀ *Hermanella* (*Traverella*) *albertana* (McDunnough 1931), ♀ *Hermanella* (*Needhamella*) *saltensis* (Flowers & Dominguez 1992), ♂ & ♀ *Hermanella* (*Hylister*) *chimaera* Kluge 2008 and some undescribed species.

2.2.2.3.2.2.2.2.2.A.3. Ulmeritus/g1 (incl. *Ulmeritoides*):

2.2.2.3.2.2.2.2.2.A.3.1. Ulmeritus/g2. In both sexes, on all leg pairs, all 1st–5th tarsomeres are covered with microtrichia gradually turned to sharply pointed microlepides (Table 14). Species examined: ♂ & ♀ *Ulmeritus carbonelli* Traver 1956.

2.2.2.3.2.2.2.2.2.A.3.2. Ulmeritoides/g. At least in male, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae); 2nd–5th tarsomeres are covered with blunt microlepides with serrate margins; toward distal part of each tarsomere these serrate microlepides are gradually turned to pointed microlepides (Table 14). Species examined: ♂ *Ulmeritoides huitoto* Dominguez & Zuñiga 2003.

2.2.2.3.2.2.2.2.2.A.4. Miroculis/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with blunt microlepides with serrate margins (Table 14). Species examined: ♂ & ♀ *Miroculis rossi* Edmunds 1963 and some undescribed species.

2.2.2.3.2.2.2.2.2.B. Choroterpini:

2.2.2.3.2.2.2.2.2.B.1. Choroterpes/fg (incl. *Euthraulus*, *Dilatognathus*). In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae); various other tarsomeres of various species are covered either with microtrichia, or with pointed microlepides (Table 15) (Kluge 2012c, 2014c). Species examined: ♂ & ♀ *Choroterpes* (s.str.) *picteti* (Eaton 1871), ♂ & ♀ *Ch.* (s.str.) *nigrescens* Barnard 1932, ♂ & ♀ *Ch.* (s.str.) *ndebele* Agnew 1962, ♂ & ♀ *Ch.* (s.str.) *ludmilae* Kluge 2012, ♂ & ♀ *Ch.* (s.str.) *mercatorius* Kluge 2012, ♂ & ♀ *Choroterpes* (*Neochoroterpes*) *oklahoma* Traver 1934, ♂ & ♀ *Choroterpes* (*Euthraulus*) *elegans* (Barnard 1932, ♂ & ♀ *Ch.* (*E.*) *bugandensis* (Kimmins 1956), ♂ & ♀ *Ch.* (*E.*) *curtus* Kimmins 1956, ♂ & ♀ *Ch.* (*E.*) *tropicalis* (Gillies 1957), ♂ & ♀ *Ch.* (*E.*) *usambarae* Gillies 1957, ♂ & ♀ *Ch.* (*E.*) *altioculus* Kluge 1984, ♂ & ♀ *Ch.* (*E.*) *caucasicus* Kluge 2012, ♂ & ♀ *Ch.* (*E.*) *sumbarensis* Kluge 1984, ♂ & ♀ *Ch.* (*E.*) *signatus* (Hagen 1858), *Ch.* (*E.*) *alagarensis* Dinakaran *et al*. 2009, *Ch.* (*E.*) *nambiyarensis* Selva-Kumar *et al*. 2013, ♂ *Ch.* (*E.*) *monophyllus* Kluge 2012, ♂ & ♀ *Ch.* (*E.*) *nandini* Selvakumar *et al*. 2014, ♂ & ♀ *Choroterpes* (*Dilatognathus*) *cataractae* Kluge 2012, ♂ & ♀ *Ch.* (*D.*) *bogori* Kluge 2014, ♂ & ♀ *Ch.* (*D.*) *major* (Ulmer 1939), ♂ *Ch.* (*D.*) *minor* (Dang 1967), ♂ & ♀ *Ch.* (*D.*) *nigella* (Kang & Yang 1994) and some undescribed species.

2.2.2.3.2.2.2.2.2.B.2. Megaglena/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 14). Species examined: ♂ & ♀ *Megaglena brincki* Peters & Edmunds 1970.

2.2.2.3.2.2.2.2.2.B.3. Klugephlebia/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 14). Species examined: ♂ & ♀ *Klugephlebia kodai* Selvakumar *et al*. 2016.

2.2.2.3.2.2.2.2.2.B.4. Indialis/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 14). Species examined: ♂ & ♀ *Indialis badia* Peters & Edmunds 1970, ♂ & ♀ *I. rossi* Peters 1975.

2.2.2.3.2.2.2.2.2.B.5. Sangpradubina/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 14). Species examined: ♂ & ♀ *Sangpradubina thailandica* Boonsoong & Sartori 2016.

2.2.2.3.2.2.2.2.2.B.6. Thraulus/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with structures intermediate between microtrichia and pointed microlepides (Figs 12–13) (Table 14). Species examined: ♂ & ♀ *Thraulus bellus* Eaton 1881, ♂ *Th. torrentis* (Gillies 1964), ♂ *Th. bishopi* Peters & Tsui 1972, ♂ & ♀ *Th. demoulini* Peters & Tsui 1973 and some undescribed species.

2.2.2.3.2.2.2.2.2.B.7. Nonnullidens/g. In both sexes, on all leg pairs, all tarsomeres are covered with microtrichia (like tibiae) (Table 14) (Kluge 2013). Species examined: ♂ & ♀ *Nonnullidens variegatus* Kluge 2013, ♂ & ♀ *N. reductus* Kluge 2013, ♂ & ♀ *N. niger* Kluge 2013.

TABLE 14. Texture of subimaginal tarsomeres in Atalophlebolinguata.

	♂ fore leg					♀ fore leg					middle & hind legs				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
2.2.2.3.2.2.2.2.2.A. Hagenulini:															
2.2.2.3.2.2.2.2.2.A.1. Hagenulus/fg (> 14 spp)	I	U	U	U	U	I	U	U	U	U	I	U	U	U	U
2.2.2.3.2.2.2.2.2.A.2. Hermanellandria (> 28 spp)	I	W	W	W	W	I	W	W	W	W	I	W	W	W	W
2.2.2.3.2.2.2.2.2.A.3. Ulmeritus/g1															
2.2.2.3.2.2.2.2.2.A.3.1. *Ulmeritus carbonelli*	I	I	I	I	T	I	I	I	I	T	I	I	I	I	T
2.2.2.3.2.2.2.2.2.A.3.2. *Ulmeritoides huitoto*	I	W	W	W	W	?	?	?	?	?	I	W	W	W	W
2.2.2.3.2.2.2.2.2.A.4. Miroculis/g (> 1 sp.)	I	W	W	W	W	I	W	W	W	W	I	W	W	W	W
2.2.2.3.2.2.2.2.2.B. Choroterpini:															
2.2.2.3.2.2.2.2.2.B.1. *Choroterpes* s.l.—**see Table 15**															
2.2.2.3.2.2.2.2.2.B.2. *Megaglena brincki*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.B.3. *Klugephlebia kodai*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.B.4. Indialis/g (2 spp.)	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.B.5. *Sangpradubina thailandica*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.B.6. Thraulus/g (> 4 spp) (Figs 12–13)	I	T	T	T	T	I	T	T	T	T	I	T	T	T	T
2.2.2.3.2.2.2.2.2.B.7. Nonnullidens/g (3 spp)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
2.2.2.3.2.2.2.2.2.C. Oriental taxa (other than Choroterpini):															
2.2.2.3.2.2.2.2.2.C.1. Iscini—see Table 16															
2.2.2.3.2.2.2.2.2.C.2. Kimminsula/g:															
2.2.2.3.2.2.2.2.2.C.2.1 gen. sp.n. (India)	?	?	?	?	?	I	V	V	V	V	I	V	V	V	V
2.2.2.3.2.2.2.2.2.C.2.1 *Petersula* (2 spp)	I	V	V	V	V	I	V	V	V	V	I	V	V	V	V
2.2.2.3.2.2.2.2.2.C.2.1 gen. n. *femoralis*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.C.2.1 *Kimminsula* (3 spp)	I	V	V	V	V	I	V	V	V	V	I	V	V	V	V
2.2.2.3.2.2.2.2.2.C.2.1 gen. sp.n. (Sri Lanka) (Fig. 8)	I	[V]	[V]	[V]	V	I	V	V	V	V	I	V	V	V	V
2.2.2.3.2.2.2.2.2.C.3. *Nathanella saraswathiae*	– I	–	–	–	–	– I	–	–	–	–	– I	–	–	–	–
2.2.2.3.2.2.2.2.2.C.4. *Sulawesia haema*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.D. Afrotropical taxa (other than Choroterpini):															
2.2.2.3.2.2.2.2.2.D.1. Adenophlebia/g—see Table 17															
2.2.2.3.2.2.2.2.2.D.2. Adenophlebiodes/g (2 spp)	I	U	U	U	U	I	U	U	U	U	I	U	U	U	U
2.2.2.3.2.2.2.2.2.D.3. Aprionyx/g (> 2 spp)	I	U	U	U	U	I	U	U	U	U	I	U	U	U	U
2.2.2.3.2.2.2.2.2.D.4. *Maheathraulus scotti*	?	?	?	?	?	?	?	?	?	?	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.E. Notogean taxa: Australia:															
2.2.2.3.2.2.2.2.2.E.1. *Atalophlebia australis*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.E.2. *Atalomicria banjdjalama*	?	?	?	?	?	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.E.3. *Nyungara bunni*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.F. Notogean taxa: N. Zealand & N. Caledonia:															
2.2.2.3.2.2.2.2.2.F.1. Deleatidium/g (3 spp)	I	U	U	U	U	I	U	U	U	U	I	U	U	U	U
2.2.2.3.2.2.2.2.2.F.2. *Celiphlebia caledonae*	I	U	U	U	U	I	U	U	U	U	I	U	U	U	U
2.2.2.3.2.2.2.2.2.F.3. *Notachalcus corbassoni*	I	U	U	U	U	I	U	U	U	U	I	U	U	U	U
2.2.2.3.2.2.2.2.2.F.4. *Tenagophila paitae*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.G. Notogean taxa: South America:															
2.2.2.3.2.2.2.2.2.G.1. *Massartella brieni*	I	U	U	U	U	I	U	U	U	U	I	U	U	U	U
2.2.2.3.2.2.2.2.2.G.2. *Hapsiphlebia anastomosis*	I	U	U	U	U	I	Ψ	Ψ	Ψ	Ψ	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.G.3. Penaphlebia/g (3 spp)	I	U	U	U	Ψ	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.G.4. *Massartellopsis irarrazavali*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.G.5. Meridialaris/g (> 3 spp)	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.G.6. Nousia/g (4 spp)	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
2.2.2.3.2.2.2.2.2.G.7. *Dactylophlebia carnulenta*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y

TABLE 15. Texture of subimaginal tarsomeres in *Choroterpes* s.l.

	♂ fore leg					♀ fore leg					middle & hind leg				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Choroterpes (s.str.) *picteti*	I	I	I	I	Y	I	I	I	I	Y	I	I	I	I	Y
Choroterpes (s.str.) *nigrescens*	I	I	I	I	Y	I	I	I	I	Y	I	I	I	I	Y
Choroterpes (s.str.) *ndebele*	I	I	Y	Y	Y	I	I	Y	Y	Y	I	I	Y	Y	Y
Choroterpes (s.str.) *ludmilae*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
Choroterpes (s.str.) *mercatorius*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
Choroterpes (*Neochoroterpes*) *oklahoma*	I	Y	Y	Y	Y	I	I	I	I	Y	I	I	I	I	Y
Choroterpes (*Euthraulus*) *sumbarensis*	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Choroterpes (*Euthraulus*) *elegans*	I	Y	Y	Y	Y	I	I	I	I	Y	I	I	I	I	Y
Choroterpes (*Euthraulus*) *bugandensis*	I	Y	Y	Y	Y	I	I	I	I	Y	I	I	I	I	Y
Choroterpes (*Euthraulus*) *caucasicus*	I	Y	Y	Y	Y	I	I	IY	Y	Y	I	I	I	I	Y
Choroterpes (*Euthraulus*) *curtus*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
Choroterpes (*Euthraulus*) *tropicalis*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
Choroterpes (*Euthraulus*) *usambarae*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
Choroterpes (*Euthraulus*) *altioculus*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
Choroterpes (*Euthraulus*) *signatus*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
Choroterpes (*Euthraulus*) *alagarensis*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
Choroterpes (*Euthraulus*) *nambiyarensis*	I	Y	Y	Y	Y	I	YI	YI	YI	Y	I	YI	YI	IY	Y
Choroterpes (*Euthraulus*) *nandini*	I	Y	Y	Y	Y	I	I Y	I Y	I Y	Y	I	I Y	I Y	I Y	Y
Choroterpes (*Euthraulus*) *monophyllus*	I	Y	Y	Y	Y	?	?	?	?	?	I	Y	Y	Y	Y
Choroterpes (*Dilatognathus*) *cataractae*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
Choroterpes (*Dilatognathus*) *bogori*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
Choroterpes (*Dilatognathus*) *major*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y
Choroterpes (*Dilatognathus*) *minor*	I	Y	Y	Y	Y	?	?	?	?	?	?	?	?	?	?
Choroterpes (*Dilatognathus*) *nigella*	I	Y	Y	Y	Y	I	Y	Y	Y	Y	I	Y	Y	Y	Y

2.2.2.3.2.2.2.2.2.C. ORIENTAL TAXA (other than Choroterpini):

2.2.2.3.2.2.2.2.2.C.1. Isca/fg (incl. *Notophlebia*). In both sexes, on all leg pairs, 1st tarsomere is covered with microtrichia (like tibiae); various other tarsomeres of various species are either also covered with microtrichia, or are covered with pointed microlepides (Table 16). Species examined: ♂ & ♀ *Notophlebia ganeshi* Kluge 2014, ♂ & ♀ *Isca* (s.str.) *purpurea* Gillies 1951, ♂ & ♀ *Isca* (*Tanycola*) *serendiba* Peters & Edmunds 1970 and some undescribed species.

TABLE 16. Texture of subimaginal tarsomeres in Iscini

	♂ fore leg					♀ fore leg					middle & hind leg				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Isca (s.str.) *purpurea*	I	Y	Y	Y	Y	I	Y I	Y	Y	Y	I	Y I	Y I	Y I	Y
Isca (*Tanycola*) *serendiba*	I	Y	Y	Y	Y	I	I	I		I	I	I	I		I
Notophlebia ganeshi	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I

2.2.2.3.2.2.2.2.2.C.2. Kimminsula/g (incl. *Petersula*). In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered either with pointed, blunt and

intermediate microlepides (indicated as V in Table 14), or with pointed microlepides (in *femoratis* [*Potamanthus*]). On 2nd–4th tarsomeres of fore leg of male of a new Ceylonese species microlepides form peculiar transverse rows alternating as microlepides pressed to surface and microlepides perpendicular to the surface (Fig. 9) (indicated as [V] in Table 14). Species examined: ♀ *Petersula courtallensis* Sivaramakrishnan 1984, gen. n. *femoralis* Hagen 1858 [*Potamanthus*], ♂ & ♀ *Kimminsula fasciata* (Hagen 1858), ♂ & ♀ *Kimminsula taprobanes* (Walker 1853), and some new species (Kluge *et al*., in press).

2.2.2.3.2.2.2.2.2.C.3. Nathanella/g. In both sexes, on all leg pairs, ventral side of 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae); dorsal side of the first tarsomere and all other tarsomeres have no true microtrichia or microlepides, but are covered with low net-like relief with cells outlines resembling blunt microlepides (Table 14). Species examined: ♂ & ♀ *Nathanella saraswathiae* Sivaramakrishnan *et al*. 1996.

2.2.2.3.2.2.2.2.2.C.4. Sulawesia/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 14). Species examined: ♂ & ♀ *Sulawesia haema* Peters & Edmunds 1990 and some undescribed species.

2.2.2.3.2.2.2.2.2.D. AFROTROPICAL TAXA (other than Choroterpini):

2.2.2.3.2.2.2.2.2.D.1. Adenophlebia/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered either with triangular microlepides (Fig. 10; Table 17: V), or with microlepides with serrate margins (Fig. 11: Table 17: W). Species examined: ♂ & ♀ *A. auriculata* (Eaton 1871), ♂ & ♀ *Adenophlebia dislocans* (Walker 1860), ♂ & ♀ *A. burgeoni* Navas 1929.

TABLE 17. Texture of subimaginal tarsomeres in *Adenophlebia* (Figs 10–11)

	♂ fore leg					♀ fore leg					middle & hind leg				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Adenophlebia auriculata	**I/V**	**V**	**V**	**V**	**V**	**I**	**V**	**V**	**V**	**V**	**I**	**V**	**V**	**V**	**V**
Adenophlebia dislocans	**I/V**	**V**	**V**	**V**	**V**	**I**	**V**	**V**	**V**	**V**	**I**	**V**	**V**	**V**	**V**
Adenophlebia burgeoni	**I/W**	**W**	**W**	**W**	**W**	**I**	**W**	**W**	**W**	**W**	**I**	**W**	**W**	**W**	**W**

2.2.2.3.2.2.2.2.2.D.2. Adenophlebiodes/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with blunt microlepides; few pointed microlepides are present near apical margins of 2nd–4th tarsomeres of middle and hind legs (Table 14). Species examined: ♂ *Adenophlebiodes decorata* Navas 1931 and some undescribed species.

2.2.2.3.2.2.2.2.2.D.3. Aprionyx/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with blunt microlepides; few pointed microlepides are present near apical margins of 2nd–4th tarsomeres of middle and hind legs (Table 14). Species examined: ♂ & ♀ *Aprionyx pellucidula* Esben-Petersen 1920, ♂ & ♀ *A. peterseni* Lestage 1924 and some undescribed species.

2.2.2.3.2.2.2.2.2.D.4. Maheathraulus/g. At least on middle and hind legs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 14). Species examined: ♂ *Maheathraulus scotti* (Eaton 1913).

2.2.2.3.2.2.2.2.2.E. NOTOGEAN TAXA: Australia:

2.2.2.3.2.2.2.2.2.E.1. Atalophlebia/fg. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 14). Species examined: ♂ & ♀ *Atalophlebia australis* (Walker 1853).

2.2.2.3.2.2.2.2.2.E.2. Atalomicria/g. At least in female, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 14). Species examined: ♀ *Atalomicria banjdjalama* Campbell & Peters 1993.

2.2.2.3.2.2.2.2.2.E.3. Nyungara/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 14). Species examined: ♂ & ♀ *Nyungara bunni* Dean 1987.

2.2.2.3.2.2.2.2.2.F. NOTOGEAN TAXA: New Zealand and New Caledonia:

2.2.2.3.2.2.2.2.2.F.1. Deleatidium/g (incl. *Lepeorus*, *Lepegenia*). In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with blunt microlepides (Table 14). Species examined: ♂ *Deleatidium myzobranchia* Phillips, ♂ *Deleatidium vernale* Phillips 1930, ♀ *Lepegenia lineata* Peters *et al*. 1978.

2.2.2.3.2.2.2.2.2.F.2. Celiphlebia/g. On all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with blunt microlepides; few pointed microlepides are present near apical margins of 2nd–4th tarsomeres of middle and hind legs (Table 14). (Table 14). Species examined: ♂ *Celiphlebia caledonae* Peters & Peters 1980.

2.2.2.3.2.2.2.2.2.F.3. Notachalcus/g. 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with blunt microlepides; few pointed microlepides are present near apical margins of 2nd–4th tarsomeres of middle and hind legs (Table 14). Species examined: ♀ *Notachalcus corbassoni* Peters & Peters 1981.

2.2.2.3.2.2.2.2.2.F.4. Tenagophila/g. On all legs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 14). Species examined: ♂ *Tenagophila paitae* Peters *et al*. 1994.

2.2.2.3.2.2.2.2.2.G. NOTOGEAN TAXA: South America:

2.2.2.3.2.2.2.2.2.G.1. Massartella/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with blunt microlepides; few pointed microlepides are present near apical margins of 2nd–4th tarsomeres of middle and hind legs (Table 14). Species examined: ♂ *Massartella brieni* (Lestage 1924).

2.2.2.3.2.2.2.2.2.G.2. Hapsiphlebia/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae); on fore leg of male, 2nd–5th tarsomeres are covered with blunt microlepides; on fore leg of female, 2nd–5th tarsomeres are covered with microlepides intermediate between blunt and pointed; on middle and hind legs of both sexes, 2nd–5th tarsomeres are covered with pointed microlepides (Table 14). Species examined: ♂ & ♀ *Hapsiphlebia anastomosis* (Demoulin 1955).

2.2.2.3.2.2.2.2.2.G.3. Penaphlebia/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae); on fore leg of male 2nd–4th tarsomeres are covered with blunt microlepides (with few pointed microlepides near apices of tarsomeres), 5th tarsomere is covered with microlepides intermediate between blunt and pointed; on fore legs of female and middle and hind legs of both sexes, all tarsomeres are covered with pointed microlepids (Table 14). Species examined: ♂ & ♀ *Penaphlebia chilensis* (Eaton 1884), ♂ *P. fulvipes* Needhan & Murphy 1924), ♂ & ♀ *P. flavidula* Pescador & Peters 1991.

2.2.2.3.2.2.2.2.2.G.4. Massartellopsis/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 14). Species examined: ♂ & ♀ *Massartellopsis irarrazavali* Demoulin 1955.

2.2.2.3.2.2.2.2.2.G.5. Meridialaris/g. On all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table14). Species examined: ♂ *Meridialaris chiloeense* (Demoulin 1955), ♂ *M. diguillinum* (Demoulin 1955), ♂ *M. tintinnabula* Pescador & Peters 1987 and some undescribed species.

2.2.2.3.2.2.2.2.2.G.6. Nousia/g (incl. *Araucophlebia*). On all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 14). Species examined: ♂ *Nousia* (s.str.) *minor* (Demoulin 1955), ♂ *N.* (s.str.) *bella* Pescador & Peters 1985, ♂ & ♀ *N.* (s.str.) *crena* Pescador & Peters 1985, ♂ & ♀ *Nousia* (*Araucophlebia*) *latifolia* Kluge 2014.

2.2.2.3.2.2.2.2.2.G.7. Dactylophlebia/g. In both sexes, on all leg pairs, 1st tarsomere (fused with tibia) is covered with microtrichia (like tibiae), 2nd–5th tarsomeres are covered with pointed microlepides (Table 14). Species examined: ♂ & ♀ *Dactylophlebia carnulenta* Pescador & Peters 1980.

Discussion

Degree of conservatism in subimaginal tarsal texture. In various mayfly taxa this degree greatly differs. In some taxa the subimaginal tarsal texture is highly conservative: in all taxa of the plesiomorphon Tridentiseta other than Teramerotarsata, in all Baetofemorata, in all *Epeorus* and in some other taxa, all subimaginal tarsomeres are invariantly covered with blunt microlepides only; in all Anteropatellata-non-Baetovectata and some other taxa, all subimaginal tarsomeres are invariantly covered with pointed microlepides only; in all Caenoptera, all subimaginal tarsomeres are invariantly covered with microtrichia only. At the same time, in some taxa the subimaginal tarsal texture is highly variable and species-specific. It allows to distinguish certain species within baetid genera *Camelo-*

baetidius, *Fallceon* (Table 4), *Nigrobaetis* (Table 5), *Labiobaetis* (Table 6), heptageniid genera *Cinygmula* (Table 8) and *Rhithrogena* (Table 9), Ephemerellidae (Table 12 and Figs 14–17) and leptophlebiid genera *Choroterpes* (Table 15), *Adenophlebia* (Table 17 and Figs 10–11) and others.

Direction of evolution. Since the same few types of elements (the microtrichia, the pointed microlepides, the blunt microlepides and the intermediate forms) are found in various taxa of Ephemeroptera, we have to conclude that during mayfly evolution these forms were repeatedly and reversibly transformed one into another. All subimaginal tarsomeres are invariably covered with blunt microlepides in the most basal groups of Ephemeroptera, which are the taxa formerly constituted a plesiomorphon Siphlonuridae s. l. (i.e., Siphlonuridae *sensu* Ulmer 1920, including Isonychiidae and Coloburiscidae) (Tables 1 and 7). This fact allows to conclude that such texture is initial for Ephemeroptera or at least for Anteritorna (since examined representatives of Posteritorna have all subimaginal tarsomeres covered with microtrichia—Table 1). However, when we turn to particular mayfly taxa, such as Baetidae and Leptophlebiidae, we see an opposite picture, where the basal taxa have all subimaginal tarsomeres covered with pointed microlepides, while the derivative taxa have subimaginal tarsi partly or completely covered with blunt microlepides.

Thus, among Baetidae s. l., all subimaginal tarsomeres are covered with pointed microlepides in the most primitive taxa—Siphlaenigmatidae, majority of the plesiomorphon Protopatellata and all species of the plesiomorphon Anteropatellata-non-Baetovectata (Table 2); various combination of pointed and blunt microlepides are found in the plesiomorphon Baetovectata-non-Baetofemorata (Tables 3, 4, 5, 6); all subimaginal tarsomeres are covered with blunt microlepides in the holophyletic taxon Baetofemorata.

Among Leptophlebiidae, 2nd–5th subimaginal tarsomeres are covered with pointed microlepides in all taxa other than Atalophleboculata; various combinations of pointed microlepides, blunt microlepides and microtrichia are found in the holophyletic taxon Atalophleboculata (Tables 13–17).

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