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**A revision of the *Alevonota* species of the Palaearctic region. III.
Two new species from Taiwan, a new combination, a new
synonymy, and additional records
(Coleoptera, Staphylinidae, Aleocharinae)**

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A b s t r a c t : *Alevonota calliceroides* nov.sp. and *A. hetzeli* nov.sp., both of them from the same locality in Hualien Hsien, Taiwan, are described and illustrated. *Homalota hepatica* ERICHSON, 1839, the type species of *Enalodroma* THOMSON, 1859, is transferred to *Alevonota* THOMSON, 1858, rendering *Enalodroma* a junior synonym of *Alevonota* and yielding the binomen *Alevonota hepatica* (ERICHSON, 1839), nov.comb. Data on the natural history of *A. hepatica* are compiled. Additional records of four species are reported, among them several new country records of *A. hepatica* and the first record of *A. gracilentata* (ERICHSON, 1839) from Ukraine.

K e y w o r d s : Coleoptera, Staphylinidae, Aleocharinae, *Alevonota*, *Enalodroma*, Palaearctic region, Taiwan, taxonomy, new species, new combination, new synonymy, additional records.

Introduction

The genus *Alevonota* THOMSON, 1858 was previously represented in the Palaearctic region by 43 species, 27 of them West Palaearctic and 16 East Palaearctic (ASSING & WUNDERLE 2008, ASSING 2017, 2018). Five species have been reported from Taiwan (SCHÜLKE & SMETANA 2015), all of them described by PACE (2009). Except for one adventive species, *A. gracilentata* (ERICHSON, 1839) (KLIMASZEWSKI et al. 2018), *Alevonota* is unknown from the Nearctic region, suggesting that the genus has a Palaearctic distribution.

The genus-group name *Enalodroma* was made available by THOMSON (1859) to include only *E. fucicola* THOMSON, 1859, the type species by monotypy and today a junior synonym of *Homalota hepatica* ERICHSON, 1839. *Enalodroma* was subsequently treated as a subgenus of *Atheta* THOMSON, 1858 (BERNHAEUER & SCHEERPELTZ 1926, BENICK & LOHSE 1974), until SAWADA (1984) synonymized *Enalodroma* with *Aloconota* THOMSON, primarily based on the structure and chaetotaxy of the mouthparts. LOHSE (1989), however, considered this synonymy implausible and attributed *Enalodroma* the status of a distinct genus. Recently, ELVEN et al. (2012) moved *Enalodroma* from Athetini to Geostibini, together with *Alevonota*, *Aloconota*, and several other genera. LEE & AHN (2012) retained the generic status and provided a detailed redescription and illustrations of the habitus and various body parts. *Enalodroma* has remained monotypical since its original description, with *E. hepatica* as its sole representative. In a morpho-

logical study, ÁDÁM (2010) concluded that "no evidence was found suggesting that [*Enalodroma* and *Alevonota*] should represent distinct genera". This, as well as ecological and additional morphological similarities of *E. hepatica* with *Alevonota* eventually initiated a re-evaluation of the status of *Enalodroma* and of the generic assignment of *E. hepatica*.

Material and methods

The material treated in this study is deposited in the following collections:

TLMF..... Tiroler Landesmuseum Ferdinandeum, Innsbruck (M. Kahlen)

cAss..... author's private collection

cFel private collection Benedikt Feldmann, Münster

cGon..... private collection Andrej Gontarenko, Odessa

The morphological studies were conducted using a Stemi SV 11 microscope (Zeiss), a Discovery V12 microscope (Zeiss), and a Jenalab compound microscope (Carl Zeiss Jena). The images were created using a digital camera (Nikon Coolpix 995), Axiocam ERc 5s and Picolay software.

Body length was measured from the anterior margin of the labrum to the posterior margin of the abdominal tergite VIII, the length of the forebody from the anterior margin of the labrum to the posterior margin of the elytra, head length from the anterior margin of the clypeus (without ante-clypeus) to the posterior constriction of the head, elytral length at the suture from the apex of the scutellum to the posterior margin of the elytra, and the length of the aedeagus from the apex of the ventral process to the base of the aedeagal capsule. The "parameral" side (i.e., the side where the sperm duct enters) is referred to as the ventral, the opposite side as the dorsal aspect.

Results

Alevonota hepatica (ERICHSON, 1839), nov.comb. (Figs 11-21)

Homalota hepatica ERICHSON, 1839: 102.

Homalota major AUBE, 1850: 306.

Calodera castaneipennis FAIRMAIRE & LABOULBENE, 1856: 380.

Enalodroma fucicola THOMSON, 1859: 39.

Homalota exarata SHARP, 1869: 186.

Atheta (*Ptychandra*) *hepatica*: GANGLBAUER (1895).

Atheta (*Enalodroma*) *hepatica*: BERNHAUER & SCHEERPELTZ (1926).

Atheta (*Enalodroma*) *hepatica*: BENICK & LOHSE (1974).

Aloconota hepatica: SAWADA (1984).

Enalodroma hepatica: LOHSE (1989), LEE & AHN (2012).

Material examined: Portugal: 1♀, Tronco, E Chjaves, 41°46'N, 7°18'W, 840 m, meadow, near stone wall, sifted, 22.III.2002, leg. Meybohm (cAss). Spain: 2♀♀, Castilla-León, P. N. de Guadarrama, Real Sitio d. S. Ildefonso (SG), Puerto de la Fuenfria, flight interception trap, 28.V.-14.VII.2017, leg. Lencina & González (cAss); 1♀, Castilla-León, Burgos, Sierra de Neila, Campino, 1500-1900 m, 22.V.1994, leg. Schülke & Grünberg (cAss) Switzerland: 1♂, Ticino, Alpe di Neggia (Vira), 1350-1450 m, 29.V.1987, leg. Feller (cAss). Germany: 1♀, Niedersachsen, 25 km SW Hannover, Deister, Nienstedt, under bark, 23.V.1986, leg. Assing (cAss); 1♀, Niedersachsen, Stadthagen, forest, pitfall trap, 29.VI.1991, leg. Sprick (cAss); 1♀, Niedersachsen,

E Schladen, Hedeper, Westerberg, pitfall trap, V.2001, leg. Schmidt (cAss); 1♀, Niedersachsen, Wilhelmshafen env., Neuenburger Urwald, wood eclector (oak), 8.IV.-10.V.1993, leg. Menke (cAss); 1♂, Nordrhein-Westfalen, Bonn env., 10.IV.1991 (cAss); 1♂, Brandenburg, Karstadt, Perleberg, pitfall trap, 20.VII.1994, leg. Sprick (cAss); 1♂, Sachsen Leipzig, LSG Lößnig-Dörlitz, pitfall trap near poplar trunk, 17.V.-8.VII.1995, leg. Sprick (cAss). Italy: 1♂, 2♀♀, Piemonte, Valle Stura (CN), Vallone Riofreddo, 1050 m, 5.V.1997, leg. Assing (cAss); 1♀, Basilicata, Rifreddo (PZ), 1100 m, 21-22.V.1984, leg. Angelini (cAss). Czech Republic: 3♂♂, České středohoří, Lipská hora, 24.IV.-18.V.1993, leg. Moravec (cAss). Slovenia: 1♂, Negova, Negovsko jez., 24.IV.1995, leg. Drovenik (cAss). Serbia: 1♂, Gramada planina, S Sastav Reka, 29.VII.2007, leg. Stévanović (cAss). Macedonia: 1♂, Cerovo vill., 41°43'N, 20°50'E, 880 m, near stream, 19.VI.2011, leg. Hlaváč (cAss). Greece: 1♂, 1♀, Makhedonia, NW Kavála, Pangéo, ski resort env., 1700 m, beech forest, litter sifted, 24.V.1999, leg. Assing (cAss); 1♀, same data, but 1650 m (cAss); 1♀, same data, but 1650 m, 28.V.1999 (cAss); 1♂, same data, but road to ski resort, 1300 m, 24.V.1999 (cAss); 1♂, Pangéo, peak region above ski resort env., 1900 m, debris near snowfield sifted, 24.V.1999, leg. Assing (cAss); 1♀, Oros Lepetimnos, track to Prof. Ilias, 39°20'N, 26°15'E, 730 m, large rocks with *Quercus ilex*, litter sifted, 25.III.2016, leg. Assing & Hetzel (cAss); 1♀, Ikaría, NE Pezi, 37°34'N, 26°04'E, 860 m, plateau, N-slope with *Crataegus monogyna* and ferns, litter and roots near stream sifted, 12.IV.2017, leg. Assing (cAss); 1♀, Ikaría, NE Pezi, 37°34'N, 26°05'E, 860 m, grazed plateau, fern litter and roots sifted, 12.IV.2017, leg. Assing (cAss). Turkey: see ASSING (2009, 2013). Russia: 1♂, Krasnodarskiy Kray, Temnolesskaya, Mezmay env., 850 m, 9.VI.1999, leg. Smetana (cAss). Armenia: see ASSING & SCHÜLKE (2019). Iran: 1♀, Mazandaran, 6 km W Part Kola, 36.14°N; 53.41°E, 2050 m, flight interception trap, VI.2015, leg. Barimani (cAss).

C o m m e n t : Intrageneric variation of external morphology in *Alevonota* is enormous, not only regarding body size and coloration, but also regarding proportions of body parts, punctation, male secondary sexual characters, and particularly habitat adaptations such as eye size, pigmentation, and the lengths of the elytra and the hind wings. On the other hand, *Alevonota* species share a more or less slender body with a parallel abdomen, often rather slender antennae with weakly coniform antennomeres IV-X, a median lobe of the aedeagus of relatively uniform morphology, and a relatively stout spermatheca with a relatively short proximal portion (often S-shaped). Moreover, except for the species exclusively confined to subterranean habitats (all the Canarian and some Continental species), West Palaearctic *Alevonota* share a similar phenology and natural history, i.e., short epigeic or aerial dispersal periods in spring and a subterranean reproduction period. Consequently, they are mostly collected - more or less accidentally - with pitfall traps and/or on the wing (flight interception traps, car-nets) during spring, only exceptionally in other seasons (ASSING 2002, ASSING & WUNDERLE 2008).

A morphological examination of material of *Enalodroma hepatica* yielded no significant differences suggesting that this species should *not* belong to *Alevonota*. True, its habitus is more robust and the antennae are less strongly incrassate than those of other species from the European continent, but these difference are insignificant when compared to those between Canarian hypogean, Canarian endogean, and Continental European, and East Palaearctic species. On the other hand, the mouthparts, the general morphology of the antennae (antennomeres weakly conical and close) (Fig. 21), the shape of the head (subquadrate), the pronotal pubescence pattern, the parallel abdomen, the modifications of the male tergites VII and VIII (present only in some *Alevonota* species), the morphology of the median lobe and the parameres of the aedeagus, the shape and chaetotaxy of the female sternite VIII, and the general shape of the spermatheca are in agreement with the current concept of *Alevonota*. Moreover, a sexual dimorphism of the elytra (*E. hepatica*: male elytra on either side with a longitudinal fold near posterior portion of suture) is shared with species such as *Alevonota ocaloides* (BRISOUT DE BARNEVILLE,

1863) (male elytra with rugose sculpture, female elytra with weak elevation along suture). For additional similarities and arguments see ÁDÁM (2010). The male and female sexual characters and the mouthparts are illustrated in Figs 11-20. In fact, external and especially aedeagal characters suggest that *E. hepatica* may be more closely allied to *A. rufotestacea* (KRAATZ, 1856), the type species of the genus, than *A. gracilentata*.

The hypothesis that *E. hepatica* belongs to the *Alevonota* lineage is also strongly supported by its ecology. Since *E. hepatica* is usually found as singletons or in small numbers and mostly with pitfall and flight interception traps during the dispersal period in spring, BENICK & LOHSE (1974) inferred that the species is probably associated with subterranean nests and burrows of small mammals. However, it has never been recorded in greater quantities in systematic studies of such habitats (see, e.g., ISRAELSON 1971a, b), suggesting that the reproduction habitat is of a cryptic subterranean nature, like that of many *Alevonota* species (ASSING & WUNDERLE 2008). The material listed above was collected from a variety of very different habitats such as the leaf litter of various types of forest, in a meadow, under bark, from dead wood, near streams, and in alpine habitats above the tree-line. The altitudes range from sea level up to 2050 m. Additionally, the species has been reported from flood debris (BARANOWSKI 1979), river banks and the shore of a reservoir (KUNZE & KACHE 1998, WENZEL 1997), sedge reed (RENNER 1980), seashore deposits (BARANOWSKI 1979), gardens (HOLZER 1998, WAGNER 1997), xerothermous grassland (BRENNER 1993, FELDMANN & LÜCKMANN 1998), bogs (VOGEL 1998), from a nest in a hollow oak (BENICK & LOHSE 1959), plant debris (SCHOLZE & JUNG 1994), decaying plant matter (VOGEL & KAUFMANN 1982), flowering *Crataegus* (LINKE 1962), and tree sap exudations (birch) (LINKE 1962). Specimens were primarily collected with pitfall traps (BRENNER 1993, FELDMANN & LÜCKMANN 1998, KÖHLER & KINKLER 2010, KUNZE & KACHE 1998, RENNER 2011, VOGEL 1982, 2013, ZANETTI et al. 2016), flight interception traps (OWEN 1993, ZANETTI et al. 2016), wine traps (ZANETTI et al. 2016), car-nets (SCHÜLKE 2012, VOGEL 2013), and sweeping vegetation (ERMISCH 1940). Of the 58 specimens reported from South Korea, as many as 56 were collected with flight interception traps and only two by sifting leaf litter (LEE & AHN 2012). ERMISCH (1940) observed a gradation in 1938, but failed to collect a single specimen in the same localities in the preceding and succeeding years. Practically all the revised and the literature records are based on single or few specimens collected during the period from March to June, mostly in April and May. Based on these observations, there is little doubt that all these records were accidental and that the habitats where the material was found do not represent the actual reproduction habitat. The latter is evidently cryptic and essentially unknown, as is the case for the majority of continental West Palaearctic *Alevonota* species.

Therefore, based on the above observations and argumentation, it is concluded that the species previously named *Enalodroma hepatica* in fact belongs to *Alevonota*, resulting in the following synonymies and combination: *Alevonota* THOMSON, 1858 = *Enalodroma* THOMSON, 1859, nov.syn., = *Ptychandra* GANGLBAUER, 1895 (previously a junior synonym of *Enalodroma*); *Alevonota hepatica* (ERICHSON, 1839), nov.comb.

Alevonota hepatica is not only widespread in the West Palaearctic region, from the Iberian Peninsula eastwards to Russia, Ukraine, Turkey, Armenia, and Iran, but has also been reported from South Korea (LEE & AHN 2012). The above material includes the first

records from Portugal, Slovenia, Serbia, Macedonia, the Russian South European Territory, and Iran.

***Alevonota egregia* (RYE, 1876)**

M a t e r i a l e x a m i n e d : Greece: 1♂, Ahaia, Oros Aroánia, 38°01'N, 22°11'E, 1600 m, 4.VI.2012, leg. Giachino & Vailati (cAss).

The distribution of *A. egregia* ranges from Turkey and the Balkans to Great Britain and Central Europe and is apparently of the Ponto-Mediterranean type (ASSING & WUNDERLE 2008).

***Alevonota gracilentia* (ERICHSON, 1839)**

M a t e r i a l e x a m i n e d : Italy: 1♂, Trentino-Alto Adige, SE Caldaro, Plantaditsch, 320 m, vinyard, 7.IX.2018, leg. Kahlen (TLMF). Ukraine: 1♂, Odessa obl., Berezovka env., "Berezovskiy" forest, 1.V.2017, leg. Gontarenko (cGon).

C o m m e n t : *Alevonota gracilentia* is widespread from West Europe to Turkey and adventive also in Canada (ASSING & WUNDERLE 2008, KLIMASZEWSKI et al. 2018). The above male from Ukraine represents a new country record.

***Alevonota taiwanica* PACE, 2009**

M a t e r i a l e x a m i n e d : Taiwan: 1♀, Hualien, Guanyuan, 24°11'22"N, 121°20'22"E, 2460 m, pine forest, sifted, 1.VIII.2018, leg. Hetzel (cFel).

C o m m e n t : The original description is based on a unique female from Anmashan, Taichung Hsien, Taiwan (PACE 2009). The above female has a spermatheca of similar shape as that of the holotype, suggesting that both specimens are conspecific.

***Alevonota calliceroides* nov.sp. (Figs 1-5)**

T y p e m a t e r i a l : Holotype ♂: "TAIWAN, Hualien, Guanyuan, pine forest, sifted, 2459 m, 24°11'22"N, 121°20'22"E, 1.VIII.2018, Hetzel leg. / Holotypus ♂ *Alevonota calliceroides* sp. n. det. V. Assing 2019" (cAss).

E t y m o l o g y : The specific epithet (adjective) alludes to the shape of the antennae, which somewhat resembles that of species of *Callicerus* GRAVENHORST, 1802.

D e s c r i p t i o n : Body length 4.9 mm; length of forebody 2.2 mm. Habitus as in Fig. 1. Coloration: body black with dark-brown elytra; legs dark-yellow; antennae blackish-brown.

Head (Fig. 2) approximately 1.05 times as broad as long, broadest across eyes; lateral contours behind eyes converging towards posterior constriction of head in nearly straight line, i.e. posterior angles completely obsolete; dorsal surface with very fine and sparse punctation, narrowly impunctate along middle; interstices glossy, with very shallow traces of microreticulation visible only at high magnification (100 x). Eyes large and bulging, slightly longer than distance from posterior margin of eye to posterior constriction of head in dorsal view. Antenna (Fig. 3) conspicuously long and slender, 1.8 mm long; antennomeres IV-V indistinctly oblong, VI-X approximately as long as broad, and XI elongate, approximately as long as the combined length of IX and X.

Pronotum (Fig. 2) 1.07 times as broad as long and nearly 1.3 times as broad as head,

broadest in anterior half; pubescence of midline directed posteriad; punctuation very fine and moderately dense; interstices without appreciable microsculpture, very glossy.

Elytra (Fig. 2) approximately as long as pronotum; punctuation dense and fine, but more distinct than that of head and pronotum; interstices without microreticulation. Hind wings fully developed.

Abdomen narrower than elytra; tergites III-V with moderately deep anterior impressions; punctuation rather sparse and fine, but distinct; anterior portions of tergites III-VII practically impunctate; tergites III-VI with very shallow transverse microsculpture and very glossy; tergites VII-VIII with more distinct microsculpture composed of short transverse meshes; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII somewhat produced and truncate in the middle; posterior margin of sternite VIII strongly convex; median lobe of aedeagus (Figs 4-5) 0.5 mm long and of robust shape.

♀: unknown.

Comparative notes: The new species is distinguished from *A. taiwanensis* PACE, 2009 (male unknown), the only other *Alevonota* species of similarly large size recorded from Taiwan, by darker coloration (*A. taiwanensis*: body brown; antennae brown), much longer antennae, a differently shaped head, larger eyes (*A. taiwanensis*: eyes shorter than postocular region), and practically obsolete microsculpture of the head and pronotum (distinct in *A. taiwanensis*). For illustrations of *A. taiwanensis* see PACE (2009).

Distribution: The type locality is situated in Taroko National Park, Hualien, Taiwan. The holotype was sifted from litter in a pine forest at an altitude of approximately 2460 m, together with *A. taiwanica* and the following species.

***Alevonota hetzeli* nov.sp. (Figs 6-10)**

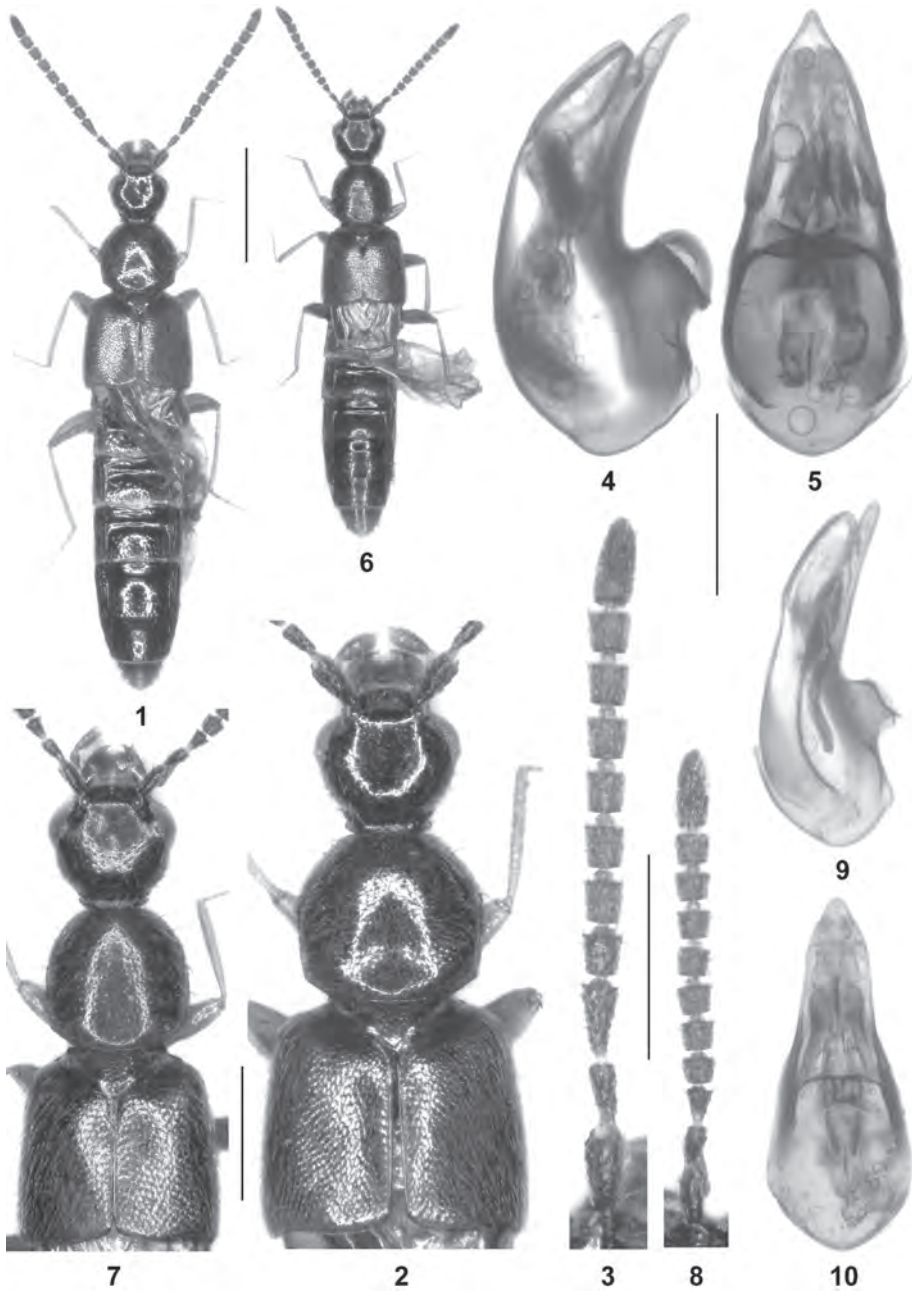
Type material: Holotype ♂: "TAIWAN, Hualien, Guanyuan, pine forest, sifted, 2459 m, 24°11'22"N, 121°20'22"E, 1.VIII.2018, Hetzel leg. / Holotypus ♂ *Alevonota hetzeli* sp. n. det. V. Assing 2019" (cAss).

Etymology: This species is dedicated to Andreas Hetzel (Hildesheim), who collected the type material of both *A. calliceroides* and *A. hetzeli*.

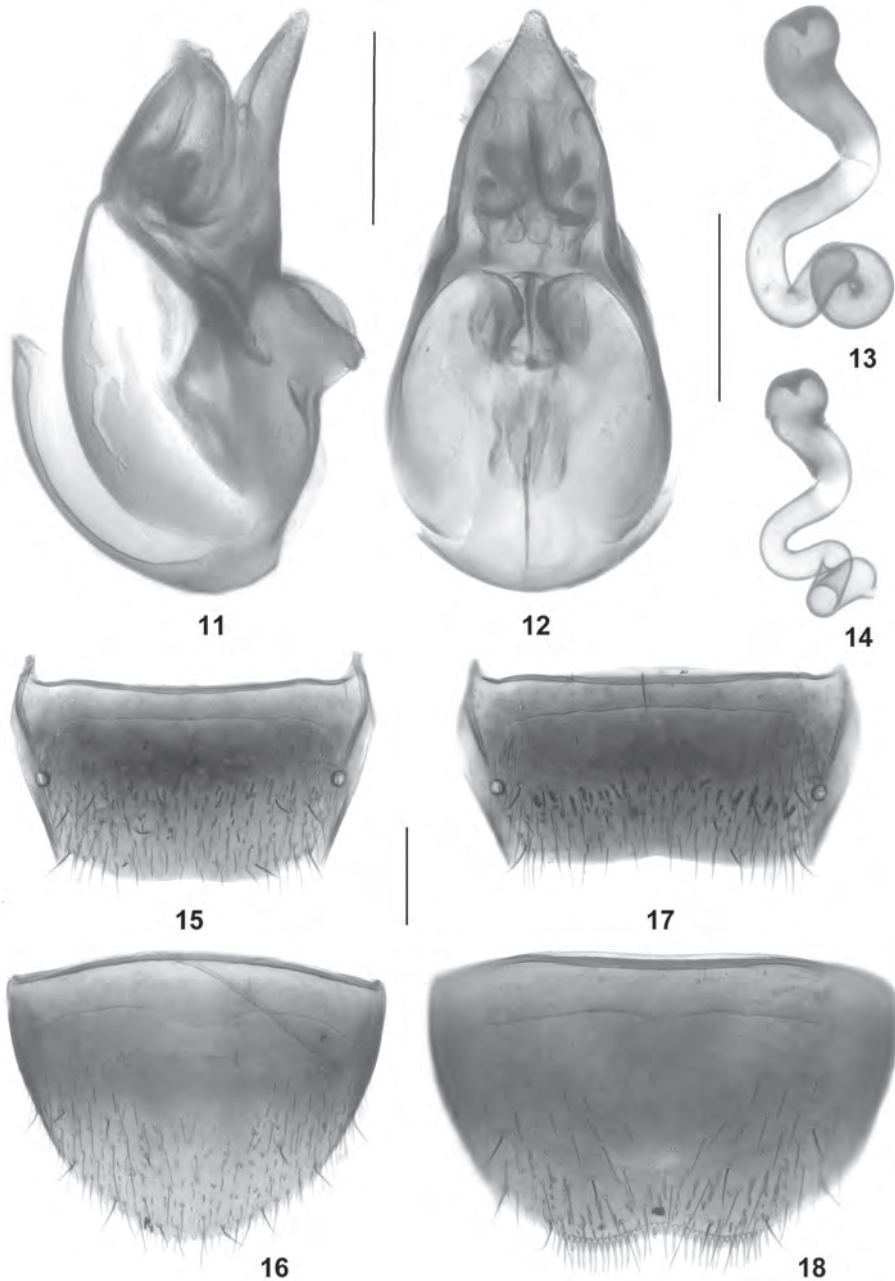
Description: Body length 3.9 mm; length of forebody 1.8 mm. Habitus as in Fig. 6. Coloration: head black; pronotum blackish-brown; elytra dark-brown; abdomen blackish-brown with the posterior margins of tergites III-VII and the posterior portion of tergite VIII reddish-brown; legs yellowish-brown; antennae blackish.

Head (Fig. 7) 1.1 times as broad as long, broadest across eyes; lateral contours between eyes and posterior constriction of head weakly convex, i.e., posterior angles completely obsolete; dorsal surface with fine and moderately sparse punctuation, narrowly impunctate along middle; interstices with distinct microreticulation.

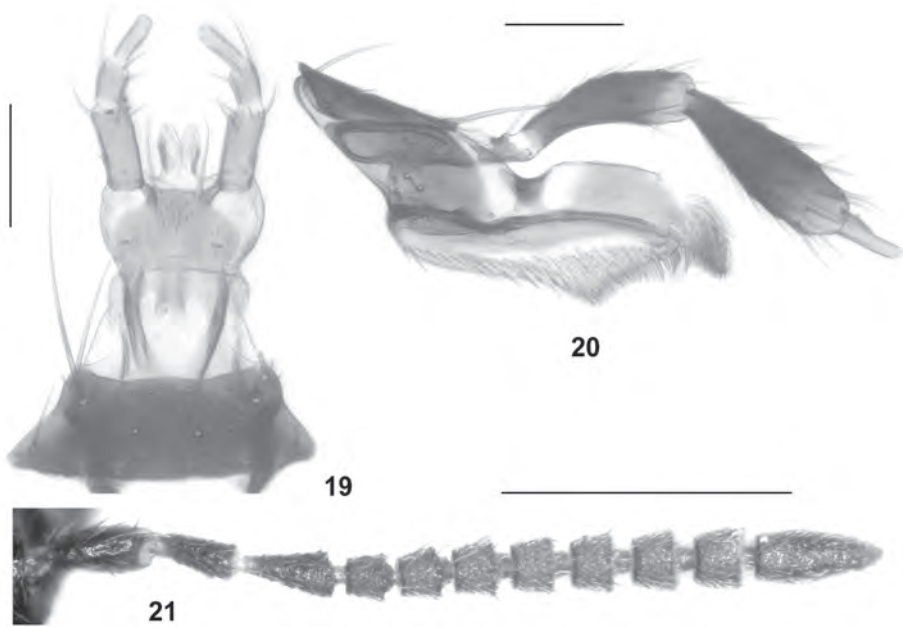
Eyes large and bulging, approximately as long as distance from posterior margin of eye to posterior constriction of head in dorsal view. Antenna (Fig. 8) 1.2 mm long; antennomeres IV transverse, but less than 1.5 times as broad as long, V-IX weakly transverse, X nearly as long as broad, and XI elongate, slightly longer than the combined length of IX and X.



Figs 1-10: *Alevonota calliceroides* (1-5) and *A. hetzeli* (6-10): (1, 6) habitus; (2, 7) forebody; (3, 8) antenna; (4-5, 9-10) median lobe of aedeagus in lateral and in ventral view. Scale bars: 1, 6: 1.0 mm; 2-3, 7-8: 0.5 mm; 4-5, 9-10: 0.2 mm.



Figs 11-18: *Alevonota hepatica*: (11-12) median lobe of aedeagus in lateral and in ventral view; (13-14) spermatheca; (15) male tergite VIII; (16) male sternite VIII; (17) female tergite VIII; (18) female sternite VIII. Scale bars: 0.2 mm.



Figs 19-21: *Alevonota hepatica*: (19) labium; (20) maxilla; (21) antenna. Scale bars: 21: 0.5 mm; 19-20: 0.1 mm.

Pronotum (Fig. 7) as broad as long and 1.1 times as broad as head, broadest approximately in the middle; lateral margins weakly convex in dorsal view; pubescence of midline directed posteriad; punctation similar to that of head, but slightly denser; interstices with distinct microreticulation.

Elytra (Fig. 7) approximately as long as pronotum; punctation dense and fine, but more distinct than that of head and pronotum; interstices with microreticulation. Hind wings fully developed.

Abdomen narrower than elytra; tergites III-V with rather deep anterior impressions; punctation moderately sparse and fine, but distinct; interstices with distinct microsculpture predominantly composed of short transverse meshes; posterior margin of tergite VII with palisade fringe.

♂: posterior margins of tergite VIII and sternite VIII strongly convex; median lobe of aedeagus (Figs 9-10) 0.39 mm long and slender.

♀: unknown.

Comparative notes: *Alevonota hetzeli* is readily distinguished from *A. calliceroides* and *A. taiwanensis* by much smaller, and from *A. laevigata* PACE, 2009 (Taiwan: Taichung) by distinctly larger body size alone. It differs from the two similarly sized *A. taiwanica* and *A. longicornis* PACE, 2009 as follows:

from *A. taiwanica* (male unknown) by much more bulging eyes, distinctly less transverse antennomeres IV-X, and a differently shaped head (*A. taiwanica*: lateral contours behind eyes somewhat parallel for some distance);

from *A. longicornis* by distinctly transverse antennomeres IV (*A. longicornis*: antenno-

meres IV approximately as long as broad), larger and more convex eyes, and by the shape of the aedeagus.

For illustrations of *A. taiwanica* and *A. longicornis* see PACE (2009).

D i s t r i b u t i o n : The type locality and the circumstances of collection are identical to those of *A. calliceroides*.

Acknowledgements

I am indebted to the colleagues indicated in the material section for loan of material, in particular to Benedikt Feldmann (Münster) for the generous gift of the holotypes of *Alevonota calliceroides* and *A. hetzeli* and for proof-reading the manuscript.

Zusammenfassung

Alevonota calliceroides nov.sp. und *A. hetzeli* nov.sp., beide vom selben Fundort in Hualien Hsien, Taiwan, werden beschrieben und abgebildet. *Homalota hepatica* ERICHSON, 1839, die Typusart von *Enalodroma* THOMSON, 1859, wird in die Gattung *Alevonota* THOMSON, 1858 gestellt. Dadurch ergeben sich die Synonymie *Alevonota* = *Enalodroma* nov.syn. und das Binomen *Alevonota hepatica* (ERICHSON, 1839), nov.comb. Daten zur Ökologie von *A. hepatica* werden zusammengestellt. Weitere Nachweise von vier Arten werden gemeldet, darunter mehrere Erstnachweise von *A. hepatica* und der Erstnachweis von *A. gracilentata* (ERICHSON, 1839) aus der Ukraine.

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