

## Order Hemiptera, family Caliscelidae

Vladimir M. Gnezdilov & Michael R. Wilson

### INTRODUCTION

The family Caliscelidae Amyot & Serville, 1843, is distributed worldwide and comprises two subfamilies – Caliscelinae Amyot & Serville, 1843, with two tribes (Caliscelini Amyot & Serville, 1843; Peltonotellini Fieber, 1872) and Ommatidiotinae Fieber, 1875, with three tribes (Ommatidiotini Fieber, 1875; Augilini Baker, 1915; Adenissini Dlabola, 1980) (Emeljanov, 1999, 2008; Gnezdilov, 2008; Gnezdilov & Wilson, 2006). The tribe Peltonotellini was recently revalidated by Emeljanov (2008) who suggested including in the tribe calisceline genera with sensory pits in imago and listed four genera: *Peltonotellus* Puton, 1886; *Acromega* Emeljanov, 1996; *Ceragra* Emeljanov, 1996; *Mushya* Kato, 1933. Judging on the presence of sensory pits in the imago, the genus *Homaloplasis* Melichar, 1906, also belongs to this tribe.

In the Arabian Peninsula the subfamily Caliscelinae is represented by the tribe Peltonotellini, with monotypical genus *Homaloplasis* Melichar, 1906 (Gnezdilov & Bourgoïn, 2009) and the subfamily Ommatidiotinae Fieber is represented by the tribe Adenissini Dlabola, 1980 (subtribe Adenissina), with two genera – *Adenissus* Linnavuori, 1973 and *Perissana* Metcalf, 1952 (subgenus *Raunolina* Gnezdilov & Wilson, 2006) (Gnezdilov & Wilson, 2006). *Homaloplasis aprica* Melichar, 1906, is recorded from Saudi Arabia, Algeria, Tunisia, and Mali (Melichar, 1906; Dlabola, 1983; Gnezdilov & Bourgoïn, 2009).

The genus *Adenissus* Linnavuori comprises 6 species. The type species of the genus, *Adenissus brachypterus* Linnavuori, 1973, was described from South Yemen (Linnavuori, 1973). A further species, *A. riadicus* Dlabola, 1985, was described from Eastern Saudi Arabia (Haradh) and recorded from UAE and Oman (Dlabola, 1985; Gnezdilov et al., 2004; Gnezdilov & Wilson, 2006). Four other species are distributed in Iran (Dlabola, 1980).

The genus *Perissana* Metcalf, 1952, comprises two subgenera: *Perissana* Metcalf, 1952, and *Raunolina* Gnezdilov & Wilson, 2006. The nominative subgenus includes three species distributed in Iran, Iraq, and Azerbaijan (Gnezdilov & Wilson, 2006). The subgenus *Raunolina* includes two species, one of them is known from Israel and Egypt and the other, *Raunolina arabica* Gnezdilov & Wilson, 2006, from Saudi Arabia.

The subtribe Bocrina Emeljanov, 1999, is closely related to the subtribe Adenissina Dlabola and is known from a single species, *Bocra ephedrina* Emeljanov, 1999, from the mountain regions of Tadzhikistan where it occurs on *Ephedra* spp. (Ephedraceae) (Emeljanov, 1999).

### MATERIALS AND METHODS

Morphological terminology follows Emeljanov (1995) and Gnezdilov (2003). *Calligonum crinitum arabicum* was identified using the guide by Jongbloed (2003). The genital segments of the examined specimens were macerated in 10% KOH and figured in glycerine jelly using a compound light microscope Leica M165 C. Photographs of the specimen were made using a Leica MZ95 microscope with a Leica video camera DFC290; images are produced using the software Helicon Focus 4.61 and Photoshop.

The recent material is divided between the Zoological Institute of the Russian Academy of Sciences (ZIN, St. Petersburg, Russia), the Hemiptera collection of the National Museum of Wales (NMWC, Cardiff, UK) and the UAE Invertebrate Collection. The holotype of

*Adenissus brachypterus* is in the American Museum of Natural History (AMNH, New York, USA).

## SYSTEMATIC ACCOUNT

### Key to the genera of Caliscelidae occurring in the Arabian Peninsula

- 1 Metope, lateral parts of pronotum, scutellum, and abdominal tergites excluding genital segments with developed sensory pits. Lower part of metope and whole postclypeus form wedge-shaped proboscis flattened dorso-laterally ..... *Homaloplasis* Melichar  
– Head and body without sensory pits. Metope and postclypeus without proboscis (Plate 4) ..... **2**
- 2 Metope wide, upper margin concave, sublateral carina are subparallel, not joined apically. Fore wings with hypocostal plate, claval suture visible proximally. Hind margin of pygofer with hook-shaped process subapically. Suspensorium with awl-shaped process. Aedeagus without ventral hooks ..... *Adenissus* Linnavuori  
– Metope narrow, upper margin straight, sublateral carina joined at its upper margin. Fore wings without hypocostal plate, claval suture invisible. Hind margin of pygofer without hook-shaped process. Suspensorium without awl-shaped process. Aedeagus with pair of ventral hooks ..... *Perissana* Metcalf (subgenus *Raunolina* Gnezdilov & Wilson)

Subfamily **Ommatidiotinae** Fieber, 1875

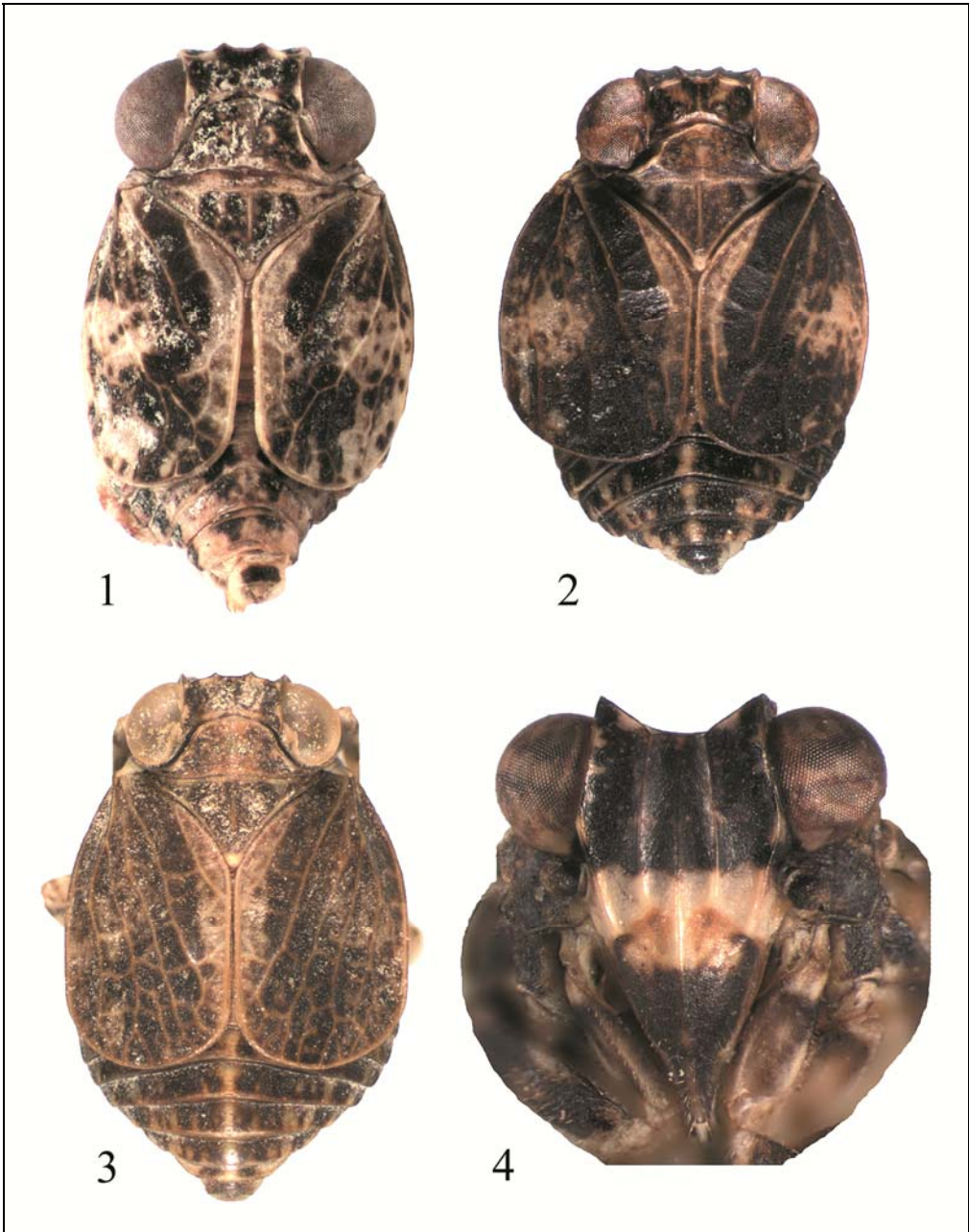
Tribe **Adenissini** Dlabola, 1980

Genus *Adenissus* Linnavuori, 1973

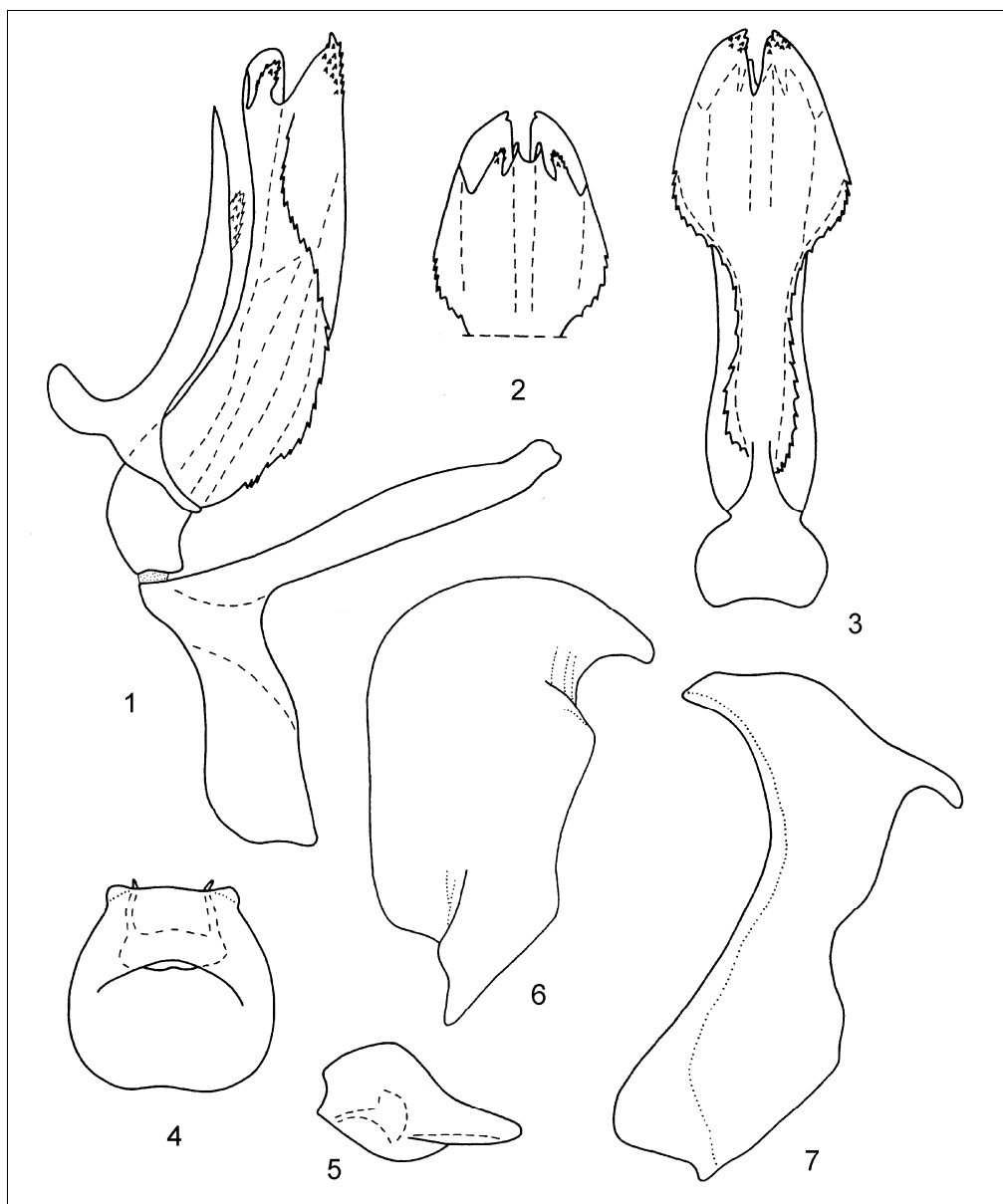
*Adenissus riadicus* Dlabola, 1985

Plates 1–4, Figures 1–15

Specimens examined: Jebel Jibir, 2♂, 5 larvae, 1272 m, 26.ix–9.x.2010, water traps, leg. A. van Harten. Sharjah Desert Park, sand dunes, 2♂, 5♀, 3 larvae, 10–25.iv.2010, leg. V.M. Gnezdilov & M.R. Wilson. Supplementary description: The body wide (Plates 1–3), dorso-ventrally flattened (in dorsal view). Metope wide, with lateral margins obtusely angulate, upper margin concave (Plate 4). Metope with median carina weak under its upper margin, distinct in its median and lower parts and running throughout post- and anteclypeus. Sublateral carinae of metope not fused with median carina, reach upper margin of metope. Median and sublateral carinae of metope are subparallel. Pedicel cylindrical. Coryphe transverse, lateral margins keel-shaped. Rostrum reaching hind coxae. Pronotum with median carina, anterior margin convex, posterior margin nearly straight. Mesonotum with weak median and lateral carinae. Brachypterous. Fore wings reach hind margin of tergites V–VI, with wide hypocostal plate and intermediate veins between longitudinal ones. Radius and mediana with long common stem. Radius bifurcate, mediana bi- or trifurcate, cubitus anterior rudimentary, cubitus posterior (claval suture) distinct only proximally, postcubitus and first anal vein fused or not fused apically. Hind wings rudimentary. Hind tibia with single lateral spine. First metatarsomere longer than second one, with 6–7 intermediate spines apically. Pretarsus with long rigid setae ventrally. Colouration variable (Plates 1–3). Metope dark brown or black, with yellow spots and dots, excluding ivory lower part above clypeus (Plate 4). Postclypeus from brown to black excluding ivory basal part, median carina pale. Anteclypeus dark brown or black, with pale median carina. Scapus and pedicel from brown to black. Coryphe and pronotum from light

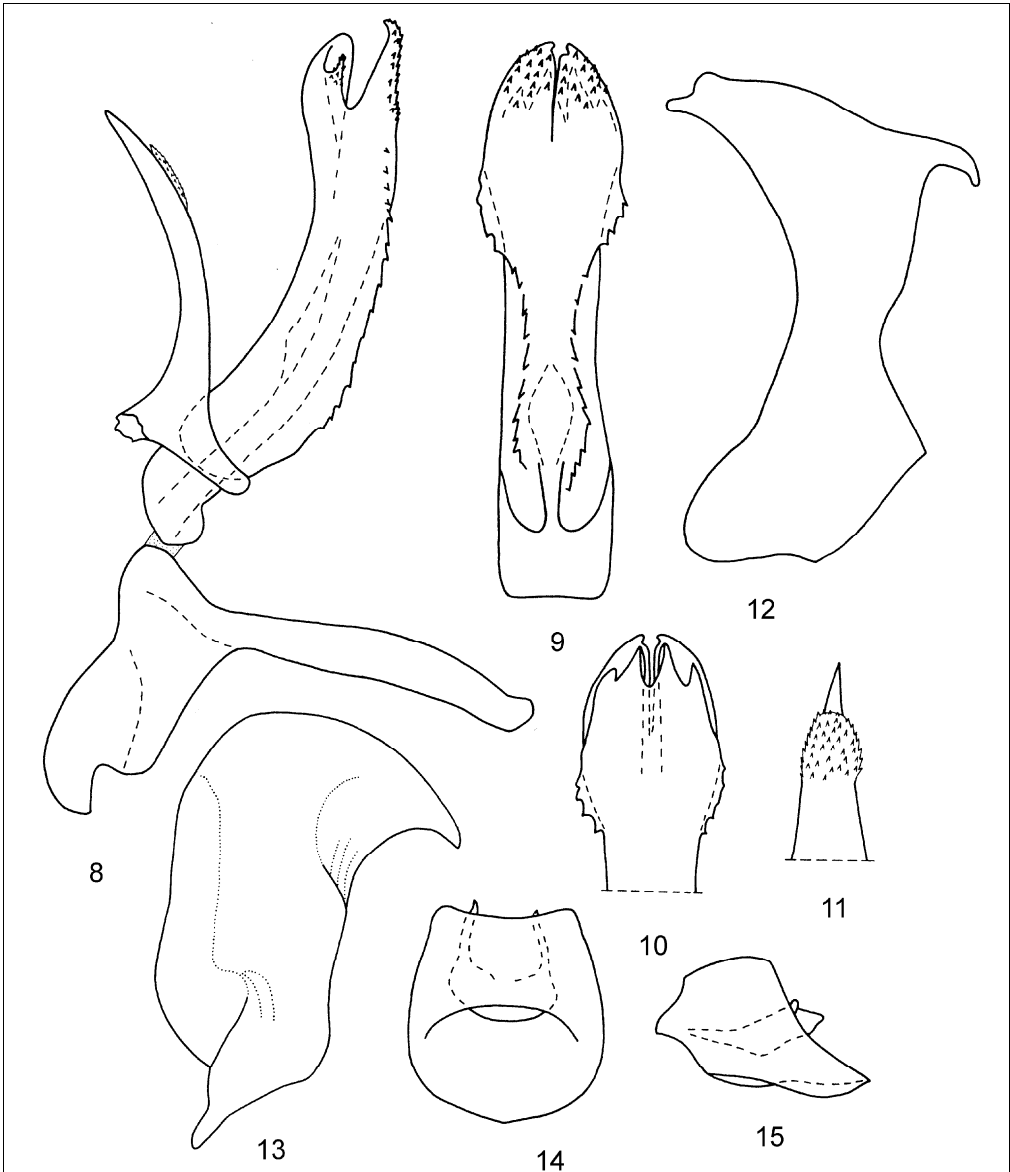


Plates 1-4. *Adenissus riadicus* Dlabola, habitus. 1: Specimen from Jebel Jibir, male, dorsal view; 2-4: Specimens from Sharjah Desert Park. 2: Male, dorsal view; 3: Female, dorsal view; 4: Male, frontal view.



Figures 1–7. *Adenissus riadicus* Dlabola, Oman, Dibab. Male genitalia. 1: Penis and connective, lateral view; 2: Apex of penis, dorsal view; 3: Penis, ventral view; 4: Anal tube, dorsal view; 5: Anal tube, lateral view; 6: Style, lateral view; 7: Pygofer, lateral view.

brown to dark brown, with dense yellow dots. Paranotal lobes, middle episternae and epimerae, and hind episternae light yellow, with dark brown or black patches. Mesonotum from light brown to black, with pale carinae and dots. Sometimes pro- and mesonotum totally



Figures 8–15. *Adenissus riadicus* Dlabola, UAE, Sharjah Desert Park. Male genitalia. 8: Penis and connective, lateral view; 9: Penis, ventral view; 10: Apex of penis, dorsal view; 11: Apex of suspensorium process, ventral view; 12: Pygofer, lateral view; 13: Style, lateral view; 14: Anal tube, dorsal view; 15: Anal tube, lateral view.

light yellow, with rare brown dots. Fore wings dark brown or black, with pale veins and claval margins, often with pale patches (Plates 1–3). Legs light yellow, with dark brown patches. Spines of legs black. Abdominal tergites from light yellow, with dark brown spots, to



Plate 5. *Calligonum crinitum arabicum* in the Sharjah Desert Park. (Photograph © V. Gnezdilov)

black, with light green yellowish spots. Abdominal sternites from light green yellowish to light brown. Male anal tube light yellow laterally, brown or black medially. Female gonopods light brown or brown. The structure of male genitalia varies in details between the specimens (Figs 1–15): Anal tube wide, convex, straight or weakly concave apically (Figs 4, 14). Hind margin of pygofer with hook-shaped subapical process (Figs 7, 12). Suspensorium (Gnezdilov & Wilson (2006) mistakenly treated it as the process of the phallobase) with large awl-shaped process above the phallobase, with pad of denticles subapically (Fig. 11). Style massive, capitulum without lateral tooth, hind margin convex, caudo-dorsal angle widely rounded (Figs 6, 13). Phallobase slightly curved (in lateral view) Figs 1, 8). Ventral phallobase lobe with two longitudinal rows of teeth, collar subapically, and slit apically (Figs 1–3, 8–10). The width of the collar varies between the specimens (Figs 3, 9). Dorsopically phallobase with 4 short processes (Figs 2, 10).

Female genitalia: Anal tube wide, truncate apically.

Total length. Males 3.7 (3.2 mm after Dlabola, 1985)–4.2 mm. Females 4.2–5.4 mm.

Remarks: In the UAE, *A. riadicus* Dlabola was collected on the coast of Arabian Gulf (Medinat Zayed), on sand dunes in the Sharjah Desert Park on *Calligonum crinitum arabicum* (Polygoniaceae) (Plate 5) and in mountains (Jebel Jibir, 1272 m) where several specimens were collected in water traps. Despite being flightless, three specimens were collected at light in the UAE (Medinat Zayed) and Oman (Jebel Shams, 1910 m; Nismah near Sur). In the Sharjah Desert Park 10 specimens of *A. riadicus* were collected during 10 hours sweeping

*C. crinitum arabicum* by net. In Oman *A. riadicus* was collected on *Limonium axillare* (Plumbaginaceae) and *Calligonum comosum* (Gnezdilov et al., 2004; Gnezdilov & Wilson, 2006). Perhaps the species has two generations – larvae are known from April and September–November (Gnezdilov et al., 2004; present data). Apparently there is difference in time of appearance of larvae in different regions. In middle–late April in sand desert (Sharjah Desert Park) the first generation appears – within the collected material females and larvae are prevalent, a single teneral male was collected on 13<sup>th</sup> April and another mature male on 25<sup>th</sup> April. In Saudi Arabia, the male holotype was collected on 17<sup>th</sup> March. The second generation probably starts (in mountains, Jebel Jibir) in late September–early October.

*Adenissus brachypterus* Linnavuori, 1973

Figures 16–21

Specimens examined: Holotype: ♂, labelled “W. Aden Prot. Lahej-Dhala road, 13-14.vii.63, Linnavuori” (AMNH). Paratype: ♂, same data (NMWC).

### Key to the species of the genus *Adenissus* in the Arabian Peninsula

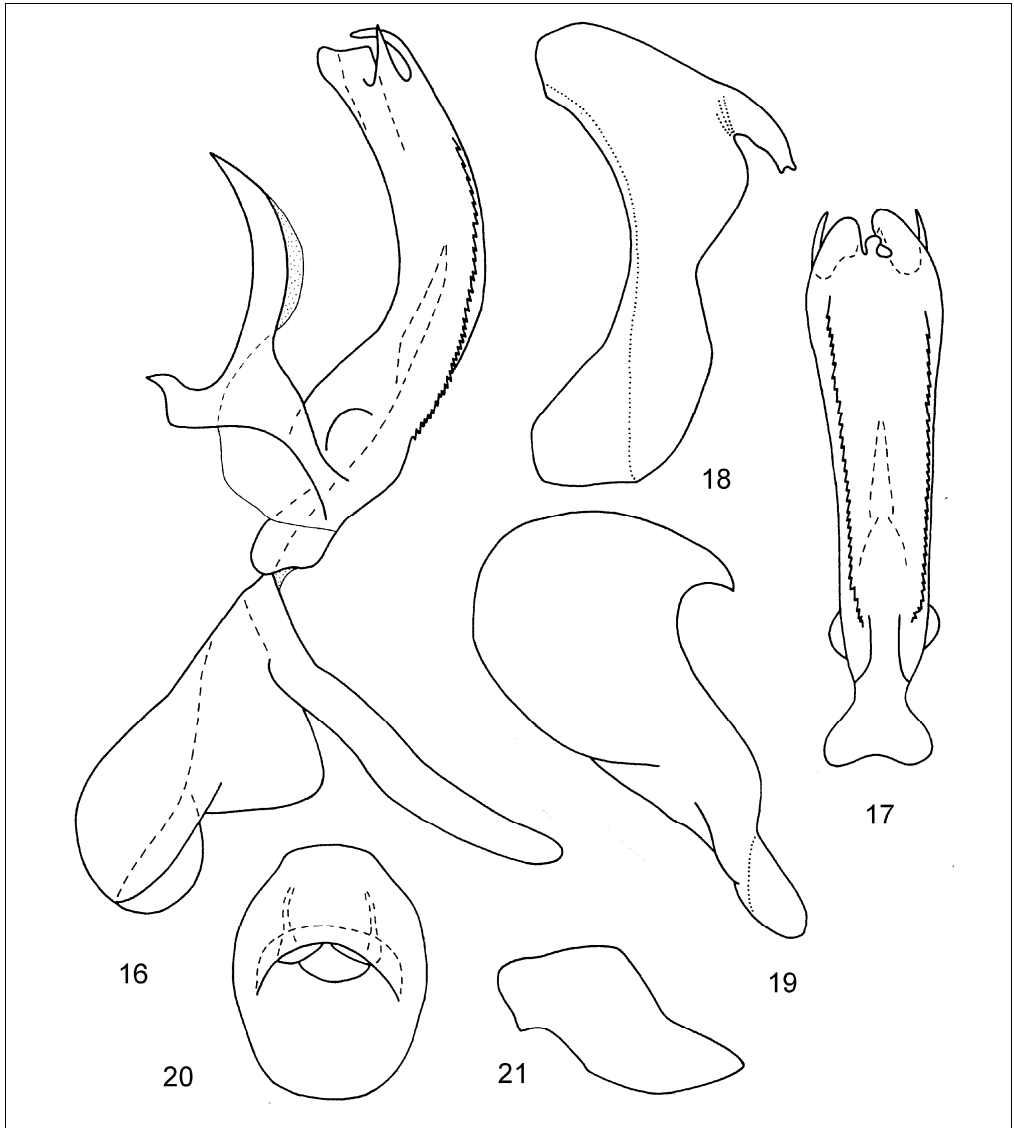
- 1 Fore wings reach hind margin of tergite IV. Ventral phallobase lobe without collar subapically (Fig. 17). The processes of hind margin of pygofer with truncate apices (Fig. 18). Male anal tube more narrow (in dorsal view) (Fig. 20) ..... *Adenissus brachypterus* Linnavuori
- Fore wings reach hind margin of tergites V–VI. Ventral phallobase lobe with collar subapically (Figs 3, 9). The processes of hind margin of pygofer with rounded apices (Figs 7, 12). Male anal tube wider (in dorsal view) (Figs 4, 14) ..... *Adenissus riadicus* Dlabola

### ACKNOWLEDGEMENTS

We are pleased to thank Mr. Antonius van Harten for his help allowing us to visit the UAE, and Mr. Khalid Mahmood for his assistance with fieldwork, and Dr. Randall Schuh and Dr. Christine A. Johnson (New York, USA) for an opportunity to study the holotype of *Adenissus brachypterus*. The first author was supported by the Alexander von Humboldt Stiftung (Germany).

### REFERENCES

- Dlabola, J. (1980): Tribus-Einteilung, neue Gattungen und Arten der Subf. Issinae in der eremischen Zone (Homoptera, Auchenorrhyncha). *Acta Musei Nationalis Pragae*, 36B (4): 173–248.
- Dlabola, J. (1983): Neue mediterrane, meistens anatolische Issiden (Homoptera, Auchenorrhyncha). *Acta Entomologica Bohemoslovaca*, 80: 114–136.
- Dlabola, J. (1985): Neue mediterrane, eremische und ostafrikanische Issiden-Taxone (Hom., Auchenorrhyncha). *Sbornik Narodniho Muzea v Praze Rada B Prirodni Vedy*, 40 (3–4): 217–243.
- Emeljanov, A.F. (1995): On the problem of classification and phylogeny of the family Delphacidae (Homoptera, Cicadina) taking into consideration larval characters. *Entomologicheskoe obozrenie*, 74 (4): 780–794. English translation published in *Entomological Review*, 1995, 75 (9): 134–150.



Figures 16–21. *Adenissus brachypterus* Linnavuori, holotype. Male genitalia. 16: Penis and connective, lateral view; 17: Penis, ventral view; 18: Pygofer, lateral view; 19: Style, lateral view; 20: Anal tube, dorsal view; 21: Anal tube, lateral view.

Emeljanov, A. F. (1999): Notes on delimitation of families of the Issidae group with description of a new species of Caliscelidae belonging to a new genus and tribe (Homoptera, Fulgoroidea). *Zoosystematica Rossica*, 8 (1): 61–72.

Emeljanov, A. F. (2008): New species of the genus *Peltonotellus* Puton (Homoptera, Caliscelidae) from Kazakhstan, Middle and Central Asia. *Tethys Entomological Research*, 16: 5–12. (In Russian with English summary)



- Gnezdilov, V.M. (2003): Review of the family Issidae (Homoptera, Cicadina) of the European fauna, with notes on the structure of ovipositor in planthoppers. *Chteniya pamyati N.A. Kholodkovskogo (Meetings in memory of N.A. Cholodkovsky), St. Petersburg*, 56 (1): 1–145. (In Russian with English summary).
- Gnezdilov, V.M. (2008): On the taxonomy of the tribe Adenissini Dlabola (Hemiptera: Fulgoroidea: Caliscelidae: Ommatidiotinae), with the description of a new genus and a new species from Vietnam. *Acta Entomologica Slovenica*, 16 (1): 11–18.
- Gnezdilov, V.M. & T. Bourgoin (2009): First record of the family Caliscelidae (Hemiptera: Fulgoroidea) from Madagascar, with description of new taxa from the Afrotropical Region and biogeographical notes. *Zootaxa*, 2020: 1–36.
- Gnezdilov, V.M., S. Drosopoulos & M.R. Wilson (2004): New data on taxonomy and distribution of some Fulgoroidea (Homoptera, Cicadina). *Zoosystematica Rossica*, 12 (2): 217–223.
- Gnezdilov, V.M. & M.R. Wilson (2006): Systematic notes on tribes in the family Caliscelidae (Hemiptera: Fulgoroidea) with the description of new taxa from Palaeartic and Oriental Regions. *Zootaxa*, 1359: 1–30.
- Jongbloed, M. (2003): The comprehensive guide to the wild flowers of the United Arab Emirates. ERWDA, Abu Dhabi, 576 pp.
- Linnavuori, R. (1973): Hemiptera of the Sudan, with remarks on some species of the adjacent countries 2. Homoptera auchenorrhyncha: Cicadidae, Cercopidae, Machaerotidae, Membracidae and Fulgoroidea. (Zoological contribution from the Finnish expeditions to the Sudan no. 33). *Notulae Entomologicae*, 53: 65–137.
- Melichar, L. (1906): Monographie der Issiden (Homoptera). *Abhandlungen der K. K. Zoologisch-botanischen Gesellschaft in Wien*, 3 (4): 1–327.

**Authors' addresses:**

Dr. V.M. Gnezdilov, Zoological Institute of the Russian Academy of Sciences, Universitetskaya nab. 1, St. Petersburg 199034, Russia; e-mail: vmgnezdilov@mail.ru, vgnedzilov@zin.ru

Dr. M.R. Wilson, National Museum of Wales, Cathays Park, Cardiff CF10 3NP, UK; e-mail: Michael.Wilson@museumwales.ac.uk