

On the distribution of *Campsicnemus armatus* (Zetterstedt, 1849) species group (Diptera: Dolichopodidae)

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The *Campsicnemus armatus* species group differs from the other groups in simple male legs, but with the mid tibia bearing a comb-like posteroventral row of blunt-ended bristles. It includes the Palaearctic *Campsicnemus armatus* (Zetterstedt, 1849), *C. pumilio* (Zetterstedt, 1843), *C. vtorovi* Negrobov et Zlobin, 1978, and *C. caffer* Curran, 1926, known from northern and southern Africa. *C. armatus* var. *deserti* Vaillant, 1953 (unavailable name) from Algeria is associated with *C. caffer*, which is now spread in the two zoogeographical Regions. New records are given for *C. armatus*, *C. vtorovi* and *C. caffer*. Modified couplets in a key to Palearctic species of *Campsicnemus* and a new key to Afrotropical species of the genus are provided. Photographs of male antenna and mid tibia of species of the *Campsicnemus armatus* group are published for the first time.

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Introduction

The genus *Campsicnemus* Haliday in Walker et al., 1851, has an extremely high diversity of endemic species in the Hawaiian Islands and French Polynesia (Evenhuis, 2009; 2015), with more than 310 species worldwide (Grichanov, 2017a). Grichanov (1998; 2009) composed the last identification keys to the Afrotropical and Palaearctic species of *Campsicnemus*. *C. armatus* (Zetterstedt, 1849) was included into the both keys, as well as into the key to *Campsicnemus* males from Atlantic Ocean islands (Grichanov, 2012a). The last paper has proposed to consider the southern African *C. caffer* Curran, 1926 as a subspecies of the trans-Palaearctic *C. armatus*, which has also two very close Palaearctic species, i.e. the trans-Palaearctic *C. pumilio* (Zetterstedt, 1843) and *C. vtorovi* Negrobov et Zlobin, 1978 known only from its type locality in Kyrgyzstan.

Grichanov (2012a) has described three new Afrotropical species of the genus and excluded *C. a. armatus* and *C. atlanticus* Dyte, 1980 from the Region. For this study, I have re-examined the recently published material on *C. armatus*, *C. caffer*, *C. pumilio* and *C. vtorovi* (Grichanov, 2012b, 2017b; Grichanov et al., 2017; Grichanov, Bagachanova, 2018; Grichanov, Ovsyannikova, 2018) and provide new records. Modified couplets in a key to Palearctic species of *Campsicnemus* and a new key to Afrotropical species of the genus are also presented, and characters of the *C. armatus* group of species are discussed and illustrated.

Material and methods

The material examined is housed at the National Museum, Bloemfontein, South Africa (BMSA), the Natal Museum, Pietermaritzburg, South Africa (NMSA), the Museum of Zoology, University of Lund, Sweden (MZLU), the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia (ZIN) and the Zoological Museum of Moscow State University, Moscow, Russia (ZMUM). The material published previously and collected from Iran, Russia (Arkhangelsk, Murmansk, Voronezh, Ulyanovsk Regions, Altai Territory, Yakutia), Sweden, South Africa has been re-examined (but not listed here).

Specimens were studied and photographed with a ZEISS Discovery V-12 stereo microscope and an AxioCam MRc5 camera. Morphological terminology and abbreviations follow Grichanov, Brooks (2017).

Results

Campsicnemus armatus species group

DIAGNOSIS. Male legs simple, but the mid tibia bearing a comb-like posteroventral row of blunt-ended bristles.

Campsicnemus armatus (Zetterstedt, 1849) (Figs 1, 4, 9, 10)

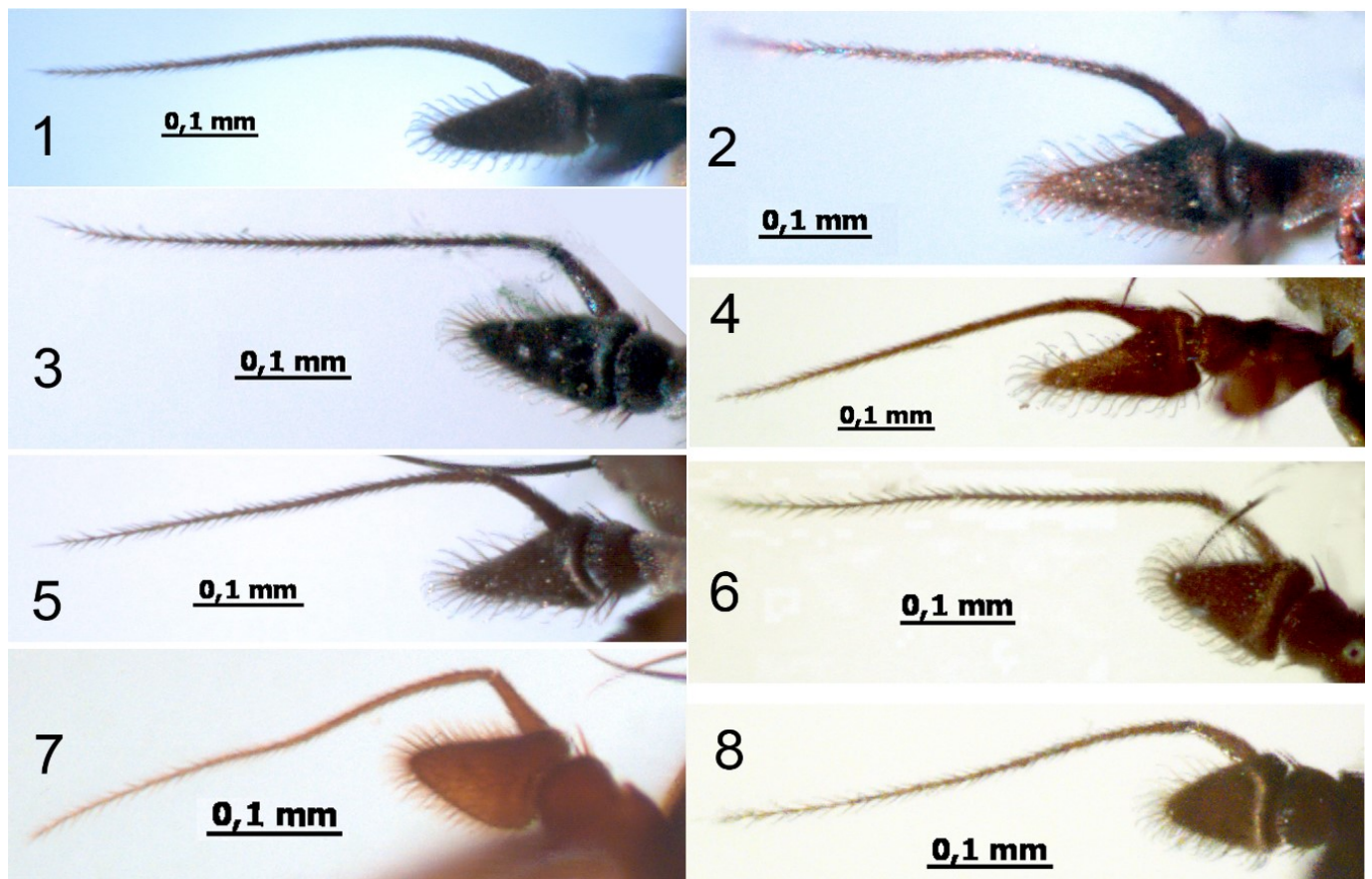


Figure 1. Figs 1-8. *Campsicnemus* sp., male antenna. Figs 1, 4. *C. armatus* (Zetterstedt): 1 — Russia: Solovetskie Islands; 4 — Russia: NE Yakutia. Figs 2, 3, 5. *C. vtorovi* Negrobov et Zlobin: 2 — Russia: Voronezh Region; 3 — Russia: Ulyanovsk Region; 5 — Iran: Markazi Prov. Figs 6-8. *C. caffer* Curran: 6 — South Africa: Western Cape; 7 — South Africa: Kwa Zulu-Natal (in ethanol); 8 — Ethiopia: Oromia.

Dolichopus armatus Zetterstedt, 1849: 3093. Type locality: Denmark: Rosenthal, Gryphium (male lectotype and 5 paralectotypes examined in MZLU).

Campsicnemus prodromus (Haliday, 1832) (nec Meigen, 1824).

Camptosceles prodromus Haliday, 1832: 358. Type locality: Ireland: Holywood.

Campsicnemus pectinifer De Meijere, 1907: 178. Type locality: Netherlands: Diemen, Naarden.

MATERIAL. 1♂, [Russia: Nenetsia:] 60 km N Narjan-Mar, Pechora River, 10.VII.2008, N.Vikhrev (ZMUM).

DISTRIBUTION. Palaearctic: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Mongolia, Netherlands, Norway, Poland, Russia (Arkhangelsk, Kamchatka, Karelia, Krasnoyarsk, Murmansk, Nenetsia, Tatarstan, Yakutia, Yamal, Yekaterinburg), Slovakia, Sweden, Turkey (Kars), UK. Here excluded from Iran and North Africa.

***Campsicnemus pumilio* (Zetterstedt, 1843)**

Dolichopus pumilio Zetterstedt, 1843: 606. Type locality: Sweden: "Sueciam in Scania ad Scandhammar et Silfakra" (male lectotype and 4 paralectotypes examined in MZLU, 2 more possible paralectotypes in Wallengren collection, MZLU).

Campsicnemus pectinulatus Loew, 1864: 390; Lundbeck, 1912: 368; Parent, 1938: 620, fig. 848. Type locality: Germany: "Ziegelwiese bei Halle"

MATERIAL. 1♂, Russia: Novgorod env., 4.07.2012, I. Grichanov (ZIN).

DISTRIBUTION. Palaearctic: Austria, Belgium, Czech, Denmark, Estonia, Finland, France, Germany, N Kazakhstan, Kyrgyzstan, Netherlands, Poland, Romania, Russia (Karelia, Krasnodar, Krasnoyarsk, Leningrad, Moscow, Novgorod, Ryazan, Yakutia, Kamchatka), Sweden, UK. Here excluded from Ulyanovsk Region.

***Campsicnemus vtorovi* Negrobov et Zlobin, 1978**

(Figs 2, 3, 5, 11-14)

Campsicnemus vtorovi Negrobov et Zlobin, 1978: 54. Type locality: Kyrgyzstan: Naryn river valley, Karakolka Mt.

Campsicnemus pumilio Grichanov, 2012b: 251 (nec Zetterstedt, 1843; misid.).

Campsicnemus armatus Ahmadi et al., 2017: 68; Grichanov, 2017b: 36; Grichanov et al., 2017: 100 (nec Zetterstedt, 1849; misid.).

MATERIAL. Iran: 2♂, Markazi prov.: Arak env., 26 km W, Baneh village, 34°05' N, 49°24' E, 2117 m a.s.l., 19.V.2017; 1♂, Shazand env., 7 km W, Astaneh Town env., Seidan chashmah, 33°55' N, 49°20' E, 2289 m a.s.l., 20.V.2017; Russia: 1♂, Ulyanovsk Region, Sengilei Distr., Shilovka env., 1-3.IX.2010, K. Tomkovich (ZIN); 8♂♀, Voronezh Region, Liski Distr., Divnogor'e, 8, 9.VII.1994, Zlobin (ZIN).

DISTRIBUTION. Palaearctic: Iran (Lorestan, Markazi), Kyrgyzstan, Russia (Altai Territory; Ulyanovsk, Voronezh). New for Iran and Altai Territory and Ulyanovsk Region of Russia.

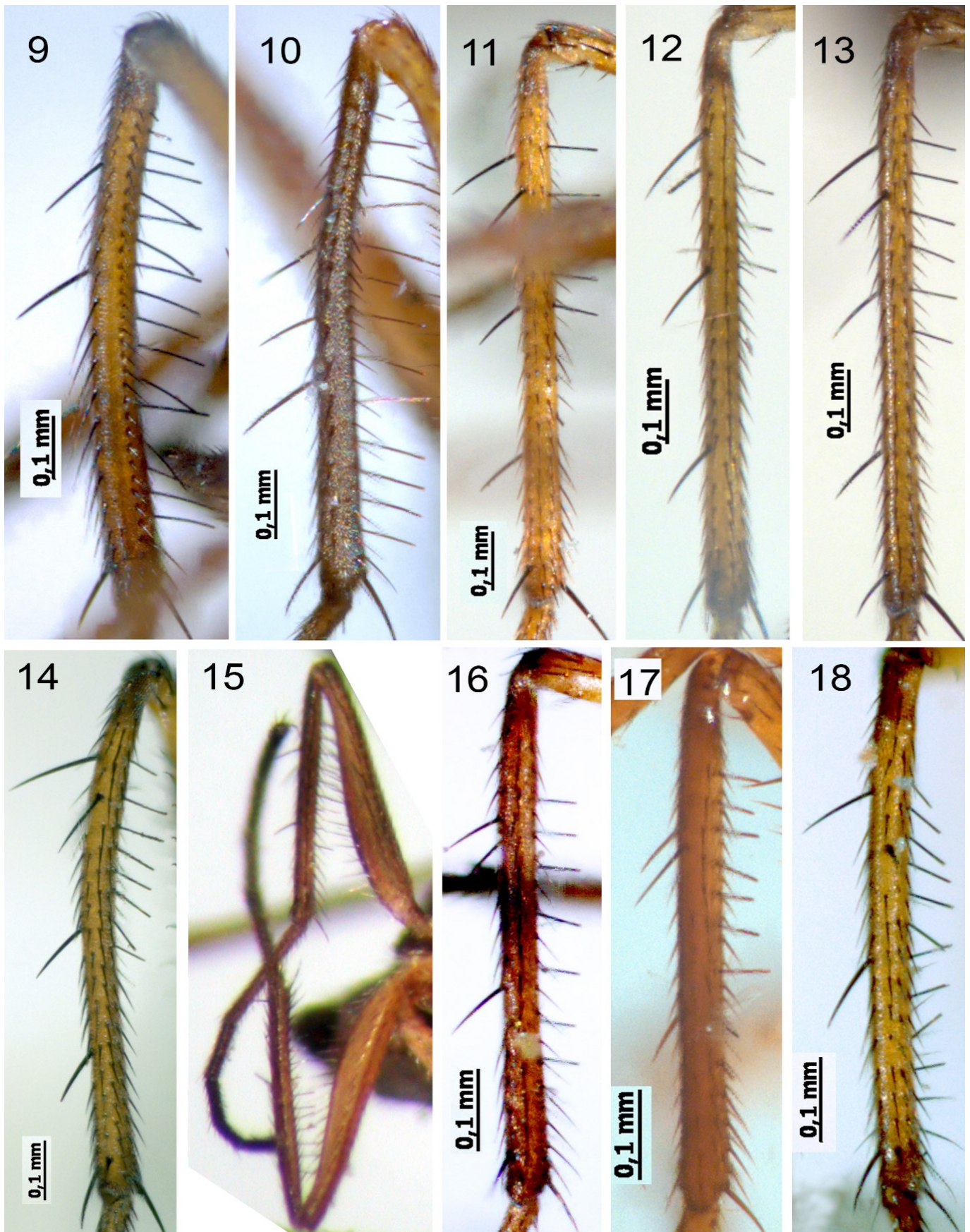


Figure 2. Figs 9-18. *Campsicnemus* sp., mid tibia. Figs 9, 10. *C. armatus* (Zetterstedt): 9 – Russia: Solovetskie Islands; 10 – Russia: NE Yakutia; Figs 11-14. *C. vtorovi* Negrobov et Zlobin: 11 – Russia: Voronezh Region; 12 – Russia: Ulyanovsk

Region; 13 — Russia: Altai Territory; 14 — Iran: Markazi Prov. Figs 15-18. *C. caffer* Curran: 15 — South Africa: Mpumalanga (holotype); 16 — South Africa: Western Cape; 17 — South Africa: Kwa Zulu-Natal (in ethanol); 18 — Ethiopia: Oromia.

***Campsicnemus caffer* Curran, 1926**

(Figs 6-8, 15-18)

Campsicnemus caffer Curran, 1926: 15; Grichanov & Mostovski, 2009a: 42. Type locality: South Africa: Mpumalanga: Barberton (male lectotype and 1 paralectotype examined in NMSA).

Campsicnemus armatus caffer Curran, 1926; Grichanov, 2012a: 8.

Campsicnemus armatus deserti Vaillant, 1953: 11 (as var. of *C. armatus*); Negrobov, 1991: 59 (as a subsp. of *C. armatus*; unavailable name according to ICZN, 45.6.4.1, as published after 1980). Type locality: not given [SE Algeria: Tassili n'Ajjer].

MATERIAL. Ethiopia: 2♂, Oromia, Ziwai L., 7.91°N, 38.73°E, 1640 m, 11-13.II.2012, N. Vikhrev (ZMUM); Namibia: 2♀, Katima Mulilo Distr., Salambala Forest at: 17°50.066'S / 24°36.225'E, 926 m, Malaise trap, 18-20.XI.2012, 926 m, A.H. Kirk-Spriggs / Miombo and Moppane woodlands (BMSA); South Africa: 1♂, Free State, Brandfort, Florisbad Res. Stat., 28°46.039'S, 26°04.234'E, 25-29.X.2010, A.H. Kirk-Spriggs / Malaise traps, *Acacia* savanna (BMSA); 1♀, Free State, Harrismith Scotland Farm, 27°28.595'S, 29°37.098'E, 10-12.XI.2009, A.H. Kirk-Spriggs / Malaise traps, dense *Leucosidea* dominated scrub (BMSA); 2♂, 1♀, Western Cape, Gamkaskloof (Die Hel), 33°21.808'S, 21°37.650'E, 16-18.X.2012, 336 m, A.H. Kirk-Spriggs / Malaise traps, Karoo and valley, *Acacia* woodland (BMSA); 1♀, same label, but 12-13.IX.2013; 1♂ (in ethanol), KZN, Royal Natal Nature Reserve, Gudu Forest, 28°40.90'S, 28°55.78'E, 1680-1730m, 22.9-17.XI.2006, Mostovski M.B., MT (NMSA).

DISTRIBUTION. Afrotropical: Ethiopia, Namibia, South Africa; Palearctic: Algeria. First record from Ethiopia.

Modified couplets in the key to Palearctic species of *Campsicnemus* (males) published by Grichanov (2009)

33. Mid tibia without a comb-like ventral row of blunt-ended bristles, with rows of simple hairs and setae; mid basitarsus as long as next segment (Russian Far East) 34
- Mid tibia with a comb-like posteroventral row of blunt-ended bristles; mid basitarsus distinctly longer than next segment 35
34. Face dark; postpedicel hardly longer than high at base; legs mainly black; mid tibia without row of long bristles, with full row of erect posteroventral setae, nearly as long as diameter of tibia; 2.3 mm *C. zlobini* Grichanov, 2012
- Face silvery white; postpedicel 2 times longer than high at base; legs almost completely pale yellow; mid tibia with row of 7-8 bristles in distal 2/3, two times longer than diameter of tibia; 1.3-1.5 mm *C. versicolorus* Negrobov et Zlobin, 1978
35. Fore coxa with only yellow hairs and bristles; mid tibia usually with 3 dorsal bristles; antennal postpedicel triangular, slightly longer than high at base; 1.5 mm (northern and southern Africa) *caffer* Curran, 1926
- Fore coxa with at least some apical bristles black; mid tibia usually with 4 dorsal bristles;

antennal postpedicel triangular or elongate triangular 37

37. Antennal postpedicel triangular, slightly longer than high at base, with rounded apex; mid tibia with a comb-like row of blunt-ended bristles in basal half only; mid femur usually with 1 row of ventral setae; 1.5 (Trans-Palaeartic except subarctic) *pumilio* (Zetterstedt, 1843)

- Antennal postpedicel elongate triangular, nearly twice longer than high at base, with acute apex; other features various 38

38. Mid tibia, posteroventrally along almost whole length, with a comb-like row of blunt-ended bristles; mid femur usually with 2 rows of ventral setae; 1.5-2.0 (Trans-Palaeartic except subtropics) *armatus* (Zetterstedt, 1849)

- Mid tibia with a comb-like row of blunt-ended bristles in basal half only; 1.7-2.4 mm (Iran, Kyrgyzstan, Russia) *vtorovi* Negrobov et Zlobin, 1978.

Key to Afrotropical species of *Campsicnemus* (males) *

*Three species and subspecies (*C. a. armatus*, *C. a. deserti* and *C. atlanticus*) are excluded from the last key (Grichanov, 1998), and three species described from the St. Helena Island (Grichanov, 2012a) are added.

1. Antenna mostly brownish yellow; fore leg simple; mid femur simple or modified; mid tibia more or less strongly thickened, covered with 1-2 rows of very long bristles (St. Helena) 2

- Antenna black; fore leg simple or modified; mid femur simple; mid tibia simple, without very long bristles 6

3. Mid tibia considerably dilated along entire length and curved; mid basitarsus with thick apical tooth; 1.5 mm *sanctae-helenae* Grichanov, 2012

- Mid tibia not dilated or slightly thickened; mid basitarsus with at most thin apical spine 4

4. Mid femur without ventral subapical excavation; mid tibia with erect ventral spinules and cilia along entire length; mid basitarsus 1.5 times longer than next segment; 3.7 mm *flavissimus* Grichanov, 2012

- Mid femur with deep ventral subapical excavation; mid tibia without erect ventral spinules and cilia; mid basitarsus no longer than next segment 5

5. Mid tibia and basitarsus densely covered with long setae along entire length; antennal postpedicel 3 times longer than high at base, with drawn-out apex; 1.85 mm *meridionalis* Grichanov, 2012

6. Fore tibia strongly dilated; tarsal segments 1, 2 and 4 shortened, and 1st-3rd segments of fore tarsus bearing very long processes covered with long hairs; 3.0 mm (St. Helena; Palaeartic) *magius* (Loew, 1845)

- Fore tibia simple or slightly dilated; tarsal segments simple or variously ornamented
..... 7

7. Fore tibia swollen, with dorsal row of 4 long setae on basal half; fore basitarsus with long appendages; other tarsomeres with long setae; about 2 mm (DR Congo)

..... *yangi* Grichanov, 1998

- Fore tibia simple; fore basitarsus without appendages

..... 8

8. Fore coxa with black hairs and bristles; mid tibia with row of simple ventral hairs; fore tarsomeres 1-3 with 2 rows of long, 3-4 times as long as diameter of segments; fore basitarsus with one long bristle at base reaching tip of 2nd segment; 2.5 mm (Cameroon)

.....
lantsovi Grichanov, 1998

- Fore coxa with yellow hairs and bristles; mid tibia with posteroventral row of blunt black setae; fore tarsus without long setae; 1.5 mm (northern and southern Africa)

..... *caffer* Curran, 1926

Discussion

The European authors (Parent, 1938; Negrobov, Stackelberg, 1969; d'Assis Fonseca, 1978; etc.) distinguished *Campsicnemus armatus* and *C. pumilio* (= *C. pectinulatus*) by the relative length of antennal postpedicel and the number of blunt bristles on mid tibia mainly. Negrobov & Zlobin (1978) described a new species *C. vtorovi* from mountains of Kyrgyzstan, comparing it with *C. pectinulatus*. *C. vtorovi* shares features of both *C. armatus* and *C. pumilio*, having elongate triangular postpedicel and comb-like row of blunt-ended bristles in basal half of mid tibia. This morphospecies was most probably overlooked in Europe until recently. All other characters used in those species descriptions and in keys seem to be variable, including colour of the legs (mostly yellow or mostly blackish femora and tibiae). Nevertheless, the number and length of posteroventral blunt-ended bristles are also variable in all the three species (see figs 9-18 and references below).

The most common species of the group, *C. armatus* and *C. pumilio*, have been often reported from the same countries (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Netherlands, Poland, Sweden, UK) and territories of Russia (Kamchatka, Karelia, Krasnoyarsk, Yakutia). This distributional pattern along with the variability of mid leg setation suggests that the two forms are both of one species. *C. pumilio* is also characterized by somewhat shorter antennal postpedicel, similar to that in *C. caffer* (see below), but this is also a variable character (figs 1-8). Taking into the consideration the new records of the intermediate *C. vtorovi* in this paper, it cannot be regarded as a subspecies of either *C. armatus* or *C. pumilio*.

Curran (1926) distinguished his new species from *C. armatus* by the presence of only three dorsal bristles on mid tibia (four bristles are usually present in the other species of the group). However, the number, position, and length of these bristles seem to be variable. Most *C. armatus* specimens examined have mid tibia with four bristles (a pair of postero/anterodorsals on basal third and a pair of dorsals below). Nevertheless, at least one male and one female of the latter species from the Russian North (Nenetsia and Solovetskie Islands) have mid tibia with only three bristles (a pair of postero/anterodorsals on basal third and one dorsal below). Vaillant (1953) distinguished his central Saharan variety from the European specimens of *C. armatus* by entirely yellow bristles on fore coxa, and this character seems to be present in all Afrotropical specimens examined. The discovery of *C. caffer* in mountains of Ethiopia has allowed me to associate the *desert* variety sensu Vaillant with this South-African species, rather than with *C. armatus*. The characters briefly

described by Vaillant (1953) for the *desertivariety* are identical with those in *C. caffer*. The Palaearctic specimens of *C. armatus*, *C. pumilio* and *C. vtorovi* bear 2 to 6 black bristles on fore coxa, sometimes with addition of a few yellow or golden bristles. The number and length of ventral bristles on mid femur and tibia are variable in *C. caffer* as well. Generally, these bristles are somewhat weaker in *C. caffer* (as in *C. pumilio* and *C. vtorovi*), than in *C. armatus*. The antennal postpedicel of *C. caffer* males is shorter than that in males of *C. armatus* and *C. vtorovi*. In addition, *C. armatus* variety with dark or blackish femora and tibiae is not uncommon (see Parent, 1938), while the similar variety is yet unknown in *C. caffer*.

Species of the *Campsicnemus armatus* group seem to be rather variable in its wide area, being a multiregional polyzonal species or a complex of cryptic species distinguished poorly without molecular analysis. *C. caffer* has a peculiar disjunctive area, occurring in southern (SAR and Namibia) and northern Africa (SE Algeria and Ethiopia). It is now spread formally in two zoogeographical Regions, though the species was reported in mountains of Algeria not far from the border with the Republic of the Niger. The nominotypical species *C. armatus* is distributed almost all over the boreal band of Palaearctic Region (except subtropics), inhabiting the banks of various water sources.

Campsicnemus as a whole is poorly represented in the Afrotropics, with three species on the continent and four species on the St. Helena, which were probably introduced to the Island by human. This is true for at least *C. magius*, mainly Mediterranean species. The continental African species of the genus have close relations with some groups of much richer Palaearctic fauna (with about 40 species).

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