

Systematic, synonymic and geographic notes on *Bembidion* (*Terminophanes*) *pulcherrimum* (Motschulsky, 1850) and its closest relatives (Coleoptera: Carabidae: Bembidiini)

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Abstract

B. pulcherrimum (Motschulsky, 1850), formerly ranked by different authors both as good species or subspecies of *B. terminale* Heer, 1841, is treated here as **bona species**. Its known distribution includes now also Turkey and NW Iran; photos are provided for the easy identification of the taxon. *B. terminale confinis* Korge, 1964 is here proposed for **new synonym** of *B. pulcherrimum*. A first record of *B. terminale kirgisorum* Netolitzky, 1933 for China, Xinjiang, is also given.

Key words: Taxonomy, tricorned body, endophallus, Palaearctic Region, Turkey, Iran, China.

Introduction

In 2006 one of us (BG) discovered three Iranian specimens of subgenus *Terminophanes* Müller-Motzfeld, 1998 in the collections of the Hungarian Natural History Museum. Some years later, other specimens of the same taxon were discovered by LT in the collection of Andreas Pütz (Eisenhüttenstadt, Germany), and we decided to proceed with a collaborative study of the material.

The subgenus *Terminophanes* was proposed in order to unify species related to *B. terminale* Heer, 1841. Its species exhibit a typical pronotal characterization (poorly pointed posterior angles, highly reduced laterobasal carinae, and flat, almost impunctate base (Müller-Motzfeld 1998) but the most important features can be found within the endophallus. First is the presence of a strongly sclerotized, funnel-shaped sclerite called “tricorned body” (Lindroth 1963; Toledano 2008) or “trichterförmige” (Müller-Motzfeld 1998), placed in the anterior portion of the inner sac, near the anterior end of the flagellum: this structure is the main apomorphy in *Terminophanes*, since, so far, it has never been documented in other groups of *Bembidion* Latreille, 1802 sensu lato. Second, the central brush is displaced at a proximal position, very close to the basal orifice of the aedeagus (in a similar position this structure is seen also in some species of subgenus *Peryphanes* Jeannel, 1941). Fifteen taxa of *Terminophanes* were treated as valid in the Palaearctic Catalogue of the Carabidae (Maggi *et al.* 2003): *B. avaricum* Belousov & Sokolov, 1988, *B. consummatum* Bates, 1873, *B. delerei* Fassati, 1957, *B. kaschmirensis dux* Andrewes, 1935, *B. kaschmirensis kaschmirensis* Netolitzky, 1920, *B. kaschmirensis ochropus* Andrewes, 1935, *B. mckinleyi scandicum* Lindroth, 1943, *B. ovalipenne* Solsky, 1874, *B. pseudoconsummatum* Kirschenhofer, 1984, *B. terminale confinis* Korge, 1964, *B. terminale*

dardum Bates, 1889, *B. terminale kirgisorum*, *B. terminale pulcherrimum*, *B. terminale terminale*, and *B. terminale tujngoli* Jedlicka, 1966. Later, Toledano (2008) confirmed the validity of the subgenus and separated it from the other groups of *Ocydromus* Clairville, 1806 *sensu lato*, including four more species within *Terminophanes*: *B. roberti* Toledano, 2000; *B. muellermotzfeldi* Toledano, 2000; *B. leve* Andrewes, 1924 and *B. zierisi* Toledano, 2008.

In the literature, the taxon *pulcherrimum* was ranked in many different ways. Netolitzky (1943) and Iablokoff-Khnzorian (1976) classified it as aberration of *B. terminale*, Belousov & Sokolov (1988), Kryzhanovskij *et al.* (1995) and Lorenz (1998) as a good species. Recently, following Müller-Motzfeld (1998), who stated that possibly also *pulcherrimum* was a subspecies of *terminale* (“möglicherweise ebenso ssp. von *terminale* sind”, *ibid.*: 75), it was ranked with this status (Maggi *et al.* 2003, Lorenz 2005).

Material and Methods

This paper is based on the study of about 250 specimens of *Bembidion* subgenus *Terminophanes* Müller-Motzfeld, 1998.

The specimens mentioned in this paper come from the collections of the following institutions and individuals:

CPEG	Andreas Pütz collection, Eisenhüttenstadt, Germany
CPMI	Maurizio Pavesi collection, Milano, Italy
CTVR	Luca Toledano collection, Verona, Italy
HNHM	Hungarian Natural History Museum, Budapest, Hungary
HUMB	Humboldt–Universität Museum für Naturkunde, Berlin
MIZ	Museum and Institute of Zoology, Warszawa, Poland
NHMW	Naturhistorisches Museum, Wien, Austria
NMNHS	National Museum of Natural History, Sofia, Bulgaria

Dissections were made using standard techniques.

The photographs are composite images with progressive focusing obtained with a Nikon DSFi1 digital camera controlled by Nikon DS-L2 stand alone remote controller mounted on a Leica Z6 microscope equipped with a 1.0x Leica lens and a customized motorized stand made by LT, then processed on a Macintosh Mac Book Pro computer with Helicon Focus ® 3.61 program and then optimized with Photoshop® Elements 3.0 and Nikon ViewNX2® on the same computer. Photographs of the aedeagi and body details are made with the same setup and processing method described above, while using a 5x Infinity Corrected Nikon Fluor lens on the Z6 microscope.

The systematic treatment of the subtribe Bembidiina follows Maddison (2012).

The distribution map was made using the online mapping software SimpleMappr (©David P. Shorthouse).

Systematics

Bembidiini Stephens, 1827

Genus *Bembidion* Latreille, 1802

Bembidion (Terminophanes) pulcherrimum (Motschulsky, 1850: 10)
(Figs. 3, 4, 9, 10, 11, 12, 13)

Peryphus pulcherrimus Motschulsky 1850: 10 (type locality: “Piatigorsk”, cfr. Netolitzky, 1935: 32);

Bembidion bisignatum Ménétries 1831 [nec Audinet-Serville, 1821];

Bembidion bisignatum Bodemeyer 1905: 85 (“Bulghar-Maaden”), 102;

Bembidion terminale ab. *pulcherrimum* Netolitzky, 1935: 32;

Bembidion terminale ab. *pulcherrimum* Netolitzky 1943: 131 (“Armen. Taurus (Moks)”);

Bembidion terminale confinis Korge 1964: 109 (type locality: “Bayburt”), **new synonym**

Bembidion terminale ab. *pulcherrimum* Iablokoff-Khnzorian 1976: 168, 181 (Alaverdi, Babajan);

Bembidion pulcherrimum Belousov & Sokolov 1988: 59, 61;

Bembidion pulcherrimum Kryzhanovskij *et al.* 1995: 87;

Bembidion pulcherrimum Lorenz 1998: 215;
Bembidion terminale possibly ssp. *pulcherrimum* Müller-Motzfeld 1998: 75;
Bembidion terminale ssp. *pulcherrimum* Marggi *et al.* 2003: 268;
Bembidion terminale ssp. *pulcherrimum* Lorenz 2005: 231.

Type material. ♀ holotype of *B. terminale confinis* Korge, 1964, “Bayburt 1600m, 3.8.63 / leg. H. Korge, Anatolia bor. [white label, printed] // ♀ Holotypus, *Bembidion (Peryphus), terminale* Heer, ssp. *confinis* Korge [red label, handwritten]” (HUMB).

Other examined material.

UNPRECISE LOCALITY: 1f#, Kaukaz (MIZ).

RUSSIA: 3♂, 3♀, Caucasus, Elbrus, Itkol, 14.6.1983, R. Fencel lgt. (CTVR).

AZERBAIJAN: 1♀, Azerbaidjan, Nachichivan, Buzgov, 16-6-1983 (CTVR).

TURKEY: 2♂, 1♀, Anatolia centr., Palandöken – D. s. Erzurum 2200m, 29.VII.1965, Korge & Heinz leg. (HUMB); 4♂, 1♀, Anatolia bor., Köse, Flußufer, 1700m, 1.VI.1968, Korge (HUMB); 1♀, Turkey – 1987 leg Schönmann et Schillhammer, Prov. Van Güseldere Gec. 5.6.1987 (NHMW); 6♀, Turkey – 1989 leg Schönmann et Schillhammer, Prov. Erzurum Tortum-Narman 9.6. Kirecii Pass (NHMW); 1♂, 2♀, Prov. Kars, Aras Fluß, Kagisman – Karakurt, 8.6.1989 leg. Schönmann et Schillhammer (NHMW, CTVR); 1♂, 1♀, Van Vilayet, 2450 m 7 km E of Guseldere Gecidi Pass on the road to Boskale 31.VII.2001, S. Beshkov leg. (NMNHS).

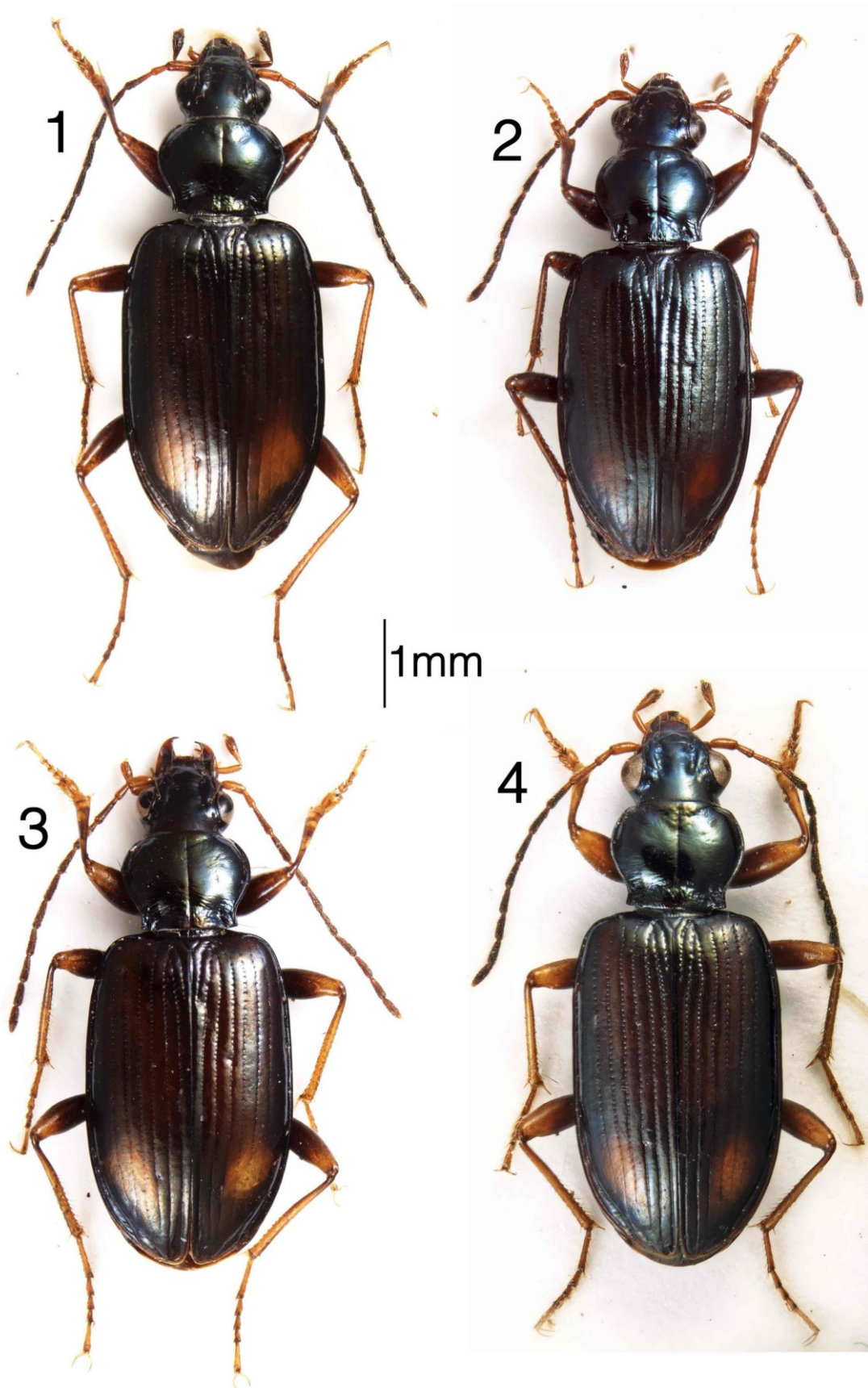
IRAN: 1♂, 1♀, Schalous Pass 2600-2900 m, Elbursgeb. 2.9.1960 leg. J. Klapperich (HNHM); 1♀, Golhak 1400 m bei Teheran 7-8.1961 leg. J. Klapperich (HNHM); Azarbaygân-e, 20 km W Hoy 38°40'N 44°39'E, 960m, 6.6.2000, lgt. E. & P. Hajdaj (CTVR); 5♂, 6♀, Prov. Mazandaran, Nur County, Elburz mts., S. slope, E Baladeh, 36°11'26.4"N 52°04'33.5"E, 1758M, small stream, 2.6.2008, Leg. A. Pütz (CEPG, CTVR).

Systematic notes. When we discovered the three Iranian specimens mentioned above, no members of this subgenus were known from Iran; being these specimens very similar in habitus to *B. terminale* Heer, 1841 (Figs. 1, 5, 6), as first they were compared with the nominospecific *B. terminale* and with *B. terminale kirgisorum* Netolitzky, 1934 (Figs. 2, 7, 8) and this revealed that the genitalia of the Iranian specimens were evidently different from both taxa. According to the updated literature, the subspecies of *B. terminale* with known distribution closest to the collecting localities of our Iranian specimens is *B. terminale pulcherrimum* (Motschulsky, 1850), known from Caucasus and Southern Russia. Therefore we compared also the genitalia of *B. terminale pulcherrimum* and their study revealed that our specimens almost perfectly matched this last taxon. This meant on the other hand that also *B. pulcherrimum* is not conspecific with *B. terminale*, confirming what was formerly correctly pointed out by I. Belousov (in Kryzhanovskij *et al.* 1995: 87, note 167): “Usually, the Caucasian and Middle Asian forms close to *terminale* are treated only as subspecies, yet the considerable differences in genital structure coupled with the lack of known transitions rather suggest their full specific status” and, formerly, by Belousov & Sokolov (1988).

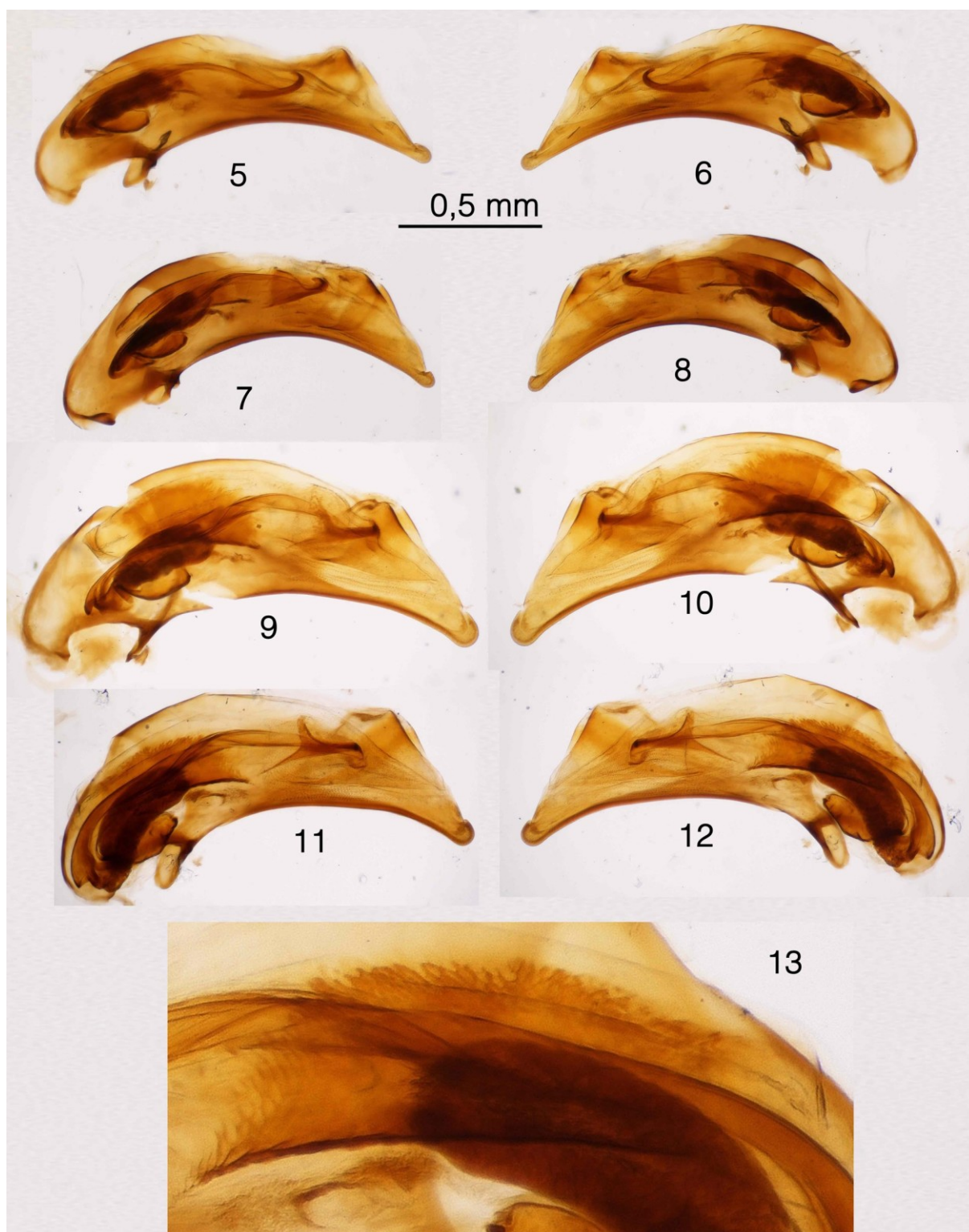
In this report, we treat again *B. pulcherrimum* as good species, because its endophallus strongly differs from that of *B. terminale* for the presence of a big, flat, peculiar “crested sclerite” (Figs. 9, 10, 11, 12, 13) at the right side of the highly sclerotized central brush, extending from near the basal end of the endophallus to about the middle of the median lobe. The other lineage is represented by *B. terminale* and *B. terminale kirgisorum*, both lacking the “crested sclerite” (Figs. 5, 6, 7, 8) and both showing a sharper shape of the median lobe if compared with that of *B. pulcherrimum*. During this study, were discovered two male specimens of *B. terminale kirgisorum*, taxon formerly unknown to China (China, Xinjiang, W Kunlun Shan, 3000m, Mazar, 28-30.VI-1993, Jaroslav Turna leg. (CPMI)), extending also the distribution of this taxon.

No typical or topotypical specimens of *B. terminale tujngoli* and *B. terminale dardum* were examined during this study, therefore we cannot state at present whether those taxa belong or not to one of the two lineages herewith mentioned for the *terminale* group.

Three specimens from Kars Province, Turkey (NHMW), not too far from the type locality, match with the original description of *B. terminale confinis* (reddish legs, yellow palps and first three antennomeres light, with remaining antennomeres darkened). The male specimen has been dissected and revealed that this population too is conspecific with *B. pulcherrimum*. The study of the holotype of *B. terminale confinis* and of other specimens of Coll. Korge (HUMB) revealed that also this taxon is conspecific with *B. pulcherrimum*, therefore we propose in this paper two nomenclatorial acts:



Figures 1–4. Habitus of 1 – *B. terminale terminale*, specimen from Italy, Valle d’Aosta, Cogne, m 1534, Torrente Valeille, 9-14/VII/90 Leg. De Martin (CTVR); 2 – *B. terminale kirgisorum* specimen from Kirgizstan, Talasski Reg., Ofmek Pass, 3300 m., 1.07.97. Dolin leg. (CTVR); 3 – *B. pulcherrimum* specimen from Caucasus, Elbrus, Itkol (CTVR); 4 – *B. pulcherrimum* specimen from Iran, Mazandaran, Nur County, Elburz mts., S. slope, E Baladeh (CTVR).



Figures 5–12. Median lobe of aedeagus of: 5 – *B. terminale terminale*, specimen from Italy, Valle d’Aosta, Cogne (CTVR), left lateral view; 6 – *B. terminale terminale*, specimen from Italy, Valle d’Aosta, Cogne (CTVR), right lateral view; 7 – *B. terminale kirgisorum* specimen from Kirgizstan, Ofmek Pass (CTVR), left lateral view; 8 – *B. terminale kirgisorum* specimen from Kirgizstan, Ofmek Pass (CTVR), right lateral view; 9 – *B. pulcherrimum* specimen from Caucasus, Elbrus, Itkol (CTVR), left lateral view; 10 – *B. pulcherrimum* specimen from Caucasus, Elbrus, Itkol (CTVR), right lateral view; 11 – *B. pulcherrimum* specimen from Iran, Mazandaran, Nur County, Elburz mts., S. slope, E Baladeh (CTVR), left lateral view; 12 – *B. pulcherrimum* specimen from Iran, Mazandaran, Nur County, Elburz mts., S. slope, E Baladeh (CTVR), right lateral view. Fig. 13: Detail of “crested sclerite” of *B. pulcherrimum*, specimen from Iran, Mazandaran, Nur County, Elburz mts., S. slope, E Baladeh (CTVR), seen in right lateral view at higher magnification ratio.

Bembidion (Terminophanes) pulcherrimum (Motschulsky, 1850) **bona species** nec subspecies of *Bembidion (Terminophanes) terminale* Heer, 1841.

Bembidion (Terminophanes) terminale confinis Korge, 1964 **new synonym** of *Bembidion (Terminophanes) pulcherrimum* (Motschulsky, 1850) (with junior synonym listed first).

Distribution. The species is distributed in Russia (Russian Southern Territory), Georgia, Azerbaijan, Armenia (Iablokoff-Khnzorian 1976: 181; Kryzhanovskij *et al.* 1995: 87; Marggi *et al.* 2003: 268), Turkey (Bodemeyer 1905: 85; Netolitzky 1943: 35; Korge 1964: 109, 1971: 3) and northwestern Iran. The new records above listed as well as several older ones are shown on Fig. 14.

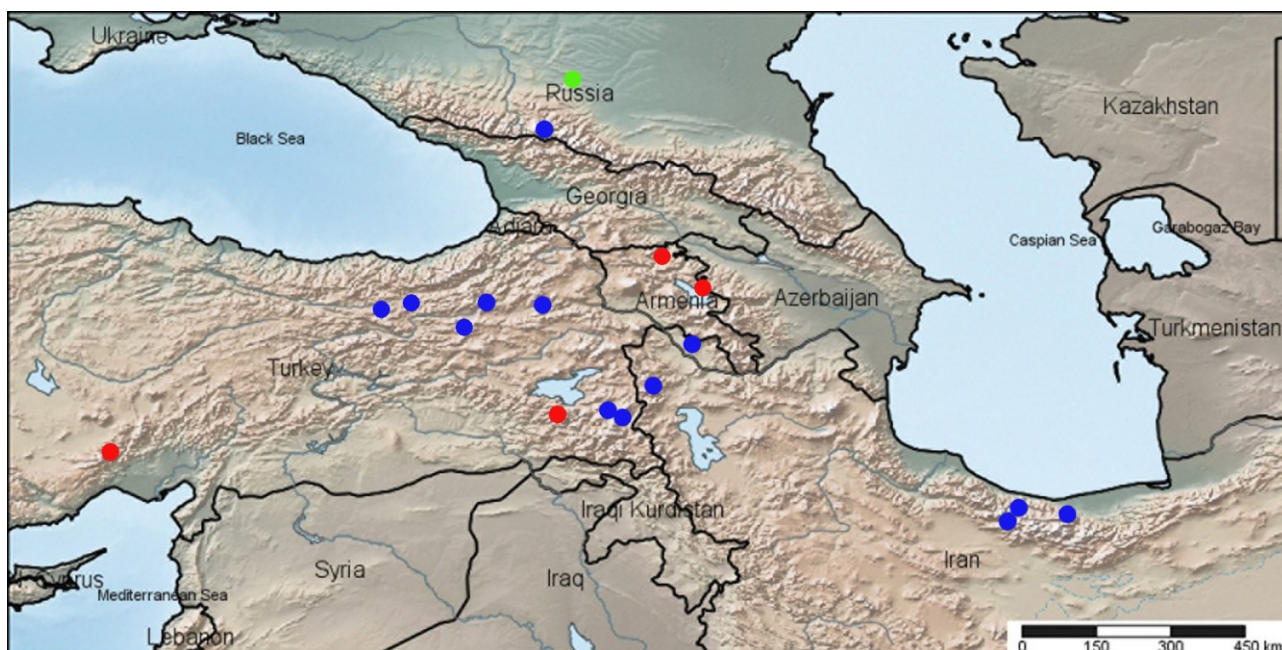


Figure 14. Distribution of *B. pulcherrimum*, based on the type locality (light green circle), other literature records (red circles) and new records (blue circles). Left sided red mark: Mount Bolkar Dağları (= “Bulghar-Maaden”); middle sided red mark: Müküs River near Bahçesaray (= “Armen. Taurus Moks”, “Miks”); right sided red marks: Alaverdi and Tsapatagh (= Babajan).

Toponymical notes. The toponymes mentioned in the labels of the specimens collected by Klapperich can be named in many different ways: Schalous Pass [other names: Chaluz Pass, Kendevan Pass] is a high mountain pass situated northwest of Teheran City. The pass reaches an altitude of 2800-2900 m.a.s.l. at its highest point. Qolhak [other names: Gulhek, Gholhak, Qulhak] is a former town and present district situated in the northeastern part of Teheran City. It lies south of the main ridge of the Elburz Mts. Moks (Netolitzky 1943: 131) is an old Armenian name of the town known today as Bahçesaray in Van Province of Turkey, while Babadjan (Iablokoff-Khnzorian 1976: 181) is a previous name of the present village of Tsapatagh situated on the shore of Sevan Lake in Armenia.

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