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Review of *Chrysolina immarginata* species group from the subgenus *Chalcoidea* (Coleoptera: Chrysomelidae) with description of a new species

Обзор видовой группы жуков-листоедов *Chrysolina immarginata* из подрода *Chalcoidea* (Coleoptera: Chrysomelidae) с описанием нового вида

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KEY WORDS: Chrysomelidae, *Chrysolina*, *Chalcoidea*, Tien-Shan, East Kazakhstan, species group, new species.

КЛЮЧЕВЫЕ СЛОВА: жуки-листоеды, *Chrysolina*, *Chalcoidea*, Тянь-Шань, Восточный Казахстан, видовая группа, новый вид.

ABSTRACT. *Chrysolina immarginata* species group is introduced and defined within the subgenus *Chalcoidea*. *Chrysolina ivanovi* Mikhailov **sp.n.** described from Eastern Kazakhstan demonstrates the northernmost limit for the distribution of this group. *Chrysolina alaiensis* (Lopatin, 1998) is resurrected from synonymy with *Chrysolina dieckmanni* (Mohr, 1966) and *Chrysolina* (*Chalcoidea*) *luchti* Lopatin, 2000 is resurrected from synonymy with *Chrysolina zangana* Chen et Wang, 1981 based on type examination.

РЕЗЮМЕ. В подроде *Chalcoidea* выделена группа видов, близких к *Chrysolina immarginata*. *Chrysolina ivanovi* Mikhailov **sp.n.**, описанный из Восточного Казахстана, представляет крайнюю северную равнинную точку для этой группы. *Chrysolina alaiensis* (Lopatin, 1998) выведен из синонимов *Chrysolina dieckmanni* (Mohr, 1966), а *Chrysolina* (*Chalcoidea*) *luchti* Lopatin, 2000 выведен из синонимов *Chrysolina zangana* Chen et Wang, 1981 на основании изучения типов.

Introduction

The subgenus *Chalcoidea* Motschulsky, 1860 initially included 7 species with the type species *Chrysomela marginata* Linnaeus, 1758. Bechyné [1950] increased the number of species in *Chalcoidea* up to 15 and divided them in two groups, but *Chrysolina unicolor* (= *immarginata* Rybakow, 1884) he placed in the newly described subgenus *Allohypericia* Bechyné, 1950. Bienkowski [2007] transferred the whole *Chrysolina* (*rufilabris*) species group to *Chalcoidea* from the subgenus *Pezocrosita* Jacobson, 1901. In the recent treatment *Chalcoidea* includes more than 30 species distributed throughout Holarctic region [Kippenberg, 2010; Bourdonné, 2012]. It is clear that this subgenus is heterogeneous and recognizing species groups inside it is the best way for understanding of its phylogeny.

Some time ago my colleague Alexander Ivanov gave me the specimen of leaf beetle collected by him in 2017 in the sands eastwards of Lake Alakol in Eastern Kazakhstan. It appeared to be close but somewhat different from *Ch. immarginata* from Tien-Shan. This finding in East Kazakhstan made me study the material from various localities within the distribution area of *Ch. immarginata* and the types of similar taxa.

Material and methods

All measurements were made using an ocular grid mounted on MBS-10 stereomicroscope. Total body length was measured from the anterior edge of pronotum to the elytral apex, body width was measured in the broadest part of elytra; length of tarsi was measured only for tarsomeres 1–3 (without claw tarsomere).

The material examined in the paper is deposited in the following collections: HNHM — Hungarian Natural History Museum, Budapest (Hungary), MFNB — Museum

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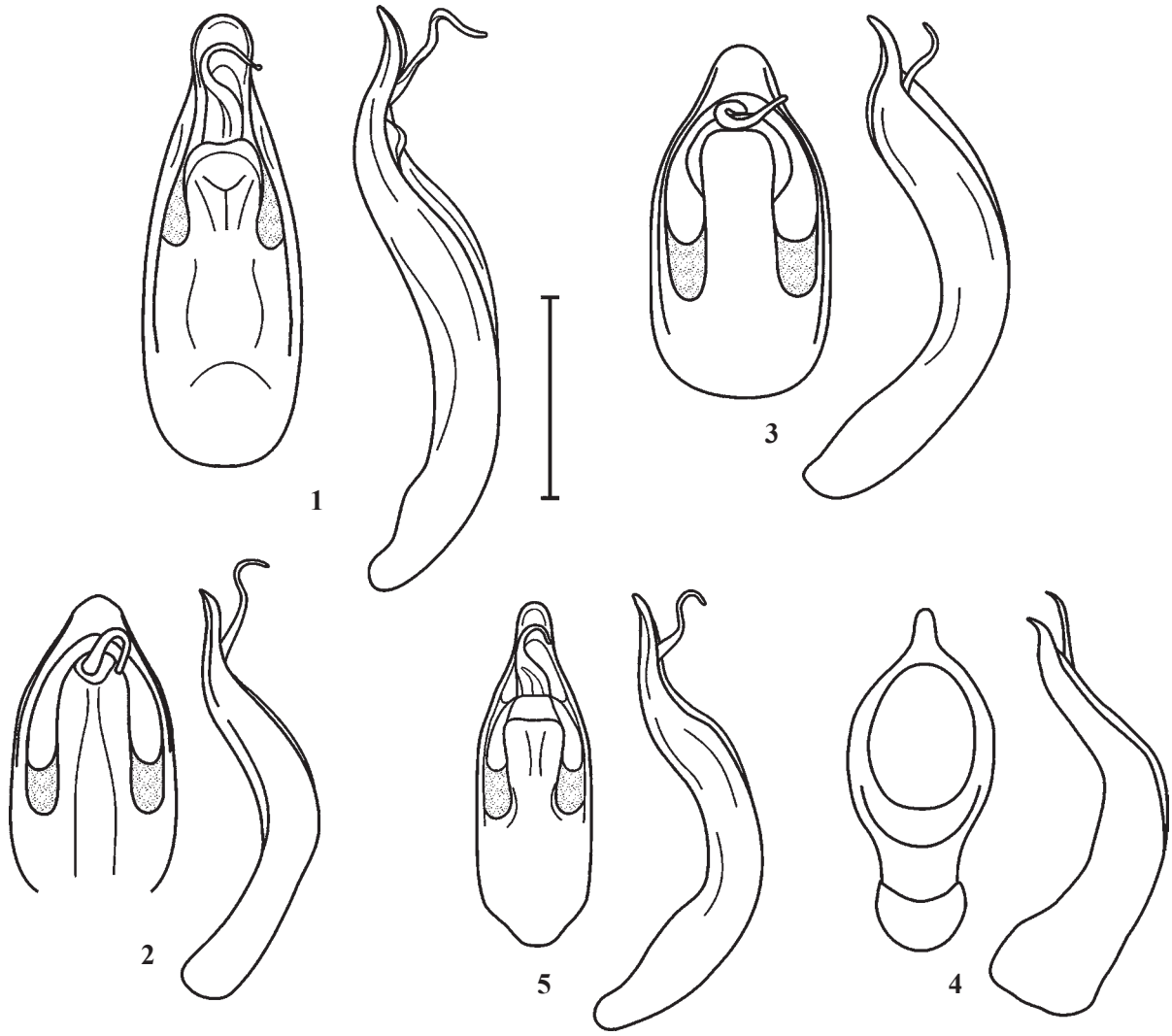
für Naturkunde, Berlin (Germany); SDEI — Senckenberg Deutsches Entomologisches Institut (Müncheberg, Germany); ZIN — Zoological Institute of the Russian Academy of Sciences (St.-Petersburg, Russia); YMC — Yuri Mikhailov's personal collection (Yekaterinburg, Russia).

Results

The species *Chrysomela unicolor* Gebler, 1845 described from the valley of the river Chu and due to the primary homonymy replaced by the younger name *Chrysomela immarginata* is peculiar in the subgenus *Chalcoidea* by its characteristic bottle-shaped aedeagus and flagellum broad and flat at basal part and narrow whip-shaped at apical part (Fig. 1). The distribution area of this species is mainly situated in Northern and Central Tien-Shan in Kyrgyzstan and SE Kazakhstan [Lopatin, 2010]. It occurs also in the Chinese part of Tien-Shan, the specimen from Kuldja is in the type series and the species is listed in Fauna Sinica [Yang et al., 2014]. However, it is not clear how far eastwards *Ch. immarginata* goes. The similar species *Ch. dieckmanni* (Mohr, 1966) was described from Karlyktag Mt. range in the extreme East of Chinese part of Tien-Shan. It is peculiar with short and broad apical process of aedeagus having similar shape of flagellum (Fig. 2). Several problems are associated with *Ch. dieckmanni*. First of all, it was described after two specimens, from which the male is from "Amur" and the female is from Karlyktag Mt. range. The record of *Ch. dieckmanni* from the Far East is questionable and more likely due to the erroneous locality label, while Karlyktag Mt. range is a real locality because the closely related species *Ch. immarginata* also occurs in Tien-Shan. However, the initial treatment of the female from Karlyktag Mt. range as *Ch. dieckmanni* by Mohr [1966] is unreliable because it is not from the same locality as the male



Figs 1–5. *Chrysolina immarginata* species group, aedeagus in dorsal and lateral view: 1 — *Ch. immarginata*; 2 — *Ch. dieckmanni*; 3 — *Ch. alaiensis*; 4 — *Ch. luchti*; 5 — *Ch. ivanovi* **sp.n.** (4 — after Lopatin, 2000, others original). Scale bar — 1mm.

Рис. 1–5. Видовая группа *Chrysolina immarginata*, эдеагус сверху и сбоку: 1 — *Ch. immarginata*; 2 — *Ch. dieckmanni*; 3 — *Ch. alaiensis*; 4 — *Ch. luchti*; 5 — *Ch. ivanovi* **sp.n.** (4 — из Лопатин, 2000, остальные — оригинал). Масштаб — 1мм.

and only the aedeagus shape can give a reliable treatment. Therefore, the real type locality of *Ch. dieckmanni* (based on the male) is unknown.

Chrysolina alaiensis from Alaisky Mt. range in southern Kyrgyzstan was originally described as a subspecies of *Ch. unicolor* (=*immarginata*) [Lopatin, 1998]. But later on the author [Lopatin, 2010] upgraded it to a species rank. On the contrary, Bieńkowski [2007] first treated this taxon also as a subspecies but of *Ch. dieckmanni* based on similarity of aedeagus shape, and later on [Bieńkowski, 2019] synonymised *Ch. alaiensis* to *Ch. dieckmanni*. But my examination of the types of *Ch. alaiensis* and *Ch. dieckmanni* resulted the conclusion that these were two separate taxa with difference in habitus, dorsal colouration and punctation and aedeagus shape (Fig. 3).

The mentioned species *Ch. immarginata*, *Ch. dieckmanni* and *Ch. alaiensis* occur in Tien-Shan and have similar aedeagus structure. One more species *Ch. luchti* Lopatin, 2000 described from Bogdo-Ola mt. range in Eastern Tien-Shan was compared with *Ch. immarginata* by Lopatin [2000] and also belongs to this species group. The aedeagus drawing given in the original description is very schematic, although it shows the peculiar outline (Fig. 4). The type of *Ch. luchti* was found in ZIN and examined, but unfortunately the mounted aedeagus had been lost. Bieńkowski [2019] proposed to synonymise *Ch. luchti* from Tien-Shan with *Ch. zangana* Chen et Wang, 1981 from Tibet. However, these two taxa inhabit distant mountain ranges and differ in dorsal colouration, punctuation and aedeagus shape. Therefore, I believe that they are not synonyms.

Here I define a group of species close to *Ch. immarginata* in the subgenus *Chalcoidea*, and a finding from the East Kazakhstan representing the extreme northern and lowland locality for this group below is described as a species new to science.

Definition of the *Chrysolina immarginata* species group

Medium sized species (males around 6.0–7.0 mm, females 7.0 mm and more), dorsum moderately to distinctly shining, black with bronze reflection, bronze or greenish bronze, elytral epipleura and sometimes lateral stripe brown.

Pronotum swollen laterally along entire length; lateral impressions shallow posteriorly and moderate anteriorly, deeper posteriorly than anteriorly, covered by coarse punctures.

Elytra with weak humeral calli and flat intervals; elytral punctation arranged in paired, mostly regular rows. Hind wings developed, slightly reduced, as long as elytra.

Male fore tarsomeres only slightly broadened, with entire sole beneath. Female tarsi narrow, first tarsomeres of all tarsi with broad glabrous stripe.

Aedeagus flattened in cross-section, thrice curved laterally (ventrally at middle, dorsally at level of apical opening and ventrally at apex). Apex characteristic bottle-shaped with long or short apical projection, flagellum basally broad and flat and narrow whip-shaped at apical part. Basal part of apical opening and broader part of flagellum is covered with oblong plate, laterally separated with sinusoid incisures (Figs 1–5).

Chrysolina immarginata species group is distributed in Tien-Shan and its northern spurs and unites 5 species listed below, including one new species described herein.

Chrysolina (*Chalcoidea*) *alaiensis* (Lopatin, 1998) **stat.rest**.

Chrysolina unicolor alaiensis Lopatin, 1998: 833 ("Киргизия, Алайский хр., к югу от г. Ош, 3400 м" [Kirgizia, Alaisky mt. range, southwards of Osh, 3400 m], holotype in ZIN, examined)
Chrysolina (*Chalcoidea*) *dieckmanni alaiensis*: Bieńkowski, 2001: 116; 2007: 193
Chrysolina (*Chalcoidea*) *alaiensis*: Lopatin, 2010: 203
Chrysolina (*Chalcoidea*) *dieckmanni* (= *alaiensis*): Bieńkowski, 2019: 65

Chrysolina (*Chalcoidea*) *dieckmanni* (Mohr, 1966)

Chrysomela (*Pezocrosita*) *dieckmanni* Mohr, 1966: 94 ("Amur", holotype in SDEI, examined; "Dsungarei, Karlyk-Tag" paratype in MFNB, examined);
Chrysolina (*Chalcoidea*) *dieckmanni dieckmanni*: Bieńkowski, 2001: 116; 2007: 192–193;
Chrysolina (*Chalcoidea*) *dieckmanni*: Bieńkowski, 2019: 65

Chrysolina (*Chalcoidea*) *immarginata* (Rybakow, 1884)

Chrysomela unicolor Gebler, 1845: 105 ("in vicinis fl. Tschui") nec Herbst, 1786: 161;
Chrysolina (*Allohypericia*) *unicolor*: Bechyné, 1950: 159;
Chrysomela (*Pezocrosita*) *unicolor*: Mohr, 1966: 90; Лопатин, 1970: 189–190;
Chrysomela immarginata Rybakow, 1884: 135 ("Kuldscha", "Son-Kul", "Issyk-Kul", syntypes in HNHM and MFNB, examined).
Chrysolina (*Chalcoidea*) *immarginata*: Bieńkowski, 2007: 197 (= *unicolor*)

Chrysolina (*Chalcoidea*) *luchti* Lopatin 2000 **stat.rest**.

Chrysolina (*Chalcoidea*) *luchti* Lopatin 2000: 130 ("China: Xinjiang, Bogdo-ola MR, SSW Jimsak, Ulgun-Terek pass, vc Talyntu riv., 2800–3485 m", holotype in ZIN, examined); Bieńkowski, 2007: 212–213.
Chrysolina zangana Chen et Wang in Wang et Chen, 1981: 512 ("Xizang: Nyalam") (= *luchti* Lopatin): Bieńkowski, 2007: 72

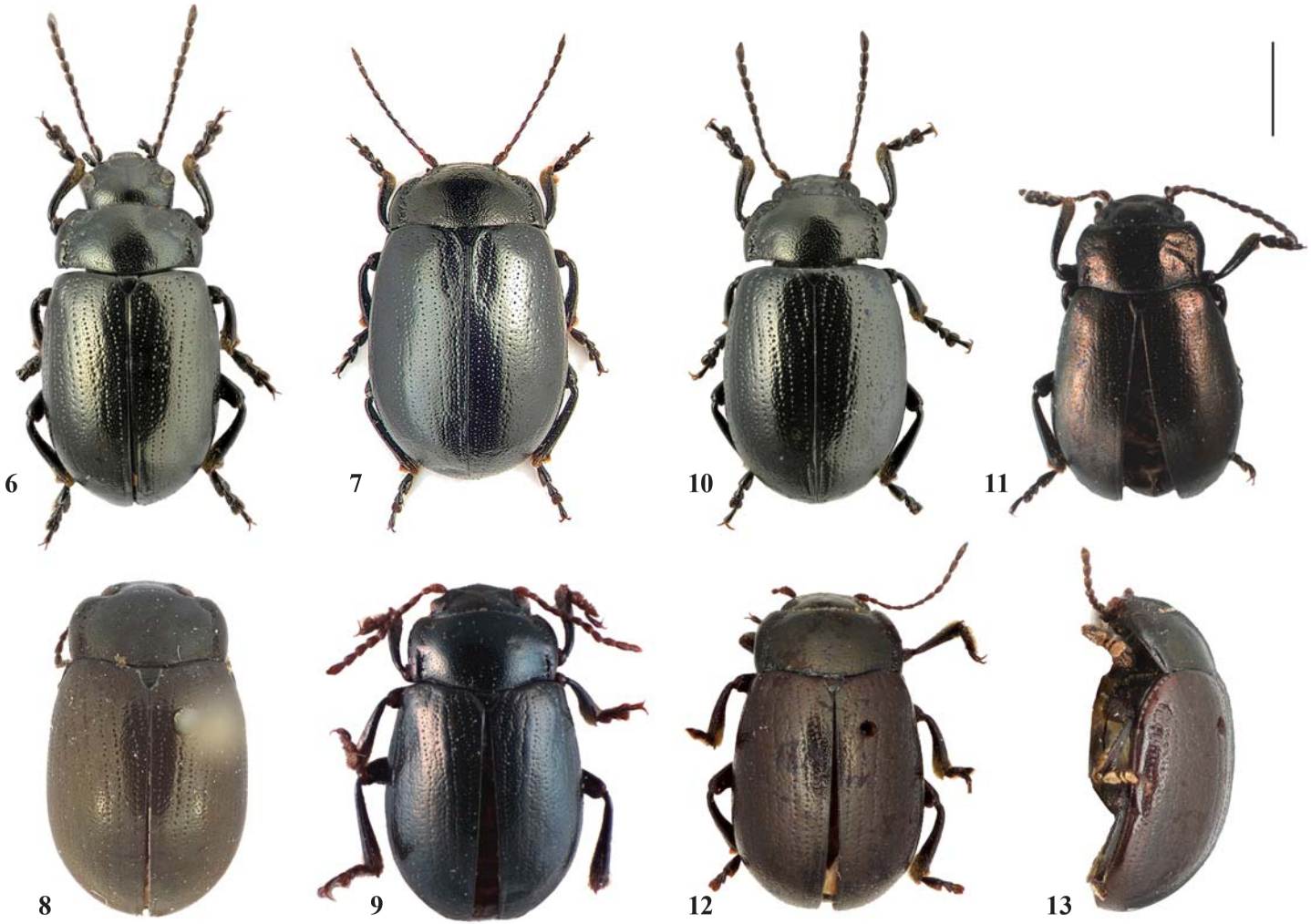
Chrysolina (*Chalcoidea*) *ivanovi* Mikhailov **sp.n.**
Figs 5, 10.

Holotype, ♂ with the labels: 1) Вост. Казахстан, 46 км ЮВ п. Маканчи, пески, 12.05.2017, А.В. Иванов [East Kazakhstan, 46 km SE Makanchi, sands, 12.05.2017, A.V. Ivanov]; 2) HOLOTYPUS, *Chrysolina* (*Chalcoidea*) *ivanovi* **sp.n.**, Yu. Mikhailov design. 2021 [red] (ZIN).

DESCRIPTION of holotype. Moderately convex, oblong ovate, dorsum shining, unicolor, black with bronze reflex, antennae, maxillary palpi and tarsi blackish brown, antennomeres 1 and 2 and claws reddish. Body length — 6.3 mm, width — 3.9 mm.

Head: frontoclypeus finely and sparsely punctured; frontal suture slightly deepened, epicranial suture barely indicated. Last maxillary palpomere almost square, with rounded sides and truncated apex, 1.2x longer then broad, 1.4x longer and only 1.1x wider than previous palpomere. Antenna inserted 2.2x closer to clypeus than to eye. Relative length of antennomeres 1–3 as ratios 7, 4, 6. Tenth antennomere 2x longer than broad, eleventh antennomere — 2.6x. Orbital lines slightly deepened, short, can be traced only in distal 1/3 and far not reach antennal insertion.

Thorax: pronotum transverse, almost twice (exactly 1.97x) broader than long, broadest before middle, evenly rounded laterally; pronotal disc distinctly convex, covered with dense medium-sized and not deep punctures. Width between anterior angles 1.4x less than basal width. Anterior angles moderately produced, rounded triangular; basal angles obtuse. Both anterior and posterior setiferous pores bear short setae. Anterior side widely margined and ciliate, incised in bracket-shape; basal edge moderately arcuately convex. Lateral sides



Figs 6–13. *Chrysolina immarginata* species group, general dorsal view: 6–8 — *Ch. immarginata* from Kyrgyzstan (6 — male from Sary-Dzhas river; 7 — female from Kadzhi-Say at south bank of Issyk-Kul lake; 8 –syntype, male from Issyk-Kul lake); 9 — *Ch. alaiensis*, male, holotype; 10 — *Ch. ivanovi* **sp.n.,** male, holotype; 11 — *Ch. luchti*, male, holotype; 12, 13 — *Ch. dieckmanni*, male, holotype (13 — lateral view). Scale bar: 1 mm (6–7, 10 — photo by K. Makarov, 9, 11 — photo by A. Moseyko, 12–13 — photo by M. Schröter).

Рис. 6–13. Видовая группа *Chrysolina immarginata*, общий вид сверху: 6–8 — *Ch. immarginata* из Кыргызстана (6 — самец с р. Сары-Джас; 7 — самка из Каджи-Сая на южном берегу оз. Иссык-Куль; 8 — синтип, самец с оз. Иссык-Куль); 9 — *Ch. alaiensis*, самец, голотип; 10 — *Ch. ivanovi* **sp.n.,** самец, голотип; 11 — *Ch. luchti*, самец, голотип; 12–13 — *Ch. dieckmanni*, самец, голотип (13 — сбоку). Масштаб: 1 мм (6–7, 10 — фото К. Макарова; 9, 11 — фото А. Мосейко; 12–13 — фото М. Шретер).

swollen along entire length, lateral calli narrow, both constitute slightly less than ¼ of basal width of pronotum. Lateral impressions in basal 1/3 moderately deepened, consist of coarse, partly merged deep punctures, in anterior part punctures are large but less deep and not merged. Prothoracic hypomera smooth, almost flat in the middle, slightly impressed along outside and covered with coarse transverse wrinkles; basal fold short and deep. Prosternal process with longitudinal impression only before apex; anterolateral portion of prosternum narrow, with slightly impressed furrow medially. Prosternum 1.4x shorter than metasternum; metasternum 1.3x shorter than as first ventrite. Scutellum triangular, 1.4x broader than long, with sharp apex and sparse fine punctures only at base.

Elytra slightly wider than base of pronotum, with weak humeral callus, each elytron 2.3x longer than wide, elytral length 4.7 mm. Large primary punctures form long scutellar row of 10–12 punctures and 9 paired rows. Rows mostly regular, only 6th row slightly confused. Intervals flat, smooth, secondary punctures fine and sparse, but wider odd intervals are covered not only with fine but also with medium-sized punctures same as on pronotum. Marginal stria with large dense punctures. Sutural stria distinct at apical slope. Epipleura inclined outside, visible along entire length. Hind wings developed.

Tarsi narrow, fore tarsi 2.7x longer than broad; ratio of width of fore tarsomeres 1–3 as 1.0, 0.8, 1.2. 3rd tarsomere 1.2x broader than long. All tarsomeres with entire sole beneath.

Abdomen: pygidium with deep impression along entire length. Ventrite 1 broadly margined anteriorly, covered with sparse fine punctures, only anterior intercoxal process covered with large wrinkles. Last ventrite distinctly and evenly convex, with slight transverse oval impression in the middle; its apex very slightly incised.

Aedeagus (Fig. 5) 2.1 mm long, with long narrow apical process gradually narrowed towards slightly bent apex.

DIFFERENTIAL DIAGNOSIS. The new species is peculiar with very slighty dilated tarsi (in *Ch. immarginata* tarsi more dilated, fore tarsomere 3 is 1.4–1.6x broader than long) and aedeagus smaller (2.1 mm long instead of 2.5–3.0 mm in *Ch. immarginata*) and narrower than in other species of the group; its apical process is long and narrow, gradually narrowed towards apex (neither spoon shaped as in *Ch. immarginata*, nor short and broad as in *Ch. dieckmanni* and *Ch. alaiensis*). Also relatively large primary punctures on elytra and distinctly convex pronotal disc covered with medium sized punctures are peculiar; setiferous pores bear short setae (in *Ch. immarginata* — long setae).

ETYMOLOGY. The species is dedicated to Alexander Vladimirovich Ivanov, an entomologist from the Institute of Plant and Animal Ecology UB RAS (Yekaterinburg), active researcher of the fauna of Kazakhstan and Central Asia, who passed away in 2021.

KEY FOR DETERMINATION OF *CHRYSOLINA* (*IMMARGINATA*) SPECIES GROUP

1 (6) Aedeagus massive and broad, with spoon-shaped or strongly shortened apex. Male body length on average not less than 6.5 mm.

2 (3) Aedeagus apical projection spoon-shaped and dilated at bent down apex. Dorsum moderately shining, black with bronze reflection, rarely without metallic reflection (Figs 6–8). Elytral epipleura and sometimes lateral stripe brown. Body length 5.7–7.3 mm (males), 6.8–8.3 mm (females). Northern and Central Tien-Shan in the limits of SE Kazakhstan, eastern Kyrgyzstan (mainly Issyk-Kul region) and Xinjiang in China. From foothill steppes in Almaty region up to 2700–3400 m a.s.l. On *Artemisia*... ..... *Ch. immarginata*

3 (2) Aedeagus apical projection short, broad, with rounded apex.

4 (5) Dorsum slightly shining, black with weak metallic luster (Fig. 9). Antennae and tarsi brown. Body length 6.7 mm (male). SW Kyrgyzstan: Alaisky Mt. range, 3400 m a.s.l. ..... *Ch. alaiensis*

5 (4) Dorsum shining, greenish bronze, elytral epipleura and lateral stripe reddish (Figs 12–13). Body length 6.5 mm (male), 7.2 mm (female). China: Xinjiang, Karlyktag Mt. range ..... *Ch. dieckmanni*

6 (1) Aedeagus smaller with narrow apical projection. Male body length 6.3 mm.

7 (8) Dorsum dark bronze with strong metallic reflection. Pronotum distinctly broadened anteriorly and narrowed basally (Fig. 11). Tarsi moderately dilated. China: Xinjiang, Bogdo-Ula Mt. range, 2800–3485 m a.s.l. .... *Ch. luchti*

8 (7) Dorsum black with bronze reflection. Pronotum evenly rounded laterally (Fig. 10). Tarsi very slightly dilated. East Kazakhstan: sands eastwards of Lake Alakol .... *Ch. ivanovi* **sp.n.**

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References

Bechyné J. 1950. 7e contribution a la connaissance du genre *Chrysolina* Motsch. (Coleoptera, Phytophaga, Chrysomelidae) // Ent. Arb. Mus. G. Frey. Bd.1. P.47–185.

Bienkowski A.O. 2001. A study on the genus *Chrysolina* Motschulsky, 1860, with a checklist of all the described subgenera, species, subspecies, and synonyms (Coleoptera: Chrysomelidae: Chrysomelinae) // Genus. Vol.12. Fasc.2. P.105–235.

Bienkowski A.O. 2007. A monograph of the genus *Chrysolina* Motschulsky, 1860 (Coleoptera, Chrysomelidae) of the world. Pt.1. Moscow: Techpolygraphcentre. 417 pp.

Bienkowski A.O. 2019. *Chrysolina* of the world — 2019 (Coleoptera: Chrysomelidae). Taxonomic review. Livny: Mukhametov G.V. Publ. 919 pp.

Bourdonné J.-C. 2012. Révision du genre *Chalcoidea* Motschulsky, 1860 avec description d'une espèce nouvelle, *Chalcoidea* (s.str.) *hollandei* (1ère partie) (Coleoptera, Chrysomelidae, Chrysomelinae) // Nouvelle Revue d'Entomologie. T.28. Fasc.2. P.99–181.

Kippenberg H. 2010. Chrysomelinae // Catalogue of Palaearctic Coleoptera. Vol.6. Stenstrup: Apollo Books. P.390–443.

Lopatin I. 2000. Neue Arten der Gattung *Chrysolina* Motsch. aus China (Coleoptera, Chrysomelidae) // Mitt. internat. entomol. Ver. Frankfurt a. M. Bd.25. H.3/4. P.129–136.

Lopatin I.K. 2010. [Leaf Beetles (Insecta, Coleoptera, Chrysomelidae) of Central Asia]. Minsk: Byelorussian University Publ. 511 pp. [In Russian]

Mohr K.-H. 1966. Bestimmungstabelle der Untergattung *Pezocrosita* Jacobson 1902 (*Allohypericia* Bechyne 1950) // Reichenbachia. Bd.8. H.13. P.89–104.

Yang X.-K., Ge S.-Q, Wang S.-Y., Li W.-Z., Cui J.-Z. 2014. Fauna Sinica. Insecta Vol. 61. Coleoptera, Chrysomelidae, Chrysomelinae // Science Press, Beijing. 641 pp. [In Chinese with English summary]