

Review of the genus *Chrysolina* Motschulsky, 1860 (Coleoptera: Chrysomelidae) from Nepal Himalaya with description of a new species

Обзор рода *Chrysolina* Motschulsky, 1860 (Coleoptera: Chrysomelidae) из Непальских Гималаев с описанием нового вида

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КЛЮЧЕВЫЕ СЛОВА: *Chrysolina*, Chrysomelidae, Непал, Гималаи, обзор, новый вид.

ABSTRACT. 11 species and subspecies of *Chrysolina* hitherto known from Nepal are reviewed. From them only 4 species and 1 subspecies not attributed to exact subgenus can be treated as Himalayan typical alpine species. One more new species *Chrysolina romandudkoi* Mikhailov **sp.n.** is described from alpine zone of Eastern Nepal. Short aedeagus with broad anchor-shaped apex distinguishes it from all known Nepalese *Chrysolina*. Elytra with regular rows of punctures place the new species closer to *Ch. dhaulagirica* and *Ch. hartmanni*, but from both species having margins of elytra red fulvous it differs in uniformly dark bronze colour and lateral callus of pronotum not separated from disc. From *Ch. nagaja* and *Ch. daccordii* having uniformly bronze body and similar habitus it differs by regular punctures on elytra. The key to high mountain *Chrysolina* from Nepal Himalaya is provided.

РЕЗЮМЕ. Дан обзор 11 видов и подвидов *Chrysolina*, известных на данный момент из Непала. Из них только 4 вида и 1 подвид, не отнесённые к конкретным под родам, могут рассматриваться как типичные гималайские высокогорные виды. Ещё один новый вид *Chrysolina romandudkoi* Mikhailov **sp.n.** описан из альпийской зоны Восточного Непала. Короткий эдеагус с широкой якоревидной вершиной отличает его от всех известных непальских *Chrysolina*. Надкрылья с правильными рядами пунктировки сближают новый вид с *Ch. dhaulagirica* и *Ch. hartmanni*, но от обоих видов, имеющих красно-рыжее края надкрылий, он отличается одноцветно-бронзовой окраской и не отделёнными от диска боковыми валиками переднеспинки. От *Ch. nagaja*

и *Ch. daccordii*, имеющих одноцветно бронзовую окраску и сходный внешний вид, он отличается упорядоченной пунктировкой. Дан ключ для определения высокогорных видов *Chrysolina* из Непальских Гималаев.

Introduction

The Central or the Nepal Himalaya is one of the four parts of the Himalayas about 800 km long between the rivers Kali in the west and Teesta in the east (the rest are the Northwest or the Punjab Himalaya, Kumaon or the Western Himalaya and the Eastern or the Assam Himalaya). Several well known peaks higher than 8000 m a.s.l. like Mt. Everest, KinchinJunga, Makalu, Dhaulagiri, Annapurna, etc. are situated in this division [Mani, 1968].

The earliest collections of high altitude insects from the Himalaya were made from the Northwest part, especially by the Dutch and German Karakoram and Nanga Parbat expeditions in the first half of XX century and Mani's entomological expeditions later on. Consequently Mani [1968] in his well known overview of high altitude insects mentioned only few species of leaf beetles mainly from Punjab Himalaya. In Central Himalaya high altitude Coleoptera at that time were mainly collected by different Mt. Everest expeditions [Mani, 1968]. Although during the last 50 years the situation has changed due to intense studies by German, Swiss and Japanese expeditions to Nepal Himalaya, whose results on Chrysomelidae were summarized in several catalogues [Medvedev, Sprecher-Uebersax, 1999a; Kimoto, 2005; Sprecher-Uebersax, 2011]. In the most recent

of them the total number of Nepalese leaf beetles was estimated as 1037 species that is still far from complete.

In May – June 2018 Russian entomologists Roman Dudko and Boris Kataev surveyed the remote highlands in Bhodjpur and Solukhumbu Districts of Eastern Nepal and I was lucky to study the material on Chrysomelidae collected by Roman Dudko. Among them I paid special attention to the species of Chrysomelinae, whose alpine faunas in Palaearctic are familiar for me. Although Nepalese fauna in general is typical Oriental one, the high mountain Chrysomelidae of the Himalayas have dominating groups closer to Palaearctic with 44% of Alticinae, 28% of Galerucinae and 24% of Chrysomelinae [Hartmann, Medvedev, 2003]. According to Sprecher-Uebersax [2011] with the corrections and additions from Ge *et al.* [2012] subfamily Chrysomelinae in Nepal includes 52 species and subspecies with 26 (or exactly half of them) endemic. The endemism of higher level is much less, with one genus *Parambrostoma* Chen, 1934 subendemic with Tibet and one subgenus *Sclerophaedon* (*Tantraedon* Daccordi et Medvedev, 2000) subendemic with India.

From the first glance it was not easy to attribute two of newly found species to exact genus. Both of them have anchor-shaped aedeagus (Figs 3–9) that is peculiar to the representatives of *Parambrostoma*. This genus is restricted mainly to the Nepal Himalaya in the zone of temperate forests below 3300 m a.s.l. but displays morphological characters of alpine species, such as the absence of hind wings and a shiny metallic surface [Ge *et al.*, 2012]. Although the representatives of *Parambrostoma* have well-defined transverse depression at basal region of the elytra and peculiar multicoloured dorsal surface with purple or violaceous spots on head and green or purple markings on pronotum and elytra [Ge *et al.*, 2012]. Taking into account uniform bronze colour, absence of transverse depression on elytra and other characters according to the key to the leaf beetle genera of Nepal [Medvedev, Sprecher-Uebersax, 2005] I attributed the new findings to the genus *Chrysolina* Motschulsky, 1860.

The material examined in this paper is housed in the following collections and depositories: ISEA — Institute for Systematics and Ecology of Animals, Siberian Branch of Russian Academy of Sciences (Novosibirsk); YMC — collection of Yuri Mikhailov (Yekaterinburg), ZIN — Zoological Institute of Russian Academy of Sciences (St.- Petersburg).

Review of the genus *Chrysolina* Motschulsky, 1860 in Nepal

11 species and subspecies of *Chrysolina* are hitherto known from Nepal [Sprecher-Uebersax, 2011]. According to the Palaearctic Catalogue [Kippenberg, 2010] three of them belong to the subgenus *Pierryvettia* Bechyné, 1950, three — to *Diachalcoidea* Bechyné, 1955, two — to *Semenowia* Weise, 1889, one — to *Chalcoidea* Motschulsky, 1860, one — to *Litho-*

pteroides Strand, 1935, and one is not attributed to exact subgenus.

Pierryvettia species having well developed wings, elongate and moderately convex body with large punctures on elytra and pronotum are quite peculiar, all Nepalese representatives of this subgenus have larger distribution areas in Oriental region [Kimoto, 2005; Sprecher-Uebersax, 2011]. *Ch. conglomerata* Maulik, 1926 is known also from India, *Ch. separata separata* (Baly, 1860) (= *aurata* Suffrian, 1851) — from Bhutan, India, China, Myanmar, Thailand, Laos and Vietnam, *Ch. inconstans* (Wiedemann, 1823) — from India and Ceylon. *Ch. bowringii* (Baly, 1860) is not found in Nepal, but known from Bhutan, China, Vietnam. *Pierryvettia* species inhabit relatively low altitudes 1300–1400 m [Medvedev, 1990], in the eastern part of the Himalaya these elevations belong to the subtropical zone, where numerous forest types are found [Halberg, 2017]. *Ch. (Lithopteroides) exanthematica exanthematica* (Wiedemann, 1821) inhabits the same lower altitudes. This species was described from Bengal but now is known as multiregional species distributed from temperate zone (Eastern Kazakhstan, Altai, Sayans, Transbaical, Yakutia, Russian Far East, Mongolia, Eastern China and Korea) to subtropical and tropical zones (Pakistan, India, Nepal, Vietnam). Therefore the Nepalese representatives of *Pierryvettia* and *Lithopteroides* can be treated as the subtropical and not specialized mountainous faunistic elements.

Chrysolina vishnu (Hope, 1831) (= *parvati* Daccordi, 1982), the only representative of *Chalcoidea*, is a Himalayan species, known from Nepal, Bhutan and India on the altitudes from 400 to 2900 m a.s.l. [Daccordi, 1982] but mostly found at 1000–2000 m a.s.l. [Medvedev, 1990]. This species is connected with lower temperate zone.

The rest of *Chrysolina* species can be treated as Himalayan typical alpine species in the meaning that they have reduced wings and inhabit high mountain biotopes above treeline.

Two species, namely *Ch. nagaja* (Daccordi, 1982) and *Ch. daccordii* (L. Medvedev et Sprecher-Uebersax, 1999), were described in the separate genus *Semenowia*, which was subsequently included by Daccordi [1994] in the genus *Chrysolina* as a subgenus. Although these two species were later excluded from the subgenus *Semenowia* and placed in a separate species group not attributed to exact subgenus but close to *Timarcholina* Bechyné, 1950 from India and Sri Lanka [Bienkowski, 2013].

Ch. daccordii was recorded in Western Nepal at Annapurna and Manaslu Mts. at the elevations 3300–4200 m [Medvedev, Sprecher-Uebersax, 1999b]. *Ch. nagaja* has *locus typicus* in Pakistan (Jhica Gali) at the elevation of 2100 m a.s.l. [Daccordi, 1982], but the accuracy of this indication is questionable because of low altitude and situation outside the Punjab Himalaya. Later on *Ch. nagaja* was found in Eastern Nepal in Sankhuwasabha and Taplejung districts in pastures and alpine meadows at the elevations 4100–4500 m [Medvedev, 1992]. Here I indicate one more locality of *Ch. nagaja* from



Figs 1–2. *Chrysolina tangalaensis* Kimoto, 2001, male, holotype, general dorsal and lateral view. Photo by Dr. Ako Tachi (Kyushu University, Fukuoka, Japan).

Рис. 1–2. *Chrysolina tangalaensis* Kimoto, 2001, самец, голотип, общий вид сверху и сбоку. Фото д-ра Аки Тачи (Университет Кюсю, Фукуока, Япония).

Eastern Nepal: Solukhumbu Distr., 1 km NE of Lamjura La Pass, Langgate Mt., 3700–4000 m, 27°35.3' N, 86°30.2' E, 2.06.2018, R. Yu. Dudko leg., 2♂♂ (YMC).

Ch. dhaulagirica dhaulagirica Medvedev, 1990, *Ch. dhaulagirica arunensis* Medvedev, 1992 and *Ch. hartmanni* Medvedev, 1999 found at the elevations 2800–4600 m. have regular rows of punctures and red fulvous marginal stripe on elytra [Medvedev, 1990, 1999]. These taxa were attributed by Kippenberg [2010] to the subgenus *Diachalcoidea* Bechyne, 1955. But I cannot support this point, because other species of this subgenus, namely *Ch. aegyptiaca* Olivier, 1807 and *Ch. sacarum* Weise, 1890 both ecologically and morphologically differ from Nepalese ones that form a separate species group. Medvedev [1990] stressed the possible

Palaeartic roots of *Ch. dhaulagirica* and proposed to include it in the subgenus *Pezocrosita* Jacobson, 1901. Although it is *Chrysolina tangalaensis* Kimoto, 2001 that according to the photos of the types kindly provided from Kyushu University (Figs 1–2) stays closer to temperate subgenera *Arctolina* and *Pezocrosita*. This species collected at the elevations 4000–4600 m is still not very clear with aedeagus not illustrated, but it differs from other high altitude Nepalese *Chrysolina* having relatively large punctures in the rows of elytra, elevated interstriae and broad male tarsi.

After the review of all hitherto known species of *Chrysolina* from Nepal I describe one more species that proved to be new to science.

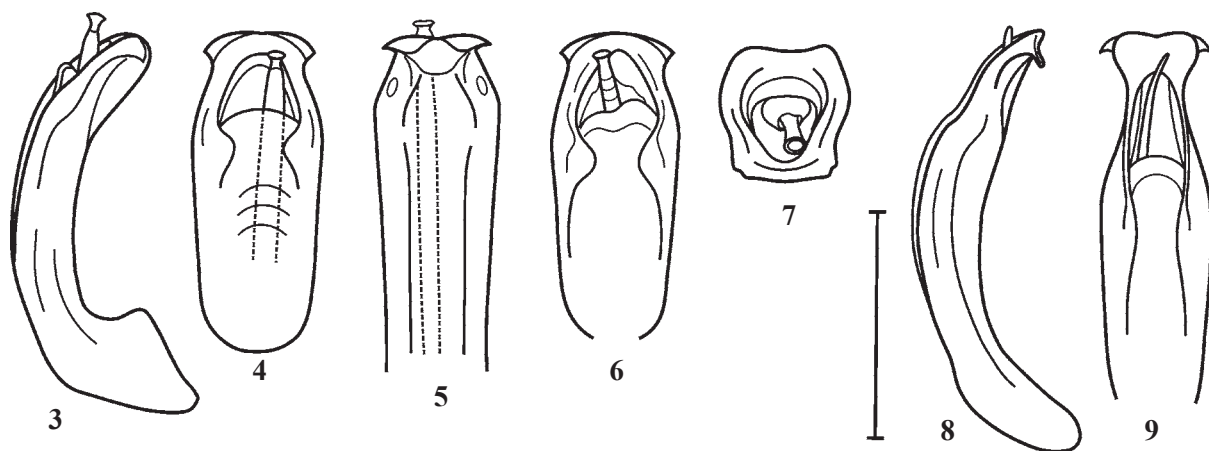
Chrysolina romandudkoi Mikhailov sp. n.

Figs 3–7, 19–21.

MATERIAL. **Holotype**, ♂ with labels: 1) E Nepal, Bhodjpur Distr., 1.5 km NE Salpa pass, h=3350 m, 27°26.7' N, 86°56.1' E, at night with torch, 21.05.2018, R. Dudko leg. 2) **HOLOTYPE**, *Chrysolina romandudkoi* sp. n. Yu. Mikhailov design. 2018 [red] (ISEA). **Paratypes**: 3♂♂, 2♀♀, E Nepal, Bhodjpur Distr., 1 km E of Salpa Pass, 2800–2850 m, 27°25.6' N, 86°56.6' E, 20.05.2018, R. Dudko leg., 10♂♂, 4♀♀, 1.5 km NE Salpa pass, h=3350 m, 27°26.7' N, 86°56.1' E, 21.05.2018, R. Dudko leg., 2♂♂, 1♀, 2 km NE Salpa pass, h=3750–3800 m, 27°27.3' N, 86°56.4' E, 22.05.2018, R. Dudko leg., 1♂, 1♀, 2.5 km NE of Salpa Pass, 3800–4150 m, 27°27.5' N, 86°56.4' E, 23.05.2018, R. Dudko leg., 3♂♂, 3♀♀, Solukhumbu Distr., 0.5 km NW of Salpa Pass, 3000–3100 m, 27°26.8' N, 86°55.2' E, 24.05.2018, R. Dudko leg. All the paratypes (30 specimens) with the red label: **PARATYPUS**, *Chrysolina romandudkoi* sp. n. Yu. Mikhailov design. 2018 (YMC, ISEA, ZIN).

DESCRIPTION (holotype). Body uniformly bronze, antennae and tarsi black with metallic luster, claws brown. Convex, obovate, slightly constricted laterally between pronotum and elytra; shining, pronotum distinctly shagreen, elytra smooth with thin wrinkles and microscopically punctulate.

Last maxillary palpomere narrow, oval, 1.5x as long as broad and 1.2–1.3x as long as previous palpomere and 1.0–1.1x broader than latter. Antenna inserted 1.9–2.1x closer to clypeus than to eye, with antennomeres 10 and 11 project beyond pronotal base. Antennomeres 6–11 weakly broad-



Figs 3–9. *Chrysolina*, aedeagus structure: 3–7 — *Ch. romandudkoi* sp.n.; 8–9 — *Ch. nagaja* (Daccordi, 1982) from Solukhumbu Distr., env. Lamjura La Pass; 3, 8 — lateral view, 4, 6, 9 — dorsal view (4 — holotype), 5 — ventral view, 7 — view of the apex and apical orifice along the main axis (paratype). Scale bar — 1mm.

Рис. 3–9. *Chrysolina*, строение эдеагуса: 3–7 — *Ch. romandudkoi* sp.n.; 8–9 — *Ch. nagaja* (Daccordi, 1982) из района Solukhumbu, окрестностей перевала Lamjura La; 3, 8 — сбоку, 4, 6, 9 — сверху (4 — голотип); 5 — снизу; 7 — вершина и апикальное отверстие вдоль продольной оси (паратип). Масштаб — 1мм.

ened. Orbital lines broadly impressed above eye, not projecting along inner border or eye.

Pronotum 1.75x as broad as long, moderately convex, broadest before the middle of its length. Anterior angles moderately produced, basal angles sharp. Anterior side of pronotum entirely marginate, with setae. Both anterior and posterior setiferous pores present. Pronotum laterally weakly swollen along entire length, lateral calli weakly or not pronounced, lateral impressions obsolete, only in basal 1/4 with punctures larger than those at disk. Punctures at pronotal disk moderately dense and fine, in addition several large punctures can be seen in posterior third. Hypomera of prothorax almost flat, weakly convex, smooth. Basal fold distinct. Intercostal prosternal process broadened posteriorly. Antero-lateral portions of prosternum flat, anteriorly marginate, with wide impression posteriorly. Metasternum entirely marginate anteriorly, with broad and convex callus between mid-coxae. Scutellum triangular, smooth, without punctures.

Elytra with very feeble humeral calli, with 9 slightly irregular rows of fine punctures and abbreviated scutellar row from 4–5 punctures. Rows except the 1st one are slightly paired, 6th row in the basal impression consists of large and deep punctures. Intervals flat, covered by sparse, obsolete wrinkles and very fine punctures. Epipleura inclined outside, visible along entire length in lateral view. Hind wings vestigial, narrow, slightly longer than metathorax.

Tarsi densely pubescent beneath, 3rd segment of all tarsi moderately dilated. Tarsomere 4 without denticles beneath.

Pygidium with well pronounced impression along entire length. Last abdominal sternite evenly convex, broadly truncate and marginate apically in male and female.

Aedeagus tube-shaped, apically truncated, with lateral denticles; flagellum straight tubular, exposed (Figs 3–7). Length 6.2 mm, width 4.2 mm.

VARIABILITY of males. Rarely pronotum obsoletely shagreen and looks as smooth as elytra, punctures in elytral rows may slightly vary in size (Figs 19–20). Hypomera of prothorax sometimes with thin wrinkles along outside.

Length 6.0–7.0 mm, width 4.0–5.0 mm

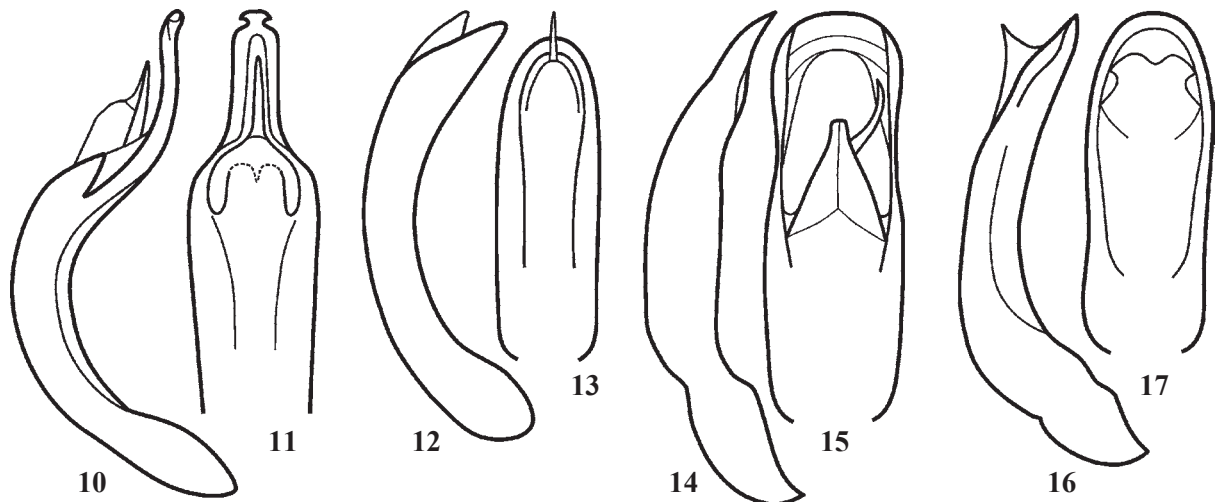
Females. Antennomeres 6–11 weakly broadened, narrower than in males. Pronotum laterally weakly to moderately swollen along entire length, lateral calli weakly or not pronounced, lateral impressions obsolete or very smooth and pronounced only in basal 2/3 (Fig. 21). Last maxillary palpomere 1.6x as long as broad, 1.2x as long as previous palpomere. Tarsomeres 1–3 with entire sole, tarsomere 3 of all tarsi narrow. Dissection of the abdomen of one female gave 7 large eggs (length 1.8–2.0 mm) with thin exochorion and embryo visible through it. Length 7.2–7.8 mm, width 4.8–5.1 mm

DIFFERENTIAL DIAGNOSIS. Short aedeagus with broad anchor-shaped apex (Figs 3–7) immediately distinguishes the new species from all known Nepalese *Chrysolina* (see Figs 8–9, 10–17). Elytra with 9 regular rows of punctures (Figs 19–21) place it closer to *Ch. dhaulagirica* and *Ch. hartmanni*. But from both species having red fulvous marginal stripe on elytra and pronotal lateral calli distinct and basally divided from disc with a groove it differs in having colour entirely dark bronze and lateral calli of pronotum not or feebly separated from disc (Figs 19–21). From *Ch. nagaja* (Fig. 18) and *Ch. daccordii* having uniformly bronze body and similar habitus it differs in having regular rows of punctures on elytra.

ETYMOLOGY. The species is dedicated to my friend Roman Dudko (Novosibirsk, Russia), who collected the type series.

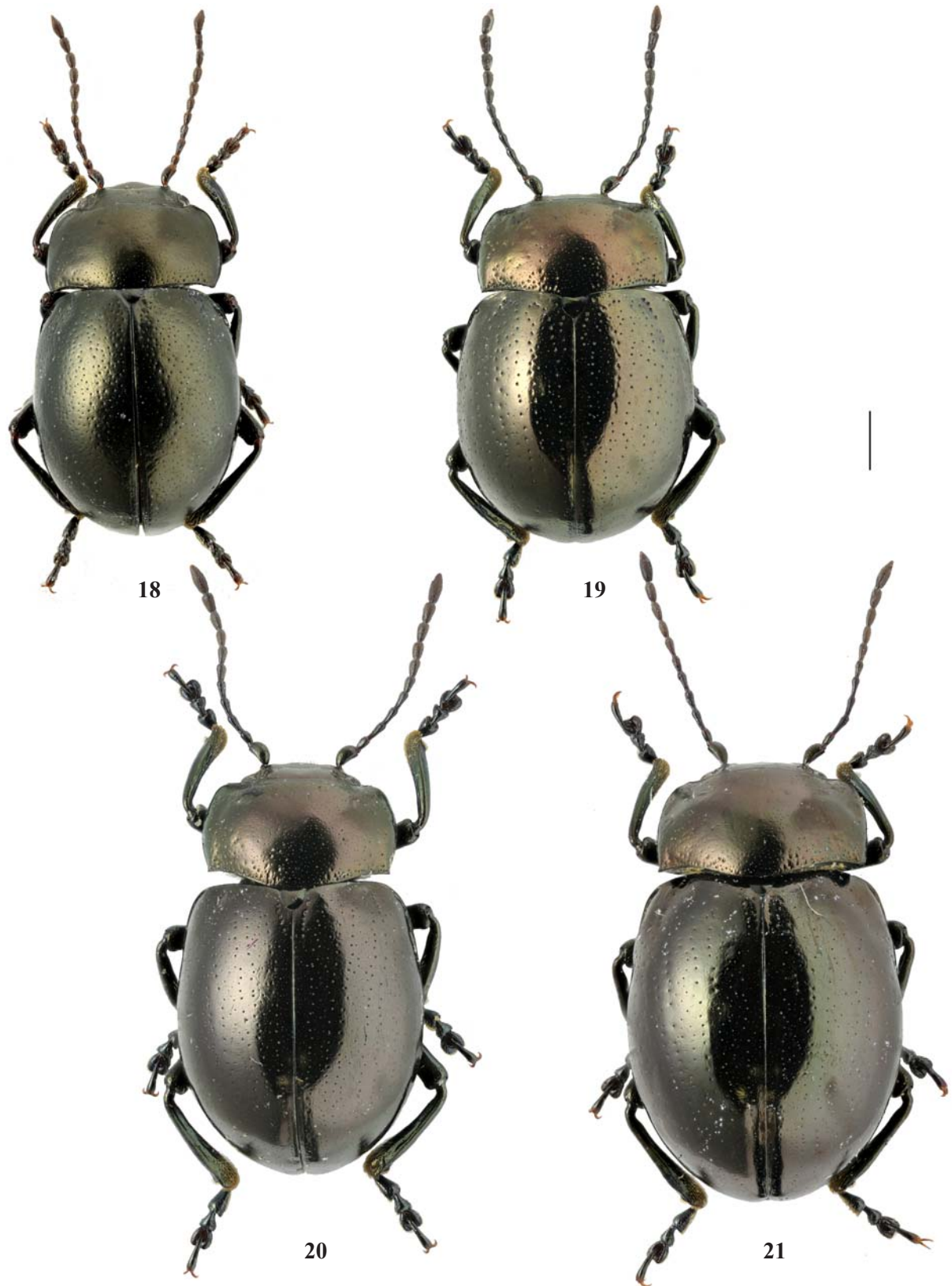
High mountain *Chrysolina* with reduced wings from Nepal Himalaya can be determined with the key below.

- 1 (4) Upperside dull, dark bronze. Elytra covered by dense, moderately large, entirely irregular punctures (Fig. 18).
2(3) Pronotum without lateral calli and impressions. Aedeagus with apex prolonged and anchor-shaped (Figs 8–9). Length: 6.0–6.4 mm (male), 7.0 mm (female). Pakistan, Eastern Nepal (Solukhumbu, Sankhuwasabha, Taplejung Distr.) *Ch. nagaja* (Daccordi, 1982)



Figs 10–17. *Chrysolina*, aedeagus: 10–11 — *Ch. daccordii* (L. Medvedev et Sprecher-Uebersax, 1999); 12–13 — *Ch. hartmanni* Medvedev, 1999; 14–15 — *Ch. dhaulagirica dhaulagirica* Medvedev, 1990; 16–17 — *Ch. dhaulagirica arunensis* Medvedev, 1992; 10, 12, 14, 16 — lateral view; 11, 13, 15, 17 — dorsal view [10–11 — after Bienkowski, 2013; 12–13 — after Medvedev, 1999; 14–15 — after Medvedev, 1990; 16–17 — after Medvedev, 1992, slightly modified].

Рис. 10–17. *Chrysolina*, эдеагус сбоку и сверху: 10–11 — *Ch. daccordii* (L. Medvedev et Sprecher-Uebersax, 1999); 12–13 — *Ch. hartmanni* Medvedev, 1999; 14–15 — *Ch. dhaulagirica dhaulagirica* Medvedev, 1990; 16–17 — *Ch. dhaulagirica arunensis* Medvedev, 1992; 10, 12, 14, 16 — сбоку; 11, 13, 15, 17 — сверху [10–11 — по Bienkowski, 2013; 12–13 — по Medvedev, 1999; 14–15 — по Medvedev, 1990; 16–17 — по Medvedev, 1992, с небольшими изменениями].



Figs 18–21. *Chrysolina*, general dorsal view: 18 — *Ch. nagaja* (Daccordi, 1982) from env. Lamjura La Pass; 19–21 — *Ch. romandukoi* sp.n., paratypes (19–20 — males, 21 — female). Scale bar — 1mm.

Рис. 18–21. *Chrysolina*, общий вид сверху: 18 — *Ch. nagaja* (Daccordi, 1982) из окрестностей перевала Lamjura La; 19–21 — *Ch. romandukoi* sp.n., паратипы (19–20 — самцы, 21 — самка). Масштаб — 1мм.

- 3(2) Lateral calli of pronotum distinctly convex, especially basally, where it is delimited with impression. Aedeagus (Figs 10–11) strongly curved in lateral view with long narrow apical projection ending with anchor-like tip. Length: 5.7–6.7 mm (male), 7.1–7.3 mm (female). Western Nepal (Mustang and Manang Distr.)
Ch. daccordii (L. Medvedev et Sprecher-Uebersax, 1999)
- 4 (1) Upperside shining. Elytra with punctures forming 9 slightly irregular paired rows.
- 5 (12) Punctures in elytral rows rather small and sparse, interspaces flat, shagreened and very finely punctured.
- 6 (11) Pronotum with lateral calli distinct, divided from disc with a groove in basal third and strong punctures anteriorly. Basal and lateral margins of elytra red fulvous.
- 7(8) Elytra without humeral calli, puncture rows distinctly paired. 1st tarsomeres of fore tarsi in males strongly dilated. Body dark bronze, elytral lateral stripe occupying two outermost intervals and epipleurae red fulvous, pronotal lateral calli brown. Aedeagus (Figs 12–13) with rounded apex and straight flagellum, placed more apically. Length 7.1–8.0 mm. Mid Western Nepal (Jumla Distr.)
Ch. hartmanni Medvedev, 1999
- 8(7) Elytra with very weak humeral calli. Elytral rows not distinctly paired. 1st tarsomeres in males moderately dilated.
- 9(10) Larger, elytral punctures in the rows dense. Body dark blue, both basal and lateral red fulvous margins of elytra broad. Aedeagus (Figs 14–15) with spatula shaped apex and flagellum placed more basally. Length: 5.8 mm (male), 6.0–6.5 mm (female). Western Nepal (Myagdi Distr.) ..
 *Ch. dhaulagirica dhaulagirica* Medvedev, 1990
- 10(9) Smaller, elytral punctures in the rows sparse. Body dark bronze, basal red fulvous margins of elytra narrow. Aedeagus (Fig. 16–17) with rounded apex and flagellum placed more apically. Length: 5.2–5.5 mm (male), 6.0 mm (female). Eastern Nepal
 *Ch. dhaulagirica arunensis* Medvedev, 1992
- 11 (6) Pronotum with obsolete lateral calli, only in females divided from disc with a smooth depression in basal third. Elytra uniformly bronze. Aedeagus (Figs 3–7) apically truncated, with lateral denticles and flagellum straight tubular. Length: 6.0–7.0 (male), 7.2–7.8 mm (female). Eastern Nepal (Bhojpur and Solukhumbu Distr.)
 *Ch. romandudkoi* **sp. n.**
- 12 (5) Punctures in elytral rows rather large, interspaces moderately convex (Figs 1–2). Elytra dark bronze; pronotum greenish, finely granulate, uniformly covered with fine punctures, with a pair of short oblique lateral depressions at basal margin. Females unknown. Length: 9.2–9.5 mm. Eastern Nepal *Ch. tangalaensis* Kimoto, 2001.

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