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RESEARCH PAPER

Description of a new species of the genus *Chrysolina* (Coleoptera: Chrysomelidae) from Honshu, and notes on records of *Chrysolina aeruginosa* in Japan

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Abstract. A new species of the genus *Chrysolina* Motschulsky, 1860 from Nagano Prefecture, Honshu, Japan is described as *Chrysolina* (*Allohypericia*) *orochi* sp. nov. with detailed illustrations of the male and female genitalia, description of larva and pupa, and record of its host plant, *Artemisia capillaris* Thunberg (Asteraceae). *Chrysolina* (*Allohypericia*) *aeruginosa* (Faldermann, 1835) is excluded from Japanese fauna based on revision of the previously published records.

Key words. Coleoptera, Chrysomelidae, Chrysomelinae, *Chrysolina*, *Allohypericia*, larva, leaf beetle, new species, pupa, taxonomy, Honshu, Japan, Palaearctic Region

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Introduction

The genus *Chrysolina* Motschulsky, 1860 comprises 438 described species worldwide (Bieńkowski 2019). In Japan, 14 species are recorded: *Chrysolina* (*Anopachys*) *aurichalcea* (Gebler, 1825) in Mannerheim (1825), *Ch.* (*An.*) *watanabei* Takizawa, 1970, *Ch.* (*Apterosoma*) *angusticollis* (Motschulsky, 1860), *Ch.* (*Ap.*) *aino* Takizawa, 1970, *Ch.* (*Ap.*) *porosirensis* Takizawa, 1970, *Ch.* (*Euchrysolina*) *virgata* (Motschulsky, 1860), *Ch.* (*Erythrochrysa*) *polita kirigaminensis* Suzuki & Saitoh, 2011, *Ch.* (*Chrysocrosita*) *nikolskyi nikolskyi* (Jacobson, 1898), *Ch.* (*Lithopteroides*) *exanthematica exanthematica* (Wiedemann, 1821), *Ch.* (*Pleurosticha*) *cavigera pirka* Takizawa, 1970, *Ch.* (*Hypericia*) *difficilis* (Motschulsky, 1860), *Ch.* (*H.*) *nikkoensis* (Jacoby, 1885), *Ch.* (*Allohypericia*) *koltzei lamii* Takizawa, 1970, and *Ch.* (unplaced) *seriepunctata* (Weise, 1887) (Chujo & Kimoto 1960, Kimoto 1964, Takizawa 1970, Saitoh 2012, Saitoh et al. 2016, Bieńkowski 2019). However, *Ch. angusticollis* can be divided into at least 20 morphologically and/or genetically differentiated "units", including also *Ch. aino* and *Ch. porosirensis* in the *Ch. angusticollis* complex in northern Japan (Saitoh 2012). Additionally, *Ch.* (*Allohypericia*) *aeruginosa aeruginosa* (Faldermann, 1835) was recorded from Japan by Chujo & Kimoto (1960), Kimoto (1964) and Takizawa (1970), but these records are doubtful. Since then, Kimoto & Takizawa (1994) mentioned, in reference to the figures of *Ch. aeruginosa* in Mohr (1963), that identification of *Ch. aeruginosa* in Kimoto (1964) is incorrect and this record should be corrected to *Ch. difficilis*.

The subgenus *Allohypericia* Bechyné, 1955 was determined to be a valid subgenus and separated from its earlier synonymy with *Anopachys* Motschulsky, 1860 in Bieńkowski (2019). In this paper, I follow the treatment of Bieńkowski (2019), who characterizes almost all members of this subgenus by the folowing features: elytral punctures arranged in distinct or mostly confused rows; elytral epipleura inclined on outer sides, visible along entire length in lateral view; aedeagus with trapeziform or rounded apex bearing two small calli or denticles ventrally. Bieńkowski (2019) includes also *Ch. koltzei lamii* Takizawa, 1970 in this subgenus, but, at least, this species does not actually fit the diagnosis for the subgenus.

Chrysolina (*Allohypericia*) *orochi* sp. nov. appears similar to *Ch.* (*Al.*) *aeruginosa aeruginosa* and *Ch.* (*Al.*) *peninsularis* Bechyné, 1952 based on external and internal traits, but these species can be distinguished by external differences as described below, and are geographically separated, so I describe *Ch. orochi* sp. nov. as a species separate from both *Ch.* (*Al.*) *aeruginosa aeruginosa* and *Ch.* (*Al.*) *peninsularis*.

Larva and pupa of 12 Japanese species of the genus *Chrysolina* were previously described by Takizawa (1971a,b, 1978) and Kimoto (1962). In this study, I describe also the larva and pupa of *Ch. orochi* sp. nov.

Materials and methods

The specimens used herein are preserved in the private collections of Fuyuki Sato (FSPC) and Takuya Takemoto (TTPC). The holotype is deposited in the Systematic Entomology collection, Hokkaido University, Sapporo, Japan (SEHU). Other museum abbreviations are as follows: The Natural History Museum, London, United Kingdom (BMNH); Zoological Museum of the Moscow State University, Moscow, Russia (ZMMU); Zoological Museum, University of Helsinki, Helsinki, Finland (MZHF); Naturhistorische Museum in Basel, Basel, Switzerland (NHMB); Museum für Naturkunde, Berlin, Germany (ZMHB); Hungarian Natural History Museum, Budapest, Hungary (HNHM); and A. N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Moscow, Russia (SIEE).

To observe male and female genitalia, specimens were relaxed in boiling water for 15 minutes before removing the abdomen from the body. Genitalia were then removed from the abdomen and softened in KOH solution (ca. 10%) for 15 minutes at 60 °C before removing muscles from the genitalia in ethanol (ca. 80%). Genitalia were then dyed in a solution of lactic acid and acid fuchsine for three hours at 60 °C, then dehydrated in acetic salicylate for 15 minutes at 6 °C, and then in xylene for two minutes at ambient temperature. Genitalia and larva were observed in α-terpineol using a stereo microscope (Nikon SMZ745T, SMZ800). SEM photos were taken with a JSM-6510 scanning electron microscope, and all photos were edited using Adobe Photoshop CS6. The following abbreviations for measurements are used in this paper as shown in Fig.1: EL – length of elytron; EW – width of elytron; HW – width of head; PEL – length of pronotum to elytron; PL – length of pronotum; PPW – pronotum width at posterior angles; PW – width of pronotum.

All specimens of larvae and pupae used in this paper were reared from eggs oviposited by collected adults.

External characters nomenclature follows Bieńkowski (2007), but, for "scutellar puncture row", I modified it with "abbreviated scutellar puncture row".

Larval tubercular pattern and nomenclature follows Kimoto (1962) and Takizawa (1971a): Tubercles: D – dorsal tubercle; DL – dorso-lateral tubercle; EP – epipleural tubercle; Epa – epipleural anterior tubercle; Epp – epipleural posterior tubercle; P – pleural tubercle; Tr – trochantin; Dai – dorso-anterior inner tubercle; Dae – dorso-anterior exterior tubercle; DLai – dorso-lateral anterior inner tubercle; Dpi – dorso posterior inner tubercle; Dpe – dorso-posterior exterior tubercle; DLp – dorso-lateral posterior tubercle; DLpi – dorso lateral posterior inner tubercle; DLi – dorso-lateral inner tubercle; DLe – dorso-lateral exterior tubercle; ES – exsternal tubercle. Setae: L – long seta; M – middle seta; S – short seta.

Plant nomenclature follows Yonekura & Kajita (2003).

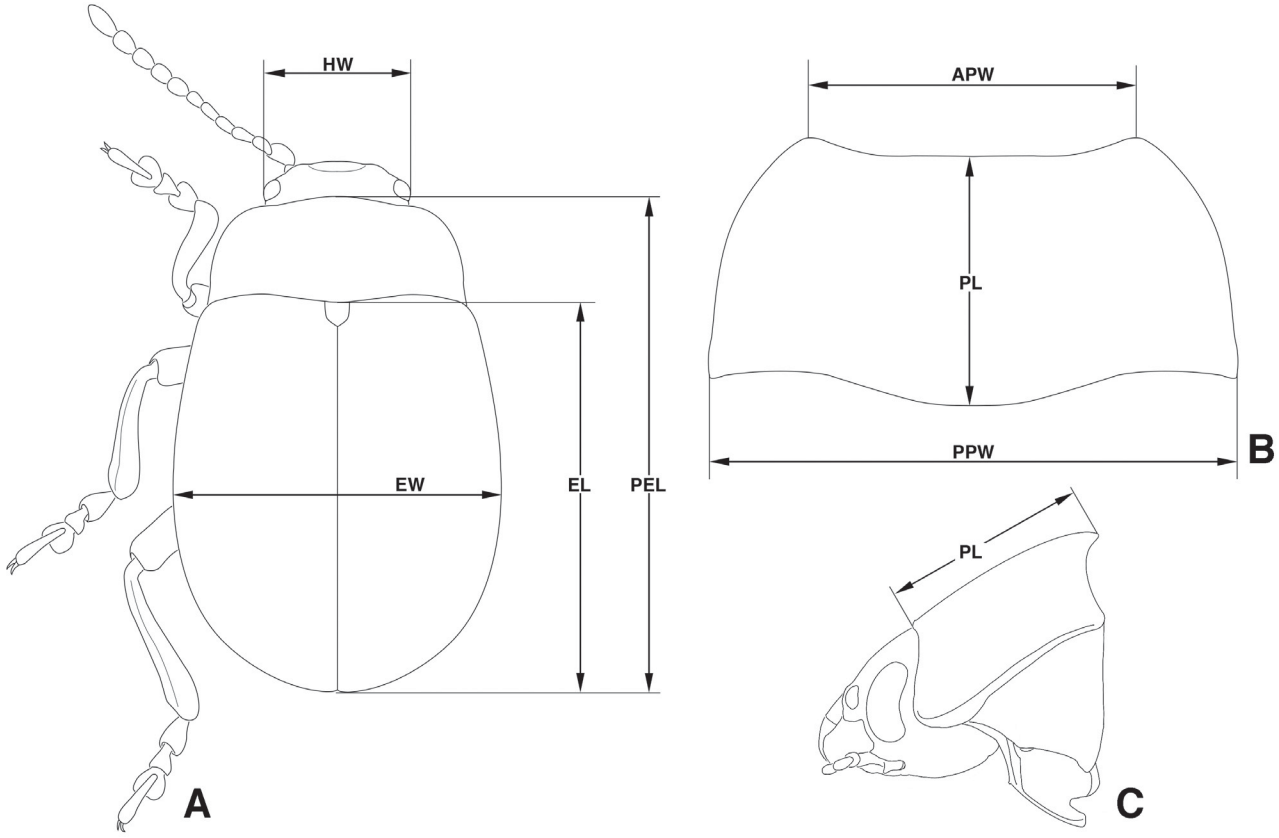

Fig. 1. Parts for biomimetic mesurements. A – adult of *Chrysolina*; B – pronotum of species in dorsal view; C – head and pronotum in lateral view. Abbreviations: APW – pronotum width at anterior margin; EL – length of elytra, measured from top of humerus to apex of each elytron; EW – maximum width across elytra; HW – width of head including eyes; PEL – length of pronotum and elytron; PL – length of pronotum; PPW – width of posterior margin of pronotum.

Chrysolina (*Allohypericia*) *orochi* sp. nov.

[Japanese name: Nanaseki-hamushi]

(Figs 2, 3, 7–15)

Type materials. Holotype: ♂, "[Japan] Nagano pref. / Ina City / Hasekurogouchi / "伊那市長谷黒河内" / 9.IX.2020 / H. Kamezawa leg." [typed on white card], "TT0000010 / ex. by Takuya Takemoto / SEHU, Japan" [typed on white card], "♂ / embedding in Canada balsam (typed on white card with enclosed genitalia by Canada balsam)", "Holotype / *Chrysolina orochi* / Takemoto, 2022 / Appended label by / T. Takemoto, 2022" [typed on a red card] (SEHU: TT0000010). Paratypes (15 ♂♂ 21 ♀♀): **JAPAN: Honshu:** Nagano Pref.: 1 ♀ (SEHU: TT0000011) same data as the holotype; 1 ♂ 7 ♀♀ (FSPC: TT0000012–0000016, 0000021, 0000023, 0000169), same data as the holotype, F. Sato leg.; 6 ♂♂ 8 ♀♀ (TTPC: TT0000009, 0000024–0000026, 0000101–0000109, 0000130), same locality but 23.IX.2021, T. Takemoto leg., 1 ♂ 1 ♀ (TTPC: TT00000156–0000157), same locality but 17.IX.2022, T. Takemoto leg.; 7 ♂♂ 3 ♀♀ (FSPC: TT00000158–0000167), Ina City, Akashina, Nanaki, 29.IX.2022, F. Sato leg., 1 ♀ (FSPC: TT0000168), 1 ♀, same locality but 20.I.2018, S. Nagai leg.

Description of adult (Figs 2; 3G; 7–11). ***Measurements.*** Body length: PEL, male, 6.4–7.9 mm, female, 7.1–8.7 mm. Width: EW, male, 4.0–5.0 mm, female, 4.6–5.7 mm. Biometric data are given in Table 1.

Table 1. Biometric data for *Chrysolina orochi* sp. nov. Abbreviations: APW – pronotum width at anterior margin; EL – length of elytra, measured from top of humerus to apex of each elytron; EW – maximum width across elytra; HW – width of head including eyes; PEL – length of pronotum and elytron; PL – length of pronotum; PPW – width of posterior margin of pronotum.

Measured portions	Male (n = 16)	Female (n = 20)
HW	1.96–2.43 (2.20±0.12)	2.12–2.50 (2.34±0.11)
APW	2.23–2.83 (2.53±0.15)	2.45–2.94 (2.69±0.14)
PPW	3.32–3.93 (3.75±0.19)	3.80–4.39 (4.10±0.16)
EW	4.03–5.01 (4.65±0.27)	4.61–5.67 (5.23±0.24)
PL	1.63–1.97 (1.80±0.1)	1.72–2.17 (1.97±0.12)
EL	4.97–6.21 (5.62±0.34)	5.54–6.93 (6.19±0.41)
PEL	6.43±7.89 (7.21±0.38)	7.06–8.69 (8.03±0.44)

Habitus. Oblong.

Coloration. Head usually dark greenish copper, sometimes dark shining purple; clypeus and labrum shiny black; antennae with antennomeres I–IV blackened brown, V–XI black. Pronotum dark greenish copper, sometimes dark

Fig. 2. Habitus of *Chrysolina orochi* sp. nov., holotype male (TT0000010) (A – dorsal view, B – ventral view, C – lateral view), paratype female (TT0000156) (D – dorsal view, E – ventral view, F – lateral view).

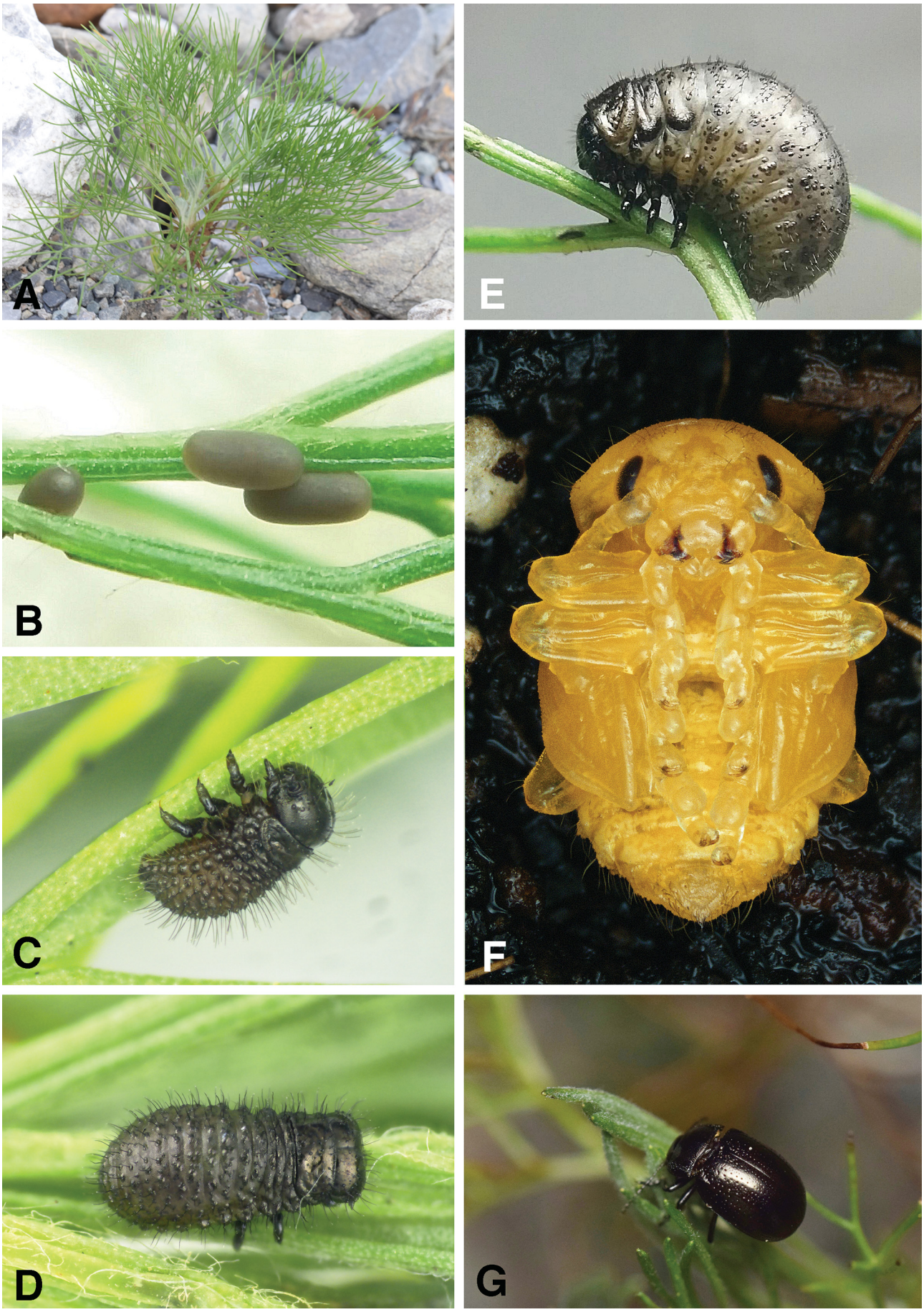

Fig. 3. Growth stages of *Chrysolina orochi* sp. nov.: A – host plant, *Artemisia capillaris* Thunberg; B – eggs; C – first instar larva; D – third instar larva; E – last (fourth) instar larva; F – pupa; G – adult.

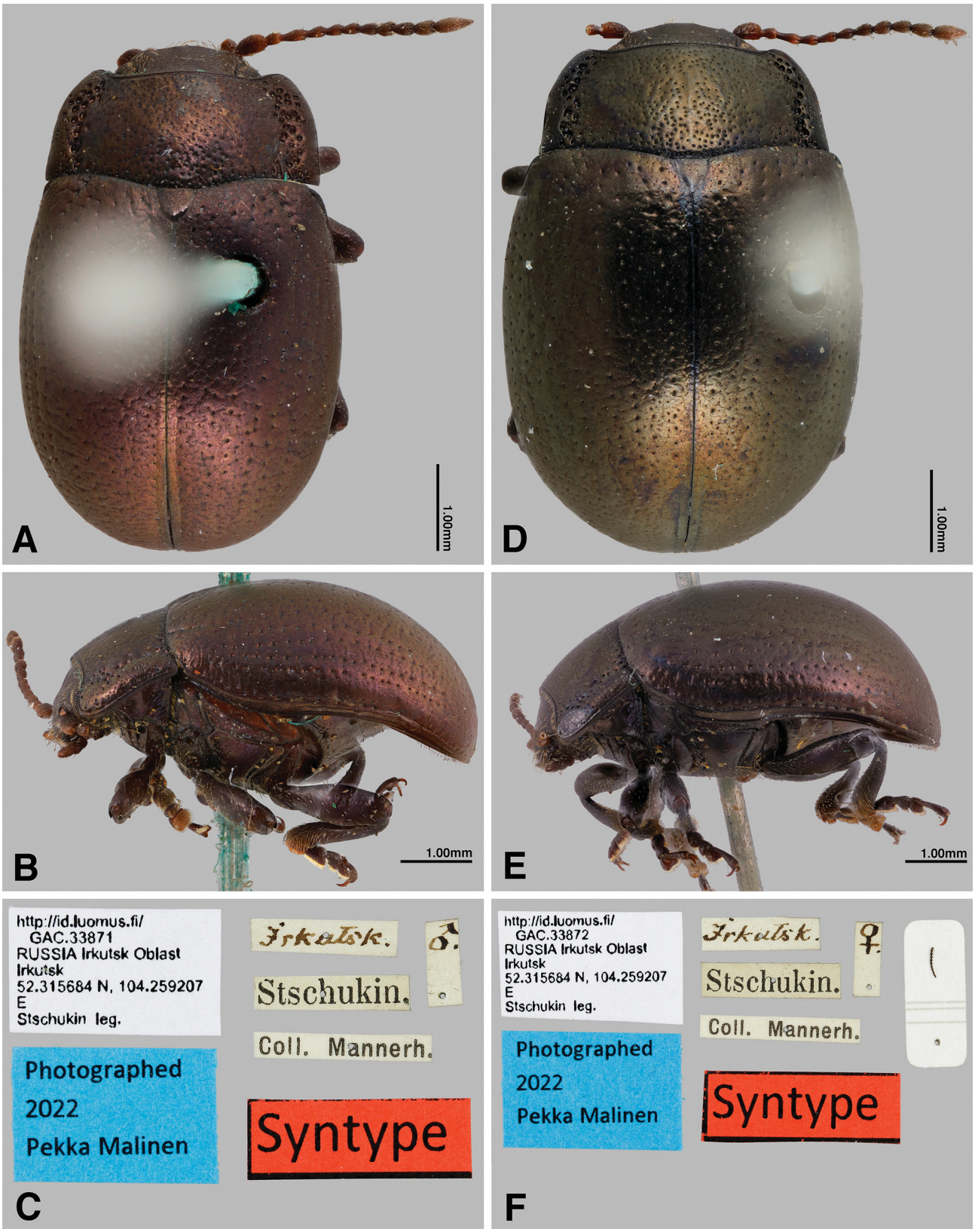

Fig. 4. *Chrysolina aeruginosa aeruginosa* (Faldermann, 1835), syntypes. Photographs by P. Malinen.

green with purplish sheen. Scutellum shiny dark grey. Elytra brownish copper with stronger tinge of green; sometimes purple with bluish sheen; rarely green with purplish sheen. Hind wings orange on radial field, central field, radial cell, upper side of medial field and basal area of apical field, other areas yellowish brown. Ventral side and legs shining black.

Structure. Head (Fig. 7A) reticulate coriaceous, sparsely covered with setiferous punctures (Fig. 8A), frons and area near eyes densely covered with setiferous punctures; inner margin of eyes with impressions covered with setiferous punctures; frontal suture curved, forming arch, posterior area of suture with weak wrinkles; labrum furnished with long setae; and labrum three times longer than clypeus.

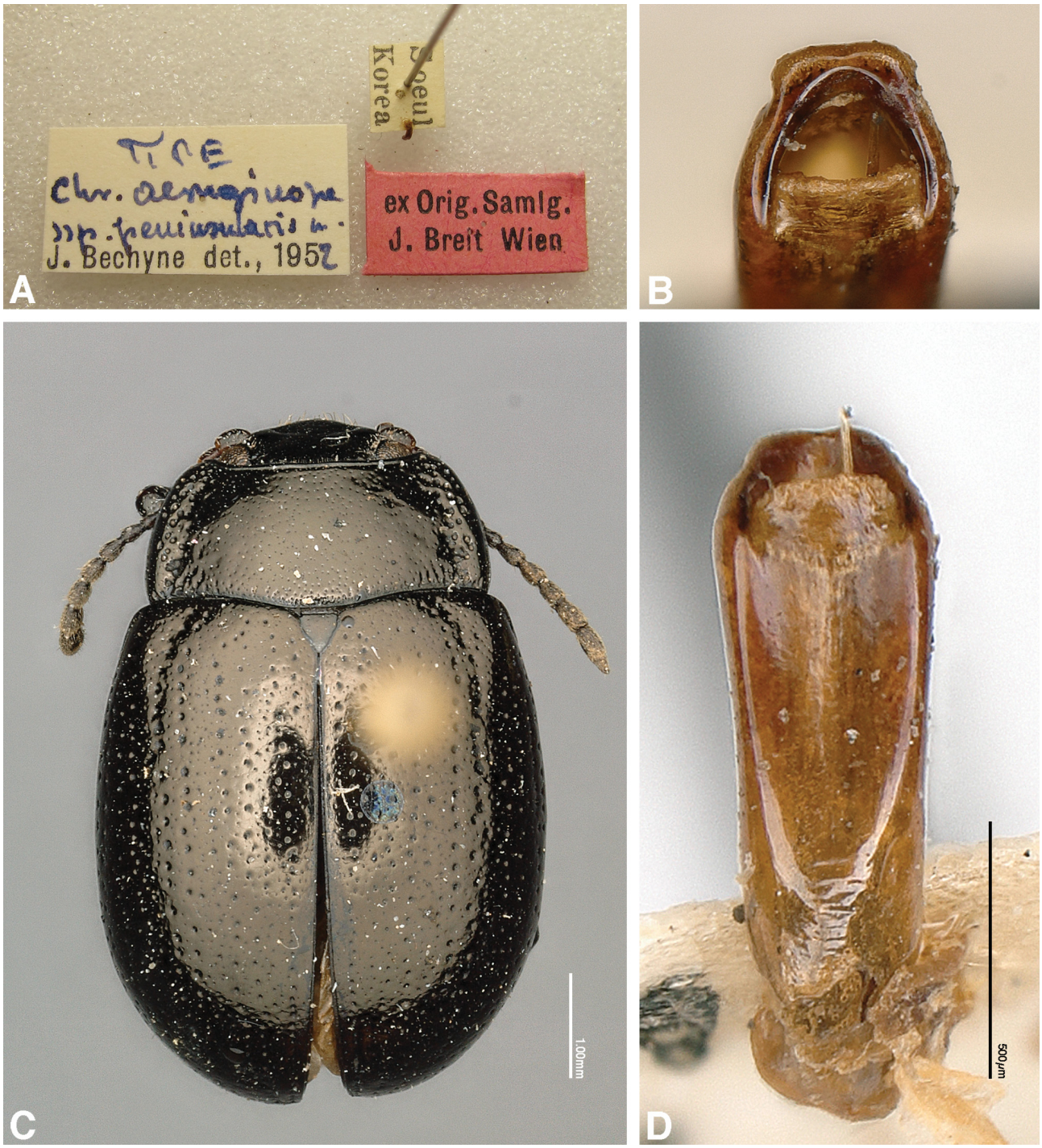

Fig. 5. *Chrysolina peninsularis* Bechyné, 1952, holotype: A – labels; B – apex of median lobe; C – habitus; D – median lobe in dorsal view. Photographs by C. Germann.

Apex of mandible bifurcate; lateral angles furnished with setae (Fig. 10A). Antennae somewhat short, filiform and setose, segments VII to XI with shorter, denser setae (Fig. 10B). Length ratios of antennomeres II–XI: Male: 1.0 : 1.3 : 1.1 : 1.1 : 1.1 : 1.3 : 1.2 : 1.3: 1.4 : 2.1 (n = 15); female: 1.0 : 1.4 : 1.1 : 1.1 : 1.1 : 1.3 : 1.2 : 1.3: 1.4 : 2.1 (n = 19); antennomere I nearly as long as about 1.6 times II; antennomere II short, robust; antennomere III thin and long; antennomeres IV–VI thin and short; antennomeres VII somewhat thin; antennomeres VIII–X oval; antennomere XI longest and apically pointed.

Pronotum (Fig. 7B) swollen laterally along entire length; setiferous pore absent at anterior corner; anterior margin furnished with setae; marginate on all margins; lateral margin weakly pinched near base; surface weakly reticulate coriaceous, sparsely covered with shallow punctures, without central line, but more dense basally; distance between punctures in central portion 2–4 times their own diameter; lateral impression covered with large rough punctures, some punctures confluent on basal area; surface reticulate coriaceous, sparsely covered with setiferous punctures (Fig. 8B).

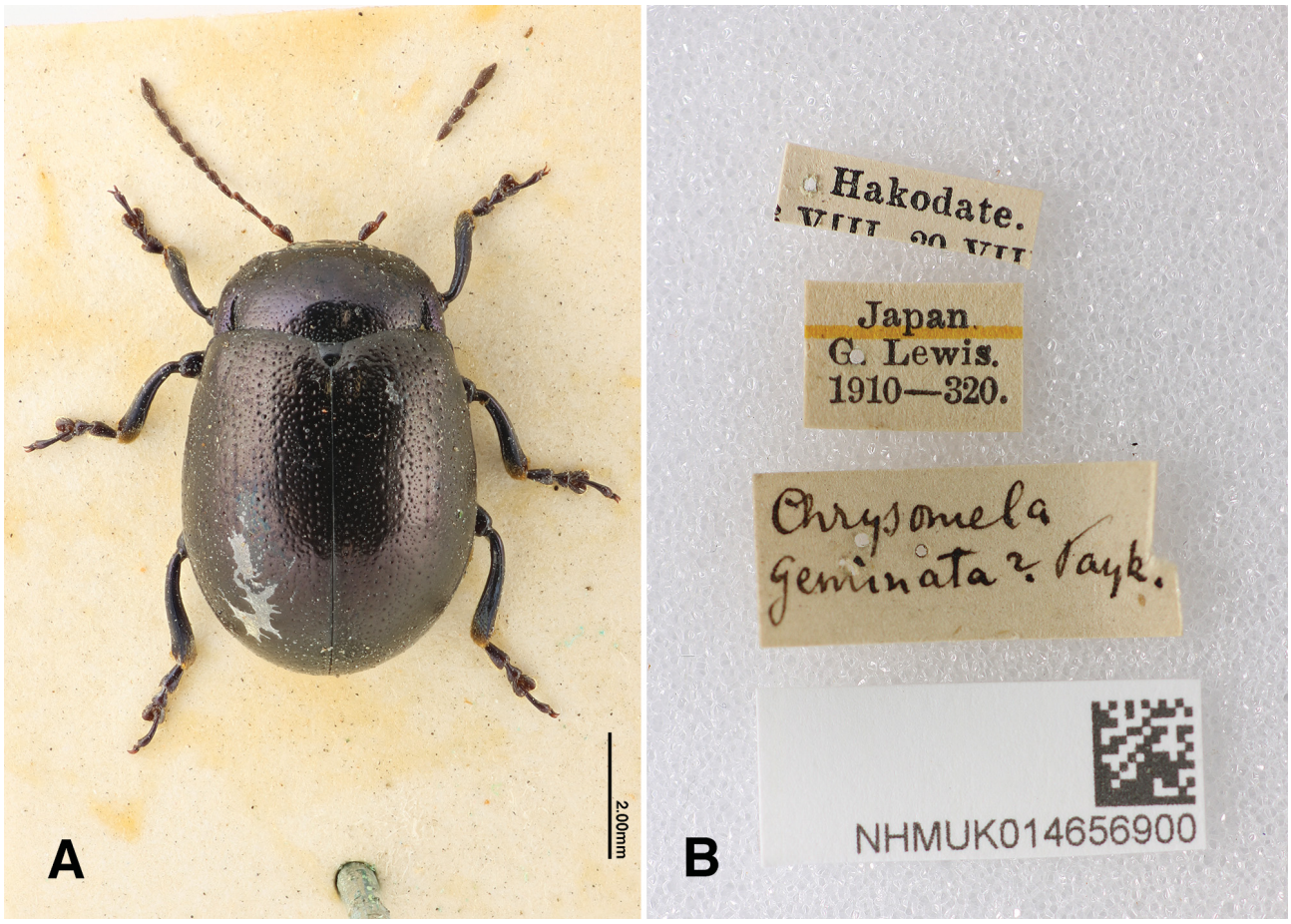

Fig. 6. *Chrysolina* (*Hypericia*) sp. in BMNH (A – habitus, B – labels). Photographs by K. Matsumoto.

Prothoracic hypomeron marginated, surface furnished with basal fold and distinct wrinkles (Fig. 7C). Anterior margin of prosternum marginated; in male both sides of intercoxal prosternal process weakly ridged and covered with large rough punctures; in female both sides of intercoxal prosternal process more weakly ridged and densely covered with large rough punctures.

Elytra elongate, moderately vaulted in lateral view (Fig. 7D); gently widened from basal 1/3 to apex; furnished with abbreviated scutellar puncture row and 9 rows of large punctures, interstices irregularly punctured, punctures separated by 1–3 times their diameter, dorsal surface with reticulate coriaceous microsculpture (Fig. 8C); sutural groove on posterior 2/5 distinct and on basal 3/5 ambiguous, lateral grooves from elytral base to apex complete; humeral calli weak; elytral epipleura outwardly inclined, visible along entire length in lateral view and inner side of apex furnished with sparse setae. Scutellum triangular.

Hind wing developed; venation (Fig. 10C) with Cu1a and isolated Cu1b simple without subbranches, as in most chrysomelinae species; R2+3, R4+5, M1, and apex spreading toward margin; base of M3 weakly sclerotized.

Mesoventrite with T-shaped process whose basal area is obscured by prosternal process between mesocoxae. Surface of metaventrite with reticulate coriaceous microsculpture and sparsely furnished with setiferous punctures (Fig. 8D); basal margin marginated and punctate; central area with distinct vertical groove and wrinkles on either side; upper margin of metacoxae marginated and punctate; lateral side marginated. Metepisternum with dense rough punctures. Sternites reticulate coriaceous and furnished with setiferous punctures (Fig. 8E); posterior margin of metacoxae marginated and punctate; lateral area of 3–6th sternite weakly concave; posterior margin of 7th sternite marginated (Figs 9A, B).

Legs with setiferous punctures; tibial setae becoming denser and longer apically. Fore tibiae straight, weakly widened near apex, and weakly concave on outer margin of apical 2/3; middle tibiae weakly bowed inwardly, weakly widened near apex and apical 2/3 concave on outer margin; hind tibiae weakly bowed inwardly, weakly widened near apex and apical 1/3 concave on outer margin; basal three segments of all tarsi gradually widened from tarsomere 1 to 3.

Pygidium with median groove along entire length.

Male. Last maxillary palpomere oval and truncate (Fig. 10D). All segments of tarsi broader than in female; base of ventral surface of tarsomere 1 on all legs sparsely furnished with pubescence, tarsomere 2 and 3 on all legs wholly pubescent (Figs 9C–E).

Genitalia as shown in Figs 11A–F: posterior margin of 8th sternite furnished with setae and central portion weakly sclerotized (Fig. 11A); apex of median lobe vertically trapezoidal (Fig. 11B), constricted near apex and bearing 2 small calli ventrally; flagellum exposed (Figs 11B–D); spicule divided into two pieces (Fig. 11E); tegmen undulate (Fig. 11F).

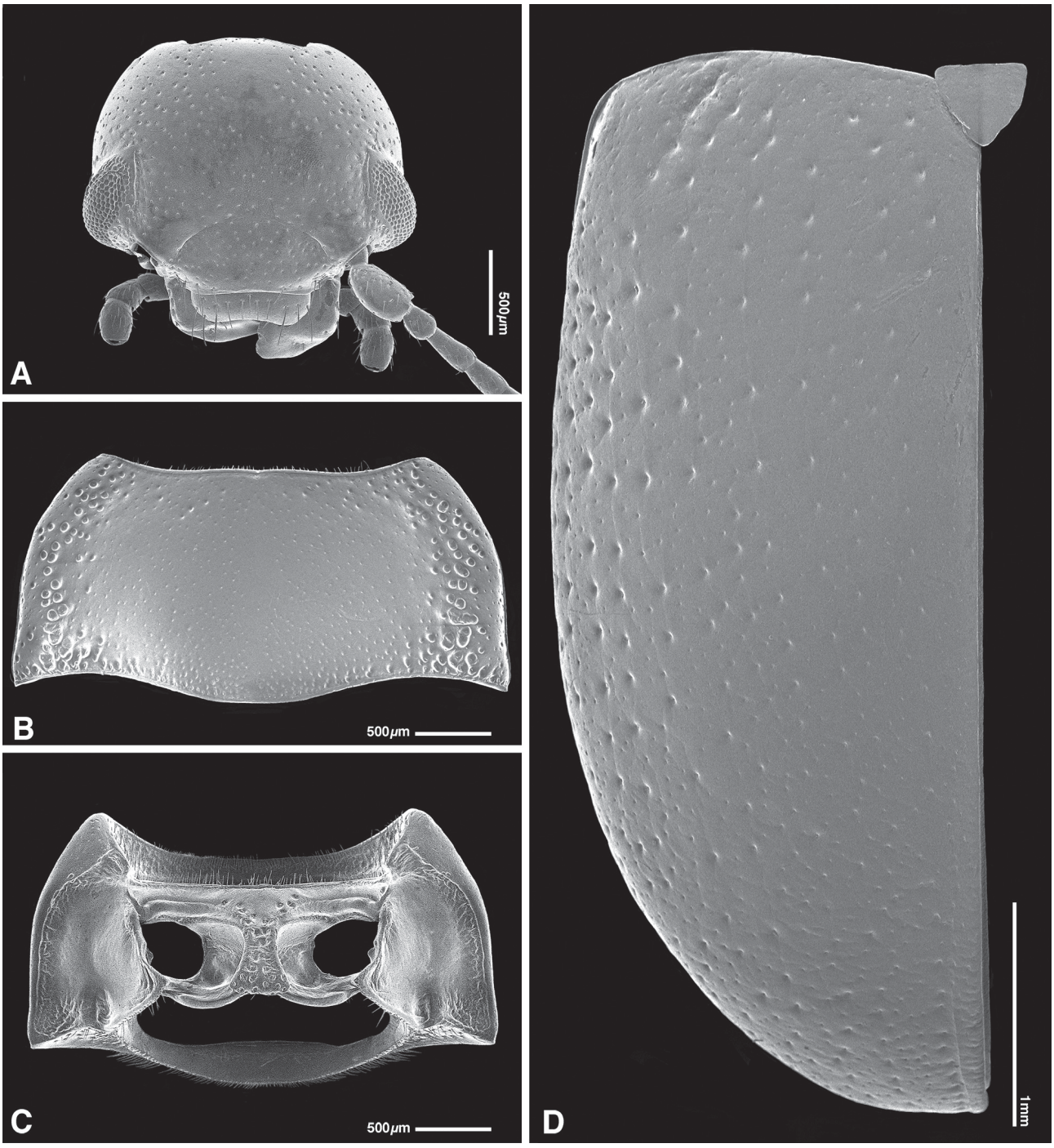

Fig. 7. External parts of *Chrysolina orochi* sp. nov. (TT0000022): A – head; B – pronotum, dorsal view; C – pronotum, ventral view; D – scutellum and elytron.

Female. Last maxillary palpomere oval (Fig. 10E). All segments of tarsi slenderer than in male; ventral surface of tarsomere 1 of all legs with median glabrous area forming triangle from base, tapering apically, extending about half length in protarsus and full length in meso- and metatarsi; ventral surface of tarsomere 2 of protarsi with glabrous area reaching about middle, meso- and metatarsi with glabrous area reaching 4/5; tarsomere 3 with basal central glabrous area at point without mesotarsi (Figs 9F–H).

Spermathecal organ as shown in Fig. 11G; spermathecal capsule (SptC) typical for *Chrysolina*, with reticulate coriaceous microsculpture on surface; spermathecal duct (SptD) in front of bursa copulatrix swollen, long, curved and well sclerotized.

Description of first instar larva (Figs 3C; 12A, B). ***Coloration.*** Head black but testaceous on anterior margin of frons, clypeus, labrum, and mouth parts. Body brown without black tubercles and spiracles (Fig. 3C). Sclerotized parts of legs black.

Structure. Body strongly convex dorsally on abdomen (Fig. 12A).

Head. Vertex and temporal side with 18–20 pairs of long setae, 18 pairs of moderately long setae and 3–6 pairs of short setae at base. Frons with 16–19 pairs of long setae.

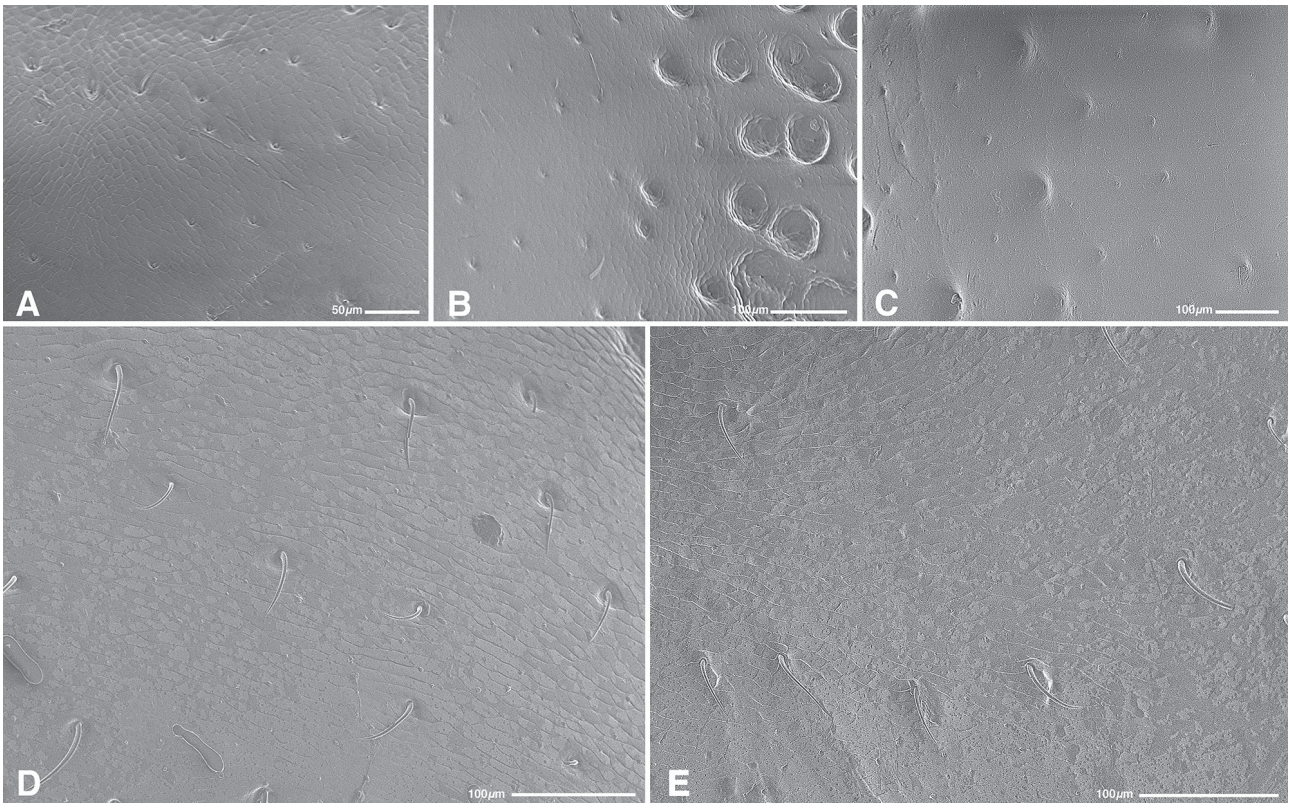

Fig. 8. Microscopic surface structures of *Chrysolina orochi* sp. nov. (TT0000022): A – head; B – pronotum; C – elytron; D – metaventrite; E – sternite 1.

Clypeus with 3 pairs of long setae. Labrum with 2 pairs of long setae. Maxillary palp 3-segmented (Fig. 12F); palpomere 1 without seta; palpomere 2 with 3 setae; palpomere 3 conical; palpiger with 2 setae; mala with 10–12 setae; stipes with 6 setae; cardo without seta. Labial palp 2-segmented; prementum with 4–5 pairs of setae; postmentum with 3 pairs of setae.

Thorax. Prothorax with D-DL-EP (28–30L 4–6S); Tr (1S); P (1L); ES (2L) weakly sclerotized; meso- and metathorax with Dai (1L); Dae (1L); Dpi (1L); Dpe (1L); DLi (2L) well developed with egg burster; DLe (3L); EPa (1S) fused with spiracle; EPp (1L); P (1L); ES (2L) weakly sclerotized.

Abdomen with Dai (1L); Dae (1L); DLai (1L); Dpi (1L); Dpe (1L); DLp (1L); DLi (2L) well developed with egg burster on 1st segment; Epa (1L); EP (3L); P (1–2S); ES (2L); segment 8 with D-DL (12–14L) fused; segment 9 with D-DL-EP (14–16L) fused; segment 10 with pygopod developed.

Apices of setae swollen (Figs 13A, C). Lacking setae but furnished with normal setae distributed as follows: head except for vertex; prothorax except for D-DL-EP; mesothorax except for P and ES; metathorax except for ES; segment 1 except for ES; segments 2–7 except for underside setae of P and ES; segments 8 and 9; legs.

Description of last instar larva (Figs 3E; 12C–I; 13E).

Diagnosis. The last instar larva is easily distinguished from larvae of other *Chrysolina* species in Japan by the following characters: body sparsely and entirely furnished with tubercles (Fig. 12C); tarsungulus furnished with tooth (Figs 12D, 13E).

Coloration. Head black with copper sheen except for testaceous anterior margin of frons, clypeus, labrum and mouthparts. Body grayish yellow without blackish brown tubercles and spiracles (Fig. 3E). Sclerotized parts of legs black.

Structure. Body strongly convex dorsally on abdomen (Figs 3E, 12C).

Head hypognathous, rounded, well sclerotized, surface entirely covered with wrinkles, particularly on both sides of coronal suture; anterior margin of frons protuding anteriorly in lateral view. Vertex with 23–26 pairs of long setae and 8–10 pairs of short setae at basal margin of vertex. Epicranial suture inverted Y-shaped; coronal suture distinct along entire length; frontal suture indistinct. Frons slightly depressed medially with 13–14 pairs of long setae. Endocarina distinct, becoming indistinct on apical half; frontoclypeal suture developed and undulate. Six stemmata on each side. Antennae 3-segmented. Clypeus trapezoidal with 3 pairs of setae. Labrum (Fig. 12H) deeply emarginate anteriorly with 2 pairs of setae, furnished with 5 pairs of setae apically. Mandibles (Fig. 12G) symmetrical, 5-toothed with 2 setae; tooth serrated.

Mouthparts same in shape and chaetotaxy as those of the first instar larva.

Thorax. Prothorax with D-DL-EP sclerotized and with sparse long setae; P (4–5S); ES and SS, each represented by short seta. Tubercles of meso- and metathorax sparsely and confusedly with DLe (8–10M); P (4M); EPa (4M, 1–2S); EPp (3–4M); ES (4–7S); SS, each represented by mid-long seta; mesothoracic spiracle annuliform with large peritreme; metathoracic spiracle vestigial. Legs

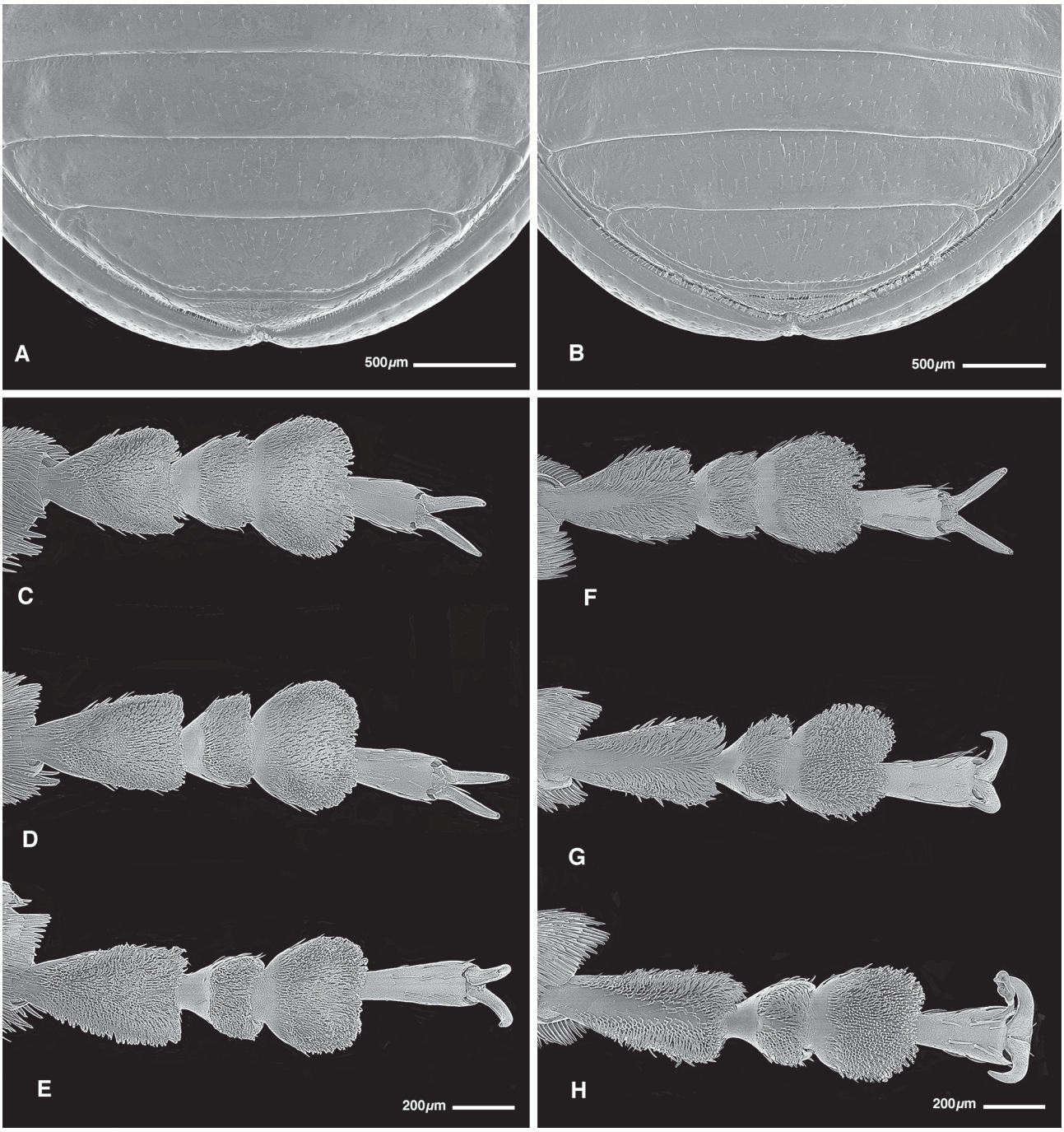

Fig. 9. Male (TT-0000022) and female (TT-0000015) posterior margin of 7th sternite and all tarsi of *Chrysolina orochi* sp. nov.: A–B – posterior margin of 7th sternite (A – male, B – female); C, F – protarsus (C – male, F – female); D, G – mesotarsus (D – male, G – female); E, H – metatarsus (E – male, H – female).

rather stout; tibia with 7–10 setae, outer side of basal connection between tibiotarsus and femora protruding; pretarsus curved, furnished with tooth and seta; tarsal pad not developed (Figs 12D, 13E).

Abdomen. Tubercles sparsely and confusedly with EP(4–6M); P(4–6M). Segment 8 with D-DL (14–16M, 8S); segment 9 with D-DL-EP (16–18M, 6–7S); segment 10 with pygopod well developed; spiracle with large peritreme similar to mesothoracic one, but smaller (Fig. 12I); eversible glands absent.

Description of pupa (Figs 15A–C). ***Coloration.*** Yellowish orange.

Structure. Head with about 14 pairs of setae; pronotum densely covered with long setae; mesothorax with two pairs of setae, one of which is on scutellum; metathorax with two pairs of setae dorsally; number of pairs of setae on abdominal segments I–IX; 12–14, 15–20, 20, 19–20, 16–17, 18–19, 19–20, 12–13, 8. Apices of fore and middle tibiae with 5 setae. Apex of metatibiae with 4–8 setae. 9th segment produced at apex (Fig. 15C).

Etymology. The specific epithet is the Japanese word "*orochi*", which refers to the legendary creature from Japanese folklore, "Akagawara-no-orochi", from the former Hase-mura village area of Nagano Prefecture. Noun

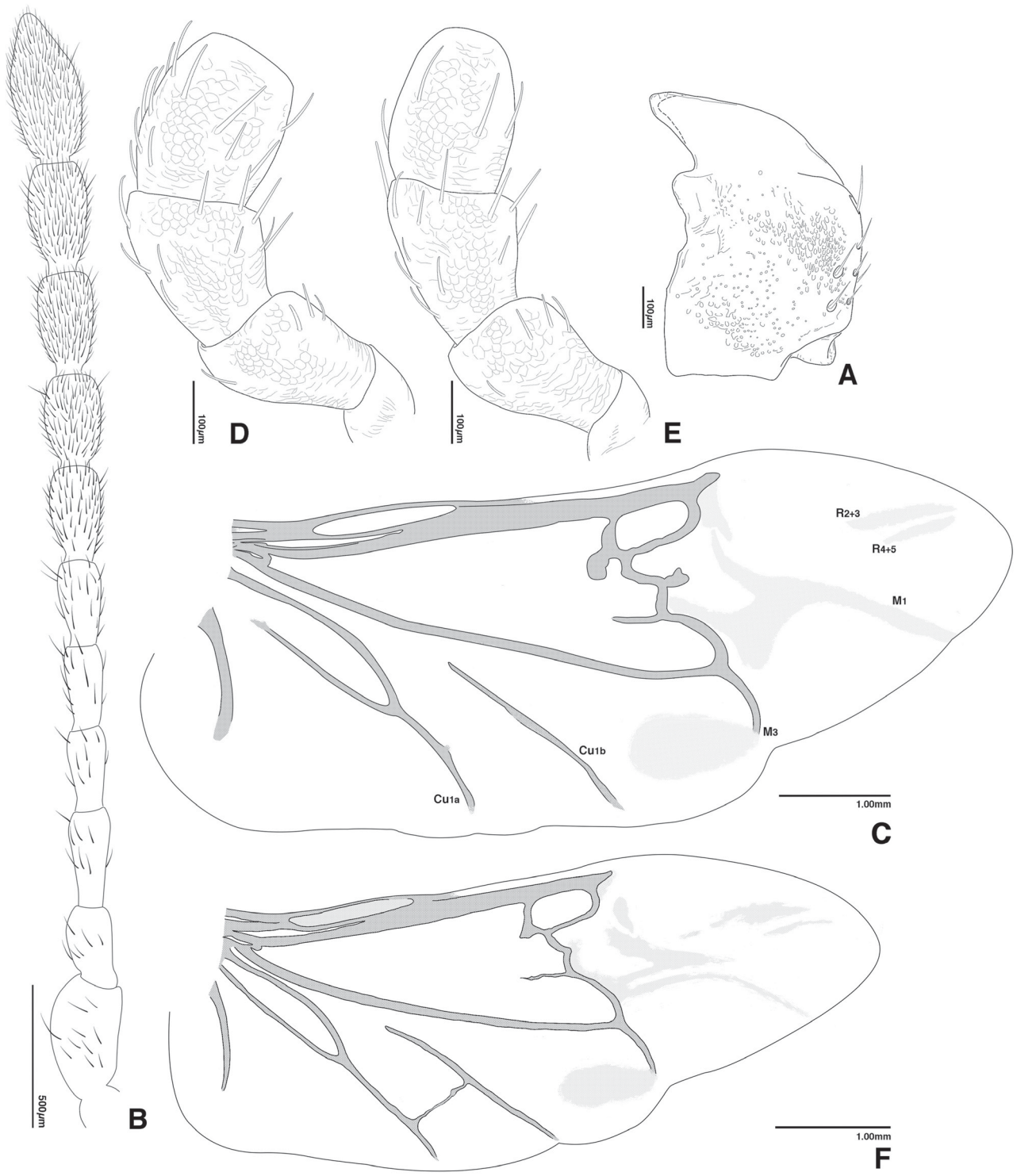

Fig. 10. Other external characters: A–E – *Chrysolina orochi* sp. nov.: A – right mandible; B – antenna; C – right hind wing; D–E – left maxillary palp (D – male, E – female). F – *Ch. aeruginosa aeruginosa* (Faldermann, 1835), right hind wing.

in apposition.

Host plants. *Artemisia capillaris* Thunberg (Asteraceae) [Japanese name: Kawara-yomogi] (Fig. 3A).

Biology. Adults were observed at night on rocks and the host plant in October (Fig. 3G). The oviposition site in the wild is unknown but eggs are laid dispersedly on leaves and stems in captivity. Eggs are greyish brown in color (Fig. 3B). In captivity at 18–22 °C, first instar larvae are hatched from eggs 7–8 days since being laid; the period of 2nd to 4th instar larvae is 19–20 days; the 4th (last) instar larvae pupate and adults emerge after 9–10 days.

Distribution. Japan (Honshu: Nagano Prefecture).

Differential diagnosis. ***Adlut.*** *Chrysolina orochi* sp. nov. is similar to *Ch. aeruginosa aeruginosa* distributed in east Kazakhstan, Siberia, Far East of Russia, Mongolia, north and northenwestern China, and *Ch. peninsularis* distributed

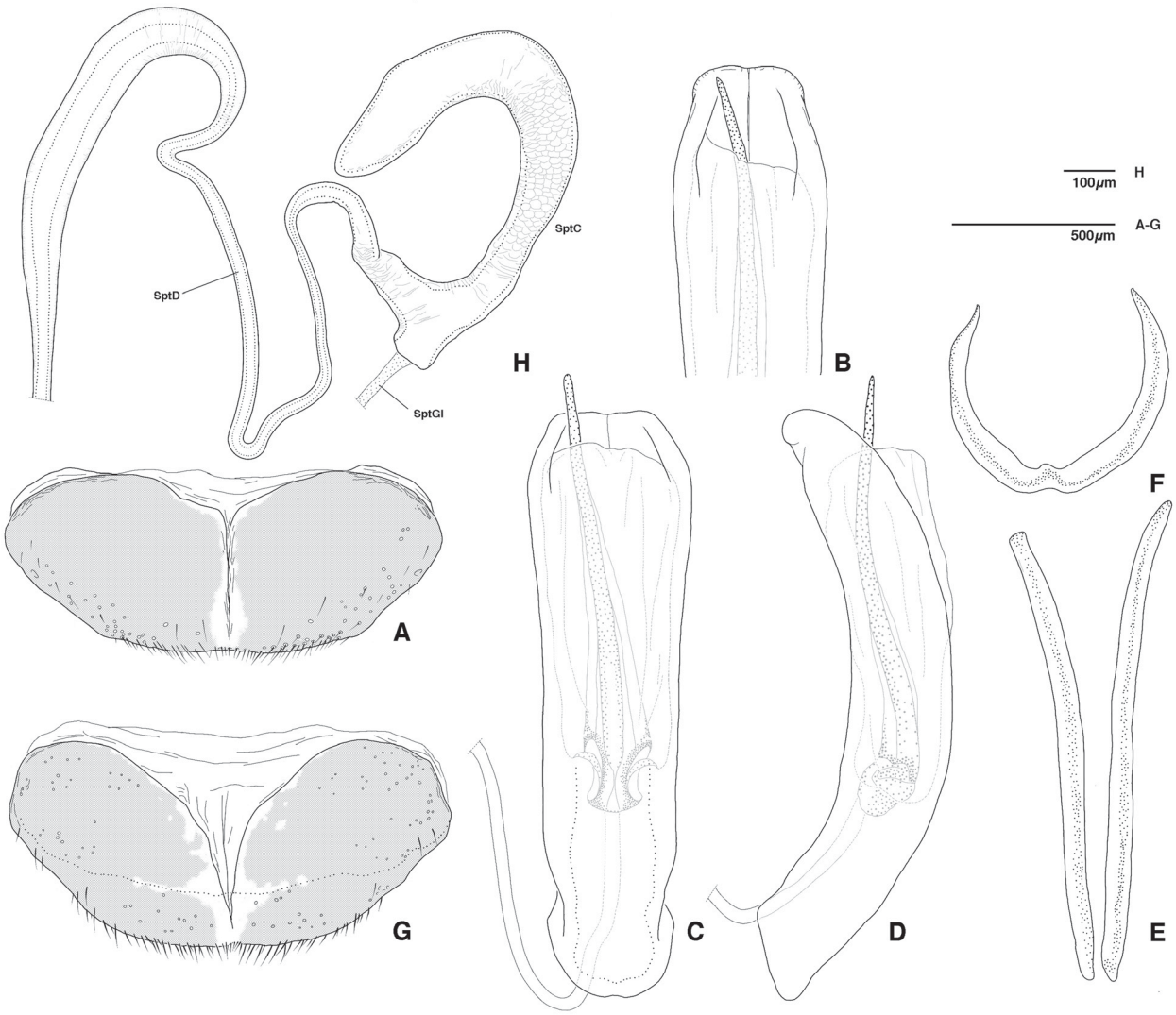

Fig. 11. Genitalia of *Chrysolina orochi* sp. nov.: A–F – TT0000010; G–H – TT0000014. A – male 8th sternite; B–D – median lobe: B – apical portion in dorsal view; C – dorsal view; D – lateral view; E – spicule; F – tegmen; G – female 8th sternite; H – spermathecal organ.

in Korea, eastern China and southern Primorsky Krai in Russia. It is possible to distinguish *Ch. orochi* sp. nov. from *Ch. aeruginosa aeruginos*a and *Ch. peninsularis* by the following characters: male genitalia longer, apex is wider and apices of 2 small calli rounded (in the other two species: male genitalia shorter, apices narrower and apex of 2 small calli sharp); habitus oblong (in the other two species oval); coloration with some variation but in most individuals, head and pronotum are dark greenish copper and elytra brownish copper with stronger tinge of green in most individuals (in *Ch. aeruginosa aeruginosa*: shining bronze or dull navy blue, sometimes with elytral 1/2 red; *Ch. peninsularis*: dark bronze); Cu1a and Cu1b in venation of hind wing are not connected (*Ch. aeruginosa aeruginosa*: Cu1a and Cu1b are connected in halfway point by a subbranche (Fig. 10F)); shape of the median glabrous area of ventral surface of tarsomere 1: in male basal point sparsely glabrous; in female forming a triangle from base, tapering apically, reaching about halfway in protarsus and along full length in meso- and metatarsi (male: *Ch. aeruginosa aeruginosa*: forming a triangle from base; *Ch. peninsularis*: basal area glabrous but pubesence a little more dense; female: *Ch. aeruginosa aeruginosa*: with broad stripe along entire length; *Ch. peninsularis*: with narrow stripe); shape of the median glabrous area of ventral surface of tarsomere 2 and 3 in female and tarsomere 2 of protarsi with glabrous area reaching about halfway, meso- and metatarsi with glabrous area reaching 4/5 length; tarsomere 3 with basal central glabrous area at point without mesotarsi (*Ch. aeruginosa aeruginosa*: with narrow stripe; *Ch. peninsularis*: wholly pubescent on all legs).

Larva. As described above, the pretarsus of this species bears a remarkable tooth. This trait is not found in any known larvae of Japanese *Chrysolina*, and can be observed in all larval stages of the species. However, according to Baselga (2008), *Gonioctena* (*Spartoxena*) *pseudogobanzi* Kippenberg, 2001 (Coleoptera: Chrysomelidae: Chrysomelinae), distributed in the southeast region of Spain, also displays this trait in at least the last instar larva. The leaves of *Artemisia capillaris,* the host plant, are thin needle shaped and the larvae of this species cling to the leaves without use of the tarsal pads. The host plant of *G. pseudogobanzi* is *Genista umbellata* (L'Hér.) Dum. Cours. (Fabaceae), having also thin needle-shaped leaves. It seems

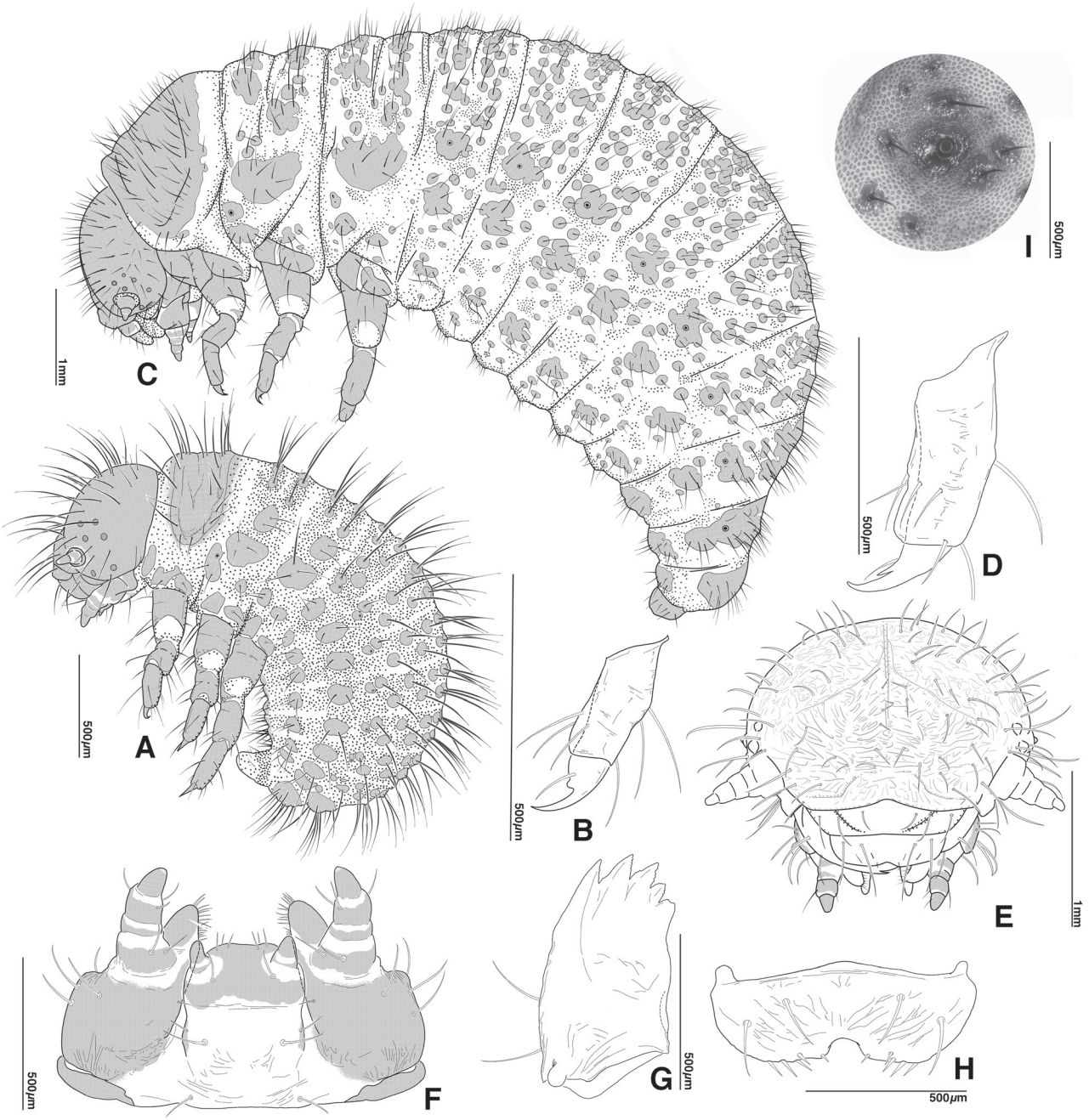

Fig. 12. Habitus and external parts of 1st instar larva (A, B) and last instar larva (C–I) of *Chrysolina orochi* sp. nov.: A – habitus in lateral view; B – tibia and tarsungulus; C – habitus in lateral view; D – tibia and tarsungulus; E – head; F – mouthparts; G – mandible; H – labrum; I – tubercles and spiracle of 1st abdominal segment.

that the claw structure of *Gonioctena pseudogobanzi* and *Chrysolina orochi* sp. nov. may be the result of an adaptation that facilitates behavior on the conidial leaves of their food plant.

Figures of Takizawa (1971a) suggest that larvae of *Ch. nikolskyi nikolskyi* and *Ch. cavigera pirka* both show remarkable absence of the tarsal pad as the larvae of *Ch. orochi*. *Chrysolina c. pirka* and *Ch. n. nikolskyi* are primarily found near the summits of high mountains (elevation about 1,900 m) in Hokkaido where the vegetation is poorly developed, and both adults and larvae live in environments where rocks are exposed. At least, *Ch. nikolskyi* larvae have been collected on stones (Takizawa, pers. comm.), while *Ch. orochi* lives on gravel-covered banks (elevation about 800 m) of rivers in Honshu. Zurek et al. (2015) showed greater ability of the tarsal pad to attach to leaves, compared to the pygopod. So, the absence of tarsal pads may be an adaptation to larval life in gravel-covered and rocky areas. Based on this, the notable leg form may be related to the habitat and the host plant.

Chrysolina (*Allohypericia*) *aeruginosa aeruginosa* (Faldermann, 1835)

(Fig. 4, 10F)

Chrysomela aeruginosa Faldermann, 1835: 440 [type locality: Russia ("in viciniis urbis Irkutzk")], syntypes in MZHF.

Chrysomela dimidiata Ménétriés, 1836: 181 [type locality: Russia ("Irkoutsk")], 1 syntype in ZMHB.

Taeniosticha instructa Motschulsky, 1860: 228 [type locality: Russia

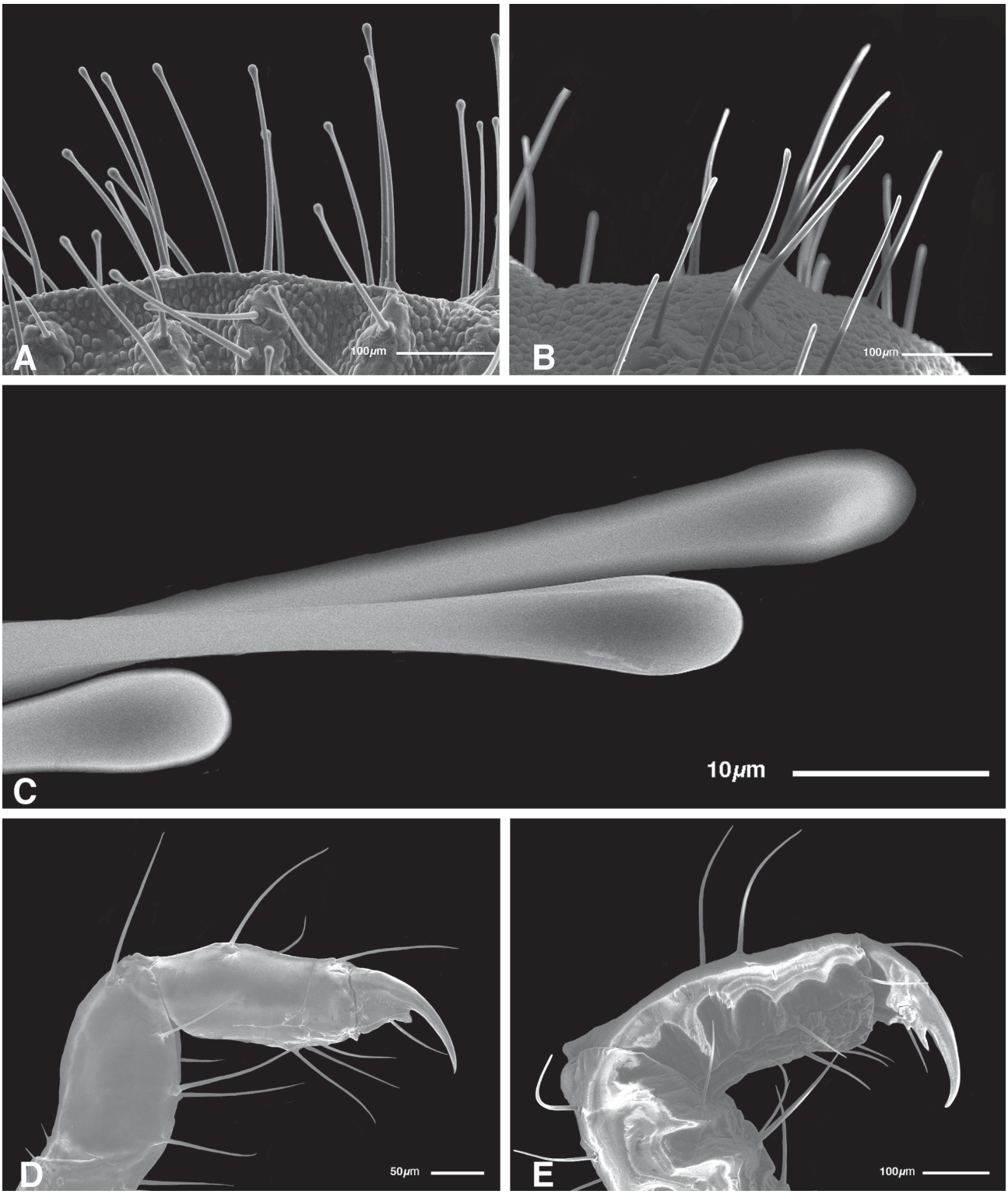

Fig. 13. External parts of larvae of *Chrysolina orochi* sp. nov.: A–B – setae of dorsum (A – 1st instar larva, B – last instar larva); C – apex of setae of 1st instar larva; D–E – tibia and tarsungulus (D – 1st instar larva, E – last instar larva).

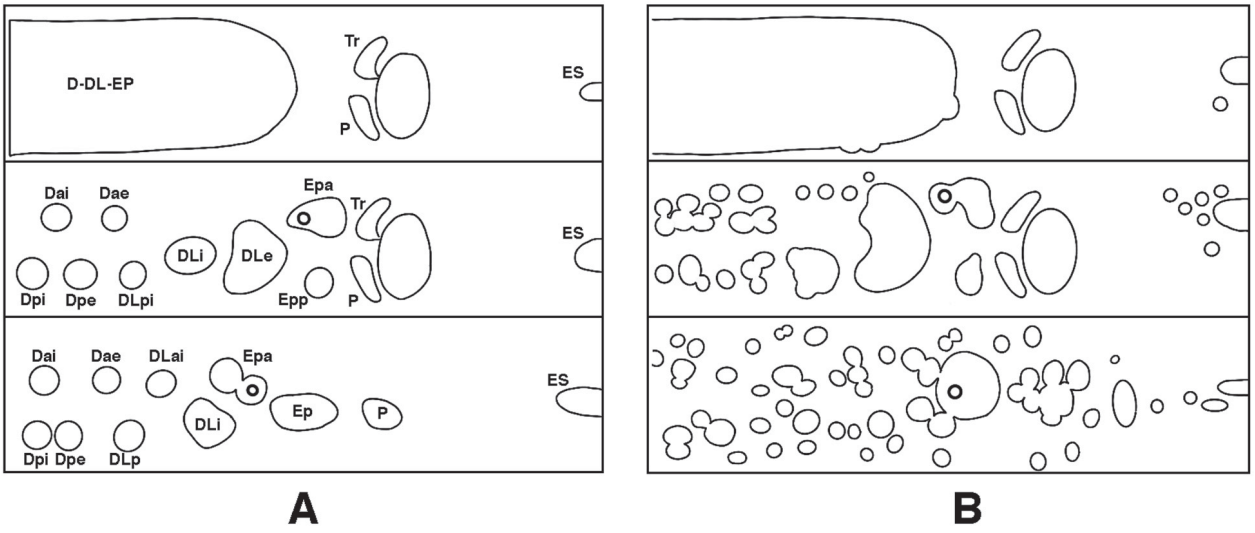

Fig. 14. *Chrysolina orochi* sp. nov., schematic presentation of tubercular pattern (top: prothorax, middle: mesothorax, bottom: 2nd abdominal segment). A – first instar larva; B – last instar larva.

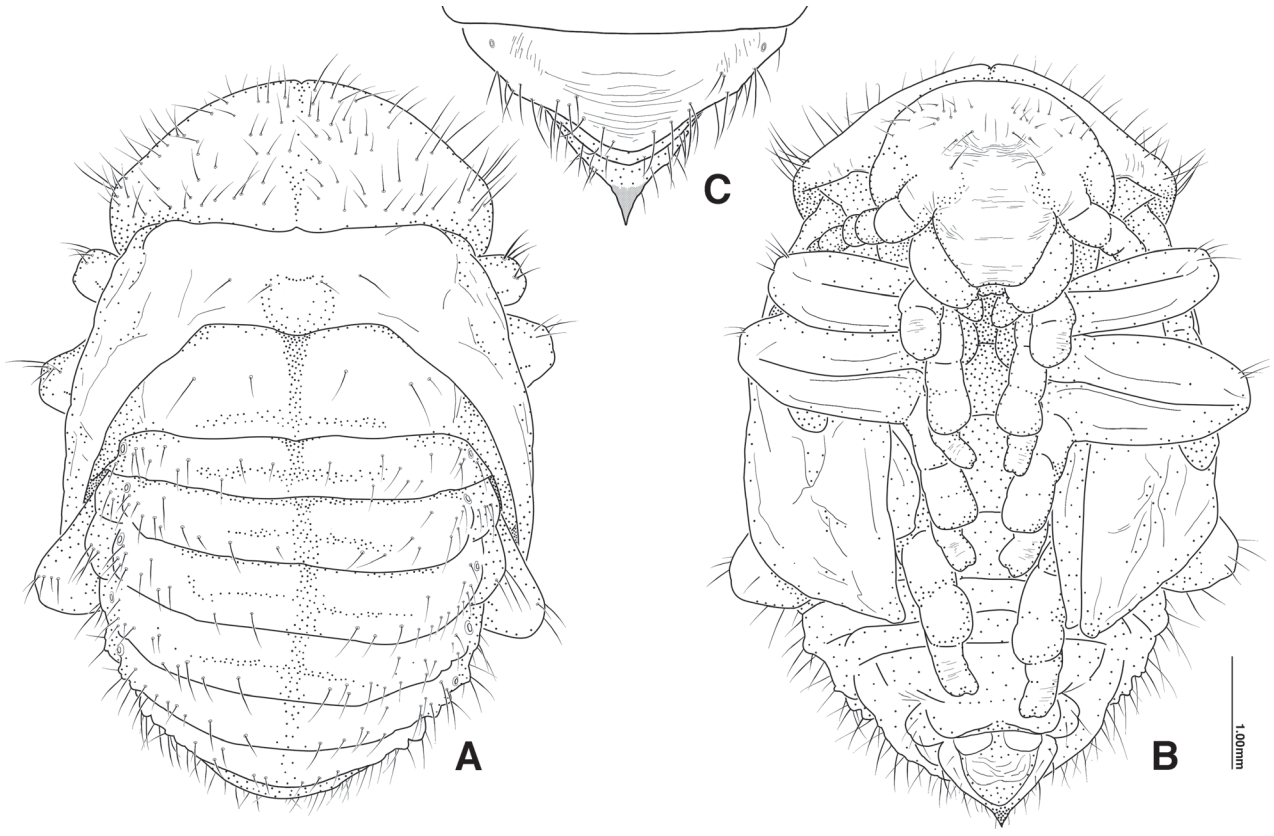

Fig. 15. Pupa of *Chrysolina orochi* sp. nov.: A – dorsal view; B – ventral view; C – apex of sternite in dorsal view.

("Daourie")], lectotype in ZMMU, paralectotype in ZMMU and 6 paralectotypes in ZMHB.

Taeniosticha regularis Motschulsky, 1860: 228 [type locality: Russia ("Daourie orientale")], syntype in ZMMU.

Taeniosticha tarda Motschulsky, 1860: 228 [type locality: Russia ("Nertschinsk", "Schilka", "Kiachta")], lectotype in ZMMU, paralectotypes in ZMMU, and 1 paralectotype in ZMHB.

Chrysomela distans Csiki, 1901: 116 [type locality: Russia ("Sibiria: Ust-Kjachta, Troitzkosavsk") and Mongolia ("Burgaltai"), syntypes in HNHM.

Chrysomela urbana Csiki, 1901: 117 [type locality: Russia ("Sibiria: Tojanov gorodok")], syntype in HNHM.

Chrysolina aeruginosa (misidentifications): Chujo & Kimoto (1960): 4 [E. Siberia, Japan]; Chujo & Kimoto (1961): 148 [E. Siberia, Japan]; Kimoto (1964): 268 [E. Siberia, Mongolia, Tibet, N. China, Japan]; Takizawa (1970): 123 [listed]; Ohno (1971): 53 [listed].

Material examined. RUSSIA: East Siberia: 4 ♂♂ 4 ♀♀, E. Siberia, Republic of Buryatia, Khamar-Daban Mts, near Ivollgynsk vill., 600 m a. s. l, 26.vii.2021, Filippov Anatoly *et al*. leg., *Chrysolina* (*Allohypericia*) *aeruginosa aeruginosa* (Faldermann, 1835), Det. T. Takemoto, 2021, (TTPC: TT0000112–0000119). **CHINA: Jinzhou:** 1 ♂, Kinshu-Toumon-gai, 27.iv.1927, T. Kondo leg., 8, (SEHU: TT0000120); 1 ♂, Kinshu-Toumon-gai, 27.iv.1927, T. Kondo leg., (SEHU: TT0000121); 1 ♂, Kinshu-Toumon-gai, 27.iv.1927, T. Kondo leg., *Chrysolina aeruginosa* Faldm., Det. H. Takizawa, 1969 (SEHU: TT0000122). **Liaoning:** 1 ♂, Manchoukuo, 11.iv.1938, I. Okada leg., Tetsurei (the back side of label), *Chrysolina aeruginosa* Faldm., Det. H. Takizawa, 1969, (SEHU: TT0000123). **Inner Mongolia:** 1 ♂, Môkyô, Chôhoku, 3.ix.1941, C. Watanabe leg. (SEHU: TT0000124).

Remarks. *Chrysolina aeruginosa* has been recorded in Honshu and Hokkaido, Japan (Chujo & Kimoto 1960, Kimoto 1964, Takizawa 1970). However, Kimoto (1964a) and Takizawa (1970) are requotations of Chujo & Kimoto (1960), so I do not mention them here. Chujo & Kimoto (1960) treated *Ch. pseudogeminata* Bechyné, 1950 and a specimen of *Ch. geminata* sensu Jacoby nec Paykull recorded from Japan by Jacoby (1885) as synonyms of *Ch. aeruginosa*, and Kimoto (1946b) designated the above two species as "instructa type" of *Ch. aeruginosa* after checking the type in BMNH.

Later, Kimoto & Takizawa (1994) mentioned that, in reference to the figures of *Ch. aeruginosa* in Mohr (1963), the identification of *Ch. aeruginosa* in Kimoto (1964b) is incorrect and the record should be corrected to *Ch. difficilis*, and he treated *Ch. pseudogeminata* and *Ch. geminata* sensu Jacoby nec Paykull as synonyms of *Ch. difficilis.*

Bieńkowski (2019) refered to the treatment of Chujo & Kimoto (1960) as inadequate because they did not check the type specimens of *Ch. pseudogeminata*. The type locality of *Ch. pseudogeminata* is "Kioto, Innai in N. Hondo", and according to Bieńkowski (2019), the type series of *Ch. pseudogeminata* deposited in National Museum, Prague, Czech Republic contains two females conspecific with *Ch. difficilis* and one male conspecific with *Ch. nikkoensis*. Bieńkowski (2019) designated one of the females with the original label "TYPUS" as a lectotype of *Ch. pseudogeminata* and treated it as a synonym of *Ch. difficilis*.

Jacoby (1885) recorded "*Ch. geminata* ?" in "Hakodate", Hokkaido but mentioned that the specimen may be another related species. This specimen is currently deposited in BMNH. Judging from the pictures of the specimen (Figs 7A, B), the specimen has the following external traits: latero-basal impression of pronotum deep; elytron has geminate rows of large punctures. These external traits agree with the diagnosis of the subgenus *Hypericia*. So, the specimen at least does not belong to the subgenus *Allohypericia* but to the subgenus *Hypericia*. Certainly, as Jacoby (1885) mentioned, there is a little difference in the punctuation of the elytra, so I did not identify the specimen and refer to it as *Chrysolina* (*Hypericia*) sp. here.

Incidentally, the key of *Ch. aeruginosa* in Takizawa (1970) is based on specimens from China deposited in SEHU (SEHU: TT0000120-0000123) (Takizawa, pers. comm.).

From the above, it is unclear why Chujo & Kimoto (1960) treated *Ch. geminata* sensu Jacoby nec Paykull and *Ch. pseudogeminata* as *Ch. aeruginosa* but all of these records (Chujo & Kimoto 1960, Kimoto 1964, Takizawa 1970) from Japan are based on misidentifications. Therefore, *Ch. aeruginosa* is not distributed in Japan.

Distribution. East Kazakhstan, Russia (Siberia, Far East), Mongolia, N and NW China (Bieńkowski 2019).

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