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The revision of soft-winged flower beetle genus *Dicranolaius* Champion, 1921 (Coleoptera: Cleroidea: Malachiidae) with description of a new genus *Australolaius* gen.n. from Australia

S.E. Tshernyshev[1,2]

[1] Institute of Animal Systematics and Ecology, Russian Academy of Sciences, Siberian Branch, Frunze Street, 11, Novosibirsk, 630091, Russia.
[2] Tomsk State University, Lenina prospekt, 36, Tomsk, 634050, Russia. E-mail: sch-sch@mail.ru

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ABSTRACT: The genus *Dicranolaius* Champion, 1921 is revised, the type species, *Laius* (*Dicranolaius*) *falcifer* Champion, 1921 is redescribed, and the differential male characters of the genus are discussed, namely 5-segmented anterior tarsi with the comb above the 2nd tarsomere, enlarged and modified 1st and 3rd antennomeres, and simple head, legs and pronotum lacking impressions or protuberances. A new genus, *Australolaius* Tshernyshev, gen.n. with a type species *Dicranolaius weiri* Liu, Ślipiński et Pang, 2015 is described for several Australian *Dicranolaius* species with male special characters as follows: anterior femora are stout and hollowed externally, urites are elongate and emarginated, and apex of the aedeagus is spicular-shaped. The external appearance, special male characters and genitalia of the type species of the studied genera are illustrated, and a distribution map are provided. A key to the *Laius*-group genera of the tribe Apalochrini is also provided.
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KEY WORDS: Malachiidae, Apalochrini, *Laius*-group, *Dicranolaius, Australolaius,* revision, new genus, taxonomy.

Ревизия рода *Dicranolaius* Champion, 1921 (Coleoptera: Cleroidea: Malachiidae) с описанием нового рода жуков малашек *Australolaius* gen.n. из Австралии

С.Э. Чернышёв[1,2]

[1] Институт систематики и экологии животных СО РАН, ул. Фрунзе, 11, Новосибирск, 630091, Россия.
[2] Томский государственный университет, проспект Ленина, 36, Томск, 634050, Россия. E-mail: sch-sch@mail.ru

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РЕЗЮМЕ: В работе представлена ревизия жуков малашек рода *Dicranolaius* Champion, 1921 с переописанием типового вида *Laius* (*Dicranolaius*) *falcifer* Champion, 1921

(Coleoptera, Cleroidea, Malachiidae). Обозначены дифференциальные признаки самцов рода: передние лапки с гребешком над вторым члеником, 1-й и 3-й членики усиков увеличены, модифицированы и скульптурированы, голова простая, без вдавлений, ноги простые. Для ряда австралийских видов, относимых ранее к роду *Dicranolaius* Champion, описан новый род *Australolaius* Tshernyshev, gen.n. с типовым видом *Dicranolaius weiri* Liu, Ślipiński et Pang, 2015, основными отличиями самцов которого являются вздутые, вырезанные и с зубцом около середины передние бедра, апикальный тергит и стернит удлиненные и вырезанные посередине, эдеагус с игольчатой ламеллой. Даны иллюстрации внешнего вида, гениталий, специфических структур самцов типовых видов представленных родов. Определительная таблица впервые подготовлена для всех родов группы *Laius* Guérin-Méneville, 1831 трибы Apalochrini.

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КЛЮЧЕВЫЕ СЛОВА: Malachiidae, Apalochrini, *Laius*-group, *Dicranolaius, Australolaius,* ревизия, новый род, таксономия.

Introduction

Soft-winged flower beetles (Coleoptera, Malachiidae) (Majer, 1987, 1994, 2002; Mayor, 2002, 2007; Tshernyshev, 2011, 2012a) are a worldwide family that includes small to moderate sized (1 to 8 mm) beetles with flexible joint sclerites and typical yellow, orange or red evaginate vesicles on the lateral sides of the thorax.

The malachiid body is dorsally flattened, elongate, parallel or suboval, and usually widened posteriorly. In some species of the genera *Carphurus* Erichson, 1840, *Carphuroides* Champion, 1923 and *Paratinoides* L. Medvedev, 1964 the elytra are shortened and do not cover the abdomen, giving these beetles a somewhat "staphylinoid" appearance. Usually, the elytra are well developed and completely cover the abdomen, with the exception of females that have a greatly swollen abdomen due to presence of eggs. In some species of *Paratinoides* and *Embrocerus* Peyron, 1877 the hind wings are reduced, but most malachiid species have fully developed wings and are very active fliers. One of the most distinguishable characters of the family are specific male structures for attracting females; this structure includes ducts of pheromone glands named "excitators" (Matthes, 1962; Evers, 1988). These special male characters are represented by specific processes and appendages on the antennae, head, pronotum, metathorax, abdomen, legs or elytra located in impressions, plicae or specific structures with a complicated sculpture. The shape, location and size of the specific male structures are used in the systematics of the group, as they appear to be species-specific. The colouration of soft-winged flower beetles varies from monochromous black to contrasting and colourful combinations of yellow, orange, red tones with dark areas tinged with a metallic blue, and a bronze or green lustre. Surface finely punctured, elytra sometimes slightly granulate or wrinkled, covered with double pubescence, thinly adpressed and long semi-erect or erect hairs.

The family is considered here to include six subfamilies, Amalthocinae, Carphurinae, Attalomiminae, Lemphinae, Malachiinae and Pagurodactylinae, within which the Malachiinae have seven tribes, Apalochrini, Attalini, Colotini, Ebaeini, Illopini, Malachiini, Troglopini (Majer, 1984, 1994, 2002; Mayor, 2002, 2007; Bocakova *et al.,* 2012). A new system, based on a cladistic study of several species from different Cleroidea families, resulted in

the Malachiidae being assigned to a subfamily to the Melyridae sensu nova (Gimmel *et al*., 2019). To build a non-conflicting and exact system, further study of all representatives of the family to include the determination of typical molecular characteristics comparable for phylogenetic analysis is required.

The systematics of the family is actively studied at present; new taxa have been described, and the fauna of different regions has been studied. The tribe Apalochrini represents soft-winged flower beetles with typical antennae possessing a 2nd antennomere which is extremely small, round or oval, usually almost completely hidden by the scape, so that the antennae appear to be 10-segmented. The highest species diversity of the tribe occurs in SE Asia, Africa and Australia where species possess a wide spectrum of male characters of importance to differentiate taxa.

In the generic review of the tribe worldwide, including Afrotropic taxa, by Evers (1987), special male characters, named "exitators", were used for the generic delimitation, as well as for the description of new species. Several new genera were described for the species formerly belonging to the *Apalochrus* Erichson, 1840 genus, namely *Epitinus* Evers, 1987, *Nudopectinus* Evers, 1987, *Opisthapalochrus* Evers, 1987, *Pectinus* Evers, 1987 and *Protapalochrus* Evers, 1987, as well as seven previously-known genera closely related to *Apalochrus*, namely *Airomalachius* Pic, 1950, *Apalochrus*, *Dromanthomorphus* Pic, 1921, *Hapalochrops* Bourgeois, 1908, *Spinapalochrus* Pic, 1919, *Paratinoides* and *Paratinus* Abeille de Perrin, 1891. Later, the monotypic genus *Setapalochrus* Evers, 1988 was described from Congo, and *Epitinus* was synonymized as a junior synonym of *Mesopezus* Jacobson, 1911 (Tshernyshev, 2003). Mayor (2003) published important nomenclatural corrections for Dasytidae and Malachiidae, and proposed the available name *Hadrocnemus* Kraatz, 1895 for Oriental species of *Apalochrus*, since this genus is the senior objective synonym of *Paritinus* is only known from the Palearctic. Due to the Eurasian species distribution of *Apalochrus* (Tshernyshev, 2015c), all African species formerly belonging to "*Apalochrus* sensu lato" should be attributed to *Hadrocnemus*.

The taxonomic structure of the tribe has recently been discussed with special reference to South-Asian genera, and, a number of recent articles devoted to or pertaining to the Malachiidae fauna of the Himalayas and an area of South-East Asia have been published (Yoshitomi, 2008, 2010, 2014; Tshernyshev, 2009, 2012b, 2015a–e, 2016a–d, 2018, 2020a, b; Yoshitomi, Lee, 2010; Asano *et al.,* 2011a, b, 2018; Asano, Yoshitomi, 2011; Geiser, 2011; Asano, Kawashima, 2010; Asano, Kojima, 2009, 2013, 2014; Asano, Okajima 2013; Plonski, 2013, 2014a, b, 2015, 2016, 2017; Plonski, Geiser, 2014; Plonski, Michael, 2014; Plonski, Puchner, 2014; Constantin, 2015; Yoshitomi *et al.,* 2015; Asano, 2013a, b, 2015, 2017, 2018; Tshernyshev, Kopetz, 2018); however, further revision is still necessary to clarify our knowledge of the taxonomy.

A series of articles on the Australian Malachiidae survey the many species that have been described over many years, as well as new species and a new genus (Liu *et al*., 2015, 2016, 2017, 2020). These publications provide revised descriptions and excellent photographic illustrations of Australian Malachiidae species of particular help in the recognition of species diversity in this spectacular region. The present paper continues such studies of Malachiidae diversity for a wide region of SE Asia and Australia.

Typical characters of the genera remained unclear because of the poorly studied special male characters. However, the genus *Pectinus* was synonymised under *Dromanthomorphus*, two new genera, *Mimapalochrus* Tshernyshev, 2015 and *Oculapalochrus* Tshernyshev, 2015, were described for SE Asia (Tshernyshev, 2015c, d), the genus *Pectapalochrus* Tshernyshev, 2015 was described for Eurasia (Tshernyshev, 2016 a), and the genera *Acroapalochrus* Tshernyshev, 2020 and *Protopectinus* Tshernyshev, 2020 for West Africa (Tshernyshev, 2020a, b). The genus *Nossibeus* Evers, 1994 was synonymized under *Laius* (Yoshitomi, 2014) due to the

absence of a generic morphological character (small comb above 2nd tarsomere in anterior legs of male) in male specimens of the type species of the genus, *Laius politus* Fairmaire, 1880, and the name *Myrmecospectra* Motschulsky, 1858 (Tshernyshev, Kopetz, 2017) was resurrected for *Myrmecophasma* Bourgeois, 1885 an unfounded synonym mistakenly cited in older papers. Thus, the tribe Aplochrini, is taxonomically rich in southern areas and worthy of further study.

Amongst those genera currently known in the Aplochrini tribe, four generic groups are considered, namely *Apalochrus*-group (*Apalochrus*, *Paratinoides*, *Protapalochrus*, *Pectapalochrus*, *Oculapalochrus*), *Collops*-group (*Collops* Erichson, 1840, *Protocollops* Evers, 1991, *Troglocollops* Wittmer, 1965, *Simoderus* Abeille de Perrin, 1891), *Laius*-group (*Laius* Guérin-Méneville, 1831, *Intybia* Pascoe, 1866, *Troglointybia* Tshernyshev, 2015, *Dicranolaius* Champion, 1921, *Eulaius* Wittmer, 1996), and *Dromanthomorphus*-group (*Dromanthomorphus*, *Hadrocnemus*, *Mimapalochrus*). The *Laius*-group is one of the commonest in SE Asia and Australia, occurring in the coastal zone, sometimes on stones washed with seawater. Several genera of the group were recently reviewed or revised, namely *Laius* (Yoshitomi, 2008, 2010, 2014; Asano, Kojima, 2009, 2013, 2014; Yoshitomi, Lee, 2010), *Intybia* (Tshernyshev, 2016d), *Stenolaius* Wittmer, 1995 (Plonski, 2015), *Dicranolaius* (Liu *et al.,* 2015, 2016, 2017).

After the revison of *Intybia* (Tshernyshev, 2016d), an investigation of the most similar genus, *Dicranolaius* appeared to be necessary. The name *Dicranolaius* was proposed for subgenus "…to the Malayan species of *Laius* with spotted elytra" (Champion, 1921: 194), consisting of two groups, one with a shining upper surface and elongate tarsi is included in a single species, *Laius* (*Dromanthomorphus*) *falcifer* Champion, 1921, and the second group united three species, *L.* (*D.*) *tetrastictus* Champion, 1921, *L.* (*D.*) *flavonotatus* Champion, 1921, and *L.* (*D.*) *erythrocephalus* Champion, 1921 with an opaque upper surface and short tarsi; however, none of these species was designated as a type for the subgenus (Champion, 1921: 195). Revising the Australian Malachiidae fauna, Liu, Ślipiński & Pang (2015) designated *Laius* (*Dicranolaius*) *falcifer* Champion, 1921 as a type species of the genus *Dicranolaius*, and attributed all species that look similar to *Intybia* and possess a tarsal comb above the 2nd tarsomere of their anterior legs to this genus (Liu, Ślipiński, Pang, 2015, 2017). However, diagnosis of the genus *Dicranolaius* remains unclear and needs to be studied on the basis of the type species. Recently, the type of *Laius* (*Dicranolaius*) *falcifer* Champion, 1921 on loan from The Natural History Museum, London has been available for study. Additional special male characters that distinguish the genus are as follows: anterior tarsi shortened, anterior femora slightly emarginate ventrally, pronotum subquadrate, inter-ocular area impressed, and simple undivided urites and narrow not curved aedeagus. A detailed description of the species and diagnosis of the genus are provided below.

Amongst Australian *Dicranolaius* is a group of species possessing special male structures different to those found in type of the genus. These are moderate-sized malachiids, c. 6–6.5 mm, with a wide flattened body, transverse and twice depressed pronotum, yellow-orange elytra with typical G-shape dark colour pattern in distal half, simple head, and dorsally excavate anterior femora, as found in four species, *Dicranolaius c-purpureus* (Lea, 1914), *D. curvicornis* (Lea, 1929) = *D. similis* Liu, Ślipiński et Pang, 2015, *D. fimbriceps* (Lea, 1929) and *D. weiri* Liu, Ślipiński et Pang, 2015. These above characters are unknown in other Apalochrini genera that possess modified basal antennomeres in males (the comparison is shown in the key below). In fact, the complex of special male characters presents a new genus, *Australolaius* Tshernyshev gen.n., as described below, with *Dicranolaius weiri* Liu, Ślipiński et Pang, 2015 selected as the type species.

Material and methods

For descriptions below, special male structures and genitalia were studied. "Special male

structures" here refer to the stout and modified 1st and 3rd antennomeres and emarginate or excavate anterior femora. Illustrations for the species have been prepared using specimens from the following localities: *Laius* (*Dicranolaius*) *falcifer* Champion, 1921 holotype — Philippines, Luzon Island, Makiling Mountain; *Australolaius weiri* (Liu, Ślipiński, Pang, 2015) — Australia, Northern Territory, Katherine Town.

The beetles were studied using an Amscope trinocular stereomicroscope (Ultimate Trinocular Zoom Microscope 6.7X-90X Model ZM-2TY), and digital photographs were taken using a Carl Zeiss Stemi 2000 trinocular microscope and the AxioVision programme. Male genitalia, embedded in DMHF (Dimethyl hydantoin formaldehyde), were mounted onto a transparent card and pinned under the specimen. Specimens of *Australolaius weiri* (Liu, Ślipiński, Pang, 2015) have been deposited at the collection of the Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia. The holotypus of *Laius* (*Dicranolaius*) *falcifer* Champion, 1921 examined was on loan from the Natural History Museum, London.

Results

Class Insecta Linnaeus, 1758
Orded Coleoptera Linnaeus, 1758
Suborder Polyphaga Emery,1886
Superfamily Cleroidea Latreille, 1802
Family Malachiidae Fleming, 1821
Subfamily Malachiinae Fleming, 1821
Tribe Apalochrini Mulsant et Rey, 1867

Genus *Dicranolaius* Champion, 1921

Laius (*Dicranolaius*) Champion, 1921: 195;
Dicranolauis Champion, 1921: Wittmer, 1952: 187.
Type species, *Laius* (*Dicranolaius*) *falcifer* Champion, 1921, designated by Liu, Ślipiński & Pang (2015).

DIAGNOSIS. Diagnosis is based on special male characters only. Size small to moderate (c. 2.2–3.8 mm) with the body elongate, parallel-sided and slightly expanded posteriorly. Contrasted colour to upper surface with a combination of dark and light colours, sometimes dark parts tinged with metallic luster; elytra with black or brown background and yellow, white or orange spots or vice-versa with yellow or orange background and dark spots. Antennae filiform, 2nd antennomere small, round, almost completely hidden by the 1st, the 1st and 3rd antennomeres enlarged and modified, the 1st antennomere subtriangular, with rounded apical angles, the 3rd antennomere different in shape in different species, usually elongated, enlarged and oval, strongly depressed and possessing processes above, 4th to 10th antennomeres cylindrical, the 11th evenly narrowed to apex. Head small, narrower than pronotum, inter-ocular area slightly impressed, eyes simple, not large, slightly protruding. Pronotum almost completely equilateral, with distinctly marginate sides, not narrowed at base, anterior side slightly protruding and posterior straight, disc convex anteriorly and depressed at base; elytra subparallel, slightly widened just behind the middle, and evenly rounded posteriorly, at base slightly wider than pronotum; humeri distinct, protruding; suture distinctly marginate and elevate; epipleurae thin, marginate, slightly elevate at the middle; hind wings normally developed in both sexes. All tarsi 5-segmented, anterior tarsi with weakly elongate distinct transverse comb above the 2nd segments, 1st to 4th tarsomeres in anterior legs twice as short as 1st to 4th tarsomeres in other legs, anterior femora excavate ventrally near apex, with a row of light-coloured straight hairs above the excavation, not swollen, intermediate and posterior tibiae simple, not swollen or excavate, straight. Intermediate and posterior femora simple and straight. Metathorax evenly swollen and simple, lacking appendage or tuft of hairs. Pygidium undivided, transverse, evenly rounded and with narrow emargination in middle; 8th ultimate abdominal ventrite udivided, narrow and transverse, pointed distally; aedeagus straight, not widened, with slightly elongate rectangular lamella; group of black thick curved bristles visible in the middle of the inner sac. Tegmen short and wide, with short thin parameres.

Species of the genus are similar to representatives of *Intybia* but differ in the presence of a

comb above 2nd tarsomere in anterior legs, emarginations in fore tibiae, specific impressed inter-ocular area in head, and aedeagus, straight and with slightly elongate rectangular and flat lamella.

NOTES. The species of the genus are known from SE Asia, Indonesia, Philippines, Malaysia, Brunei and Australia.

List of species in the genus *Dicranolaius* Champion, 1921

D. acacia Liu, Ślipiński et Pang, 2017 — Australia: New South Wales.
D. acervatus (Lea, 1917) — Australia: Queensland.
D. adonis (Pic, 1921) — Indonesia: Sumatra, Vietnam.
D. albomaculatus (Lea, 1921) — Australia: South Australia.
D. alice Liu, Ślipiński et Pang, 2017 — Australia: Northern Territory.
D. ammophilus (Lea, 1917) — Australia: South Australia.
D. anic Liu, Ślipiński et Pang, 2017 — Australia: Northern Territory.
D. archer Liu, Ślipiński et Pang, 2017 — Australia: Queensland.
D. armstrongianus Wittmer, 1954 — Australia: New South Wales.
D. aulacophoroides (Lea, 1917) — Australia: Western Australia.
D. balah Liu, Ślipiński et Pang, 2017 — Australia: South Australia.
D. baloghi Wittmer, 1978 — Australia: Northern Territory.
D. basimaculata (Wittmer, 1995) — Brunei.
D. bellulus (Guérin-Méneville, 1831) — Australia: New South Wales, Victoria, Queensland.
= *D. cyanocephalus* (Lea, 1898)
= *D. intermedius* (Lea, 1898)
= *D. nidicola* (Lea, 1898)
= *D. orcicornis* (Lea, 1898)
D. benneri Wittmer, 1953 — Indonesia: Java.
D. bogan Liu, Ślipiński et Pang, 2017 — Australia: New South Wales.
D. borneensis (Pic, 1910) — Indonesia: Borneo.
D. brittoni Liu, Ślipiński et Pang, 2017 — Australia: Western Australia.
D. cardaleae Liu, Ślipiński et Pang, 2017 — Australia: Northern Territority.
D. carus (Lea, 1899) — Australia: Western Australia.
D. championi Wittmer, 1951 — Malaysia: Perak, Indonesia.
D. chinchilla Liu, Ślipiński et Pang, 2017 — Australia: Queensland, New South Wales.
D. cinctus (Redtenbacher, 1867) — Australia: New South Wales, Queensland.
= *Laius femoralis* Blackburn, 1892
= *Laius mastersii* Macleay, 1872
D. concavifrons (Lea, 1917) — Australia: West Australia.
D. conicicornis (Blackburn, 1888) — Australia: Victoria, New South Wales.
= *D. rugiceps* (Lea, 1898)
D. confusus Liu, Ślipiński et Pang, 2017 — Australia: Queensland, New South Wales, Victoria.
D. crypticus Liu, Ślipiński et Pang, 2017 — Australia: Queensland.
D. demarzi Wittmer, 1962 — Australia: Northern Territory.
D. desertus Liu, Ślipiński et Pang, 2017 — Australia: South Australia.
D. distortus (Blackburn, 1888) — Australia: South Australia.
D. egenus (Lea, 1899) — Australia: New South Wales, Queensland.
D. eremitus (Blackburn, 1895) — Australia: South Australia.
D. eromanga Liu, Ślipiński et Pang, 2017 — Australia: Queensland.
D. erythrocephalus (Champion, 1921) — Malaysia: Perak, Indonesia.
D. eyrensis (Blackburn, 1892) — Australia: South Australia.
D. falcifer (Champion, 1921) — Philippines.
D. flavifrons (Lea, 1917) — Australia: Western Australia.
D. flavonotatus (Lea, 1917) — Australia: Queensland, Malaysia: Perak, Indonesia.
D. foramicornis Wittmer, 1959 — Australia: Western Australia.
D. freyi Wittmer, 1959 — Australia: Western Australia.

D. guttulatus (Fairmaire, 1877) — Australia: Queensland.
= *D. longus* (Lea, 1929) — Australia: Northern Territory.
D. hudsoni Liu, Ślipiński et Pang, 2017 — Australia: South Australia.
D. inconstans (Lea, 1921) — Australia: Northern Territory, South Australia.
D. intricatus (Lea, 1921) — Australia: South Australia.
D. janthinipennis (Lea, 1921) — Australia: New South Wales, Queensland.
D. kimberley Liu, Ślipiński et Pang, 2017 — Australia: Northern Territory, Western Australia.
D. kinchega Liu, Ślipiński et Pang, 2017 — Australia: New South Wales.
D. leai Wittmer, 1953 — Australia: Western Australia, Queensland.
= *D. beswickensis* Wittmer, 1962
= *D. semimaculatus* (Lea, 1929)
=*D. tetrastictus* (Lea, 1922) nec (Champion, 1921)
D. maculiventris (Lea, 1929) — Australia: Queensland, New South Wales, South Australia, Western Australia.
D. magnificus Wittmer, 1962 — Australia: Northern Territority.
D. mainoroensis Wittmer, 1962 — Australia: Northern Territority.
D. major (Blackburn, 1888) — Australia: Queensland.
D. mangalicola Asano et Kawashima, 2010 — Japan.
D. melanoderes (Lea, 1917) — Australia: Queensland.
D. micrus Liu, Ślipiński et Pang, 2017 — Australia: Queensland.
D. minutus (Lea, 1914) — Australia: Queensland.
D. moffatt Liu, Ślipiński et Pang, 2017 — Australia: Queensland.
D. monteithi Liu, Ślipiński et Pang, 2017 — Australia: Northern Territory, Queensland.
D. nigricornis Wittmer, 1995 — Brunei.
D. orthodoxus (Lea, 1909) — Australia: Queensland.
D. pallidus (Lea, 1899) — Australia: Western Australia.
D. pilbara Liu, Ślipiński et Pang, 2017 — Australia: Western Australia.
D. plagiaticollis (Fairmaire, 1877) — Australia.
D. planiceps (Lea, 1898) — Australia: New South Wales, Victoria.
D. proserpine Liu, Ślipiński et Pang, 2017 — Australia: Queensland.
D. pulleni Liu, Ślipiński et Pang, 2017 — Australia: South & Western Australia.
D. purpureiceps (Lea, 1915) — Australia: Western Australia.
D. quorn Liu, Ślipiński et Pang, 2017 — Australia: South Australia.
D. reidi Liu, Ślipiński et Pang, 2017 — Australia: Western Australia.
D. rockhampton Liu, Ślipiński et Pang, 2017 — Australia: Queensland.
D. rufitarsus Wittmer, 1995 — Brunei.
D. rugulipennis (Fairmaire, 1877) — Australia: New South Wales, Queensland.
= *Laius nodicornis* Blackburn, 1888
D. sinus (Lea, 1899) — Australia: Queensland, New South Wales.
D. spinicornis Wittmer, 1954 — Australia: New South Wales.
D. spinifex Liu, Ślipiński et Pang, 2017 — Australia: Western Australia.
D. stenotarsus (Lea, 1917) — Australia: Northern Territory, Queensland.
D. takizawai Asano, 2012 — Borneo.
D. tetrasticus (Champion, 1921) — Australia, Indonesia: Borneo, Sarawak.
D. thylungra Liu, Ślipiński et Pang, 2017 — Australia: Queensland.
D. trifoveicornis (Lea, 1921) — Australia: South Australia.
D. uptoni Liu, Ślipiński et Pang, 2017 — Australia: Northern Territory, Western Australia, Queensland.
D. variegatus (Blackburn, 1889) — Australia: Northern Territory, Western Australia, Queensland.
D. verticalis (Macleay, 1826 nec Fairmaire, 1877) — Australia: Queensland.
= *D. tarsalis* (Lea, 1909)
D. v-flavus (Lea, 1929) — Australia: Queensland, Western Australia.
D. villosus (Lea, 1899) — Australia: New South Wales.

D. zborowskii Liu, Ślipiński et Pang, 2017 — Australia: Queensland.

Dicranolaius falcifer (Champion, 1921)
Fig. 1 A–N.

Laius (*Dicranolaius*) *falcifer* Champion, 1921: 194, 204-205, fig. 7.

Dicranolaius falcifer (Champion, 1921): Wittmer, 1953: 222.

MATERIAL. Holotype, male, **Philippines**, Luzon Island, Makiling Mountain, C.F. Baker (Fig. 1M).

DESCRIPTION. Male (Fig. 1A, B). Body slightly elongate, subparallel, slightly expanded posteriorly just behind the middle.

Body dark brown to black, except for orange-yellow prothorax and pronotum, yellow femora, tibiae an two basal tarsomeres in anterior legs, tibiae in intermediate legs; antennae dark brown with yellow apical half of the 1st antennomere, almost completely yellow 2nd and 3rd antennomeres, and yellow basal portions of the 4th to 5th antennomeres; head dark-brown with yellow distal half, spots in elytral disc white. Each elytron with two spots, one wide, oval, transverse, located in basal half above the middle, not reaching suture or external side, and the other located near apices of elytra below the middle, also not reaching suture of external side, spot in elytra look like transverse interrupted white bands. Underside of basal half of the head, meso- and meta-thorax and abdomen yellow-orange. Surface evenly covered with short semi-erect light pubescence and sparse long erect hairs. Vesicles yellow, thoracic mesepimera black-brown.

Head (Fig. 1,E) not wider than pronotum, slightly elongated, eyes small, round, protruding, but not stretched, frons slightly impressed; intero-cular area with indistinct thin longitudinal triangular carina in the middle, genae impressed and oblique; clypeus narrow due to closely settled antennae, weakly elongate, transverse, straight; labrum not elongated, transverse; palpi simple with apical segment slightly enlarged, subcylindrical, evenly narrowed distally and cut, intermediate segments short and transverse; surface of head finely and sparsely punctured, with indistinct microsculpture, shining, covered with white semi-erect pubescence and several erect long hairs.

Antennae filiform (Fig. 1C, D), 1.7 mm long, reaching the basal quarter of the elytra; 1st antennomere enlarged, subtriangular, with rounded apical angles, 2nd antennomere small, round-oval, almost completely hidden by 1st antennomere, 3rd antennomere elongated, enlarged and oval, twice depressed and with two narrow curved processes from above; 4th antennomere short and cylindrical, similar in length to 5th or 6th antennomeres, 7th to 11th antennomeres slightly elongated and cylindrical, apical antennomere 1.5 times as long as the 10th, evenly narrowed and pointed at apex; surface evenly covered with short, light pubescence and sparse, semi-erect light hairs on outer sides of antennomeres.

Pronotum almost completely equilateral, with distinctly marginate sides, not narrowed at base, anterior side slightly protruding and posterior straight, disc convex anteriorly and depressed at base; surface shining, densely finely punctured with indistinct microsculpture, surface evenly covered with fine, short, light adpressed pubescence and dense erect dark hairs.

Scutellum small, narrow, oval, with rounded and slightly elevate apical margin, almost completely covered by pronotum, distinctly marginate, sparsely punctured and evenly pubescent with light semi-erect hairs.

Elytra subparallel, slightly widened just below the middle, and evenly rounded posteriorly,

abdominal ventrite; K — aedeagus, subdorsal view; L — tegmen; M — original labels; N — distribution map. Scale bar 0.5 mm.

Fig. 1. *Laius* (*Dicranolaius*) *falcifer* Champion, 1921, голотип, самец. A — внешний вид, дорзально; B — внешний вид, латерально; C — левый усик; D — правый усик; E — голова, сублатерально; F — левая передняя лапка; G — правое переднее бедро; H — левая передняя нога; I — пигидий (апикальный тергит); J — апикальный стернит; K — эдеагус, субдорзально; L — тегумен; M — оригинальные этикетки; N — карта распространения. Масштаб 0,5 мм.

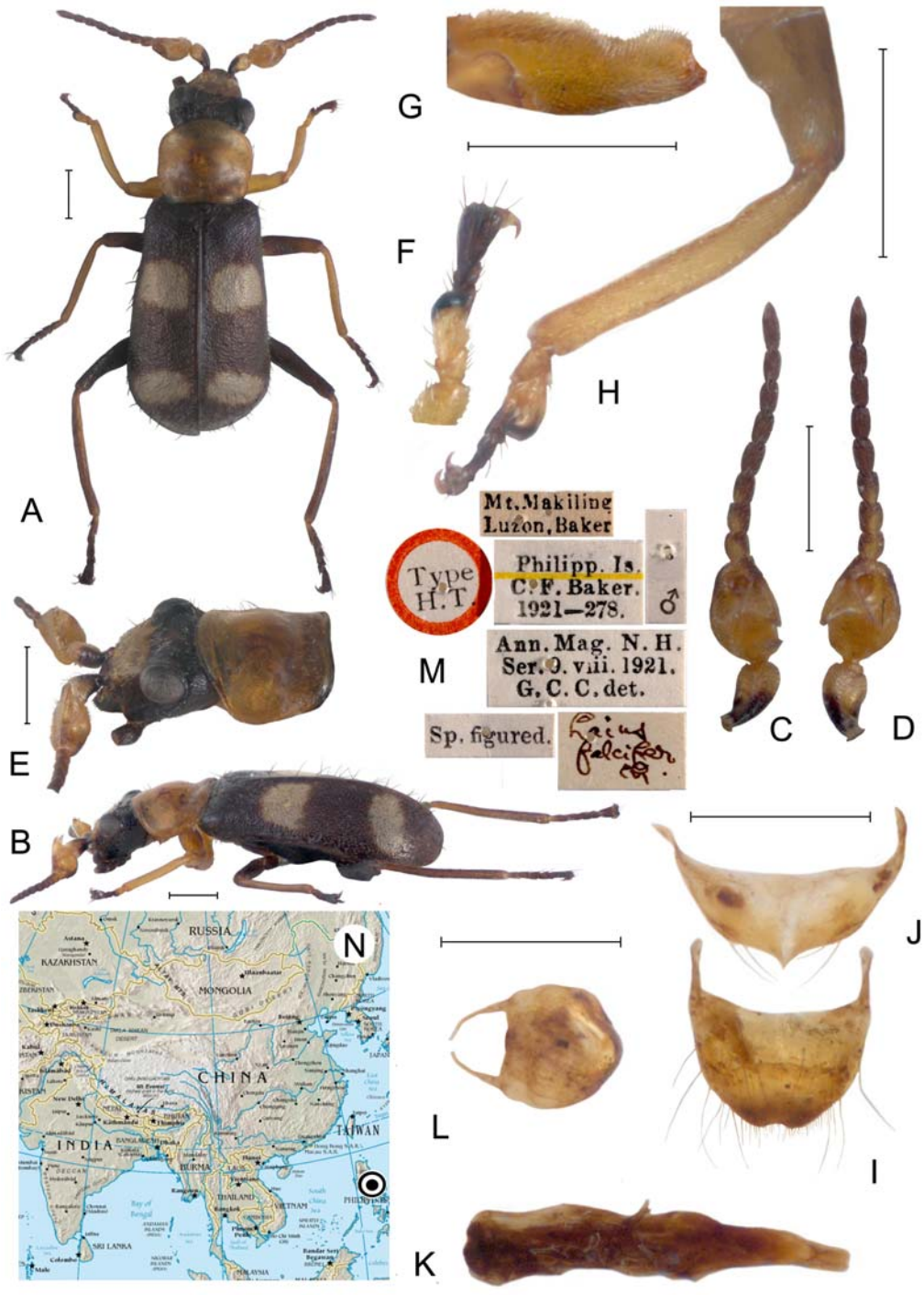

Fig. 1. *Laius* (*Dicranolaius*) *falcifer* Champion, 1921, holotype, male. A — external appearance, dorsal view; B — external appearance, lateral view; C — left antenna; D — right antenna; E — head, sublateral view; F — left anterior tarsus; G — right anterior femur; H — left anterior leg; I — pygidium; J — ultimate

at base slightly wider than pronotum; humeri distinct, protruding; suture distinctly marginate and elevate; epipleurae thin, marginate, slightly elevate in the middle; surface dull, with dense and coarse punctures and indistinct microsculpture, evenly covered with light semi-erect pubescence and strong erect dark hairs.

Hind wings normal.

Legs simple; posterior femora reaching elytral apices; all tibiae straight, femora narrow, slightly compressed, not curved; anterior femora in male excavate in inner side near apex and provided with a row of light-coloured straight hairs above the excavation (Fig. 1H); all tarsi 5-segmented, narrow, 2nd tarsomere in anterior tarsi with weakly elongate transverse black comb above (Fig. 1F), 1st[t] to 4th tarsomeres in anterior legs twice as short as 1st to 4th tarsomeres in other legs, 4th tarsomere is the smallest, twice as long as the 1st tarsomere in all legs, 1st and 2nd tarsomeres almost of equal length, and the 3rd tarsomere 1.3–1.5 times shorter than the 2nd tarsomere, claw segment depressed, widened and largest in all legs and equal to 1st to 3rd tarsomeres in intermediate legs and 1st and 2nd tarsomeres in other legs; claws small, thin and sharp, with small membrane at base. Surface of legs evenly covered with light short semi-erect pubescence, single long dark hairs disposed of terminal sides of tarsomeres.

Ventral body surface densely and finely punctured, dull, evenly covered with fine, adpressed dark hairs. Metathorax slightly swollen, simple, lacking appendage of hair tuft. Pygidium (apical tergite) transverse, evenly rounded and slightly emarginate at apex (Fig. 1I); 8th ultimate abdominal ventrite (apical sternite) undivided, narrow and transverse, pointed at apex (Fig. 1J); aedeagus straight, elongate at apical third, with rectangular lamella, several strong long and curved horns in inner sac are noticeable at the middle of the aedeagus (Fig. 1K); tegmen short and wide, with short thin parameres 2.5 times shorter than the base of tegmen (Fig. 1L).

Length 3.8 mm, width (at elytral base) 0.9 mm.

Female not studied.

DISTRIBUTION*:* Currently, this species is known only from the Luzon Islands, Philippines (Fig. 1N).

Australolaius Tshernyshev **gen.n.**
http://zoobank.org/
urn:lsid:zoobank.org:act:5A973302-54D1-4115-A80E-DDAE8E3F5907

Type species, *Dicranolaius weiri* Liu, Ślipiński et Pang, 2015, designated in the present paper.

DIAGNOSIS. Diagnosis is based mainly on special male characters. Size large (c. 5.6–6.8 mm) with the body elongate, wide, flattened, parallel-sided and slightly expanded posteriorly. Upper side yellow-orange with dark spots tinged with metallic blue, and underside orange-red and dark brown lacking metallic luster, antennae dark brown with the basal antennomeres orange-yellow. Antennae filiform, 1st antenomere enlarged, stout, subtriangular, 2nd antennomere small, round-oval, almost completely hidden by the 1st, 3rd antennomere elongate, enlarged and rounded, strongly depressed ventrally, 4th to 11th antennomeres simple, elongate, subcylinrdical. Head not narrower than pronotum, slightly elongated, eyes small, round, weakly protruding, not stretched, frons flat; inter-ocular area with a weak transverse impression in the middle, genae impressed and oblique. Pronotum transverse, with thin margination of sides, not narrowed at base, anterior side slightly protruding and posterior straight, lateral sides evenly rounded; disc convex in the middle and twice depressed at base and at distal margin. Elytra subparallel, slightly widened just behind the middle, and evenly rounded posteriorly, at base not wider than pronotum; humeri distinct and slightly protruding; suture distinctly marginate and elevate; epipleurae marginate and elevate at the middle; surface dull, very densely punctured, lacking microsculpture, evenly covered with light semi-erect pubescence and strong erect hairs. Hind wings normally developed in both sexes. All tarsi 5-segmented, anterior tarsi with short but distinct transverse comb above the 2nd segments and

1.4–1.5 times as short as intermediate or posterior tarsi, anterior femora excavate ventrally in apical third, widened, intermediate and posterior tibiae simple, not swollen or excavate, straight. Intermediate and posterior femora simple and straight. Metathorax swollen, simple, lacking appendage of hair tuft and covered with fine white pubescence. Pygidium elongate, longitudinal, truncate at apex and narrowly emarginate in the middle with a sharp spicula inside emargination; 8th ultimate abdominal ventrite bilaciniate with adjoining lobes, narrow and transverse, each lobe cut distally; aedeagus straight, with extremely narrow and elongate apical lamella, a number of strong short and curved horns in inner sac are noticeable at the middle of the aedeagus; tegmen short and wide, barrel-shaped, with short wide and flattened parameres.

Species of the genus are comparable with the representatives of *Laius* and *Dicranolaius*, and can be distinguished from the genus *Laius* by the presence of tarsal comb in anterior legs of male, contrasting colouration of upper surface, different shape of anterior legs with simple tibiae lacking indentation or emargination, and emarginated in dorsal side femora; and from *Dicranolaius* it differs by its larger body size, emargination in dorsal side of anterior femora, specific shape of pygidium provided with sharp spicula inside apical emargination, and typical aedeagus with needle-shape elongate lamella.

NOTE. The species of *Australolaius* Tshernyshev, gen.n. are known only from the northern part of Australia, and thereby the genus is endemic to Australia.

List of species in the genus *Australolaius* Tshernyshev, gen.n.

A. c-purpureus (Lea, 1914) **comb.n.** — Australia, Northern Territory: Cape Crawford, Katherine, Borroloola, Delamere; Queensland: Selheim, Reelborrom Creek.

A. curvicornis (Lea, 1929) (= *Dicranolaius similis* Liu, Ślipiński et Pang, 2015: Liu, Ślipiński et Pang, 2017: 462) **comb.n.** — Australia, Northern Territory: Katherine; Queensland: Camooweal; Northern part of Western Australia.

A. fimbriceps (Lea, 1929) **comb.n.** — Australia, Northern part of Western Australia: Noonkanbah.

A. weiri (Liu, Ślipiński et Pang, 2015) **comb.n.** — Australia, Northern Territory: Katherine, Pine Creek, Cooper Creek, Tindal.

Australolaius weiri (Liu, Ślipiński et Pang, 2015) **comb.n.**
Fig. 2 A–L.

Dicranolaius weiri Liu, Ślipiński, Pang, 2015: 278, Figures 1A, 1B, 2A, 2D, 2E, 3A, 3D, 3G.

MATERIAL. **Australia**, Northern Territory, Katherine Town, h~110 m a.s.l., 14°30´S, 132°15´E, at light, 12.xi.1979, G.S. Medvedev — 3 males, 4 females (ZIN).

DESCRIPTION. Male (Fig. 2A–C). Body elongate, subparallel, wide, slightly expanded posteriorly just behind the middle.

Body black, except for orange-yellow prothorax and pronotum; yellow mouthparts, inter-ocular area of head, basal five antennomeres and anterior femora and tarsi, bases of coxae and tibiae in intermediate and posterior legs and basal quarter anterior tibiae; orange-red basal abdominal ventrites and elytra, those also with contrasting colour pattern formed with black spots and striae with violaceous metallic luster and with pale yellow edging.

Each elytron with oval black-violaceous spot at the base covering humeri, and inverted G-shape stripe below the middle in apical half, expanded on outer side and colouring epipleura in the apical quarter (Fig. 2B). Surface evenly covered with short semi-erect light pubescence and sparse long erect yellow hairs. Vesicles pink-yellow, thoracic mesepimera brown.

Head not narrower than pronotum, slightly elongated, eyes small, round, weakly protruding, not stretched, frons flat; inter-ocular area with a weak transverse impression in the middle, genae impressed and oblique; clypeus narrow, transverse, straight; labrum not elongated, transverse; palpae simple with apical segment rectangular with rounded edges, evenly rounded at the tip, intermediate segments subtriangular, short and transverse; surface of head finely and sparsely punctured, with indistinct microscu-

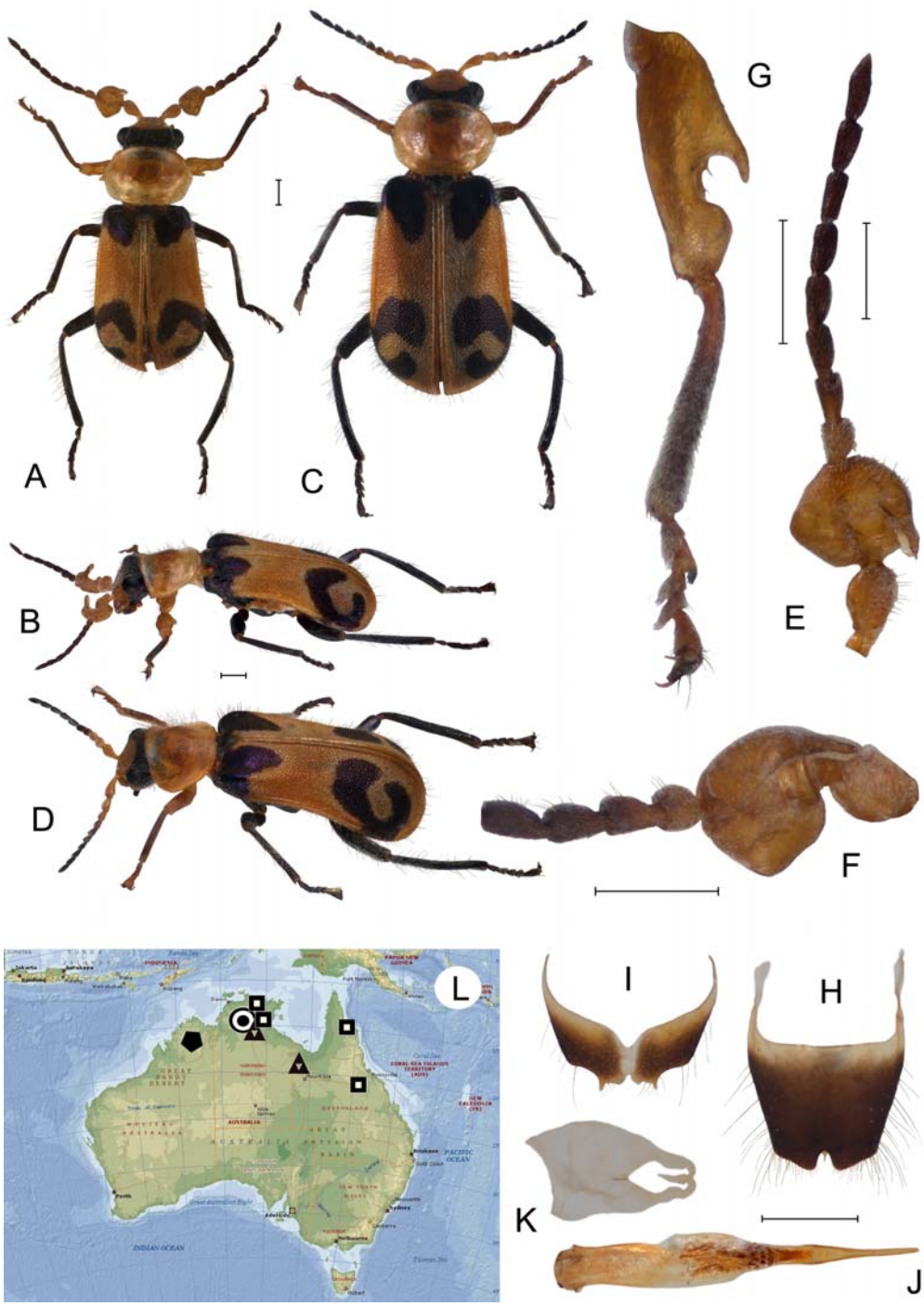

Fig. 2. *Australolaius weiri* (Liu, Ślipiński et Pang, 2015) male (A, B, E–K), female (C, D), L, circle. A, C — external appearance, dorsal view; B, D — external appearance, lateral view; E — left antenna; F — basal antennomeres of left antenna; G — left anterior leg; H — pygidium; I — ultimate abdominal ventrite; J —

lpture, shining, covered with white adpressed fine pubescence.

Antennae filiform (Fig. 2F, E), 3.2 mm long, reaching the basal quarter of the elytra; 1st antennomere enlarged, stout, subtriangular, with rounded apical angles, 2nd antennomere small, round-oval, almost completely hidden by the 1st antennomere, 3rd antennomere elongated, enlarged and round, twice depressed and with a narrow handle-shaped process from above bearing a row of white curved hairs externally; 4th antennomere rectangular, slightly shorter in length than 5th antennomere, 5th–10th antennomeres slightly elongated and subcylindrical, apical antennomere 1.3 times as long as the 10th, evenly narrowed and truncate at apex; surface evenly covered with short, light sparse semi-erect light hairs.

Pronotum transverse, with thin margination of sides, not narrowed at base, anterior side slightly protruding and posterior straight, lateral sides evenly rounded; disc convex in the middle and twice depressed at base and at distal margin; surface shining, with indistinct puncturation and microsculpture, surface sparsely covered with fine, short, light semi-erect and erect hairs.

Scutellum small, narrow, triangular, with rounded apical side, distinctly marginate, almost completely covered by pronotum, coarsely punctured and evenly pubescent with dark adpressed hairs.

Elytra subparallel, slightly widened just behind the middle, and evenly rounded posteriorly, at base not wider than pronotum; humeri distinct and slightly protruding; suture distinctly marginate and elevate; epipleurae marginate, strong and elevate at the middle; surface dull, extremely densely punctured lacking microsculpture, evenly covered with light semi-erect pubescence and strong erect hairs.

Hind wings normal.

Legs thin and elongate, posterior femora reaching elytral apices; all tibiae thin, straight, femora slightly compressed, not curved, narrow, excepting widened anterior femora, excavate in outer (dorsal) side near apex with elongate curved sharp horn-like dentticle above the excavation (Fig. 2G); all tarsi 5-segmented, narrow, 2nd tarsomere in anterior tarsi with short transverse black comb above (Fig. 2G), anterior tarsi 1.4-1.5 times as short as intermediate or posterior tarsi, 4th tarsomere is the smallest and 1.5 times shorter than the 3rd tarsomere and 1.1 times shorter than the 1st tarsomere in intermediate and posterior legs and the same length as the 3rd in anterior legs, 2nd and 3rd tarsomeres are of equal length in intermediate and posterior legs while the 1st and 2nd are equal for anterior legs, 5th tarsomere as long as the 2nd and 3rd tarsomeres in intermediate and posterior legs and as the 1st and 2nd tarsomeres in anterior legs, slightly depressed and apically widened, with very short and small sharp claws possessing round membrane at base. Surface of legs evenly covered with light short semi-erect pubescence, single long dark hairs disposed on terminal side of apical tarsomeres.

Ventral body surface evenly punctured, dull, covered with fine, adpressed dark hairs. Metathorax swollen, simple, lacking appendage of hair tuft and covered with fine white pubescence. Pygidium (apical tergite) elongate, longitudinal, truncate at apex and narrowly emarginate in the middle with a sharp spicula inside emargination (Fig. 2H); 8th ultimate abdominal ventrite (apical sternite) bilaciniate with adjoining lobes, narrow and transverse, each lobe cut distally and with a thin denticle at apex (Fig. 2I); aedeagus straight, with extremely narrow and elongate apical lamella, a number of strong

aedeagus, subdorsal view; K — tegmen; L — distribution map: quadrate — *A. c-purpureus* (Lea, 1914); triangle — *A. curvicornis* (Lea, 1929). pentagon — *A. fimbriceps* (Lea, 1929). Scale bar 0.5 mm.

Рис. 2. *Australolaius weiri* (Liu, Ślipiński et Pang, 2015) самец (A, B, E–K), самка (C, D), L, круг. A, C — внешний вид, дорзально; B, D — внешний вид, латерально; E — левый усик; F — базальные членики левого усика; G — левая передняя нога; H — пигидий (апикальный тергит); I — апикальный стернит; J — эдеагус, субдорзально; K — тегумен; L — карта распространения: квадрат — *A. c-purpureus* (Lea, 1914); треугольник — *A. curvicornis* (Lea, 1929). пятиугольник — *A. fimbriceps* (Lea, 1929). Масштаб 0,5 мм.

short and curved horns in inner sac are noticeable at the middle of the aedeagus (Fig. 2J); tegmen short and wide, barrel-shaped, with short wide and flattened parameres being 4.5 times shorter than the base of tegmen (Fig. 2K).

Length 5.0 mm, width (at elytral base) 1.7 mm.

Female (Fig. 2C, D) differs from male by the following characters: larger size, anterior femora simple and anterior tarsi lacking a comb above 2nd tarsomere, antennae narrow, 1st and 3rd basal antennomeres slightly widened, triangular, yellow marking of inter-ocular area wide and expanding to the forehead.

Length 6.4 mm, width (at elytral base) 2.0 mm.

DISTRIBUTION. The species is known from several nearby localities in Northern Territory of Australia, namely: Katherine, Pine Creek, Cooper Creek, Tindal (Fig. 2L, circle).

KEY TO GENERA OF THE TRIBE APALOCHRINI WITH SPECIFIC MALE STRUCTURES IN 1ST, 3RD AND/OR 4TH ANTENNOMERES

1. Anterior tarsi 4-segmented, lacking comb on 2nd segment, 1st and 3rd antennomeres swollen and modified, the 1st is triangular and the 3rd is the same width, different in shape, with strong impressions and bunch of hairs on external side ..... ***Collops*** Erichson, 1840
— Anterior tarsi 5-segmented 2
2. Special male characters are located in modified 1st, 3rd or 4th antennomeres, head simple .. 3
— Special male characters are located in modified 1st and 3rd antennomeres and in sculptured or excavated head 15
3. First antennomere enlarged and slightly clavate, 3rd and 4th wide, modified, excavated on sides 4
— First antennomere enlarged and slightly triangular, 3rd wide, modified, excavated and bearing tuft of hairs, 4td antennomere simple 5
4. Second tarsomere in anterior legs simple, lacking a comb above .. ***Heterolaius*** Champion, 1920
— Second tarsomere in anterior legs bears a comb above ..... ***Syndesmolaius*** Evers, 1986
5. Anterior femora and tibiae stout and enlarged, emarginate ventrally, upper surface monochromously dark with blue metallic luster, anterior tarsi simple, lacking comb above 2nd tarsomere 6
— Anterior femora and tibiae simple, not modified, anterior tarsi with or without a comb above 2nd tarsomere 7
6. Tarsomeres in all legs simple .... ***Laius*** Guérin-Méneville, 1831 (=***Nossibeus*** Evers, 1994)
— Tarsomeres in all legs strongly shortened ....***Zelotypus*** Abeille de Perrin, 1900
7. Body ant-like, pronotum strongly narrowed and depressed posteriorly and convex anteriorly, elytra strongly depressed at base, and convex posteriorly, anterior tarsi simple lacking a comb above the 2nd tarsomere .... ***Myrmecospectra*** Motschulsky, 1858 (=***Myrmecophasma*** Bourgeois, 1885)
— Body simple, not ant-like 8
8. Humeri with longitudinal carinate pheromone gland ducts, 1st and 3rd antennomeres oval, slightly widened and elongate, anterior tarsi simple, lacking comb above 2nd tarsomere .... ***Eulaius*** Wittmer, 1996
— Humeri simple, lacking pheromone glands ... 9
9. 4th to 11th antennomeres flabellate, anterior tarsi with a comb above the 2nd tarsomere .... ***Flabellolaius*** Wittmer, 1952
— 4th to 11th antennomeres filiform, anterior tarsi with a comb above the 2nd tarsomere or lacking it 10
10. Anterior tarsi with a comb above the 2nd tarsomere 11
— Anterior tarsi lacking a comb above the 2nd tarsomere 13
11. Elytra entirely black or with orange-red edges lacking stripes, surface finely punctured and covered with sparse double pubescence with short adpressed goldish and long erect black hairs, metathorax simple, not swollen .... ***Protocollops*** Evers, 1991
— Elytra with contrasting black and yellow-orange colouration with stripes and spots, surface coarsely punctured and densely covered with double pubescence with short semi-erect goldish and long erect white or brown hairs, metathorax slightly swollen 12
12. Anterior femora with weakly excavated on inner side near apex and provided with a row of lightly-coloured straight hairs above the excavation, pygidium (apical tergite) prolonged, evenly rounded at apex, ultimate ventrite (apical sternite) bilaciniate, evenly rounded and pointed at apex ..... ***Dicranolaius*** Champion, 1921
— Anterior femora strongly excavate on dorsal side near apex lacking hairs, pygidium (apical tergite) longitudinal, truncate at apex and narrowly emarginate in the middle with a sharp spicula in the emargination, ultimate ventrite (apical sternite) bilaciniate with adjoining lobes, transverse,

cut distally and with thin denticles at apex .... ***Australolaius*** Tshernyshev, gen.n.

13. Anterior tarsomeres well visible and are of equal shape 14
— Second tarsomere in anterior legs shortened, lacking elongate ventral lobe and tightly adjoining to the third antennomere, so the tarsi look 4-segmented .... ***Notointybia*** Liu,Ślipiński et Pang, 2020
14. Anterior femora simple. lacking excavations . ..... ***Intybia (Intybia)*** Pascoe, 1866
— Anterior femora excavate on ventral side near the middle and provided with a hair tuft from above ..... ***Intybia (Protolaius)*** Tshernyshev, 2020
15. Third antennomere rectangular, longitudinal, slightly widened and flattened, head sculptured with transverse wrincles in forehead or inter-ocular area, body colouration monochromously black-brawn, anterior tarsi with a comb above the 2nd tarsomere .. ***Stenolaius*** Wittmer, 1995
— 3rd antennomere different shape, enlarged, with emarginations or impressions and tuft of hairs; anterior tarsi with a comb above the 2nd tarsomere or lacking it 16
16. Anterior tarsi lacking a comb above the 2nd tarsomere, head narrowed and elongate, eyes look stretched and protruding, inter-ocular area sculptured with longitudinal carinae, protuberances or impressions .... ***Troglointybia*** Tshernyshev, 2015
— Anterior tarsi with a comb above the 2nd tarsomere, head not narrowed, eyes not protruding, inter-ocular area or forehead hollowed or with protuberances or carinae in a middle (*Troglocollops* Wittmer, 1965) 17
17. Pronotum monochromously black, 1st and 3rd antennomeres enlarged and equal in width .... ***Troglocollops*** (***Troglocollops***) Wittmer, 1965
— Pronotum black with yellow edging 18
18. 1st antennomere clavate, not enlarged, slightly narrower than the 3rd which is subquadrate in shape ..... ***Troglocollops*** (***Troglocollopsoides***) Wittmer, 1979
– 1st antennomere strongly enlarged, stout, wide and flattened at apex, the 3rd antennomere oval and narrower than the 1st ..... . ***Troglocollops*** (***Alexeus***) Tshernyshev, 1994

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