

New species of the *Amphisternus*-group of Lycoperdininae from Philippines (Coleoptera: Endomychidae)

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Abstract. Two new species of lycoperdinine Endomychidae from Philippines, Mindanao, are described and illustrated. These are a new species of *Amphisternus* Germar, 1843: *Amphisternus alberti* sp. nov., and a new species of *Gerstaeckerus* Tomaszewska, 2005: *Gerstaeckerus rufiplagiatus* sp. nov. Both species belong to *Amphisternus*-group of Lycoperdininae. The keys to the species of *Amphisternus* and *Gerstaeckerus* (= *Engonius* Gerstaecker, 1857) originally proposed by Strohecker are modified and updated.

Key words. Coleoptera, Cucujoidea, Endomychidae, Lycoperdininae, new species, key to species, taxonomy, Philippines, Oriental Region

Introduction

The subfamily Lycoperdininae is the largest group of the primarily mycophagous cucujoid family Endomychidae (SHOCKLEY et al. 2009a,b). It contains over 700 described species worldwide and is regarded as well-defined and monophyletic. The monophyly of this subfamily was confirmed by phylogenetic analyses based on morphology (TOMASZEWSKA 2000, 2005) and on molecular markers (ROBERTSON et al. 2008).

TOMASZEWSKA (2005) recognized 38 genera divided into five generic groups in Lycoperdininae. Since then five new genera of Lycoperdininae have been described: two, *Stroheckeria* Tomaszewska, 2006 and *Humerus* Chang & Ren, 2013, from the Oriental Region (TOMASZEWSKA 2006, CHANG & REN 2013), and three, *Hylaperdina* Tomaszewska, 2012, *Chileanus* Tomaszewska, 2012, and *Atopomychus* Tomaszewska & Szawaryn, 2013, from the Neotropical Region (TOMASZEWSKA 2012, TOMASZEWSKA & SZAWARYN 2013).

The Lycoperdininae fauna of the Philippines contains 31 species in 9 genera (SHOCKLEY et al. 2009a) classified in three of five generic groups recognized by TOMASZEWSKA (2005) in her cladistic analyses.

An additional material of the Oriental Endomychidae provided by Albert Allen (Boise, Idaho) allowed me to discover two new species of Lycoperdininae from the Philippines,

described here as *Amphisternus alberti* sp. nov. and *Gerstaeckerus rufiplagiatus* sp. nov. Both species belong to genera of *Amphisternus*-group of Lycoperdininae.

Material and methods

Measurements were made using an ocular micrometer attached to an Olympus SZH-10 dissecting microscope, and were recorded as follows: total length, from apical margin of clypeus to apex of elytra; pronotal length, from the middle of anterior margin to base of pronotum; pronotal width, at widest part; elytral length, along suture including scutellum; elytral width, across both elytra at widest part. Male and female genitalia were dissected, cleared in 10% solution of KOH, and placed in glycerine on slides for further study. Structural illustrations were made from slide preparations using a camera lucida attached to Olympus dissecting microscope.

Photographic images were made using a digital camera mounted on Olympus SZX16 dissecting microscope. The final plates were prepared using Adobe Photoshop CS®.

The beetle morphology follows LAWRENCE et al. (2011) including use of Roman numerals for the body segments; specific terminology and classification follow TOMASZEWSKA (2010). Characters of the species that agree with the generic descriptions provided by TOMASZEWSKA (2005) are not included in the following species descriptions.

The holotype of *Gerstaeckerus plagiatus* sp. nov. and the holotype and a paratype of *Amphisternus alberti* sp. nov. are deposited in Museum and Institute of Zoology PAS, Warszawa, Poland (MZPW); two paratypes of *A. alberti* are deposited in a private collection of A. Allen (AABI).

Taxonomy

Lycoperdininae Redtenbacher, 1844

Lycoperdinae Redtenbacher, 1844: 118. Type genus: *Lycoperdina* Latreille, 1807.

According to TOMASZEWSKA (2005), the subfamily Lycoperdininae contains five generic groups: *Daulis*-group, *Lycoperdina*-group, *Amphix*-group, *Amphisternus*-group, and *Eumorphus*-group.

The *Amphisternus*-group now includes ten Oriental genera, *Amphisternus* Germar, 1843, *Amphistethus* Strohecker, 1964, *Brachytrycherus* Arrow, 1920, *Cacodaemon* Thomson, 1857, *Gerstaeckerus* Tomaszewska, 2005, *Humerus* Chang & Ren, *Ohtaius* Chûjô, 1938, *Spathomeles* Gerstaecker, 1857, *Stictomela* Gorham, 1886, and *Stroheckeria* Tomaszewska. The monophyly of this group is well supported by the form of the mesoventrite with apex of the intercoxal process widened laterally, overlapping part of the coxae; moreover the elytra with basal margins thickened and raised (occurring also in some genera of *Eumorphus*-group), the mandible with apical tooth widely chisel-shaped shared with some other Lycoperdininae, and male genital segment having additional, internal V- or U-shaped sclerite occurring also in some other Lycoperdininae unite this group. CHANG & REN (2013) provided the most recent key to genera of *Amphisternus*-group.

***Amphisternus* Germar, 1843**

Amphisternus Germar, 1843: 85. Type species: *Amphisternus tuberculatus* Germar, 1843, subsequently designated by ARROW (1925): 282.

Amphisternus: TOMASZEWSKA (2005): 14 (redescription).

Diagnosis. *Amphisternus* is similar to *Cacodaemon*, *Amphistethus*, *Spathomeles* and *Stictomela* in having the elytra provided with high tubercles and/or spines. Among these genera, *Amphisternus* appears to be closely related to *Cacodaemon* having the ovipositor with base of spermatheca provided with large, at least weakly sclerotized, nodulus-like structure, and the mandible with apices strongly asymmetrical. Both features shared with *Cacodaemon* separate *Amphisternus* from *Amphistethus*, *Spathomeles* and *Stictomela*. From *Cacodaemon*, *Amphisternus* can be distinguished by the maxillary lacinia long and stout throughout, provided with tuft of S-like setae at apex and a row of dorsal spines, the intercoxal process of mesoventrite widening apically and covering part of coxae and the intercoxal process of metaventrite widely bordered and raised.

Remarks. STROHECKER (1964) included 12 species of *Amphisternus* in his Synopsis of the Amphisternini. STROHECKER (1968) described another new species, *A. lugubris* from Sabah (Borneo). This species was however omitted in the key by WANG & REN (2007) who described *A. rufituberus* Wang & Ren, 2007 from China. CHANG & REN (2013) added another new species from China, *A. pubescens* Chang & Ren, 2013. This genus now contains 16 species, including the new species described here. This is the first record of *Amphisternus* from the Philippines.

Key to the species of *Amphisternus*

(based on STROHECKER (1964) and WANG & REN (2007))

- 1 Dorsum covered with short, dense pubescence; body length 8.7 mm; China, Yunnan.
..... *A. pubescens* Chang & Ren, 2013
- Dorsum without pubescence. 2
- 2 Elytral umbo without spine. 3
- Elytral umbo with cylindrical or conical spine. 12
- 3 Wingless, elytral humeri strongly oblique. 4
- Winged, humeri subrectangular. 7
- 4 Elytra wholly black, very coarsely punctured; body length 7.5 mm; Vietnam, Laos.
..... *A. sordidus* Arrow, 1928
- Elytra with red or yellow areas. 5
- 5 Elytra with 2 preapical spots. 6
- Elytra with single pre-apical spot; body length 6.5–7.0 mm; Java.
..... *A. verrucosus* Gorham, 1897
- 6 Elytral humeri dark; discal prominence smaller, rounded; preapical spots transversely-
-oval, sometimes connected in form of transverse band; body length 6.3 mm; Indonesia
(Sumatra). *A. nanus* Strohecker, 1964
- Elytral humeri with red-orange spot; discal prominence large, rectangular; preapical
spots elongate-oval; body length 6.8–7.8 mm; Philippines (Mindanao).
..... *A. alberti* sp. nov.

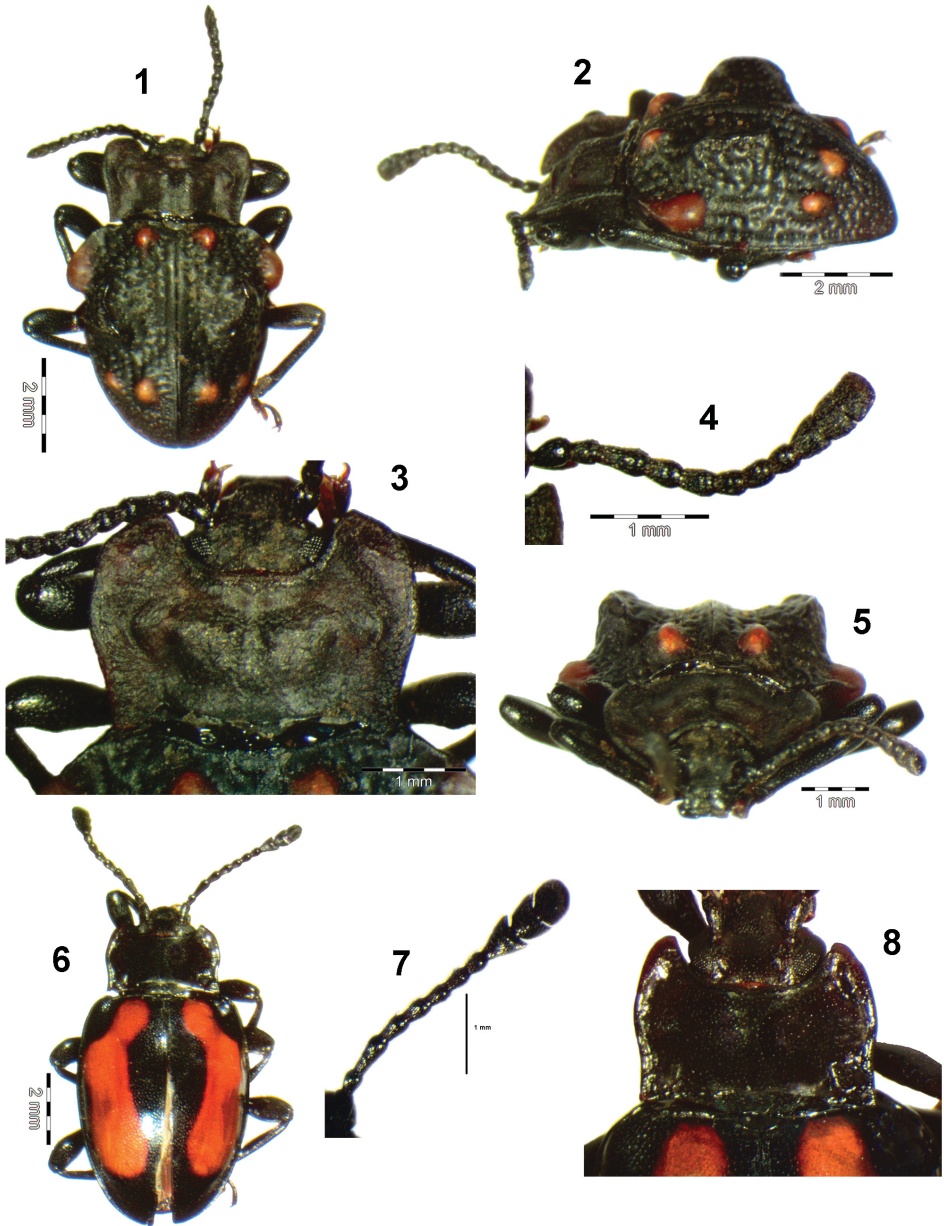
- 7 Umbonal carina without tubercle. 8
 – Umbonal carina with tubercle. 10
 8 Elytra slightly longer than their combined width. 9
 – Elytra 1.5 times as long as wide; body length 9.5–10.0 mm; Malaysia.
 *A. opacus* Strohecker, 1957
 9 Elytra abruptly rounded to apex; body length 8.0–9.3 mm; Java.
 *A. tuberculatus* Germar, 1843
 – Elytra distinctly tapering behind middle; body length 7.0 mm; Indonesia, Malaysia.
 *A. eruptus* Gorham, 1901
 10. Elytra with a discal subcarinate tubercle. 11
 – Elytra with a high discal prominence; body length 7.5 mm; Indonesia, Malaysia (Malacca).
 *A. vomeratus* Gorham, 1901
 11 Scape of antenna and the outer half of each femur blood-red; body length 9.0 mm; Burma.
 *A. corallifer* Gerstaecker, 1857
 – Scape of antennae and femora black; body length 10.7–11.3 mm; China.
 *A. rufituberus* Wang & Ren, 2007
 12 Elytra much prolonged at apex; body length 7.4 mm; Malaysia.
 *A. caudatus* Strohecker, 1964
 – Elytra rather abruptly rounded to apex. 13
 13 Discal prominence of elytron truncate; body length 7.0 mm; Malaysia.
 *A. grandjeani* Pic, 1930
 – Discal prominence of elytron rounded at apex. 14
 14 Elytron with broad post-median pale bar; body length 8.0 mm; Malaysia (Malacca).
 *A. malaccanus* Pic, 1930
 – Elytron with 2 small spots behind middle; body length 7.5 mm. 15
 15 At least hind elytral pustules red; discal elytral prominence at least as high as long;
 Malaysia (Sarawak). *A. mucronatus* Gerstaecker, 1857
 – Elytral pustules dark; discal elytral prominence lower than long, Malaysia (Sabah).
 *A. lugubris* Strohecker, 1968

Amphisternus alberti sp. nov.

(Figs 1–5, 9–13)

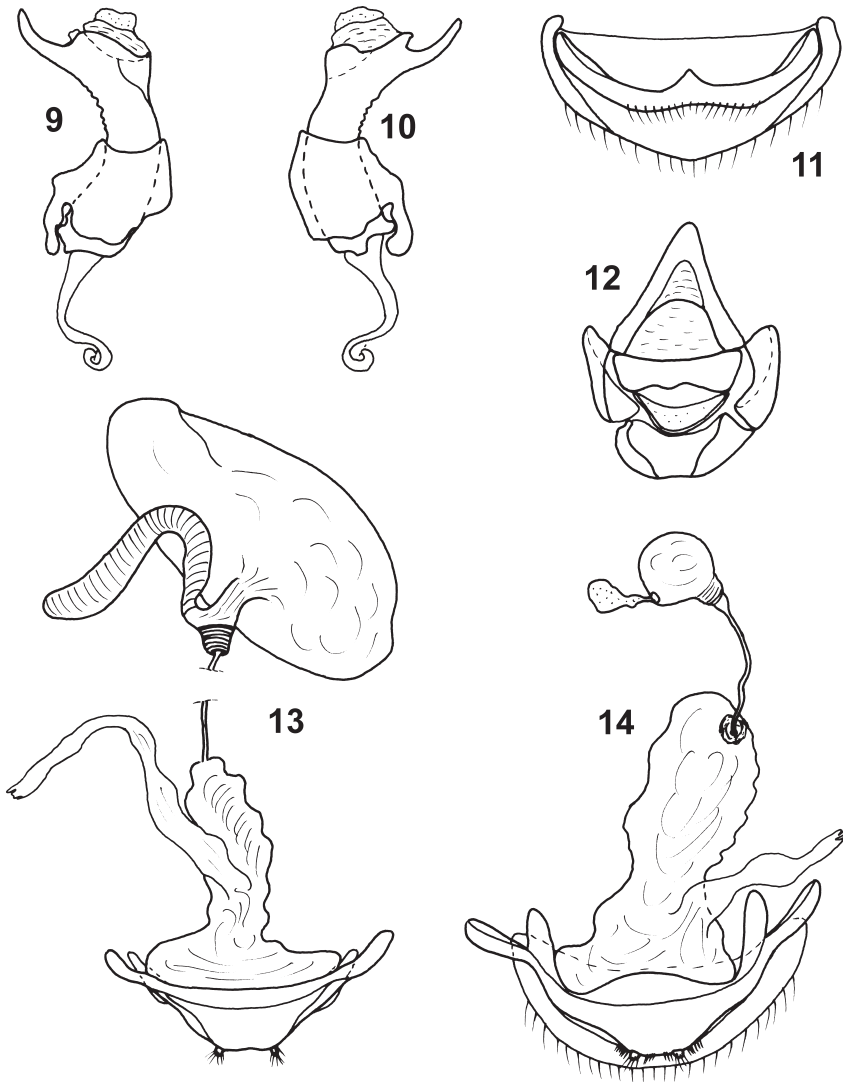
Type material. HOLOTYPE: ♂, 'PHILIPPINES/ MINDANAO/ Zamboanga del Norte/ II. 2011/ leg. I. Lumawig// Holotype *Amphisternus alberti* sp. nov., Tomaszewska 2014' (MZPW). PARATYPES: ♀, same data as holotype (MZPW); ♀, same but 'XII. 2010' (AABI); ♀, 'PHILIPPINES, MINDANAO, Misamis Oriental, X. 2013, leg. I. Lumawig' (AABI).

Description. Length 6.8–7.8 mm. Body 1.70–1.83 times as long as wide; pronotum 0.50–0.60 times as long as wide; elytra 1.15–1.25 times as long as wide; 2.75–2.90 times longer than pronotum, 1.23–1.32 times wider than pronotum. Body (Figs 1, 2, 5) short-oval, convex, opaque; colour black with only elytral tubercles red-orange. Antenna (Fig. 4) with antennomere 3 about 1.3 times longer than antennomere 4 or 5. Pronotum (Fig. 3) impunctate, weakly reticulated; pronotal disk with two pairs of weak convexities/tuberc-



Figs 1–8. Habitus. 1–5 – *Amphisternus alberti* sp. nov.; 6–8 – *Gerstaeckerus rufiplagiatus* sp. nov. 1, 6 – dorsal habitus; 2 – lateral habitus; 3, 8 – pronotum; 4, 7 – antenna; 5 – habitus, anterior view.

les; anterior angles blunt, posterior angles weakly acute. Elytra weakly wider than base of pronotum; shoulders obliquely widened and carinate; humeral carina with prominent red-orange tubercle; each elytron with basal moderately high, round-oval, red-orange tubercle, a pair of similar tubercles in apical third and a large, carinate black tubercle, somewhat rectangular in shape (in lateral view) a little in front of mid length (Fig. 2); elytral punctures coarse and almost touching one another. Hind wings absent. Male fore



Figs 9–14. Genitalia. 9–13 – *Amphisternus alberti* sp. nov.; 14 – *Gerstaeckerus rufiplagiatus*, sp. nov. 9 – aedeagus, dorsal view; 10 – aedeagus, ventral view; 11 – abdominal segment VIII, male, ventral view; 12 – male genital segment, ventral view; 13, 14 – female genitalia, ventral view.

tibia with small tooth in apical third and male fore trochanters with small triangular tubercle on outer edge. Aedeagus (Figs 9, 10) short and stout; median lobe with inner margin denticulate in mid length.

Female genitalia (Fig. 13). Ovipositor with styli distinct, subterminal; spermatheca large, elongate-oval.

Differential diagnosis. This species is most similar to *A. nanus*, but can be distinguished by larger body, which is deeply black and opaque, humeral carina less oblique and with large rounded, red-orange tubercle, and discal tubercle larger and rectangular in lateral view.

Etymology. The new species is dedicated to Mr. Albert Allen, who kindly sent me the specimens of this new species for study.

Distribution. Philippines (Mindanao).

Gerstaeckerus Tomaszewska, 2005

Engonius Gerstaecker, 1857: 220 (younger homonym of *Engonius* Perty, 1833). Type species. *Engonius sexguttatus*

Gerstaecker, 1857 subsequently designated by ARROW (1925): 310.

Gerstaeckerus Tomaszewska, 2005: 42 (new substitute name for *Engonius* Gerstaecker, 1857, redescription).

Diagnosis. *Gerstaeckerus* is most similar to *Ohtaius* and *Brachytrycherus* in general body appearance. However, the maxillary lacinia without tuft of S-like setae at apex and provided with short spinulae and two long spines on dorsal surface separate *Gerstaeckerus* from both genera. Moreover the body more elongate, the head lacking well developed, separated gular sutures, and the intercoxal process of mesoventrite widening apically and covering part of coxae, separate *Gerstaeckerus* from *Brachytrycherus*, while the femora without fringe of long hairs on inner surface can distinguish it from *Ohtaius*.

Remarks. STROHECKER (1971) included 14 species in his review of the genus *Engonius* for which he also provided a key to their determination. He treated further four species as dubious taxa because of material unavailable for study. VAZIRANI & SAHA (1972) described a new species of *Engonius* from India, *E. kamengensis*. STROHECKER (1984) made some synonymies of Pic's species including *Engonius spurius* Strohecker, 1971 (= *E. trisignatus* Pic, 1946). SHOCKLEY et al. (2009a) listed 20 species of *Gerstaeckerus*, although mistakenly treated *G. similis humeralis* (Arrow, 1928) once as species (*G. humeralis*) and thence as the subspecies. In fact the genus currently contains 19 species (with two subspecies of *G. similis*).

The updated key to the species of *Gerstaeckerus* provided below includes 15 species, leaving *G. dalatensis* (Pic, 1928), *G. luteofasciatus* (Pic, 1940), *G. latenotatus* (Pic, 1940), *G. herklotsii* (Guérin-Méneville, 1857) as species *incertae sedis*, following STROHECKER (1971). The described new species here is the second species of *Gerstaeckerus* known from the Philippines.

Key to the species of *Gerstaeckerus*

(based on STROHECKER (1971))

- | | | |
|---|--|---|
| 1 | Each elytron with one elongate orange-red fascia; Philippines (Mindanao) | |
| | | <i>G. rufiplagiatus</i> sp. nov. |
| – | Each elytron with two or three pale markings. | 2 |
| 2 | Elytron with two spots in anterior half. | 3 |
| – | Elytron with one spot, band or ring in anterior half. | 7 |

- 3 Posterior elytral marking small, round. 4
 – Posterior elytral marking spanning most of elytral width. 5
- 4 Pronotum shiny; body length 11.0–12.0 mm; Malaysia (Sarawak, Perak, Penang), Indonesia (Sumatra). *G. sexguttatus* (Gerstaecker, 1857)
 – Pronotum subopaque; body length 9.0 mm; Malaysia (Borneo).
 *G. brookei* (Gorham, 1885)
- 5 Elytral spots blood-red; Philippines. *G. sanguineolentus* (Gorham, 1875)
 – Elytral spots orange or yellow. 6
- 6 Apex of prosternal process subtruncate; posterior elytral marking in form of large rectangle; Malaysia (Borneo), Singapore, Thailand. *G. trisignatus* (Pic, 1946)
 – Apex of prosternal process v-excised; posterior elytral marking in form of transversely oval bar; India. *G. sikkimensis* (Strohecker, 1971)
- 7 Front elytral mark ring-like, enclosing umbo. 8
 – Front elytral mark not ring-like. 10
- 8 Pronotum granulate, opaque; body length 11.0–12.5 mm; Malaysia, Indonesia (Sumatra, Java). *G. rubropictus* (Gerstaecker, 1857)
 – Pronotum shiny, punctate; body length 9.0–10.5 mm. 9
- 9 Elytron with round pre-apical spot; body length 10.5 mm; Indonesia (Sumatra).
 *G. obliquus* (Strohecker, 1957)
 – Elytron with transverse posterior marking; body length 9.0 mm; Java, New Guinea.
 *G. perspicillaris* (Gerstaecker, 1857)
- 10 Elytron with dentate cross-band in front. 11
 – Elytron with round, oval or dumbbell marking in front. 13
- 11 Elytral cross-bands strongly dentate. 12
 – Elytral cross-bands weakly dentate; Vietnam. *G. similis humeralis* (Arrow, 1928)
- 12 Deeply black, feebly shiny; body length 9.0–10.0 mm; Cambodia, China, India, Laos, Myanmar, Thailand, Vietnam. *G. gratus* (Gorham, 1891)
 – Black, shiny; body length 7.5 mm; China. *G. chensicieni* (Kryzhanovskij, 1960)
- 13 Front elytral markings deeply constricted; Singapore, Malaysia (Perak).
 *G. junctus* (Pic, 1930)
 – Front elytral markings round or oval. 14
- 14 Elytra widest beyond mid length; elytral markings round; body length 7.0–7.6 mm; India. *G. kamengensis* (Vazirani & Saha, 1972)
 – Elytra widest at mid length; elytral markings transversely or obliquely oval. 15
- 15 Body short-oval, elytra highest basad; length 8.0–9.0 mm; Malaysia, Myanmar, Singapore, Sumatra, Thailand. *G. gibbosus* (Gorham, 1885)
 – Body long-oval, elytra highest near middle. 16
- 16 Elytral outline arcuate; body more oval; 10.0 mm; Malaysia, Myanmar, Sumatra, Thailand. *G. klugi* (Gerstaecker, 1857)
 – Elytral outline subparallel; body more elongate; length 10.0–11.0 mm; Laos, Thailand, Vietnam. *G. similis similis* (Arrow, 1920)

***Gerstaeckerus rufiplagiatus* sp. nov.**

(Figs 6–8, 14)

Type material. HOLOTYPE: ♀, 'PHILIPPINES / Mindanao/ Bukidnon / Calahinan / X. 2013 / leg. I. Lumawig // Holotype *Gerstaeckerus rufiplagiatus* sp. nov., Tomaszewska 2014' (MZPW).

Description. Length 9.00 mm. Body 1.88 times as long as wide; pronotum 0.55 times as long as wide; elytra 1.27 times as long as wide; 3.40 times longer than pronotum, 1.48 times wider than pronotum. Body black, with only each elytron covered with elongate, reddish fascia (Fig. 6); shiny; moderately convex; glabrous. Antenna (Fig. 7) about 0.5 times as long as body; club flattened and comparatively narrow. Pronotum (Fig. 8) widest near anterior third; lateral margins rounded along anterior half then constricted in basal third; posterior angles about right-angled, anterior angles subacute; punctures fine, 2.0–3.0 diameters apart. Prosternal process about 0.5 times as wide as procoxal diameter, excised at apex. Elytra with lateral margins weakly rounded toward apex; widest in front of mid length; with punctures as large as the pronotal ones, 1.5–2.5 diameters apart. Female genitalia as in Fig. 14.

Male unknown.

Differential diagnosis. This species is easily distinguished from all its congeners by having elongate, red-orange fascia on each elytron.

Etymology. The specific epithet refers to the elongate red-orange fasciae on the elytra.

Distribution. Philippines (Mindanao).

Acknowledgements

The specimens of the new species were brought to my attention by Albert Allen (Boise, Idaho). I express my sincere thanks to A. Allen for permission to deposit the holotypes of the new species in the Museum and Institute of Zoology, PAS. I thank Adam Ślipiński for reading and commenting on a draft of this paper. Karol Szawaryn (MZPW) helped with habitus photographs.

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