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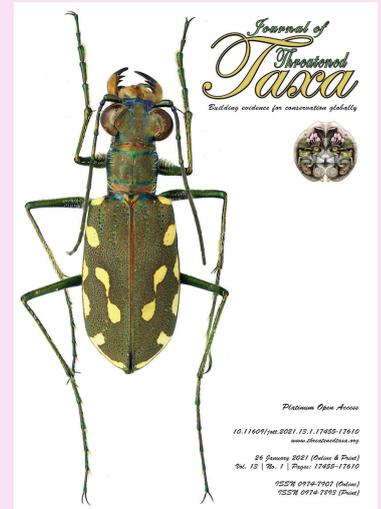
### SHORT COMMUNICATION

#### REVIEW OF THE TIGER BEETLE GENUS *CALOMERA* MOTSCHULSKY, 1862 (COLEOPTERA: CICINDELIDAE) OF THE PHILIPPINES

Milton Norman Medina, Alexander Anichtchenko & Jürgen Wiesner

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## Review of the tiger beetle genus *Calomera* Motschulsky, 1862 (Coleoptera: Cicindelidae) of the Philippines

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**Abstract:** The genus *Calomera* Motschulsky, 1862 from the Philippines is reviewed. Five species *C. angulata* Fabricius, 1798, *C. cabigasi* Cassola, 2011, *C. despectata* (Horn, 1892), *C. lacrymosa* (Dejean, 1825), and *C. mindanaoensis* (Cassola, 2000) are described with diagnoses, illustrations, notes on their ecology, and distribution remarks. Status of the taxa *C. insularis* (Blanchard, 1853) is discussed. Images of endophallus structures of *C. lacrymosa* and *C. mindanaoensis* are given for the first time. A key to the Philippine *Calomera* species is provided.

**Keywords:** Asia, endemic, ground beetle, widespread.

The epithet convention used in this review followed the established priority of *Calomera* over *Lophyridia* (Lorenz 1998, 2005; Cassola 2000). These two genera were often interchanged until Cassola finally resolved the taxonomic ambiguity and established *Calomera* as the valid genus by the rule of priori (Cassola 2000, 2011).

The genus is distinct from the other genera of Indo-Malayan Cicindelidae by the following features: elytral maculation not restricted to the lateral margin only;

pubescens of underside not felted; labrum with more than 10 marginal setae and, in the inner sac of the aedeagus a flagellum is present and complexly coiled on both sides of the inner sac. In the Philippines, the genus is represented by five species: *C. angulata* (Fabricius, 1798), *C. cabigasi* Cassola, 2011, *C. despectata* (W.Horn, 1892), *C. lacrymosa* (Dejean, 1825), and *C. mindanaoensis* (Cassola, 2000). This paper provides accurate literature for aspiring coleopterists and hobbyists in southeastern Asia, particularly in the Philippines, a megadiverse country (Heaney & Regalado 1998; Cassola & Pearson 2000; Catibog-Sinha & Heaney 2006), where there are numerous areas not previously explored and its tiger beetle fauna is still understudied (Medina et al. 2019, 2020b).

### MATERIAL AND METHODS

The material from the following institutional and private collections have been examined: DUBC –

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**Competing interests:** The authors declare no competing interests.

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Daugavpils University Beetles Collection (Latvia); UMCRC – University of Mindanao Coleoptera Research Center (The Philippines); JWGC collection of Jürgen Wiesner, Wolfsburg, Germany.

High-resolution habitus images of *Calomera* species are available at Carabidae of the World web-project <http://carabidae.org>

## RESULTS

### *Calomera angulata angulata* (Fabricius, 1798) (Image 1)

**Materials examined:** Luzon: Pola, Ifugao, N Luzon, August 2014 (1 male, DUBC); Isabela, Sierra Madre, N Luzon, August 2013 (1 male, DUBC). Negros: Negros Oriental, Dumaguete, XI.2014 (1 male, 3 females; DUBC); Don Salvador Benedicto, Negros Occidental, XI.2014 (2 males, DUBC).

**Diagnosis:** Body color bronze to dark copper or occasionally green. Elytra of male slender and female expanded at mid-body. Elytral pattern complete, ivory-coloured; medial band with “C”-shaped extension along suture toward the apice of elytron. Similar to *C. despectata*, but its elytra pattern of markings and expanded elytra of female distinguish it.

**Ecology:** This species can be found mostly in lowland ecosystems both in reservoirs and riverine habitats characterized by sandy and non-saline soil.

**Remarks:** First record from Negros Island. Previously known from Luzon.

**Distribution:** Nominative subspecies widely distributed in southern and southeastern Asia. Known from Afghanistan, Cambodia, China, India, Indonesia (Borneo, Sumatra), Laos, Nepal, Myanmar, Malaysia, Pakistan, The Philippines, Sri Lanka, Thailand, and Vietnam.

### *Calomera despectata* (Horn, 1892) (Image 2)

**Materials examined:** Luzon: Zambales (1 male, Paratype, at Museum für Tierkunde Dresden, Germany). Mindanao: Davao City, Catigan, Toril, sandy river with secondary dipterocarp forest at the bank, 1,000m, 7.004°N & 125.241°E, 24.iv.2019, M. Medina leg (2 males; UMCRC); Agusan del Norte, Esperanza, 11.2014 (5 males, 3 females; DUBC).

**Diagnosis:** Body color bronze to dark copper or occasionally green. Elytra of male slender and female expanded at mid-body. Elytral pattern complete, white or ivory-coloured; medial band with “S”-shaped extensions along suture toward the apice of elytron.

**Ecology:** The species was collected at a much higher elevation as compared to the other two *Calomera*

predominantly presented in Mindanao, *C. mindanaoensis* and *C. lacrymosa*. Biotype mark with rocky river bank, 1,000m, secondary forest, partially shaded.

**Remarks:** Larval morphology was described by Trautner & Schawaller (1996).

**Distribution:** Philippines: Luzon; Visayas, Leyte (Cabras et al. 2016b) with a new distribution record in Mindanao, Davao City, Catigan Toril.

### *Calomera cabigasi* Cassola, 2011 (Image 3)

**Material.** Mindanao: Compostela Valley, New Bataan, Cagan, near stream, 949m, 7.291°N & 126.103°E, 23.iv.2013, M. Medina leg. (1 female; UMCRC); Bukidnon, Cabanglasan, October 2014 (1 male, 1 female; DUBC).

**Diagnosis:** Species with dark blue, sometimes almost black, dull elytra; elytral punctation not visible through. The two discal dots showing a tendency to almost coalesce with each other through a narrow lineole in between, which is sometimes poorly visible or almost effaced. Labrum structure (Images 10a-b).

**Ecology:** Unlike with the other two *Calomera* in Mindanao (*C. mindanaoensis* and *C. lacrymosa*) this species is found in relatively higher altitudes between 800–1,300 m, near secondary to primary forest approximately 5–10 m from the fluvial systems.

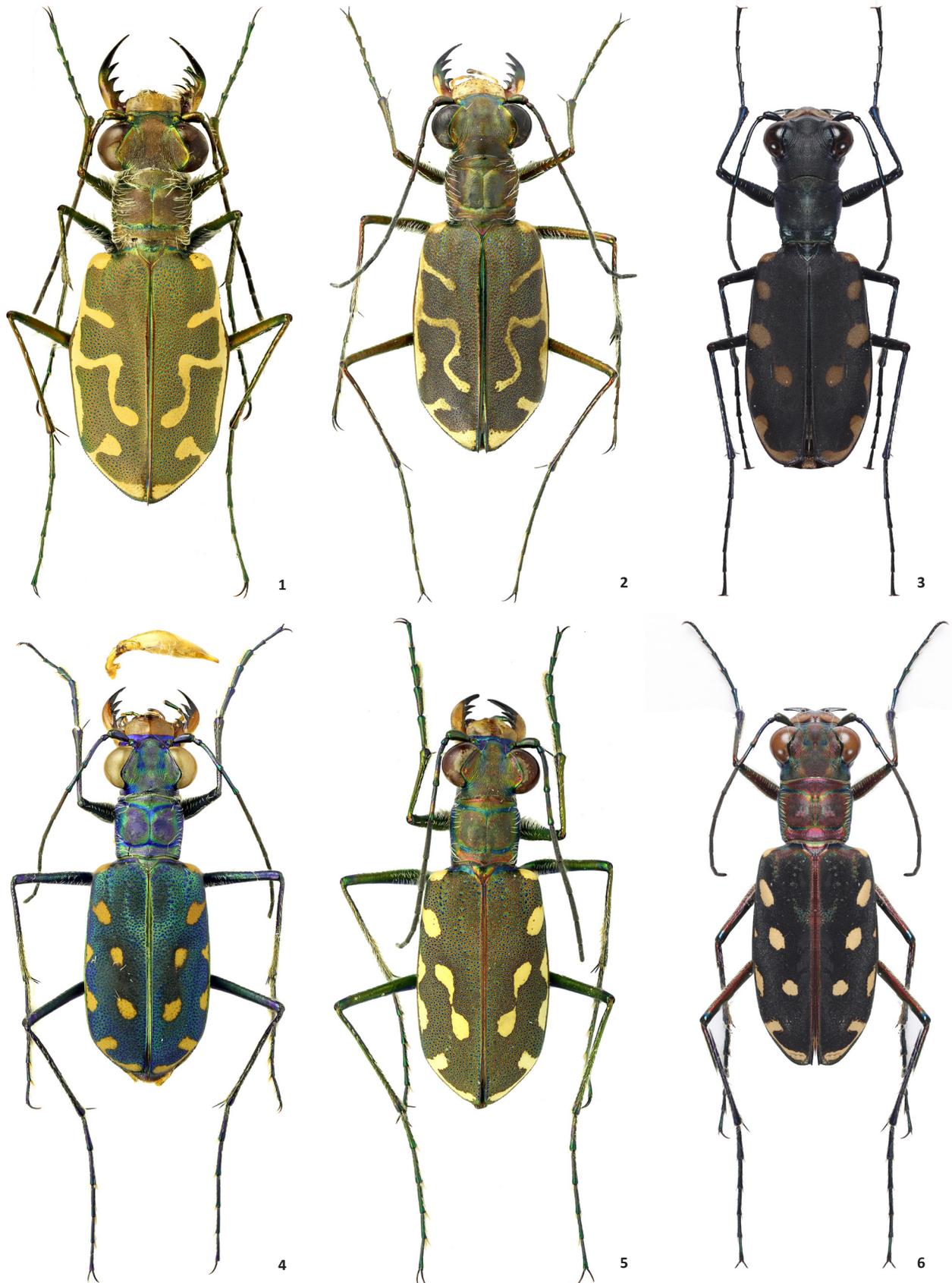
**Remarks:** Among the three *Calomera* species in Mindanao, this one is considered the rarest to find. The specimen at the CRC was collected through light trapping between 18.00h and 20.00h.

**Distribution:** Endemic to Mindanao, Misamis Oriental, Gingoog; Bukidnon, Impasug-ong; New Bataan, Cagan – new distribution record (Type locality: “Misamis Oriental, Gingoog”).

### *Calomera lacrymosa* (Dejean, 1825) (Images 4–5)

**Materials examined:** Luzon: Apayao, Calanasan, rocky and sandy river, 80–150 m, 18.125°N & 120.593°E, 24.xi.2017, RJT. Villanueva leg (1 male, UMCRC); Aurora, Dingalan, Aug. 2013 (4 males, 1 female; DUBC); Sierra Madre, Aurora, E Luzon, XII.2014 (1 female; DUBC); Cagayan, Baggao X.2014 (1 female, DUBC). Mindanao: Davao City, Tawan-tawan, rocky and sandy river, 330m, 7.105°N & 125.202°E, 12.ii.2019, M. Medina leg (10 males, 6 females, UMCRC); Zamboanga del Norte, Gutalac, XII.2014 (3 males; 3 females, DUBC); idem but X.2014 (4 males; 2 females, DUBC); Bukidnon, Mt. Kalatungan, XI.2014 (2 males, DUBC). Palawan: Bordeus, X.2018 (1 male, DUBC). Tablas: San Agustin, October 2018 (2 males, DUBC).

**Diagnosis:** *C. lacrymosa* (Dejean, 1825) is a rather small *Calomera* species, having cupreous, greenish,



Images 1–6. Habitus of *Calomera* species from the Philippines: 1—*C. angulata* | 2—*C. despectata* | 3—*C. cabigasi* | 4—*C. lacrymosa* (Luzon) | 5—*C. lacrymosa* (Mindanao, Zamboanga) | 6—*C. mindanaoensis*. © 1,2,4,5—A. Alexander Anichtchenko | 3,6—Christine Torrejos.

or sometimes bluish elytra; slightly blackened on disc, with the blue-green punctuation mostly well apparent through especially in front part. Elytral markings normally include an anterior lateral dot, and in many specimens, on one elytron at least, there is an evident narrow lineole tending to connect the two discal dots. Labrum structure (Images 8–9).

**Ecology:** *C. lacrymosa* is one of the most adaptive species that thrives in almost all lowland river systems compared to the other four species of *Calomera* in the Philippines. In Mindanao, *C. lacrymosa* seem to occur sympatrically with *C. mindanaoensis* where it co-inhabited in the same river at different microhabitat (Medina 2020). The minimum requirement for *C. lacrymosa* to thrive includes lowland open area with direct sunlight and sandy river. Moreover, unlike *C. lacrymosa*, *C. mindanaoensis* was not observed thriving in a fluvial system with poor water quality.

**Remarks:** Population from peninsular Zamboanga (Mindanao) was described under the name *insularis* by Blanchard (1853). This taxon is considered a synonym of *C. lacrymosa*. Specimens from Zamboanga has slight but constant differences, i.e. smaller body size, always cupreous body colour (Image 5), the teeth of labrum of males are less distant from each other than in specimens from Luzon (Images 9a,b), and apice of aedeagus slightly blunt (Image 12). Probably this population deserve status of subspecies.

**Distribution:** *C. lacrymosa* is widespread in the Philippine Islands, from Luzon to Mindanao. It was known in Mindoro, Palawan, Romblon, Samar in Visayas, and Balabac (Wiesner 1992a).

#### ***Calomera mindanaoensis* Cassola, 2000** (Image 5)

**Materials examined:** Mindanao: Davao de Oro, New Bataan, Cagan, 1,300m, rocky and sandy river, [7.242°N & 126.124°E], 23.iv.2013, MND. Medina leg (17 males, 19 females UMCRC); Davao de Oro, Montevista, Mayaon, rocky and sandy river, 150m, [7.433°N & 125.555°E], 12–14.iv.2012, MND. Medina leg (4 males, 1 female, UMCRC); Davao de Oro, Nabunturan, MHSPL, rocky and sandy river, 300m, [7.284°N & 126.014°E], 07–15.i.2012, MND. Medina leg (17 males, 19 females, UMCRC); South Cotabato, Mt. Parker, Lake Holon, 1,200m, [6.055°N & 124.525°E], 07–15.i.2012, A.A. Cabras leg (1 female, UMCRC); idem but 5–10.X.2019, Anichtchenko A. leg. (2 females, DUBC); Davao de Oro, Nabunturan, Cabalanan, rocky and sandy river, 80m, [7.284°N & 126.014°E], 21.iv.2012, K. Jumawan leg. (1 male, 2 females, UMCRC); Mount Hamiguitan Range Wildlife Sanctuary, 6.738°N & 126.145°E, 500m, 30.iii–2.iv.2018, Anichtchenko A.

leg. (1 male, 1 female; DUBC); Sebu Lake, 28.ix.2014, K. Kolesnichenko leg. (1 female, DUBC); Araibo, Pantukan, Candalaga Mts, 15–20.x.2019 Anichtchenko A. leg. (2 males, 2 females, DUBC).

**Diagnosis:** Species is very similar to *C. lacrymosa*, however slightly larger in size on average, with darker, nearly velvety dark blue elytra; elytra punctuation nearly extinct (Cassola 2000). Anterior lateral spot very small, sometimes lacking, the two discal dots not connected each other by a narrow lineole. Labrum structure (Images 7a–b).

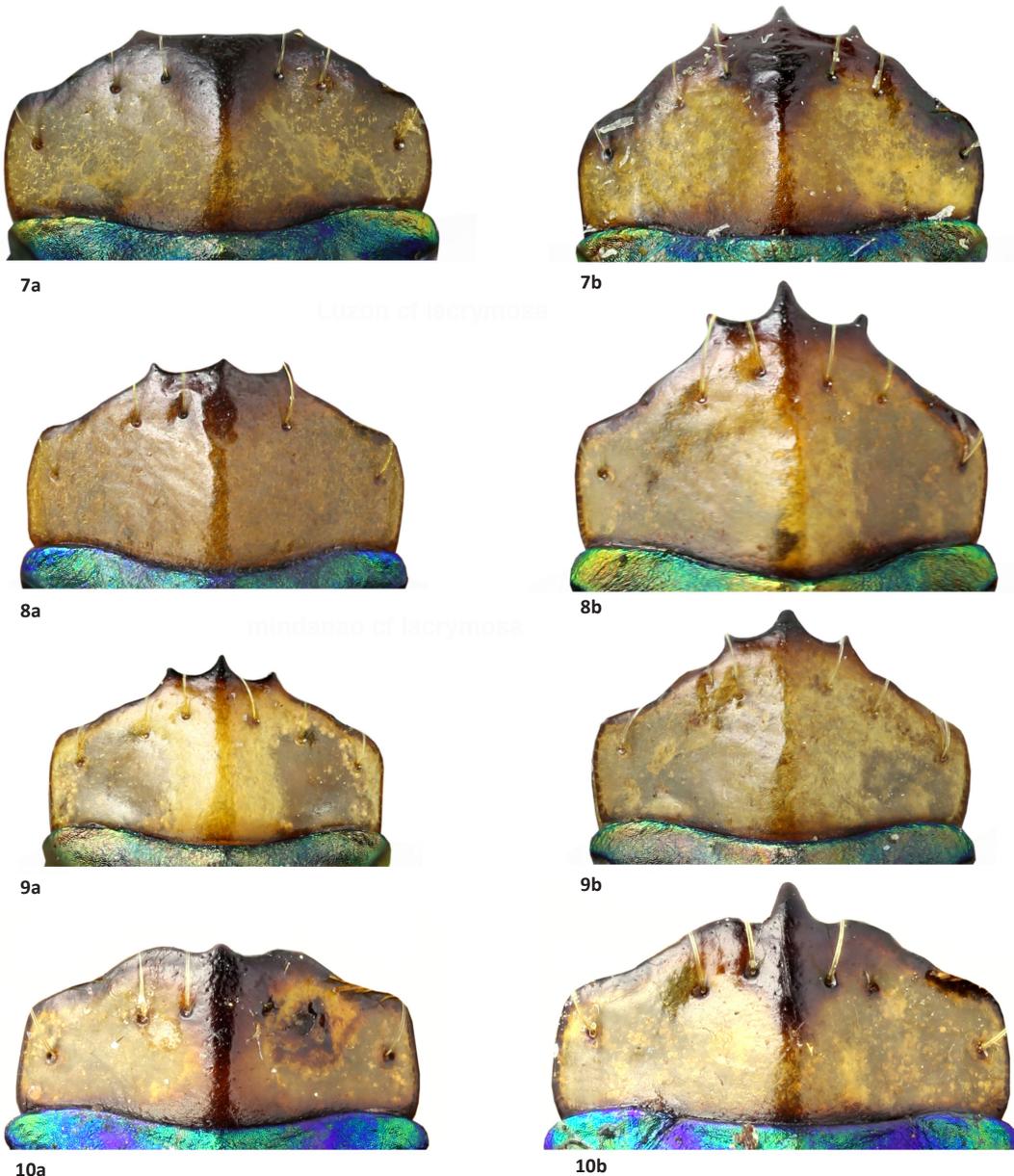
**Ecology:** Similar with its closest counterpart *C. lacrymosa*, *C. mindanaoensis* is also an adaptive species as it can tolerate severely disturbed habitats, even within banana plantations near fluvial systems just in the case in Maragusan in Davao de Oro. Common in lowland up to middle upland areas between 100–800 m, mostly thrives in sandy and rocky soil near the river or creek. It is active from 08.00–11.00 h on hot sunny days.

**Remarks:** Most of the materials are collected during their feeding time between 08.00–11.00 h Philippine Standard Time through hand netting. After this period, they are expected to have absorbed ample heat energy making them more agile and harder to catch. After this, most species are becoming harder to find as they started to rest and hide in shrubs and understory.

**Distribution:** At present, the known distribution of *C. mindanaoensis* is within Greater Mindanao. Materials were collected from the provinces of Davao de Oro, Bukidnon, Tagum City, Lake Sebu in South Cotabato (Cabras et al. 2016a), additional records are from Davao City in Tamugan and Matina Pangi, Mt. Hamiguitan Range Wildlife Sanctuary in Davao Oriental, Davao del Sur in Sta. Cruz, and Island Garden City of Samal (Medina et al. 2020b).

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Images 7–10. Labrum: a—male | b—female of: 7—*C. mindanaoensis* | 8—*C. lacrymosa* (Luzon) | 9—*C. lacrymosa* (Mindanao, Zamboanga) | 10—*C. cabigasi*. © A. Alexander Anichtchenko.

**Key to species of *Calomera* Motschulsky, 1862 from Philippines**

- 1 Median elytral band interrupted, consist of three rounded spots (Images 3–6) ..... 2
- Median elytral band continuous (Images 1–2) ..... 4
- 2 Sides of pronotum with white setae (Images 4–6) ..... 3
- Sides of pronotum without white setae (Image 3) ..... *C. cabigasi*
- 3 Head, pronotum and elytra concolor. Labrum of males tridentate, with central tooth (Images 8–10) ..... *C. lacrymosa*
- Head and pronotum metallic cupreous red, elytra dark blue. Labrum of males bidentate, without central tooth (Image 9a) .....  
..... *C. mindanaoensis*
- 4 Humeral macula of elytra inclined in respect to lateral margin of elytra (Image 2). Elytra of females not dilated in the middle .....  
..... *C. despectata*
- Humeral macula of elytra less inclined, almost perpendicular to lateral margin of elytra (Image 1). Elytra of females strongly dilated in the middle .....  
..... *C. angulata*



Images 11–12. Endophallus structure: 11—*C. mindanaoensis* | 12—*C. lacrymosa* (Mindanao, Zamboanga). © A. Alexander Anichtchenko.

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