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Two New Flightless Weevils in the Genus *Metapocyrtus* Heller (Coleoptera, Curculionidae, Entiminae) from Mt. Candalaga, Davao de Oro, Mindanao Island, Philippines

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Two flightless weevils from the genus *Metapocyrtus* Heller, 1912 namely *Metapocyrtus (Orthocyrtus) managusan* Cabras, Agbas and Obrial, sp. nov. and *Metapocyrtus sidlakan* Cabras, Agbas and Obrial, sp. nov. are described and illustrated from Mt. Candalaga, Davao de Oro. Additional ecological and mimicry notes with other sympatric weevils are also provided.

Key words: Biodiversity, Davao de Oro, endemic, mimicry, Mt. Candalaga, new species, weevil.

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INTRODUCTION

The family Curculionidae, commonly known as true weevils, belongs to the order Coleoptera (beetles) and is one of the largest coleopteran families that has about 51,000 species (Oberprieler et al., 2007). Within this family is the subfamily Entiminae, also known as broad-nosed weevils, which is the largest subfamily of true weevils comprising over 53 tribes and approximately 14,615 described species worldwide (Yunakov et al., 2024). The subfamily Entiminae are small to medium-sized plant-feeding weevils that mostly feed on roots in their larval stage (Yunakov, 2018) and are easily recognized for their: “short, broad rostrum with adelognathous mouthparts (the

prementum closing the buccal cavity from beneath), mandibles bearing deciduous cusps that assist the teneral weevil in escaping from its earthen pupal cell but then break off, and, in the larva, a cushion-like antennal sensorium" (Oberprieler et al., 2007, p. 506). Among the tribes of Entiminae in the Philippines, the tribe Pachyrhynchini is the most conspicuous owing to its large size, bright and colorful iridescent markings, and great diversity. The tribe is currently represented by 18 genera.

Under the speciose genus *Metapocyrtus* is the subgenus *Orthocyrtus* Heller, 1912, endemic to the Philippines where it is distributed throughout the archipelago (Bolino et al., 2022) and is easily identified by the notably large size, and rostrum that is of medium length, dorsally straight mostly in a plane with front, and at the base, the sides are rectangularly declined (Schultze, 1925; Cabras et al., 2018). During the past 7 years, 11 species new to science under the subgenus have been discovered and described from Mindanao island namely: *M. (O.) mansaka* Cabras, Bolino, and Medina, 2018, *M. (O.) ginalopezae* Cabras and Medina, 2019, *M. (O.) davaoensis* Cabras, Medina, and Bolino, 2021, *M. (O.) hirakui* Cabras, Medina, and Bolino, 2021*, M. (O.) barsevskisi* Cabras, Villanueva, and Medina, 2021*, M. (O.) villalobosae* Patano, Amoroso, Mohagan, Guiang, and Yap, 2021*, M. (O.) regalis* Cabras, Medina, and Bolino, 2022*, M. (O.) tboli* Cabras, Medina, and Bolino, 2022*, M. (O.) reagani* Cabras, Medina, and Bolino, 2022*, M. (O.) melibengoy* Cabras and Medina, 2022 *M. (O.) flomlok* Cabras and Medina, 2022 (Cabras et al., 2018, 2021a, 2021b, 2021 c; Cabras and Medina, 2020; Patano et al., 2021; Cabras et al., 2022a, 2022b, 2022c). Two of the mentioned species, *M.* (*O.*) *mansaka* Cabras, Bolino, and Medina, 2018, and *M.* (*O.*) *ginalopezae* Cabras and Medina, 2019 are found in Maragusan, Davao de Oro. In this paper, an additional novel species from the same locality is described and illustrated with another *Metapocyrtus* s.l.. Notes on their ecology and possible mimetic relationship with other weevils and beetles are also presented.

MATERIALS AND METHODS

Morphological characters were observed under Leica, Luxeo 4D and Nikon SMZ745T stereomicroscopes. The treatment of the genitals follows Yoshitake (2011). Images of the habitus were taken using Canon EOS 6D digital camera equipped with an MP-E 65-mm macro lens. Images were stacked and processed using a licensed version of Helicon Focus 6.7.0, then contrast adjusted in Photoshop CS6 Portable software.
Abbreviations and symbols mentioned are abbreviated as follows:
/ different lines;
// different labels;
LB body length, from the apical margin of pronotum to the apex of elytra;
LR length of rostrum;
LP pronotal length, from the base to apex along the midline;
LE elytral length, from the level of the basal margins to the apex of elytra;
WR maximum width across the rostrum;
WP maximum width across the pronotum;
WE maximum width across the elytra.

Comparative materials and specimens used in the study are deposited in the following institutional collections:
PNM National Museum of Natural History (PNMNH) under the National Museum of the Philippines;
TIRL Terrestrial Invertebrate Research Laboratory, Davao Oriental State University, City of Mati, Philippines.

TAXONOMY

***Metapocyrtus (Orthocyrtus) managusan* Cabras, Agbas & Obrial sp. nov.**
Fig. 1 A–B

Holotype (Fig. 3), 1 ♀: Philippines – Mindanao Island, Davao de Oro, Maragusan/ 04.09.2024, leg. D. Agbas & G. Obrial. (typed on white card) // HOLOTYPE female / *Metapocyrtus (Orthocyrtus) pseudomansaka* / CABRAS, AGBAS & OBRIAL, 2024 (typed on red card)" (Presently at TIRL, to be deposited at PNM.

Diagnosis. The new species can easily be mistaken as *M.* (*O.*) *mansaka* due to its uncanny similarity, particularly in elytral markings featuring three distinct transverse bands but can easily be differentiated by its small size and unique scaly marking on the pronotum with two longitudinal narrow bands on each side attenuated apically whereas *M.* (*O.*) *mansaka* has transverse scaly marks. *M.* (*O.*) *managusan* also has unequal transverse bands wherein the basal and apical bands are wider while the middle band is significantly thinner compared to the subequal bands for *M.* (*O.*) *mansaka.*

Description. Female.

Dimension : LB: 12.5mm. LR: 1.2mm. WR: 1.5mm. LP: 3.0mm. WP: 2.8mm. LE: 7.5mm. WE: 5.0 mm. N=1

Integument black. Body and pronotal surface, rostrum, head, legs, and underside weakly lustrous.
Head dorsal surface moderately rugopunctate; forehead between eyes weakly depressed with distinct median furrow; lateral surface below the eye densely covered with tessellated, appressed round and elliptical, light peach scales; eyes medium-sized and weakly convex, obscurely prominent on the outline of head.
Rostrum separated from the head by a distinct transverse groove with two deep concavities on each side; longer than wide (LR 2.0 mm; WR 1.6 mm); coarsely rugopunctate with distinct median furrow and with shallow but wide concavity on basal half beset with appressed, round, and ovate, light peach scales; lateral sides before antennal scrobe with light peach scales continuous that of the head, below antennal scrobe with appressed, piliform scales of similar color; dorsal contour in lateral view almost flat, subapically weakly convex, lateral contour in dorsal view constricted at base and weakly widened anteriorly; dorsolateral margin weakly rounded.
Prothorax subglobular, truncated at both ends, slightly wider at base than apex; nearly subequal (LP 2.9 mm; WP 3.0 mm); surface mostly glabrous with sparse and fine punctures and scaly markings on dorsum and lateral sides; dorsum with two longitudinal bands of appressed, round, turquoise, and pale yellow ochre scales on each side attenuated apically; lateral surface with band near lateral margin before coxae composed of appressed, round, light peach, and pale yellow ochre scales; dorsal contour in lateral view nearly flat, lateral contour in dorsal view weakly convex.
Elytra ovate, longer than wide (LE 7.5 mm; WE 5.0 mm), slightly wider, and two and half times longer than prothorax (WE 5.0 mm; WP 3.0 mm; LE 7.5 mm; LP 2.9 mm), body surface sparsely covered with irregular punctures, and with three transverse scaly bands of appressed, contiguous, round, turquoise, light peach and pale yellow-ochre scales, one thick band subbasally, one premedian band and one large band fully covering apical half; dorsal contour in lateral view strongly and uniformly convex slightly interrupted before apex; lateral contour in dorsal view uniformly convex, slightly narrow at base then gradually widens towards middle then abruptly tapers towards subacute apex. Apex sharply produced with suberect brown setae. **Legs** with moderately

clavate femora. Femora with appressed, ovate, pale peach, and pink scales forming a band subapically. Tibiae covered with suberect brown setae, moderately serrated along inner edge; protibiae and mesotibiae mucronate at apex. Procoxae with appressed, ovate, light peach scales. Mesoventrite with piliform colored scales at middle and sparse, ovate, light peach scales on sides. Metaventrite densely covered with tessellated, appressed, round, light peach scales on sides, and similar but less dense and contiguous light peach and blue green scales at middle. Ventrite I rugose anteriorly, convex and with sparse setae in the middle, sparsely covered with round light peach scales on sides. Ventrite II–V subglabrous. Ventrite V flat.

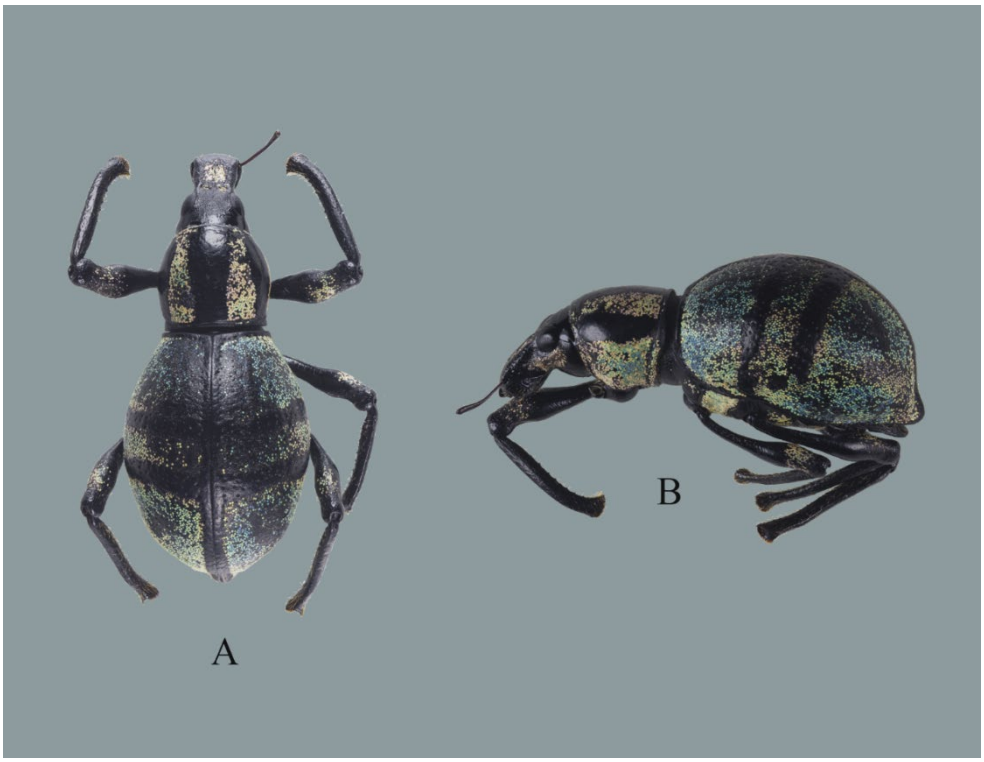

Fig. 1. Habitus of *Metapocyrtus* (*Orthocyrtus*) *managusan* sp. nov. A– dorsal view. B– idem, lateral view.

Etymology. The specific epithet "managusan" or "Man-Agusan" is derived from the Mansakan term that means the settlers along the Agusan River. Now it is called Maragusan a municipality in Davao De Oro.

Distribution. Philippines (Mindanao: Davao de Oro, Maragusan, Mt. Candalaga.)

***Metapocyrtus sidlakan* Cabras, Agbas & Obrial sp. nov.**

Figure 2 A, C

Holotype, 1 ♂: Philippines – Mindanao Island, Davao Oriental/ Lupon, Brgy. Calatagan, 09.22.2024/ leg. D. Agbas & G. Obrial. (typed on white card) // HOLOTYPE ♂ / *Metapocyrtus sidalakan*/ CABRAS,

AGBAS & OBRIAL, 2024 (typed on red card)" (Presently at TIRL, to be deposited at PNM. **Paratypes** (3 ♀♀);1 ♀: Philippines – Mindanao Island, Davao de Oro/ Maragusan, Mapawa-Bahi rd., 04.09.2024 / leg. D. Agbas & G. Obrial. (typed on white card); 1 ♀: Philippines – Mindanao Island, Davao de Oro/ Maragusan, Mt. Candalaga Camp 2, 05.9-11.2024/ leg. D. Agbas & G. Obrial. (typed on white card); 1 ♀: Philippines – Mindanao Island, Davao de Oro/ Maragusan, Mt. Candalaga, trail to peak/ 05.9-11.2024, leg. E. Avergonzado & J. Japitan. (typed on white card).

Diagnosis. The new species is unique from its congeners for its stouter body, and the presence of three longitudinal stripes in the pronotum and the two large triangular scaly patches in the elytra.

Description. Male.

Dimension : LB: 10mm. LR: 2.0mm. WR: 1.8mm. LP: 3.5mm. WP: 3.8mm. LE: 6.5mm. WE: 5.0mm. N=1

Integuments black. Body and pronotal surface, rostrum, head, legs, and underside moderately lustrous.

Head dorsal surface rugopunctate; forehead between eyes weakly and evenly depressed with distinct median ridge reaching posterior margin of eyes, sparsely adorned with appressed, round, iridescent golden yellow orange and pink scales interspersed with sparse, appressed piliform, iridescent orange scales; lateral surface below the eye with elliptical scaly markings of appressed, tessellated, round and ovate, iridescent yellow-orange scales, interspersed with pale greenish iridescent appressed piliform scales; eyes small-sized and weakly convex, not prominent on the outline of head.

Rostrum separated from the head by a distinct transverse groove almost reaching the lateral margin, coarsely rugopunctate until apical third; with subappressed, sparse, piliform iridescent turquoise scales, and distinct median furrow until the middle, adorned with sparse, appressed, iridescent, round yellow-orange scales, apical third weakly punctured with few suberect setae; slightly longer than wide (LR 2.0 mm; WR 1.8 mm), lateral surface before antennal scrobe with tessellated, appressed round and ovate, iridescent yellow-orange scales contiguous with that of the head, below antennal scrobe with suberect, piliform, iridescent turquoise scales; dorsal contour in lateral view flat until apical third then gradually declines towards apex, lateral contour in dorsal view weakly constricted at base and gradually widens towards apex; dorsolateral margin weakly rounded. Antennal scape and funicle subequal in length. Scape with sparse, subappressed setae, funicle with suberect setae. Antennae with segments 1 and 2 subequal in length, twice longer than wide; segment 3 significantly shorter than segment 1 and 2 but slightly longer than segment 4–6; segments 4 to 6 as long as wide; segment 7 slightly longer and wider than 4 to 6; club subelliptical, nearly three times longer than wide.

Prothorax subglobular, truncated at both ends, posterior margin wider than anterior margin; slightly wider than long (LP 3.5mm; WP: 3.8mm); very weakly and finely rugo-punctate, punctures with appressed, minute, piliform, white setae; dorsum with the following scaly markings composed of tessellated, appressed, round, iridescent pale yellow scales: a) longitudinal stripe medially, and b) longitudinal stripes on each side of dorsum, both extending from posterior and anterior margin, c) transverse stripes on basal and apical margin, and d) thin band near lateral margin before coxae, contiguous with posterior and anterior stripes; dorsal contour in lateral view weakly convex, lateral contour in dorsal view weakly convex, widest before middle.

Elytra ovate, irregularly punctured, longer than wide (LE: 6.5mm; WE: 5.0mm), significantly wider and almost twice longer than prothorax (WE: 5.0mm; WP: 3.8mm; LE: 6.5mm; LP 3.5mm), each elytron covered with two broad scaly bands composed of appressed, round, iridescent golden yellowish and turquoise scales covering most of body surface except the middle and postmedial area near suture; lateral contour in dorsal view uniformly convex, slightly narrow at base then gradually widens towards middle then dilates towards a subacute apex; apex with short, suberect setae. **Legs** with moderately clavate femora. Femora covered with sparse subappressed, iridescent red-orange and pale green piliform scales and subapically with a patch of sparse, round and lachrymiform, iridescent red-orange scales. Tibiae denticulated and with long suberect dense setae on inner margin, weakly rugose on outer surface, and covered with sparse suberect setae that are shorter at base and longer at apex as well as sparse and appressed round red-orange iridescent scales near base. Protibiae and mesotibiae mucronate at apex. Tarsi moderately long and pubescent. Tarsomere 1 subtriangular, longer than tarsomere 2; tarsomere 2 short and triangular; tarsomere 3 bilobed, slightly longer than tarsomere 2; tarsomere 5 subequal with combined tarsomere 1 and 2; tarsal claws free.

Coxae covered with piliform scales. Procoxae with a patch of appressed, iridescent yellow-orange, round scales on anterior side. Mesoventrite sparsely covered with suberect iridescent colored piliform scales and white setae. Metaventrite covered with sparse colored piliform scales and white setae on middle and distally with patch of circular to elliptical appressed, iridescent red-orange scales. Ventrites 1 and 2 with dense suberect setae on middle and on sides with sparse, appressed, iridescent orange scales; Ventrite 1 with more dense scales than Ventrite 2. Ventrites 3–5 with sparse setae. Ventrite V flattened, rugopunctate on apical half with sparse, suberect setae and sparse subappressed iridescent green piliform scales.

Female.
(Figure 2 B, D)

Dimension: LB: 12–14.1mm. LR: 1.5–1.6mm. WR: 1.4–1.8mm. LP: 3.0– 3.5mm. WP: 3.0– 3.5mm. LE: 7.0– 8.0mm. WE:5.0–5.5mm. N=2 Females differ from males in the following characteristics: a) rostrum squarish and shorter, b) forehead in between the eyes has shallow depression; b) pronotum as long as wide (LP: 3.0-3.5mm, WP: 3.0-3.5mm) ; d) pronotum with sparse minute iridescent orange scales in between the three longitudinal scaly stripes; f) apical declivity abrupt with a protruding acuminate elytral apex ; g) Ventrite 1 and 2 convex; h) Ventrite 5, flattened. Otherwise, female is similar to the male.

Etymology. The specific epithet "*sidlakan*" is the Bisayan term for the east where the type localities are situated in Mindanao Island.

Distribution. Philippines (Mindanao: Davao de Oro, Maragusan, Mt. Candalaga). Philippines (Mindanao: Davao Oriental, Lupon, Brgy. Calatagan)

Short note on the taxonomy of *M. sidlakan* sp. nov. and *M.* (*O.*) *managusan* sp. nov.

The new species *M.* (*O.*) *managusan* sp. nov. is described based on a single female specimen. Despite the exhaustive sampling of the first and second authors in Mt. Candalaga, only 1 specimen of *M.* (*O.*) *managusan* sp. nov. was collected (dead on the ground). Despite the lack of a male material, the authors decided to describe *M.* (*O.*) *managusan* sp. nov. based on its obvious difference from its congeners. The new species is related to the *M.* (*O.*)

mansaka species group together with *M*. (*O*.) *davaoensis*, *M*. (*O*.) *barsevskisi* among others. On the other hand, *M. sidlakan* seems to possess the characteristics that belong to a new species group of *Metapocyrtus* that the third author is currently working on. The authors decided to tentatively refrain from assigning the species to any subgenus. However, the continued placement of this species in the sensu lato will depend on future revision of the genus, and its subgenera or species groups.

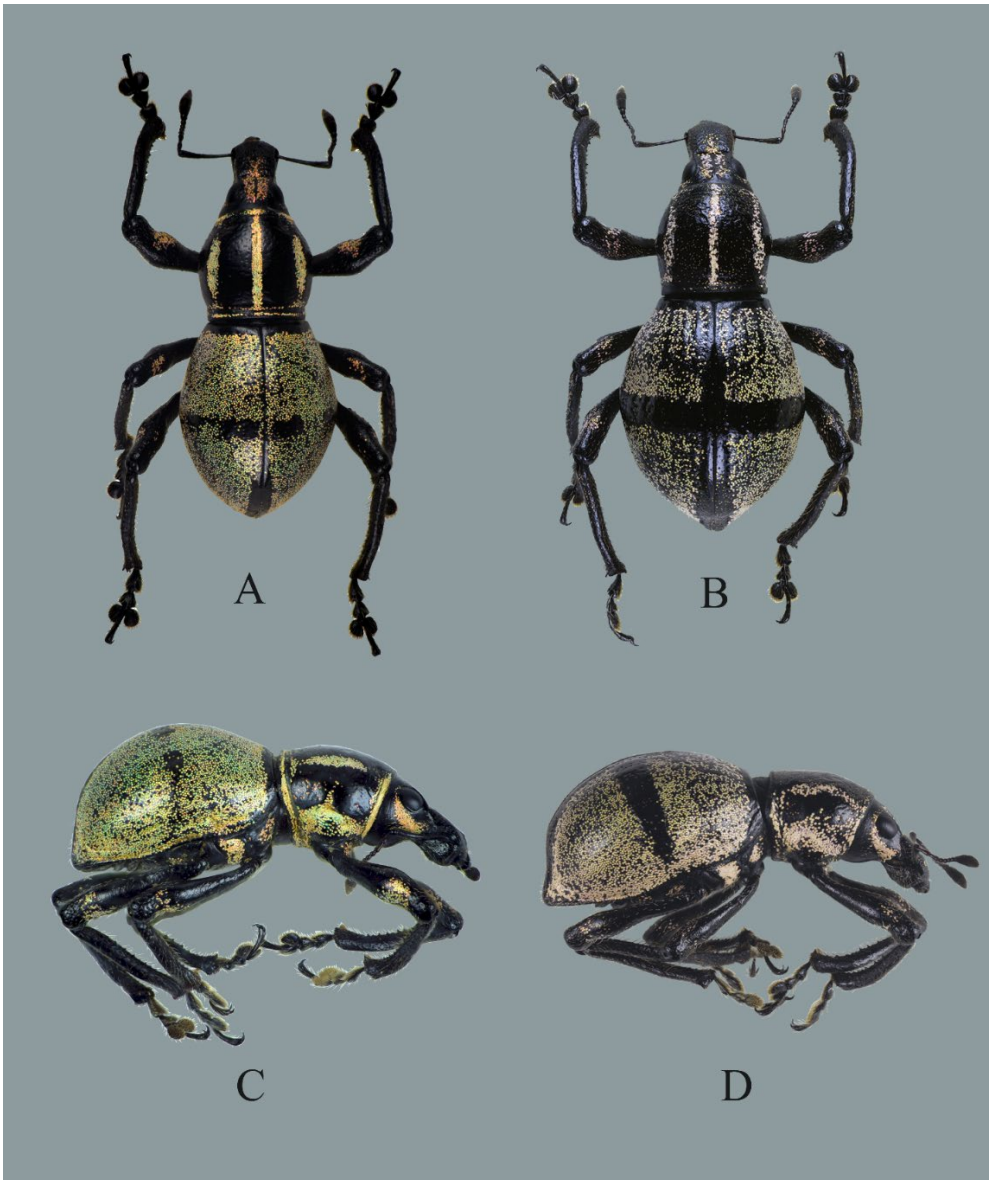

Fig. 2. Habitus of *Metapocyrtus sidlakan*: A– ♂ holotype, dorsal view. C– idem, lateral view; B–♀ paratype, dorsal view, D– idem, lateral view.

Fig. 3. Genitalia of *M. sidlakan* sp. nov. A– Aedeagus dorsal view. B– idem, lateral view, C– Sternite IX.

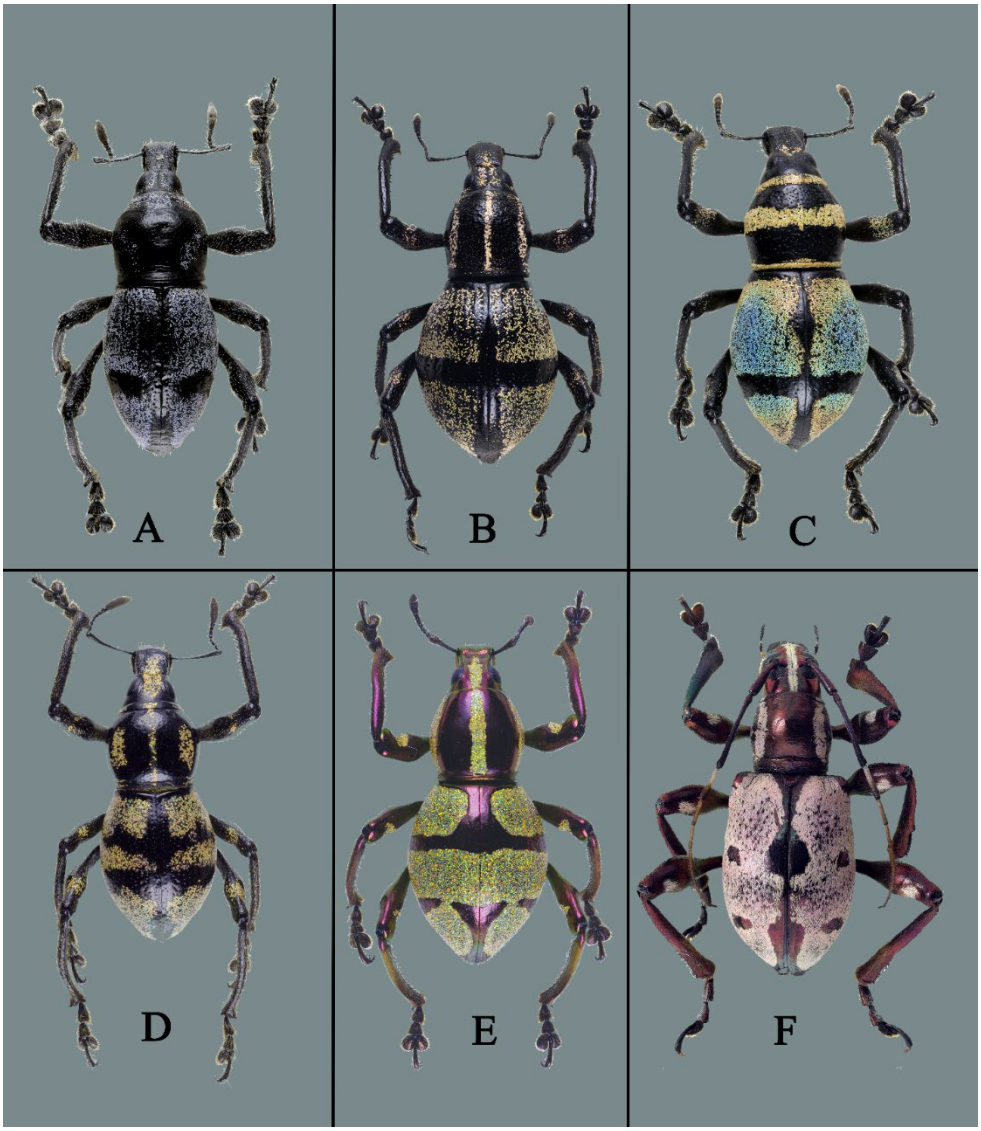

Fig. 4. Possible mimetic complex of *M.* (*O.*) *sidlakan* sp. nov. with sympatric weevils: A) *M. dagtum*, B) *M. sidlakan* sp. nov., C) *M.* (*O.*) *mansaka*, D) *M. salesi,* E. *P. miltoni,* F) *Doliops comvalensis*

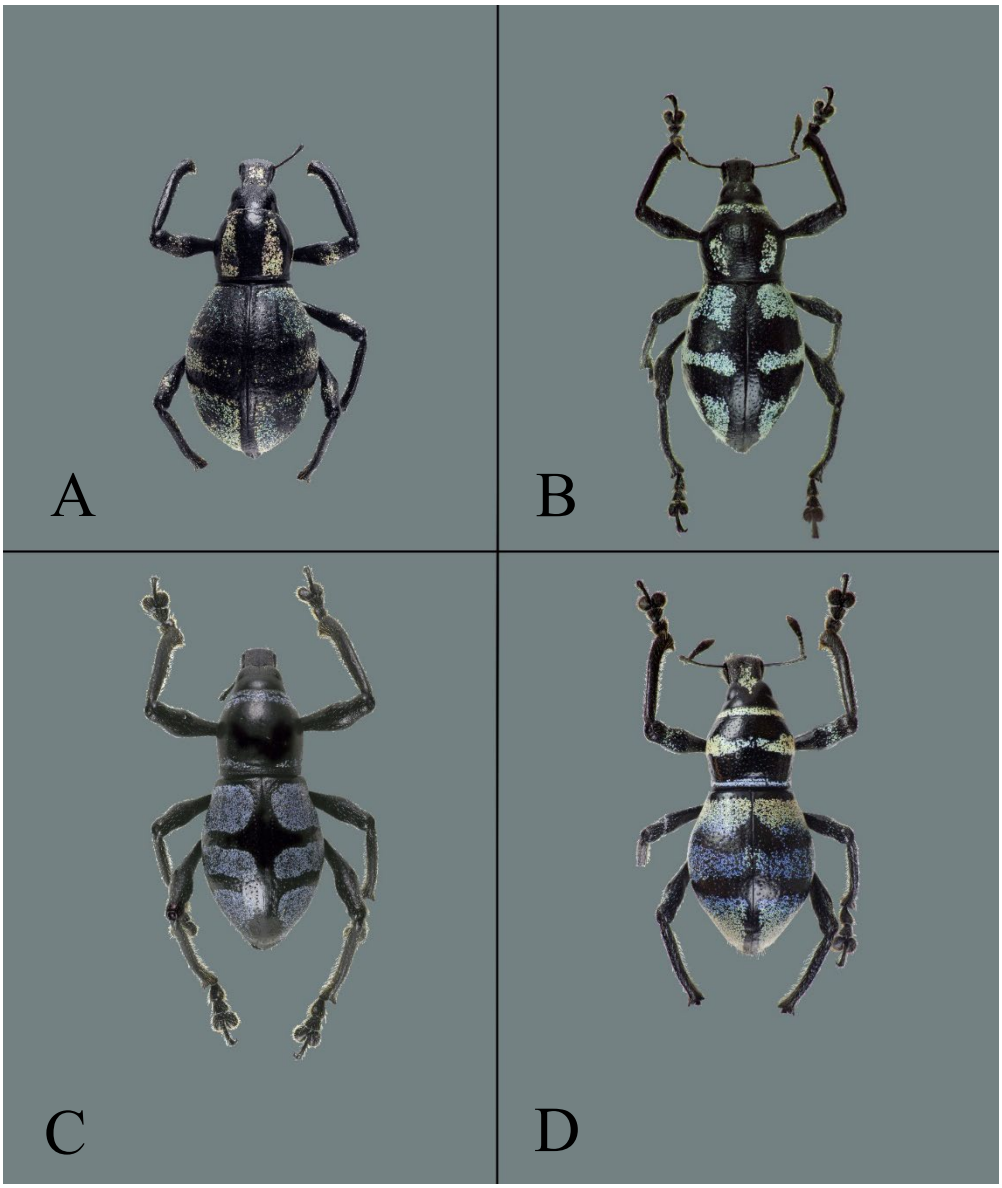

Fig. 5. Possible mimetic complex of *M.* (*O.*) *managusan* sp. nov. with sympatric weevils: A) *M. (O.) managusan*, B) *M. dagtum*, C) *M. kuehli*, D) *M. (O.) mansaka*

Fig. 6. Habitat and threats to *M. sidlakan* and *M.* (*O.*) *managusan*: A) land conversion to agricultural space, B) Collecting the new species using hand- net, C) road development in the type locality, D) forest clearing and logging to the type locality of *M. sidlakan*

Discussion on Mimicry

The phenomenon characterized by the external morphological resemblance of organisms that are not closely related to each other is called mimicry (Wickler, 2023). This spectacular occurrence is a result of natural selection and has captured the imagination of both scientists and enthusiasts and thus has been feted on numerous printed works as well as factual films (Jamie, 2017). Mimicry is a fascinating phenomenon, but at the same time difficult to understand since mimetic resemblances can exist as colors, forms, and behaviors and can be based on the different ecological relations like predation, symbiosis, parasitism, and/or competition where the number of the compositions of species involved may vary to a vast extent (Maran, 2017).

Two of the common types of mimicry associated with the tribe Pachyrhynchini, and other weevils and beetles in the Philippines are Mullerian and Batesian mimicry. Batesian mimicry named after Sir Henry Walter Bates is when a species copies the warning signaling of other species without them having to possess the real characteristics that are undesired by the same predator, such examples of this type of mimicry includes bee fly that mimics a bee which has the capability to harm attackers and the nonvenomous scarlet kingsnake or *Lampropeltis elapsoides* mimicking the

warning coloration and patterns of the venomous Eastern snake *Micrurus fulvis* (Dixit et al., 2021). Mullerian mimicry on the other hand, is characterized when unpalatable species co-evolves to have similar looking appearances, a way to reduce the predation of the species by training the predators to avoid them (Sherratt, 2008). This type of mimicry is commonly observed in a number of bees and wasps where they exhibit striking color patterns (black and yellow stripes) interpreted as an aposematic signal that advertises their venomous sting deterring predators (Chatelian et al., 2023).

One example of Mullerian mimicry observed in the tribe Pachyrhynchini is within the genus *Pachyrhynchus* Germar, 1824, wherein different species often display very similar elytral patterns and coloration despite not being closely related and use these patterns and iridescent coloration as aposematic signal against predators (Van Dam et al., 2023; Tseng et al., 2014). This mimicry complex, although not necessarily Mullerian, from the tribe Pachyrhynchini has also been documented not only with *Pachyrhynchus* Germar, 1824 but with other members of the tribe as well as other genera of Entiminae and other beetle families in different parts of the archipelago. In Mindanao Island, Philippines, several mimicry complexes have been identified which includes the mimicry between the tribes Pachyrhynchini and Polycatini such as *M. (O.) hirakui* Cabras, Medina, and Bolino, 2021, P. *tikoi* Rukmane, 2016 (Pachyrhynchini), and *Polycatus mimicus* Bramanti, Bramanti, and Rukmane, 2020 (Polycatini) (Cabras et al., 2021). The two novel species described in this paper, *M. sidlakan* sp. nov. and *M. (O.) managusan* sp. nov. exhibit mimetic relationships with other unrelated beetle species found in the same area where they were first discovered. *M. sidlakan* sp. nov., as shown in Figure 4, has three mimetic congeners sharing similar elytral bands but are from different subgenera, different genus (*Pachyrhynchus* Germar, 1824), and different family of beetles (Cyrambycidae) under the genus *Doliops* Waterhouse, 1841. Additionally, another mimicry complex involving *M. (O.) managusan* sp. nov. and its congeners have been observed and is shown in Figure 5, where the most common characteristic observed to be mimetic is the three-banded elytral pattern.

Brief Ecologic Notes

Mount Candalaga is located in the municipality of Maragusan, Davao de Oro, Mindanao, Philippines, and is part of the Eastern Mindanao Biodiversity Corridor (EMBC), which supports a diverse lineup of flora and fauna. Standing at approximately 2,100 meters above sea level (masl), the mountain hosts a pristine montane forest ecosystem that is rich in endemic species where many of which are unique to Mindanao. Specimens of *M. sidlakan* sp. nov. and *M. (O.) managusan* sp. nov. were first discovered at the southern edge of the mountain at about 1,600 masl along a road that is under development. *M. sidlakan* was collected from tall, unidentified tree using a hand net. Meanwhile, *M. (O.) managusan* sp. nov. was found dead on the ground, with no other specimens observed. Despite the extensive efforts of the first and second authors using beating sheets and a long net, no additional specimens of either species were found. A second location within the mountain where extra specimens of *M. sidlakan* sp. nov. were collected was from Mt. Candalaga's "Camp 2" (1,300masl) and the trail to the mountain peak (2000-2100masl) where only 2 female specimens were added, despite exhaustive sampling. This suggests that these species are likely canopy dwellers, as no specimens were found on shrubs or other lower vegetation where the researchers could reach and sample. The scarcity of ground-level findings reinforces the hypothesis that the

species might predominantly inhabit the forest canopy.

The habitat of the two new species is confronted with significant threats from extensive deforestation and the rapid conversion of pristine forest area into agricultural spaces (Figure 6A and D). Furthermore, the ongoing road development that aims to link the two towns (Brgy. Mapawa and Brgy. Bahi) separated by the mountain, has rendered the reformed terrain unstable due to the presence of weak sandy soil (Figure 6C). This instability has led to several felled trees in the area. Given these challenges, it is imperative to implement an immediate and comprehensive environmental plan to mitigate the rapid loss of forest cover and biodiversity in the mountain.

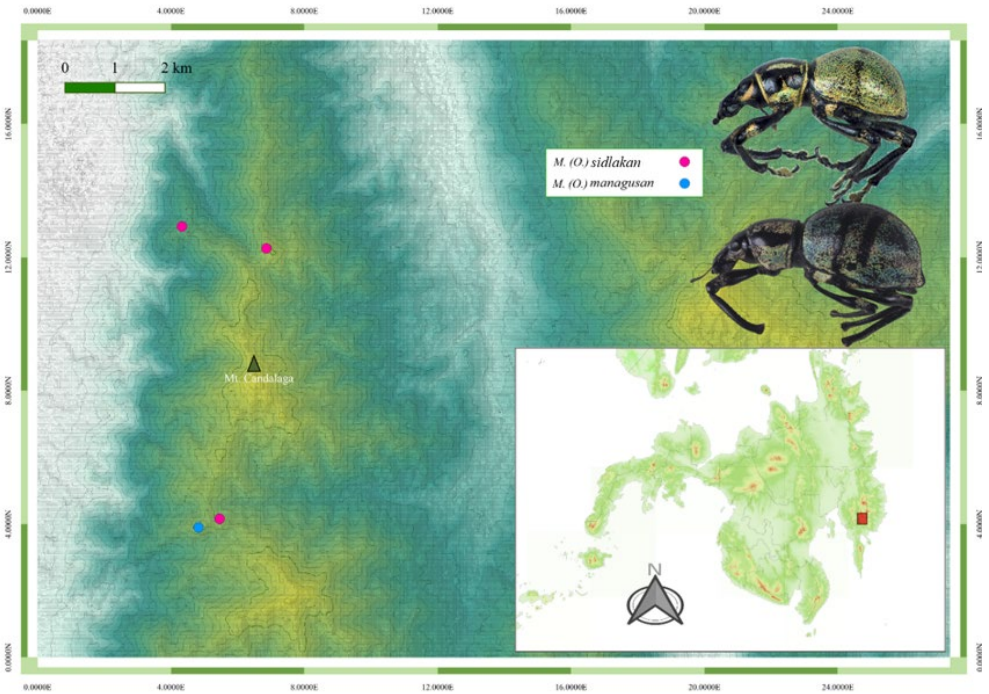

Fig. 7. Distribution Map of *M. sidlakan* sp. nov. and *M. (O.) managusan* sp. nov.

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