

Contribution to knowledge of the genus Agrilus Curtis, 1825 (Coleoptera Buprestidae) of Taiwan. Part 4

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ABSTRACT	In this fourth contribution seven further new species of <i>Agrilus</i> Curtis, 1825 (Coleoptera Buprestidae) from Taiwan are described: <i>Agrilus albicans</i> n. sp., <i>A. chientai</i> n. sp., <i>A. lidao</i> n. sp., <i>A. pespilosus</i> n. sp., <i>A. sanguinolentus</i> n. sp., <i>A. volubilis</i> n. sp., <i>A. yamadai</i> n. sp.
KEY WORDS	Oriental Region; Agrilini tribe; taxonomy; new species; ecological records.
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INTRODUCTION

The faunal richness of the island of Taiwan relative to the genus Agrilus is surprising, favored by the mountains and forests that create ecological niches that over time have increased strong diversification. Climates also play an important role, since all climatic gradations are present, from the temperate zones in the north, to the tropical ones in the south, passing through the subtropical in the intermediate zone.

After more than a year, further explorations have led to the discovery further new entities, confirming what was supposed in one of our previous contributions (2023). These are cryptic species, difficult to classify taxonomically, extremely rare, of which only some are described in this contribution; the remaining ones have been left pending at the moment, waiting for the discovery of further material to prove their specific validity.

MATERIAL AND METHODS

As stated in the first three contributions (Curletti

& Ong, 2022a, 2022b, 2023) the specimens were prepared dried, and glued on cards by using common syndetic for further study, description and conservation.

The pictures (by Ong) for the macro photography of specimens, have been taken with a Canon 80D and MP-E 65 mm macro lens combination. The Cognisys Stackshot automated macro rail is used for taking photos of different depths and then importing them into the Helicon Focus software for focus stacking. For even smaller objects like aedeagus, a combination of Mitutoyo 10x M Plan APO objective with extension tubes connecting with the camera body has been used. The stacked photos were finally edited in Adobe Photoshop v.23.3.2. The figures have bodies scale of 1.0 mm; aedeagi with scale of 0.5 mm.

The species descriptions follow the procedure proposed by Curletti (2010) which allows, with the help of photography, to identify an appropriate habitus of the taxa, omitting most of the unnecessary, unimportant and subjective repetitive morphological descriptions, and dwelling in more detail on distinctive characters that cannot be assessed through the images. Regarding the subgenera employed, the classification proposed by Cobos (1986) based on the characters of female ovipositors has been partially adopted, reevaluating the subgenus *Anambus* Thomson, 1864.

ACRONYMS. NMNST: National Museum of Natural Science, Taichung, Taiwan; UOTT: Uitsiann Ong collection, Tainan, Taiwan; GCCI: G. Curletti collection, Museo Civico di Storia Naturale, Carmagnola, Italy.

RESULTS

Systematics

Agrilus (Anambus) yamadai n. sp. (Figs. 1–3) https://www.zoobank.org/80A58853-D46D-4ED1-8D57-74299FF666E7

MATERIAL EXAMINED. Holotype male: Taiwan, Kaohsiung, Baolai, 23°05'35"N 120°43'19"E, 30.IV.2023, Wataru Yamada leg. (NMNST). Paratypes: 1 male, Taiwan, Nantou, Wanda Power Plant, 23°58'32"N 121°07'50"E, 8.V.2024, U. Ong leg.; 1 female, idem, 23°58'34"N 121°07'49"E, 9.V.2024, U. Ong leg.; 1 female, idem, 23°58'33"N 121°07'49"E, 4.VI.2024, U. Ong leg.; 5 males and 3 females, idem, 23°58'33"N 121°08'09"E, 5.VII.2024, U. Ong leg. (UOTT, GCCI).

DESCRIPTION OF THE HOLOTYPE. Male. Length 5.7 mm. Bright bronze color, with the pronotum and vertex perceptibly tending to copper. Dorsal pubescence short but well visible, white, uniformly distributed. Vertex 1/3 of the anterior margin of the pronotum. Green front, covered with thin white pubescence, more visible and longer at the base. Epistome coppery, transversely carinate. Antennae serrate from the 4th antennomere. Sculpture composed of uniform rounded cells. Pronotum wider than long, width/length ratio 1.44. Lateral margins slightly arcuate with posterior angles obtuse. Disc convex, with a slight basal median depression. Thicker pubescence on the sides and in the mentioned depression. Sculpture regular, transverse. Prehumeral carinulae entire. Marginal carinae flanked by the posterior 2/3, but not fused together. Gular lobe widely sinuate. Prosternal process slightly dilated. Scutellum transverse, carinate. Elytra with separately rounded and microdenticulate



Figures 1-3. Agrilus yamadai n. sp. Holotype. Fig. 1: dorsal view. Fig. 2: ventral view. Fig. 3: aedeagus, 1.8 mm.

apices. Abdomen with uniform pubescence, similar to the elytral one. Apex of the basal ventrite deeply sinuated. Legs bronzed. Metatibia longer than the metatarsus. Basal metatarsomere almost as long as the sum of the following three. Anterior claws bifid; median claws with the external spur bifid and the internal dentate, posterior claws dentate. Aedeagus 1.8 mm in length, symmetrical, curved at the base in lateral view. Parameres winged. Apex of the median lobe pointed (Fig. 3).

PARATYPES DESCRIPTION. Length from 5.6 to 5.9 mm. Except for size, no substantial differences are observed, except those of the sexual dimorphism. Females have a bronze frons and all claws have internal spurs rounded and blunt.

ETYMOLOGY. The species is named after Wataru Yamada who found the first known specimen.

HOST PLANT. Zelkova serrata (Thunb.) Makino (Ulmaceae).

REMARKS. *Agrilus yamadai* n. sp. belongs to a group of species that are very similar to each other, easily confused, but well differentiated in the conformation of the male genitalia. Regardless of their

respective aedeagi and considering the most striking morphological characteristics such as the uniform elytral pubescence and the bronze/copper colour, A. yamadai n. sp. is similar to A. valdedotatus Curletti & Ong 2022, to A. esakii ssp. pudicus Curletti & Ong 2022 and to A. intimus Curletti & Ong, 2023. Agrilus valdedotatus differs in its parallel prosternal process and in the less strongly sinuate apex of the apical ventrite. From A. esakii *pudicus* in its more elongated shape and more tapered elytra at the apex, in its parallel prosternal process and in the apex of the basal ventrite similar to the previous species. Agrilus intimus has a dilated prosternal plate, but forming pointed angles; the dorsal color does not present bronze reflections and the elytral apices are rounded together.

Agrilus (Anambus) albicans n. sp. (Figs. 4–6) https://www.zoobank.org/C7AFE87D-D89A-44C7-B7DB-1BB56261DE9C

MATERIAL EXAMINED. Holotype male: Taiwan, Kaohsiung, Baolai, 24.V.2019, Uitsiann Ong leg. (NMNST). Paratypes: 1 male, Taiwan, Pingtung, Dahanshan, 3.V.2021, Chiamu Chen leg. (UOTT).



Figures 4-6. Agrilus albicans n. sp. Holotype. Fig. 4: dorsal view. Fig. 5: ventral view. Fig. 6: aedeagus, 1.15 mm.

DESCRIPTION OF THE HOLOTYPE. Male. Length 4.2 mm. Short and stocky shape. Dark bronze color, not very bright, blackish anteriorly. Uniform white dorsal pubescence. Vertex wider than half the anterior margin of the pronotum. Dark bronze front with slightly more metallic reflections than the rest of the body, almost glabrous except at the base where there is a long white pubescence that also covers the clypeus. Antennae short, serrate from the 4th antennomere. Pronotum wider than long, width/length ratio 1.36, wider anteriorly, with slightly arcuate margins and posterior angles obtuse. Sculpture composed by oblique striae. White pubescence on the sides, in the median and in posterior side. Prehumeral carinulae not entire, interrupted before half the length of the pronotum. Marginal carinae fused together posteriorly. Gular lobe deeply incised in the median part. Prosternal process wide, flat, barely perceptibly dilated. Scutellum carinate. Elytra with apices separately rounded and microdenticulate. Ventral side almost black. Ventrites with uniform pubescence. Apex of the apical ventrite rounded. Legs concolorous. Metatibia longer than the metatarsus, basal metatarsomere less long than the sum of the following three. Anterior claws bifid, median with the external spur bifid and the internal one dentate, posterior claw dentate. Aedeagus 1.15 mm in length, symmetrical, with median lobe acuminate (Fig. 6).

PARATYPE DESCRIPTION. Length 3.7 mm. The paratype has the pronotum less blackish on the sides.

ETYMOLOGY. From the Latin "*albĭcans*"(= whitish), due to the reflection of the white pubescence in contrasts with the darker integuments.

HOST PLANT. Unknown.

REMARKS. Agrilus albicans n. sp. can be confused with A. mica Curletti et Ong 2022: same size, same slightly elongated shape, same coloration, same width of the vertex, same dorsal pubescence. However, A. mica differs not only in the shape of the aedeagus, but also in some substantial characters: entire prehumeral carinulae, gular sclerite and apex of the basal ventrite slightly sinuate, presence of longitudinal median depression on the basal ventrite.

Agrilus (Anambus) sanguinolentus n. sp. (Figs. 7–9)

https://www.zoobank.org/5726B0F3-623D-4094-81FC-4C8F498E0BBD MATERIAL EXAMINED. Holotype male: Taiwan, Kaohsiung, Baolai, 23°05'35"N 120°43'19"E, 1.V.2024. Uitsiann Ong leg. (NMNST). Paratypes: 1 female, idem, 9.VI.2017, U. Ong leg.; 1 female, idem, 30.IV.2023, Wataru Yamada leg.; 2 females, idem, 26.III.2024, U. Ong leg.; 1 male, Taiwan, Nantou, Wanda Power Plant, 23°58'33"N 121°07'49"E, 8.V.2024, U. Ong leg.; 1 female, idem, 23°58'25"N 121°07'52"E, 8.V.2024, U. Ong leg.; 1 female, idem, 23°58'34"N 121°07'50"E, 4.VI.2024, U. Ong leg. (UOTT, GCCI).

DESCRIPTION OF THE HOLOTYPE. Male. Length 5.2 mm. Dorsal color bright copper. Head moderately rounded in dorsal view. Vertex wider than half the anterior margin of the pronotum. Frons olive green with uniform white pubescence, but longer at the base. Clypeus broad, carinate. Antennae black, serrate from the 4th antennomere. Pronotum wider than long, width/length ratio 1.30. Maximum width in the basal ³/₄. Margins slightly arcuate, posterior angles obtuse. Appearance slightly humped, depressed on the sides and posteriorly. Almost glabrous, few setae are appreciable on the anterior part of the sides. Sculpture with regular striae, oblique in the basal part. Prehumeral carinulae entire. Marginal carinae joined posteriorly. Gular lobe widely sinuate. Prosternal plate dilated. Scutellum transverse, carinate. Elytra with apices separately rounded and microdenticulate. Disc with scattered and disordered white pubescence in the anterior 2/3, almost absent on the sides, more compact, dense and uniform in the distal part. Ventral side less bright than dorsal; pubescence denser on the sides of the ventrites. Apex of the apical ventrite largely little sinuate. Legs concolorous. Metatibia longer than the metatarsus. Basal metatarsomere as long as the sum of the following three. Anterior claws bifid, median with the external spur bifid and the internal one dentate, posterior claw dentate. Aedeagus 2.1 mm in length, elongated, narrow, symmetrical, with apex of the median lobe acute (Fig. 9).

PARATYPES DESCRIPTION. Length from 4.8 to 5.9 mm. The paratypes have a more orderly elytral pubescence: a hairless area at ³/₄ is evident, that clearly divides the anterior pubescence from the posterior one. The ventral pubescence is uniform. Sexual dimorphism in the color of the frons, red-wine in females with less abundant pubescence and all the claws of the tarsi all dentate.



Figures 7-9. Agrilus sanguinolentus n. sp., holotype. Fig. 7: dorsal view. Fig. 8: ventral view. Fig. 9: aedeagus, 2.1 mm.

ETYMOLOGY. From Latin "*sanguinolentum*" (= bleeding); stained with blood, for the copper brilliant color.

HOST PLANT. Zelkova serrata (Thunb.) Makino (Ulmaceae).

REMARKS. The color, the pronotum shape and the elytral pubescence are the main characters that in our opinion allow us to highlight *A. sanguinolentus* n. sp. Among the species present on the Taiwan, *A. bocaki dimidius* Curletti et Ong, 2023 and *A. inflammatus* Curletti et Ong, 2023 are the closest taxa, with the pronotum posteriorly wider and elytral pubescence interrupted at 2/3.

The new species is easily distinguished from *A. bocaki dimidius* by its bright copper color, while *A. inflammatus* is bicolor, with a copper pronotum but with less bright elytra of a dark bronze color.

Agrilus (Anambus) volubilis n. sp. (Figs. 10–12) https://www.zoobank.org/34A1481D-EB33-4495-9B5A-8B0D47F0864C

MATERIAL EXAMINED. Holotype male: Taiwan,

Kaohsiung, Baolai, 23°05'35''N 120°43'19"E, 26.IV.2017. Uitsiann Ong leg. (NMNST). Paratypes: 1 female, idem, 9.VI.2017, U. Ong leg.; 1 male, idem, 30.IV.2023, Wataru Yamada leg.; 1 male, idem, 26.III.2024, U. Ong leg. (UOTT, GCCI).

DESCRIPTION OF THE HOLOTYPE. Male. Length 4.9 mm. Aedeagus 2 mm in length, symmetric, parallel, elongated; median lobe wide with pointed apex (fig. 12). For the further description see the diagnosis.

PARATYPES DESCRIPTION. Length from 4.2 to 4.9 mm. As for *A. sanguinolentus* the only differences are sexual: female with red-wine frons and all claws dentate.

ETYMOLOGY. From Latin "volūbilis" with the meaning of changeable, inconstant.

HOST PLANT. Uncertain. All the specimens were collected on the leaves of *Zelkova serrata* (Thunb.) Makino. (Ulmaceae), which is believed to be the adult's potential host plant.

REMARKS. *Agrilus volubilis* n. sp. is easily confused with *A. sanguinolentus* n. sp. with which it shares the majority of morphological characters, making its description useless, as it is almost a mirror image of this second species. They are most likely sister species that live together in the same habitat. There are very few details that allow for their diversification and which are summarised in the Table 1.

Agrilus volubilis n. sp.	Agrilus sanguinolentus n. sp.
Dark bronze color, not very bright, not coppery.	Bright metallic color, copper reflections
Frons flat in dorsal view	Frons rounded in dorsal view
Pronotum sculpture oblique across the entire surface	Pronotum sculpture oblique only in the posterior part
Male metatarsal formula 1=2+3+4	Male metatarsal formula 1<1+2+3
Aedeagus with narrow and subparallel parameres	Aedeagus with more club-shaped parameres
Aedeagus with broad and less acuminate median lobe	Aedeagus with thinner median lobe
Aedeagus with winged parameres	Aedeagus not winged

Table 1. Morphological characters distinguishing Agrilus volubilis n. sp. from A. sanguinolentus n. sp.



Figures 10-12. Agrilus volubilis n. sp., holotype. Fig. 10: dorsal view. Fig. 11: ventral view. Fig. 12. aedeagus, 2.0 mm.

Agrilus (Anambus) pespilosus n. sp. (Figs. 13–15) https://www.zoobank.org/440FCC94-ED25-4167-B048-A5AA73429ED6

MATERIAL EXAMINED. Holotype male: Taiwan, Kaohsiung, Baolai, 23°05'35"N 120°43'19"E, 22.III.2024. U. Ong leg. (NMNST). Paratypes: 1 male, idem, 9.IV.2024, U. Ong leg.; 1 male, idem, 21.VI.2024, Chiamu Chen leg. (UOTT).

DESCRIPTION OF THE HOLOTYPE. Male. Length 5.6 mm. Body color black. Vertex slightly furrowed, less than half as wide as the anterior margin of the pronotum. Frons olive green, with barely visible white pubescence at the base. Clypeus trapezoidal. Antennae serrate from the 4th antennomere. Pronotum slightly wider than long, width/length ratio 1.25, with maximum width at half its length. Lateral margins slightly arcuate, posterior angles obtuse. Disc with a basal median depression and another, transverse, behind the anterior margin. Pubescence absent. Sculpture regular, transverse. Prehumeral carinulae entire. Marginal carinae joined posteriorly. Gular lobe barely perceptibly sinuate. Prosternal plate dilated, covered distally by long white pubescence that continues into the median part of the mesometasternum and basal ventrite, where it gradually decreases towards the following ventrites. Scutellum carinate. Elytra slightly elongated posteriorly, with apices separately rounded and microdenticulation obsolete. Disc with white pubescence thickened along the suture, divided into two segments: the first, basal, more elongated and interrupted shortly after half length; the second interrupted before the apex. Ventral pubescence, in addition to that already described, denser on the sides of the ventrites and on the metepisterna and on the metecoxa. Apex of the basal ventrite deeply sinuate. Legs with metatibia longer than the metatarsus. First metatarsomere as long as the sum of the following four. A series of long white setae on the basal metatarsomere. Anterior claws bifid, median with the external spur bifid and the internal one dentate, posterior claw dentate. Aedeagus 1.8 mm in length, symmetrical, sclerotized, with parameres sinuate on the external side. Apex of the median lobe obtuse (Fig. 15).

PARATYPES DESCRIPTION. Length 6.0 mm. The



Figures 13-15. Agrilus pespilosus n. sp., holotype. Fig. 13:, dorsal view. Fig. 14: ventral view. Fig. 15: aedeagus, 1.8 mm.

characters listed in the holotype description are also constant in the paratypes.

ETYMOLOGY. Name composed by the sum of two Latin terms: " $p\bar{e}s$ " = foot and " $pil\bar{o}sus$ " = hairy, with the setae on the metatarsus.

HOST PLANT. Uncertain. All the specimens were collected on the leaves of *Zelkova serrata* (Thunb.) Makino. (Ulmaceae), which is believed to be the adult's potential host plant.

REMARKS. The pubescence of the basal metatarsomere is the character that unmistakably characterizes *A. pespilosus* n. sp. for Agrilofauna of Taiwan.

Agrilus (Anambus) chientai n. sp. (Figs. 16–18) https://www.zoobank.org/D8B0CFE5-C072-42C0-9547-398EB6202A1D

MATERIAL EXAMINED. Holotype male: Taiwan, Nantou, Chientai Forest Road, 5.VI.2018, 23°57'16"N 121°07'22"E, Uitsiann Ong leg. (NMNST). Paratype: female, idem, 9.VI.2019, Sinyan Shih leg. (UOTT).

DESCRIPTION OF THE HOLOTYPE. Male. Length

4.6 mm. Slightly elongated shape. Pronotum and vertex dark bronze, bright light bronze in the anterior 2/3 of the elytra, black in the posterior third. Vertex wider than half of the anterior margin of the pronotum. Frons olive green, pubescent, but with setae more elongated at the base. Clypeus without transverse carina, contiguous to the frontal line. Antennae serrate from the 4th antennomere. Pronotum glabrous, wider than long, width/length ratio 1.44, maximum width in the posterior half. Lateral margins slightly arcuate. Posterior angles obtuse. Disc slightly convex, with regular shallow sculpture. Prehumeral carinulae entire. Marginal carinae fused posteriorly before the basal angle. Pubescence poor, visible on the sides, especially on the anterior angles. Gular lobe widely sinuate. Prosternal plate slightly dilated. Scutellum transverse, carinate. Elytra with separately rounded and microdenticulate apices. The black posterior part with strong illumination takes on a bronze color at the apices. White pubescence leaning against the suture in the median and anterior bronze zone, which widens forming a denser transverse band after half the length, marking the border with the black zone. A second smaller spot is present in the black posterior part. Ventral



Figures 16-18. Agrilus chientai n. sp., holotype. Fig. 16:, dorsal view. Fig. 17: ventral view. Fig. 18: aedeagus, 1.6 mm.

side dark bronze with barely visible regular pubescence, except for the metecoxa and metepisterna where the pubescence is more accentuated. Apex of the apical ventrite sinuate. Concolorous legs. Metatibia longer than the metatarsus. Basal metatarsomere less long than the sum of the following three. Anterior claws bifid, median with the external spur bifid and the internal one dentate, posterior claw dentate. Aedeagus 1.6 mm in length, symmetric, short, sclerotized, curved in lateral view. Apex of the median lobe obtuse (Fig. 18).

PARATYPES DESCRIPTION. Length 5.1 mm. The only differences are sexual: bronzed and less pubescent frons, all the claws dentate.

ETYMOLOGY. After Chientai, the name of the forest of the typical series. Noun in apposition.

HOST PLANT. Unknown.

REMARKS. The color and the arrangement of elytral pubescence place *A. chientai* n. sp. in a group of species well represented in the Western and Eastern Palearctic fauna and in Australian fauna. In particular, *A. businskorum* Jendek et Grebennikov, 2011 and *A. terracotta* Jendek et Grebennikov, 2011 are the species that appear morphologically most similar. The first is present in China, while the second has a wider distribution, reported not only from China, but also from India and Vietnam. Both these species have different conformations of the male genitalia, with the apices of the median lobe not obtuse but rounded. In addition to this, the two species have a more squared elytral apex and more elongated metatarsomeres. The aedeagus of *A. chientai* n. sp. appears similar to that of *A. jamabusi* Miwa et Chûjô, 1940 from Japan, but this species has different shape, pubescence and coloration.

Agrilus (Robertius) lidao n. sp. (Figs. 19–21) https://www.zoobank.org/FCCE5BD6-060E-4457-8149-8C0901640E7E

MATERIAL EXAMINED. Holotype male: Taiwan, Taitung, Lidao, 3.VI.2022, Uitsiann Ong leg. (NMNST). Paratype female, idem, 12.VI.2022, U. Ong leg. (UOTT).

DESCRIPTION OF THE HOLOTYPE. Male. Length 4.9 mm. Uniform bronze color. Head globose, rounded, protruding. Eyes barely visible dorsally. Vertex



Figures 19-21. Agrilus (Robertius) lidao n. sp., holotype. Fig. 19:, dorsal view. Fig. 20: ventral view. Fig. 21: aedeagus, 1.8 mm.

slightly less wide than the anterior margin of the pronotum. Frons with green reflections, pubescent, with long and thin setae clearly visible, but not covering the integuments. Clypeus broad, doubly keeled. Eyes small, rounded, basal. Antennae serrate from the 4th antennomere. Pronotum transverse, width/length ratio 1.60. Maximum width approximately halfway. Lateral margins regularly rounded but with right posterior angles. Disc depressed laterally and to a lesser extent also posteriorly. Surface glabrous, sculpture composed of regular oblique striae. Prehumeral carinulae entire. Marginal carinae close together posteriorly, but not joined. Gular lobe widely sinuate. Prosternal plate parallel. Scutellum carinate. Elytra with separately rounded apices, microdenticulate. Surface with barely visible perisutural white pubescence reaching half-length where it forms a larger plate. Another patch of disordered pubescence in the preapical area. Ventrites with short and regular pubescence. Apex of the apical ventrite sinuate. Legs concolorous; metatibia longer than the metatarsus. Basal metatarsomere less long than the sum of the following three. Anterior claws with internal spur bifid, external dentate; median claws inverted, with internal spur dentate, external bifid; posterior claws whit both spurs dentate. Aedeagus 1.6 mm in length, sclerotized, symmetric, with apex of the median lobe rounded (Fig. 21).

PARATYPES DESCRIPTION. Length 5.2 mm. In the paratype the maximum width of the pronotum is in the anterior part, with the posterior angles obtuse. On the elytra the posterior pubescence covers the entire apical part. The secondary sexual characters of female are in the bronzed frons and in the all claws dentate.

ETYMOLOGY. After the *locus typicus*. Noun in apposition.

HOST PLANT. Unknown.

REMARKS. Within the Taiwanese fauna, *A. lidao* n. sp. is unmistakable. The only species that vaguely resembles to it is *A. convexivertex* Curletti

et Ong, 2022. *Agrilus lidao* n. sp. is easily differentiated by its less elongated body, globose head, rounded eyes, and non-uniform pubescence.

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