

[研究文章 Research Article]

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## Additional Records of the Species of the Genus *Atholus* Thomson (Coleoptera, Histeridae) from Taiwan, with an Updated Key to the Taiwanese Species

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**Abstract.** Additional records of the genus *Atholus* from Taiwan are provided based on the museum and private collections in Taiwan and Japan. Eight species of the genus *Atholus* are recorded and distributed in Taiwan, with specimens of six species examined in this study. The key to Taiwanese species of *Atholus* is provided, and the illustrations of male 9<sup>th</sup>, 10<sup>th</sup> tergites, and 9<sup>th</sup> sternum of *Atholus levis* Mazur and *A. confinis* (Erichson) are published for the first time.

**Keywords:** fauna, distribution, description, taxonomy, Histerini

### Introduction

The first comprehensive review of the genus *Atholus* Thomson from Taiwan was published by Ôhara (1999). Later, Mazur (2008) recorded *A. bifrons* (Marseul) from Taiwan based on a specimen collected in Taishan, New Taipei City. In the following year, Mazur (2009) reported another species, *A. confinis* (Erichson), and provided a key to Taiwanese *Atholus*. Finally, Mazur (2013) described a new species, *A. levis* from Laos, and included Taiwanese specimens in the type series. To date, eight species of *Atholus* are distributed in Taiwan, making it one of the most diverse genera of Histerini in the country.

This group is a cosmopolitan genus of Histerini distributed across the world, with an exception in the Continental Australia and Antarctica. Currently, there are 77 species of *Atholus*, with almost half of them occurring in the Oriental Region (Mazur, 2011). The group is characterized by its outwardly curved anterior margin of the mesoventrite, except for *A. coelestis*. However, the marginal stria of the mesoventrite is not emarginate in all *Atholus* species. Generally, the Oriental species have one pronotal lateral stria, and the subhumeral striae of the elytra may vary with either external, internal, both, or none, but usually not complete when present. Moreover, the carinal striae on prosternal keel are absent, and the protibia is generally dilated and stout, with the anterolateral angle bearing two or three denticles. The median lobe of the male genitalia without distinct armature, and the ducts of spermathecae are always not coiled.

In this study, we examined more than one hundred specimens from museum and private collections in Taiwan and Japan. As a result, six species were identified through close examination of the specimens. We illustrated the male 9<sup>th</sup> and 10<sup>th</sup> tergites, as well as the 9<sup>th</sup> sternum of *Atholus levis* Mazur and *A. confinis* (Erichson) for the first time. In addition, we provided distributional records that shed light on Taiwanese biogeography. Furthermore, we updated the key to species of the genus *Atholus* from Taiwan.

### Materials and methods

To conduct morphological observations, specimens were collected and preserved under dry conditions. Genitalia were prepared following the methodology of Ôhara (1994). We took color photographs using a Canon EOS 650D camera with a Canon MP-E65 f2.8 1–5x Macro lens, and stacked all photos using Helicon Focus 5.3 Pro. The terminology used in this study follows Ôhara (1994). The specimens were deposited in the following locations: Systematic Entomology, Hokkaido University, Sapporo, Japan (SEHU); National Museum of Natural Science, Taichung, Taiwan (NMNS); Taiwan Agricultural Research Institute, Taichung, Taiwan (TARI); National Taiwan University, Taipei, Taiwan (NTU); private collection of Yu-Hsiang Ho, Taichung, Taiwan (PCHO); and private collection of the late Taichi Shibata, Osaka, Japan (PCSH).

### Results

Family Histeridae Gyllenhal, 1808  
Subfamily Histerinae Gyllenhal, 1808  
Tribe Histerini Gyllenhal, 1808

Genus *Atholus* C.G. Thomson, 1859  
弓腹閻魔蟲屬

*Atholus* C.G. Thomson, 1859: 76. Type species: *Hister bimaculatus* Linnaeus, 1758.

*Atholister* Reitter, 1909: 286. Type species: *Hister scutellaris* Erichson, 1834.

*Euatholus* Kryzhanovskij, 1976 (in: Kryzhanovskij & Reichardt, 1976): 387. Type species: *Hister duodecimstriatus* Schrank, 1781.

*Peranus* Lewis, 1906: 401. Type species: *Hister scutellaris* Erichson, 1834.

***Atholus bifrons* (Marseul, 1854)**

凹額弓腹閻魔蟲

*Hister bifrons* Marseul, 1854: 545 [India].

*Atholus bifrons*: Lewis, 1906: 402; Mazur, 2009: 113 [New to Taiwan]; dela Cruz & Ôhara, 2022: 237 [Japan].

**Specimens examined.** TAIWAN. [Taichung City] 1 ex., Tunghai University, 10.X.1993, R. J. Yao (NTU).

**Distribution.** Hong Kong; India; Indonesia; Japan; Taiwan (Fig. 7); Thailand; Vietnam (Mazur, 2011).

***Atholus coelestis* (Marseul, 1857)**

蒼穹弓腹閻魔蟲

*Hister (Atholus) coelestis*: Miwa, 1931: 57 [Kôshun]; Kamiya & Takagi, 1938: 31.

*Atholus coelestis*: Lewis, 1915: 55; Ôhara, 1992: 173; 1994: 137; 1999: 31 [Taipei City, Nantou County, Chiayi County, Tainan City, Kaohsiung City, Pingtung County, Lanyu Is., Lutao Is.]; Mazur et al., 2015: 1454 [Luzon].

**Specimens examined.** TAIWAN: [Taipei City] 1 ex., Qingtiangang, 2.X.1992, C. Y. Lai (NTU); 1 ex., Taipei, 28.IV.1970, K. S. Lin (TARI); 1 ex., Hsintien, Taipei, 9.V.1967, K. S. Lin (TARI). [Taoyuan City] 1 ex., Shihmen Reservoir, 27.VII.1969, T. Kobayashi (PCSH). [Hsinchu County] 4 exs., Neiwan, 24.VII.1969, Y. Maeda (PCSH). [Nantou County] 2 exs., Guandaoxi, 29.IV.1980, A. Tanaka (SEHU); 5 exs., same locality but different date, 15.V.1989 (SEHU); 1 ex., Feng Kuei Dou, 15.X.2006, T. C. Wang (SEHU). [Pingtung County] 1 ex., Fangliao, Yuquan V., 22.4333, 120.6051, 11.III.2018, cow dung, B. H. Ho (PCHO); 1 ex. Manzhou, 28-30.VI.2019, cow dung, Y. H. Ho (PCHO); 3 exs., Baoli, 11.II.2019, cow dung, K. W. Chan (PCHO); 2 exs., Hengchung, 13.XI.1980, T. C. Hsu (NTU); 1 ex., Sizhongchi, 11.V.1986, M. Ôhara (SEHU); 1 ex., Kengting, 7.XI.1987, C. F. Lee (NTU). [Hualien County] 8 exs., Shoufeng, 12.I.2019, cow dung, Y. H. Ho (PCHO). [Taitung County] 3 exs., Lanyu Island, 8.X.1970, Y. Kiyoyama (PCSH); 1 ex., same locality but different date and collector, 25.III.1971, H. Nomura (PCSH); 1 ex., same locality but different date and collector, 14.VII.1972, Y. Maeda (PCSH); 5 exs., Lu-tao Is. (Lüdao Is.), 26 to 28.IV.1986, M. Ôhara (SEHU). [Kinmen County] 2 exs., Jinsha, 4.IV.2019, Y. H. Ho (PCHO); 1 ex., Jinsha, Tianpu Reservoir, 31.III.2019, Y. H. Ho & P. Y. Shih (PCHO); 1 ex., Houhu, 1.VI.2019, Y. H. Ho (PCHO); 2 exs., Lieyu, 2.IV.2019, cow dung, Y. H. Ho & P. Y. Shih (PCHO).

**Distribution.** Celebes; China; Comores; India; Indochina; Japan; Nepal; Philippines; Sri Lanka; Taiwan (Fig. 7); Tajikistan (Mazur, 2011).

***Atholus confinis* (Erichson, 1834)**

長紋弓腹閻魔蟲

(Figs 1–3)

*Hister confinis* Erichson, 1834: 154 [Cuba].

*Atholus confines*: Mazur, 2009: 114 [synonymic note].

*Atholus rothkirchi* Bickhardt, 1919: 143, synonymized by Mazur, 2009: 114.

**Specimens examined.** TAIWAN: [Chiayi County] 1 ♀, Zhongpu, 27.VII.2021, J. C. Lin (PCHO). [Pingtung County] 1 ♂, Fangliao, Yuquan V., 22.4333, 120.6051, 11.III.2018, Cow dung, B. H. Ho (PCHO); 1 ♂, Same locality and date but different collector, Y. H. Ho & P. Y. Shih (PCHO).

**Distribution.** Africa (tropical); Cuba; Dominicana; Guadeloupe; Puerto Rico; St. Vincent; Taiwan (introduced?) (Fig. 7); USA: Florida, Hawaii; Yemen (Mazur, 2011)

**Note.** The specimens in our study were collected from cow dung or localities close to stock farms. Lundyshv (2017) recorded this species as being collected from cow excrement in Tanzania, while Gomy (2004) reported finding this species in cow dung in the Republic of Yemen. These data suggest that cow excrement may be the primary habitat for this species. However, Tishechkin (2010) recorded two specimens collected by pitfall trap near bat guano and one specimen collected from a rabbit carcass in Florida.

***Atholus depistor* (Marseul, 1873)**

毛弓腹閻魔蟲

*Peranus depistor*: Lewis, 1915: 55 [Horisha].

*Hister (Peranus) depistor*: Miwa, 1931: 57 [Horisha]; Kamiya & Takagaki, 1938: 31.

*Atholus depistor*: Ôhara, 1992: 176 [Taiwan: Kenting Park]; 1999: 32 [Nantou County, Hualien County, Pingtung County].

**Specimens examined.** TAIWAN: [Taipei City] 1 ex., Taipei, 1967, K. S. Lin (TARI); 1 ex., Yanmingshan, 28.X.2007, J. F. Tsai & T. C. Wang (TARI). [Hsinchu County] 1 ex., Neiwan, 23.VII.1969, Y. Maeda (PCSH). [Pingtung County] 1 ex., Tai-wu, Pei-ta-wu-shan, 900 m, 1.VIII.2015, Y. T. Chung (TARI); 1 ex., Fangliao, Yuquan V., 22.433205, 120.605166, 11.III.2018, cow dung, Y. H. Ho (PCHO); 1 ex., same locality but different date and collector, 26.XI.2017, B. H. Ho (PCHO). [Kinmen County] 1 ♀, Jinning, 24.4594, 118.3020, 18.VIII.2020, K. T. Lin (PCHO).

**Distribution.** Eastern China; Japan; Korea; Russia: Far East; Taiwan (Fig. 7) (Mazur, 2011).

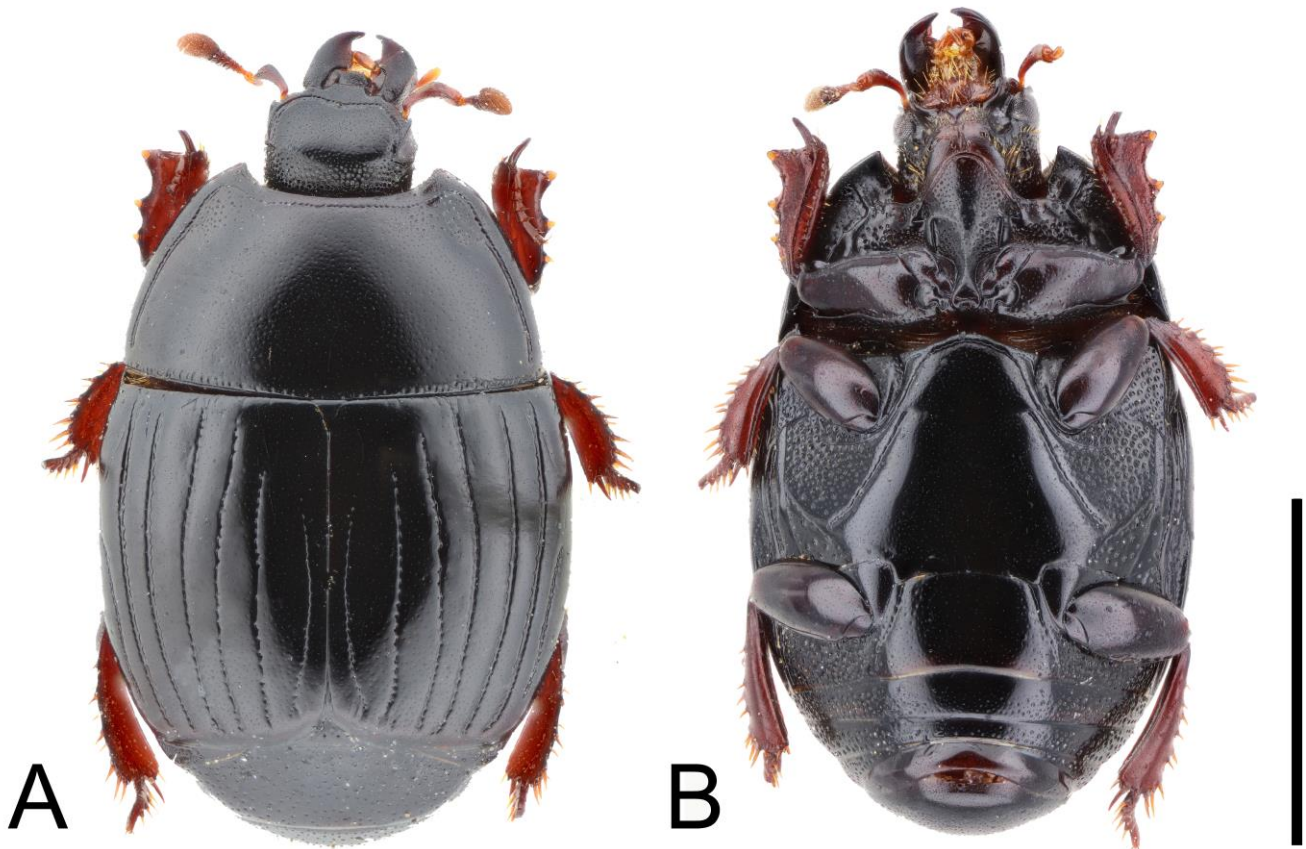


Fig. 1. *Atholus confinis* (Erichson, 1834), habitus. A. Dorsal view. B. Ventral view. Scale bar = 2.0 mm.

*Atholus duodecimstriatus quatuordecimstriatus* (Gyllenhal, 1808)

十四紋弓腹閻魔蟲

*Hister (Atholus) duodecimstriatus*: Miwa, 1931: 57 [Taipei]; Kamiya & Takagi, 1938: 31.

*Atholus duodecimstriatus quatuordecimstriatus*: Lewis, 1915: 55 [Taipin]; Ôhara, 1993: 135; 1994: 137; 1999: 32 [Taiwan: Nantou County].

**Specimens examined.** No available additional specimens for this study.

**Distribution.** Continental China; Japan; Korea; Nepal; Northern and high elevations in Central Europe; Oman; Russia: Primorskij and Ussuriyskij Krai; Sweden; Taiwan; Vietnam (Mazur, 2011).

**Note.** After re-examining a female specimen from Nantou County that was previously recorded by Ôhara (1999), we have determined that it was misidentified and actually belongs to *A. pirithous* (Marseul, 1873). Ôhara (1999) had noted that the specimen had the 5th dorsal stria present on the apical half and sutural stria present on the apical two-thirds, but upon closer examination, we were able to confirm the correct identification as *A. pirithous*.

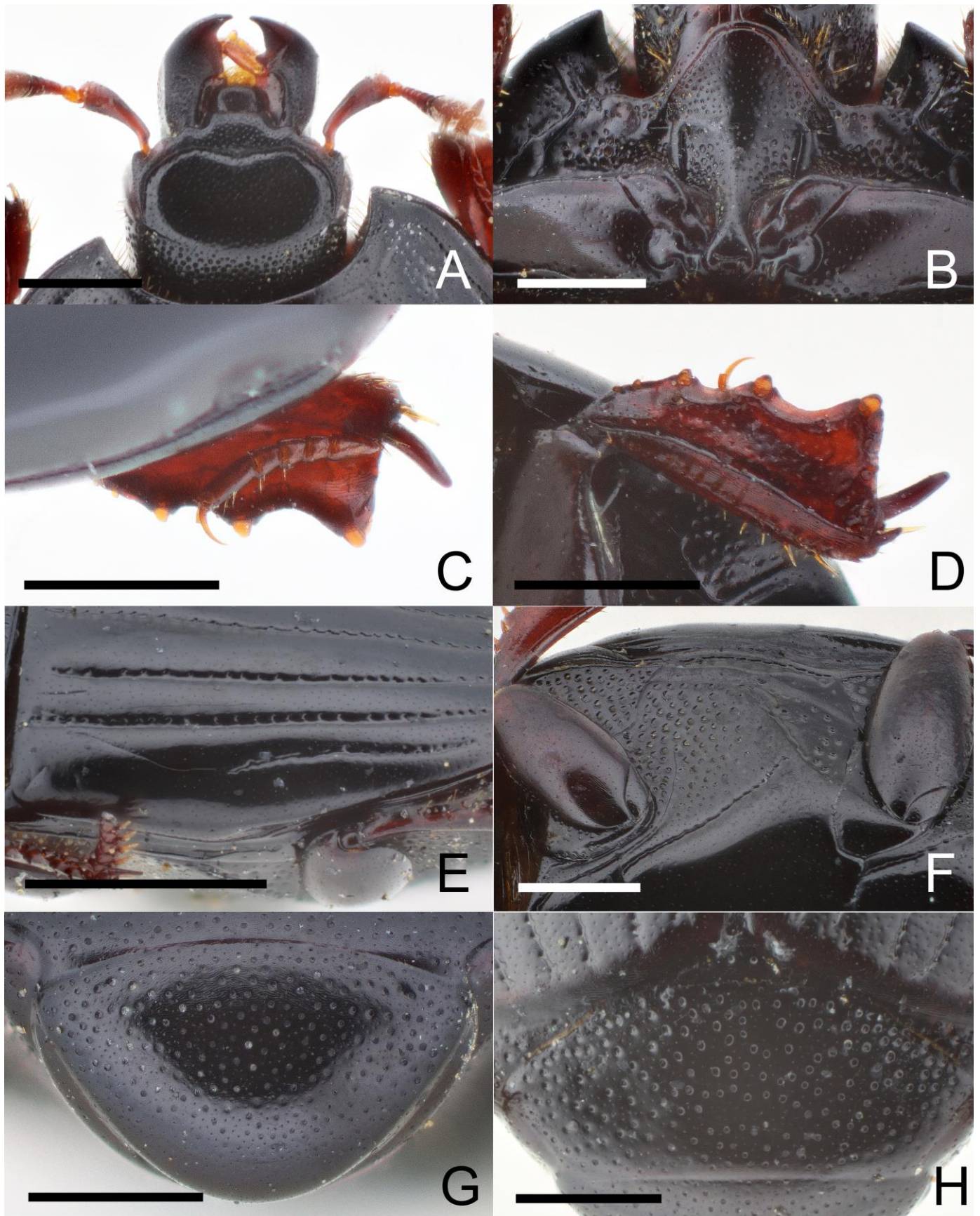


Fig. 2. *Atholus confinis* (Erichson, 1834), habitus. A. Head, dorsal view. B. Prosternum, ventral view. C. Right protibia, dorsal view. D. Ditto, ventral view. E. Subhumerus of left elytron, lateral view. F. Mesoventrite, ventral view. G. Pygidium, caudal view. H. Propygidium, caudal view. Scale bars: A–D, F–H = 0.5 mm, E = 1.0 mm.

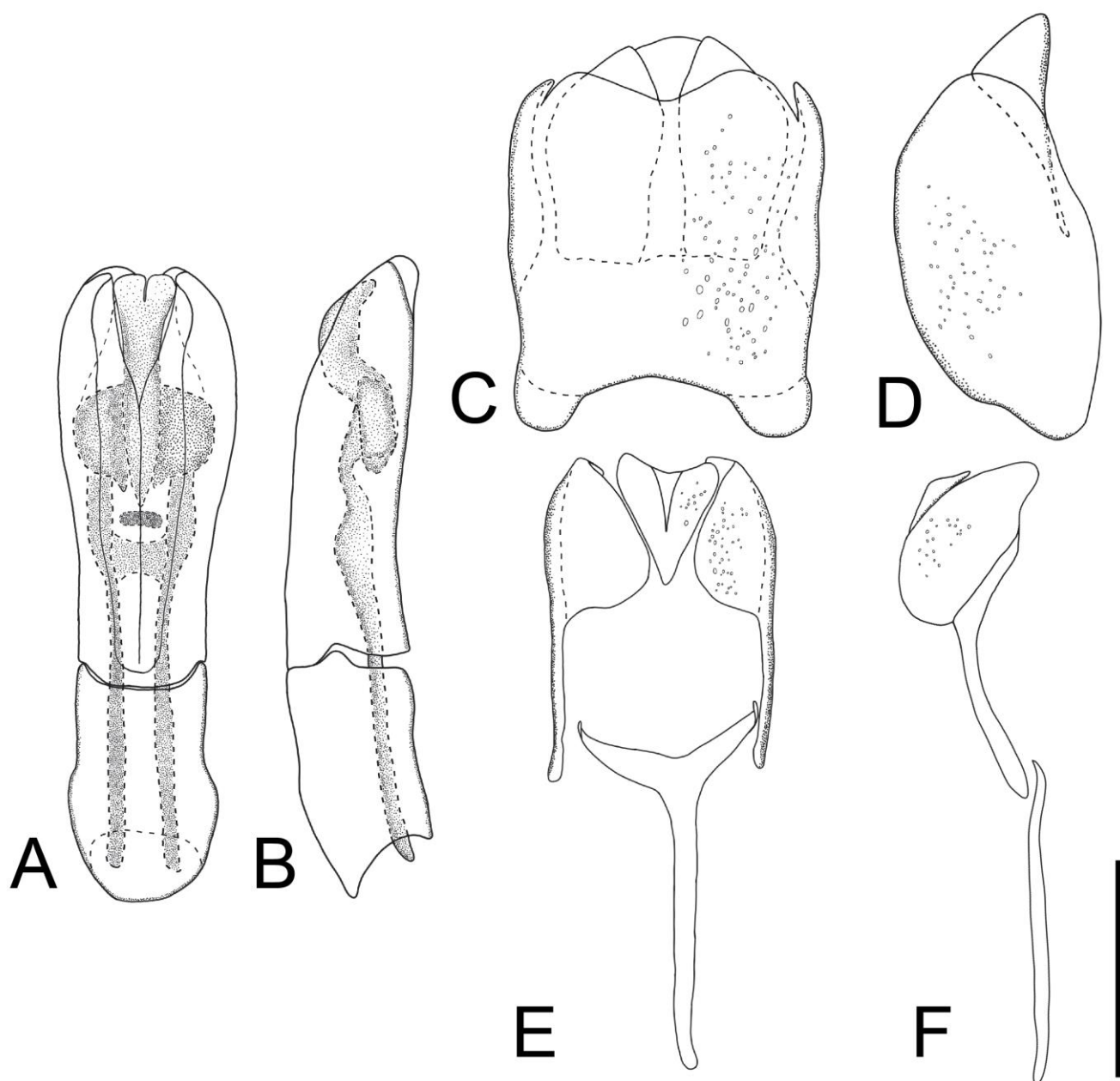


Fig. 3. *Atholus confinis* (Erichson, 1834), male genitalia. A. Aedeagus, dorsal view. B. Ditto, lateral view. C. 8<sup>th</sup> tergite and sternite, dorsal view. D. Ditto, lateral view. E. 9<sup>th</sup> and 10<sup>th</sup> tergites and 9<sup>th</sup> sternum, dorsal view. F. Ditto, lateral view. Scale bar = 0.5 mm.

*Atholus levis* Mazur, 2015

勒氏弓腹閻魔蟲

(Figs 4–6)

*Atholus levis* Mazur, 2013: 195 (without type deposition locality) [Nantou County: Jhushan]; Mazur, 2015: 2 (with type deposition locality).

**Specimens examined. TAIWAN:** [Nantou County] 3 exs., Ren'ai, Huisun Forest Area, 6.V–9.VI.2018, flight interception trap, Y. H. Ho (PCHO); 1 ex., same locality and method but different date and collector, 29.IV–16.V.2018, W. R. Liang (PCHO); 1 ex., same locality, collector, and method but different date, 9–25.VI.2018 (PCHO); 1 ex., same locality, collector, and method but different date, 26.VII–14.VIII.2018 (PCHO); 1 ex., same locality, collector, and method but different date, 9.VI–6.X.2019 (PCHO); 1 ex., same locality and method but different date and collector, 19–22.IV.2020, Y. H. Ho & P. Y. Shih (PCHO). [Chiayi County] 2 exs., Dapu, Shimiantong, 25.V–8.VI.2011, flight interception trap, M. L. Jeng (NMNS). [Tainan City] 1 ex., Xinhua, Sinhua Forest Reserve, 5.II–4.III.2020, flight interception trap, G. Y. Chen (PCHO). [Pingtung County] 1 ex., Manzhou, IV–8.V.2011, M. L. Jeng

(NMNS).

**Distribution.** Nepal; Oriental Region; Taiwan (Fig. 8) (Mazur, 2011).

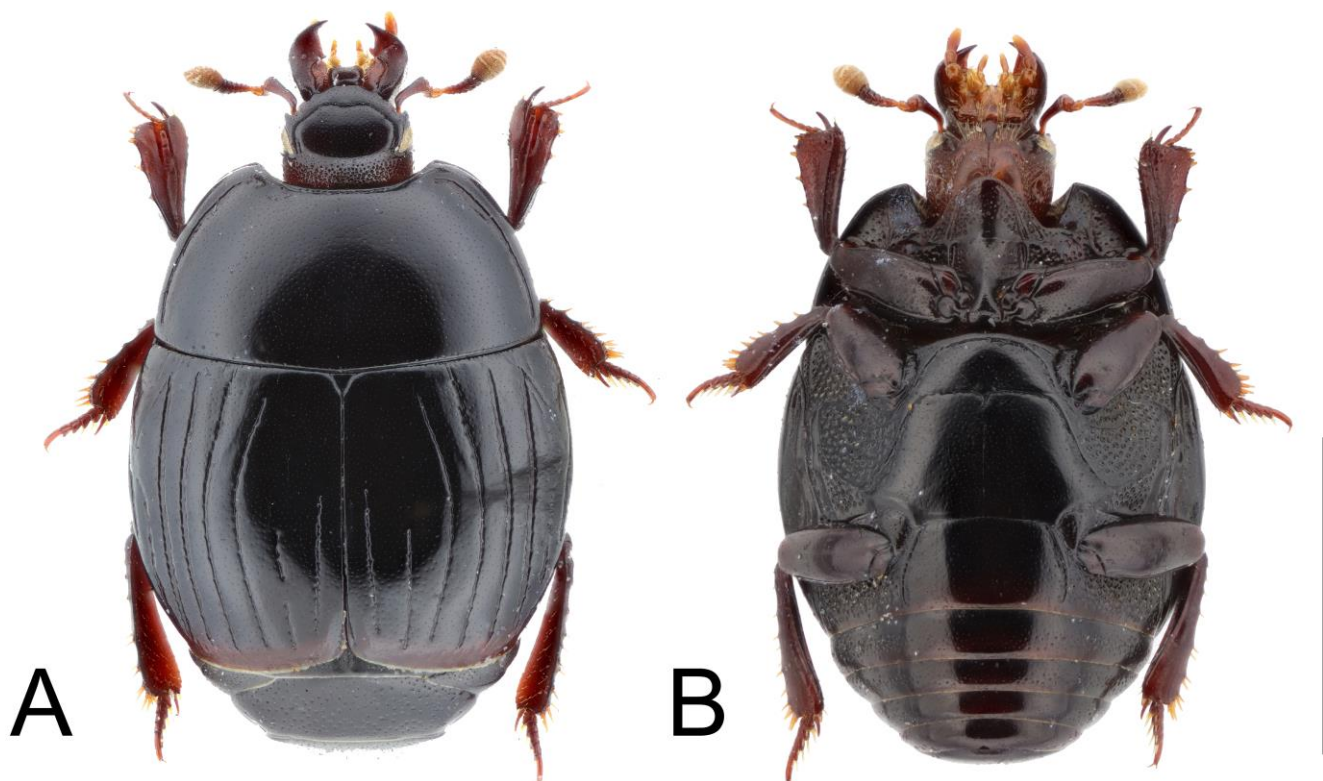


Fig. 4. *Atholus levis* Mazur, 2015, habitus. A. Dorsal view. B. Ventral view. Scale bar = 2.0 mm.

*Atholus philippinensis* (Marseul, 1854)

菲律賓弓腹閻魔蟲

*Hister philippinensis* Marseul, 1854: 547.

*Hister philippensis* (sic): Gemminger & Harold, 1868: 771.

*Hister (Atholus) philippinensis*: Bickhardt, 1913: 173 [Taiwan: Hoozan and Taihorin]; Miwa, 1931: 57 [Hoozan, Taihorin]; Kamiya & Takagi, 1938: 31.

*Hister sectator* Lewis, 1901: 375, synonymized by Bickhardt, 1917: 194.

*Atholus sectator*: Lewis, 1906: 402.

*Atholus philippinensis*: Lewis, 1906: 402; 1915: 55; Ôhara, 1999: 36 [Nantou County].

**Specimens examined.** No available additional specimens for this study.

**Distribution.** Borneo; Burma; India; Java; Malaysia; Philippines; Southern China; Sumatra; Taiwan; Vietnam (Mazur, 2011).

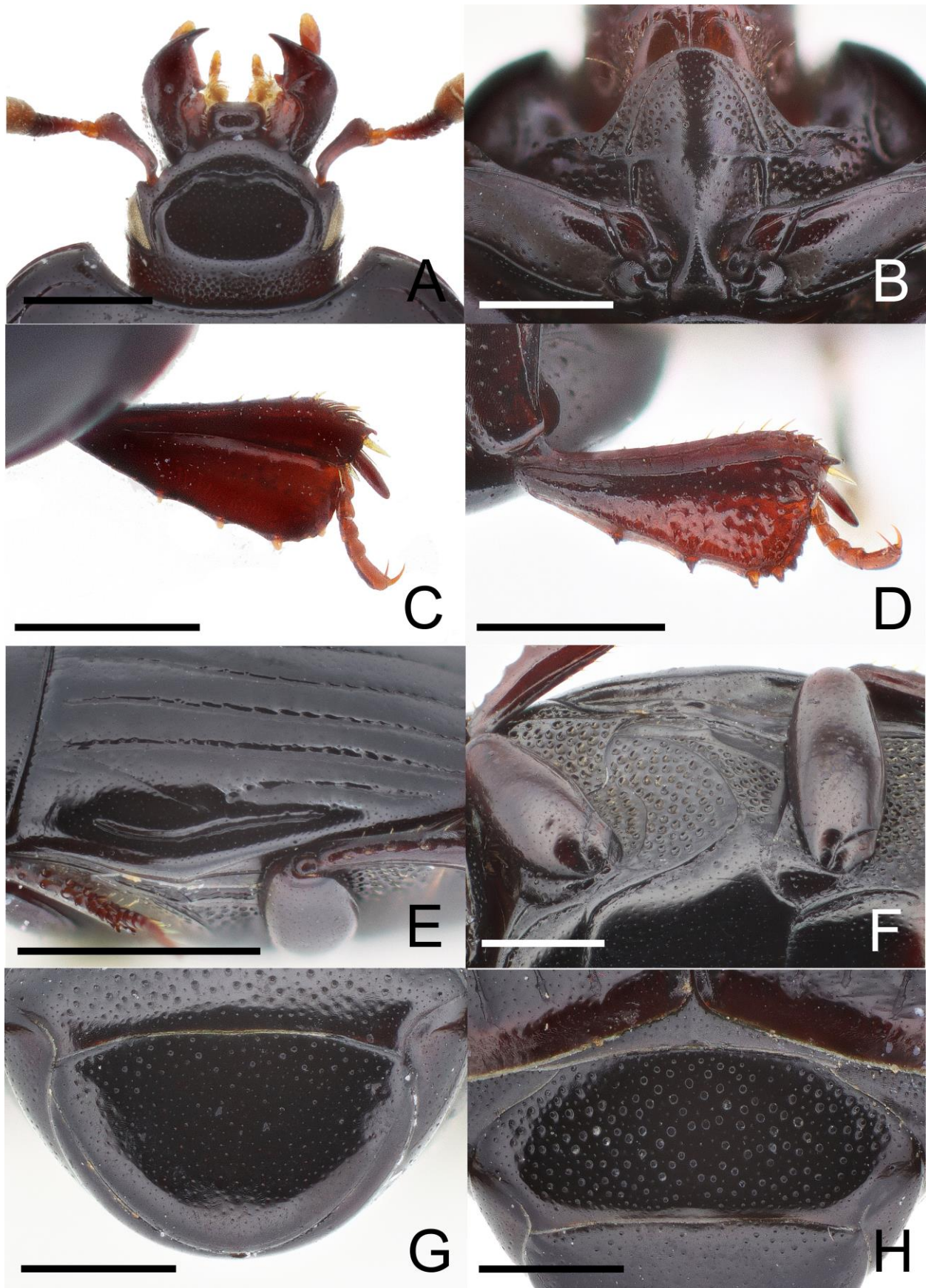


Fig. 5. *Atholus levis* Mazur, 2015, habitus. A. Head, dorsal view. B. Prosternum, ventral view. C. Right protibia, dorsal view. D. Left protibia, ventral view. E. Subhumerus of left elytron, lateral view. F. Mesoventrite, ventral view. G. Pygidium, caudal view. H. Propygidium, caudal view. Scale bars: A–D, F–H = 0.5 mm, E = 1.0 mm.

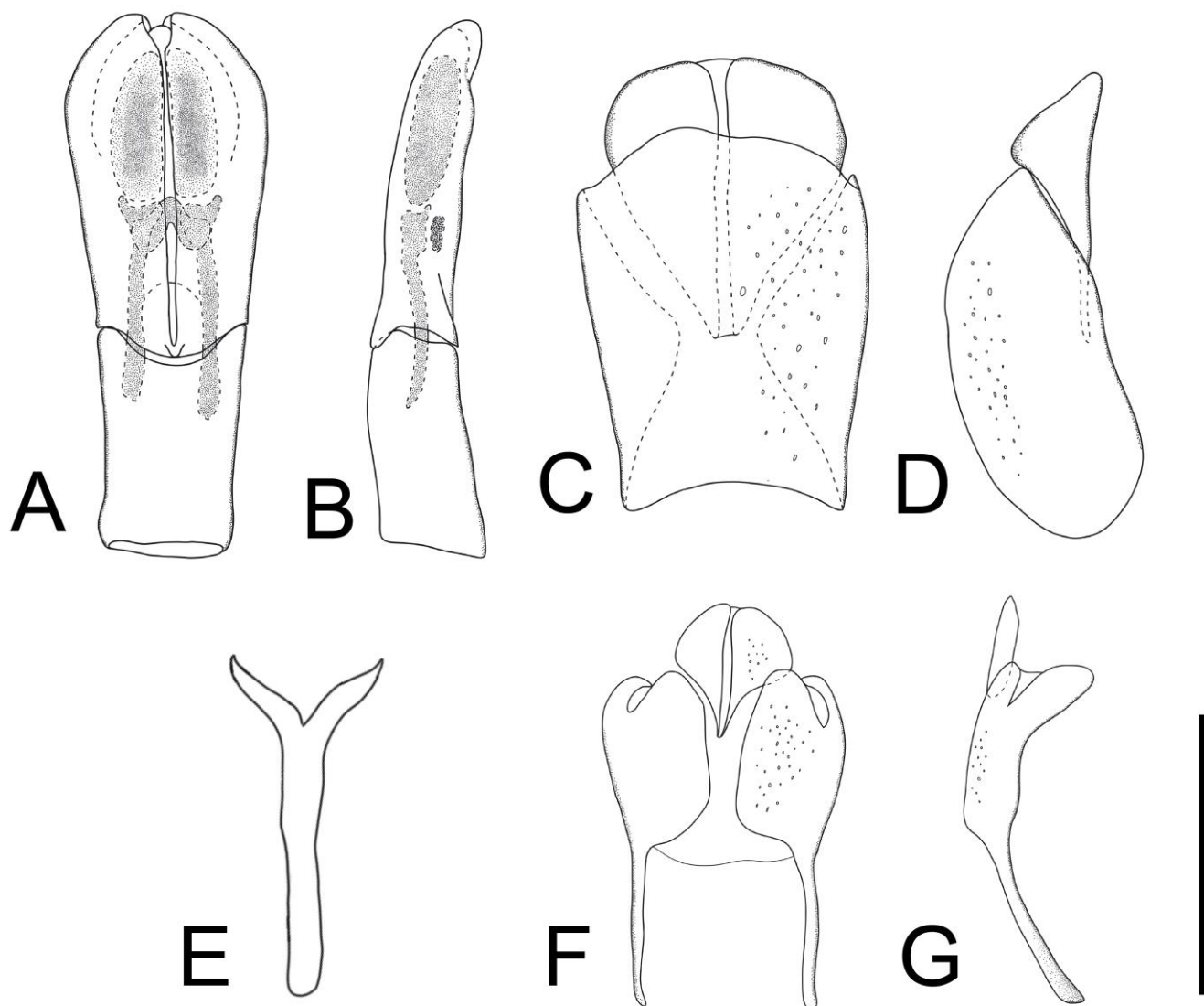


Fig. 6. *Atholus levis* Mazur, 2015, male genitalia. A. Aedeagus, dorsal view. B. Ditto, lateral view. C. 8<sup>th</sup> tergite and sternite, dorsal view. D. Ditto, lateral view. E. 9<sup>th</sup> sternum, dorsal view. F. 9<sup>th</sup> and 10<sup>th</sup> tergites, dorsal view. G. Ditto, lateral view. Scale bar = 0.5 mm.

*Atholus pirithous* (Marseul, 1873)

皮氏弓腹閻魔蟲

*Hister pirithous* Marseul, 1873: 224.

*Hister ixion* Lewis, 1892: 30, synonymized by Mazur, 2009: 115.

*Hister reitteri* Bickhardt, 1918: 231.

*Hister (Atholus) pirithous*: Bickhardt, 1913: 173 [Taiwan: Taihorin and Hoozan]; Miwa, 1931: 58 [Taihorin, Hoozan]; Kamiya & Takagi, 1938: 31.

*Atholus pirithous*: Lewis, 1915: 55 [Shinten]; Ôhara, 1993: 141; 1994: 138; 1999: 36 [Taipei City, Taoyuan City, Taichung City, Nantou County, Kaohsiung City, Pintung County, Hualien County, Lanyu Is.].

**Specimens examined. TAIWAN:** [Taipei City] 1 ex., Taipei, 13.V.1967, K. S. Lin (TARI); 1 ex., Da'an, Fuyang Eco Park, 9.II.2019, H. Y. Lin (PCHO). [Taoyuan City] 1 ex., Tungyanshan, 28.VI.2010, H. Lee (TARI); 1 ex., Fuxing, Taman, 6.VII.2007, T. Y. Liu (PCHO). [Hsinchu County] 1 ex., Beipu, 24.7052, 121.0594, 2.III.2019, in the rotten banana, H. C. Liu (PCHO). [Miaoli County] 1 ex., Guandaoshan, 28.VII.1995, no collector's name (SEHU). [Taichung City] 25 exs., Kukuan, 730 m, 14–17.X.1980, K. S. Lin & C. H. Wang (TARI). [Nantou County] 1 ex., Wusha, 1,150 m, 14.VII.1982, S. C. Lin & C. N. Lin (TARI); 2 exs., Lushan, 1,000 m, 27–31.V.1980, S. C. Lin & C. N. Lin (TARI); 1 ex., Huisun Forest Area, 23.IV.2015, Y. T. Chung (TARI); 1 ex., same locality but different date and collector, 7.VI–6.X.2019, flight interception trap, W. R. Liang (PCHO); 2 exs., Ren'ai, Qingjing Farm, 27.VII.2018, Y. H. Ho & P. Y. Shih (PCHO); 1 ex., Ren'ai, Meifeng, 15.VII.2021, Y. H. Ho & C. T. Hsu (PCHO); 1 ex., Mt. Guandao,



Heping, 8.VIII.1995, no collector's name (SEHU); 1 ex., Jenai, Nanshanhsi, 28.II.2001, C. C. Lo (NMNS); 1 ex., Lushan, 16.IX.1997, C. C. Lo (NMNS); 1 ex., Guguan, Heping Dist., 1,250 m, 8.VIII.1989, M. Ôhara, from decaying pineapple (SEHU); 3 exs., Shihsito, Puli, 7, 8 & 10.VIII.1989, M. Ôhara (SEHU); 1 ex., Pulu, 21.VIII.1979, K. Sugino (SEHU). [Pingtung County] 6 exs., Kenting Forest Recreation Area, 21°58'05.3"N 120°49'00.7"E, #390, 12 to 16.VIII.2010, Flight Interception Trap, Coleptera 4 to 7, 9 & 10, Tseng Hsin-Huei & Lan Yen-Chiu (SEHU); 1 ex., Linlo, 27.XII.2012, J. C. Chen (TARI); 1 ex., Fangliao, Yuquan V., 22.4332, 120.6051, 11.III.2018, cow dung, Y. H. Ho (PCHO). [Taitung County] 1 ex., Xichuanshan, 470 m, 31.III.2019, Monkey Dung, B. H. Ho (PCHO); 3 exs., Lijia Rindao, Beinan Twonship, 30.VI.2014, T. Niisato (SEHU). [Hualien County] 1 ex. Shoufeng, 12.I.2019, cow dung, Y. H. Ho (PCHO). [Ilan County] 1 ex., Yulan, 3.V.2018, Y. H. Ho & F. S. Hu (PCHO).

**Distribution.** China: Guandong, Shanghai; Japan; Korea; Nepal; Oman; Russia: Far East; Taiwan (Fig. 8); Vietnam (Mazur, 2011).

**Key to the Taiwanese Species of the Genus *Atholus* (modified from Ôhara, 1999; Mazur, 2009)**

1. Lateral pronotal stria incomplete, present only on apical half; apical end of 3<sup>rd</sup> dorsal elytral stria strongly bent medially ..... *A. coelestis* (Marseul, 1857)
  - Lateral pronotal stria nearly complete; 3<sup>rd</sup> dorsal elytral stria not strongly bent ..... 2
2. Fifth dorsal and sutural elytral striae present only on apical half ..... 3
  - Fifth dorsal and sutural striae complete or sutural stria slightly abbreviated basally ..... 6
3. Fourth elytral dorsal stria nearly complete, external subhumeral stria short and present medio-basally ..... 4
  - Fourth elytral dorsal stria abbreviated basally, external subhumeral stria long, shortly abbreviated on apical fourth ..... *A. philippinensis* (Marseul, 1854)
4. Inner lateral pronotal stria incomplete behind the head; protibia with denticles on apical angle sparsely present ..... *A. levis* Mazur, 2015
  - Inner lateral pronotal stria complete behind the head; protibia with denticles on apical angle oppressed together ..... 5
5. Frons longitudinally incised at middle; anterior margin of pronotum outwardly and acutely arcuate; pygidium coarsely punctured ..... *A. bifrons* (Marseul, 1854)
  - Frons flat; anterior margin of pronotum feebly emarginated; pygidium finely punctate ..... *A. pirithous* (Marseul, 1873)
6. Lateral disc of metasternum with long hairs; external subhumeral stria present medially, usually united with internal one; propygidium evenly and coarsely punctuate ..... *A. depistor* (Marseul, 1873)
  - Lateral disc of metasternum without hair; external subhumeral stria wanting; propygidial punctation becoming coarser basally ..... 7
7. Pronotal foveae present in anterolateral angles ..... *A. confinis* (Erichson, 1834)
  - Pronotum without foveae in anterolateral angles ..... *A. duodecimstriatus quatuordecimstriatus* (Gyllenhal, 1808)

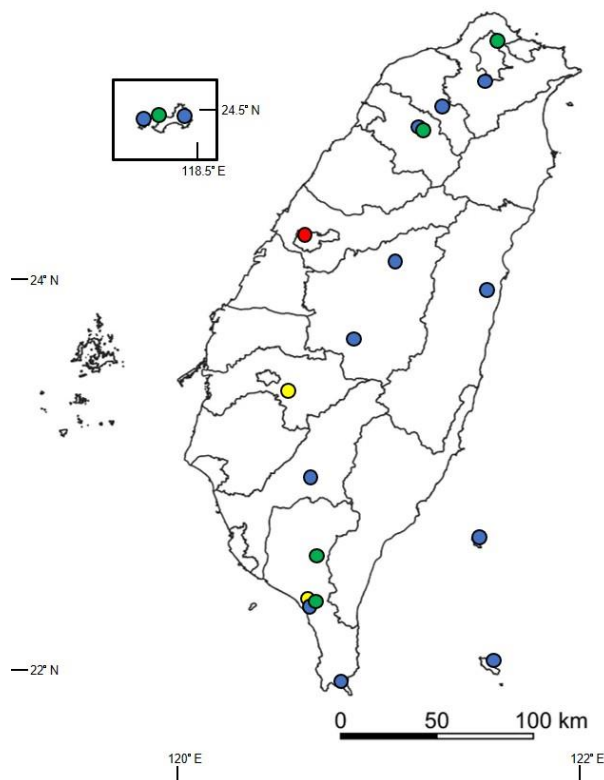


Fig. 7. Specimen records of *Atholus* spp. in Taiwan in this study. Green spots: *A. depistor* (Marseul, 1873). Red spots: *A. bifrons* (Marseul, 1854). Blue spots: *A. coelestis* (Marseul, 1857). Yellow spots: *A. confinis* (Erichson, 1834).

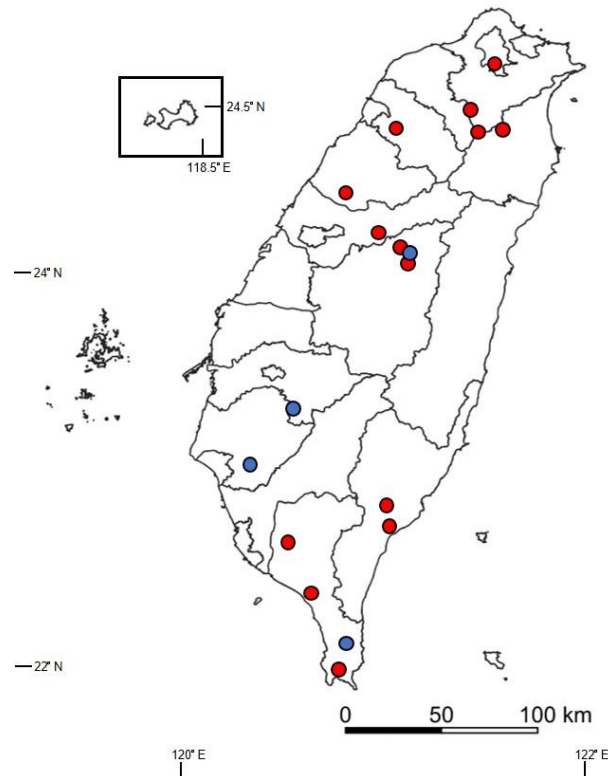


Fig. 8. Specimen records of *Atholus* spp. in Taiwan in this study. Red spots: *A. pirithous* (Marseul, 1873). Blue spots: *A. levis* Mazur, 2015.

#### Acknowledgments

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## 臺灣產弓腹閻魔蟲屬之補充紀錄及物種檢索表 (鞘翅目：閻魔蟲科)

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**摘要：**本研究根據臺灣及日本的博物館館藏與私人蒐藏標本，提供臺灣產弓腹閻魔蟲屬(*Atholus*)的補充紀錄。臺灣的弓腹閻魔蟲屬目前已記錄八種，本研究檢視其中六種。同時也更新了臺灣產弓腹閻魔蟲屬之物種檢索表，並首次提供勒氏弓腹閻魔蟲(*Atholus levis* Mazur)及長紋弓腹閻魔蟲(*A. confinis* (Erichson)) 的雄性第九至十節背板及第九節腹板之圖像。

**關鍵詞：**動物相、分布、描述、分類學、閻魔蟲族