



Taxonomic study of the genus *Aphonoides* (Orthoptera: Oecanthidae: Podoscirtinae) in China

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Key words. New species, crickets, molecular markers, morphological character

Abstract. This study presents a comprehensive taxonomic revision of the genus *Aphonoides* Chopard, 1940 in China, integrating morphological examination with molecular phylogenetics. As a result, we describe a new species, *A. ouyue* He & Wei, sp. n., from China, and synonymize *A. aspidoid* Zheng et al., 2021, syn. n. with *A. japonicus* (Shiraki, 1930). We also upgrade *A. medvedevi alius* Gorochov, 2007 to species status as *A. alius* Gorochov, stat. n., remove *A. tessellatus* Chopard, 1969, *A. punctatus* (Haan, 1844) and *A. fuscirostris* (Chopard, 1969) from the Chinese fauna, and provide the first description of the genitalia for *A. wuyiensis* Yin & Zhang, 2001. Molecular analysis of the *COI* gene (658 bp), including *Aphonoides* and *Mistshenkoana* Gorochov, 1990, reconstructs a phylogenetic tree confirming that both genera are monophyletic. The results also strongly support the current morphological classification of *Aphonoides*.

ZooBank Article Registration: <https://zoobank.org/urn:lsid:zoobank.org:pub:05CA11EB-1329-4DB2-858F-991125A639A0>

INTRODUCTION

The genus *Aphonoides* Chopard, 1940 (Oecanthidae: Podoscirtinae) comprises small, slender crickets (body length 9–18 mm) distributed in East Asia, Southeast Asia, and Oceania (Gorochov, 2007; Cigliano et al., 2024). These crickets lack stridulatory apparatus, exhibit a brown or yellow colouration and possess similar forewing vein patterns in both sexes (Zheng et al., 2021). They are typically phytophagous or detritivorous, with some species also observed feeding on flowers (Ingrisch, 1997; Tan et al., 2017, 2020).

To date, the genus *Aphonoides* comprises 75 species and subspecies (Cigliano et al., 2024). In contrast, the East Asian fauna remains poorly documented, with only eight species previously recorded in the region. The taxonomic history of these records is as follows: Shiraki (1930) first described *A. japonicus* from Japan. Subsequent reports include three species from China by Yin & Liu (1995), *A. tessellatus* Chopard, 1969, *A. punctatus* (Haan, 1844) and *A. fuscirostris* (Chopard, 1969), as new country records. Ichikawa (2001) described *A. rufescens* from Japan. Yin & Zhang (2001) added *A. wuyiensis* from Fujian, China.

More recently, Zheng et al. (2021) described two new species from China (*A. curvus* and *A. aspidoid*) and reported *A. rufescens* and *A. medvedevi medvedevi* Gorochov, 1985 as new country records. Notably, no species of this genus have been reported from Korea or Mongolia, suggesting its distribution is likely restricted to southern East Asia.

All previous studies of this genus were based on morphology. To address the taxonomic uncertainties and provide a more robust understanding, we conducted a comprehensive revision of the genus *Aphonoides* in China, integrating both morphological and molecular analyses. In this study, we describe a new species, *Aphonoides ouyue* He & Wei, sp. n., and synonymize *A. aspidoid* with *A. japonicus*. We also provide the first detailed descriptions of the male genitalia and the ovipositor of *A. wuyiensis*, confirming its validity. Molecular analyses of the *COI* gene confirm the monophyly of the genus and support the elevation of *A. medvedevi alius* Gorochov, 2007 to species status as *A. alius*. Finally, we exclude *A. tessellatus*, *A. punctatus* and *A. fuscirostris* from the Chinese fauna. This study provides a revised and more accurate taxonomic framework for *Aphonoides* in China, forming the basis for future biogeographical and ecological studies.

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MATERIAL AND METHODS

Sampling

Aphonoides crickets are typically found in mountainous forests. They were collected visually at night, often observed perching on leaves, and also using light traps. Upon collection, specimens were preserved in 60% ethanol. For molecular analysis, one hind leg (including femur and tibia) was dissected from each individual, transferred to 100% ethanol, and stored separately. The remaining bodies were kept dry for morphological study. Male genitalia were subsequently dissected, cleared in a 10% NaOH solution, and preserved in a glycerol-alcohol mixture (Randell, 1964). Specimens studied in this study are deposited in the Museum of East China Normal University, Shanghai, China (ECNU) and the Shanghai Entomological Museum, Chinese Academy of Sciences (SEM).

Preparation of illustrations

Morphological examinations were conducted using a Leica M125 stereo microscope. High-resolution images were captured with an SC2000 digital CMOS camera. Illustrations were prepared from photographs using Adobe Photoshop 2020 and Illustrator 2020. The distribution map was generated in ArcGIS 10.2, with base maps sourced from the public climate database at <https://worldclim.org>.

DNA extraction and amplification

Genomic DNA was extracted from the hind leg muscle of each specimen using the AxyPrep Genomic DNA Miniprep Kit (AXY-GEN), following the manufacturer's protocol. A 658-bp fragment of the cytochrome C oxidase subunit I (*COI*) gene was amplified using the primer pairs LCO-1490/HCO-2198 (Folmer et al., 1994) or COBU/COBL (Pan et al., 2006). Polymerase chain reaction (PCR) was performed with an initial denaturation at 94°C for 3 min, followed by 35 cycles of 94°C for 30 s, 45°C for 30 s, and 72°C for 30 s, with a final extension at 72°C for 5 min. All newly generated sequences have been deposited in GenBank under the accession numbers listed in Table 1.

Terminology and abbreviations

The terminology used to describe spurs followed Desutter-Grandcolas et al. (2023); male genitalia and female ovipositor followed Gorochoy (2002) and Wu et al. (2023), respectively.

Abbreviations: SZ – length from apex of fastigium to end of hindwing; BL – body length from apex of fastigium to posterior margin of subgenital plate; PL – pronotum length from anterior margin to posterior margin at midline; FWL – forewing length from base to apex; HFL – hind femur length from base to apex; OvL – ovipositor length from distal edge of anal plate to the ovipositor tip.

Table 1. Collecting information and *COI* fragment GenBank accession numbers.

Genus	Species	Voucher	Collection site	Genbank	Data Source
<i>Aphonoides</i>	<i>changi</i>	3811	China, Guangdong, Shaoguan	OQ118067	this study
	<i>japonicus</i>	1230	China, Hainan, Wuzhi Mountain	OQ118068	this study
		1323	China, Hainan, Jianfengling	OQ118069	this study
		1423	China, Guangdong, Shaoguan	OQ118074	this study
		4605	China, Zhejiang, Ningbo	OQ118071	this study
		4606	China, Zhejiang, Ningbo	OQ118072	this study
		4607	China, Zhejiang, Ningbo	OQ118073	this study
		4378	China, Guangxi, Fangchenggang	OQ118070	this study
	<i>medvedevi alius</i>	3812	China, Guangdong, Shaoguan	OQ118075	this study
	<i>medvedevi medvedevi</i>	1601	China, Hainan, Jianfengling	OQ118076	this study
		1602	China, Hainan, Jianfengling	OQ118077	this study
		1688	China, Hainan, Xian'an Stone Forest	OQ118078	this study
		1708	China, Hainan, Xian'an Stone Forest	OQ118079	this study
	<i>ouyue</i>	245	China, Zhejiang, Lishui	OQ118089	this study
		1014	China, Zhejiang, Wenzhou	OQ118088	this study
		2390	China, Zhejiang, Wenzhou	OQ118090	this study
		4490	China, Zhejiang, Lishui	OQ118091	this study
		4491	China, Zhejiang, Lishui	OQ118092	this study
	<i>rufescens</i>	1276	China, Hainan, Wenchang	OQ118080	this study
		1277	China, Hainan, Wenchang	OQ118082	this study
		1351	China, Hainan, Limu Mountain	OQ118083	this study
		1352	China, Hainan, Limu Mountain	OQ118084	this study
		1401	China, Hainan, Wenchang	OQ118081	this study
	<i>wuyiensis</i>	475	China, Yunnan, Xishuangbanna	OQ118085	this study
		513	China, Yunnan, Xishuangbanna	OQ118087	this study
		978	China, Yunnan, Xishuangbanna	OQ118086	this study
<i>Mistshenkoana</i>	<i>gouriata</i>	1499	China, Fujian, Wuyishan	OR033143	Wei et al., 2024
		2016	China, Zhejiang, Quzhou	OR033144	Wei et al., 2024
		3810	China, Guangdong, Shaoguan	OR033150	Wei et al., 2024
	<i>kongtumensis</i>	2015	China, Zhejiang, Quzhou	OR033137	Wei et al., 2024
		4304	China, Guangxi, Fangchenggang	OR033138	Wei et al., 2024
	<i>melanocephala</i>	1422	China, Guangdong, Shaoguan	OR033154	Wei et al., 2024
		4276	China, Yunnan, Wenshanzhou	OR033156	Wei et al., 2024
		4353	China, Guangxi, Baise	OR033157	Wei et al., 2024
	<i>nhachangi</i>	1372	China, Hainan, Changjiang	OR033139	Wei et al., 2024
	<i>tianya</i>	1459	China, Hainan, Jianfengling	OR033151	Wei et al., 2024
		1779	China, Hainan, Changjiang	OR033152	Wei et al., 2024
<i>Oecanthus</i>	<i>oceanicus</i>	352	China, Guangdong, Shenzhen	MH893718	Liu et al., 2018

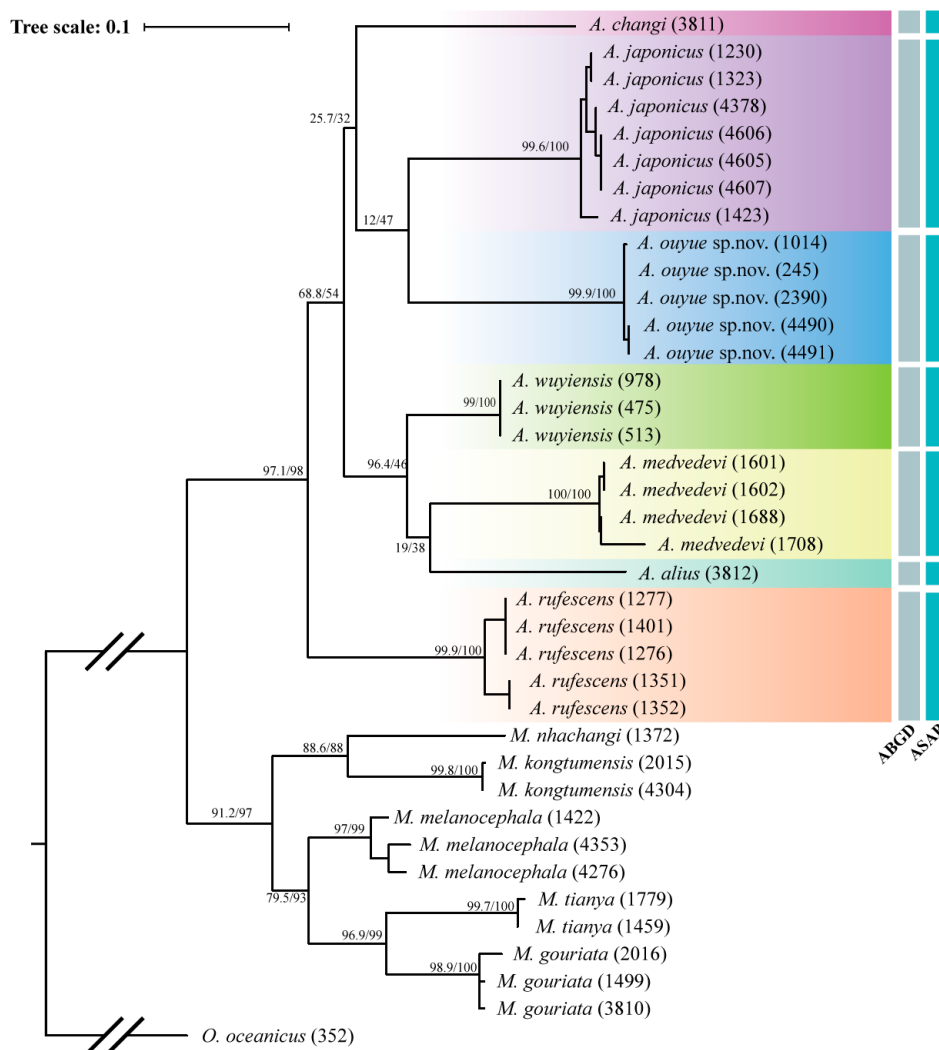


Fig. 1. Maximum likelihood (ML) phylogenetic tree of species of *Aphonoides* (A.) and *Mistshenkoana* (M.) inferred from the *COI* gene fragments. Nodal support is indicated as SH-aLRT/bootstrp values. Clades of *Aphonoides* are color-coded to correspond with Molecular Operational Taxonomic Units (MOTUs) identified by the ABGD and ASAP partitioning methods. Voucher numbers from the ECNU collection are provided in parentheses. *Oecanthus oceanicus* was used for rooting the tree.

iNaturalist Links

iNaturalist observation records are cited using their unique iNaturalist Observation ID's. For example, the ID 259932465 links to the observation at <https://www.inaturalist.org/observations/259932465>.

Molecular analyses

A base substitution saturation analysis of 26 *Aphonoides* *COI* fragments revealed that transitions (Ts) and transversions (Tv) increased linearly with P-distance. A linear relationship was also observed between the Ts/Tv ratio and P-distance, indicating that the *COI* fragments had not reached substitution saturation. Therefore, these data are suitable for subsequent phylogenetic analysis. The *COI* fragment sequences isolated from *Aphonoides* species, together with those of *Mistshenkoana kongtumensis* Gorochoy, 1990, *M. nhachangi* Gorochoy, 2007, *M. melanocephala* He & Wei, 2024, *M. tianya* He & Wei, 2024 and *M. gouriata* Zheng, Xin, Xie & Ma, 2021 (the latter was described as *M. gouriatus*, but the genus *Mistshenkoana* is feminine), were used for constructing a phylogenetic tree with *Oecanthus oceanicus* He, 2018

as the outgroup to root the tree. The sequences were aligned in MEGA 11 following the MUSCLE method (Tamura, 2021). The best-fit evolutionary model TIM+F+I+G4 was derived from ModelFinder embedded in PhyloSuite (Kalyaanamoorthy et al., 2017; Zhang et al., 2020). Maximum likelihood (ML) analysis was conducted in IQ-Tree (Nguyen et al., 2015; also integrated within PhyloSuite) with 5000 ultrafast bootstrap replicates (Minh et al., 2013). Tree topologies were tested with the Shimodaira-Hasegawa-like approximate likelihood-ratio test (Guindon et al., 2010). To estimate the number of molecular operational taxonomic units (MOTUs), two methods were employed: Automatic Barcode Gap Discovery (ABGD) and Assemble Species by Automatic Partitioning (ASAP). The ABGD analysis was conducted online (<https://bioinfo.mnhn.fr/abi/public/abgd/abgdweb.html>) with the default settings, using a relative gap width ($X = 1.2$) and intraspecific divergence (P) values between 0.001 and 0.100 with the K2P model (Puillandre et al., 2011). The ASAP analysis was also performed online (<https://bioinfo.mnhn.fr/abi/public/asap/>) with the Jukes-Cantor (JC69) model and default settings (Puillandre et al., 2020).

RESULTS

Molecular study

We obtained fragments of the *COI* gene from 26 specimens of seven species or subspecies of *Aphonoides*, including the newly described *A. ouyue* sp. n. The same sequences of *Mistshenkoana gouriata*, *M. kongtumensis*, *M. melanocephala*, *M. nhachangi*, *M. tianya* and *Oecanthus oceanicus* were available from previous publications (Table 1). According to the phylogenetic tree, the monophyly of *Aphonoides* is strongly supported by maximum likelihood (bootstrap: 97.1%, SH-aLRT: 98; Fig. 1), there are clear boundaries between the previously described *Aphonoides* species and the newly discovered *A. ouyue* sp. n. (bootstrap: 99.9%, SH-aLRT: 100; Fig. 1), with seven species identified by ABGD and the best species partition of ASAP. The second-best species partition of ASAP is similar to the best one, but *A. japonicus*, *A. medvedevi* and *A. rufescens* are divided into several branches. *A. japonicus* splits into three branches: *A. japonicus* 1230 + 1323 + 4378, *A. japonicus* 4606 + 4607, and *A. japonicus* 1423. *A. medvedevi* is divided into two branches: *A. medvedevi* 1601 + 1602 + 1688 and *A. medvedevi* 1708. *A. rufescens* also splits into two branches: *A. rufescens* 1351 + 1352 and *A. rufescens* 1276 + 1277 + 1401. The third-best species partition of ASAP is also similar to the best one, but *A. medvedevi* and *A. rufescens* are divided into several branches (the same as in the second-best species partition of ASAP).

Systematics

Family Oecanthidae Blanchard, 1845

Subfamily Podoscirtinae Saussure, 1878

Genus *Aphonoides* Chopard, 1940

Aphonoides Chopard, 1940: 203; Yin & Liu, 1995: 103–104, Figs 308–311; Yin & Zhang, 2001: 87–89, Figs 1, 2; Gorochov, 2007: 237–255, Figs I–XII; Gorochov, 2008: 22–32, Figs XXII–XXIV; He, 2018: 522; Zheng et al., 2021: 412–418, Figs 10–16.

Type species. The genus *Aphonoides* was established by Chopard in 1940 and included four species: *Gryllus punctatus* Haan, 1844, *A. karnyi* Chopard, 1940, *A. pubescens* Chopard, 1940 and *Podoscirtus angustifrons* Chopard, 1930. *Gryllus punctatus* Haan, 1844 was designated as the type species in the original publication (it was selected by the article editors and not by Chopard himself, see comments in Gorochov, 2007).

Diagnosis. Body slender. Rostrum of head between antennal cavities somewhat narrower than scape with more or less truncate apex. Inner tympanum open, but outer one obliterated (only a small, weakly distinct concavity). Wings long (hind wings distinctly longer than fore wings); longitudinal veins of forewings parallel; Sc with several normal branches; forewings with more or less white crossveins (usually in distal and lateral part) and without darkish spots around crossveins. Lateral epiphallal lobes of male genitalia short, not hooked, undivided; ectoparameres with narrow, more or less long proximal part and lobe-like distal part having comparatively small anterior branch (large in some species) at its base and stretching forward in lateral

view. Apex of ovipositor drilling (more or less rounded and with large teeth on hind and ventral surfaces).

Species of the genus *Aphonoides* are morphologically very similar to those of *Mistshenkoana*, but can be distinguished by the following features: forewings of *Aphonoides* decorated with more or less white crossveins (in most species on the distal lateral side and membranes between Sc and R), while forewings of *Mistshenkoana* without any white crossveins, instead with some small darkish spots around crossveins in distal half; hind wings of *Aphonoides* longer than those of *Mistshenkoana*; male anal plate of *Mistshenkoana* with a small median projection (usually bifurcate) at proximal part, while that of *Aphonoides* without; male genital plate of *Aphonoides* shorter than in *Mistshenkoana*; spermatophore of *Aphonoides* with rounded (not very elongate) ampulla, while spermatophore of *Mistshenkoana* with very elongate ampulla (Gorochov 2007, 2008).

Key to species of *Aphonoides* in China

- 1 Forewings without any white crossveins, with some small darkish spots around crossveins in distal half; hindwings slightly longer than forewings; male anal plate with a small median projection at proximal part; spermatophore with very elongate ampulla.....*Mistshenkoana* Gorochov, 1990
- Forewings with white crossveins, without darkish spots around crossveins; hindwings distinctly longer than forewings; male anal plate without median projection at proximal part; spermatophore with rounded ampulla (*Aphonoides* Chopard, 1940) 2
- 2 Head with a large rounded concavity between eyes and rostral apex..... *A. changi* Gorochov, 2007
- Head without distinct dorsal concavity 3
- 3 Legs more or less spotted with dark brown (Fig. 2A, B, D–F)..... 4
- Legs unicolour (Fig. 2C, G–J) 7
- 4 Crossveins of forewings almost white (Fig. 2A, B), hind tibiae with eight inner and six outer subapical spurs (Fig. 6A, B) *A. ouyue* He & Wei, sp. n.
- Crossveins white only on the distal lateral side of forewings and membranes between Sc and R (Fig. 2C–J), hind tibiae with six inner and five outer subapical spurs (Fig. 6C–N) ... 5
- 5 Hind femora with three large darkish spots on dorsal half (Fig. 2C)..... *A. alius* Gorochov, 2007, stat. n.
- Hind femora without three large darkish spots on dorsal half (Fig. 2A, B, D–J) 6
- 6 Face with two brown bands behind eyes (Fig. 5D) *A. wuyiensis* Yin & Zhang, 2001
- Face without brown band behind eyes *A. medvedevi* Gorochov, 1985, stat. rev.
- 7 Epiphallus armed with multiple curved structures *A. curvto* Zheng, Xin, Xie & Ma, 2021
- Epiphallus without multiple curved structures 8
- 8 Apical part of epiphallus truncated..... *A. japonicus* (Shiraki, 1930)
- Apical part of epiphallus pointed..... *A. rufescens* Ichikawa, 2001

Aphonoides alius Gorochov, 2007, stat. n.

Figs 2D, 3C, 4E, F, 5C, 6E, F, 7C, 8G–I

Aphonoides medvedevi alius Gorochov, 2007: 239, Figs II: 5–8.

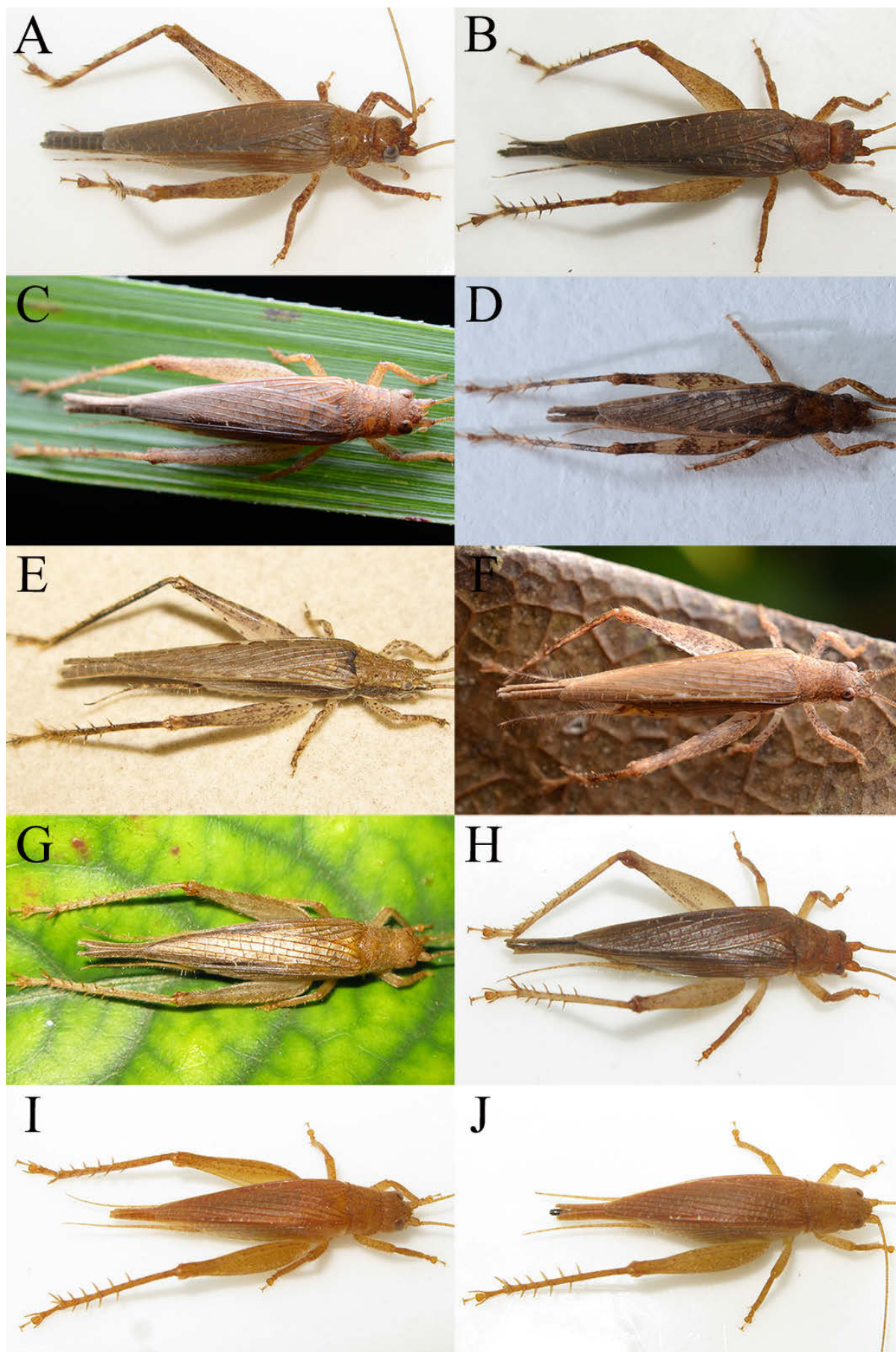


Fig. 2. *Aphonoides*, fresh undried specimens. A, B – *A. ouyue* sp. n.; C – *A. changi*; D – *A. alius*; E – *A. wuyiensis*; F – *A. medvedevi*; G, H – *A. japonicus*; I, J – *A. rufescens*.

Diagnosis. *A. alius* is recognized by the following combination of characters: Uniform brown to dark brown (Figs 2D, 7C); eyes decorated with a brown band on the median line (Fig. 2D); ocelli ovoid with median one slightly smaller (Fig. 3C); tympanum about 3/10 the length of fore tibia (Fig. 4E, F); forewing with dark band along dorsal edge and several white crossveins near dark band; comb of Sc with 5–6 branches; brown membranes between Sc and R interrupted by several white crossveins (Fig. 5C); hind femora spotted (Figs 2D, 7C); hind tibiae with three large darkish spots on dorsal half (including proximal parts of nearest spines Fig. 6E, F); cerci spotted; male genitalia: hind epiphallic lobes triangular, rather short, with sharp apices; ectoparameres shorter than epiphallic lobes, each with one small and curved anterior branch, shorter than caudal branch (Fig. 8G–I).

Measurements (mm): ♂ (n = 1): SZ: 16.2; BL: 14.6; PL: 2.4; FWL: 10.5; HFL: 7.3.

Type material (not examined). Holotype: ♂; VIETNAM, Gia Lai, 20 km N of town Kannack, primary forest near vill. Buon Luoi, 700–800 m; 1–10 May 1995; A. Gorochoy leg. Paratypes: 4♂, 2♀; VIETNAM, Gia Lai, 20 km N of town Kannack, primary forest near vill. Buon Luoi, 700–800 m; 17–20 Jun 1988, 3–11 Jun. 1993, 1–10 May 1995; A. Gorochoy leg. 1♀; VIETNAM, Gia Lai, 40 km N of town Kannack, primary forest near vill. Tram Lap, 800–900 m; 20–24 Apr. 1995; A. Gorochoy leg. 3♂, 2♀; THAILAND, Nakhon Ratchasima, near Nat. park Khao Yai, primary forest, 500–1000 m; 26 Oct.–4 Nov. 2000; A. Gorochoy and L. Anisutkin leg.

Material examined. CHINA: 1♂; Guangdong Prov., Shaoguan City, Ruyuan, Babaoshan Management and Protection Station (E113.03, N24.93); 21 Aug. 2020; Tao Zhang leg.; GenBank: OQ118075; ECNU 3812.

iNaturalist Chinese observations: 1♂, Jiangxi Prov., Yichun City (E115.08, N28.90), 27 Jul. 2023, 259932465; 1♂, Hainan Prov., Lingshui Li Autonomous County (E109.87, N18.72), 20 Oct. 2024, 248629808; 1♂, Yunnan Prov., Jinghong City, Xishuangbanna Dai state (E100.86, N22.17), 13 Nov. 2022, 187869422.

Distribution. China (Guangdong, Hainan, Jiangxi, Yunnan), Vietnam, Thailand.

Remarks. Based on the molecular results, we recommend elevating *A. medvedevi alius* to a species rank. *A. alius* is very similar to *A. medvedevi*, but their hind femora are different in colour – spotted in *A. alius* but unicolour in *A. medvedevi*. Male genitalia of this species have narrower epiphallic lobes and shorter ectoparameres. In ventral view, epiphallic lobes and ectoparameres of this species are straight, while those of *A. medvedevi* are bent.

***Aphonoides changi* Gorochoy, 2007**

Figs 2C, 3B, 4C, D, 5B, 6C, D, 7B, 8D–F

Aphonoides changi Gorochoy, 2007: 242, Figs I: 1, III: 1–4.

Aphonoides punctatus Yin & Liu, 1995: 104, Figs 309–310, misidentification.

Diagnosis. *A. changi* is recognized by the following combination of characters: Uniform brown (Figs 2C, 7B); head with large rounded concavity between eyes and rostral apex (Figs 2C, 3B); ocelli inconspicuous and small for

this genus (Fig. 3B); pronotum darker than in other species (Fig. 2C); tympanum about 1/4 the length of fore tibia (Fig. 4C, D); forewing with lateral part and area between bases of proximal branches of Sc with dark veins and dark membranes; comb of Sc with 6–7 branches; few whitish crossveins in distal and lateral part of forewings (Fig. 5B); hind tibiae unicolour (Fig. 6C, D); cerci spotted; male genitalia: hind epiphallic lobes long, triangular, with blunt, rounded apices and longe setae apically; ectoparameres shorter than hind epiphallic lobes, each with one small anterior branch (Fig. 8D–F).

Measurements (mm): ♂ (n = 1): SZ: 18.8; BL: 17.1; PL: 1.9; FWL: 12.7.

Type material (not examined). Holotype: ♂; THAILAND, Trat, Chang I. in Siam bay, primary forest on low mountains near sea; 5–20 Nov. 2000; A. Gorochoy and L. Anisutkin leg.

Material examined. CHINA: 1♂; Guangdong Prov., Shaoguan City, Ruyuan, Babaoshan Management and Protection Station (E113.03, N24.93); 15 Sep. 2020; Tao Zhang leg.; GenBank: OQ118067; ECNU 3811. 1♂; Jiangxi Prov., Jiulianshan (E114.58, N24.68); 14 Sep. 1986; Zhemin Zheng & Guopei Gan leg.; SEM 14021623.

Remarks. This species resembles *A. medvedevi* by the genitalia, but the epiphallic lobes are shorter than those in *A. medvedevi*, the proximal part of the ectoparameres is longer, and the distal part has more complex anterior branches at base.

There are some differences between our specimen and the holotype described by Gorochoy (2007) from Thailand: The tibiae and femora of our specimen are unicolour, while those of the holotype are spotted. We consider these differences as intraspecific variation.

Distribution. China (Guangdong, Jiangxi); Thailand.

***Aphonoides japonicus* (Shiraki, 1930)**

Figs 2G, H, 3E, 4I, J, 5E, 6I, J, 7E, 8M–O, 9E, F

Aphonomorphus japonicus Shiraki, 1930: 251.

Aphonoides japonicus: Chopard, 1968: 402; Ichikawa et al., 2001: 277, Fig. 12e, f.

Aphonoides aspidoid Zheng et al., 2021: 418, Fig. 16, syn. n.

Diagnosis. *A. japonicus* is recognized by the following combination of characters: Uniform brown (Figs 2G, H, 7E); ocelli almost uniform in size (Fig. 3E); tympanum about 1/5 the length of fore tibia (Fig. 4I, J); comb of Sc with 7–8 branches; few whitish crossveins are in distal and lateral part of forewings; brown membranes between Sc and R interrupted by several white crossveins (Fig. 5E); hind tibiae unicolour (Fig. 6I, J); male genitalia: hind epiphallic lobes triangular, with truncated apices (Fig. 8M, red arrow); ectoparameres shorter than hind epiphallic lobes, each with one strong anterior branch, as long as caudal branch (Fig. 8N, O); female ovipositor with the dorsal valvulae apically blunt, armed with three projections on the apical margin and an irregularly elevated surface (Fig. 9E), the ventral valvulae are blade-shaped, apically sharp (Fig. 9F).

Measurements (mm): ♂ (n = 4): SZ: 17.6–18.7; BL: 12.4–13.7; PL: 2.1–2.5; FWL: 10.4–10.9; HFL: 4.9–7.0. ♀

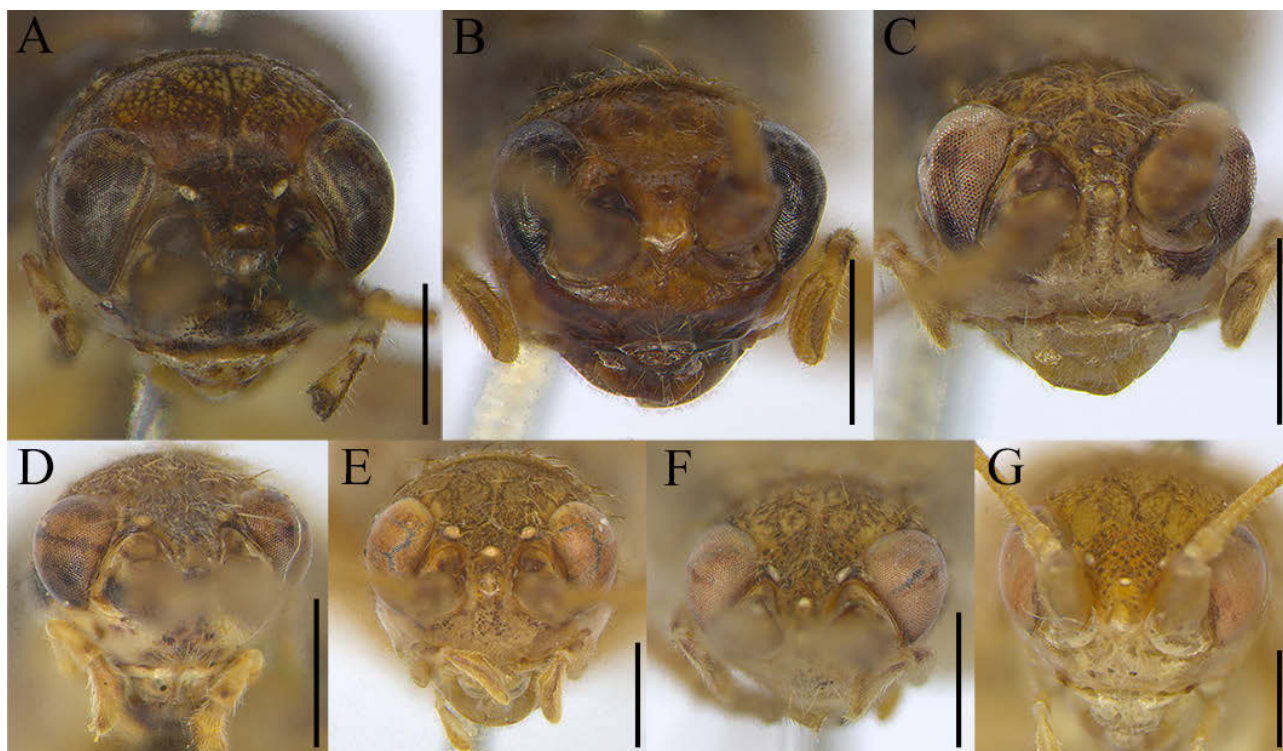


Fig. 3. *Aphonoides* front view of head. A – *A. ouyue* sp. n. (ECNU 245); B – *A. changi* (ECNU 3811); C – *A. alius* (ECNU 3812); D – *A. wuyiensis* (ECNU 978); E – *A. japonicus* (ECNU 1423); F – *A. medvedevi* (ECNU 1601); G – *A. rufescens* (ECNU 1276). Scale bars: 1 mm.

(n = 3): SZ: 18.7–19.5; BL: 12.6–13.8; PL: 1.0–2.7; FWL: 11.1–11.7; HFL: 5.5–6.6; OvL 6.6–6.8.

Type material (not examined). Shiraki (1930) did not designate the type specimen and only mentioned that the species was distributed in Gifu and Kyoto, Japan.

Material examined. CHINA: 1♂ and 2♀; Zhejiang Prov., Ningbo City, Tiantongshan (E118.44, N29.31); 30 May 2015 collected in nymph and reared to adult in lab; Zhu-Qing He leg.; GenBank: OQ118071, OQ118072, OQ118073; ECNU 4605, ECNU 4606, ECNU 4607. 1♂; Guangdong Prov., Chebaling National Nature Reserve (E114.27, N24.73); 3 Aug. 2018; Zhu-Qing He leg.; GenBank: OQ118074; ECNU 1423. 1♂; Hainan Prov., Wuzhishan National Nature Reserve (E109.33, N18.49); 7 Aug. 2018; Zhu-Qing He leg.; GenBank: OQ118068; ECNU 1230. 1♂; Hainan Prov., Jianfengling National Forest Park (E108.90, N18.49); 9 Aug. 2018; Zhu-Qing He leg.; GenBank: OQ118069; ECNU 1323. 1♀; Guangxi Prov., Fangchenggang City, Pingfeng Rainforest Park (E108.01, N21.68); 4 Jul. 2021; Zhu-Qing He leg.; GenBank: OQ118070; ECNU 4378.

iNaturalist Chinese observations: 1♂; Hunan Prov., Chenzhou City (E112.89, N24.93); 23 Oct. 2023; 213789499; 1♂; Guangdong Prov., Qingyuan City (E113.42, N24.19); 21 Jul. 2018; 260117196; 1♀; Guangdong Prov., Shenzhen City (E114.06, N22.54); 18 Sep. 2019; 260117189; 1♂; Guangdong Prov., Huizhou City (E113.88, N23.12); 29 Jul. 2019; 260117111; 1♂; Zhejiang Prov., Ningbo City (E121.87, N29.82); 22 Sep. 2023; 184491487; 1♂; Guangdong Prov., Shenzhen City, Longhua District (E114.06, N22.59); 25 Jul. 2023; 175879451; 1♂; Guangdong Prov., Shenzhen City (E114.39, N22.64); 6 Jul. 2022; 129521586; 1♀; Guangdong Prov., Shenzhen City, Futian District (E114.06, N22.54); 24 Jul. 2022; 127803672; 1♂; Zhejiang Prov., Lishui City, Qingtian county (E120.26, N28.15); 27 Aug. 2021; 111613275; 1♀; Guangdong Prov., Shenzhen City, Luohu District (E114.20, N22.58); 12 Sep. 2022; 134705128.

Distribution. China (Guangdong, Guangxi, Hainan, Hunan, Zhejiang); Japan.

Remarks. This species is very similar to *A. rufescens*, but it is coloured yellowish brown, while *A. rufescens* is coloured reddish brown. It is also distinguished from *A. rufescens* by the the epiphallic lobes which are trapezoidal, while those of *A. rufescens* are triangular.

Zheng et al. (2021) described the species *A. aspidoid*, which is very similar to *A. japonicus* described by Shiraki (1930). Ichikawa (2001) illustrated the characters of male genitalia of *A. japonicus*; the illustrations show that the pseudepiphallic lophi are trapezoidal as in *A. aspidoid*. Thus, we consider *A. aspidoid* Zheng et al., 2021 as a new junior synonym of *A. japonicus*.

***Aphonoides medvedevi* Gorochov, 1985, stat. rev.**

Figs 2F, 3F, 4K, L, 5F, 6K, L, 7F

Aphonoides medvedevi Gorochov, 1985: 23, Fig. 4.

Aphonoides medvedevi medvedevi: Gorochov, 2007: 239, Figs I: 15, II: 1–4; Zheng et al., 2021: 414, Figs 12, 13.

Diagnosis. *A. medvedevi* is recognized by the following combination of characters: Uniform light brown, spotted with brown (Figs 2F, 7F); eyes with a brown band on the median line (Fig. 2F); three ocelli with median one smallest and ovoid; lateral ocelli transversely ovoid (Fig. 3F); a pair of small dark spots in middle of pronotal disc (Fig. 2F); tympanum about 1/3 the length of fore tibia (Fig. 4K, L); few whitish crossveins in distal and lateral part of forewings; membranes between Sc and R darkened and interrupted by several white crossveins; comb of Sc with 6–7 branches (Fig. 5F); hind tibiae slightly spotted (Fig. 6K,



Fig. 4. *Aphonoides* inner and outer side of fore tibia. A–B – *A. ouyue* sp. n. (ECNU 245); C–D – *A. changi* (ECNU 3811); E–F – *A. alius* (ECNU 3812); G–H – *A. wuyiensis* (ECNU 978); I–J – *A. japonicus* (ECNU 1423); K–L – *A. medvedevi* (ECNU 1601); M–N – *A. rufescens* (ECNU 1276). Scale bars: 1 mm.

L); cerci spotted; male genitalia: hind epiphallallic lobes triangular, with sharp apices; ectoparameres shorter than hind epiphallallic lobes, each with one short anterior branch, about half the length of caudal branch.

Measurements (mm): ♂ (n = 2): SZ: 16.2–17.6; BL: 14.5–14.8; PL: 1.9–2.3; FWL: 10.6–11.2; HFL: 7.3–7.5.

Type material (not examined). Holotype: ♂; VIETNAM, Ninh Binh, nat. reserve Cuc Phuong; 23 Apr. 1975; L. Medvedev leg.

Material examined. CHINA: 2♂; Hainan Prov., Jianfengling National Forest Park (E 108.90, N 18.49); 20 Mar. 2019; Zhu-Qing He leg.; GenBank: OQ118076, OQ118077; ECNU 1601, ECNU 1602. 2♂ nymphs; Hainan Prov., Xian'an Stone Forest (E 109.43,



Fig. 5. *Aphonoides* forewing from side. A – *A. ouyue* sp. n. (ECNU 245); B – *A. changi* (ECNU 3811); C – *A. alius* (ECNU 3812); D – *A. wuyiensis* (ECNU 978); E – *A. japonicus* (ECNU 1423); F – *A. medvedevi* (ECNU 1601); G – *A. rufescens* (ECNU 1276). Scale bars: 1 mm.

N18.60); 22 Mar. 2019; Zhu-Qing He leg.; GenBank: OQ118078, OQ118079; ECNU 1688, ECNU 1708. 1♂; VIETNAM: Tonkin Mont. Bavi 900–1000 m; Aug. 1940; A. De Cooman leg.; SEM 14010357.

Distribution. China (Hainan); Vietnam.

Remarks. Based on the molecular results, we recommend considering *Aphonoides alius* and *A. medvedevi* separate species (see remarks under *A. alius*). *A. medvedevi* also resembles *A. wuyiensis*, but can be distinguished by the face and the male genitalia: in this species, lateral surfaces of the head are unicolour, while in *A. wuyiensis*, there are dark brown longitudinal stripes on lateral surfaces of the head; epiphallal lobes of this species are sharper than those of *A. wuyiensis* and the anterior branch of the ectoparamere is longer.

There are only minor differences between our specimens and the holotype described by Gorochoy (2007) from Vietnam: The holotype is decorated with dark grey longitudinal stripes on lateral surfaces of the head, while lateral surfaces of our specimens are unicolour. We consider the difference as intraspecific variation.

***Aphonoides ouyue* He & Wei, sp. n.**

Figs 2A, B, 3A, 4A, B, 5A, 6A, B, 7A, 8A–C, 9A, B

ZooBank taxon LSID:

3714CC61-C5AD-4212-8537-478282C8B2BF

Aphonoides fuscirostris Chopard, 1969: Yin & Liu, 1995: 103, Fig. 308, misidentification.

Diagnosis. *A. ouyue* is recognized by the following combination of characters: Uniform brown to dark brown (Fig. 2A, B); eyes decorated with a brown band on median line

(Fig. 2A, B); three ocelli with the median one smallest and ovoid, lateral ocelli flat and larger than median one (Fig. 3A); tympanum about 1/5 the length of fore tibia (Fig. 4A, B); forewings with white crossveins (Figs 2A, B, 5A), comb of Sc with 7–8 branches (Fig. 5A); hind tibiae spotted, with eight inner and six outer subapical spurs, while those of other species with six inner and five outer subapical spurs (Fig. 6A, B); cerci spotted (Fig. 2A, B). Male genitalia: hind epiphallal lobes triangular, rather short, apices sharp with setae (Fig. 8A); ectoparameres longer than hind epiphallal lobes, each with one strong and curved anterior branch, little shorter than caudal branch (Fig. 8B, C). Female ovipositor: ventral valvulae longer than dorsal valvulae (Fig. 9A, B).

Description. Male. Head narrower than the anterior margin of pronotum. Vertex broad and flattened. Frontal rostrum blunt, slightly wider than antennal scape (Figs 2A, B, 7A). Median ocellus smallest of the three, ovoid; lateral ocelli larger and flatter than median one, long ovate (Fig. 3A). Eyes strongly prominent and large, about 1/2 the length of head, decorated with a brown band on the median line (Figs 2A, B, 3A, 7A).

Thorax. Pronotum broad and finely pubescent, anterior margin straight and posterior margin slightly convex, lateral lobes with lower margins curved; two eye-like spots on pronotum disc distinct and smooth (Figs 2A, B, 7A). Forewings obviously shorter than hindwings, uncovered portion shorter than hind femur; longitudinal veins of forewings paralleled and bulgy, crossveins light (Figs 2A, B, 5A, 7A), comb of Sc with 7–8 branches, costal area of forewings with only a few crossveins irregularly situated between branches of Sc (Fig. 5A).



Fig. 6. *Aphonoides* dorsal and ventral view of hind tibia. A–B – *A. ouyue* sp. n. (ECNU 245); C–D – *A. changi* (ECNU 3811); E–F – *A. alius* (ECNU 3812); G–H – *A. wuyiensis* (ECNU 978); I–J – *A. japonicus* (ECNU 1423); K–L – *A. medvedevi* (ECNU 1601); M–N – *A. rufescens* (ECNU 1276). Abbreviations: ia – inner apical spurs (1 to n); oa – outer apical spurs (1 to n); is – inner subapical spurs (1 to n); os – outer subapical spurs (1 to n). Scale bars: 1 mm.

Legs. Only inner side of fore tibia with elongate-ovoid tympanum, about 1/5 the length of fore tibia, pitted (Fig. 4A, B). Hind tibiae serrulated, with short and thin spines among subapical spurs, sparser as closer to the apex; with eight inner and six outer subapical spurs; three inner and three outer apical spurs, outer spurs short (the middle one longer; the other two equal in length) and the inner spurs long (superior one longest, inferior one shortest) (Fig. 6A, B).

Colouration. Body brown to dark brown (Figs 2A, B, 7A). Eyes brown; frontal rostrum dark brown; clypeus and labrum brown (Fig. 3A). Pronotum brown. Tibia and femur light brown, with brown spots; hind tibiae apically dark brown (Figs 2A, B, 7A). Forewings dark brown, crossveins white (Figs 2A, B, 5A, 7A). Hind tibiae and spurs distinctly spotted (Fig. 6A, B). Cerci spotted (Fig. 2A, B).

Genitalia. Epiphallus wide and short, broadly trapezoidal, slightly concave, without arms (Fig. 8A); epiphallal lobes with several setae apically and basally (Fig. 8C), separated by a roughly triangular excavation apically, medial base with pointed projection (Fig. 8A, B); in lateral view, ectoparameres apically bifurcated, anterior branch long, strong, and distinctly arched, little shorter than caudal branch, caudal branch thick; rami connected to epiphallus; apodema principales thick (Fig. 8C).

Female. Resembles male, slightly larger.

Ovipositor. Ventral valvulae longer than dorsal valvulae. The dorsal valvulae blunt, armed with three projections on the apical margin and with an irregularly elevated surface (Fig. 9A). The ventral valvulae blade-shaped, apically sharp. Protrusion of their lateral margin long (Fig. 9B).

Measurements (mm): Holotype: SZ: 14.2; BL: 10.3; PL: 1.6; FWL: 9.6; HFL: 6.4; ♂ (n = 4): SZ: 13.9–14.2;

BL: 8.8–10.3; PL: 1.6–1.8; FWL: 9.5–9.6; HFL: 6.1–6.4. ♀ (n = 1): SZ: 16.6; BL: 12.9; PL: 2.3; FWL: 10.9; HFL: 7.8; OvL: 6.5.

Type material. Holotype: ♂; CHINA, Zhejiang Prov., Lishui City, Qingyuan County, Baishanzu Nature Reserve (E119.20, N27.75); 9 Sep. 2016; Zhu-Qing He leg.; GenBank: OQ118089; ECNU 245. Paratypes: 1♀; Zhejiang Prov., Wenzhou City, Taishun County, Wuyanling National Nature Reserve (E119.67, N27.72); 3 Oct. 2019; Zhu-Qing He leg.; GenBank: OQ118090; ECNU 2390. 1♂; Zhejiang Prov., Wenzhou City, Taishun County, Wuyanling National Nature Reserve (E119.67, N27.72); 14 Jul. 2017; Zhu-Qing He leg.; GenBank: OQ118088; ECNU 1014. 2♂; Zhejiang Prov., Lishui City, Jingning County, Wangdongyang Mountain Wetland Nature Reserve (E119.62, N27.71); 20 Aug. 2021; Pu Gong leg.; GenBank: OQ118091, OQ118092; ECNU 4490, ECNU 4491.

Other material examined. CHINA: 1♂; Fujian Prov., Wuyishan City, Sangang (E117.69, N27.75); 27 Aug. 1994–3 Sep. 1994; Haisheng Yin & Xingbao Jin leg.; SEM 14064521. 1♂; Fujian Prov., Wuyishan City, Sangang (E117.69, N27.75); 27 Aug. 1994–4 Sep. 1994; Haisheng Yin & Xingbao Jin leg.; SEM 14064522. 1♂; Fujian Prov., Wuyishan City, Sangang (E117.69, N27.75); 27 Aug. 1994–5 Sep. 1994; Haisheng Yin & Xingbao Jin leg.; SEM 14064523. 1♂; Zhejiang Prov., Taishun City (E119.72, N27.56); 29 Aug. 1987; Xianwei Liu & Xingbao Jin leg.; SEM 14022861. 1♂; Zhejiang Prov., Taishun City, Wuyanling National Nature Reserve (E119.67, N27.72); 4 Sep. 1987; Xianwei Liu & Xingbao Jin leg.; SEM 14022879. 1♂; Zhejiang Prov., Taishun City, Wuyanling National Nature Reserve (E119.67, N27.72); 27 Aug. 1987; Xianwei Liu & Xingbao Jin leg.; SEM 14022952.

inaturalist Chinese observations: 1♂; Zhejiang Prov., Wenzhou City, Taishun County, Wuyanling National Nature Reserve (E119.67, N27.72); 17 Aug. 2024; 236290405; 1♂; Zhejiang Prov., Lishui City, Suichang County (E119.08, N28.36); 30 Sep. 2023; 191848497.



Fig. 7. *Aphonoides* dorsal view of body. A – *A. ouyue* sp. n. ECNU 245; B – *A. changi* (ECNU 3811); C – *A. alius* (ECNU 3812); D – *A. wuyiensis* (ECNU 978); E – *A. japonicus* (ECNU 1423); F – *A. medvedevi* (ECNU 1601); G – *A. rufescens* (ECNU 1276). Scale bars: 1 mm.

Type locality. CHINA, Zhejiang Prov., Lishui City, Qingyuan County, Baishanzu Nature Reserve, E119.20, N27.75.

Etymology. The new specific epithet derived from where the materials of types were collected. These areas including Baishanzu, Wuyanling and Wangdongyang are located in the south Zhejiang and north Fujian, and were called Ouyue in ancient China.

Distribution. China (Fujian, Zhejiang).

Remarks. The new species is distinct from other species of the genus from China: The crossveins of forewings are white in this species, while in others, crossveins white only on the distal lateral side of the forewings and the membranes between Sc and R; the epiphallic lobes of male genitalia are quadrilateral in this species, with pointed projection in the medial base, while they are triangular or trapezoidal in other species, and without pointed projection in the medial base.

Aphonoides rufescens Ichikawa, 2001

Figs 2I, J, 3G, 4M, N, 5G, 6M, N, 7G

Aphonoides rufescens Ichikawa, 2001: 48; Zheng et al., 2021: 413, Figs 10–11.

Diagnosis. *A. rufescens* is recognized by the following combination of characters: Uniform reddish brown (Figs 2I, J, 7G); ocelli small for the genus (Fig. 3G); tympanum about 1/5 the length of fore tibia (Fig. 4M, N); few whitish crossveins in distal and lateral part of forewings; comb of Sc with 6–7 branches, crossveins are also whitish between Sc and its branches (Fig. 5G); hind tibiae unicolour (Fig. 6M, N); male genitalia: hind epiphallic lobes long, triangular, with distinct sharp apices; ectoparameres shorter than hind epiphallic lobes, each with one small anterior branch, caudal branch rounded in ventral view; female ovipositor: the ventral valvulae are blade-shaped, apically blunt; protrusion of their lateral margin is shorter and thicker than in other species.

Measurements (mm): ♂ (n = 4): SZ: 18.6–18.8; BL: 15.4–15.6; PL: 1.6–2.7; FWL: 8.6–8.9; HFL: 7.1–7.2. ♀

(n = 1): SZ: 18.5; BL: 14.9; PL: 2.6; FWL: 11.1; HFL: 6.4; OvL: 7.5.

Type material (not examined). Holotype: ♂; JAPAN, Ono-aida, Yakushima Island, 16 Sep. 1978; M. Umano leg. Paratype: 1♀; JAPAN, Koseda, Yakushima Island, 1 Sep. 1980; J. Aoyama leg.

Material examined. CHINA: 2♂ and 1♀; Hainan Prov., Tongguling (E111.03, N19.67); 4 Aug. 2018; Zhu-Qing He leg.; GenBank: OQ118080, OQ118081, OQ118082; ECNU 1276, ECNU 1401, ECNU 1277. 2♂; Hainan Prov., Limushan (E109.77, N19.21); 5 Aug. 2018; Zhu-Qing He leg.; GenBank: OQ118083, OQ118084; ECNU 1351, ECNU 1352.

iNaturalist Chinese observations: 1♀; Guangdong Prov., Shenzhen City, Nantian District (E113.97, N22.56); 24 Aug. 2022; 132110518; 1♂; Guangdong Prov., Shenzhen City, Luohu District (E114.21, N22.58); 6 Aug. 2023; 195261396.; 1♂; Guangdong Prov., Shenzhen City, Nantian District (E113.93, N22.60); Sep. 2023; 184225071.

Distribution. China (Guangdong, Hainan); Japan.

Remarks. This species is reddish brown, distinct from other species of the genus in China. Regardless of colouration, this species resembles *A. medvedevi* in the genitalia, but the epiphallic lobes are slightly shorter than those of *A. medvedevi* and the anterior branch of ectoparamere of this species is narrower than the posterior. The reason why this species split into two branches in the phylogenetic tree may be the difference of origin. The individuals of the first branch, including 1277, 1276, 1401, are from Tongguling, Hainan, while the individuals of the second branch, including 1351, 1352, are from Limu Mountain, Hainan.

Aphonoides wuyiensis Yin & Zhang, 2001

Figs 2E, 3D, 4G, H, 5D, 6G, H, 7D, 8J–L, 9C, D

Aphonoides wuyiensis Yin & Zhang, 2001: 87, Figs 1, 2; Gorochov, 2007: 239; He, 2018: 522; Zheng et al., 2021: 412.

Diagnosis. *A. wuyiensis* is recognized by the following combination of characters: Uniform light brown, spotted with brown (Figs 2E, 7C); eyes with a brown band on the

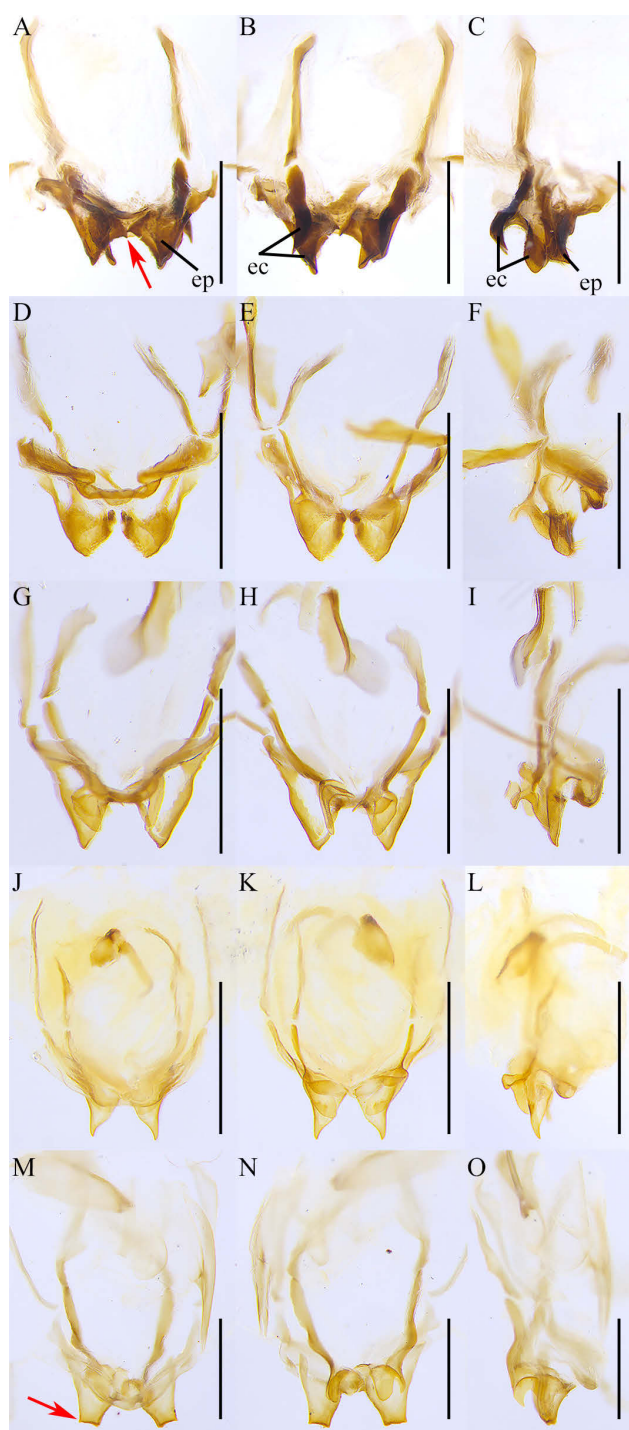


Fig. 8. *Aphonoides* dorsal, ventral and lateral view of male genitalia, respectively. A–C – *A. ouyue* sp. n. (ECNU 245) (medial base of epiphallus lobe with pointed projection marked by the red arrow); D–F – *A. changi* (ECNU 3811); G–I – *A. alius* (ECNU 3812); J–L – *A. wuyiensis* (ECNU 978); M–O – *A. japonicus* (ECNU 1423) (truncated apex marked by the red arrow). ec – ectoparamere; ep – epiphallus. Scale bars: 1 mm.

median line (Figs 2E, 3D); the middle ocellus significantly smaller than the two on the side (Fig. 3D); in lateral surfaces of head, two brown bands behind eyes (Fig. 5D); a pair of small dark spots in middle of pronotal disc (Figs 2E, 7D); tympanum about 1/3 the length of fore tibia (Fig. 4G, H); membranes between Sc and R darkened and interrupted by several white crossveins; comb of Sc with 6 branches

(Fig. 5D); hind tibiae darkened (Fig. 6G, H); cerci spotted; male genitalia: hind epiphallus lobes long, triangular, with distinct sharp apices (Fig. 8J, K); ectoparameres shorter than hind epiphallus lobes, each with one small anterior branch (Fig. 8L).

Description. Male. Genitalia. Epiphallus broadly trapezoidal, slightly concave, without arms (Fig. 8J); epiphallus lobes thin and long, apices distinctly sharp, without setae, separated by a large roughly triangular excavation apically (Fig. 8J, K); in lateral view, ectoparameres apically bifurcated, anterior branch short and broad. Rami connected to epiphallus; apodema principales thick (Fig. 8L).

Female. Ovipositor. Ventral valvulae shorter than dorsal valvulae. The dorsal valvulae are blunt at the end, armed with three projections on one side and an irregularly elevated surface (Fig. 9C). The ventral valvulae are blade-shaped, apically sharp. Protrusion of their lateral margin is long (Fig. 9D).

Measurements (mm): ♂ (n = 2): SZ: 17.0–18.4; BL: 15.9–16.5; PL: 2.1–2.6; FWL: 10.7–11.2; HFL: 7.1–7.3. ♀ (n = 1): SZ: 18.1; BL: 16.0; PL: 1.7; FWL: 11.5; HFL: 5.8; OvL: 6.1.

Type material. Holotype: ♂; CHINA, Fujian Prov., Wuyishan, Sangang; 27 Aug. 1994; Hai-Sheng Yin and Xing-Bao Jin leg.; SEM 14066905.

Other material examined. CHINA: 1♂; Yunnan Prov., Xishuangbanna, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences (E101.26, N21.93); 19 Oct. 2017; Zhu-Qing He leg.; GenBank: OQ118086; ECNU 978. 1♂ and 1♀; Yunnan Prov., Xishuangbanna, Mengla, Wangtianshu (E101.59, N21.60); 26 Apr. 2017; Zhu-Qing He leg.; GenBank: OQ118087, OQ118085; ECNU 513, ECNU 475.

iNaturalist Chinese observations: 1♂; Yunnan Prov., Xishuangbanna, Mengla (E101.27, N21.92); 12 Nov. 2021; 100990032; 1♂; Yunnan Prov., Xishuangbanna, Mengla (E101.60, N21.53); 16 Oct. 2023; 197039277; 1♂; Yunnan Prov., Xishuangbanna, Mengla (E101.27, N21.92); 24 Nov. 2022; 187869349; 1♂; Yunnan Prov., Xishuangbanna, Mengla (E101.60, N21.50); 16 Oct. 2023; 188154156; 1♂; Yunnan Prov., Xishuangbanna, Mengla (E101.25, N21.94); 14 May. 2023; 161949373.

Distribution. China (Fujian, Yunnan).

Remarks. This species resembles *A. medvedevi* based on shape and colour, but differs in the face and the male genitalia: This species has two brown bands behind the eyes in the face, but *A. medvedevi* does not; the epiphallus lobes of *A. wuyiensis* are sharper than those of *A. medvedevi*, and the anterior branch of the ectoparamere is shorter.

Gorochov (2007) mentioned that this species might be a synonym of *A. medvedevi*. However, based on our description of the male genitalia and molecular results presented above, *A. wuyiensis* is a valid species.

DISCUSSION

Taxonomic revision of the Chinese *Aphonoides* species

The genus *Aphonoides* has historically received limited taxonomic attention compared to other Podoscirtinae species, primarily due to their morphological uniformity – characterized by similar external morphology including



Fig. 9. *Aphonoides* dorsal and ventral view of female ovipositor, respectively. A–B – *A. ouyue* sp. n. (ECNU 2390); C–D – *A. wuyiensis* (ECNU 475); E–F – *A. japonicus* (ECNU 4378). dv – dorsal valvulae; vv – ventral valvulae. Scale bars: 0.5 mm.

the monochromatic colouration (yellow or brown). The absence of stridulatory organs on the forewings has necessitated reliance on the genital morphology for species delimitation (Gorochov, 2007). However, early taxonomic studies often lacked detailed descriptions of male genitalia, leading to an underestimation of the genus diversity and numerous undescribed species. This is evidenced by Gorochov's (2007, 2008) substantial contribution, which described 35 new species primarily from Southeast Asia and Oceania, and Tan's (2022) discovery of five additional species of the tribe Aphonoidini in Singapore through genital examination.

In China, taxonomic understanding remained incomplete until Zheng et al. (2021) described two new species and reported two new records, providing descriptions of the male genitalia (though we herein synonymize *A. aspidoid* with *A. japonicus*). Our comprehensive study addresses these gaps by examining all specimens available to us with detailed male genitalia analysis, resulting in: (1) the description of a new species, (2) the proposal of a new synonym, and (3) the re-evaluation of three species reported by Yin and Liu (1995). We demonstrate that their *A. punctatus* (Haan, 1844) represents *A. changi*, while their *A. fuscirostris* Chopard, 1969 is actually a new species here described as *A. ouyue* sp. n. Finally, a specimen (CHINA, 1♂; Hunan Prov., Dayong City, Zhangjiajie (E 114.58, N 24.68); 3. Oct. 1986; Liu Xian-Wei leg.; SEM 14069479) previously identified as *A. tessellatus* Chopard, 1969 proved to be a species of *Mistshenkoana* upon re-examination, leading us to exclude these three taxa from the Chinese fauna.

Female identification presents additional challenges due to the genus's morphological conservatism (Tan, 2022). Our study pioneers the use of *COI* barcoding for *Aphonoides* species identification, which not only corroborates morphological distinctions but also enables accurate sex matching – a significant advancement for future taxonomic work.

Phylogenetic relationships and evolutionary insights

The genus *Aphonoides* has undergone substantial taxonomic revisions since its establishment. Chopard's (1940) original four-species composition has been altered, with *A.*

angustifrons (Chopard, 1930) transferred to a new genus *Mistshenkoana* Gorochov, 1990. Gorochov (2007) also re-assigned *A. fuscirostris* to the genus *Zamunda* as its type species. Remarkably, the monophyly of *Aphonoides* had never been tested until our molecular study. Our phylogenetic analysis strongly supports the monophyly of Chinese *Aphonoides* species and aligns with morphological findings.

Notably, we elevated *A. medvedevi* *alias* Gorochov, 2007 to species status as *A. alias* stat. n., based on both morphological distinctions and its considerable phylogenetic distance from *A. medvedevi*. Moreover, *A. alias*, *A. medvedevi*, and *A. wuyiensis* share two distinctive traits: forewings mottled with dark spots and face with two brown bands behind eyes. They form a well-supported clade in our phylogeny, suggesting these morphological traits may represent synapomorphies for this group. The presence of similar features in the Australian Bangri group (Rentz & Su, 2019) raises intriguing questions about their potential evolutionary relationship, warranting *COI* sequencing to test possible monophyly.

Biogeography and phenology of Chinese *Aphonoides*

Our taxonomic revisions expand the Chinese *Aphonoides* fauna to eight species (Fig. 10), with a clear southern China distribution pattern. This aligns with the genus's ecological constraints, as Podoscirtinae typically oviposit in plant stems, making northern populations vulnerable to lethal winter temperatures. The distribution of *A. japonicus* and *A. rufescens* exhibits interesting parallels between China and Japan: in Japan, *A. japonicus* occupies northern regions while *A. rufescens* is southern (Ichikawa et al., 2006). Similarly, in China, *A. japonicus* ranges from the Yangtze River basin to Hainan, whereas *A. rufescens* is restricted to Hainan and Shenzhen. The discovery of *A. wuyiensis* in southern Yunnan is a surprise – 1,800 km from its type locality in Fujian – suggesting overlooked populations.

Phenological data from our study and Zheng et al. (2021) indicate *Aphonoides* species primarily emerge between July and October, except in Hainan and southern Yunnan where activity may extend beyond this period. This tem-

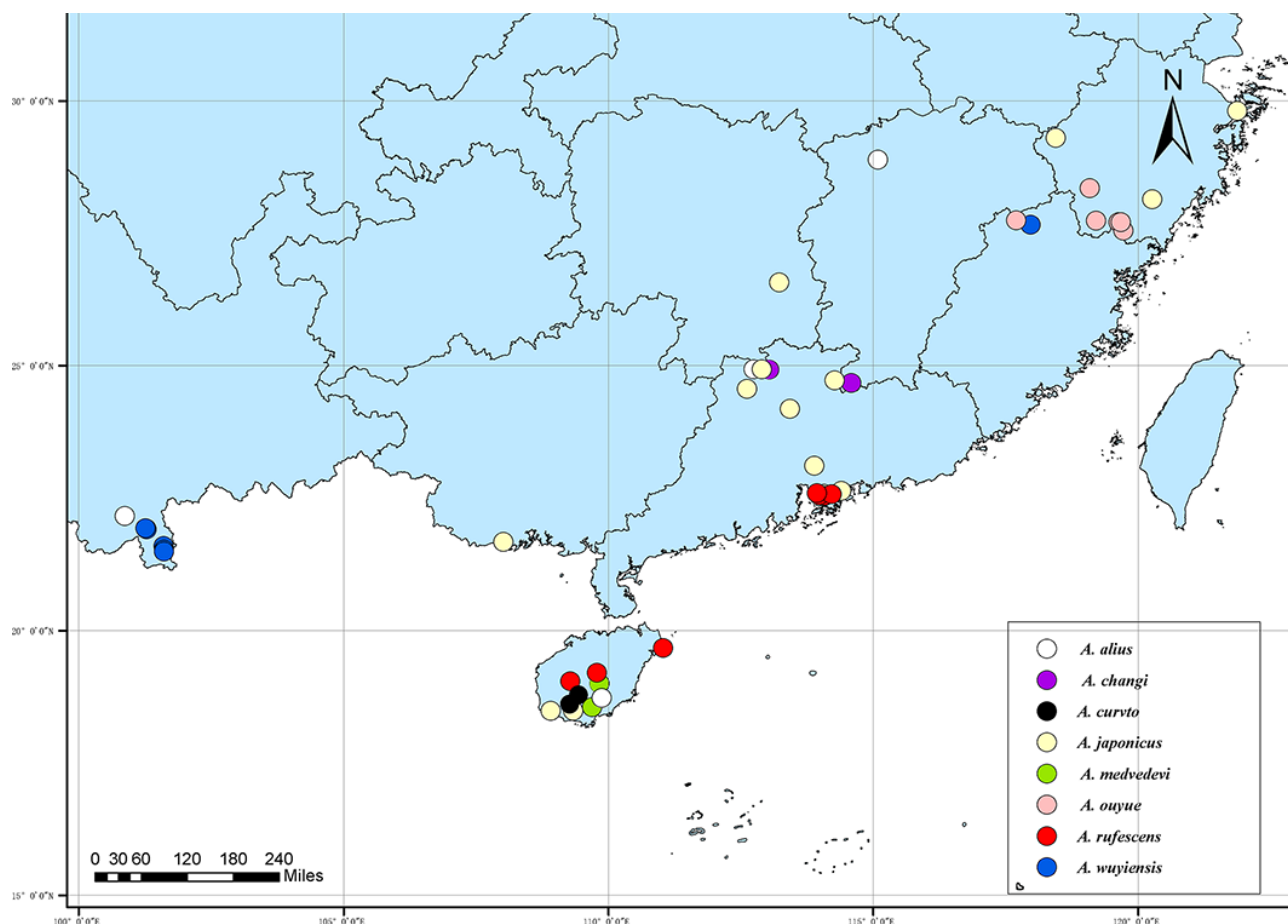


Fig. 10. Geographic distribution of *Aphonoides* species across China. The information regarding *A. curvto* is derived from Zheng et al. (2021).

poral pattern highlights the importance of conducting targeted surveys in southern China during these months to enhance species documentation and uncover undescribed diversity.

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