

Research Article

Revision of the Genus *Aethalodes* with a New Subspecies from Anhui, China (Cerambycidae: Lamiinae)

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Abstract

Aethalodes is a tiny genus in the subfamily Lamiinae Latreille, 1825 of the family Cerambycidae Latreille, 1802. It was established in 1888 with *Aethalodes verrucosus* Gahan, 1888 as the type species. In order to have a better and more complete understanding of this genus and the two known subspecies, the scientific literature on the genus and 2 known subspecies was traced with the original descriptions carefully studied, and all the type specimens available are found to be female adults, which have been examined and compared with each other and also with the identified male specimens from other reliable sources. A revision of the genus *Aethalodes* and the two known subspecies has been made, as the original descriptions of the genus and nominate type subspecies by Gahan were incomplete and somewhat defective in lack of the male type specimen. The subspecies *Aethalodes verrucosus formosanus* Kriesche, 1924 is raised back to species level as *A. verrucosus formosanus* Kriesche, 1924 based on the newly-found significant differences in the length of the antennae as the decisive feature distinguishing it from *A. verrucosus* as an independent species. Fieldwork has been carried out to try to find and collect *Aethalodes* specimens with light and net trappings, and a new subspecies, *Aethalodes verrucosus anhuiensis* subsp. nov. is described from China's Anhui Province with images, whose unique partial white squamosity on the black body is distinguished from the dark brown squamosity of the nominate subspecies. Both *Aethalodes verrucosus verrucosus* Gahan, 1888 and the newly-found subspecies may be rare in China. More field surveys are required to find and observe *Aethalodes* adults, their host plants and habitat in China, and efforts should be made to collect more specimens for further study.

Keywords

Aethalodes, Cerambycidae, New Subspecies, China's Anhui Province

1. Introduction

Aethalodes Gahan, 1888 is the full scientific genus name of a tiny group of Lamiinae Latreille, 1825 -also called lamiines or flat-faced longhorned beetles in the family Cerambycidae Latreille, 1802. It was established by Gahan [5] on the basis of the type species *Aethalodes verrucosus*

Gahan, 1888, collected from North China. Kriesche [8] described *Aethalodes formosanus* from Taiwan region as a new species, which Breuning [3] changed into *Aethalodes verrucosus* ssp. *formosanus* Kriesche, 1924 and has been recognized by subsequent entomologists ever since.

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Received: 13 August 2024; **Accepted:** 2 September 2024; **Published:** 11 September 2024



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For 134 years from 1888 when the genus was established up to the end of 2022, *Aethalodes* remained a tiny genus of Cerambycidae Latreille, 1802, with only one valid species including two subspecies described to science in the world due to their rarity and limited geographic ranges. The nominate subspecies has been reportedly distributed only in China's mainland and Vietnam, while *A. verrucosus formosanus* Kriesche, 1924 is endemic to Taiwan region [1-15].

The study has made a revision of the genus *Aethalodes* and the two known subspecies, as the two syntypes of *A. verrucosus verrucosus* Gahan, 1888 and the two neotypes of *A. verrucosus formosanus* Kriesche, 1924 are all female adults, which made the original descriptions of the genus and nominate type subspecies by Gahan incomplete and somewhat defective, and also caused Breuning to change *A. formosanus* into *A. verrucosus formosanus* in lack of the male adult type specimen. Identified male specimens of the two subspecies from reliable sources are examined and compared with the female type specimens. The subspecies *A. verrucosus formosanus* Kriesche, 1924 is raised back to species level as *A. verrucosus formosanus* Kriesche, 1924 due to the significant differences in the length of the antennae, which is the decisive feature distinguishing it from *A. verrucosus* as an independent species.

An male adult of *Aethalodes* was found in Anhui Province in the east of China in our fieldwork and is proposed to be a new subspecies named *Aethalodes verrucosus Anhuiensis* ssp. nov.

2. Material and Methods

The material examined in this study is from the following museums, institutions or collections.

AAF = Anhui Academy of Forestry, Hefei City, Anhui Province, China

IIC = Insect Islands Collection, Ishigaki Island, Japan

NHMUK = The Natural History Museum, London, UK

SDEI = Senckenberg Deutsches Entomologisches Institut (Senckenberg German Entomological Institute), MÜNcheberg, Germany

TEOL = Taiwan Encyclopedia of Life

Fieldwork. From March to September in 2022 and 2023, light and net trappings were adopted in our fieldwork to systematically collect longhorn beetles in Dabie Mountains in the west, the Yellow Mountains in the south and Jianghuai hilly region in the middle of Anhui Province, China. Among many adults of longhorn species collected, a male adult of *Aethalodes* was found. The specimen, which has been carefully examined, is proposed to be a new subspecies and named *Aethalodes verrucosus Anhuiensis* ssp. nov. The holotype has been kept in the Insect Collection, Anhui Academy of Forestry, also a designated China national forestry popular science base and a Anhui provincial popular science base open to public.

All measurements are in millimeters (mm). Images of the

new subspecies were taken using a Cannon EOS 90D camera with a Cannon EF 50 mm 2.5 Micro-lens.

3. Taxonomy

3.1. Genus *Aethalodes* Gahan, 1888

3.1.1. Description

Aethalodes Gahan, 1888: 270; *Aethalodes verrucosus* Gahan, 1888, monotype, North China; Aurivillius, 1922; Breuning, 1961.

Diagnosis. The moderate-sized head has a strong concave between its rather short and somewhat distant antennal tubercles; the front is subequilateral and convex. The last joint of palpi is ovate-cylindrical. The antennae of the female adult reaches about half to three fourths of the elytron and that of the male adult is about three fourths of the elytron or longer; the stout and subcylindrical scape is curved slightly and expanded somewhat at the apex that has a distinct small cicatrice; the fourth joint, which is obviously shorter than the scape, has the combined length of the second and third together. The prothorax has large rounded tubercles on the disk as well as acute spines at the sides. The oblong and rough elytron has alternant rows of smaller and larger granules and is rounded at the apex; each elytron has a small median projection at its base. The legs are subequal with linear femora and emarginate middle tibiae; both the anterior and middle legs are a little shorter than the posterior ones. The Prosterna and mesosterna are both simple while the metasternum is moderately elongate.

Differential diagnosis. Gahan summarized that *Aethalodes* is distinguished from the similar-formed genus *Trachystola* by its short third antennal joint, strange tuberculation of its thorax and the less obvious median projection at the base of each elytron. According to these distinctions, *Trachystola armata* Nonfried, 1892 and *Trachystola nodicollis* Fairmaire, 1899 are regarded as the scientific synonyms of *Aethalodes verrucosus* Gahan, 1888.

Distribution. China (including Taiwan); Vietnam.

3.1.2. Type Species

Aethalodes verrucosus verrucosus Gahan, 1888 (Figures 1-2)

Aethalodes verrucosus verrucosus Gahan, 1888: 270-271, pl. XVI, Figure 1, Syntypes, The Natural History Museum, London, North China; *Trachystola armata* Nonfried, 1892: 86, 93; *Trachystola nodicollis* Fairmaire, 1899: 640; *Aethalodes verrucosus* Aurivillius, 1922: 65; *Trachystola armata* Aurivillius, 1922: 64; *Trachystola nodicollis* Aurivillius, 1922: 64; *Aethalodes verrucosus* Kriesche, 1924: 285; Gressitt, 1937: 595; Breuning, 1961: 319; Hua, 2002: 191; Hua, et al., 2009: 194, 333, Pl. LX II: 713; Wang, 2014; Lazarev & Murzin, 2020: 37.

Etymology. Latin: with warts.

Diagnosis. Length 22-33 mm, width 9-12 mm. Except for the tubercles on the pronotum and summits of the granules on the elytra, the stout black body is covered with a dark brown squamosity. The head is impunctate. The antenna of the male reaches about three fourths of the elytron and that of the female is about half the elytron; The prothorax has five tubercles on the disk and acute spines at the sides, and the largest heart-shaped median tubercle is remarkably emarginate behind with two light notches in the front, opposite the two smaller, nearly smooth and rounded-shaped tubercles placed one on each side in front of the largest median one, while the other two smallest and hardly noticeable tubercles lie respectively on each side of and is closely connected to the largest median one with their free lateral borders overlapping and partly hiding them. Each elytron has five rows of smaller granules and four rows of larger serrated tubercles. The su-

tural smaller-granule row appears double at the base while on the outer margin of each elytron, there is another short row of smaller granules that extends from the base about one third of its length.

3.1.3. Material Examined

Syntype pattern. ♀ (Figure 1A), CHINA, North China, Ganhan C. J. 1888: 270-271, pl. XVI, Figure 1. Syntypes. ♀♀ (Figure 2A; B), CHINA, North China, Charles Joseph GAHAN, NHMUK 014596100, NHMUK 015529345. Identified specimen. ♂ (Figure 1B), CHINA, Guangxi, Gongcheng County, 7-IV-2006; Wang ZC 2014: 556: Figure 3054.

Distribution. China (North China, Shaanxi, Hubei, Zhejiang, Jiangxi, Hunan, Sichuan, Fujian, Guangdong, Guangxi, Guizhou, Hainan); Vietnam.

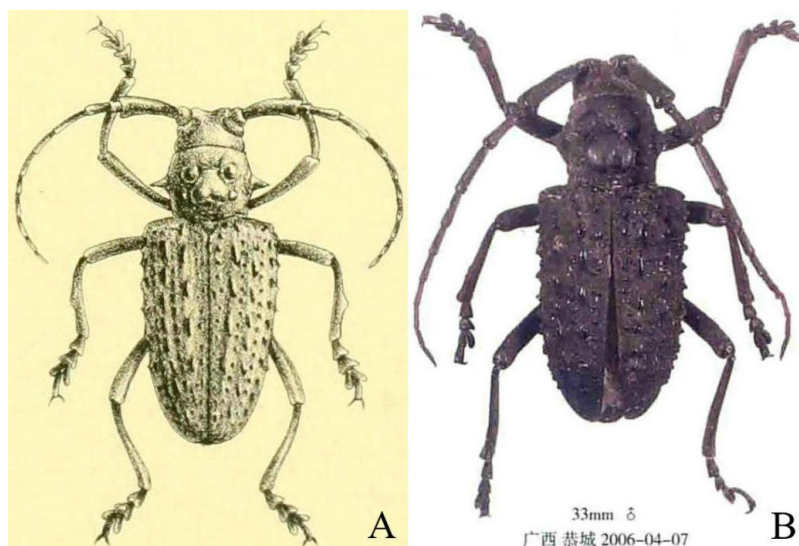


Figure 1. *Aethalodes verrucosus verrucosus* Gahan, 1888. A. Syntype pattern, ♀, CHINA, North China, Ganhan C. J. 1888: 270-271, pl. XVI, Figure 1; B. Identified specimen, ♂, CHINA, Guangxi, Gongcheng County; 7-IV-2006; Wang ZC 2014: 556: Figure 3054.

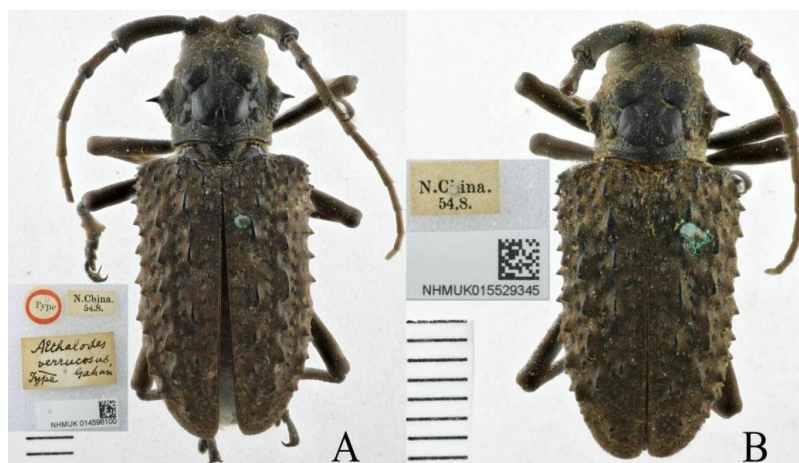


Figure 2. *Aethalodes verrucosus verrucosus* Gahan, 1888. A. Syntype, ♀, NHMUK 014596100; B. Syntype, ♀, NHMUK 015529345. Scale bar = 1 mm.

3.2. *Aethalodes formosanus* Kriesche, 1924 Stat. rev. (Figures 3-5)

3.2.1. Description

Aethalodes formosanus Kriesche, 1924: 285; *Aethalodes verrucosus* ssp. *formosanus* Kriesche, 1924; Breuning S. 1961: 319; Wang ZC, 2014: 556: Figure 3053.

Kriesche first described *Aethalodes formosanus* from Taiwan as a new species. Breuning changed the species into *Aethalodes verrucosus* ssp. *formosanus* Kriesche, 1924, in a pure catalog without providing any convincing scientific evidence for such a taxonomic change.

Etymology. Latin: from Formosa (Taiwan region)

Differential diagnosis. The antennae of the male adult is longer than the body (that of *Aethalodes verrucosus* is short than the body, reaching about three fourths of the elytron) and that of the female reaches about three fourths of the elytron (that of *Aethalodes verrucosus* reaches about half the elytron). Such a significant difference in the length of the antennae is the decisive feature distinguishing *Aethalodes formosanus* from *Aethalodes verrucosus* as an independent species.

Aethalodes formosanus also differs from *Aethalodes verrucosus* in the following details: the black body is covered with more prominent rust-colored squamosity; the largest median tubercle on the disk is somewhat quadrate and unsmooth for the male, the two side front tubercles are more ridged and less rounded for both the male and female. For the male, the large central tubercle of the pronotum is longitudinally furrowed throughout; the lateral edges of this furrow are raised, especially in front (in the nominate subspecies this furrow is weak behind and becomes increasingly weaker towards the front; it does not go all the way through). On each

side of the furrow there is a narrow longitudinal pit in front; the rest of the hump is roughly wrinkled and granular (in the nominate subspecies without pits and smooth). The two smooth round tubercles in front of this central tubercle in the nominate subspecies appear here as two noticeably larger, irregularly fissured, almost kidney-shaped formations; the area between them, almost flat in the nominate subspecies, only very shallowly deepened in the middle towards the front, shows here a narrow longitudinal groove with raised edges. The lateral parts of the pronotum are roughly wrinkled with individual deep furrows. The large spines are spaced farther apart within the individual rows on the blankets, but are sometimes significantly longer at their base (but not higher), especially in the first two rows. In contrast, the first row of short spines next to the suture is less developed in its initial part; here, too, the spines are somewhat wider.

3.2.2. Type Material (Not Examined)

Holotype (unavailable). TAIWAN Region, Formosa, Taihorin.

3.2.3. Type Material Examined

Neotype. ♀, TAIWAN Region, Formosa, Kosempo; 7-VII-1911, Hans SAUTER, Bernhard Schwarzer det.; SDEI 303808 (Figure 3). Neotype. ♀, TAIWAN Region, Formosa, Banshorvo Distr., Sokutsu, 7-VIII-1912; same data as 303808, SDEI 303809 (Figure 4). Identified specimen. ♂, TAIWAN Region, Kaixiang ZHAN, TEOL (Figure 5A). Identified specimen. ♀, TAIWAN Region, Nantou County; IIC (Figure 5B).

Distribution. Taiwan region.



Figure 3. *Aethalodes formosanus* Kriesche, 1924 stat. rev., neotype, ♀, SDEI 303808. A. Dorsal view; B. Ventral view; C. Lateral view.



Figure 4. *Aethalodes formosanus* Kriesche, 1924 stat. rev., neotype, ♀, SDEI 303809. A. Dorsal view; B. Ventral view; C. Lateral view.

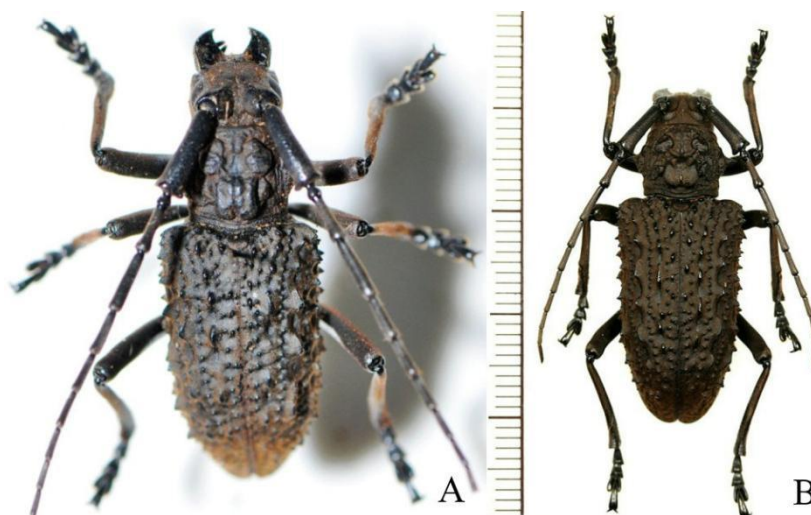


Figure 5. Identified specimens of *Aethalodes formosanus* Kriesche, 1924 stat. rev. A. ♂, TAIWAN Region, Kaixiang ZHAN, TEOL; B. ♀, TAIWAN Region, Nantou County, IIC.

3.3. *Aethalodes verrucosus anhuiensis* YY. Zhou ssp. nov. (Figures 6-7)

Description (male). Length 26.0 mm, width 11.0 mm. The antennae reaches three fourths of the elytron; the scape is stout, punctate, subcylindrical, slightly curved and gradually thickened from the base to the apex. The black body is partly but significantly covered with white squamosity between its antennal tubercles, around or on the tubercles and granules of the pronotum and elytra, ventral surface and legs. The head is impunctate. The prothorax has acute spines at the sides and

five tubercles on the disk, in which the largest median one has a deeper notch behind and two shallower notches at the front opposite the two smaller ridged tubercles on each side in front; an unnoticeable short cut is surrounded by the three, the other two smallest, lowest and hardly noticeable tubercles lie respectively on each side of and is closely connected to the largest median one. Each elytron has five rows of smaller granules and four rows of larger serrated tubercles. The sutural smaller-granule row appears double at the base while on the outer margin of each elytron, there is another short row of smaller granules that extends from the base about one third of its length.



Figure 6. *Aethalodes verrucosus anhuiensis* ssp. nov., Holotype. A. Dorsal view; B. Ventral view; C. Lateral view.

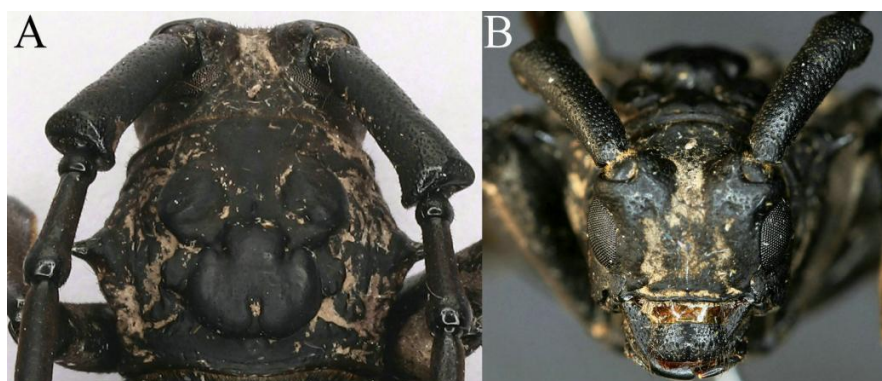


Figure 7. *Aethalodes verrucosus anhuiensis* ssp. nov., Holotype. A. Dorsal view of head, pronotum & scape; B. Front view.

Holotype. ♂, CHINA, Anhui Province, Lu'an City, Shucheng County, Shucha Township, Gou'erkou Village; 31°19'20.75"N, 117°01'16.59"E; alt.107 m; 26- VI -2023; Yeyong ZHOU & Zengfa DING (AAF); Light trap; AAF 23062608.

Etymology. From Anhui Province.

Differential diagnosis. The black body is significantly covered with white squamosity, the decisive feature distinguishing it from the nominate subspecies as an independent new subspecies.

Habitat. The holotype was collected at a hilly woodland consisting of coniferous and broadleaved woody plants including *Pinus massoniana*, *Pinus elliottii*, *Camellia sinensis*, *Cunninghamia lanceolata*, *Styphnolobium japonicum*, *Morus alba*, *Camellia oleifera* and *Rhododendron simsii*, 75 km from the provincial capital Hefei City and a branch range in the eastern foot of Dabie Mountains in the eastern province of Anhui, China.

4. Conclusion

In this paper, the original description of the genus *Aethalodes* was revised by examining of the only two female

syntypes and an identified male specimen of the type species *Aethalodes verrucosus* Gahan, 1988, while *Aethalodes verrucosus formosanus* Kriesche, 1924 is raised back to species level based on the newly-found significant differences in the length of the adult antennae as the decisive feature distinguishing *Aethalodes formosanus* from *Aethalodes verrucosus* as an independent species. A new subspecies, *Aethalodes verrucosus anhuiensis* subsp. nov. is described from China's Anhui Province, whose unique partial white squamosity on the black body is distinguished from the dark brown squamosity of the nominate subspecies. More field surveys are required to find and observe *Aethalodes* adults, their host plants and habitat in China, and efforts should be made to collect more specimens for further study.

5. Discussion

In view of the fact that only one male adult of *Aethalodes* was collected among many adults of longhorn species in our 14 month-long longhorn beetle-collecting fieldwork, there is reason to believe that *Aethalodes verrucosus* population may be very small in China now, where, like in some other countries, longhorn beetles have long been regarded as pests

without recognizing the fact that native longhorn beetles are valuable members of the forest ecosystem maintaining ecological balance and playing an immensely important role in nutrient recycling.

It is hoped that a unified network could be established in China where amateur naturalists and experts could record, share, and discuss their observations of insects and other living things, improving their understanding on biodiversity, contributing data to science and helping protect biodiversity at the same time.

Abbreviations

AAF	Anhui Academy of Forestry
IIC	Insect Islands Collection
NHMUK	The Natural History Museum
SDEI	Senckenberg Deutsches Entomologisches Institut
TEOL	Taiwan Encyclopedia of Life

Acknowledgments

This research was supported by Anhui Provincial Natural Science Foundation Project (Grant Number 109136081024). We are grateful to Principal Curator Dr Gavin Broad, Senior Curator Maxwell V. L. Barclay and Photographer Keita Matsumoto (The Natural History Museum, London, UK) for arranging, checking and photographing the two syntypes of *Aethalodes verrucosus verrucosus* Gahan, 1888. We thank Deputy to the Director & Curator Dr Stephan M. Blank, Technician Mandy Schröter and Photographer Kevin Weiling (Senckenberg German Entomological Institute, Münchenberg, Germany) for providing the original literature photocopies, arranging, checking and photographing the two neotypes of *Aethalodes formosanus* Kriesche, 1924. Sincere thanks are given to the developers and maintainers of the Biodiversity Heritage Library of Smithsonian Institution, GBIF France Titan database about Longhorns or Timber-Beetles (Cerambycidae), Taiwan Encyclopedia of Life (TaiEOL) and iNaturalist for providing valuable information for our research. We express our gratitude to ZHAN Kaixiang and the host of Insect Islands Collection from Ishigaki Island, Japan for providing images of *Aethalodes* specimens. We are grateful to entomologists HUA Lizhong, Hajime Nara, G. A. Saemulson and S. W. Lingafelter and WANG Zhicheng for giving descriptions and images on *Aethalodes* in their publications.

Author Contributions

Zhou Yeyong: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing

Ding Zengfa: Investigation

Conflicts of Interest

The authors declare no conflicts of interest.

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