Zoological Systematics, 41(3): 261–272 (July 2016), DOI: 10.11865/zs.201627

ORIGINAL ARTICLE

New synonymies and records of the stag-beetle genus *Aegus* MacLeay from Chinese fauna (Coleoptera: Lucanidae)

Yuyan Cao[1], Michael D. Webb[2], Ming Bai[3], Xia Wan[1*]

[1]*Department of Ecology, School of Resources & Engineering, Anhui University, Hefei 230601, China*
[2]*Department of Life Sciences (Entomology), The Natural History Museum, Cromwell Road, SW7 5BD, London, UK*
[3]*Institute of Zoology, Chinese Academy of Sciences, Beijing 100101, China*
[*]*Corresponding author, E-mail: wanxia@ahu.edu.cn*

Abstract Four new synonyms in the stag-beetle genus *Aegus* MacLeay from Chinese fauna are proposed and discussed based on their type specimens: *A. pichoni* Didier 1931, **syn. nov.** = *A. laevicollis* Saunders 1854; *A. beauchenei* Boileau 1902, **syn. nov.** and *A. caprinus* Didier, 1928, **syn. nov.** =*A. taurus* Boileau, 1899; *A. dispar* Dider 1931, **syn. nov.** =*A. kuangtungensis* Nagel, 1925. A species checklist with fifteen species of this genus from China is given, including two new record species, *A. labilis* Westwood, 1864 from Xizang and *A. coomani* Didier, 1926 from Guangxi.

Key words Coleoptera, Lucanidae, *Aegus*, new synonym, Chinese fauna.

1 Introduction

Aegus MacLeay is the largest genus stag beetle genus in Lucanidae with about 260 species and subspecies known in the World. The vast majority of them are distributed in Southeast Asia and the Pacific and 15 valid species (including1 subspecies) are reported here from Chinese fauna. The taxonomy of *Aegus* is badly in need of revision. At the generic level, fourteen genera have either been synonymized with *Aegus* (see the checklist) or placed as subgenera (Maes, 1992, 2004; Özdikmen & Turgut, 2006) but these authors usually did not fully discuss their reasoning making further work necessary to confirm the synonymy.

Species identifications of *Aegus* are also difficult due to dramatic external intraspecific variation resulting from sexual dimorphism and male polymorphism. Therefore, many species and subspecies that have been published solely on the basis of a small sample (of either male or female), has led to more taxonomic confusion and a relatively high proportion of possible synonyms (pers. com. Dr. Luca Bartolozzi). For future revision of the genus it will be important to make reference to type specimens using reliable characters for the species identification irrespective of the size of males, i.e., shape of ventral basal tooth of mandible, shape of labrum, number of elytra striae and structure of aedeagus. Characters of head and genitalia are also valuable for identifying females.

Recently, we have the opportunity to study some type material of *Aegus* deposited in European museums. Based on this work, four new synonymies of species described from Chinese fauna (see the checklist) are here proposed and their examined type specimens are discussed.

2 Materials and Methods

urn:lsid:zoobank.org:pub:3359ADE7-D4BC-402E-A689-C7AD4CBEC846
Received 8 March 2016, accepted 5 July 2016
Executive editor: Fuqiang Chen

The terminology used here refers to the work of Holloway (2007). Measurements are in millimeters (mm). The following abbreviations are used:

BP—basal piece;
ML—median lobe;
PA—paramere;
PES—permanently everted internal sac;
TL—type locality;
TD—type depository.

Materials used in this work are deposited in or borrowed from the following institutions:

BMNH—The Natural History Museum, London, UK;
MAHU—Museum of Anhui University, Hefei, Anhui, China;
MNHN—Museum National d' Histoire Naturelle, Paris, France;
NSMT—National Science Museum (Natural History), Tokyo, Japan;
NZMC—the National Zoological Museum of China, Beijing, China;
ZMHB—Museum für Naturkunde, Humboldt-Universität, Berlin, Germany;
ZIN—Museum of the Zoological Institute, Russian Academy of Sciences, St Petersburg, Russia.

3 Taxonomy

3.1 Nomenclatorial changes

Genus *Aegus* MacLeay, 1819

Aegus Macleay, 1819. *Horae Ent.*, 1(1): 112. Type species: *Aegus chelifer* Macleay, 1819.

Alcimus Fairmaire, 1849. *Rev. Mag. Zoo. Appl.*, 1: 416. Type species: *Alcimus dilatatus* Fairmaire 1849. Syn. by Arrow, 1935. *Trans. R. Ent. Soc. Lond.*, 83: 113–114. Preoccupied name: *Alcimus* Loew, 1848 in Asilidae, Diptera; *Alcimus* Dallas, 1851 in Pentatomidae, Hemiptera.

Paraegus Gahan, 1888. *Proc. Zoo. Soc. Lond.*, 37: 539. Type species: *Paraegus listeri* Gahan, 1888. Syn. by Arrow, 1943. *Proc. R. Ent. Soc. Lond.* (B), 12: 140.

Xenostomus Boileau, 1898. *Bull. Soc. Ent. Fr.*, 47: 264. Type species: *Xenostomus ritsemae* Boileau, 1898. Syn. by Arrow, 1943. *Proc. R. Ent. Soc. Lond.* (B), 12: 140.

Eubussea Zacher, 1913. A*rbeit. Kaiser. Bio. Anst. Land- und Forst.*, 9(1): 93. Type species: *Eubussea dilatata* (Fairmaire, 1849). Syn. by Arrow, 1935. *Trans. R. Ent. Soc. Lond.*, 83: 113–114.

Malietoa Kriesche, 1921. *Archiv Naturgesch.* (A), 86(8) [1920]: 104. Type species: *Malietoa hindenburgi* Kriesche, 1921. Syn. by Arrow, 1935. *Trans. R. Ent. Soc. Lond.*, 83: 113–114.

Elsion Kriesche, 1921. *Archiv Naturgesch. (A)*, 86(8) [1920]: 105. Type species: *Elsion sepicanum* Kriesche 1921. Syn. by Benesh, 1960. *Coleop. Cat. Suppl.*, 8: 100.

Odontaegus Kriesche, 1935. *Koleop. Rundsch.*, 21: 174. Type species: *Gnaphaloryx dain* Kriesche, 1920. Syn. by Didier & Seguy, 1953. *Encycl. Ent.*, 27 (A): 154.

***Aegus laevicollis laevicollis* Saunders, 1854** (Figs 1–5, 14–15, 17)

Aegus laevicolle Saunders, 1854. *Trans. Ent. Soc. Lond.*, (2)3: 54., plate IV, fig. 8. Incorrect original spelling.

Aegus punctiger Saunders, 1854. *Trans. Ent. Soc. Lond.*, (2)3: 55, plate III, fig. 6. Syn. by Parry, 1864. *Trans. R. Ent. Soc. Lond.*, 3(2): 92.

Aegus formosae Bates, 1866. *Proc. Zool. Soc. Lond.*, 1866: 347. Syn. by Parry, 1870. *Trans. R. Ent. Soc. Lond.*, 1870(1): 63.

Aegus laevicollis: Parry, 1870. *Trans. R. Ent. Soc. Lond.*, 1870(1): 63. Correct subsequent spelling (ICZN, Chapter 7: Article. 31. 2).

Aegus laevicollis laevicollis: Mizunuma & Nagai, 1994. *The Lucanid Beetles of the World*: 288, pl. 127.

Aegus pichoni Didier, 1931. *Librairie speciale Agricole*, Paris Fascicule 9: 210–211. **syn. nov.**

Type material examined. Syntype ♂ of *Aegus laevicollis* Saunders (BMNH) (Fig. 1), labelled: "SYNTYPE (blue label) /85 28 / laevicollis var. max China [yellow label, handwritten] / BMNH (E) #611193 / H. Bomans det. 1983, Aegus laevicollis Saund., ♂, SYNTYPE?". Syntype ♂ of *Aegus laevicollis* Saunders (BMNH) (Fig. 2), labelled: "SYNTYPE [blue label] / Type [red label] / TYPE SP. [brown label] / Aegus laevicollis n. sp. [brown label, handwritten] / Aegus laevicollis, type sp., China [yellow label, handwritten] / BMNH (E) # 611200 / H. Bomans det. 1983, Aegus laevicollis Saund., ♂, SYNTYPE". Syntype ♂ of *Aegus laevicollis* Saunders (BMNH), labelled: "SYNTYPE [blue label] / 11331 / Fortune / Fry

Coll. 1905-110 / BMNH (E) # 611198 / H. Bomans det. 1983, Aegus laevicollis Saund., ♂, SYNTYPE?". Syntype ♀ of *Aegus punctiger* Saunders (BMNH) (Fig. 3), labelled: "SYNTYPE / Cotype / 85/28 /Aegus punctiger Saunders. Ent. [-?] Shanghai [handwritten] / SYNTYPE Aegus punctiger Saund. M. E. Bacchus det. 1983 / H. Bomans det., 1983 Aegus laevicollis Saund. ♀ / BMNH (E) # 611199". Syntype ♀ of *Aegus punctiger* Saunders (BMNH), labelled: "SYNTYPE [blue label] / Cotype [yellow label] /85/28 / China, Fochow / laevicolle ♀, punctiger Saunders / SYNTYPE, Aegus puncticollis Saund., M. E. Bacchus det, 1983 / BMNH (E) # 611536. Syntype ♂ of *Aegus pichoni* Didier (MNHN), labelled: "TYPE [red label] / Hang-Tchéou, prov. du Tchèkiang, Pichon, Chine / Pichoni Didier [handwritten] / Museum Paris Coll. R. Didier 1937 / Aegus pichoni, Did., Holotype ♂, J. P. Lacroix det. 1973". Syntype ♂ of *Aegus pichoni* Didier (MNHN), labelled: "Hang-Tchéou, prov. du Tchèkiang, Pichon, Chine / Museum Paris / Aegus pichoni, Did., J. P. Lacroix det. 1973".

Additional material examined. China, Anhui, 23.VII.1936, 1♂3♀, collector unknown (NZMC); Anhui, Mt. Huangshan, 22.VII.1965, 2♀, collector unknown (NZMC); Zhejiang, Mt. Moganshan, 20.V.1935, 26♂1♀, collector unknown (NZMC); Zhejiang, Mt. Tianmushan, 20.VII.1936, 1♂3♀, collector unknown (NZMC); Fujian, Fuzhou, 12♂4♀, collector unknown (NZMC); Fujian, Mt. Wuyishan, 22.VII.2011, 4♂2♀, leg. Yuyan Cao (MAHU).

Distribution. China (Hunan, Anhui, Shanghai, Zhejiang, Fujian).

Remarks. *A. laevicollis* was described from an unknown number of males (syntypes), of "Length 9/10 inch", and a figure of a fully-developed male given (see Fig. 1a). No data was given but for the paper title indicating the species was from China collected by R. Fortune and in the introduction it is noted that Fortune collected in the "Tea Districts". There is one large male syntype labelled with the specimen number (Fig. 1) which matches Saunders's figure and a few other specimens labelled as syntypes of *A. laevicollis* in the BMNH. Saunders also described *A. punctiger* in the same paper from an unknown number of females (syntypes), of "Length 7/10 inch", also stating "This species appears to be rare as very few specimens have been sent home". Two syntypes are present in BMNH. Saunders (1854) initially named this species "*A. laevicolle"*, a spelling that did not agree in gender with the generic name and was incorrect according to the ICZN (Chapter 7: Article 30. 2); Parry (1870) corrected the name to its current spelling of "*A. laevicollis*".

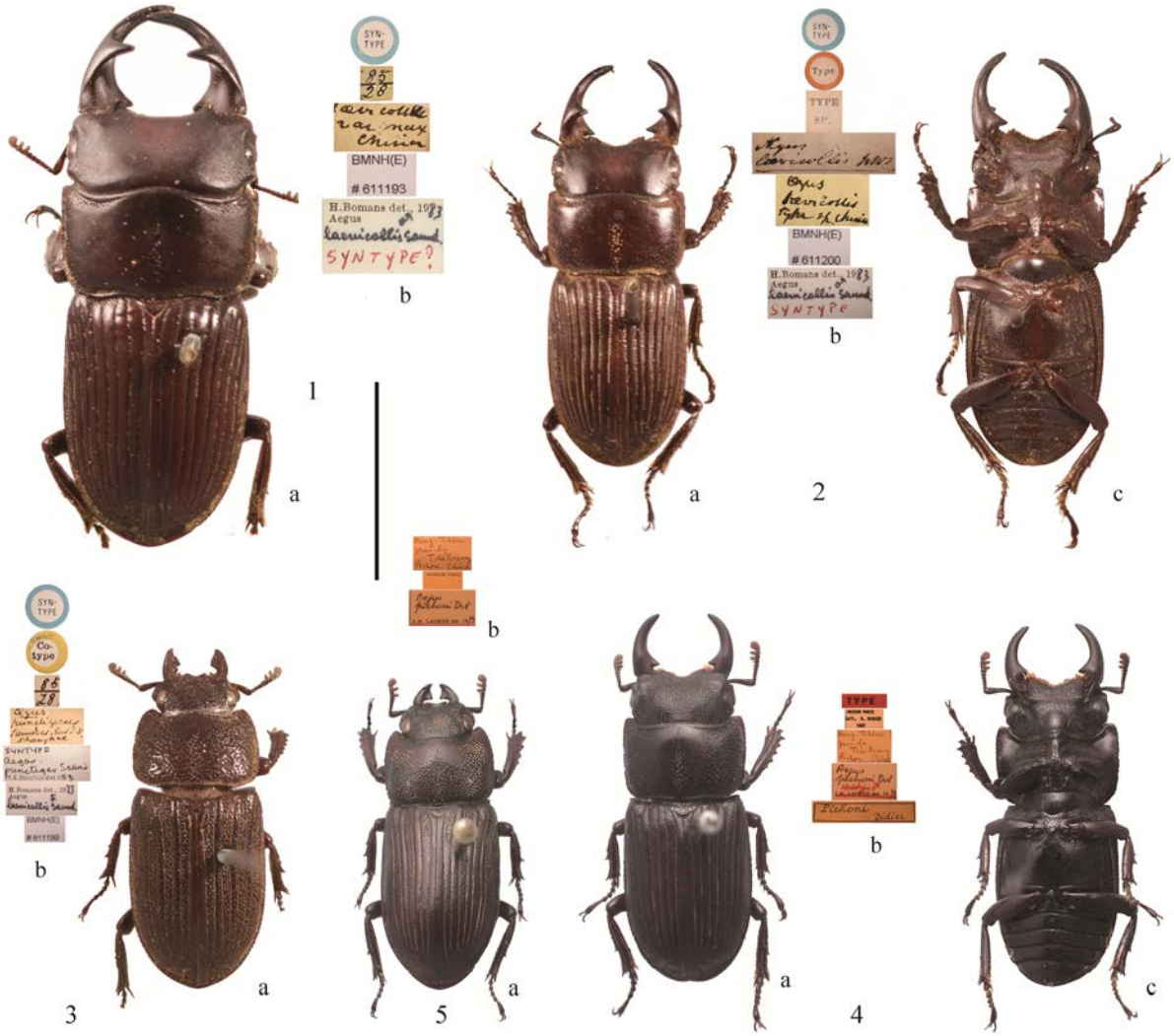
The species of *A. pichoni* Didier was described with the following data: "Types ♂ et ♀, collectés à Hang-Tchéou, province du Tché kiang [=Hangzhou, Zhejiang], China, par notre ami M. Albert Pichon, à qui nous sommes heureux de dédier cette espèce nouvelle." A small male and female (syntypes, Figs 4–5) are in the Paris Museum matching this data. Their characters, including the male and female genitalia, indicate they are a small male and female of *A. laevicollis.*

Intraspecific variation is very conspicuous in this species, especially the head and mandibles of differently sized males. In large males: head mainly granulated with dense large punctures behind eyes; mandibles fully-developed, about twice length of head, with large ventral basal teeth and dorsal middle teeth, dorsal ones much larger and longer than ventral ones; large triangular frontal tubercles on head, strongly erect; pronotum mainly smooth except for densely punctured straight margins. In medium-sized males (Fig. 2): head more deeply punctured; mandibles fully-developed, about as long as or slight longer than length of head, dorsal teeth slightly larger or as same size as basal teeth and more backward pointing; frontal tubercles smaller and feebly erect; pronotum mainly densely and deeply punctured, the margins slightly serrated, depression with denser and deeper punctures. In small males: head evenly covered with dense and deep large punctures; mandibles with very small ventral basal teeth, dorsal teeth vestigial or absent; frontal tubercles absent; pronotum covered with very dense punctures, margins strongly serrated. Female is very similar to small male except for smaller head and feebler mandibles with a broad large tooth ventrally at mid-length.

Despite the above variation the basal tooth, labrum and pronotum of *A. laevicollis* exhibit a high degree of similarity. The basal tooth is small and bluntly triangular, the labrum is short, about half width of head, almost semicircular, and deeply concave in middle, and the pronotum is almost square-shaped, parallel-sided, with a distinct longitudinal depression at mid-length posteriorly, its front angle produced and entire without any apical concavity. In addition, the elytra possess six deep discal striae and two feeble lateral ones. The aedeagus is almost uniform in shape and size: PA laminate about 1/2 length of BP, apex bluntly rounded in lateral view; BP slightly rounded in basal 2/3 and much thinner and narrower in distal 1/3, with two very short finger-shaped stripes on membranous surface; ML almost symmetrical, with almost straight lateral margins and very small, sharp and recurved apex. PES long and thin, about 3 times as long as length of tegmen (Fig. 17).

Taxonomy of *A. laevicollis* is also quite problematic because of the large number of subspecies. Two allied species, *A. formosae* Bates from Taiwan Island and *A. subnitidus* Waterhouse from Japan, were thought to be synonyms of *A. laevicollis*. In our opinion, the two taxa could be subspecies of *A. laevicollis* due to their geographical isolation and some stable morphological differences (see the checklist). Japanese entomologists added a lot of allied taxa to this species (Nomura, 1960; Ichikawa & Imanishi, 1976; Fujita & Ichikawa, 1985; Mizunuma & Nagai, 1994; Asai, 2001; Fujita, 2002; Murayama & Shimizu, 2004). Until now, the species group of *A. laevicollis* has contained 15 taxa. Thirteen of them including *A. subnitidus* were treated as subspecies from various Japanese Islands except for the two full species, *A. laevicollis* and *A.*

formosae. Therefore, taxonomy of these taxa should be very interesting but challenging work with regard to so many "subspecies".

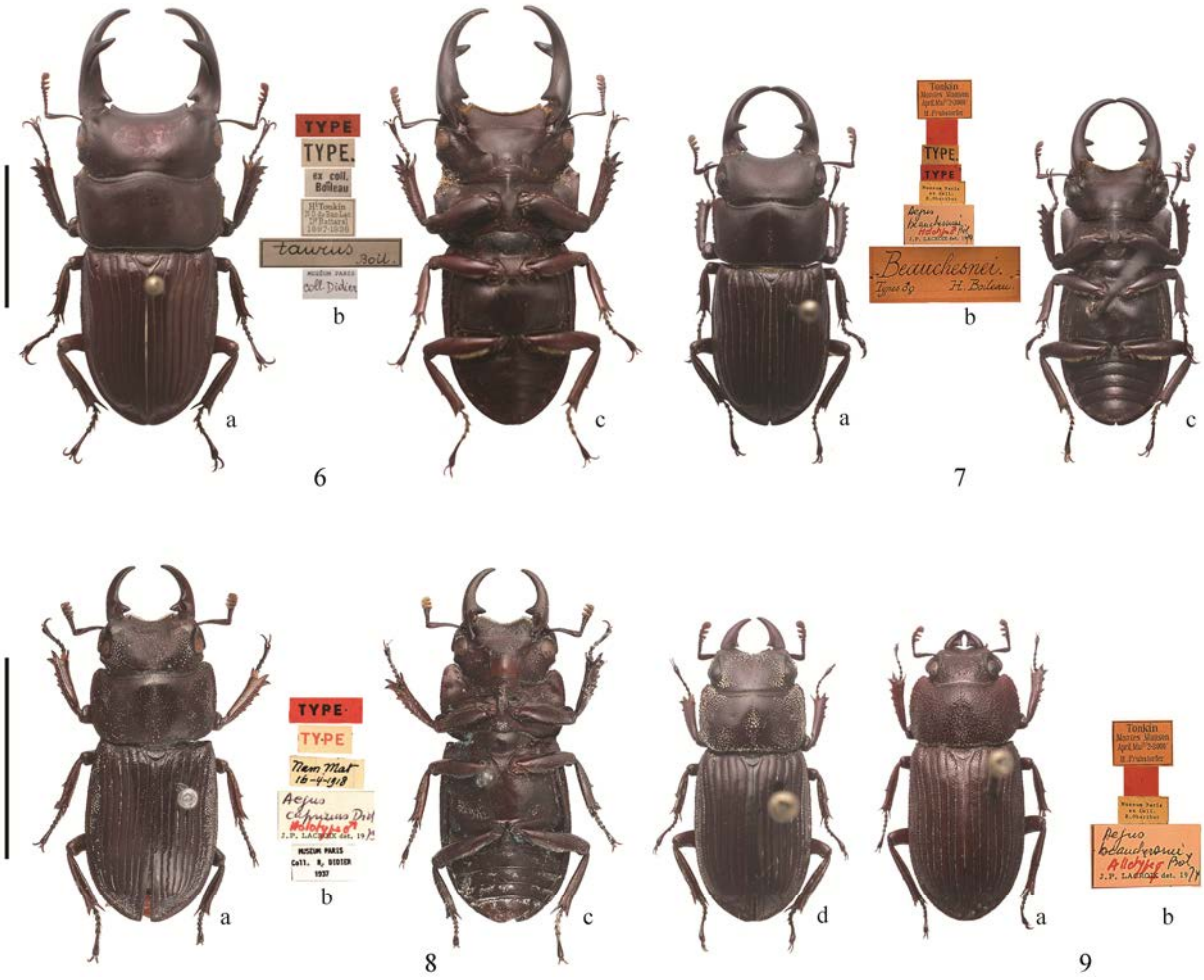


Figures 1–5. *Aegus laevicollis*. 1. Syntype of *A. laevicollis*, large ♂. 2. Medium-sized ♂. 3. Syntype of *A. punctiger* (synonym of *A. laevicollis*), ♀. 4. Syntypes of *Aegus pichoni* (synonym of *A. laevicollis*), small ♂. 5. Syntypes of *Aegus pichoni* (synonym of *A. laevicollis*), ♀. a. Dorsal view. b. Labels. c. Ventral view. Scar bars = 10 mm.

***Aegus taurus* Boileau, 1899** (Figs 6–9, 18)

Aegus taurus Boileau, 1899. *Bull. Soc. Ent. Fr.*, 48: 320.
Aegus beauchenei Boileau, 1902a. *Bull. Soc. Ent. Fr.*, 1902: 288. **syn. nov.**
Aegus caprinus Didier, 1928. *Librairie speciale Agricole*, Paris Fascicule 2: 60. **syn. nov.**

Type material examined. Syntype ♂ of *Aegus taurus* Boileau (MNHN), labelled: "Type [red color] / Type [yellow color] / Ht. Tonkin, N. O. De Bao-Lac, Dr. Battarel, 1897–1898 / ex. coll. Boileau / MUSEUM PARIS, Coll. Didier /taurus Boil." Syntype ♂ of *Aegus taurus* (BMNH), labelled: "Paratype (red label) / Ht. Tonkin, Dong Van, Cap Gadel 1898 / 7033 / H. E. Bomans BMNH (E) 1999-248". Syntype ♂ of *Aegus beauchenei* Boileau (MNHN), labelled: "Type [red color] / Type [yellow color] / Tonkin, Montes Manson, April–Mai, 2000–3000 feet, H. Fruhstorfer / Museum Paris, ex. coll. R. Oberthür / Beauchesnei, Types ♂♀, H. Boileau / Aegus beauchenei, Boil., Holotype ♂, J. P. LACROIX, det., 1974". Syntype ♀ of *Aegus beauchenei* Boileau (MNHN), labelled: "Tonkin, Montes Manson, April–Mai, 2000–3000 feet, H. Fruhstorfer / Museum Paris, ex. coll. R. Oberthür / Aegus beauchenei, Boil., allotype ♀, J. P. LACROIX, det., 1974". Syntype ♂ of *Aegus caprinus* Didier (MNHN), labelled: "TYPE [red label] / TYPE [yellow lable] / nam mar, 6-14-1918 / MUSEUM PARIS,



Figures 6–9. *Aegus taurus*. 6. Syntype of *A. taurus*, large ♂. 7. *A. beauchenei*, **syn. nov.** of *A. taurus*, syntype, medium-sized ♂. 8. *A. caprinus*, **syn. nov.** of *A. taurus*, syntype, small ♂. 9. *A. beauchenei*, **syn. nov.** of *A. taurus*, syntype, ♀. a. Dorsal view. b. Labels. c. Ventral view. d. Diagnosed specimen, dorsal view. Scar bars = 10 mm.

Coll. Didier, 1937 / A. caprinus, Did., Holotype ♂, J. P. LACROIX, det., 1973".

Additional material examined. China, Hainan, Jianfengling, Tianchi, 750 m, 22.III.1980, 3♂2♀, leg. Shuyong Wang (NZMC); Guangxi, Longzhou, Mt. Daqingshan, 360 m, 22.I.1963, 1♂, leg. Chunguang Wang (NZMC); Guangxi, Napo, Beidou, 550 m, 22.VI.2000, 1♀, leg. Jun Chen (NZMC); Guangxi, Jinxiu, Mt. Dayaoshan, 25.VI.2011, 7♂2♀, leg. Xiaoyan Hu (MAHU).

Distribution. China (Guangxi, Hainan), N. Vietnam.

Remarks. Boileau (1899) described this species from many males from North Vietnam in the following way: "Plusieurs ♂, du Haut-Tonkin: Dong-Van". It was described on the basis of typical large males but small males were also mentioned and the female was unknown. A large male (syntype) with "Type" and handwritten labels of Boileau in the MNHN has external characters consistent with the original description. A small male labelled "Paratype" in the BMNH from Bomans collection is also considered a syntype as its external characters and locality correspond to the original description.

The two species treated here as junior synonyms of *A. taurus* were described from the same area as *A. taurus*. The first *A. beauchenei* was described from many examples (syntypes) in the following way: "Tonkin, plusieurs exemplaires". A medium-sized male and a female with "Type" and handwritten labels of Boileau (MNHN) are considered syntypes (Figs 7, 9); "*beauchenei*" in the paper was wrongly written as "*Beauchesnei*" on the handwritten label (Fig. 7b). The second species, *A. caprinus* was described from an unknown number of males (small) and females (syntypes) in the following way: "Types ♂ et ♀ de Nam-Mia et Pow-Lan (Tonkin) ex-collection Boileau". A small male syntype (Fig. 8) has been examined (MNHN) but the female has not been found during this study.

Morphological comparisons of the above type specimens revealed that of all three species belong to the same species. All share the following stable characters: male mandibles with small, short and triangular ventral basal teeth; labrum

laminated and gently curved; pronotum transverse with truncated front angles, median longitudinal depression present but with very sparse punctures; six deep dorsal striae and two weak lateral oblique striae on each elytron; the meso- and hind femora with dense yellow hairs ventrally. As a key character for species identification, the aedeagus of the three type specimens show several similarities: PA laminated, about 1/3 length of BP, apex sharp in the lateral view; BP quite long, almost parallel-sided in basal 2/3 and sharp in distal 1/3; ML almost symmetrical, with almost straight lateral margins and very small, sharp and incurved apex; PES stout, covered with densely hairs, about twice as long as length of tegmen (Fig. 18). Therefore, we proposed *A. beauchenei* and *A. caprinus* as two new junior synonyms of *A. taurus* with the following intraspecific variation: syntype of *A. taurus* a large male, syntype of *A. beauchenei* a medium-sized male, syntype of *A. caprinus* a small male and a syntype of *A. beauchenei* a female.

Maes (1992) listed *A. taurus* as a subspecies of *A. laevicollis* without explanation. In fact, they are totally different species due to the morphology of the mandibles, labrum and pronotum (Figs 1–9). The aedeagus is also distinctly different in the two species, especially the PES of *A. taurus* (Fig. 18) which is short and very stout, while that of *A. laevicollis* (Fig. 17) is quite long and thin.

***Aegus kuangtungensis* Nagel, 1925** (Figs 10–13, 16, 19)

Aegus kuangtungensis Nagel, 1925. *Ent. Mitt.*, 14(5): 170.

Aegus dispar Didier, 1931. *Librairie speciale Agricole*, Paris Fascicule 9: 211. **syn. nov.**

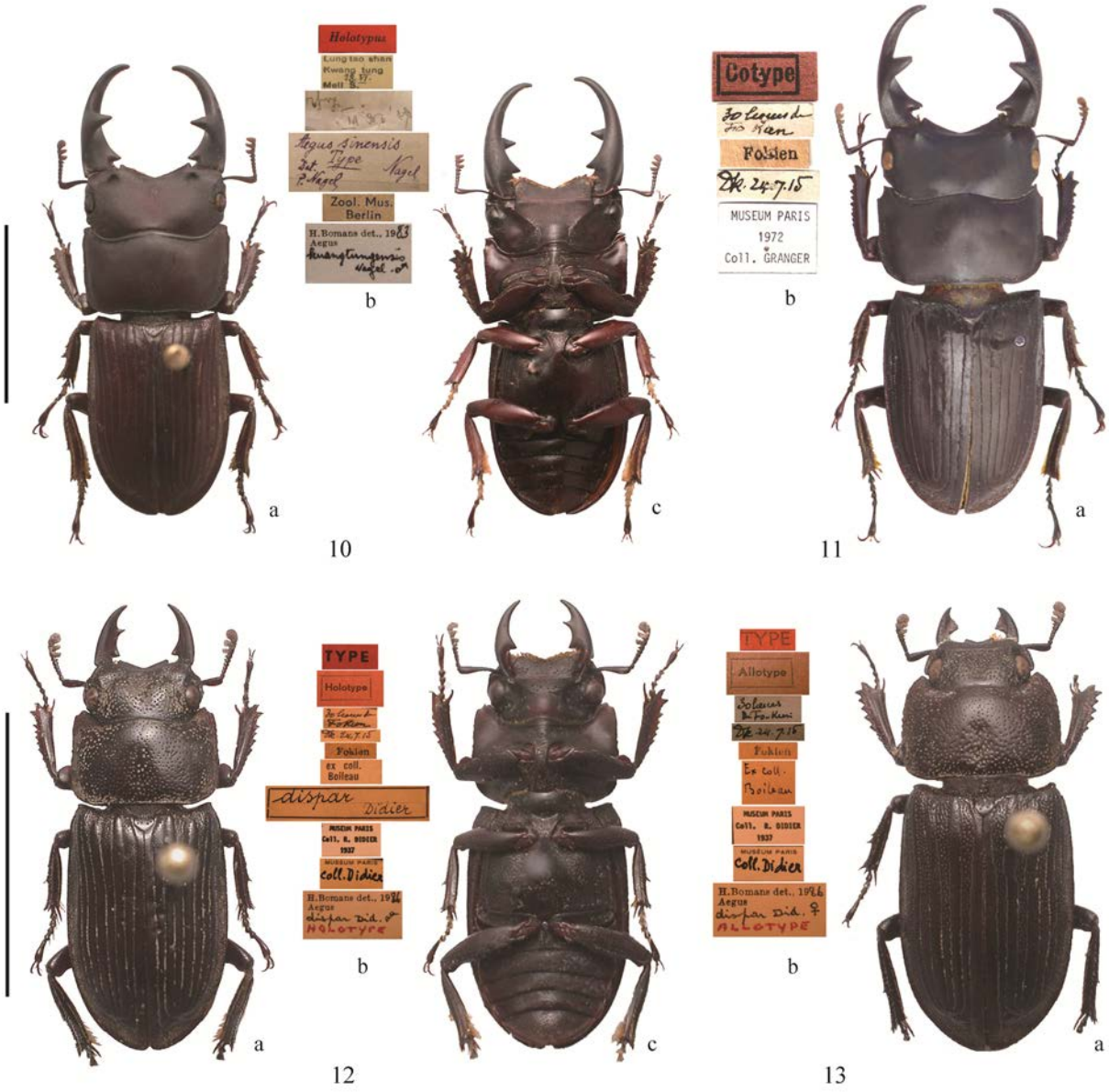
Type material examined. Syntype ♂ of *Aegus kuangtungensis* Nagel (ZMHB), labelled: Holotypus [red label] / Lung tao shan, Kuang tung, 28. VI., Mell. S. leg. / Aegus sinensis Type Det. P. Nagel Nagel. [handwritten] / Zool. Mus. Berlin / H. Bomans det., 1983 Aegus kuangtungensis Nagel,♂. Syntype ♂ of *Aegus dispar* Didier (MNHN), labelled: "Holotype [red lable] / TYPT [red] / 30 lieues de Fo-kien [handwritten] / DR [or Dk]. 24.7.15 / Fukien [handwritten] / dispar Didier [handwritten] /Ex coll. Boileau / MUSEUM PARIS coll. Didier / MUSEUM PARIS Coll. R. DIDIER 1937 / H. Bomans det., 1986, Aegus dispar Did., ♂ HOLOTYPE". Syntype ♀ of *Aegus dispar* Didier (MNHN), labelled: "Allotype [red label] / TYPE [red] / 30 lieues de Fo-kien [handwritten] / Fukien [handwritten] / DR [or Dk]. 24. 7. 15 / Ex coll. Boileau / MUSEUM PARIS coll. Didier / MUSEUM PARIS Coll. R. DIDIER 1937 / H. Bomans det., 1986, Aegus dispar Did., ♀ ALLOTYPE". Syntype ♂ of *Aegus dispar* Didier (MNHN), labelled: "Cotype [brown label, printed] / 30 lieues de Fo-kien [handwritten] / Fukien [Handwritten] / D.R.[or Dk] 24. 7.15 / MUSEUM PARIS coll. Didier.

Additional material examined. China, Hunan, Runshun, Shamuhe linchang, 600 m, 9.VIII.1988, 3♀5♂, leg. Shuyong Wang (NZMC); Hunan, Dong'an, Damiaokou Linchang, 10.VI.1981, leg. Xiaosheng Du (NZMC); Hunan, Mangshan, Pingkeng, VII.1978, 1♂, leg. Chuncai Yin (NZMC); Zhejiang, Mt. Tianmushan, 29.VII.1996, 1♂, leg. Jiang Xianlian; Zhejiang, Sanmuping, Mt. Tianmushan, 29.VI.1996, 1♂, leg. Mingshui Zhao (NZMC); Fujian, Shanghang, 23.VII.1988, 2♂, collector unknown (NZMC); Fujian, Mt. Wuyishan, 18.VII.2013, 3♂2♀, leg. Yuyan Cao & Yuanyuan Wu (MAHU); Guangxi, Jinxiu, Dayaoshan, 8♂2♀, 23.VII.2011, leg. Xiaoyan Hu (MAHU).

Distribution. China (Zhejiang, Hunan, Fujian, Guangdong, Guangxi).

Remarks. Two males (syntypes) of *A. kuangtungensis* was described by Nagel with the following habitat data: "Hab.: in monte draconis apud Siu-dsau, Kuangtung prov. China meridion. (Dr. R. Mell legit 2♂)". The place name showed that the type locality could be the current Mt. Dragon in Siu-dsau, Kuangtung (around the area of Shaoguan, Guangdong). One syntype was figured originally (Fig. 16), which was very helpful to diagnosis this species due to the type depository was not given. According to Krajcik (2003), the private collection of Nagel was possibly donated to the Hannover Museum in Germany and destroyed in the World War II. However, one male labelled "Holotypus" in ZHMB is in accordance with the original description (body 19 mm, mandible 6 mm, width 8 mm). Possibly, Nagel donated one male syntype to ZHMB but did not mention in the paper. We also found a name label of "*A. sinensis*" attached to this male (Fig. 10b). It seemed that Nagel once intended to name this specimen as *"sinensis"* but eventually replaced it with *kuangtungensis*. Female of this species was said as unknown in the description of Nagel. Bomans (1989) incorrectly reported a female from Mt. Wuyishan (Fujian Porvince) as the "Allotype" of *A. kuangtungensis*.

The extant syntype of *A. kuantungensis* (Fig. 10) is a dark brown medium-sized male. Head is transverse, scattered with minute punctures, slightly concaved centrally with two small frontal tubercles flattened horizontally and projected as small horns. Mandibles are well developed, about as 1.5 times as the length of head, each mandible with a small triangular basal tooth ventrally and a large triangular dorsal tooth near midlength. Labrum is laminated over short distance, almost V shape with deep emargination in middle. Pronotum transverse, slightly wider than head, mainly smooth except for densely punctured margins; anterior angles thorn-like strongly truncate, hind angles quite rounded; lateral margins slightly serrated; posteriorly median longitudinal depression not pronounced with few small punctures. Elytra are bright brown with seven

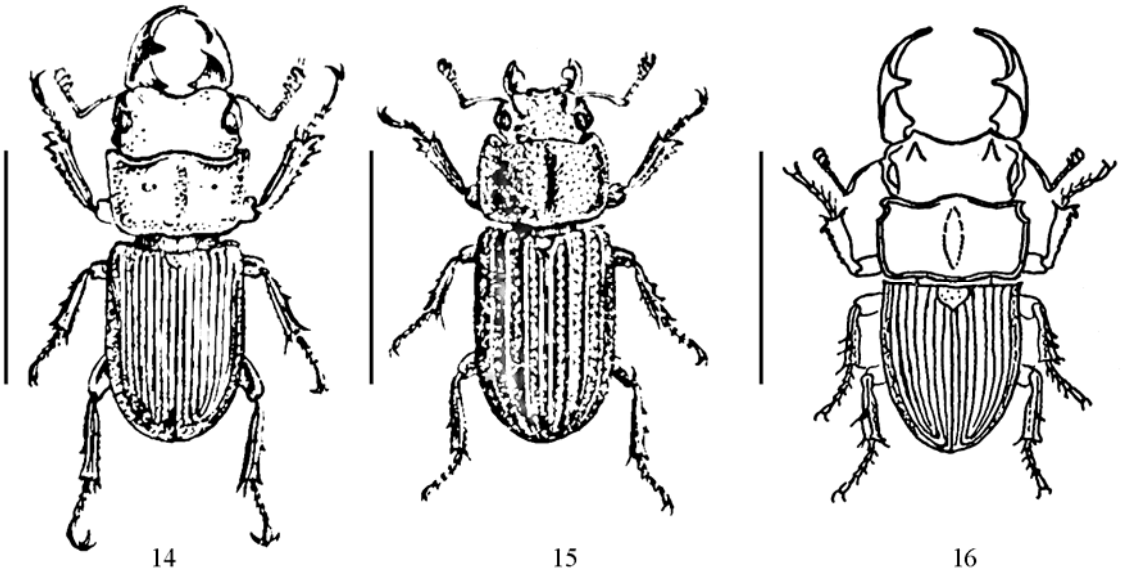


Figures 10–13. *Aegus kuangtungensis*. 10. Syntype of *A. kuangtungensis*, medium-sized ♂. 11. *A. dispar* (synonym of *A. kuangtungensis*), "Cotype", large ♂. 12. *A. dispar* (synonym of *A. kuangtungensis*), syntype, small ♂. 13. *A. dispar* (synonym of *A. kuangtungensis*), syntype, ♀. a. Dorsal view. b. Labels. c. Ventral view. Scar bars = 10 mm.

deeply dorsal striae and a weak lateral one. Legs short, finely serrated along outer margin of tibiae; front tibiae with 5–6 large teeth laterally; middle tibiae with 2 small ones; hind tibiae with a single very minute tooth, with long dense yellow hairs along the inner margin of tibia.

A. dispar was described from an unknown number of female and small male ("♂ (min)") specimens (syntypes) in the following way: "Types ♂ et ♀, de Fukien, ex collection Boileau" (Figs 12–13), Fukien (=Fujian, China). Two specimens (syntypes) in MNHN match this data but a further specimen (MNHN) labelled with a "Cotype" label is of uncertain status as it is a large male (Fig. 11). The very small male syntype of *A. dispar* is distinctly different from large males of *A. kuantungensis* (including its syntype) in a few head characters. For example, its head has scattered deep dense punctures, frontal tubercles absent; mandibles poorly developed with only small basal teeth ventrally, the dorsal teeth absent; especially the left one is abnormally during the development and with another small median tooth ventrally; pronotum evenly covered with dense punctures; lateral margins markedly serrated; the middle depression posteriorly deeply and densely punctured. However, some important characters are common to both species, i.e., ventral basal teeth of mandibles are short and small; labrum laminated, almost V-shaped with deep medial emargination; elytra with seven deep dorsal striae and a weak lateral

one; hind tibiae with quite long dense yellow hairs laterally; aedeagus very similar: PA laminated, about 1/2 length of BP, apex quite broad in lateral view; BP almost parallel-sided in basal 2/3 and much thinner and narrower in distal 1/3, with two finger-shaped stripes on membranous surface; ML almost symmetrical, with bent lateral margins and very small, sharp and incurved apex; PES very long and thin with very soft tip, almost transparent and membranous, about four times as long as length of tegmen (Fig. 19). The two species are not highly similar in morphology but were originally collected from almost the same area: *A. kuantungensis* from north of Guangdong not far from the type locality of *A. dispar*, Fujian. Other collection records show that *A. kuantungensis* is widely distributed in the South China, such as Hunan, Fujian, Zhejiang and Guangdong Provinces. Based on the above findings, *A. dispar* is proposed as a new junior synonym of *A. kuantungensis*; the type series of both species essentially exhibiting the phenotype variations of *A. kuantungensis*, i.e., the syntype of *A. kuantungensis* is a medium-sized male, the syntype male of *A. dispar* is a small male with left mandible abnormality and the remaining syntype of *A. dispar* is a female. The specimen of *A. dispar* in MNHN with a "Cotype" label is a large male from Didier collection and therefore its status is uncertain. Some additional large and small specimens from Fujian Province are here identified as *A. kuantungensi* based on the above finding.



Figures 14–16. Syntypes. 14. *A. laevicollis*, large ♂, from Saunders (1854, plate IV, fig. 8). 15. *A. punctiger* (synonym of *A. laevicollis*), ♀, from Saunders (1854, plate III, fig. 6). 16. *A. kuangtungensis*, large ♂, from Nagel (1925). Scale bars = 10 mm.

3.2 Checklist of *Aegus* MacLeay from Chinese fauna

***Aegus angustus* Bomans, 1989**

Aegus angustus Bomans, 1989. *Nouv. Rev. Ent. (N. S.)*, 6(1): 17. TL: China, Fujian, Mt. Wuyishan. TD: BMNH.

Distribution. China (Zhejiang, Fujian, Hubei, Guangdong, Sichuan).

***Aegus bidens* Möllenkamp, 1902**

Aegus bidens Möllenkamp, 1902. *Insektenbörse*, 19(36): 353. TL: N. Vietnam, Tonkin. TD: MNHN.

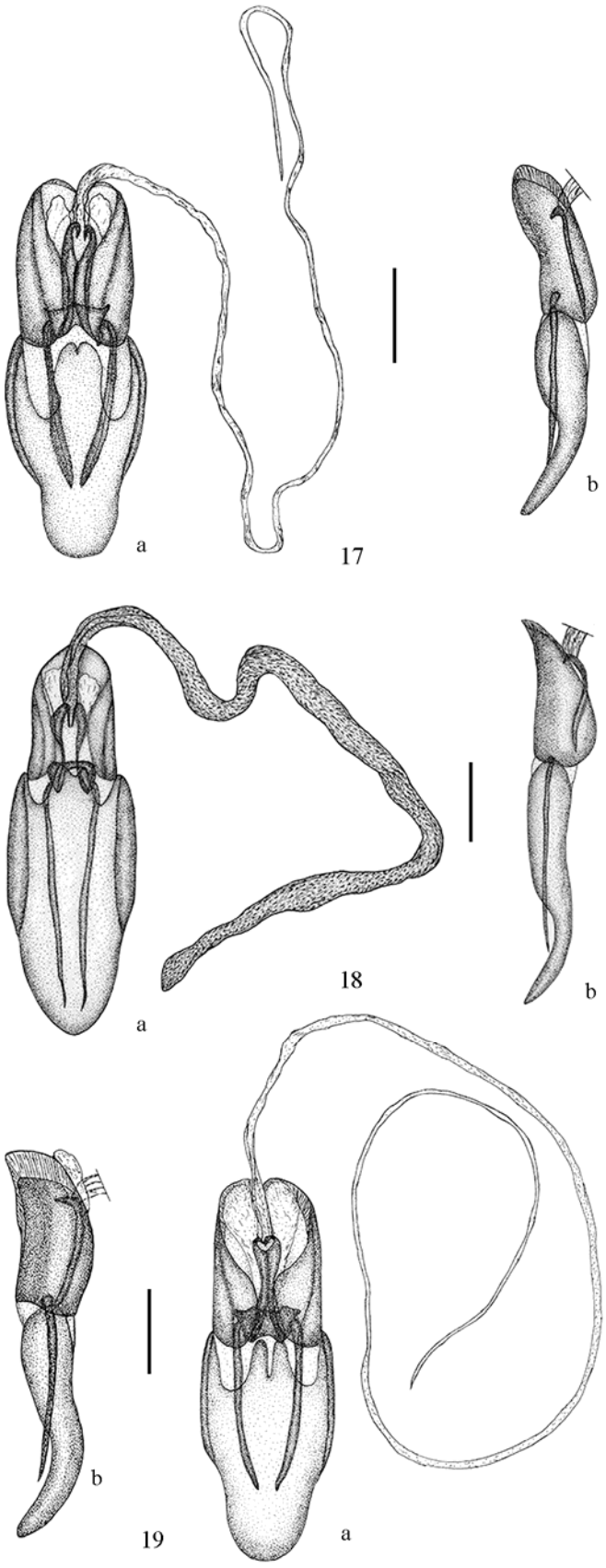
Aegus cornutus Boileau, 1899. *Bull. Soc. Ent. Fr.*, 48: 319. TL: China; TD: MNHN. Syn. by Didier & Sèguy, 1953, *Encycl. Ent.*, 27(A): 155.

Aegus imitator Nagel, 1941. *Deutsch. Ent. Zeitsch.*, 1941: 58. TL: China, Yunnan; TD: Unknown, probably in Hannover Museum and was destroyed in the World War II. Syn. by Benesh, 1960, *Coleop. Cat. Suppl.*, 8: 100.

Distribution. China (Zhejiang, Guangxi, Guangdong, Yunnan), N. Vietnam.

***Aegus callosilatus* Bomans, 1989**

Aegus callosilatus Bomans, 1989. *Nouv. Rev. Ent. (N. S.)*, 6(1): 20. TL: China, Fujian, Mt. Wuyishan. TD: BMNH.



Figures 17–19. Aedeagus. 17. *Aegus laevicollis*. 18. *A. taurus*. 19. *A. kuangtungensis*. a. Ventral view. b. Lateral view. Scar bars = 1 mm.

Distribution. China (Fujian).

***Aegus chelifer* MacLeay, 1819**

Aegus chelifer MacLeay, 1819. *Horae Ent.*, 1(1): 113. TL: Australasiâ. TD: BMNH.

Aegus nitidus Boileau, 1899. *Bull. Soc. Ent. Fr.*, 48: 321, TL: Pontianak. TD: MNHN. Syn. by Boileau, 1913. *Trans. R. Ent. Soc. Lond*., 1913: 256.

Aegus specularis Jakowleff, 1900. *Horae Soc. Ent. Ross.*, 34: 633. TL: Cochinchina. TD: ZIN. Syn. by Arrow, 1943. *Proc. R. Ent. Soc. Lond. (B)*, 12: 141.

Aegus specularis tonkinensis Kriesche, 1921. *Archiv Naturgesch. (A)*, 86(8) [1920]: 101. TL: Cochinchina. TD: ZMHB.

Distribution. China (Fujian, Guangxi, Guangdong, Yunnan), N. Vietnam, Madagascar.

***Aegus coomani* Didier, 1926 New record to China**

Aegus coomani Didier, 1926. *Bull. Soc. Ent. Fr.*, 1926: 18. TL: N. Vietnam, Tonkin. TD: MNHN.

Distribution. China (Guangxi), N. Vietnam.

***Aegus fukiensis* Bomans, 1989**

Aegus fukiensis Bomans, 1989. *Nouv. Rev. Ent. (N. S.)*, 6(1): 21. TL: China, Fujian, Mt. Wuyishan. TD: BMNH.

Distribution. China (Zhejiang, Fujian).

***Aegus kuantungensis* Nagel, 1925**

Aegus kuantungensis Nagel, 1925. *Ent. Mitt.*, 14(5): 170, Fig. 2. TL: China, Guangdong. TD: ZMHB.

Aegus dispar Didier, 1931. *Librairie speciale Agricole*, Paris Fascicule 9: 211. TL: China, Fujian. TD: MNHN. **syn. nov.**

Distribution. China (Guangdong, Guangxi, Fujian).

***Aegus kurosawai* Okajima & Ichikawa, 1986**

Aegus kurosawai Okajima & Ichikawa, 1986. *Coleop. Assoc. Japan*: 181. TL: China, Taiwan. TD: NSMT.

Distribution. China (Taiwan).

***Aegus laevicollis laevicollis* Saunders, 1854**

Aegus laevicolle Saunders, 1854. *Trans. Ent. Soc. Lond.*, (2)3: 54. TL: China, Tea District. TD: BMNH.

Aegus punctiger Saunders, 1854. *Trans. Ent. Soc. Lond.*, (2)3: 55. TL: China, Tea District. TD: BMNH. Syn. by Benensh, 1960. *Coleop. Cat. Suppl.*, 8: 103.

Aegus pichoni Didier, 1931. *Librairie speciale Agricole*, Paris Fascicule 9: 210. TL: China, Zhejiang, Hang-Tcheou. TD: MNHN. **syn. nov.**

Aegus laevicollis laevicollis: Mizunuma & Nagai, 1994. *The Lucanid Beetles of the World*: 288, pl. 127.

Distribution. China (Anhui, Hubei, Hunan, Zhejiang, Fujian, Sichuan).

***Aegus laevicollis formosae* Bates, 1866**

Aegus formosae Bates, 1866. *Proc. Zool. Soc. Lond*., 1866: 347. TL: China, Taiwan. TD: BMNH.

Aegus laevicollis formosae: Mizunuma & Nagai, 1994. *The Lucanid Beetles of the World*: 288, pl. 127.

Distribution. China (Taiwan).

***Aegus labilis* Westwood, 1864 New record to China**

Aegus labilis Westwood, *In:* Parry, 1864. *Trans. R. Ent. Soc. Lond.*, 3(2): 54. TL: India, Darjeeling. TD: BMNH.

Distribution. China (Xizang), N. E. India, Bhutan.

***Aegus melli* Nagel, 1925**

Aegus melli Nagel, 1925. *Ent. Mitt*., 14(5): 174. TL: China, Guangdong. TD: ZMHB.

Distribution. China (Guangdong).

***Aegus nakaneorum* Ichikawa & Fujita, 1986**

Aegus nakaneorum Ichikawa & Fujita, 1986. *Spec. Bull. Jap. Soc. Coleop*., 2: 139. TL: China, Central Taiwan. TD: NSMT.

Distribution. China (Taiwan).

***Aegus pavus* Boileau, 1902**

Aegus parvus Boileau, 1902b. *Bull. Soc. Ent. Fr.*, 1902: 320. TL: China, Vallée du Tong-Hò. TD: MNHN.

Distribution. China (Jiangsu).

***Aegus taurus* Boileau, 1899**

Aegus taurus Boileau, 1899. *Bull. Soc. Ent. Fr.*, 48: 320. TL: N. Vietnam, Haut-Tonkin, Dong-Van. TD: MNHN.
Aegus beauchesnei Boileau, 1902a. *Bull. Soc. Ent. Fr*., 1902: 288. TL: N. Vietnam, Tonkin. TD: MNHN. **syn. nov.**
Aegus caprinus Didier, 1928. *Librairie speciale Agricole*, Paris Fascicule 2: 60. TL: N. Vietnam, Nam Mar. TD: MNHN. **syn. nov.**

Distribution. China (Guangxi, Hainan), N. Vietnam.

Funding This research is supported by the National Natural Science Foundation of China (31071954, 31201745, 31572311).

Acknowledgements We are grateful to Ms. Valérie Lemaître for her help in translating from the French and checking the manuscript. We are also indebted to Mr. Max Barclay, Mr. Malcolm Kerley, Ms. Beulah Garner (Natural History Museum, London, UK) and Dr. Stéphane Boucher (Muséum National d'Histoire Naturelle, Paris, France), for their assistances during the corresponding author's visit; to Dr. Johannes Frisch and Mr. Joachim Willers (Museum für Naturkunde, Humboldt-Universität, Berlin, Germany) for the loan of type material, to Dr. Luca Bartolozzi (Natural History Museum, Zoology Section 'La Specola', University of Florence, Firenze, Italy) for his kind help during the corresponding author studied in Italy. Many thanks are also to: Dr. Siqin Ge, Dr. Meiying Lin and Dr. Hongbin Liang (The National Zoological Museum of China, Beijing) for the loan of some specimens.

References

Arrow, G.J. 1935. A contribution to the classification of the coleopterous family Lucanidae. *Transactions of the Royal Entomological Society of London*, 83: 105–125. doi: 10.1111/j.1365-2311.1935.tb00417.x.

Arrow, G.J. 1943. On the genera and nomenclature of the Lucanoid Coleoptera, and descriptions of a few new species. *Proceedings of the Royal Society of London*, (B), 12: 133–143. doi: 10.1111/j.1365-3113.1943.tb00761.x.

Asai, A. 2001. A new subspecies of *Aegus laevicollis* (Coleoptera, Lucanidae) from Gaja-jima I. of the Tokara Isls., Northern Ryukyus, Japan. *Gekkan-Mushi*, 362: 23–25.

Bates, H. 1866. On a collection of Coleoptera from Formosa sent home by R. Swinhoe, Esq., H. B. M. Consul, Formosa. *Proceedings of the zoological Society of London*, 1866: 346–348.

Benesh, B. 1960. *Lucanidea (sic). In:* Hincks, W.D. (ed.), *Coleopterorum Catalogus Supplementa. Pars 8*. W. Junk. Gravenhage, Netherlands. 178 pp.

Bomans, H.E. 1989. Inventaire d'une collection de Lucanides récoltés en Chine continentale, avec descriptions d'espèces nouvelles (Coleoptera, Lucanidae). *Nouvelle revue d'entomologie* (*N. S.*), 6(1): 3–23.

Boileau, H. 1898. Description de Lucanides nouveaux. *Bulletin de la Société Entomologique de France*, 47: 264–268.

Boileau, H. 1899. Descriptions sommaires d'*Aegus* nouveaux (Col.). *Bulletin de la Société Entomologique de France*, 48: 319–322.

Boileau, H. 1902a. Descriptions sommaires de Dorcides nouveaux (Col.). *Bulletin de la Société Entomologique de France*, 1902: 287–289.

Boileau, H. 1902b. Description de Dorcides nouveaux. *Bulletin de la Société Entomologique de France*, 1902: 320–321.

Boileau, H. 1913. Note sur Lucanides conservés dans les collections de l'Université d'Oxford et du British Museum. *Transactions of the Royal Entomological Society of London*, 1913: 213–272.

Carpaneto, G.M., Bartolozzi, L., Mazzei, P., Pimpinelli, I., Viglioglia, V. 2010. *Aegus chelifer* Macleay 1819, an Asian stag beetle (Coleoptera Lucanidae) invading the Seychelles Islands: a threat for endemic saproxylic species? *Tropical Zoology*, 23: 173–180.

Didier, R. 1926. Description d'un *Aegus* nouveau. *Bulletin de la Société Entomologique de France*, 1926: 18–21.

Didier, R. 1928. Étude sur les Coléoptéres Lucanides du globe. IV. Descriptions sommaires de Dorcides nouveaux. *Librairie speciale Agricole*, Paris Fascicule 2: 54–64.

Didier, R. 1931. Étude sur les Coléoptères Lucanides du globe. XV. Introduction à l'étude de l'évolution des Dorcides et essai de classification (Suite). *Librairie speciale Agricole*, Paris Fascicule 9: 210–211.

Didier, R., Séguy, E. 1953. Catue illustré des Lucanides du Globe. Lechevalier, Paris. Texte. *Encyclopédie Entomologique*, 27(A): 1–223.

Fairmaire, L. 1849. Essai sur les Coleopteres de la Polynesie. *Revue et Magasin de Zoologie pure et appliquee*, Paris 1: 410–422.

Fujita, H. 2002. A new subspecies of *Aegus laevicollis* Saunders, 1854 (Coleoptera, Lucanidae) from Iheya-jima Is. of the Okinawa Islands. *Gekkan-Mushi*, 377: 22–23, 24 figs.

Fujita, H. 2010. *The Lucanid Beetles of the World.* Mushi-sha's Iconographic Series of Insects, 6, Tokyo. 488pp.

Fujita, H., Ichikawa, T. 1985. A revisional synopsis of the family Lucanidae (Coleoptera) from the Nansei and Izu Islands. *Gekkan-Mushi*, 170: 2–13.

Gahan, C.J. 1888. On the Coleoptera of the Christmas Island. *Proceedings of the Zoological Society of London*, 37: 538–541.

Holloway, B.A. 2007. *Lucanidae (Insecta: Coleoptera), Fauna of New Zealand, 61*. Manaaki Whenua Press, New Zealand. 254 pp.

Ichikawa, T., Imanishi, O. 1976. Some new subspecies of the *Aegus laevicollis* Saunders from Japan (Coleoptera, Lucanidae). *Elytra*, 3(1–2): 9–14.

Ichikawa, T., Fujita, H. 1986. A new species of the genus *Aegus* (Coleoptera, Lucanidae) from Central Taiwan. *Special Bulletin of the Japanese Society of Coleopterology*, 2: 139–142.

ICZN (International Code of Zoological Nomenclature online). Avaliable from http://iczn.org/iczn/index.jsp. (accessed 11 July 2016)

Jakowleff, B.E. 1900. Description de quelques nouvelle espèces de la famille des Lucanides. *Horae Societatis Entomologicae Rossicae*, 34: 631–642.

Kim, J.I., Kim, S.Y. 2010. Review of family Lucanidae in Korea with the description of one new species. *Entomological Research*, 40(1): 55–81. doi: 10.1111/j.1748-5967.2009.00263.x.

Krajcik, M. 2001. *Lucanidae of the World. Catue- Part I. Checklist of the Stag Beetles of the World (Coleoptera: Lucanidae)*. Most, Czech Republic. 108 pp.

Krajcik, M. 2003. *Lucanidae of the World. Catue- Part II. Encyclopaedia of the Lucanidae (Coleoptera: Lucanidae)*. Plzen, Czech Republic. 197 pp.

Kriesche, R. 1921. Zur Kenntnis der Lucaniden. *Archiv für Naturgeschichte.* (A), 86(8) [1920]: 92–107.

Kriesche, R. 1935. Ueber paläarktisch-chinesische. Lucaniden. *Koleopterologische Rundschau*, 21: 169–174.

MacLeay, W.S. 1819. *Horae Entomologicae: or Essays on the annulose animals Vol.1, part 1*. S. Bagster, London. 160pp.

Maes, J.M. 1992. Lista de los Lucanidae (Coleoptera) del mundo. *Revista Nicaraguense de Entomologia*, 22B: 61–121.

Maes, J.M. 2004. Coleoptera, Lucanidae. Available from http://www.coleoptera.org/p1760.htm (accessed 11 July 2016).

Mizunuma, T., Nagai, S. 1994. *The Lucanid Beetles of the World. Mushi-sha Iconographic Series of Insects 1*. H. Fujita, Tokyo, Japan, 338 pp

Möllenkamp, W. 1902. Beitrag zur Kenntniss der Lucaniden-Fauna. *Insektenbörse*, 19(36): 283.

Murayama, A., Shimizu, T. 2004. A new subspecies of *Aegus laevicollis* (Coleoptera, Lucanidae) from Nakanoshima Is., of the Tokara Isls., Southwest Japan. *Gekkan-Mushi*, 402: 33–36.

Nagel, P. 1925. Neues über Hirschkäferarten (Col. Lucan.). *Entomologische Mitteilungen*, 14(5): 166–176.

Nagel, P. 1941. Neues über Hirschkäfers. *Deutsche Entomologische Zeitschrift*, 1941: 54–75.

Nomura, S. 1960. List of the Japanese Scarabaeoidea (Coleoptera). *Toho-Gakuho*, 10: 39–79.

Okajima, S., Ichikawa, H. 1986. A new stag-beetle of the genus *Aegus* (Coleoptera, Lucanidae) from Taiwan. *In*: Ueno, S.I. (ed.), *Entomological Papers Presented to Yoshihiko Kurosawa on the Occasion of His Retirement*. Coleopterists' Association of Japan, Tokyo. pp. 180–183.

Özdikmen, H., Turgut, S. 2006. Nomenclatural changes in Lucaninae (Coleoptera: Lucanidae). *Munis Entomology & Zoology*, 1(1): 145–148.

Parry, F.J.S. 1864. A catalogue of lucanoid Coleoptera; with illustrations and descriptions of various new and interesting species. *Transactions of the Royal Entomological Society of London*, 3(2): 1–113. doi: 10.1111/j.1365-2311.1864.tb00096.x.

Parry, F.J.S. 1870. A revised Catue of the Lucanoid Coleoptera; with remarks on the nomenclature and descriptions of new species. *Transactions of the Royal Entomological Society of London*, 1870(1): 53–118.

Saunders, W.W. 1854. Characters of undescribed Lucanidae, collected in China by R. Fortune, Esq. *Transactions of the Royal Entomological Society of London*, (2)3: 45–55. doi: 10.1111/j.1365-2311.1854.tb02659.x.

Waterhouse, C.O. 1873. On the pectinicorn Coleoptera of Japan, with descriptions of three new species. *The Entomologist's Monthly Magazine*, 9[1872–73]: 277–278.

Zacher, F. 1913. Die Schädlinge der Kokospalmen auf den Süseeinseln. *Arbeiten aus der Kaiserlichen Biologischen Anstalt für Land- und Forstwirtschaft*, 9(1): 73–107.