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● Description of a new flightless stag beetle genus and species from New Guinea with taxonomic notes on its related taxa (Coleoptera: Lucanidae)

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Abstract: A new flightless genus and species of Lucanidae, *Pelekysaegus robustus* **gen. et sp. nov.**, is described from New Guinea. The new genus is morphologically allied to *Pachistaegus* de Lisle, 1967, *Tumidaegus* Bomans, 1988, *Cherasphorus* Bomans, 1988 and *MicroLucanus* Bomans & Bartolozzi, 1996, sharing a combination of flightlessness and secondary sexual dimorphism at the elytral apex in males. Based on external morphology, several species previously placed in *Gnaphaloryx* Burmeister, 1847 are re-evaluated. *Gnaphaloryx furfuraceus* (de Lisle, 1970) is transferred to *Cherasphorus* Bomans, and *G. pulverosus* (Benesh, 1952) and *G. stigmatifer* de Lisle, 1974 are transferred to *MicroLucanus* Bomans & Bartolozzi; *G. pollinosus* de Lisle, 1973 is tentatively transferred to *MicroLucanus* Bomans & Bartolozzi. In addition, *Pelekysaegus* **gen. nov.**, together with *Pachistaegus* de Lisle, *Tumidaegus* Bomans, *Cherasphorus* Bomans, and *MicroLucanus* Bomans & Bartolozzi, is herein placed in the tribe Aegini Huang & Chen based on shared morphological characters. The taxonomic implications of these changes are briefly discussed.

Keywords: Aegini, new combination, secondary sexual character, systematics, tribal placement

● 新几内亚一无飞翔能力锹甲新属与新种记述及其相关类群的分类学注释 (鞘翅目: 锹甲科)

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摘要: 本文描述了来自新几内亚的锹甲科一无飞翔能力新属及新种——*Pelekysaegus robustus* **gen. et sp. nov.**。该新属在形态上与 *Pachistaegus* de Lisle, 1967、*Tumidaegus* Bomans, 1988、*Cherasphorus* Bomans, 1988 及 *MicroLucanus* Bomans & Bartolozzi, 1996 相近, 共同特征包括无飞翔能力以及雄性鞘翅末端存在第二性征异型。基于外部形态特征, 对先前归入 *Gnaphaloryx* Burmeister, 1847 的多个物种进行了重新评估: 将 *Gnaphaloryx furfuraceus* (de Lisle, 1970) 移入 *Cherasphorus*, 将 *G. pulverosus* (Benesh, 1952) 和 *G. stigmatifer* de Lisle, 1974 移入 *MicroLucanus*, 并将 *G. pollinosus* de Lisle, 1973 暂时移入 *MicroLucanus*。此外, 基于共有形态特征, 本文建议将新属 *Pelekysaegus* **gen. nov.** 与 *Pachistaegus*、*Tumidaegus*、*Cherasphorus* 和 *MicroLucanus* 一同归入肥角锹族 Aegini Huang & Chen。文中简要讨论了这些变动的分类学意义。

关键词: 肥角锹族, 新组合, 第二性征, 系统学, 族级归类

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● Introduction

Several flightless Lucanidae genera from New Guinea and nearby islands, including *Pachistaegus* de Lisle, 1967, *Tumidaegus* Bomans, 1988, *Cherasphorus* Bomans, 1988, and *Microlucanus* Bomans & Bartolozzi, 1996, have not been consistently assigned to a tribe within Lucanidae in the previous studies.

Among those genera, *Pachistaegus* was established by de Lisle (1967) for the New Guinean species *P. besucheti*, with a second species, *P. coiffaiti* described by de Lisle (1975). de Lisle (1970) also described *Aegus furfuraceus* based on a single male specimen from New Guinea and noted its similarity to *Cherasphorus sculptipennis* (Parry, 1864). Mizunuma & Nagai (1994) subsequently suggested that this species probably belongs to *Gnaphaloryx* Burmeister, 1847, and Bartolozzi *et al.* (2011) replaced this species into *Gnaphalaroryx* Burmeister. Yamamoto & Qodri (2022) pointed out morphological similarities between *Gnaphaloryx furfuraceus* (de Lisle) and *Pachistaegus besucheti* de Lisle and noted that further study of *G. furfuraceus* (de Lisle) is needed. These differing views indicate uncertainty regarding the generic placement of this species. Yamamoto & Qodri (2022) also noted that *Gnaphaloryx stigmatifer* de Lisle, 1974 and *G. pollinosus* de Lisle, 1973 resemble species of *Tumidaegus* Bomans.

After establishment of *Pachistaegus* de Lisle, Bomans (1988) later described the female of *Pachistaegus besucheti* de Lisle and established two additional flightless genera, *Cherasphorus* Bomans and *Tumidaegus* Bomans from New Guinea. Bomans & Bartolozzi (1996) described *Microlucanus* from Guadalcanal, Solomon Islands, and suggested that the new genus is closely related to *Pachistaegus* de Lisle and *Tumidaegus* Bomans. Notably, they reported a distinctive secondary sexual character at the elytral apex in *Microlucanus*, which is also observed in *Pachistaegus* de Lisle, *Tumidaegus* Bomans, *Cherasphorus* Bomans, and the new genus described in this study. This character, together with fused elytra, supports the hypothesis that these genera represent a closely related lineage within Lucanidae. This hypothesis is further supported by the shared reduction of the scutellum in *Microlucanus* Bomans & Bartolozzi, *Pachistaegus* de Lisle, *Tumidaegus* Bomans, and the new genus described herein.

In this study, a new genus from New Guinea that morphologically resembles those flightless genera is described under the name *Pelekysaegus* **gen. nov.** with a new species, *Pelekysaegus robustus* **gen. et sp. nov.** In addition, based on morphological evidences, several species previously placed in *Gnaphaloryx* Burmeister are transferred to *Cherasphorus* Bomans and *Microlucanus* Bomans & Bartolozzi, and five genera (*Pachistaegus* de Lisle, *Tumidaegus* Bomans, *Cherasphorus* Bomans, *Microlucanus* Bomans & Bartolozzi, and *Pelekysaegus* **gen. nov.**) are here placed into tribe Aegini.

● Material and methods

Examined specimens were dried and mounted, with genitalia stored in microtubes containing 80% ethanol. Photographs of the specimens were taken using a digital camera (Canon EOS R5) with a macro lens [Canon MP-E 65mm F2.8 1-5x]. For Figs 1D–F and 2B, images were acquired using a digital camera (Canon EOS 5D Mark IV) with a macro lens [Tamron Auto Focus 60mm f/2.0 SP DI II LD IF 1:1 Macro Lens]. Image stacking was processed using Zerene Stacker and editing was processed using Adobe Photoshop (Adobe Inc. San Jose, CA, USA). Terminology mainly follows Holloway (2007). Body length was measured including the mandibles, and width was measured across the median angles of the pronotum. The following abbreviations are used in this paper: **APC**, the personal collection of Antonio Polak, Mitchell, Australian Capital Territory, Australia; **BPBM**, Bernice Pauahi Bishop Museum, Hawaii, USA; **CIL**, Chungwoo Insect Lab, Seoul, Korea; **FMNH**, Field Museum of Natural History, Chicago, USA; **Te Papa**, Museum of New Zealand, Te Papa Tongarewa, New Zealand.

● Taxonomy

Family Lucanidae Latreille, 1804

Subfamily Lucaninae Latreille, 1804

Tribe Aegini Huang & Chen, 2013

Genus *Pelekysaegus* Chang gen. nov.

<https://zoobank.org/0B62AB77-47BF-4FB7-8C82-602224BA7DE6>

Type species: *Pelekysaegus robustus* Chang gen. et sp. nov.

Etymology. From the Greek term “πέλεκυς”, meaning “doubled-bitted axe” and “*Aegus*” after the genus name of Lucanidae. The name refers to the characteristic axe-shaped internal tooth of the male mandible, which is bifid and reminiscent of a double-bitted axe. The gender of the name is masculine.

Diagnosis. *Pelekysaegus* gen. nov. can be distinguished from other genera of Aegini by the combination of the following features: dorsal surface covered with long setae; head with a pair of unpunctured anterolateral tubercles; canthus narrow, fully dividing the eye; male mandibles not bidentate, without dorsomedial tooth; anterolateral angles of pronotum not advanced in male; posterolateral angles of pronotum strongly emarginate; elytra fused along the suture; each elytron with three costae marked with long golden setae.

Description. **Body length:** 14–17 mm (n=2). **Width:** 7–8 mm (n=2). **Shape:** Entirely convex. Dorsal surface shiny black, covered with golden setae. Ventral surface well punctured and setose. **Head:** Transverse, with a pair of unpunctured anterolateral tubercles located diagonally above the eyes. Clypeus visible in dorsal view, with the anterior margin emarginate in the male, almost straight in the female. Eyes small, fully divided by narrow canthi. Male mandible slightly longer than head, with a single stout internal tooth, slightly curved upward, apex simple. Female mandibles curved, with one simple inner tooth. Antennae geniculate, 10-segmented. Antennal club 3 segmented, with the last two antennomeres entirely tomentose. Mentum broader than long, solid, punctured. **Pronotum:** Transverse, wider than the head. Lateral margin crenulate. Anterolateral angles of the pronotum advanced in female, not advanced in male. Posterolateral corners strongly emarginate. Pronotal disc marked by a median longitudinal depression, middle concave. Prosternal process well developed, widened behind the procoxae, apex rounded. **Scutellum:** Reduced, broader than long. **Elytra:** Oval, fused along the suture. Each elytron has three costae marked with long golden setae. Base concave. Lateral margin crenulate. Apex relatively smooth in male, densely setose in female. **Legs:** Densely covered with setae. Yellow setae on the ventral surface of the tarsal joints long. **Abdomen:** Ventrites setose. Setae longer in male. **Male genitalia:** Aedeagus elongate. Paramere shorter than basal piece. Penis slightly shorter than the paramere and wider than the paramere in ventral view. Base of the penis without a pair of projections on the dorsal crossbar. Apex of flagellum slightly enlarged. Paired struts present.

TABLE 1. Comparison of secondary sexual dimorphism of the elytral apex among flightless lucanid genera discussed in this study.

Genera	Male elytral apex	Female elytral apex
<i>Pelekysaegus</i> gen. nov.	Relatively smooth, sparsely and finely punctured, lacking prominent setae.	Densely covered with setae. not different from the rest of the tegmen.
<i>Microlucanus</i>	Smooth and shiny, sparsely and finely punctured.	Not different from the rest of the tegmen.
<i>Tumidaegus</i>	Smooth and shiny, sparsely and finely punctured.	Densely punctured. not different from the rest of the tegmen.
<i>Pachistaegus</i>	Relatively smooth.	Unknown
<i>Cherasphorus</i>	Relatively smooth, sparsely and finely punctured, lacking dense setae.	Densely covered with setae. Not different from the rest of the tegmen.

TABLE 2. Morphological differences among *Pelekysaegus* **gen. nov.** and its related genera.

	<i>Pelekysaegus</i> gen. nov.	<i>Pachistaegus</i>	<i>Tumidaegus</i>	<i>Cherasphorus</i>	<i>Microlucanus</i>
Eye	Fully divided by canthus	Partially divided by canthus	Fully divided by canthus	Fully divided by canthus	Partially divided by canthus
Male mandible	Male mandible with a single axe-shaped internal tooth.	Male mandible with a basal tooth and dorsomedial tooth.	Male mandible with basal tooth followed by denticle.	Male mandible with basal tooth (dorsomedial tooth present in <i>C. furfuraceus</i>)	Male mandible with a double tooth followed by one or more denticles
Median longitudinal depression of pronotum	present	present	absent	present	present
Scutellum	reduced	reduced	reduced	normal	reduced

***Pelekysaegus robustus* Chang gen. et sp. nov.**

<https://zoobank.org/60DC81DF-4866-4BF8-BB5F-7341D6015634>

Figs 1, 2, 3, 10A

Type locality. Papua New Guinea, Morobe province, Aseki.

Type materials. Holotype: ♂, Oiwa Village, Aseki, Morobe Province, Papua New Guinea, XII.2002 (CIL). **Paratype:** 1 ♀, with the same location data as holotype, 16.VIII.2006 (APC).

Etymology. From the Latin term ‘robustus’ meaning ‘thick’.

Holotype description. (Figs 1A–C, 2A, 3, 10A) **Body length:** 17 mm. **Width:** 8 mm. **Color:** Shiny black. **Head:** Broader than long, anteriorly concave, forming wide triangular depression, with a pair of unpunctured tubercles located diagonally above the eyes. Clypeus broad, filling the intermandibular space, broadly emarginate anteriorly. Canthi narrow, fully dividing the eyes. Postocular margin with dull temporal process. Mandible punctured, slightly longer than head, with a single axe-shaped inner tooth below the middle, slightly curved upwards, apex simple. Antennae geniculate, with 3-segmented club. Antennomere 3-6 symmetrical, 7 asymmetrical. Mentum slightly bilobed anteriorly. **Pronotum:** Broader than long, wider than head or elytra, hexagonal in shape. Lateral margin crenulate, not parallel. Posterior margin narrower than the anterior margin of the elytra. Anterolateral and median angles prominent, posterior angles rounded. Posterolateral corners strongly emarginate. Disc marked by a median longitudinal depression, middle concave. **Scutellum:** very small but visible, broader than long. **Elytra:** Very convex, fused along the suture. Region around the suture smooth. Base region concave. Lateral margin crenulate. Each elytron with three costae marked with long golden setae. Costa 1 is the longest but not reaching the elytral margin. Costa 2 intermediate, 3 shortest. Space between elytral costae covered with moderate setigerous puncture. Apex relatively smooth, weakly rugose, with minute punctures. **Hind wings:** atrophied. **Legs:** Femora and tibia densely covered with golden setae. Protibia almost straight, with outer teeth usually decreasing in size distally. Mesotibia relatively short, metatibia almost straight. Ventral setae of the tarsal articulations long. **Abdomen:** Ventrites covered with golden setae. **Male genitalia:** Aedeagus about 2.7 times longer than wide (without flagellum). Proximal end of basal piece narrowed. Paramere about 0.7 times as long as the basal piece in the ventral view. Penis slightly shorter than the paramere and wider than the paramere in ventral view. Flagellum long, about 2 times longer than the aedeagus, with apex slightly enlarged. Paired struts present.

Genus *Cherasphorus* Bomans, 1988

Cherasphorus Bomans, 1988: 13.

Type species: *Cherasphorus inflatus* Bomans, 1988.

Diagnosis. This genus can be distinguished from its related genera by the combination of the the following characters: body less convex; dorsal surface covered with dense setae; canthus fully dividing the eye; pronotal disc with median longitudinal depression; anterolateral angles of the pronotum advanced; scutellum not reduced; elytral costae marked with dense setae; region between the elytral costae with large punctures.

Composition. 4 species: *C. inflatus* Bomans, 1988 (Figs 6, 11A); *C. sculptipennis* (Parry, 1864) (Fig. 10D); *C. suzukii* Fujita, 2010; *C. furfuraceus* (de Lisle, 1970) **comb. nov.**

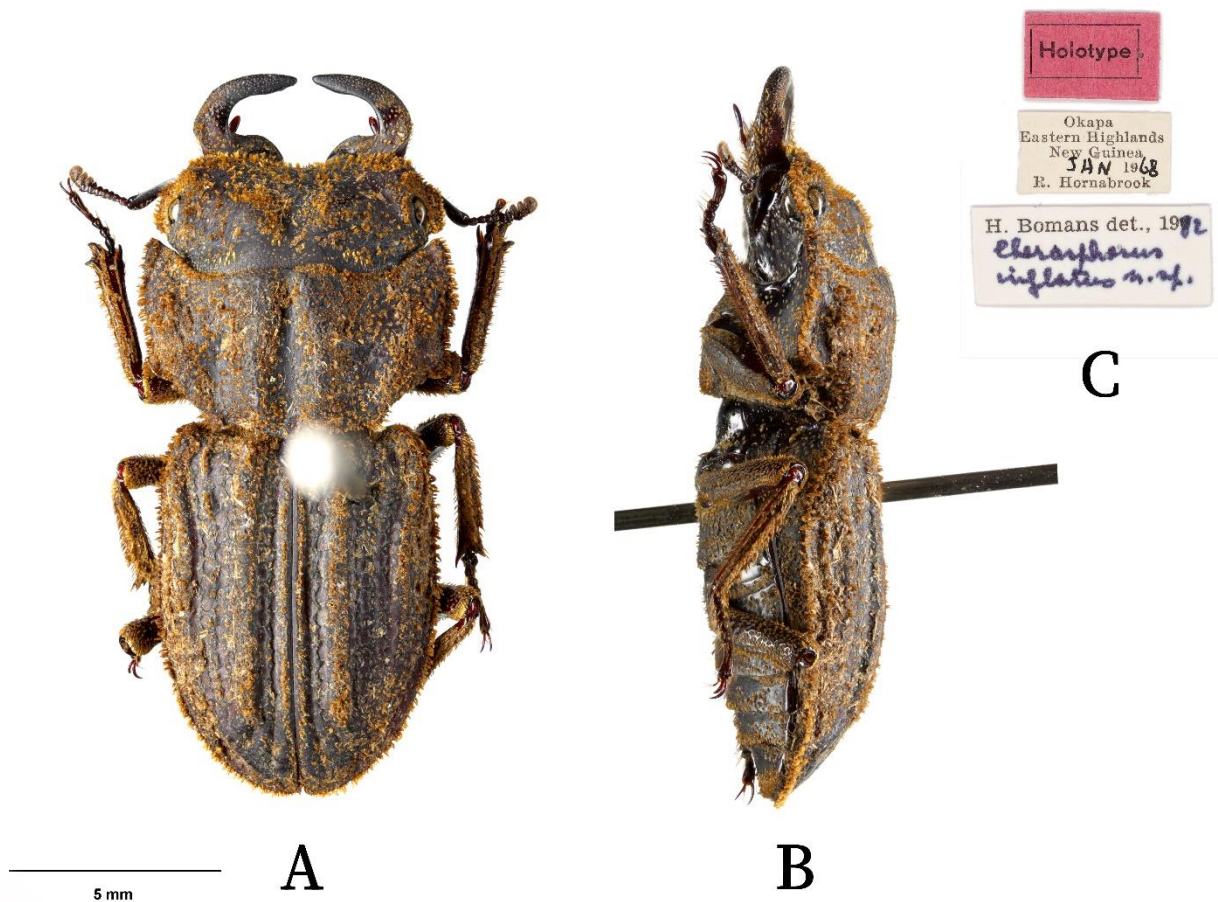


FIGURE 6. *Cherasphorus inflatus* Bomans, 1988, male holotype (©Te Papa, registration number AI.000041, licensed under CC BY 4.0.): **A** dorsal habitus **B** lateral habitus **C** data labels.

Microlucanus Bomans & Bartolozzi, 1996

Microlucanus Bomans & Bartolozzi, 1996: 214.

Type species: *Microlucanus greensladeae* Bomans & Bartolozzi, 1996.

Diagnosis. This genus can be distinguished from its related genera by the combination of the the following characters: body convex; canthus partially dividing the eye by 2/3 of its diameter; inner margin of male mandible with a double tooth followed by one or more denticules; scutellum reduced; base region of elytra concave.

Remarks. *Aegus pulverosus* was described by Benesh (1952) from a single female specimen collected in Bougainville, Solomon Islands. Examination of photographs of the holotype deposited in FMNH (Fig. 8) reveals a close overall resemblance to *Microlucanus greensladeae* Bomans & Bartolozzi in habitus, body proportions, trilobed clypeus and elytral configuration.

It is noteworthy that the holotype bears a determination label by M. J. Paulsen assigning the specimen to *Microlucanus pulverosus*. This determination, however, has never been formally published and therefore has no nomenclatural standing.

Although male characters are unknown, the available female morphology corresponds well with the current concept of *Microlucanus* as defined by Bomans & Bartolozzi (1996), particularly in the general body form and canthus partially dividing the eye by 2/3 of its diameter. Given these similarities, this species is herein transferred to *Microlucanus* Bomans & Bartolozzi.

***Microlucanus pollinosus* (de Lisle, 1973) comb. nov.**

Gnaphaloryx pollinosus de Lisle, 1973: 141; Maes 1992: 96; Mizunuma & Nagai 1994: 309, pl.147, fig. 99; Bomans & Bartolozzi 1996: 220; Krajcik 2001: 64; Krajcik 2003: 88; Fujita 2010: 420, pl. 247, fig. 1406-1; Bartolozzi *et al.* 2011: 53; Yamamoto & Qodri 2022: 15.

Diagnosis. This species can be distinguished from other *Microlucanus* species by its elytron having five costae.

Remarks. de Lisle (1973) described *Gnaphaloryx pollinosus* based on a single female specimen from Bougainville, Solomon Islands, assigning it to *Gnaphaloryx* primarily due to its partially divided eyes. Subsequent authors have expressed uncertainty regarding this placement, noting similarities with *Pachistaegus* de Lisle and *Tumidaegus* Bomans (Mizunuma & Nagai 1994), or suggesting closer affinity to *Tumidaegus* than to *Gnaphaloryx* (Yamamoto & Qodri 2022).

Gnaphaloryx females are characterized by strongly outwardly bent protibiae, a feature absent in *G. pollinosus*, whose protibiae are normal. Moreover, the original description states that the scutellum of the holotype is invisible, a character shared by *Pachistaegus* de Lisle, *Tumidaegus* Bomans, *Microlucanus* Bomans & Bartolozzi and *Pelekysaegus* **gen. nov.**, but not by *Gnaphaloryx* Burmeister.

Considering the partially divided eyes and reduced scutellum, *Microlucanus* Bomans & Bartolozzi appears to be the most suitable generic placement among currently recognized taxa. Therefore, *G. pollinosus* de Lisle is herein tentatively transferred to *Microlucanus* Bomans & Bartolozzi. This placement should be regarded as provisional, pending re-examination of the holotype and the discovery of male specimens, which are essential for a more definitive generic assignment.

***Microlucanus stigmatifer* (de Lisle, 1974) comb. nov.**

Fig. 9

Gnaphaloryx stigmatifer de Lisle, 1974: 786; Maes 1992: 96; Bomans & Bartolozzi 1996: 220; Krajcik 2001: 64; Krajcik 2003: 88; Bartolozzi *et al.* 2011: 54; Yamamoto & Qodri 2022: 16.

Diagnosis. This species can be distinguished from other *Microlucanus* species by the combination of the following features: anterior margin of clypeus not trilobed; posterolateral corners of the pronotum strongly emarginate; lateral pronotal margins weakly crenulate; elytra densely punctured.

Remarks. de Lisle (1974) described *Gnaphaloryx stigmatifer* from a single male specimen from Bougainville, Solomon Islands, assigning it to *Gnaphaloryx* based on its incompletely divided eyes and narrow posterior margin of the pronotum. However, recent work indicates that only *Gnaphaloryx opacus* Burmeister, 1847 possesses partially divided eyes within the genus (Yamamoto & Qodri 2022), rendering this character insufficient for generic

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● Additional information

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Photo Gallery

贵州盗螳 *Cranopygia guizhouensis* Chen, 2024
Yanlou, Guiyang, Guizhou
photograph by Ri-Xin JIANG [姜日新]