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A new species of *Bomansius* Lacroix (Coleoptera: Lucanidae) from Vanuatu, with redescriptions of its genus and its only congener, *Bomansius gabrieli* Lacroix, 1978

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Abstract. A new species of the genus *Bomansius* Lacroix (Coleoptera: Lucanidae), which had been illustrated in the literature but never formally named, is described from Aneityum Island, Vanuatu (former New Hebrides) under the name of *Bomansius cheesmanae* Kakinuma, **new species**. The generic redescription of *Bomansius* and the redescription of *B. gabrieli* Lacroix, 1978 are also given based on additional specimens. *Bomansius* is transferred to tribe Aegini Huang and Chen, 2013.

Key words. Stag beetle, New Hebrides, taxonomy, flightless, Aegini.

Introduction

The brachypterous stag beetle genus *Bomansius* Lacroix, 1978 (Coleoptera: Lucanidae) was described for the species *Bomansius gabrieli* Lacroix, 1978. The species was briefly described by Lacroix from only the male holotype, female allotype and one female paratype without any photographs. The holotype and allotype are at present still in the private collection of its late author and have unfortunately remained unavailable for study; as such the species has remained difficult to diagnose. Furthermore, the existence of another undescribed species has long been known, but without comparative material of *B. gabrieli* for study it has remained undescribed. The second species was indicated by photographs of specimens deposited in the Natural History Museum, London (NHM) in Mizunuma and Nagai (1994) and Fujita (2010). These specimens were collected by Lucy Evelyn Cheesman, who explored the South Pacific and collected many specimens of insects, plants and other animals for the NHM, on her last expedition at Aneityum Island of New Hebrides (now Vanuatu) in 1955 (Laracy 2013; Lotzof 2018). The specimens, together with others now in the Field Museum, Chicago (FMNH) were labeled with the doubly unpublished name "*Apteroaegus cheesmani*" by Bernard Benesh.

With recent material of *B. gabrieli* now available for study, it is possible for the first time to give a more detailed and illustrated redescription of *B. gabrieli* and thus to formally describe the second species. Thanks to Dr. M.J. Paulsen (University of Nebraska State Museum), I had the opportunity to examine the photos of the undescribed *Bomansius* collected by L. E. Cheesman, and to compare them with recently collected specimens of *Bomansius* sp. from Aneityum and *B. gabrieli* from Erromango, confirming that the specimens from Aneityum Island are clearly distinct from *B. gabrieli.* In this paper, the undescribed species is described as *Bomansius cheesmanae*, **new species**.

Materials and Methods

All photographs except Fig. 1 were taken using an Olympus OM-D E-M1 Mark II with a M.ZUIKO DIGITAL ED 60 mm F2.8 Macro or a Canon MP-E 65 mm 1–5× macro lens and KIPON EF-MFT AF, and subsequently stacked using CombineZP software. Figure 1 is courtesy of Dr. M.J. Paulsen.

Length is measured both including and excluding mandibles. Width is measured across the pronotum. Terminology mainly follows Holloway (2007), Paulsen and Ratcliffe (2005), and Huang and Chen (2013, 2017). The following institutions and private collections provided specimens examined in this study.

FMNH Field Museum of Natural History, Chicago, IL, USA
LBC Luca Bartolozzi Collection, Florence, Italy
MJPC M.J. Paulsen Collection, Lincoln, NE, USA
MNHN Muséum national d'Histoire naturelle, Paris, France

NHM Natural History Museum, London, UK
SKC Shunsuke Kakinuma Collection, Saitama, Japan

Taxonomic Treatment

The subfamily and tribal status of the genus *Bomansius* has been controversial. Lacroix (1978) originally described *Bomansius* in Dorcinae. Maes (1992) later transferred *Bomansius* to Sclerostomini in Figulinae with most of other flightless genera from Oceania. In recent studies, Dorcinae and Figulinae are included in Lucaninae (Holloway 2007; Paulsen 2017) and I follow this classification here. Krajcik (2001) listed *Bomansius* under Lampriminae without any explanation and this is obviously unsupported because of the many morphological differences. In several websites such as "Lucanidae of the World - Genera and Catalogue" (Maes 2007), *Bomansius* is included in Lissapterini (Lucaninae), but I could not find the primary source of this placement. Moreover, Huang and Chen (2013) pointed out that Lissapterini Maes, 1992 is a nomen nudum of Sclerostomini Benesh, 1955, because there was no formal establishment of tribe Lissapterini. Lacroix (1978) indicated the relationships between *Hoplogonus* Parry, *Lissotes* Westwood and *Bomansius,* and the similarity of *Bomansius* with *Colophon* Westwood, but *Bomansius* is confirmed to be morphologically quite different from these three genera in this study. Based on morphological characters shared with many species of *Aegus* MacLeay, especially the similar ill-defined and concave labrum, entirely or almost entirely divided eyes, and bidentate mandibles, *Bomansius* is here transferred to tribe Aegini Huang and Chen, 2013 (Lucaninae). However, future phylogenetic study is needed to support this placement. Molecular phylogenetic research on *Bomansius* and other genera thought to belong to Aegini is underway.

Subfamily Lucaninae Latreille, 1804

Tribe Aegini Huang and Chen, 2013

= Aegini Maes, 1992, *nomen nudum* (Smith 2006)

Genus *Bomansius* Lacroix, 1978

Bomansius Lacroix 1978: 288.

Type species. *Bomansius gabrieli* Lacroix 1978: 289, by original designation.

Genus Redescription

Length: (including mandibles) 11.5–17.5 mm, (excluding mandibles) 10.4–14.2 mm. **Width:** 5.4–8.6 mm. **Color:** Body black, sometimes brownish. **Shape:** Body somewhat oval, very convex and thick overall. **Head:** Form large, wide especially in larger male. Labrum fused to clypeus, short and concave in males, trapezoidal or weakly concave in females, with long, yellow, dense hairs except at middle. Eyes small, located behind middle of head, totally divided (anterior and posterior canthi adjoined; Fig. 11–12, 28–31) or almost but not totally divided (Fig. 13–14, 26–27) by a long anterior canthus and a very short posterior canthus. Mandibles falciform, slender, moderately short, almost as long as or slightly shorter than head; inner margin at the base covered with very dense long hairs. Male mandibles with two inner teeth (one dorsomedial and one basal ventromedial); apex simple. Female mandibles acute, with one simple inner tooth. Antennae geniculate, 10–segmented; antennal club (articles 8–10) entirely tomentose, shorter than funicle; scape slightly shorter than club plus funicle in males, much shorter in females. Mentum much wider than long, weakly bilobed. Labial palp with terminal article weakly dilated. Lacinia of maxilla without hook. **Pronotum:** Form convex, wider and longer than head; lateral edges with punctures and sparse setae. Lateral and basal margins raised like gutter. **Scutellum:** Form short, semicircular. **Elytra:** Form very short, somewhat circular, strongly convex; suture fused; surface covered with large punctures, not distinctly grooved longitudinally; striae absent or vague; edge with sparse setae on lateral sides. Wings atrophied, very small (Fig. 15). **Legs:** Protibia gradually widening toward apex; apical tooth large, bidentate. Mesotibia and metatibia with rows of long, yellow setae on surface. Setae on ventral surface of joints of tarsomeres long. **Abdomen:** Ventrites setose; setae denser and longer in males, sparser and shorter in females. **Male genitalia** (Fig. 16, 32)**:** 9th abdominal segment with proximal half of sternite (ventral plate) circularly sclerotized.

Aedeagus with moderately broad, permanently everted internal sac; internal sac weakly widened, sclerotized, clothed with microsetae from apex to less than half of the length. Base of internal sac with a dorsal crossbar, without a pair of projections on dorsal crossbar nor lateral bridge; lateral lobes at the base of internal sac long, narrowly sclerotized, distal part somewhat sagittate; paired struts present.

Diagnosis. *Bomansius* is separated from other genera of Aegini by the following characters: very short and convex form; mandibles slender; elytra fused along suture and not distinctly grooved longitudinally; wings atrophied; apical tooth of protibia large and bidentate; male aedeagus with broader and shorter internal sac, lateral lobes at the base of internal sac sclerotized in sagittate shape. *Bomansius* is easily distinguished from many of the other flightless genera of Lucaninae present in Australasia realm (*Lissotes*, *Hoplogonus*, *Geodorcus* Holloway, *Paralissotes* Holloway) by the totally or almost totally divided eye, from *Lissapterus* by having an entirely tomentose antennal club, and from *Microlucanus* Bomans and Bartolozzi by the mostly glabrous dorsum and elytral edge without crenulations.

Bomansius cheesmanae Kakinuma, new species

(Fig. 1–16)

"*Apteroaegus* sp." Mizunuma and Nagai 1994: 312, pl. 151, Fig. 147, with the manuscript name "*Apteroaegus cheesmani*", without description (unavailable names).

Bomansius sp. Fujita 2010: 420, pl. 247, Fig. 1402, with the manuscript name "*Apteroaegus cheesmani*", without explicit description of a new taxon or fixation of types (unavailable name).

Type material. Holotype male (Fig. 1), NHM, labeled: a) "NEW HEBRIDES: / Aneityum. / Red Crest. 1,200 ft. / 3 m. N.E. of Anelgauhat. / iv–v.1955"; b) "L.E. Cheesman. / B.M. 1955-217."; c) "♂"; d) red bordered, circular "Type"; e) on red paper, handwritten "*Apteroaegus* / *cheesmani* / MS Benesh", on underside "B. Benesh / Holotype"; e) black-bordered label, handwritten "*Apteroaegus* / *cheesmani* / Benesh / Nom. M.S.", on underside "Det. B. Benesh / 24/3/57"; f) on red paper, "*Bomansius* / *cheesmanae* / ♂ Kakinuma / HOLOTYPE".

Two male paratypes (FMNH) labeled: a–c) as holotype; d) "on red paper, "Apteroaegus / cheesmani ", on underside "B. Benesh / Paratype"; e) "CNHM 1965 / Bernard Benesh / General Coleop. Colln.". One male, three female paratypes (NHM) labeled: a–b) as holotype; c) "♂" or "♀" as appropriate; d) on red paper, handwritten "Apteroaegus / cheesmani", on underside "B. Benesh / Paratype"; e) yellow bordered, circular "Para- / type". One male, three female paratypes (FMNH, MJPC) labeled: a) "NEW HEBRIDES: / Aneityum. / Red Crest. 1,200 ft. / 3 m. N.E. of Anelgauhat. / iii.1955"; b) as holotype; c) "♂" or "♀" as appropriate; d) "on red paper, "Apteroaegus / cheesmani ", on underside "B. Benesh / Paratype"; e) "CNHM 1965 / Bernard Benesh / General Coleop. Colln.". Six female paratypes (NHM, LBC, MJPC) labeled: a) "NEW HEBRIDES: / Aneityum. / Red Crest. 1,200 ft. / 3 m. N.E. of Anelgauhat. / iii.1955"; b) as holotype; c) "♀"; d) yellow bordered, circular "Para- / type"; e) "on red paper, "Apteroaegus / cheesmani ", on underside "B. Benesh / Paratype". One male paratype (LBC) labeled: a) "NEW HEBRIDES: / Aneityum. / Coast. / II.1955"; b–c) as holotype; d) on red paper, handwritten "Apteroaegus / cheesmani", on underside "B. Benesh / Paratype"; e) yellow bordered, circular "Para- / type". 14 male paratypes, seven female paratypes (SKC, MJPC, NHM, Fig. 2–16) labeled: "VANUATU: Tafea Prov. / Aneityum Island / near Anelghowhat / 19-21.II.2018"

All paratypes with paratype label, on yellow paper: "*Bomansius* / *cheesmanae* / [male or female symbol] Kakinuma / PARATYPE"

Totals: 20♂, 19♀.

Phenology. February (22 specimens), March (10), April/May (7).

Etymology. This new species is named in honor of Lucy Evelyn Cheesman (1881–1969), a British entomologist and traveler who collected the holotype and many paratypes.

Distribution. Vanuatu (formerly New Hebrides): Aneityum Island.

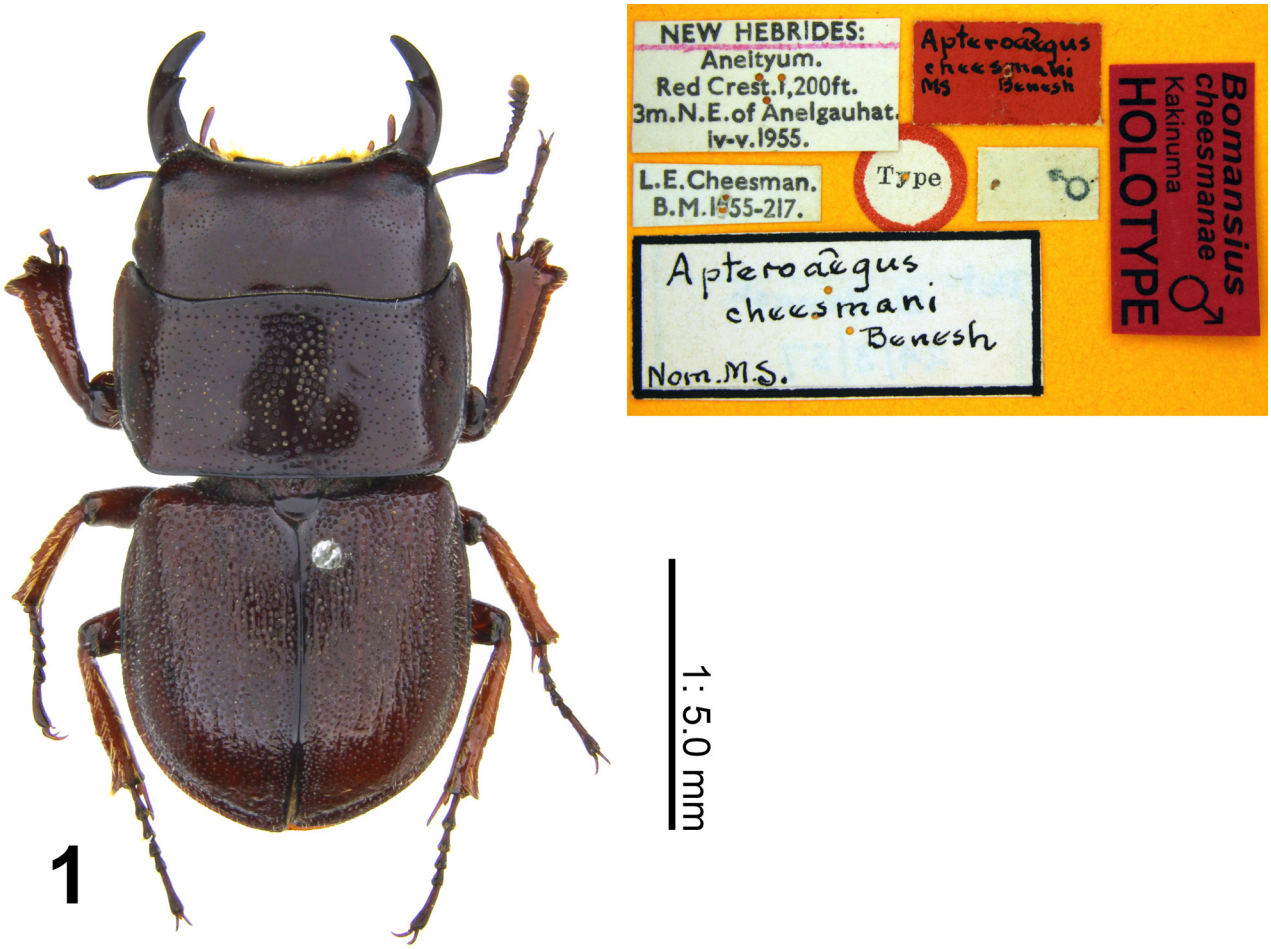
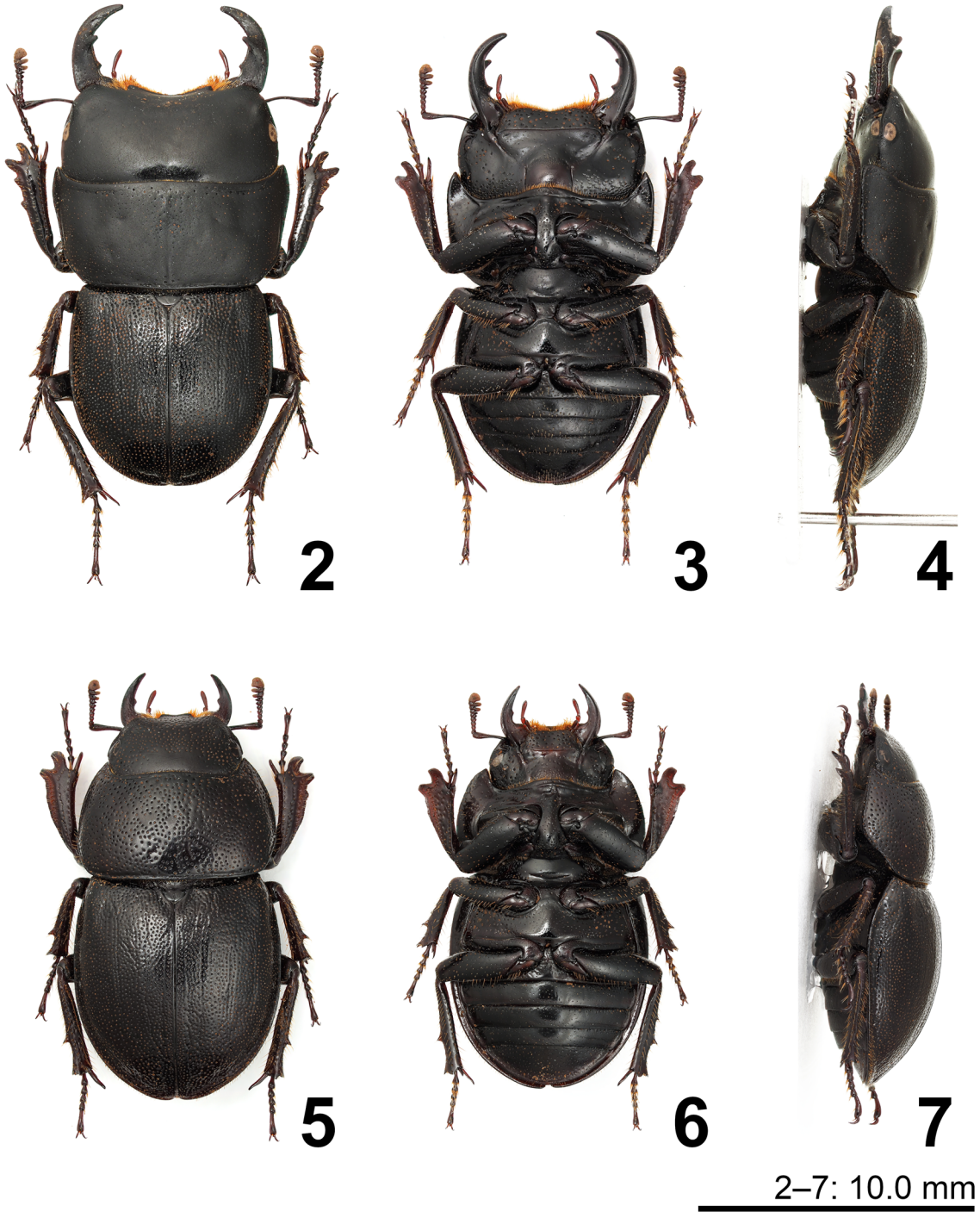


Figure 1. *Bomansius cheesmanae* **new species**, holotype male, dorsal habitus with labels.

Description

Holotype male. (Fig. 1) **Length:** (including mandibles) 14.8 mm. (excluding mandibles) 12.3 mm. **Width:** 6.5 mm. **Color:** Reddish black (teneral). **Head:** Form widest behind eyes; dorsal surface smooth, surface glossy; punctures mostly small to minute, very shallow, sparse, without setae, with small areas punctured largely and deeply between eyes on each side. Labrum about 0.37× as wide as head. Eyes almost completely divided by canthi; anterior canthus narrow, long, adjoined with short posterior canthus. Mandibles almost as long as head; dorsomedial tooth projecting forward, ventromedial tooth obsolete; punctures on surface fine and shallow; dorsal surface at the base covered with dense long hairs, but sparser than inner margin. Mentum with moderately large and shallow punctures; anterior margin with long dense hairs. **Pronotum:** Form almost as wide as elytra; surface glossy; punctures mostly small to medium, larger around the disc, without setae; lateral edge slightly sinuous, with long sparse setae; front angles acute; lateral and basal margins with narrow bead. **Elytra:** Form about as wide as long. Surface glossy, covered with large punctures randomly dense and entire except around elytral suture; punctures mostly without setae, but on lateral and posterior declivity bearing short to very short setae; lateral margin with long, sparse setae, setae shorter and denser posteriorly. **Legs:** Protibia slightly curved inwards. Mesotibia with one very small external tooth below middle. Metatibia with a vestigial external tooth below middle.

Paratype males. (n = 19, Fig. 2–4, 8–10) **Length:** (including mandibles) 11.5–17.5 mm. (excluding mandibles) 11.0–14.2 mm. **Width:** 5.7–8.6 mm. **Color:** Black or reddish black (teneral). **Head:** Labrum about 0.36–0.39× as wide as head. Surface less glossy than holotype, almost opaque or weakly glossy.



Figures 2–7. *Bomansius cheesmanae* **new species**, paratypes. **2–4)** Male. **2)** Dorsal habitus. **3)** Ventral habitus. **4)** Lateral habitus. **5–7)** Female. **5)** Dorsal habitus. **6)** Ventral habitus. **7)** Lateral habitus.

Eyes mostly totally (Fig. 11–12), rarely not totally (Fig. 13–14: female) divided by canthus. Anterior canthus without or with very few minute setae from lateral view. Ventromedial tooth on mandible larger and more distinct than in holotype. **Pronotum:** Surface sometimes uneven, with same glossiness as head. **Elytra:** Striae vaguely indicated on some of paratypes. **Legs:** Protibia with or without 1-2 external teeth proximal to apex. Mesotibia with or without an external tooth below middle, with one or more proximal small teeth. **Abdomen:** Posterior half on each ventrite with sparse, moderately long setae medially. **Large male** (Fig. 2–4, 8–9)**:** Head and pronotum conspicuously large. Mandibles strongly curved inward, with distinct inner teeth. Pronotum wider than elytra, widest at apical fifth, gradually convergent to basal fifth, then strongly convergent to hind angle; punctures smaller and shallower except around center and apex. **Small male** (Fig. 10)**:** Head small; punctures larger. Mandibles short, weakly curved. Pronotum almost entirely and densely covered with large, deep punctures; lateral sides nearly parallel from apical fifth to basal third.

Paratype females. (*n* = 19, Fig. 5–7) **Length:** (including mandibles) 12.9–16.0 mm. (excluding mandibles) 11.5–14.2 mm. **Width:** 5.8–7.2 mm. Externally different from holotype and male paratypes as follows: Body thicker and more convex overall. Head widest at eyes (canthus), much narrower than in male; punctures larger and denser. Labrum about 0.25× as wide as head, trapezoidal, weakly concave on large specimens. Mandibles acute, shorter, with one simple small internal tooth below middle; mentum narrower. Pronotum with rounded lateral sides, punctures similar to small males. Surface of head and pronotum weakly glossy. Protibia broader. Mesotibia and metatibia with more distinct external teeth. Very few setae on ventrites only at apex of 5th ventrite.

Notes. Bernard Benesh (1891–1964) placed determination labels and type labels on the specimens in the NHM and FMNH. The specimen that would have become his holotype is from the NHM, however, neither his indicated generic nor species names were ever made available. I have nevertheless followed Benesh in designating the same holotype specimen from the NHM and dedicating the species to Lucy Evelyn Cheesman. As described above, the holotype male is somewhat teneral and slightly differs from most of the specimens of the type series in color, glossiness of surface and the shape of mandibles, but these characters are not essential to confirm the identification of the species.

Diagnosis. *Bomansius cheesmanae* **new species** is similar to its only congener *B. gabrieli*, but differs by having a broader head, longer and more strongly curved male mandibles with a steeply forward-projecting dorsomedial tooth and a smaller ventromedial tooth in males. The pronotum is larger and distinctly wider than the elytra in large males. Females have relatively longer mandibles and sparser punctures on the pronotum. Both sexes display a pronotal basal edge defined by a shallow and narrow groove without a row of large punctures, vague or obsolete elytral striae, and smaller elytral punctures.

Bomansius gabrieli Lacroix, 1978
(Fig. 17–32)

Bomansius gabrieli Lacroix 1978: 289; Maes 1992: 50; Mizunuma and Nagai 1994: 312, pl. 151, Fig. 148; Krajcik 2001: 23; Fujita 2010: 420, pl. 247, Fig. 1403

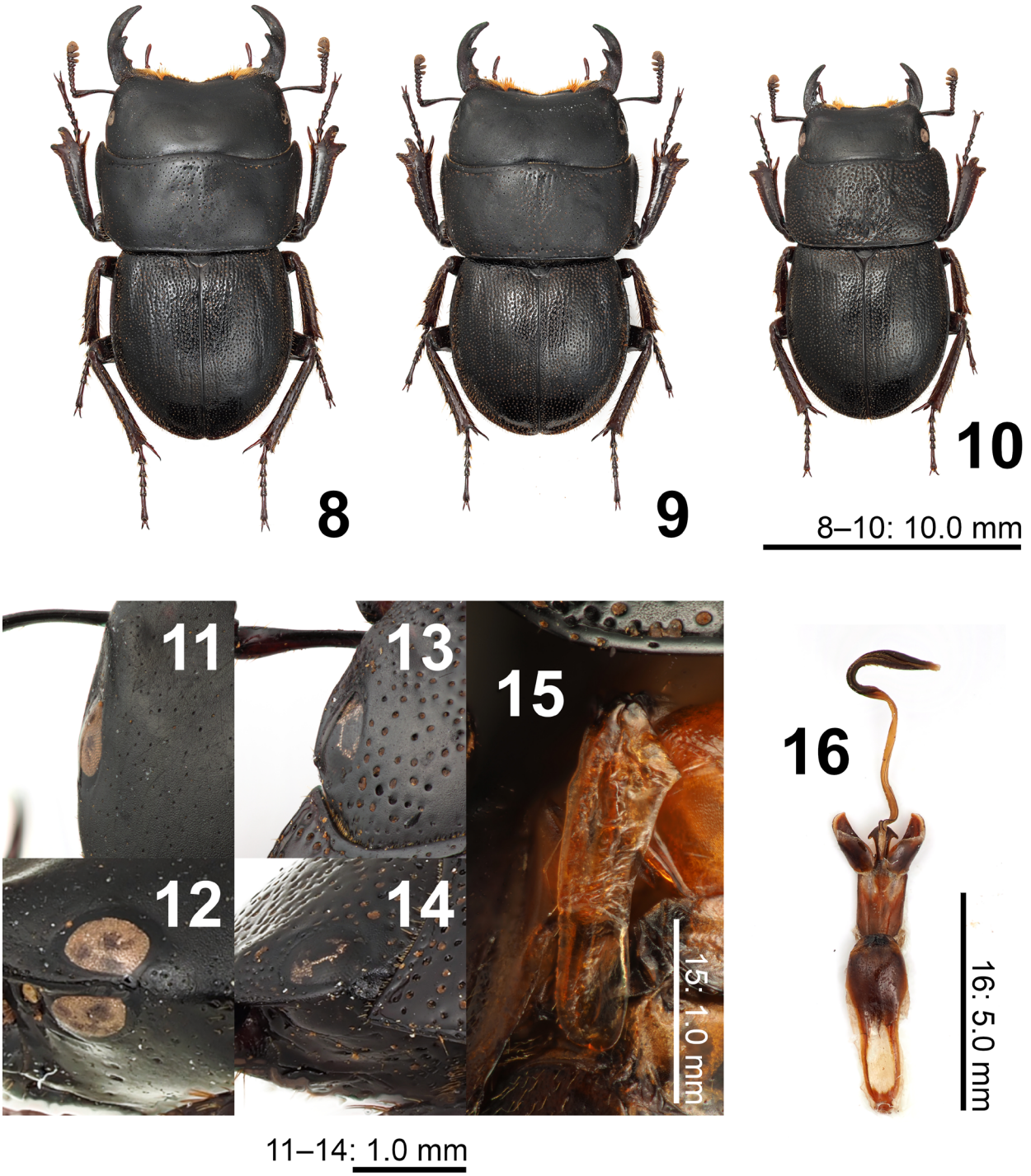
Type locality. Vanuatu (Nouvelles Hébrides). Erromango Island: Baie Dillon.

Material examined. Four males, six females (SKC, MJPC): Vanuatu: Tafea Prov., Erromango Island, near Dillon's Bay (= Baie Dillon).One male (Fig. 33), MNHN, labeled: a) "NllesHébrides / E. Auber de / la Rüe 1936"; b) "*Bomansius* / *gabrieli* / Lacroix / S. Boucher dét. 00."

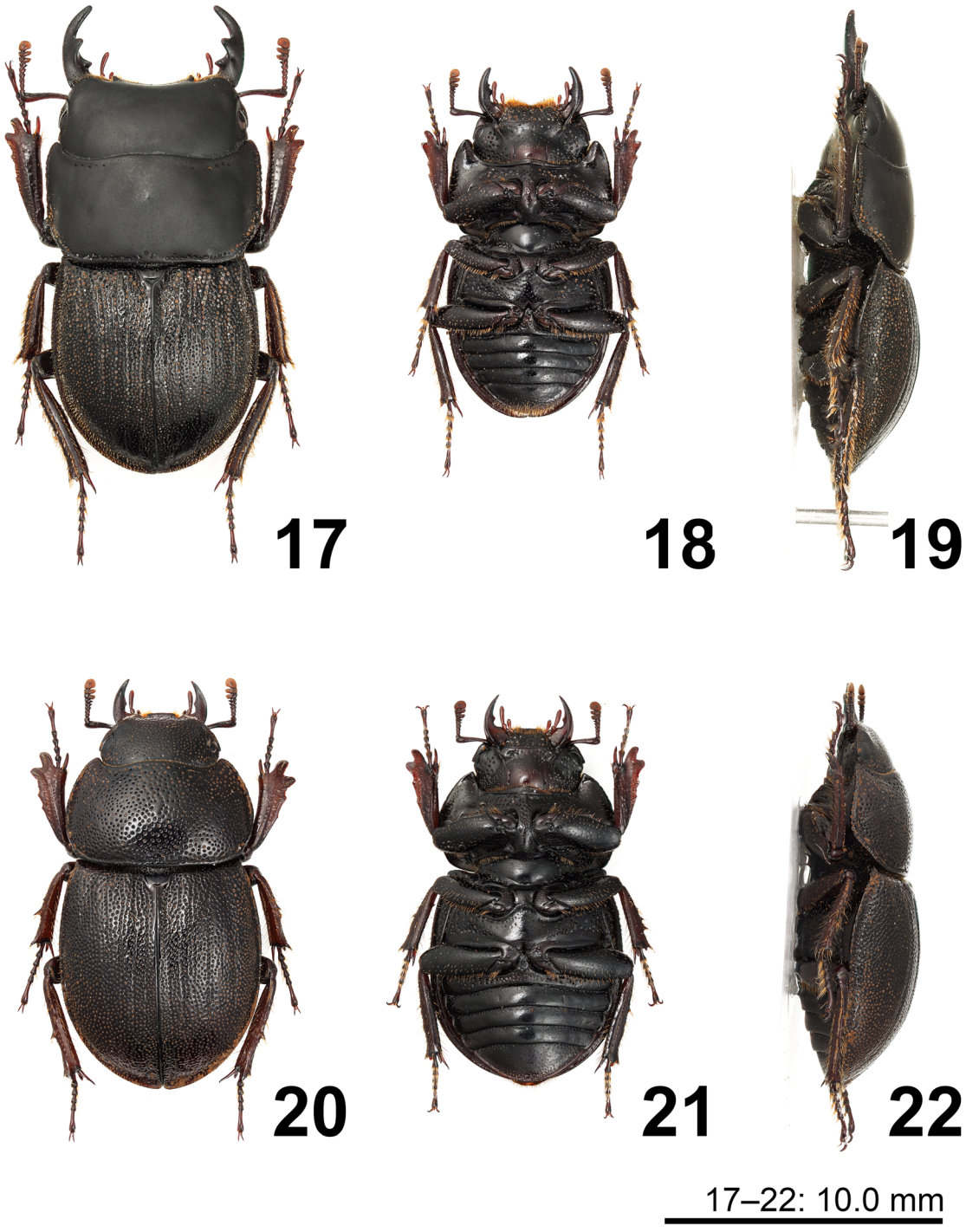
Distribution. Vanuatu (formerly New Hebrides): Erromango Island.

Redescription

Males (*n* = 5, Fig. 17–19, 23–24, 33): **Length:** (including mandibles) 11.5–16.9 mm. (excluding mandibles) 10.4–14.0 mm. **Width:** 5.4–7.8 mm. **Color:** Body usually black, sometimes brownish, with tibiae more or less brownish. **Head:** Widest at eyes (canthus). Labrum about 0.38–0.43× as wide as head (wider than



Figures 8–16. *Bomansius cheesmanae* **new species**, paratypes. **8–10)** Males, dorsal habitus. **11–14)** Eyes. **11–12)** Male, eyes totally divided by canthi. **11)** Dorsal view. **12)** Lateral view. **13–14)** Female, eyes not totally divided by canthi. **13)** Dorsal view. **14)** Lateral view. **15)** Atrophied wing of male. **16)** Male aedeagus with sternite of 9th abdominal segment, ventral view.



Figures 17–22. *Bomansius gabrieli.* **17–19)** Males. **17)** Dorsal habitus. **18)** Ventral habitus. **19)** Lateral habitus. **20–22)** Females. **20)** Dorsal habitus. **21)** Ventral habitus. **22)** Lateral habitus.

0.4× as wide as head except for very small specimen). Eyes almost but not totally divided (Fig. 26–27) or totally divided (Fig. 28–29, 30–31: female) by canthi. Anterior canthus with minute setae from lateral view. Mentum with large and deep punctures. **Pronotum:** Form almost as wide as elytra; lateral edges crenulate, with short sparse setae; large punctures lined just in front of basal edge; lateral and basal edges with distinct bead. **Elytra:** Surface moderately glossy, covered with large to very large punctures; punctures mostly without setae, but on lateral and posterior declivity with very short to minute setae; elytral edge with short, sparse setae on lateral sides, denser posteriorly; elytral striae weakly or vaguely indicated; elytral edge with short, sparse setae on lateral sides; large and dense punctures visible from lateral view. **Legs:** Protibia almost straight or slightly curved interiorly, usually with two external teeth proximal to apex. Mesotibia with one very small external tooth below middle. Metatibia with a vestigial external tooth below middle. Setae in lines on mesotibia and metatibia dense. **Abdomen:** Apex of 5th ventrite with dense, long setae. **Large males** (Fig. 17, 19, 33)**:** Dorsal surface of head and pronotum opaque, mostly with very fine, shallow, sparse punctures; mandibles almost as long as head; both inner teeth distinct. Pronotum with large, moderately dense punctures along lateral and posterior edges, few large punctures near anterior edge; lateral sides subparallel from near frond angles to basal third. **Small males** (Fig. 18, 23–24)**:** Dorsal surface of head and pronotum moderately glossy; head smaller; surface with large, deep, dense punctures but finer on frons, around eyes and center; mandibles slightly shorter than head; inner teeth small, especially dorsomedial tooth. Pronotum almost entirely with large, deep, dense punctures; lateral sides rounded.

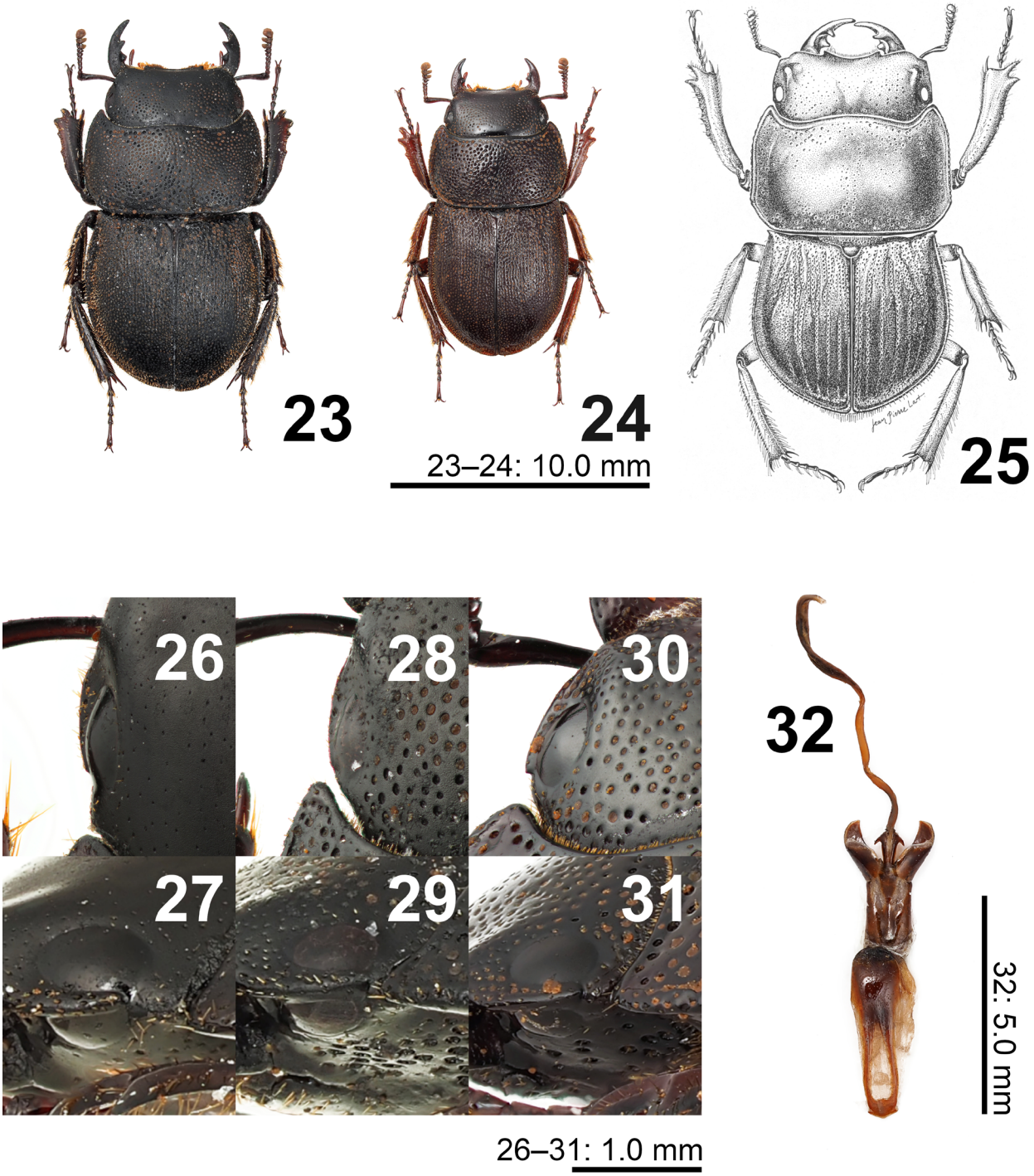
Females (n = 6, Fig. 20–22): **Length:** (including mandibles) 12.3–15.3 mm. (excluding mandibles) 11.1–13.5 mm. **Width:** 5.7–7.0 mm. Externally different from small males as follows: Body thicker and more convex overall. Head much narrower than males; labrum about 0.25× as wide as head, trapezoidal; mandibles acute, shorter, narrower, with one simple small internal tooth below middle; mentum narrower. Pronotum with lateral sides more rounded; lateral edges sinuous, with short setae sparser. Protibia broader. Mesotibia with a distinct external tooth below middle, often with one or more proximal small teeth. External teeth on mesotibia and metatibia more distinct. Setae in lines on mesotibia and metatibia sparser. Apex of 5th ventrite with only short, sparse setae.

Diagnosis. *Bomansius gabrieli* is similar to *B. cheesmanae* **new species**, but differs by having a smaller head, shorter and more weakly curved mandibles with a less steeply forward-projecting dorsomedial tooth and larger and distinct ventromedial tooth in males. The pronotum is shorter and not distinctly wider than the elytra in large males. Females have relatively shorter mandibles and larger and denser punctures on the pronotum. Both sexes display a pronotal basal edge with a row of large punctures, slightly more distinct elytral striae, and larger elytral punctures.

Notes. The holotype and allotype of *Bomansius gabrieli* are deposited in J.P. Lacroix's collection; they are not available for study and the state of preservation is unknown since Lacroix's death in 1989. The specimens I examined differ from the holotype description and somewhat poor illustration (Fig. 25) as follows: anterolateral margin of head not concave; labrum narrower; supra-antennal brow less prominent; pronotum longer, with short setae on lateral sides; anterolateral corners of elytra not distinctly acute; elytral punctures distributed overall, not disappeared on distal third; protibia shorter, wider and less strongly curved; apical tooth of protibia obtuse, tibial spurs longer, tarsomere 1 clearly longer. According to the original description, length of the holotype male is 11.5 mm (including mandibles), the mandibles are 1.3 mm long and pronotum width is 6 mm, but the male having similar size examined in this study (Fig. 24, length including mandibles 11.5 mm, pronotum width 5.4 mm) has much less developed mandibles and a distinctly smaller head, much denser and larger punctures on the head and pronotum compared to the original drawing of the holotype male. Considering the morphological differences between large males and small males examined in this study, the measurements may be wrong and the holotype may actually be larger than the published length.

It is well known that sometimes the drawings of Lacroix did not totally conform to the specimens (L. Bartolozzi, pers. comm.)

One male in the MNHN (Fig. 33) has been found and identified by Dr. S. Boucher in 2000 among many other undetermined insects from New Hebrides, Erromango forest, tree trunks, collected by Aubert de la Rüe in 1936. It is also historically relevant, as it is probably the first specimen ever collected (S. Boucher, pers. comm.). This specimen



Figures 23–32. *Bomansius gabrieli.* **23–24)** Males, dorsal habitus. **25)** Holotype male (after Lacroix 1978). **26–31)** Eyes. **26–27)** Male, eyes not totally divided by canthi. **26)** Dorsal view. **27)** Lateral view. **28–29)** Male, eyes totally divided by canthi. **28)** Dorsal view. **29)** Lateral view. **30–31.** Female, eyes totally divided by canthi. **30)** Dorsal view. **31)** Lateral view. **32)** Male aedeagus with sternite of 9th abdominal segment, ventral view.

Figure 33. *Bomansius gabrieli*. Male (MNHN), dorsal habitus with labels and dissected genitalia.

is different from other materials examined; the inner margin at the base of the mandibles of only has a few short and poorly visible setae, though this is possibly because the setae were abraded.

Discussion

Bomansius is known from two islands in Vanuatu, but there might be other, probably new species on other islands, especially Tanna, which is located between Erromango and Aneityum. Extensive field study on each island will be necessary to clarify the biodiversity of Vanuatu.

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