Zootaxa 5866 (1): 157–165
https://www.mapress.com/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.5866.1.12
http://zoobank.org/urn:lsid:zoobank.org:pub:D40444CA-1D8C-4547-AE52-C168D687739F

A new Species of *Byrsax* Pascoe, 1860 (Coleoptera: Tenebrionidae) from the Papuan Region

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Abstract

In this study, a remarkable new species of the genus *Byrsax* Pascoe, 1860 (Tenebrionidae: Tenebrioninae: Bolitophagini), *Byrsax titanus* **sp. nov.** from the rainforests of Batanta Island, Indonesia and Papua New Guinea, is described and illustrated. Additionally, a checklist and a key of *Byrsax* species of the Papuan Region is provided.

Key words: darkling beetles, Bolitophagini, taxonomy, Raja Ampat Islands, New Guinea

Introduction

The species of the small, Old World boletophagine genus *Byrsax* are specialised fungivores, feeding on the basidiocarps of polypore fungi (Arunraj et al. 2013; Yamashita et al. 2015). The genus was established by Pascoe (1860) and its adults can be described as darkling beetles with a strongly convex body, the dorsum of which is usually covered with an encrusted layer composed of dust and debris embedded in a waxy secretion, compressed pro- and denticulate metasternum, granules and/or tubercles present on the strongly transverse and widely emarginate pronotum and elytra, while males also possess a pair of processes on the head (’horns’) (Pascoe 1860; Akita & Masumoto 2012, Masumoto et al. 2021).

The genus is distributed across the eastern Palaearctic, Oriental, and Australasian regions (Bouchard *et al*. 2021, Telnov 2023). To date, 28 species and two subspecies (both of *Byrsax niponicus* Lewis, 1894) have been described within or subsequently assigned to the genus (Akita & Masumoto 2012; Telnov 2023), three of which, namely *Byrsax pinnaticollis* Carter, 1914 (Queensland, Northeastern Australia and Guadalcanal, Solomon islands) *B. biroi* Kaszab, 1939 (Eastern Papua, Witu Island and New Britain, Papua New Guinea) and *B. crypticus* Telnov, 2023 (Rennel Island, Solomon Islands) are known to occur in the Papuan Region (Telnov 2023).

Material and methods

All taxa are listed in alphabetical order due to the lack of sufficient data to establish a phylogenetic arrangement. All label text is reproduced *verbatim*, with no corrections or additions. Authors’ comments are given in square brackets. The holotype of the new species is provided with a red framed label on white paper with printed red text “HOLOTYPUS” or “PARATYPUS”, respectively. Paired morphological structures are treated as singular in text.

Accepted by M. Lillig: 29 Jun. 2026; published: 10 Aug. 2026

For morphological studies, a Leica MZ12.5 binocular stereomicroscope (Leica Microsystems, Wetzlar, Germany) was used. Habitus images were produced with Raynox Super Macro Conversion Lens DCR-250 adapter set (Yoshida Industry Co., Tokyo, Japan) attached to a Nikon D7200 digital camera (Nikon Co., Tokyo, Japan). The dissected male genitalia were mounted on separate cards on the same pins under the corresponding specimens. Images of genital organs were made using an Olympus SZX12 photographic microscope (Olympus Co., Tokyo, Japan) and its softwares DPController and DPManager. Helicon Focus 8 (Helicon Soft, Kharkiv, Ukraine) was used for image stacking. Further image manipulations were performed using Adobe Photoshop.

For the definition of the Papuan Region see Gressitt (1982), Beehler *et al*. (1986), Riedel (2002), and Telnov (2011).

The studied material is deposited in the following institutes:

BZM – Bogor Zoological Museum, Cibinong, Indonesia

HNHM – Hungarian Natural History Museum, Budapest, Hungary

Results

***Byrsax titanus* sp. nov.**

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Type material designated. Holotype ♂ [BZM] (Figs 1, 3–8): Indonesia, West Papua, Batanta Island, Mount Batanta, 417 m, 0°52’31.8”S, 130°37’53.8”E, 11.03.2026. **Paratypes** 1♀ [HNHM]: same data as holotype. 1♂ [HNHM]: Flyr [Fly River] New Guinea Col. J. Sedlacek [handwritten] [antennomeres 2–11 of the right antenna are missing; labrum missing; pro- and mesotarsi missing]. 1♂ [HNHM]: BaiyerR, [Baiyer River] N. Guinea XII. 26. 78-I. 25. 79 1100m. J. Sedlacek [printed] [all tarsi missing, abdomen and the right mesothoracic leg detached from the specimen, mounted on a separate card positioned under the specimen on the same pin; genitalia dissected and missing].

Measurements. Holotype ♂, total body length excluding head processes (’horns’) 13.5 mm. Retracted portion of the head 1.7 mm long (excluding ’horns’), maximum head width across canthus 3.6 mm. Minimum distance between inner margin of eyes 2.2 mm. Length of clypeal process ~ 3.3 mm. Pronotum 3.7 mm long, maximum width across midlength (including deplanated denticles) 7.2 mm. Elytra 8.2 mm long, maximum combined width across base 8.2 mm. Paratype ♀, total body length 15.5 mm. Maximum head width across canthus 3.8 mm. Minimum distance between inner margin of eyes 2.4 mm. Pronotum (excluding frontal processes) 4 mm long, maximum width across midlength (including deplanated denticles) 8 mm. Elytra 9.3 mm long, maximum combined width across base 9 mm.

Description. Holotype, male (Figs 1, 3–8). Body robust, shortly subcylindrical, strongly convex dorsally, dorsum strongly tuberculate, opaque with distal areas of tubercles glossy, with microsculpture. Dorsum, venter, femora and tibiae black, antennae, maxillary and labial palpi, tarsi and expanded lateral margins of pronotum and elytra reddish brown.

Head. Strongly transverse, retracted to pronotum up to posterior margin of compound eye, flattened on frons in dorsal aspect. Mandible apex bidentate. Distinct but fine, strongly arched impression at place of frontoclypeal suture. Labrum subtrapezoidal, dark brown, moderately punctate, glossy with microreticulation and sparsely setose with long, rufous anteriorly directed setae. Clypeus punctate, with paired, strongly elongated slightly sinuate, apically strongly abruptly curved both laterally and apically dorso-posteriorly pointing process (’horn’) just inwards of supraocular plica. Anterior, lateral external, and posterior surfaces of a process irregularly denticulate and tuberculate, lateral inner surface with sparse dentation, transversely rugulose. A narrow gap present between ‘horn’ and supraocular plica. Supraocular plica short, not touching upper margin of compound eye. Gena flattened in dorso-ventral aspect, produced laterally in front of compound eye. Genal canthus with short subtriangular process, strongly protruding from lateral outline of head, partially concealing basal antennomere from above, irregularly sinuous in dorsal and lateral view, extending towards somewhat beyond midlength of an eye. Frons between eyes flattened, irregularly punctate, with median depression which extends towards edge of vertex. Vertex strongly, irregularly corrugate, glossy. Compound eye asymmetrically elliptical, slightly protruding from lateral and dorsal outline of head, anterior margin subtruncate, posterior and dorsal margins rounded. Dorsal cranial setae inconspicuous, short and sparse, pale rufous, leaving large areas of head glabrous. Also, cranial processes sparsely and irregularly covered with short setae. Antenna moderately long, clavate, antennal club flattened and widened apically, consists of seven antennomeres.

Antennomere two shortened. Antennomere three with small median lateral angulation, more than twice as long as second antennomere. Antennomeres 5–10 strongly serrate and asymmetrical, each with large, subtrapezoidal lateral lobe, lobes of antennomeres 6–10 longer than corresponding antennomere. Ultimate antennomere asymmetrical, apically broadly rounded, flattened dorso-ventrally, slightly less than twice as long as penultimate and slightly shorter then combined length of two preceding antennomeres. Terminal maxillary palpomere fusiform, tapered apically. Terminal labial palpomere fusiform, tapered apically.

Prothorax. Pronotum widest across midlength (maximum width to length ratio is 1.95), strongly transverse, widely emarginate prebasally, opaque, pronotal disc strongly convex in dorsal aspect. Median area of pronotal disc with irregular vertical conical tubercles forming ridges and leaving narrow median longitudinal area smooth and gently undulate, gently sloping laterad towards expanded, flattened and strongly flattened lateral margin. Anterior margin broadly emarginate laterally, broadly and slightly produced anteriorly concealing occiput, posterior margin slightly rounded, shallowly emarginate at posterolateral denticle (representing posterolateral angle of pronotum). Sparse, deep and irregularly circular punctures between tubercles, due to irregularity of punctures, width of intervening spaces compared to diameter of punctures largely vary. Deplanated lateral area of pronotum with subvertical conical tubercles. intervening spaces punctured, dorsum between tubercles opaque. Lateral margin of explanate lateral area of pronotum with about 8–10 denticles, two anterior tubercles bicuspidate. Moderately deep, short emargination on lateral margin of pronotum beyond of two anterior denticles. Moderately deep and rather broad posterolateral slit at posterior margin of pronotum between rather short posterolateral tubercle with denser setation and expanded lateral margin. Dorsal pronotal setae very inconspicuous, sparse, short and curved, observed on lateral area of pronotal disc. Prosternum distinctly longitudinally carinate on median portion; prosternal process short and subtriangular with coarse, irregular punctation.

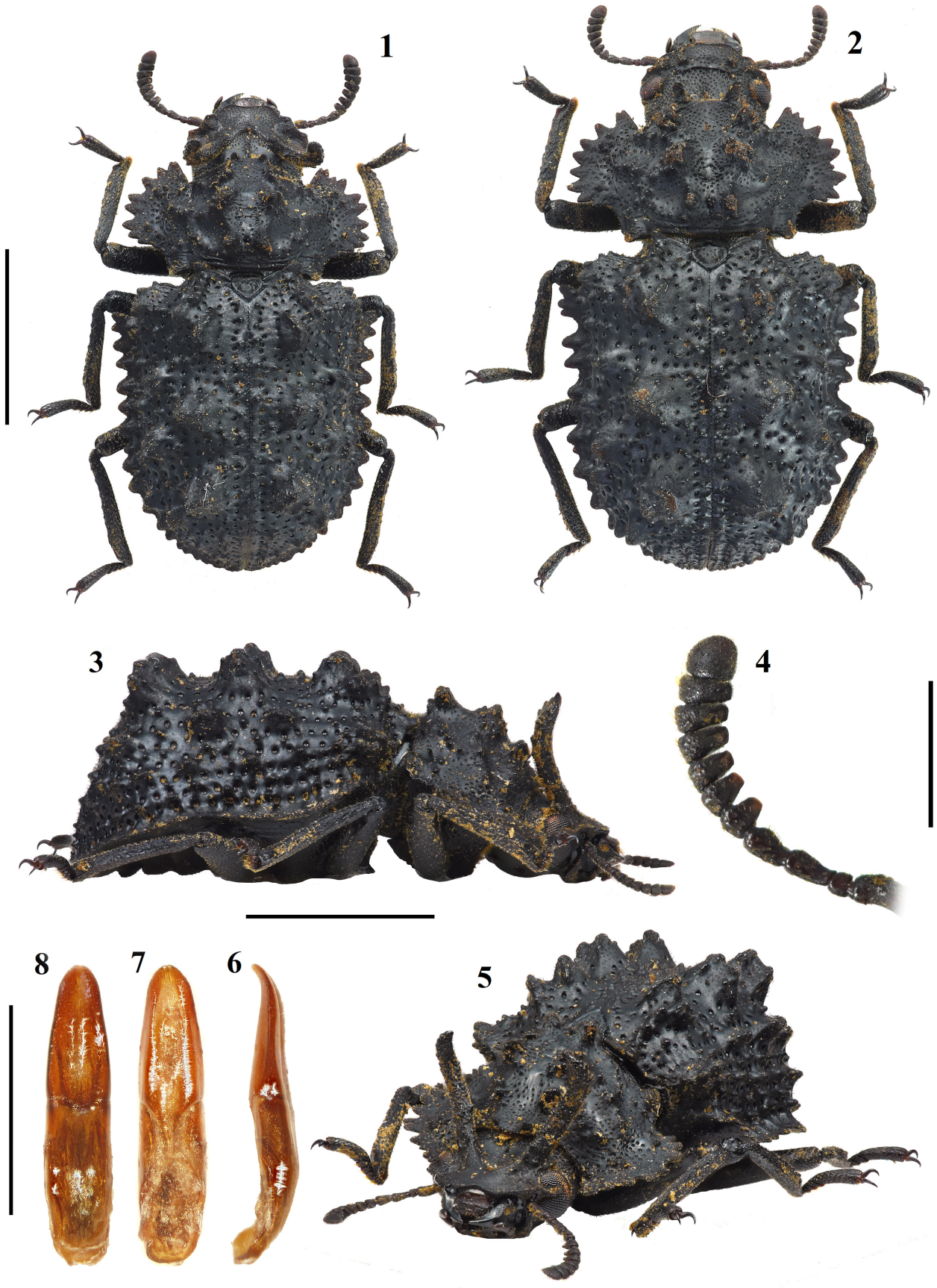
Pterothorax. Scutellar shield broadly triangular with dorsally produced subtriangular process with glossy texture at anterior area, apically pointed, sparsely punctured and microsculptured dorsally. Elytra widest at anterior portion posterior to humerus (including tubercles), nearly as long as wide (maximum width to length ratio is 1), strongly convex in dorsal aspect, subparallel-sided, laterally strongly declivous, flattened and modified into narrow expanded and deplanated lateral margin. Anterior margin of elytron with vertical tubercle in front of its tuberculate anterolateral angle. Humeral callosity distinctly convex, multituberculate. Elytral suture not raised. Elytral disc with series of ventral conical tubercles of variable size and height. Short tubercles form two parallel rows along the sides of suture. Laterally farther from suture, three distinct, enlarged, multituberculate tubercles present on each elytron, vaguely aligned in two parallel rows. Tubercles becoming distinctly smaller on declivous lateral portion of elytron and are sparse on expanded lateral area of elytron. Elytral punctures much larger and deeper than those on pronotum. Punctures irregularly spaced, not arranged in rows. Intervening spaces between punctures and tubercles microsculptured. Intervals between punctures in rows wider than or as wide as puncture diameters. Lateral margin of elytron irregularly denticulate, linguiform denticles rounded apically. Elytral setae as those on pronotum, rather sparse across whole elytral disc and lateral sides. Epipleuron complete, broad except at elytral apex, moderately densely punctate and sparsely setose. Mesoventrite glabrous and glossy without microsculpture. Metaventrite opaque, microsculptured, with longitudinal groove in the middle, very sparsely setose with inconspicuous, short pale yellowish setae, sparsely and irregularly punctured with large punctures in the middle section between meso- and metacoxae, sloping lateral regions without punctation.

Abdomen. Ventrites strongly transverse, glossy, with inconspicuous pale setation and evenly, densely covered with large punctures; ventrite 1 forming a marginate linguiform process between metacoxae; last abdominal ventrite broadly rounded.

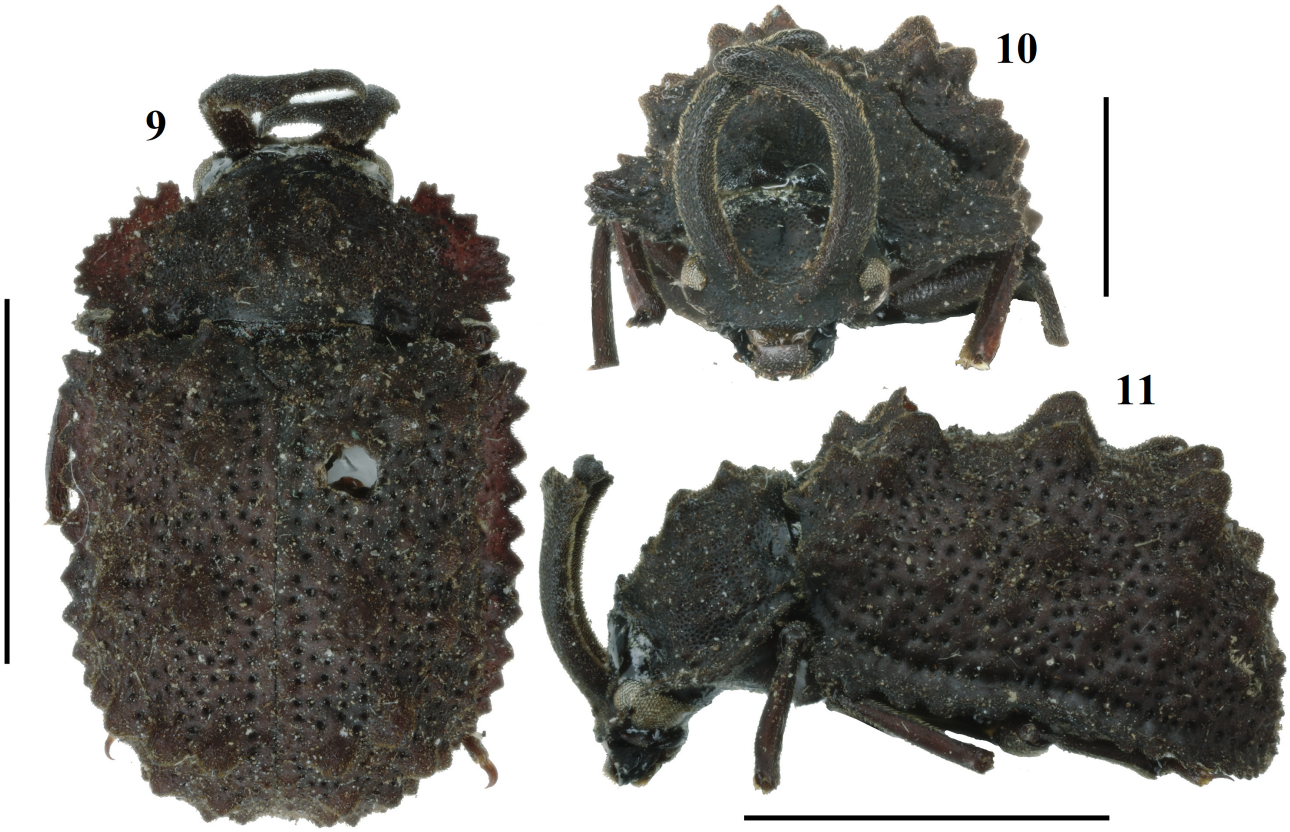
Legs. Moderately long (femur notably long compared to known congeners). Femur glossy, shortly and sparsely setose. Tibia subopaque, moderately glossy, with dense, short, pale yellowish setae, tricarinate (median carina incomplete). Terminal tarsomere of metathoracic tarsus thickened, slightly arched, distinctly longer than combined length of remaining metatarsomeres.

Aedeagus. Fusiform, well sclerotised as in Figs 6–8. Apicale of approximately same length as basale.

Female. General habitus, elytral tuberculation, and morphology of legs and antennae as in male. Clypeus transverse, broadly arcuate, significantly elevated, with short, paired conical process on the lateral areas. Pronotal disc with similarly arranged, but more prominently developed tubercles, anterior margin with longitudinally prolonged paired, process-forming tubercles and curved upwards. Female paratype appears generally more robust than the males (See Figs 1–2 and the measurements section).



FIGURES 1–8. *Byrsax titanus* **sp. nov.**, holotype ♂ and paratype ♀. **1:** holotype ♂, habitus, dorsal view; **2:** paratype ♀, habitus, dorsal view; **3–8:** holotype ♂: **3:** lateral view (mirrored). **4:** antenna; **5:** dorso-lateral view; **6–8:** aedeagus; **6:** lateral view; **7:** ventral view; **8:** dorsal view. Scale bars: 5 mm (**1–3**), 1 mm (**4, 6–8**), not to scale (**5**).



FIGURES 9–11. *Byrsax macleayi* Pascoe, 1866 syntype ♂. **9:** Habitus, dorsal view; **10:** Habitus, frontal view; **11:** Habitus, lateral view. Scale bars: 5 mm (**9**, **11**); 2.5 mm (**10**).

Diagnosis. *Byrsax titanus* **sp. nov.** differs greatly from all congeners known from the Papuan Region in the significantly larger body and the general appearance. The new species is remarkably distinct compared to the described species of its genus, but slightly resembles *Byrsax macleayi* Pascoe, 1866 (Figs 9–11), a species occurring in Eastern Australia (studied from the male syntype deposited at the Natural History Museum, London) because of the large, opaque, dark coloured body and most notably, the positioning of the elytral tubercules. However, *B. titanus* **sp. nov.** can be readily distinguished by the following characters: the distal third of the clypeal process is abruptly curved laterally, in contrast to the less curved but comparatively more densely setose clypeal processes of *B. macleayi*, in which the apical portions are situated closer together and may even overlap (see Figs 9–11). Although this latter condition may represent an individual abnormality specific to the studied and photographed male syntype, the apical portions of the antennae are generally positioned closer together in the examined non-type males of this species as well. In the latter species the flattened subtrapezoidal lobes of the antennomeres forming the antennal club are lacking (given the fact that the male syntype of *B. macleayi* lacks antennae, this trait was studied from non-type male specimens deposited at the Hungarian Natural History Museum, Budapest). The large tubercles on the pronotum and elytra of the new species appear stronger acuminate compared to the more convex, somewhat apically rounded tubercles of the Australian congener. The posterolateral portion of the pronotum in *B. macleayi* is broadly rounded with a weakly developed, shallow posterolateral slit, while in *Byrsax titanus* **sp. nov.** this area appears strongly excavated. The new species also vaguely resembles *B. cornutus* (Fabricius, 1787) (Indian Subcontinent, tropical SE Asia; studied from the male syntype of its junior synonym *B. horridus* (Walker, 1858) and a comparative material of males deposited at the Natural History Museum, London) but differs in the less strongly developed median pronotal tubercles (centrally positioned tubercle develops in a rather high, distally multispinose ridge in males of *B. cornutus*), the broadly excavated, slit-like posterior portion of the lateral margin of pronotum (more or less slit-like in *B. cornutus*), the clypeal dorsal process (‘horn’) not dichotomically divergent distally (the process appears distally dichotomic in large males of *B. cornutus*) and the processes are positioned between compound eyes (shifted towards clypeus in

males of *B. cornutus*). The aforementioned differential features are also true for a comparatively large species *B. excisicollis* Gebien, 1914 (Malay Peninsula, Sundaland, Wallacea (Sulawesi)).

Etymology. Descriptive. Given the fact that *Byrsax titanus* **sp. nov.** is yet the largest known species in the genus, the species epithet (from the Latin, "giant" or "Titan-like") refers to its considerable size and robust appearance. Adjective.

Distribution. Based on the geographic distance between the type localities, the species is likely widely distributed across rainforests of the Papuan Region.

FIGURES 12–14. Habitat and host fungus of *Byrsax titanus* **sp. nov. 12:** Sporophores-covered, fallen decaying logs, Batanta; **13:** Holotype ♂ and paratype ♀; **14:** The host fungus *Ganoderma* sp. with living specimens of *B. titanus* **sp. nov.** (photos by Tibor Kovács).

Bionomy. The holotype male and the paratype female were encountered in a lower-elevation (400 m) rainforest of Mount Batanta (highest mountain on Batanta: 1184 m) feeding on *Ganoderma* sp. (Polyporales: Ganodermataceae) sporophore growing on a fallen dead log at the daytime (See Figs 12–14). Although, it cannot be stated that it occurs only in lower-elevation rainforests, because one of the male paratypes was collected at 1,100 meters above sea level.

FIGURES 15–17. Frontal view of known males of *Byrsax titanus* **sp. nov.**, frontal view. **15:** Holotype from Batanta Island, Indonesia; **16:** Paratype from Fly River region, New Guinea; **17:** Paratype from Baiyer River region, New Guinea. Scale bar: 3 mm.

Byrsax Pascoe, 1860 species in the Papuan Region: a simplified checklist

We list the species yet recorded from the Papuan Region (see the definition above). Only a reference to the original description and for the species originally described not from the Papuan Region also a first reference from this zoogeographic area.

Byrsax titanus sp. nov.

Described herein.

Distribution: Raja Ampat Islands (Batanta), New Guinea (Fly River, Baiyer River (both without exact locality information)).

Byrsax biroi Kaszab, 1939

Kaszab (1939: 188 original description, as '*B. Birói*').

Distribution: New Guinea (Huon Peninsula; Garove Island (formerly also known as Deslac)), Bismarck Archipelago (West New Britain Province).

Byrsax crypticus Telnov, 2023

Buck (1958: 116 as *Byrsax tuberculatus* Gravely, 1915); Kaszab (1980: 40 as *B. biroi*); Telnov (2023: 166 original description).

Distribution: Solomon Archipelago (Rennell Island; ?Choiseul Island).

Byrsax pinnaticollis Carter, 1914

Carter (1914: 234 original description); Telnov (2023: 169, record from the Papuan Region).

Distribution: Australia (Queensland), Solomon Archipelago (Guadalcanal Island).

Key to the species of *Byrsax* Pascoe, 1860 occurring in the Papuan Region

1.	Antennal club of 8 antennomeres	***B. crypticus***
-	Antennal club of 7 antennomeres	2
2.	Posterolateral area of pronotum broadly excavated in dorsal view	***B. titanus* sp. nov.**
-	Pronotum with narrow posterolateral slit	3
3.	Narrow gap present between supraocular plica and clypeal dorsal process ('horn')	***B. biroi***
-	Supraocular plica fused to clypeal dorsal process ('horn')	***B. pinnaticollis***

Discussion

Working on this genus is challenging due to the well-known high degree of morphological diversity strengthened by the strong variability of several known *Byrsax* species in body size (also size and shape of clypeal and pronotal processes varies between different sized males) and due to crusted, hardened layer of debris embedded in the waxy substance concealing dorsum and legs.

Interestingly and in a contrast to general assumptions regarding horn-like processes bearing boletophagine taxa, the vertical length of clypeal processes in *Byrsax titanus* **sp. nov.** does not demonstrate a direct correlation with body size. The processes of the holotype, which has the greatest body length among the available specimens, is significantly shorter than that of the paratype from the Fly River region, whereas the male from the Baiyer River valley with the same body length (13 mm) as the former specimen, has a very short process, the shortest among the known males (See Figs 15-17).

The recent records of *Byrsax* from the Solomon Islands (Telnov 2023) highlighted the fact that the genus is likely underrecorded in the Papuan Region and its eastern distribution limit in the tropical Pacific lies eastwards of New Guinea. With the discovery of the new species from Papua New Guinea and the Raja Ampat Archipelago, another faunal gap is filled, and the presence of *Byrsax* in the entire territory of New Guinea and its satellite insular systems is confirmed. The discovery of a new *Byrsax* species from a small number of specimens collected in the Raja Ampat Islands, Indonesia and in Papua New Guinea highlights the value of historical specimens from properly managed entomological collections and at the same time point to the need for new research expeditions to the Papuan Region. Furthermore, the discovery sheds light on the hiatus regarding our knowledge of the Papuan entomofauna and promotes further nature conservation and research activity in the region.

Acknowledgements

We would like to express our deep gratitude to Aranka Grabant (HNHM, Budapest, Hungary) for her assistance in mounting the specimens and preparing the habitus images, Balázs Tóth (HNHM, Budapest, Hungary) for his assistance in preparing the genital photographs, to Bence Péter Schlitt (ELTE, HNHM, Budapest, Hungary), György Makranczy (HNHM, Budapest, Hungary) and Zoltán Vas (HNHM, Budapest, Hungary) for providing numerous invaluable suggestions throughout the course of our work. We are also sincerely grateful to the reviewers, Paloma Mas-Peinado (UAM-CIBC, Madrid, Spain) and Maxim Nabozhenko (DFRC RAS, DSU, Makhachkala, Russia) and the subject editor Martin Lillig (Saarbrücken, Germany) for their time, valuable comments and constructive suggestions.

Thanks are also due to the other members of the Batanta research team who accompanied the second author - Róbert Horváth, Péter Juhász (Debrecen, Hungary), István Fodor (Dunavarsány Hungary), Kristian Sauyai (Wailebet, Batanta) - who helped to make the collecting trip in the upper region of Agung Batanta possible. Most of the financial support for the second author's field trip to Batanta came from Róbert Horváth (Ostoros, Hungary),

who also provided free accommodation and catering. He and the Papua Paradise Eco Resort (Birie Island) provided the base camp and helped organise the field trips. We would like to thank Ronnius Sauyain (Wailebet, Batanta) for the unforgettable days he gave the second author in Agung Batanta, the & "Goa-homestay", the valley of Kalijakut River and Wailebet; without him the trip would not have been successful. Our study was carried out in compliance with the Memorandum of Understanding signed by the Research Centre for Biology, Indonesian Institute of Sciences (currently Biology Research Centre, were consolidated under the new National Research and Innovation Agency), and the Hungarian Natural History Museum.

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