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GENUS *BYRSAX* PASCOE, 1860 (COLEOPTERA: TENEBRIONIDAE) IN THE SOLOMON ISLANDS AND NEW GUINEA WITH DESCRIPTION OF A NEW SPECIES

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Abstract
New faunistic, country and biogeographical records are provided for *Byrsax biroi* Kaszab, 1939 and *B. pinnaticollis* Carter, 1914. *Byrsax crypticus* sp. nov. from the Solomon Islands is described and illustrated. Morphological features of the Papuan representatives of the genus *Byrsax* are briefly discussed.

Keywords: taxonomy, darkling beetles, Papuan Region

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INTRODUCTION

Byrsax Pascoe, 1860 is a small genus of tenebrionine Bolitophagini W. Kirby, 1837 distributed in the eastern Palaearctic, Oriental, Papuan and Australian regions (Gebien 1925, Kaszab 1939, Matthews & Bouchard 2008, Bouchard et al. 2021). Originally erected by Pascoe (1860) in Colydiinae Billberg, 1820 (Zopheridae Solier, 1834) to hold *Byrsax coenosus* Pascoe, 1860 (junior synonym of *Boletophagus gibbifer* Wesmael, 1836), which is the type of the genus by monotypy. About 28 species and subspecies were described in or placed to *Byrsax* by subsequent authors. In the Palaearctic fauna, *Byrsax* is represented by 12 species and subspecies (Iwan *et* al. 2020, Masumoto et al. 2021). About 11 species are known from tropical Asia including the Indian Subcontinent, Philippine and Greater Sunda archipelagos, some shared with the Palaearctic Realm and Wallacea (account in Gebien 1925, additions in Ando & Yamasako 2013, Grimm 2014). In the Australian fauna three species are yet known (Matthews & Bouchard 2008), four species yet reported from Wallacea (all - Sulawesi) three of which shared with other Greater Sunda Islands and the Mainland SE Asia (Ando & Yamasako 2013). A single species, *Byrsax biroi* Kaszab, 1939, was hitherto recorded from the Papuan Region, including eastern New Guinea and Rennell Island of the Solomon Archipelago (Kaszab 1939, Kaszab 1980).

A small number of specimens, historical and recently obtained from the Solomon Islands and New Guinea, allows some additions and corrections to the list of *Byrsax* species of the Solomon Archipelago. *Byrsax pinnaticollis* Carter, 1914 is reported for the first time from the Papuan Region (see definition in Gressitt

1982, Beehler et al. 1986, Riedel 2002, Telnov 2011) and a new species, *B. crypticus* sp. nov., is described from Rennell Island.

MATERIAL AND METHODS

All taxa are listed in alphabetical order since a phylogenetic arrangement is not yet possible. New records are listed chronologically. All label text is reproduced *verbatim*, with no corrections or additions. Labels (if more than one for the same specimen) are separated by double slash. Author's comments are given in square brackets. The holotype of the new species is provided with a black framed label on red paper with printed text "HOLOTYPUS".

Paired morphological structures are generally treated as singular in text. A telegraphic style is used for diagnoses.

For morphological studies, a Leica S6D binocular stereomicroscope (Leica Microsystems, Wetzlar, Germany) was used. Habitus images were produced with a Canon EOS 5D SLR camera and a Canon MP-E 65 mm lens (Canon Co., Tokyo, Japan). Genitalia were relaxed in KOH solution, dissected male genitals were mounted on microscope slides and fixed in Dimethyl hydantoin formaldehyde (DMHF) to make mounts for imaging and later fixed in DMHF on same cards near corresponding specimens. An AmScope BH200 light microscope was used for studies of microscopic mounts. Images of genital organs were made using an Olympus Though TG-6 (Olympus Corporation, Tokyo, Japan) digital camera attached to a light microscope. Helicon Focus 7 software (Helicon Soft, Kharkiv, Ukraine) was used for image stacking. Further image manipulations were performed using the GNU Image Manipulation Program (GIMP).

The studied material is deposited in the following collections:
BHMN – Natural History Museum, London, United Kingdom;
HMNH – Hungarian Museum of Natural History, Budapest, Hungary.

ZooBank URN for this publication: urn:lsid:zoobank.org:pub:734E3865-1D7F-491D-9DBA-C58286364DF7

RESULTS

***Byrsax biroi* Kaszab, 1939** (Figs. 1–2, 6A–B) Kaszab (1939: 188 & fig. 1) original description as '*Byrsax Birói*': 'Deslacs I.' (holotype), 'Neu-Guinea. Sattelberg' (paratype)).

Type material examined. Holotype ♂ [HMNH] (Fig. 1): I.Deslacs Biró 1901 [printed] // Typus [printed, text red] Byrsax Birói n. sp. 1938. D[r]Kaszab [handwritten] [label red framed] // Holotypus [printed, text red] 1939 Byrsax ♂ Birói [handwritten] Kaszab [printed, text red] [label red framed] // Photo ID: HNHM_COL_89 [printed].

Paratype ♀ [HMNH] (Fig. 2): N. Guinea Biró 1899. [printed] // Sattelberg Huon-Golf. [printed] // Allotypus [printed, text red] 1939 Byrsax ♀ Birói [handwritten] Kaszab [printed, text red] [label red framed] // Typus [printed, text red] Byrsax Birói n. sp. 1938. D[r] Kaszab [handwritten] [label red framed] // Byrsax biroi Kasz. [handwritten] Dr Z. Kaszab det., 19 [printed] 63 [handwritten].

Additional material examined. 1♂ & 2♀ [BHMN]: PAPUA: Kokoda. 1.200ft. v.1933. L.E.Cheesman. B.M.1933-427. [printed] // G. Bryant Coll. B.M.1926–86. [printed]. The ♂ specimen bears additional label: Byrsax biroi Kasz. [handwritten] Z. Kaszab det., [printed].

Morphology. The flattened and expanded lateral area of basal margin of elytron nearly smooth in all studied specimens. A narrow gap present between supraocular plica and head dorsal process ('horn').

Distribution. Huon Peninsula, Papua New Guinea ('Sattelberg', type locality); Witu

Islands, West New Britain Province, Papua New Guinea ('Deslacs I.', type locality); Owen Stanley Range, Papuan Peninsula, Papua New Guinea.

Figure 1. *Byrsax biroi* Kaszab, 1939, holotype ♂. A: dorsal view, B: dorso-frontal view Images: D. Telnov [not to scale].

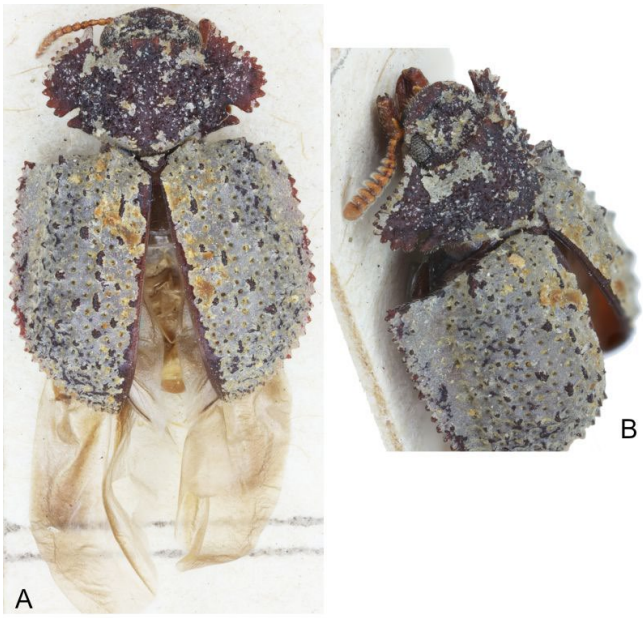

Figure 2. *Byrsax biroi* Kaszab, 1939, paratype ♀. A: dorsal view, B: dorso-lateral view. Images: D. Telnov [not to scale].

Figure 3. *Byrsax crypticus* sp. nov., holotype ♂.
A: dorsal view, B: lateral view, C: frontal view, D: dorso-lateral view. D. Telnov.

***Byrsax crypticus* sp. nov.** (Figs. 3, 6C–E)
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Buck (1958: 116) record 'Niupani' (Rennell Is.), as *Byrsax tuberculatus* Gravely.
Kaszab (1980: 40) identification corrected to *B. biroi*.

Type material designated. Holotype ♂ [BHMN] (Fig. 3): SOLOMON IS. Rennell I. Niupani. 22.xi.1953. J.D.Bradley. [printed] // RENNELL I. Expedition. B.M.1954-222. [printed] // Byrsax tuberculatus Grav. [handwritten] Det. F. D. Buck [printed] // Byrsax biroi Kasz. [handwritten] Dr Z. Kaszab det., 19 [printed] 96 [handwritten] [antennomeres 4–11 of the left antenna missing; the left hind leg detached from the specimen, glued on the same card near the specimen].

Additional material examined. 1♀ [BHMN] (Fig. 4): SOLOMON ISLANDS, Choiseul Is., Sasamugga area, Vanami vill. NE env. along Vavudu stream, 7°01'46"S 156°45'55"E to 7°01'37"S 156°44'34"E, 26–30.iv.2023, 20–65 m, disturbed & primary lowland rainforest on basalt, leg. D.Telnov. This specimen is not a part of the type series, see note below.

Derivatio nominis. From Latin 'cryptic' (cryptic) to point on external similarities with other congeners and several misidentifications made by earlier specialists.

Measurements. Holotype ♂, total body length not including head processes or 'horns' 4.6 mm. Retracted part of head 0.3 mm long (not including 'horns'), maximum width across canthus 1.4 mm. Pronotum 1.4 mm long, maximum width across midlength 2.9 mm. Elytra 3.4 mm long, maximum width across base 3.2 mm. Studied ♀ from Choiseul (not a paratype) is 3.5 mm long.

Description. Holotype ♂ (Figs. 3, 6C–E). Dorsum dark brown, venter and expanded lateral margins of pronotum and elytra reddish brown. Maxillary and labial palpi and antenna pale yellowish brown. Legs pale brown. Body shortly subcylindrical, strongly convex in dorsal aspect, subopaque on forebody, opaque on elytra and venter. Head strongly transverse, retracted to pronotum up to posterior margin of compound eye, flattened on frons in dorsal aspect. Mandible apex strongly, acutely bidentate. Anterior margin of labrum emarginate. Distinct but fine, strongly arched groove at place of frontoclypeal suture. Clypeus impunctate, with a long paired slightly curved, dorso-posteriad pointing process ('horn') just inwards of supraocular plica ('ridge' of authors). Length of clypeal process about 1 mm. Anterior, external, and posterior margin of a process irregularly denticulate, inner margin transversely rugulose. A narrow gap present between 'horn' and supraocular plica. Supraocular plica short, touching upper margin of compound eye. Gena flattened in dorso-ventral aspect, produced laterad in front of

compound eye. Genal canthus strongly protruding from lateral outline of head, partially concealing basal antennomere, irregularly sinuous in dorsal and lateral view, extending towards somewhat beyond midlength of an eye. Frons between eyes flattened, irregularly punctate, intervening spaces slightly glossy. Vertex strongly, irregularly corrugate, opaque. Compound eye asymmetrically elliptical, slightly protruding from lateral and dorsal outline of head, anterior margin subtruncate, posterior and dorsal margin rounded. Dorsal cranial setae inconspicuous, short and sparse, pale rufous, leaving large areas of head glabrous. Also processes sparsely covered with short setae. Antenna moderately long, clavate. Basal antennomere about 2.3–2.4× as long as antennomere 2. Antennomere 2 shortened. Antennomere 3 with small median lateral angulation, about twice as long as antennomere 2. Antennomeres 4–10 strongly serrate and asymmetrical, each with large, acutely angulate median lateral lobe, lobes of antennomeres 6–10 longer than corresponding antennomere. Terminal antennomere asymmetrical, apically broadly rounded, flattened dorso-ventrally, about twice as long as penultimate and about as long as combined length of two preceding antennomeres. Terminal maxillary palpomere fusiform, tapered apically. Terminal labial palpomere fusiform, tapered apically. Pronotum widest across midlength, strongly transverse, subopaque, median area of pronotal disc convex in dorsal aspect, gently sloping laterad towards expanded, flattened and strongly deplanated lateral margin. Anterior margin broadly emarginate, posterior margin irregularly rounded, shallowly emarginate at posterolateral denticle (representing posterolateral angle of pronotum). Median area of pronotal disc with irregular vertical conical tubercles leaving narrow median line smooth. Dense irregularly circular punctures between tubercles, intervening spaces generally narrower than punctures, subopaque. Deplanate lateral area of pronotum with subvertical conical tubercles (five large, two minute or absent), intervening spaces impunctured, dorsum between tubercles opaque. Lateral margin of explanate lateral area of pronotum with about 11 denticles, two anterior of which bicuspidate. Moderately deep, short emargination on lateral margin of pronotum beyond to two anterior denticles. Deep and rather broad posterolateral slit at posterior margin of pronotum between moderately long posterolateral tubercle and expanded lateral margin. Dorsal pronotal setae very inconspicuous, sparse, short and curved, observed on lateral area of pronotal disc. Scutellar shield broadly triangular, apically pointed, dorsally punctured-corrugated. Elytra hardly longer than wide, strongly convex in dorsal aspect, nearly parallel-sided, laterally strongly declivous, flattened and modified into narrow expanded and deplanated lateral margin. Anterior margin of elytron with vertical tubercle in front of tuberculate anterolateral angle. Humeral callosity distinctly convex, multituberculate. Suture not raised. Elytral disc with series of irregular ventral conical tubercles of variable size and height. Some tubercles merging into short longitudinal plicae (especially postscutellar, either side of suture). Tubercles becoming distinctly smaller on declivous, lateral part of elytron and are sparse on expanded lateral area of elytron. Elytral punctures much larger and deeper than those on pronotum, arranged into nine rather regular longitudinal rows on each elytron, in part confused or interrupted by tuberculate structures. Intervening spaces between punctures and tubercles smooth. Intervals between punctures in rows narrower than punctures. Lateral margin of elytron regularly denticulate, denticles rounded apically. Elytral setae as those on pronotum, sparse across whole elytral disc and lateral sides. Epipleuron complete, very broad except at elytral apex, moderately densely punctate and sparsely setose. Metathoracic wings fully developed (functional). Legs moderately long. Femur glossy, shortly setose on ventral part. Tibia moderately glossy, with dense, short, whitish setae, tricarinate (median carina incomplete). Male basal metatarsomere strongly shortened, about as long as second metatarsomere. Terminal tarsomere of each leg thickened, slightly arched, distinctly longer than combined length

of remaining tarsomeres. Pretarsal claws with short empodium. Male last visible tergite and sternite broadly rounded at posterior margin. Aedeagus as in Fig. 6C–E, apicale about same long as basale.

Sexual dimorphism. Female (Fig. 4) smaller and less strongly convex, head without processes.

Figure 4. *Byrsax* cf. *crypticus* sp. nov., additional ♀ from Choiseul Island, dorsal view. D. Telnov.

Differential diagnosis. The new species appears similar to *Byrsax biroi* (eastern New Guinea and Bismarck Archipelago) but differs in the strongly lobate male and female antennomere 4, and in the shape of the aedeagus (the length ratio of the basale to apicale about 1 *versus* 1.45 in *B. biroi*). *Byrsax similaris* Ando et Yamasako, 2013 (North Sulawesi) has the posterolateral slit of pronotum significantly narrower compared to that in the new species, the antennomere four is not lobate and the antennomere five slightly lobate in this species.

Ecology. Occurs in lowland rainforests.

Distribution. So far reliably known from Rennell Island, Rennell and Bellona Province, Solomon Islands. The distribution to include Choiseul Island would the identification of the studied female confirmed.

Note. The female from Choiseul (Fig. 4) with antennomere 4 strongly lobate (antennomeres 4–10 strongly serrate) but no male from the same locality is available to confirm the yet tentative identification.

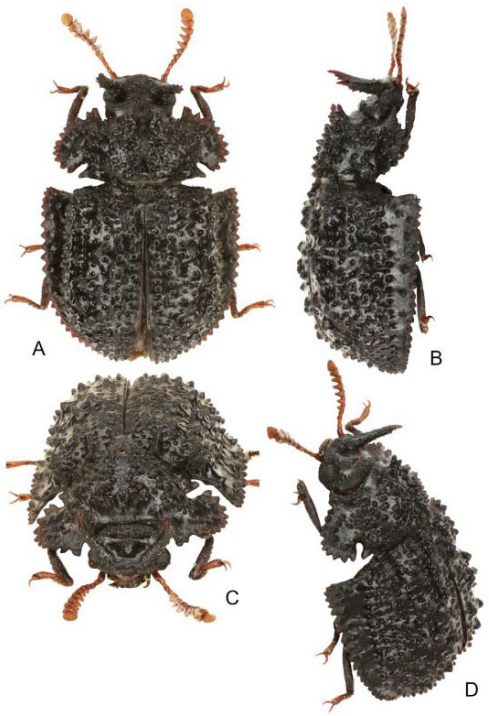

Figure 5. *Byrsax pinnaticollis* Carter, 1914, ♂ from Guadalcanal Island. A: dorsal view, B: lateral view, C: frontal view, D: dorso-lateral view. Images: D. Telnov [not to scale].

***Byrsax pinnaticollis* Carter, 1914** (Figs. 5–6F–H)

Carter (1914: 234) original description: ‘Queensland: Cairns’.

Matthews & Bouchard (2008: 292) checklist, list of synonyms.

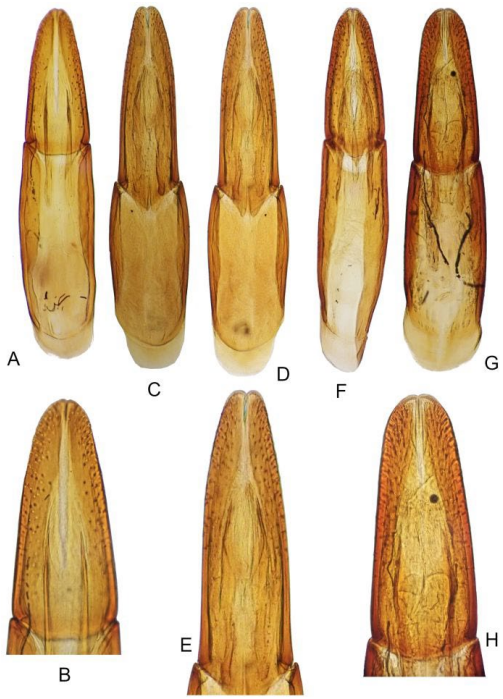

Figure 6. Papuan and Australian *Byrsax*, aedeagi. A: ventral view, *B. biroi*, specimen from Kokoda, B: ditto, apicale enlarged, C: ventral view, holotype *B. crypticus* sp. nov., D: ditto, dorsal view, E: ditto, apicale enlarged, F: ventral view, *B. pinnaticollis*, specimen from Eubenangee, G: ventral view, specimen from Guadalcanal Island, H: ditto, apicale enlarged. Images: D. Telnov [not to scale].

Type material. Not examined (as of Matthews & Bouchard (2008), there are several syntypes deposited in various Australian museums.

Additional material examined. 1♂ & 1♀ [BHMN] (Fig. 5): N.QUEENSLAND. Eubenangee. [printed] March 1950 [handwritten] J.G.Brooks. B.M.1950-433. [printed]; 2♂ & 2♀ [BMNH]: Australia, NQ Eubenangee iii.1950 G.Brooks [handwritten] // Byrsax pinnaticollis Carter. [handwritten] // E.Gowing-Scopes collection BMNH{E}2005–4 [printed]; 1♂ [BMNH] (Fig. 5): SOLOMON ISLANDS, Guadalcanal Is., Honiara S env., Barana vill. S env., 9°29'5"S 159°58'40"E, 20–23.iv.2023, 220–350 m, disturbed lowland rainforest on limestone, leg. D.Telnov.

Morphology. The studied ♂ from Guadalcanal (Fig. 5) is 5.7 mm long, the ♂♂ from Queensland are 4.1 and 4.6 mm and the ♂ from Kokoda – 4 mm long. Proportionally, the anterior paired pronotal process is more strongly developed in the specimen from Guadalcanal and the area between processes stronger impressed in dorsal and anterodorsal aspect. Head dorsal process touching compound eye, supraocular plica fused to the process, shifted dorsad and positioned above dorsal surface of eye at base of a process, without a gap between process and plica. Antennomeres 5–10 strongly serrate and asymmetrical, each with acutely angulate median lateral lobe. Antennomere 4 asymmetrical and shortened but without projecting lobe. The flattened and expanded lateral area of basal margin of elytron uneven but not denticulate.

Distribution. Queensland, Australia ('Cairns' type locality); Guadalcanal, Solomon Islands. First record for the Solomon Islands Archipelago and the Papuan biogeographical region.

DISCUSSION

Identification of *Byrsax* species is challenging since external features vary to a great extent depending on the size of the specimens (larger males usually have stronger developed head 'horns' and, if applicable, pronotal processes). In the studied specimens, antennae are serrate starting from antennomere four (*B. crypticus* sp. nov.) or five (*B. biroi*, *B. pinnaticollis*) which, in my understanding, can be considered reliable character for threating at least the Papuan Region species. However, more comparative material is required to test this hypothesis.

Male aedeagi and terminalia of *B. biroi* and *B. pinnaticollis* does not provide informative features for treating both congeners (Fig. 6).

However, the aedeagus of *B. crypticus* sp. nov. appears distinct, with apicale about as long as the basale (Fig. 6C–E). In the studied male of *B. biroi* from Kokoda, the length ratio of basale to apicale is about 1.45 (Fig. 6A–B). In the *A. pinnaticollis* males from Queensland this ratio is about 1.6–1.7 (Fig. 6F) while in the male from Guadalcanal - 1.4 (Fig. 6G–H) unveiling an intraspecific variability. For smaller *B. pinnaticollis* males lacking obvious paired anterior pronotal process the only possibly stable distinguishing feature from males of *B. biroi* could be the position of a supraocular plica: in *B. pinnaticollis* this plica is attached to outer lower margin of 'horn' when in *B. biroi* a narrow gap is present between 'horn' and plica.

Female *Byrsax* appear even more challenging to classify to species if no male material is available from the same area. The specimen from Choiseul is here tentatively arranged to *B. crypticus* sp. nov. considering the strongly lobate antennomere 4 (antennomere 4 is not known to be lobate in both *B. biroi* and *B. pinnaticollis*).

Occurrence of the previously considered Queensland-restricted *Byrsax pinnaticollis* in the Solomon Islands highlights the obvious lack of records of tenebrionid material form the large intermediary area of New Guinea and its numerous satellite islands. There might be a little doubt about the origin of the Guadalcanal population of *B. pinnaticollis* since the area the species has been recorded from is situated near the capital, at place of intensive WWII fighting, where personnel and cargo arrived from or transited through Australia were involved. On the other hand, there are only a few examples of beetle introductions known from the Solomon Islands. Therefore, I hypothesize that *B. pinnaticollis* has much wider natural distribution than previously thought. The presence of *B. pinnaticollis* in New Guinea and surrounding islands is likely, and both the western and eastern extent of the distribution area of this taxon remain unclear.

Byrsax biroi is not yet considered a part of the Solomon Archipelago's fauna since the identification by Kaszab (1980) refers to *B. crypticus* sp. nov. However, the presence of *B. biroi* in the Solomons is not impossible considering the record from adjacent New Britain Province of Papua New Guinea.

Byrsax similaris (North Sulawesi) is lacking other distinguishing features from *B. biroi* and *B. crypticus* sp. nov. other than the posterolateral slit of pronotum which is significantly narrower in the former. Considering the high intraspecific variability within *Byrsax*, both taxa are likely conspecific.

CONCLUSIONS

The discovery of a new *Byrsax* species in the historical material deposited at the BMNH once more highlights the value of properly managed biological collections. The new faunistic records of the genus *Byrsax* from New Guinea and the Solomon Islands based on a small material point on the poor level of knowledge of the Papuan entomofauna and highlights a need for further comprehensive research in the study region, until megadiverse undisturbed habitats remain available.

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