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Review of the biology, distribution and taxonomic history of *Gnoma boisduvali* Plavilstshikov, a longicorn beetle from the rainforests of Papua New Guinea and Irian Jaya

(Insecta, Coleoptera, Cerambycidae, Lamiinae)

By **Trevor J. Hawkeswood** and **Diethard Dauber**

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Biological and morphometric details are provided on the tropical longicorn beetle *Gnoma boisduvali* Plavilstshikov (Cerambycidae, Lamiinae, Gnomini) based on collections made during 1989 by the senior author in the East Sepik Province, Papua New Guinea. The taxonomic history and distribution records for the beetle are also reviewed and a distribution map provided. The species inhabits tropical rainforests and flies into clearings or around human habitation, where they mate and feed on bark and sap flows from certain trees, e. g. *Citrus grandis* Osbeck (Rutaceae), *Ficus* sp. (Moraceae), *Spathodea campanulata* Beauv. (Bignoniaceae) and *Intsia bijuga* (Colebr.) Kuntze (Caesalpiniaceae), although at this stage, there is no evidence that any of these plants are larval hosts for *G. boisduvali*. The only recorded larval host is *Theobroma cacao* L. (Sterculiaceae). Morphometric data indicates that there is marked sexual dimorphism in the length of the antennae, in the length of the protibia and profemur, and generally, in the length of the pronotum. The sexes are also clearly distinguished on the basis of elytral pattern. From the recent collection of *G. boisduvali* from Papua New Guinea, the males can be divided into two groups based on body size- it is possible that "major" and "minor" males exist in this species, as they do in other beetle groups such as the Scarabaeidae and the Geotrupidae.

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Introduction

The genus *Gnoma* Fabricius (Cerambycidae, Lamiinae) contains over 30 species of mainly black beetles with variable cream markings, found in the New Guinea, Indonesian, Malaysian and Pacific regions (Thomson 1860, Schwarzer 1926, Breuning 1945, Dillon & Dillon 1950, Gressitt 1952). The adults are characterized by having a long prothorax (especially in the males), which is positioned at an oblique angle to the longitudinal axis of the abdomen and elytra so that the head is positioned higher than the rest of the body. Most of the species apparently also exhibit a marked degree of sexual dimorphism in such characters as length of antennae, body coloration and markings and

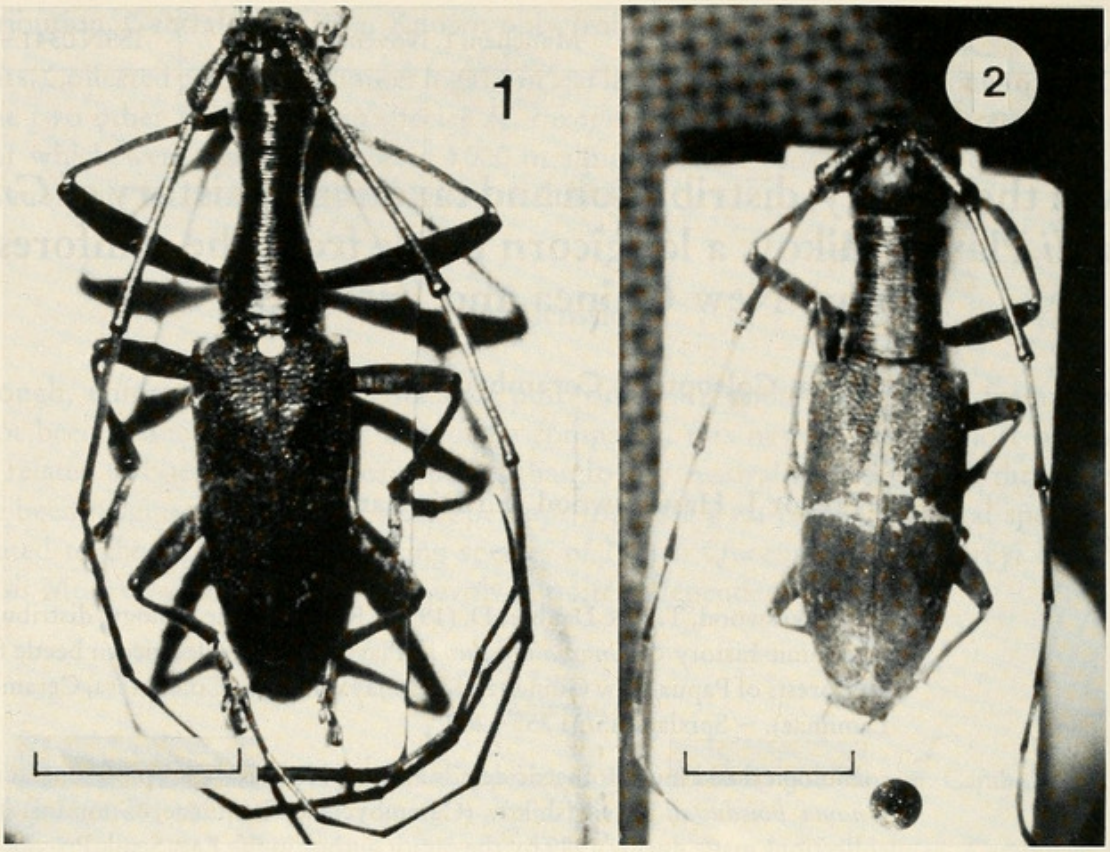

Fig. 1: Minor male of *Gnoma boisduvali* Plavilstshikov, collected on 28 October 1989, from Passam, East Sepik Province, Papua New Guinea, by T. J. Hawkeswood, in collection of D. Dauber. Scale line = 5 mm. (Photo: D. Dauber).

Fig. 2: Female of *Gnoma boisduvali* Plav., collected on 25 October 1989, from Passam, East Sepik Province, by T. J. Hawkeswood, in collection of D. Dauber. Scale line = 5 mm. (Photo: D. Dauber).

length and width of the prothorax (Thomson 1860, Lacordaire 1866, Breuning 1945, Dillon & Dillon 1950, Gressitt 1952). The various species tend to be uncommon and virtually nothing is known about their biology and behaviour. Recently one of us (TJH) has collected a small series (of both males and females) of one species, *Gnoma boisduvali* Plavilstshikov (Figs 1 & 2) from northern Papua New Guinea and observations on its biology, behaviour and sexual dimorphism are recorded here for the first time. Comments are also provided on the general distribution of the beetle in Papua New Guinea, localities listed for Papua New Guinea and Irian Jaya and a map provided.

Materials and Methods

a. Study area, climate and vegetation

Observations and collections of beetles were undertaken during 1989 in several areas near the village of Passam (3°45'S, 143°35'E) in the East Sepik Province, Papua New Guinea. The area receives an average monthly rainfall ranging from 128 mm to 225 mm and maximum daily temperatures range from 29°C to 35.5°C, while minimum daily temperatures range from 18°C to 22°C throughout the year. The first half of 1989 was abnormally wetter than usual and temperatures were cooler than average. The humidity of the Passam area remains high (usually between 70% and 90%) throughout the year. Higher humidity readings during December to May, correspond to larger amounts of cloud cover, which varies from 65% to 92% daily. The average altitude of the area is 960 metres.

According to Robbins (1968) the vegetation of the Passam area is composed of lowland hill (rain) forest with three main tree layers. The rainforest is of a very mixed composition with more than 60 tree species having been recorded from the canopy alone (Robbins 1968). Some of the common and dominant tree and shrub species of the Passam area include the following: *Canarium indicum* L. (Burseraceae), *Alstonia scholaris* R. Br. (Apocynaceae), *Intsia bijuga* (Colebr.) Kuntze (Caesalpiniaceae), *Artocarpus altilis* (Park.) Fosberg and *Ficus* spp. (Moraceae), *Spathodea campanulata* Beauv. (Bignoniaceae), *Pometia pinnata* Forst. f. (Sapindaceae), *Albizia falcataria* (L.) Back. (Mimosaceae), *Schizomeria serrata* (Hochr.) Hochr. (Cunoniaceae), *Flindersia amboinensis* Poir. (Flindersiaceae), *Euodia* spp. (Rutaceae), *Celtis* spp. (Ulmaceae), *Vitex cofasus* Reinw. (Verbenaceae), *Terminalia kaernbachii* Warb. (Combretaceae) and *Macaranga quadriglandulosa* Warb. (Euphorbiaceae).

b. Observations/collections of beetles

Specimens of *G. boisduvali* were collected from the field during April and October 1989 and later various parameters such as length of antennae, thorax, head, elytra, elytral width and total body length of each beetle were measured in the laboratory. The data obtained are presented in Tables 1 and 2.

Table 1. Comparison of various body measurements between males and females of *Gnoma boisduvali* Plavilstshikov from Passam, Papua New Guinea (all measurements are in mm)

Date collected	Sex	Body length	Head length	Thorax length	Elytral length	Elytral width	Thorax/elytra length ratio
8 April	♀	16.4	2.2	4.3	9.9	4.8	0.434
15 April	♀	18.2	2.2	4.8	11.2	5.5	0.429
15 April	♀	17.8	2.2	4.6	11.0	5.2	0.418
15 April	♀	17.0	2.1	4.5	10.4	5.0	0.433
21 April	♀	18.5	2.0	5.0	11.5	5.1	0.435
25 October	♀	16.5	2.2	4.5	9.6	4.7	0.469
25 October	♀	18.8	2.2	5.0	10.5	5.0	0.476
28 October	♀	17.0	1.8	4.6	10.2	4.5	0.450
Mean		17.5	2.1	4.7	10.5	5.0	0.443
± SD		0.9	0.1	0.3	0.7	0.3	0.020
15 April	♂	21.2	2.6	8.0	10.6	5.0	0.755
15 April	♂	20.2	2.4	7.7	10.1	5.0	0.762
15 April	♂	15.5	2.0	5.0	8.5	3.6	0.590
21 April	♂	14.6	1.2	5.0	8.4	3.5	0.595
2 October	♂	24.2	2.7	9.0	12.0	5.6	0.750
28 October	♂	16.5	1.6	5.8	8.5	4.0	0.682
Mean		18.7	2.1	6.8	9.7	4.5	0.689
± SD		3.8	0.6	1.7	1.5	0.9	0.080

Table 2. Comparisons of lengths of some appendages between males and females of *Gnoma boisduvali* Plavilstshikov from Passam, Papua New Guinea (all measurements are in mm)

Date collected	Sex	Protibia length	Profemur length	Antennal length	Antennae/body length* ratio
8 April	♀	4.6	4.5	25.0	1.52
15 April	♀	5.2	5.1	28.5	1.57
15 April	♀	4.9	4.8	26.2	1.47
15 April	♀	5.0	5.0	26.5	1.56

Date collected	Sex	Protibia length	Profemur length	Antennal length	Antennae/body length* ratio
21 April	♀	5.0	5.0	27.5	1.49
25 October	♀	4.5	4.5	23.5	1.42
25 October	♀	4.7	4.5	26.0	1.38
28 October	♀	4.2	4.0	25.2	1.48
Mean		4.8	4.7	26.0	1.49
± SD		0.3	0.4	1.5	0.07
15 April	♂	10.2	10.0	51.2	2.42
15 April	♂	8.8	8.8	41.5	2.05
15 April	♂	6.0	5.9	28.2	1.82
21 April	♂	5.2	5.2	27.5	1.88
2 October	♂	10.5	10.2	53.5	2.21
28 October	♂	6.8	6.8	25.5	1.55
Mean		7.9	7.8	37.9	2.00
± SD		2.2	2.1	12.6	0.30

* Body length measurements used in this ratio are obtained from Table 1

Observations

a. Biological data from the field

The first specimen was collected at a house light (incandescent) during the early evening (ca. 20.00 hrs) at Passam, East Sepik Province. A week later, several males and females were noticed on the trunks of a dying, standing tree (ca. 4 m high) of Pomelo, *Citrus grandis* Osbeck (Rutaceae) on 15 April 1989 and further material was collected from this and another tree of *C. grandis* on 21 April. The Pomelo trees were growing near habitation immediately near tropical rainforest. The beetles were mating on the tree trunks or feeding on the bark and mucilaginous pale reddish-brown sap that was oozing from the lower trunks and branches. The beetles became more active upon disturbance, some eluding capture by immediately taking flight. In the air they flew rapidly upwards to a height of about 3 m above ground level before landing higher up on the branches of another Pomelo tree or flying away from the area. They attempted to bite fiercely when handled and softly stridulated at the same time. Despite extensive searches in the area and at other localities, no further material of *G. boisduvali* was obtained until 2 October when a large male was collected from the trunk of a coarse-leaved, sandpaper fig *(Ficus* sp., Moraceae) which had been injured by some of the local inhabitants; a clear sap was oozing profusely from near the top of the tree (2 m high) and was trickling down the trunk. The tree was examined almost daily for the next month but no further *G. boisduvali* were attracted.

The species was finally encountered in a deep ravine during late October, where adults were flying actively in a bright sunlit clearing towards the base of the ravine. A number of logs from recently fallen trees of *Intsia bijuga* (Colebr.) Kuntze (Caesalpiniaceae), *Spathodea campanulata* Beauv. (Bignoniaceae), *Ficus* sp. (Moraceae) and other unidentified trees which had been recently cut down by the local inhabitants were scattered around the base of a ravine. The beetles were landing on and rapidly taking flight from the sunlit areas on the logs in association with other beetles and other insects such as *Omadius* sp. (Cleridae), *Mecopus* sp. (Curculionidae), *Pericalus figuratus* Chaudoir (Carabidae) (all Coleoptera) and robberflies (Asilidae: Diptera). Mating and

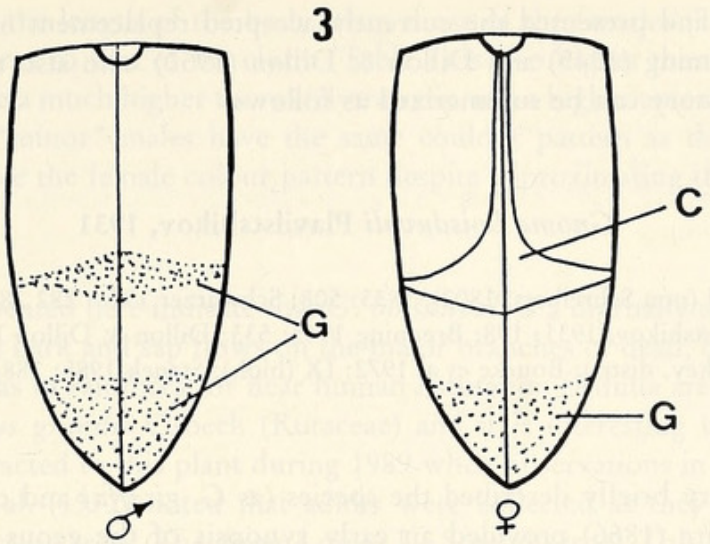

Fig. 3: Comparison of the elytral colour pattern between the sexes of *Gnoma boisduvali* Plav., based on material from Passam, East Sepik Province (C = cream, G = gray). (Drawn by T. J. Hawkeswood).

egg-laying by *G. boisduvali* was not observed so the utilization of the logs as larval hosts was not able to be determined.

b. Sexual dimorphism

G. boisduvali exhibits sexual dimorphism both in colour pattern (Fig. 3) and size of several body parts. Examination of the sample of females from Passam revealed that there is little variation between individuals in such characters as the lengths of the body, thorax and elytra (Table 1) or in the lengths of the protibiae, profemora and antennae (Table 2). Consequently little variation was detected in the antennal length to body length ratio (Table 2) and the thorax length to elytral length ratios (Table 1) for these females. On the other hand, considerable size variation was found in the males; on the basis of size, the sample of males could be divided into two groups. The larger males (i. e. those collected on 15 April except for the third specimen and on 2 October) were larger than any of the females and had longer thorax (Table 1) although the elytral width and elytral length of these larger males and the females did not vary considerably (Table 1). The lengths of the protibiae and profemora of males (excepting the two smallest males i. e. those collected on 21 April and 28 October) were longer than those of the females (Table 2). The antennae/body length ratio indicates that the antennae of the females are about 1.5 times the length of the body while that of the males varies from about 1.8–2.4 times the length of the body.

Discussion

a. Nomenclatural history

Gnoma boisduvali Plavilstshikov was originally (and very briefly) described by Boisduval (1835) but Boisduval was apparently unaware his name was preoccupied by *Gnoma giraffa* Schreibers (1802).* Schwarzer (1926) was also not aware of this situation when he redescribed *G. giraffa* Boisduval (see translation which is discussed below). Plavilstshikov (1931) discussed the nomen-

* This may have resulted from the fact that Schreibers described his species as *Cerambyx giraffa* and not as a *Gnoma*.

clature of the species and presented the currently accepted replacement name. This terminology was followed by Breuning (1945) and Dillon & Dillon (1950) who also redescribed the species. The nomenclatural history can be summarized as follows:

Gnoma boisduvali Plavilstshikov, 1931

Gnoma giraffa Boisduval (non Schreibers, 1802), 1835: 508; Schwarzer 1926: 282 284, pl. IV, fig. 22, 23.
Gnoma boisduvali Plavilstshikov, 1931: 198; Breuning 1945: 533; Dillon & Dillon 1950: 37, pl. 1, fig. 17, 18; Gressitt 1952: 55, 58 (key, distr.); Bourke et al 1972: IX (biol.); Stanek 1985: 288, pl. 434, 435 (illustr.).

b. Sexual dimorphism

Boisduval (1835) very briefly described the species (as *G. giraffa)* and did not note any sexual dimorphism. Lacordaire (1866) provided an early synopsis of the genus *Gnoma,* noting sexual dimorphism in antennal length, pronotum dimensions and elytral shape but did not discuss any particular species. Schwarzer (1926) provided the first detailed description of *G. boisduvali* (as *G. giraffa)* and an English translation is provided here with later comments: "The sexes are easily separated by the apical part of the elytra. There is no concentration of oblique pubescence in the reticulate or speckled markings which occur in all other (known) species from New Guinea. The sexes differ in habit and markings. In males the pronotum is nearly twice as long as wide and at the narrowest part is at most ⅔ as wide as it is in the female. In females the elytra are considerably longer and more parallel than in the males. In males, the dark ground tomentation is much finer than in the females (where it is better developed and brownish); the central elytral marking, which resembles a rectangle resting on one of its corners, consists in females of dense, white hairs and is gradually narrowed towards the scutellum. Females are not constant in respect to this colour; there are some females (probably local varieties) which resemble the males in respect to colour and markings.". It is evident that Schwarzer did not notice any small males in the material before him. The reference to females resembling males could be explained as confusion with other species. No such material was found in the population from Passam. Plavilstshikov (1931) only provided a replacement name and did not provide any data on morphology or biology. Breuning (1945) provided a redescription noting sexual dimorphism of the colour pattern etc. in the species but did not note any morphological differences in males. Dillon & Dillon (1950) provided the most detailed description of *G. boisduvali* to date (the first in English) and noted a number of sexual dimorphic characters not described by earlier authors but again did not recognize the existence of "major" and "minor" males, although in a general statement they noted the size of the species varied from 11 to 24 mm. Other authors after Dillon & Dillon (1950) have not mentioned the possibility of the existence of the two types of males. The measurements of the males collected from Passam in the present study indicate that the males of *G. boisduvali* exist as two morphological variants based on body size; the larger males could be grouped and classified as "major" males, (i. e. those measuring 20–25 mm body length and 5–6 mm wide) and the smallers ones (i. e. 14–18 mm body length and 3.5–4 mm wide), as "minor" males, a condition that also exists with males of some species of Lucanidae and Geotrupidae (Coleoptera). It should also be noted that the body proportions of the "minor" males are different from those of the "major" males (see Tables 1 & 2), and the "minor" males are almost the same dimensions as the females (except for antennal length). However, a larger series of this species is needed before the "major/minor" male hypothesis can be confirmed as fact.

To summarize our findings on morphometrics, the males of *G. boisduvali* exhibit more variation in the length of the body, thorax length, elytral length and width, length of the protibiae and profemora and antennal length, than do the females. The dimensions of the so-called "minor" males approximate those of the females, although their bodies are usually narrower and the antennae are

longer in proportion to the length of the body, than those of the females (Table 2), and the ratio of the length of the thorax to that of the elytra (Table 1) is also higher than those of the females. All males therefore, have a much higher thorax/elytra ratio and a higher antennae/body length ratio than the females. The "minor" males have the same coulour pattern as the "major" males and therefore do not resemble the female colour pattern despite approximating the size of the females.

c. Biology

The observations presented here indicate that *G. boisduvali* is a diurnally active longicorn beetle which is attracted to the bark and sap flows on the major branches of dead, dying or injured trees, especially in cleared areas in rainforest or near human habitation. Adults are particularly attracted to the introduced *Citrus grandis* Osbeck (Rutaceae) and it is interesting to note that no other Cerambycidae were attracted to this plant during 1989 when observations in the Passam area were undertaken. Bourke et al. (1972) noted that adults were collected as they emerged from larval chambers (channels) in cacao trees *(Theobroma cacao* L., Sterculiaceae). This appears to be the only published larval host record for the species.

d. Distribution

Various authors have recorded distribution data for *G. boisduvali,* but much of these data are incomplete, vague or use old names often misspelled. These records are corrected below and the present known distribution of *G. boisduvali* plotted on the map provided (Fig. 4). The currently accepted provinces of Papua New Guinea are also included for completeness since most of the previously published records omit this information for one reason or the other.

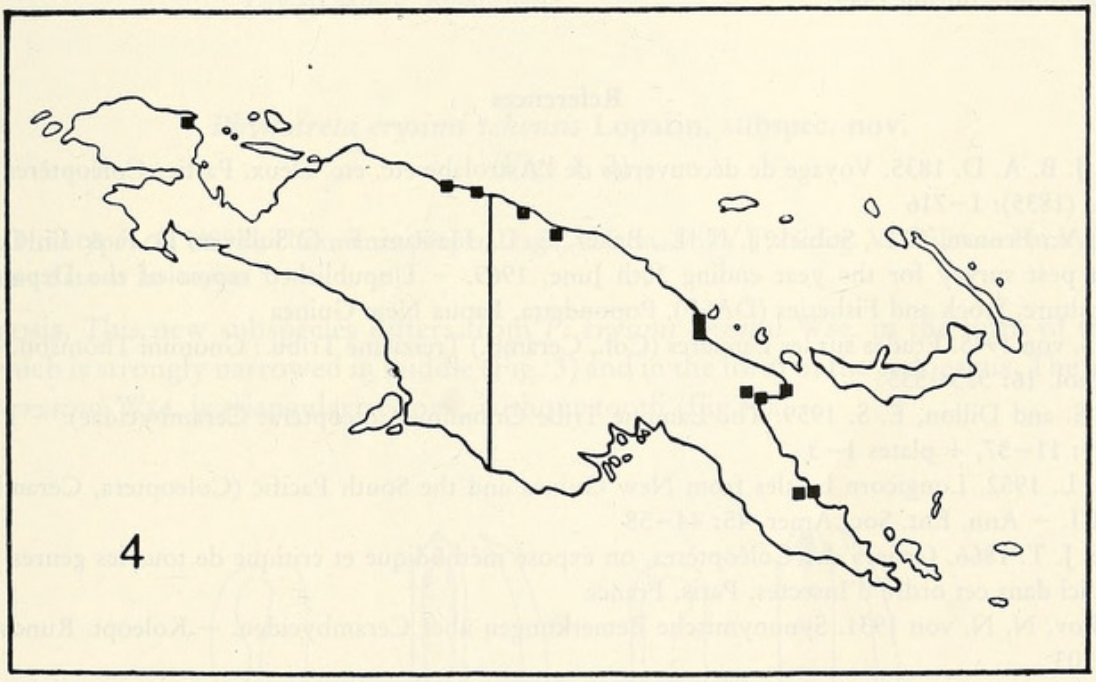

Fig. 4: Map of Irian Jaya and Papua New Guinea showing the known distribution of *Gnoma boisduvali* Plav. (Drawn by T. J. Hawkeswood).

Distribution records: **Papua New Guinea:** Dimark Plantation, Northern Province, June 1968, (collector not cited) (Bourke et al. 1972); New Britain Province (Breuning 1945, cited as Nouvelle-Bretagne); Aitape, West Sepik Province, (3°09'S, 142°20'E) (Dillon & Dillon 1950, cited incorrectly as Papua); Aitape, West Sepik Province, Feb. 1936, A. J. Marshall (Dillon & Dillon 1950); Passam, East Sepik Province, various dates, T. J. Hawkeswood

(Hawkeswood & Dauber this paper); Alexishafen, Madang Province, (5°06'S, 145°49'E) (collector not cited) (Dillon & Dillon 1950, locality incorrectly cited as Alexishalen); Madang (Stephansortia), Astrolabe Bay, Madang Province (5°20'S, 145°48'E) (collector not cited) (Dillon & Dillon 1950); Lae, Morobe Province, (6°43'S, 147°00'E), Dec. 1944 to Jan. 1945, J. G. Brooks (Dillon & Dillon 1950); Nadzab, Markham River Valley, Morobe Province (6°35'S, 146°45'E, (collector not cited), (Dillon & Dillon 1950, locality incorrectly cited as Nadzat); Finschhafen, Morobe Province (6°34'S, 147°50'E) (collector not cited) (Dillon & Dillon 1950, locality incorrectly cited as Finchhaven); Cromwell Range, Morobe Province, (6°15'S, 147°25'E) (collector not cited) (Dillon & Dillon 1950); Oro Bay, Northern Province, (8°43'S, 148°30'E), Jan. 1944, J. R. Heller (Dillon & Dillon 1950); Mt. Lamington district, Northern Province, (8°55'S, 148°10'E), Aug. 1929, C. T. McNamara (Dillon & Dillon 1950). – **Irian Jaya:** Andai (Humboldt Bay) (c. 1°00'S, 134°00'E) (O.) Staudinger (Breuning 1945, cited as Baie de Humboldt, Andai); Maffin Bay, (c. 2°26'S, 140°20'E) (?), Aug. 1944, E. S. Ross (Gressitt 1952); Jayapura (2°33'S, 140°42'E), (collector not cited), (Dillon & Dillon 1950, cited by the old name of Hollandia).

Dillon & Dillon (1950) list three further localities, namely Toem and Monumbo, but we have not been able to locate these on recent maps of this region.

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