

A new species of the phasmid genus *Lonchodes* from Sabah (Insecta: Phasmida: Lonchodinae)

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Abstract. A new species of stick insect, *Lonchodes robertongi* n.sp., is described and illustrated from Kawag Gibong Forest Reserve in Lahad Datu, Sabah. The female has an elongated lamina supraanalis similar to that of *Lonchodes everetti* (Kirby 1896) but they are easily distinguished by the eggs and males. A distribution map is provided for the species of *Lonchodes* which have an elongated lamina supraanalis (11th abdominal tergite).

Keywords: Borneo, distribution, Kawag Gibong, *Lonchodes everetti*, *Lonchodes robertongi*, new species, Sabah

INTRODUCTION

As part of an ongoing project looking at distribution of phasmids, mantids and cockroaches in Borneo, several Forest Reserves were visited in south-eastern Sabah in October 2022. I visited Kawag Gibong Forest Reserve in Lahad Datu for two nights accompanied by Rob Byatt from the UK, and several members of the Entomology Staff from the Forest Research Centre, Sepilok. One of the specimens collected was an adult female phasmid which initially appeared to be *Lonchodes everetti* (Kirby 1896). The specimen was kept alive; the eggs were found to differ significantly from eggs of *L. everetti*, so the eggs were incubated in the hope that males could be reared.

Abbreviations used for museum collections:

BORN = Borneensis, Universiti Sabah Malaysia, Kota Kinabalu, Sabah.

BMNH = Natural History Museum, South Kensington, London, U.K.

FRCS = Forest Research Centre, Sepilok, Sabah.

OXUM = Oxford University Museum, Oxford, U.K.

PEB = P.E. Bragg, Lower Pilsley, Chesterfield, Derbyshire, U.K.

Other abbreviations: HT = Holotype. PT = Paratype.

Measurements were taken from the longest and shortest male and female specimens (Table 1) and from a randomly selected egg. Measurements of the egg, head, pronotum, median segment and lamina supraanalis (11th abdominal tergite) were made using a microscope and eyepiece graticule with measurements rounded to the nearest 0.1 mm, except for the measurement for the egg capitulum which is given to 0.01 mm. Other measurements of the insects were made using electronic calipers and rounded to

the nearest 0.5 mm. Photographs were taken from a mixture of live and preserved specimens using a Canon 350D camera fitted with a 60 mm macro lens and a ring-flash. Drawings were made using a Motic M400 microscope fitted with a camera lucida. Descriptive terminology follows Bragg (1997) for the insects, and Clark (1976) for the eggs.

Lonchodes everetti can be distinguished from other described species of *Lonchodes* by the female's elongated lamina supraanalis. However, it has been known for some time that there is at least one other such species on Bukit Belalong in Brunei (Bragg, 2001: 498), that species remains un-named because there are no adult females available. The new species described here, from Kawag Gibong Forest Reserve in Sabah, is a third species in which the female has an elongated lamina supraanalis.

***Lonchodes everetti* (Kirby, 1896)**

Data for *Lonchodes everetti* has previously been recorded by Bragg (2001: 450) and by Bragg & Bushell (2002: 3). Seow-Choen (2016: 296, figs 683-688; 2017: 142, figs 92A-I) illustrates *L. everetti* and lists the species as occurring on Mt. Trus Madi, Sabah (2017: 244) but without giving any data. Bragg & Bushell's record included a transcription error: "Beramayot F.R." should have read Deramakot Forest Reserve. Specimens which I have not re-examined would warrant re-examination to confirm the species; in particular, in view of the proximity of Kawag Gibong and Lahad Datu, the specimen from "Lahad Datu, Ladang Tanming Dua" (Bragg, 2001: 450) should be re-examined: this specimen is now in BMNH.

New data:

SABAH, Tawai FR, Jalan Microwave, N05° 38' 29" E117° 12' 44". ♀ nymph (PEB-3119) P.E. Bragg, 10.viii.2001. (Abdomen partly eaten by cockroaches after preservation).

SABAH, Sepilok Arboretum, N05° 51' 54" E117° 56; 31". ♀ (PEB-3112), ♂ (PEB-3113) P.E. Bragg, 08.viii.2001.



Figure 1. A. Head of female *Lonchodes everetti*. B-F. *Lonchodes robertongi*: B. Head of female, C. Head of male, D. Dorsal view of female abdomen, E. Lateral view of female abdomen, F. Lateral view of male abdomen.

The male from Sepilok is almost completely orange-brown, rather than the usual brown and green colouration. Females of *everetti* lack any horns or lobes on the head (Figure 1A).

Lonchodes robertongi n.sp.

This species is named after Dr Robert C. Ong who recently retired from his post as Head of the Forest Research Centre of the Sabah Forestry Department. Dr Ong was instrumental in the establishment of the Rainforest Discovery Centre in Sepilok, which is an outstanding environmental education centre for both members of the public and researchers to visit.

Diagnosis:

The female has an elongated lamina supraanalis and is similar in size and general appearance to *L. everetti* Kirby, 1896; the male is of a similar form to other large species of *Lonchodes*. Males and females of *L. robertongi* can be distinguished from *everetti* by:

- The presence of lateral protuberances on the hind margin of the thorax, just above the coxa (Figure 2A).
- The larger lobes on the upper surface of the mid femur.
- The longer legs: in the male the hind tibia clearly exceeds the end of the abdomen (they are about level in *everetti*), in the female the apex of the mid tibia projects beyond the head.

- Tubercles on the hind margin of the 5th abdominal tergum in both sexes, and tubercles on the 4th in the female (Figure 2B).
- The lamina supraanalis of the female is blunt or bilobed, not pointed (Figure 1D).
- The female of *robertongi* has “horns” on the head (Figure 1B).
- The egg of *robertongi* has a curved polar mound, bending about 90° away from the micropylar plate.

The un-named species from Bukit Belalong differs from *L. robertongi* because it does not have any protuberances over the hind coxa, the males lack a lobe on the mid-femur. It differs from *L. everetti* by the elongated shape of the male’s anal segment (Figure 3C). It differs from both *everetti* and *robertongi* because the hind tibia of the male does not reach as far as the end of the abdomen.

Type material:

Holotype: SABAH, Kawag Gibong F.R. N05° 03’ 02” E117° 59’ 00”. ♀ (PEB-4113)
P.E. Bragg, 12.x.2022.

Paratypes: 7♀♀ (PEB-4153 to PEB-4159), 8♂♂ (PEB-4160 to PEB-4167) Reared from the holotype by P.E. Bragg in 2023.

The holotype has five eggs in a gelatin capsule pinned below the specimen, these eggs were laid by the holotype. The female paratypes each have three eggs in a gelatin capsule; these eggs were laid by a mixture of siblings so the eggs with a paratype specimen may not have been laid by that individual. It is my intention to distribute the type specimens as follows – FRCS: Holotype ♀, PT♀ & 2 PT♂♂; BORN: PT♀ & PT♂; BMNH: PT♀ & PT♂; OXUM: PT♀ & PT♂.

Description of female (Figures 1B, 1D-E, 2A-B & 4A)

When live the whole of the body is dark green mottled with brown except for the underside of the abdomen which is paler, almost yellow mottled with brown. The legs, especially the fore legs, are more darkly mottled than the body. The anterior face of the fore femur and posterior face of the hind femur are red. Preserved specimens are a mottled dark and light brown with reddish colouring on the fore and hind femora. The antennal segments are apically darkened. Head and thoracic nota densely and roughly granulose; abdomen dorsally granulose but decreasingly so towards the posterior. Body ventrally densely granulose, decreasingly so towards the posterior. Fore & mid legs granulose, hind legs not granulose. Body length 143-169 mm; full measurements in Table 1. Holotype length 161.5 mm.

Antennae about as long as the fore legs, with basal segment flattened and laterally dilated, 2nd only slightly longer than wide, 3rd only about half as wide as 2nd, segments 3-5 narrowing very slightly, remainder more or less uniform width. Head about one-and-a-quarter times longer than wide, with a pair of horn-like tubercles between the eyes. Pronotum about 1.4 times longer than wide; with a shallow median transverse groove and a transverse groove just behind the anterior margin, these are connected by a central and two lateral longitudinal grooves. Propleura projecting slightly. Mesonotum long, first 80% of uniform width then widening to just over double

the width at the posterior, at this point the mesopleura project, increasing the body width to about 3.3 times the width of the middle of the mesonotum. Metanotum with anterior and posterior of equal width but laterally compressed in the middle; metanotum 3.75 times longer than median segment. Median segment about as long as wide. Metapleura projecting below the median segment. The hind margin of the metapleura flare outwards to form a lobe on each side of the median segment. Abdomen of similar width as thorax but 7-10 segments narrowing slightly. Segment 5 with a very obvious upwardly projecting lobe which is about half the width of the segment; 4th with a smaller lobe and 3rd with a very small lobe. Segments 2-8 all roughly twice as long as wide (7-8 shorter than 2-6), 9-10 about as long as wide. Lamina supraanalis about 3 times longer than wide, sometimes with a slightly bilobed apex. Operculum reaching beyond anal segment (10th tergite), scoop-shaped, rugulose, with a slight ventral keel, apex rounded. Praeopercular organ a mound with a small pair of lateral tubercles and a posteriorly directed spine-like lobe. Cerci short, slightly flattened, tapering.

Hind legs reaching to just beyond end of 7th abdominal segment. Mid femora thickened, slightly arched, with a lobe on the dorso-posterior carina: lobe is about three times longer than high. Hind femora straight and slender. All femora and tibiae with reasonably distinct medio-ventral carinae. Ventro-posterior carina of fore femur with a small triangular spine-like lobe at the apex. Mid femur with a pair of ventral-apical lobes each with 3 spines. Hind femur with a pair of minute spines at the apex of the ventro-anterior and ventro-posterior carinae. Fore tibia with dorsal carinae united to form a lamina with a proximal lobe. Middle tibia with dorsal carinae united proximally to form a rounded lobe; medio-ventral carina with a lobe-like lamina proximally. Fore tarsi with large rounded lobe on the basal tarsomere, 1st tarsomere longer than 2-4 combined. Hind tarsi with 1st tarsomere about as long as 2-4 combined. Mid tarsi with 1st and 2nd tarsomeres of similar size and each about as long as 3-4 combined.

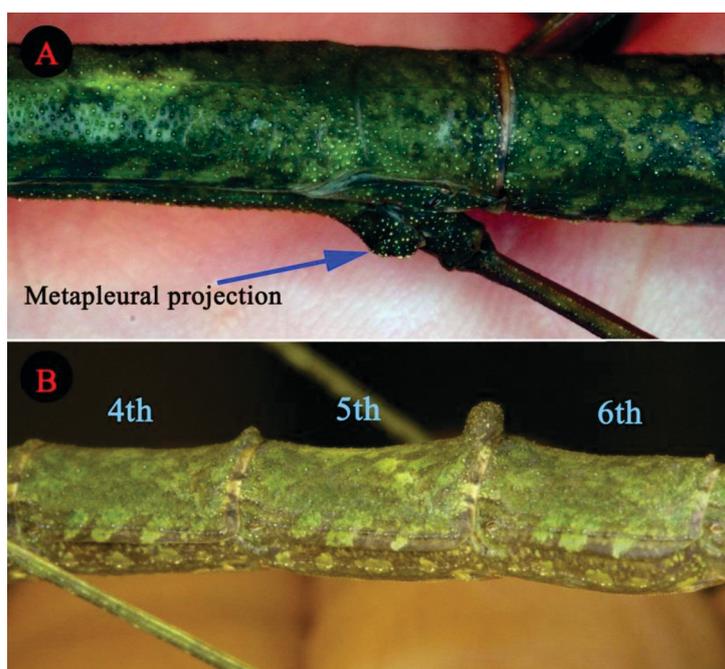


Figure 2. *Lonchodes robertongi* female: **A.** Dorso-lateral view of median segment of female. **B.** Lateral view of abdominal segments 4-6.

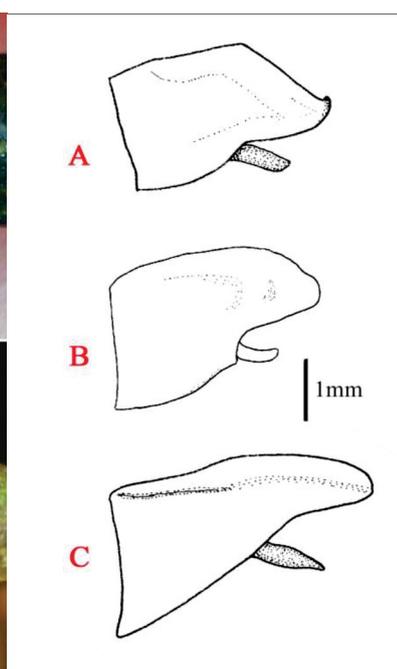


Figure 3. Anal segments of males: **A.** *L. everetti*, **B.** *L. robertongi*, **C.** Bukit Belalong species.

Description of male (Figures 1C, 1F, 3B & 4B)

Generally very dark brown with mesonotum, metanotum, and abdominal segments 2-5 very dark green; abdominal segments 6-10 almost completely brown; the apices of the mesonotum and metanotum, and the whole of the median segment are brown. Base of all tibiae, and of the mid and hind femora white; the proximal end of the first tibial joints are also white although this may be only slightly on middle and hind legs. After preservation the body and legs are mainly dark brown with dark green on the middle of the mesonotum and metanotum, the distal end of all tibiae and femora very pale brown, almost white. Anterior face of fore femur and posterior face of hind femur red. Head & thoracic nota densely granulose, abdomen granulose, becoming sparingly and finely granulose towards the posterior. Thoracic sterna, fore femora, mid femora and mid tibiae granulose. Body length 113-116 mm; full measurements in Table 1.

Antennae longer than the fore legs; 1st segment flattened, 2nd short and only slightly longer than wide, third narrowing, remainder uniformly slender. Head slightly longer than wide, with a minute pair of tubercles between the eyes. Pronotum one-and-a-quarter times longer than wide, with median transverse depression, a transverse groove just behind anterior margin, and the anterior half with longitudinal groove. Mesonotum about 13 times longer than wide, almost uniformly slender with posterior widened. Mesopleura protrude at the leg joint, at this point the body is three times wider than the middle of the mesonotum. Metanotum slightly arched and slightly dilated at each end. Metanotum four times longer than median segment; the joint between these two segments is very indistinct. Metapleura projecting at leg joints and metasternum flaring out to form a lobe-like projection over the coxa. Abdominal segments 2-6 of similar size and all about three and a half times longer than wide. Posterior margin of 5th tergum with an upward projecting lobe; 6th tergum with a similarly positioned minute tubercle. Segment 7 about $\frac{3}{4}$ length of 6th, widening at posterior; 8th widening, 9th narrowing, maximum width of 8th about twice as wide as segments 2-6. Anal segment divided longitudinally, apices widely spaced, incurving, with black spines on the ventral surface; almost quadrangular when viewed laterally, with ventral edge slightly longer than dorsal. Poculum shallow, rounded, with rounded apex. Cerci short, cylindrical.

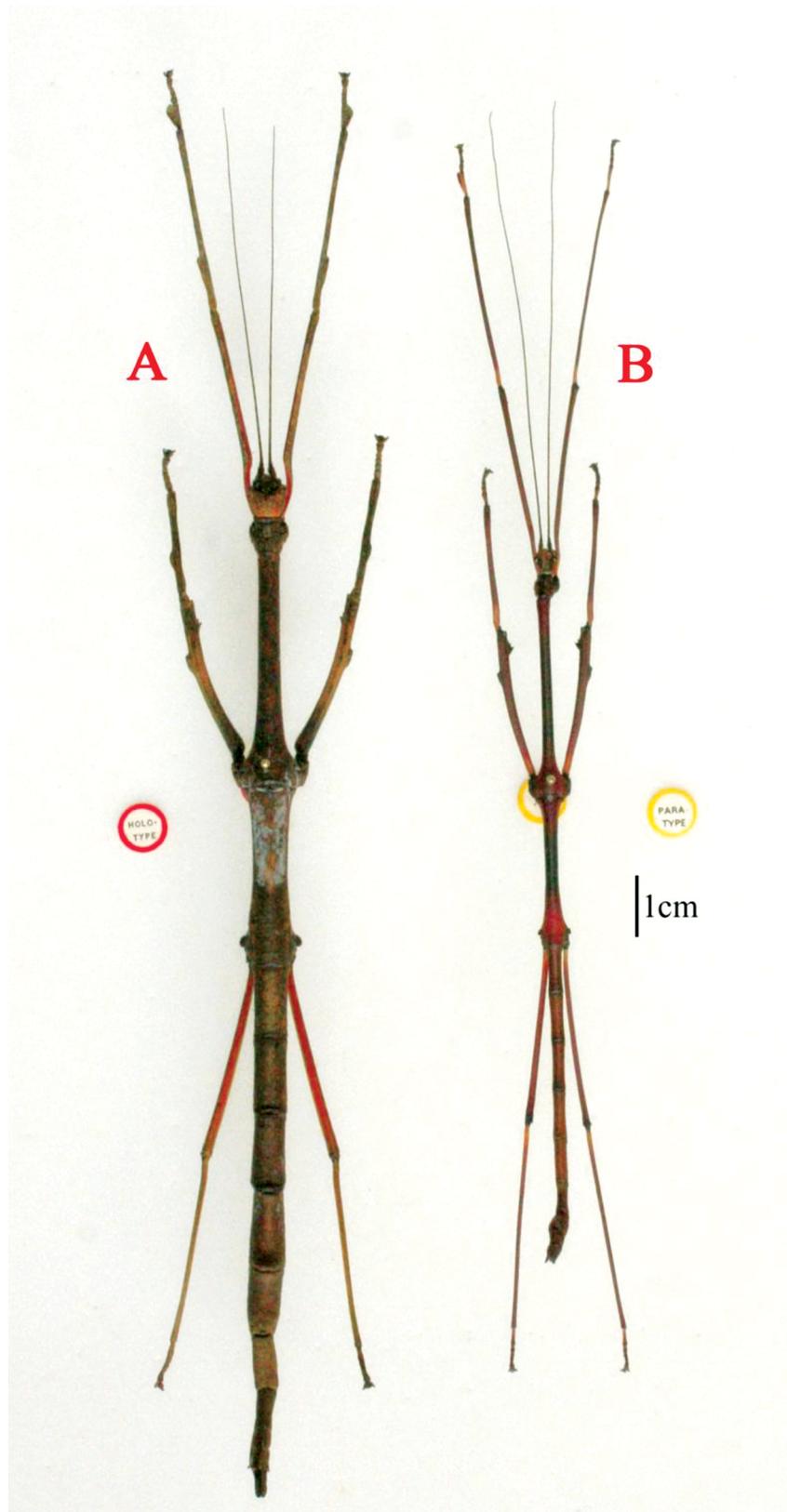


Figure 4. *Lonchodes robertongi*, **A.** Holotype female, **B.** Paratype male.

Fore femora with base compressed and incurving, with an indistinct medio-ventral carina; apex of ventro-posterior carina with one triangular lobe-like spine and one or two minute spines, ventro-anterior and medio-ventral unarmed. Middle femur slightly thickened, slightly arched, with a very small lobe near the distal end of the dorso-posterior carina, medio-ventral carina indistinct; ventral apex with a pair of small lobes either side of the medio-ventral carina each bearing 3-5 spines. Hind femur with apices of ventro-anterior with 2 minute spines (not much more than granules) and ventro-posterior carinae with 2 minute spines, medio-ventral carina unarmed. All tibiae without lobes or spines. Fore tarsi with a small lobe on basal tarsomere. Fore tarsi with first tarsomere longer than combined length of 2-4, mid tarsi with first tarsomere about as long as combined length of 2-4.

Table 1. Measurements of *Lonchodes robertongi* n.sp. (length in mm).

<i>Lonchodes robertongi</i> n.sp.				♂	♀
	♂	♀			
Total length	113-116	143-169	Fore femur	32.5-33.0	31.0-38.5
Antennae	77.0-78.5	62.0-69.0	Fore tibia	33.0-33.5	31.0-35.5
Head	4.0-4.2	6.9-7.3	Fore tarsus	8.5-9.5	5.5-9.5
Pronotum	3.6-3.7	5.2-6.3	Mid femur	24.5-25.0	24.0-28.5
Mesonotum	31.0-31.5	30.5-37.0	Mid tibia	22.5	19.0-22.0
Metanotum	19.5-20.0	19.0-22.0	Mid tarsus	6.0-6.5	7.0-8.0
Median segment	4.2-4.3	5.6-6.4	Hind femur	29.0-30.0	27.5-31.0
Lamina supraanal	-----	4.4-5.3	Hind tibia	34.0-35.5	28.5-31.5
			Hind tarsus	7.0	6.5-7.0

Description of egg

Capsule ovoid, but with a long curved polar mound, operculum flat with a capitulum. Capsule mostly light brown, but with darker brown surrounding the micropylar plate; micropylar plate and capitulum are a pale cream colour. Capitular stalk extremely short, usually not visible. Capsule mainly smooth, with some fine pitting mainly on the side opposite the micropylar plate. The polar mound appears as a continuation of the dorsal (micropylar) side of the capsule, curving about 70° towards the ventral side. There is no physical collar around the anterior end but the capsule is lighter in colour where a collar would be. There is no obvious opercular angle.

The micropylar plate is not raised and is in the form of a narrow oval, slightly narrower at the opercular end, with the micropyle close to the polar end. A typical egg measured: Length 3.3 mm (c. 2.8 mm excluding the polar mound), Height 2.6 mm, Width 2.2 mm, Capitulum 0.34 mm.

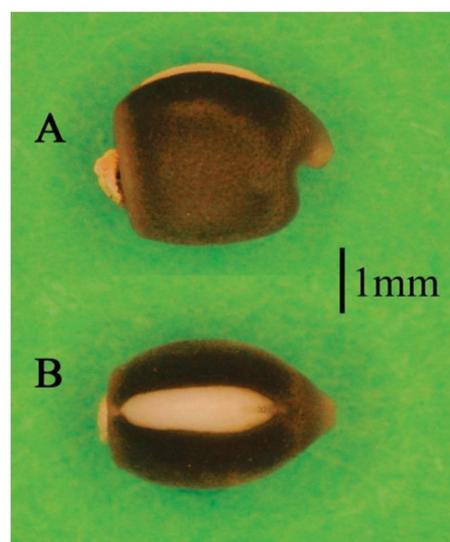


Figure 5. Egg of *L. robertongi*
A. Lateral view, B. Dorsal view.

Notes

Lonchodes robertongi is in culture within the Phasmid Study Group as culture PSG 410. It feeds on Bramble and Hypericum, with a preference for bramble. In captivity, the survival is poor in cold and damp conditions, this implies it may be restricted to lowland habitats. The egg laying rate of one female, measured over a few days, at 28°C was found to be 4.5 eggs per day. The egg capitulum is very easily detached, some seem to become detached when the egg lands after being laid.

Distribution map

The distribution map shows the recorded localities for three species: *L. everetti* (in red), *L. robertongi* (in yellow) and the species from Bukit Belalong (in pale blue). I have re-examined specimens of *everetti* in my own collection: those from Sarawak, and reared specimens of unknown origin, and the new records above. The rather vague “Baram” (Sarawak Museum specimen) has not been re-examined; the location is treated as Marudi because the collector, Charles Hose, was based there while in the Baram region, although he is known to have collected from the estuary and as far upriver as Mt. Dulit (Hose 1929). I have not re-examined any specimens from Keningau, Ulu Dusun, Sandakan, or Lahad Datu; they are included on the map as *L. everetti*.

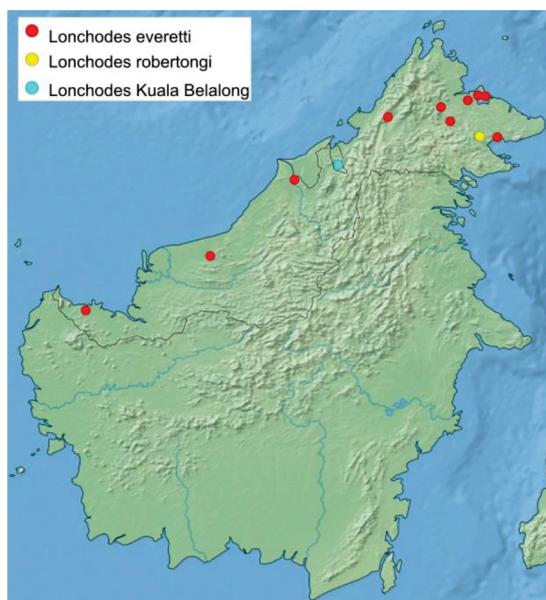


Figure 6. Distribution map of *Lonchodes*.

ACKNOWLEDGEMENTS

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Dr Robert C. Ong with the specimens of the newly described stick insect named after him, *Lonchodes robertongi*.