



## A new giant species of *Acrophylla* Gray, 1835 (Phasmida: Phasmatidae: Phasmatini) from the highlands of the Wet Tropics, Queensland, Australia.

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### Abstract

Searching of suitable habitat during the wet season months has revealed a spectacular new species of phasmid from Queensland, Australia: *Acrophylla alta* sp. nov., which is described and figured from the holotype and paratype females only, also eggs. A key is provided to compare it with other similar species within the genus. Habitat type and known foodplants are noted.

**Key words:** Stick insect, *A. alta* new species, Phasmatodea, cloud forest, Atherton Tablelands, altitude, endemic, taxonomy

### Introduction

The Wet Tropics region of Tropical North Queensland encompasses many different habitat types across a wide range of altitudes, from sea level in the Daintree National Park to well over 1000m a.s.l in the highlands and elevated plateaus, such as the Atherton and Evelyn Tablelands. As such, the diversity within the phasmid fauna of the region is the highest in Australia. Several endemic species, such as Monteith's Leaf-insect, *Walaphyllium monteithi* (Brock, P.D. & Hasenpusch, J.W., 2003), *Acrophylla wuelfingi* (Redtenbacher, 1908), and *Anchiale briareus* (Gray, 1834) are well known to phasmid enthusiasts, being readily available in the pet trade. The longest known species of phasmid in Australia, *Ctenomorpha gargantua* (Hasenpusch, J.W. & Brock, P.D., 2006) also occurs in the region. Despite its apparent, superlative overall length, this species is seldom observed in nature. At the time of writing, the measurements of female *C. gargantua* have yet to be formally published, although specimens exist in collections.

While historically, many entomologists have studied the fauna of the Wet Tropics (Lambkin, C. & Daniels, G., 2023), there have been several species of insect which have apparently been difficult to obtain with any regularity, or simply been overlooked entirely until relatively recently. This may be due to a largely canopy-dwelling habit within forests comprising mature trees reaching well over 30m. Weather events such as cyclones and heavy rain during thunderstorms can knock such insects to lower vegetation, where a keen observer may notice them. Online community-science platforms such as iNaturalist and Atlas of Living Australia (ALA) have become invaluable resources and depositories of digital records for both casual and targeted observations of stick-insects. Two such observations on iNaturalist alerted the authors to the presence of a large species of *Acrophylla* from the upland rainforests of Mt Lewis National Park and the Evelyn Tablelands. These individuals were identified by the author (Ross Coupland) to be *Acrophylla caprella* (Westwood, 1859), as they seemed to fit the description provided in Brock, P.D. & Hasenpusch J.W. (CSIRO Publishing 2009), wherein a possible female specimen from 'Cape York' was pictured. Following studies on the phasmid fauna of the Neotropics, *A. caprella* was found to belong to a South American genus and as such, removed from the Australian fauna (Hennemann, F. & Conle, O.V., 2024). The authors' comments are summarised as follows:

“*Hirtuleiodes caprellus*.. The generic affiliation of this species has been questionable previously. While originally

placed in *Phibalosoma*....Kirby (1904) was the first who erroneously affiliated *caprella* with Australia by placing it in the genus *Ctenomorpha* (Gray, 1835). This was due to misinterpreting the type-locality “Nova Hollandia” as New Holland. In fact, Nova Hollandia is a small town in Brazil. Therefore, the species is here transferred from the Australian genus *Acrophylla* (Gray, 1835).”

## Materials & Methods

The type material was photographed using Canon equipment (Canon R3 body with EF 100mm macro lens and Canon speedlite (Angus Emmott), Canon 1DsMKIII body with Sigma 50mm macro lens and Canon speedlite (in nature, Ross Coupland)). Processed using Adobe Lightroom on Apple computers. Digital callipers were used to take specimen measurements. Descriptions are based on examinations of type material, supplemented by images of a further female individual, provided by Renee and Wayne Young.

Searches for observations using the iNaturalist platform were conducted using the search term ‘phasmida’ and limited to geographical boundary ‘Australia’. Geographical boundaries may be refined by expanding the map to a particular area of interest. Taxonomic searches may be refined to family, genus or species level by entering such terms in the search field.

Both type specimens were prepared, photographed and measured before being deposited in the Queensland Museum (QM) collection in Brisbane. Collection registration numbers are provided.

There appears to be no previously collected specimens constituting *A. alta* **sp. nov.** in either the collections of the Queensland Museum (QM) or the Australian National Insect Collection (ANIC) in Canberra.

## *Acrophylla* Gray, 1835

**Type species by subsequent designation:** *Phasma titan* MacLeay, 1826 in Kirby, 1904

Synonym: *Vetilia* Stål, 1875

**Type species:** *Acrophylla enceladus* (Gray, 1835) by original monotypy.

No. of sp. in Australia 7. Worldwide, 10 (Checklist and other references to species and genera available on Phasmida Species File Online database)

**Generic Characteristics.** Elongate, robust phasmids of medium to very large size. Both sexes somewhat slender, but especially males. Female individuals usually between 150mm body length (250mm total length) to over 260mm body length (440mm total length). Male individuals between 90mm body length (110mm total length) to 150mm body length (210mm total length). Profemora, mesofemora and tibiae serrate but variable in density and length of serrations. Dorsal surface of mesonotum spinose, tending to tuberculate in some species. Ventral surface of mesonotum and metanotum usually more sparsely tuberculated or spinose depending on species. Head longer than wide with pronounced ocelli in males, less so in females. Pronotum usually similar length to head, generally smooth with some figuring, elongate mesonotum 3.25–4 x length of pronotum with metanotum around half length of mesonotum. Antennae rather thin, reaching around end of profemora in females, more elongated in males, roughly equal in length to end of protibiae. Forewings faintly mottled with light brown with the overall colouration largely matching abdominal segments. In some sp. there may be patches or stripes of white on the forewings in both males and females. Rarely, these white patches extend down the length of the dorsal surface of the pre-anal portion of the hindwings. Hindwings usually with tessellated colouration of light brown to almost black. While males have fully functional wings, females are unable to fly due to large mass but can use wings to safely descend when knocked from vegetation or in startle displays against predators (Brock, P.D. & Hasenpusch, J.W., 2009). Base of pre-anal portion of hindwing may feature striking pink/purple colouration in some species. Cerci on female individuals short to very short and pointed in some sp. tending to a wider, flattened form in others. Some sp. having much longer, straighter cerci extending well beyond the large, boat-shaped operculum. The operculum extends beyond the end of the anal segment (see Table 1. for comparative notes). In males, the subgenital plate reaches about the end of the 9<sup>th</sup> abdominal segment.

**Eggs.** Large (length > 8.0 mm). Capsule oval >2x longer than wide. May be textured with conspicuous pits or smooth with more-or-less defined, long micropylar plates with widened base section. Usually a large, pale capitulum present.

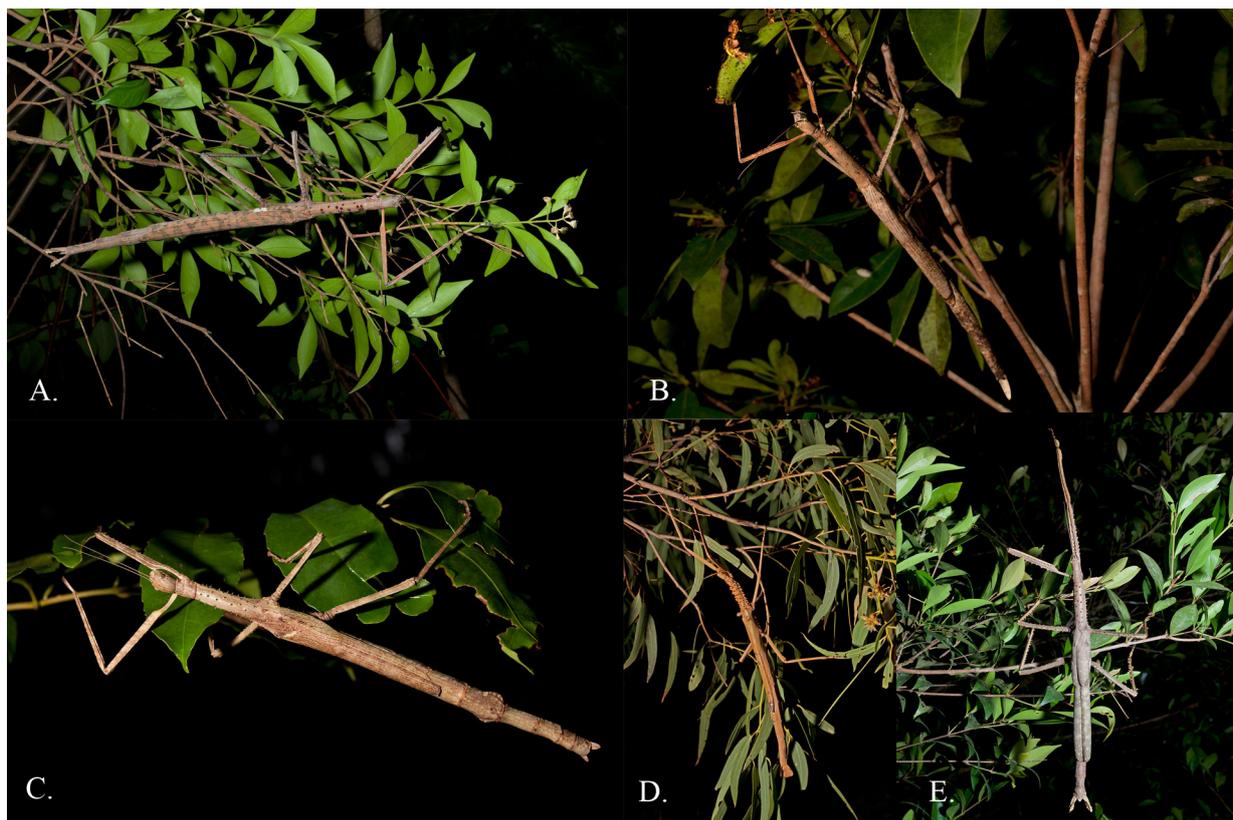


FIGURE 1. Comparison of some adult females within the genus *Acrophylla*. All from Queensland. A. *A. titan*, Brisbane. B. *A. wuelfingi*, Cairns. C. *A. cookorum*, Montville. D. *A. enceladus*, Tewantin. E. *A. alta* sp. nov., Millaa Millaa. Photos: Ross M. Coupland.



FIGURE 2. ♀ holotype *A. alta* sp. nov. in nature. On *Syzygium* sp. cf. *smithii*, Myrtaceae. Photo: Ross M. Coupland.

**Distribution.** Australasia (9) and China (1).

**Note:** *Acrophylla sichuanensis* (Chen & He, 2001) from China warrants further examination as it most likely belongs to a different genus, (Hennemann, F. *et al.*, 2008).

**TABLE 1.** Keys to ♀♀ of *Acrophylla* with similar morphological characters.

Character	<i>A. titan</i> Fig 1, A.	<i>A. wuelfingi</i> Fig 1, B.	<i>A. cookorum</i> Fig 1, C.	<i>A. alta</i> sp. nov. Fig 1, E.
Body length including cerci	200mm–260mm	128mm–233mm	150mm–158mm	265mm–279mm
Dorsal surface of mesonotum	Sparse, bold, conical purple spines	Moderately-spaced low, conical spines of green to dark brown in colour	Well-spaced green, modest spines	Dense, bold spination. Colour matching that of underlying mesonotum
Cerci form and relative operculum length	Long and flat, wavy towards tips. Operculum large, boat-shaped and pointed. Extending just beyond end of abdomen	Very short. Pointed at tips. Operculum elongate, curved and much longer (approx. 5x) than cerci	Short, leaf-like. Operculum short, extending just beyond anal segment, reaching about half length of cerci	Long and wavy with dull serrations to edges. Operculum pointed at tip, extending beyond abdomen to about quarter length of cerci
Distribution	Southern Sydney region, NSW to north along eastern coast of Aus., trending to inland Qld in northern portion of range	Mackay, Qld north to Iron Range NP (apparent geographic disparity with Wet Tropics population). Inland, across to western limit of Atherton and Carbine Tablelands	Patchy distribution throughout suitable, wetter forests from Port Macquarie, NSW north to Sunshine coast hinterland, Qld	Upland, wet forests of the Evelyn and Atherton tablelands, Qld and associated mountain ranges to the east
Eggs All images: Paul Brock Except <i>A. alta</i> sp. nov. (Angus Emmott)				
Egg morphology	Dark brown with densely-spaced, shallow pitting. Large, pale capitulum	Almost black with densely-spaced, shallow pitting. Small, dark capitulum	Surface sculptured with distinct, pale capitulum. Indistinct micropylar plate	Pale and large with dense, deep pitting. Micropylar plate pronounced. Capitulum smooth and rounded

***Acrophylla alta* sp. nov.**

[Highlands Giant Acrophylla]

(Figs. 2–4)

**Holotype** ♀, AUSTRALIA, Queensland, Millaa Millaa, 17°31'13"S 145°34'01"E, 19.xi.2024, R.M. Coupland, 1090m a.s.l. (QM; Registration number: T261445).

**Paratype** ♀, AUSTRALIA, Queensland, Upper Barron, 17°25'58"S 145°30'47"E, 09.ii.2025, P. van Oosterzee, N. Preece, A.J. Emmott, 1020m a.s.l. (QM; Registration number: T261446).

**Description.** Very large, spinose stick-insect of generally light brown colouration featuring prominent light to emerald-green ventrolateral surfaces to the abdomen and mesonotum. Conspicuous white patch on lateral edge of forewings adjacent to base of metafemora. Faint mottling present on dorsal surfaces of forewings and pre-anal portion of hindwing. Prominent, dense spination on mesonotum, mesotibiae and metatibiae. Profemora heavily

serrate tending to flanged on protibiae and tarsi. Conspicuous, lateral flanges present on mesotibiae and metatibiae. Cerci elongate with dull serrations (Fig. 5A, B).

♀ (**Fig. 3**). Head: smooth, slightly longer than wide. Three ocelli present but not prominent. Eyes subtly mottled light brown/green with faint, broken longitudinal, light cream bands. Antennae thin, about same length as profemora, 26 segments, basal segment longer and wider than segment 2.



**FIGURE 3.** *Acrophylla alta* sp. nov. ♀ holotype, ventral (A.) and dorsal (B.) surfaces. Images: Angus J. Emmott.

Thorax: Pronotum slightly longer than head, width similar, with subtle sculpturing on dorsal surface featuring randomly-spaced, small tubercles. Mesonotum, pronotum and head of uniform, light brown colouration. No spines present on underside of pronotum. Mesonotum approx. 4× length of pronotum with densely-spaced, pronounced spines on all surfaces (Fig. 5C, D). Two thin, lateral lines of light green consistent with lateral abdominal colouration, running length of mesonotum, interspaced with a thicker, spinose line of light brown. Ventral surface of mesonotum and metanotum also densely spinose.

Abdomen: Smooth and lightly mottled with indistinct patterning on dorsal surface tending to blotching along lateral edges. Ventrolateral portions of abdominal segments 1–7 featuring striking green colouration (Figs 2, 6A & 7A). Different individuals may exhibit a lighter to emerald-green, possibly influenced by age or environmental factors. Colouration of ventral apex surfaces largely consistent with that of dorsal surface. Segments 5 and 6 slightly laterally lobed. Segments 7–9 shorter, smooth and uniform in colour. Segment 9 and anal segment roughly equal in length (Fig. 5B). Operculum large, boat-shaped and tapered to pointed tip, reaching beyond end of anal segment (Fig 5A).

Cerci: Long, similar length to abdominal segments 8–10. Indistinctly shaped, being both dorsally and laterally compressed along length with dull serrations on edges from mid to tips (Figs. 5A, B).

Wings: Forewings approximately 0.5x length of hindwings (Fig. 3B). Colouration of hindwing dorsal surfaces slightly lighter brown than mesonotum, femora etc and featuring subtle, mottled patterning overlayed with darker venations. Conspicuous white mark on lower edge of forewings adjacent to metafemora. This mark is somewhat triangular and rounded in shape, but the feature may vary in other individuals, as noted with other species within the genus, such as *Acrophylla titan* (MacLeay, 1826) and *A. cookorum* (Brock, P.D. & Coupland, R.M., 2022). Base of pre-anal portion of hindwing featuring distinct, dark brown patterning, not visible when at rest. Entire ventral

surface of pre-anal portion also distinctly mottled in dark brown. Hindwings tessellated, black to light brown, lighter brown at edges with tessellated venations across entire surface (Figs. 3B, 7B). Several small, light brown accents equally spaced along outer edge of hindwings.

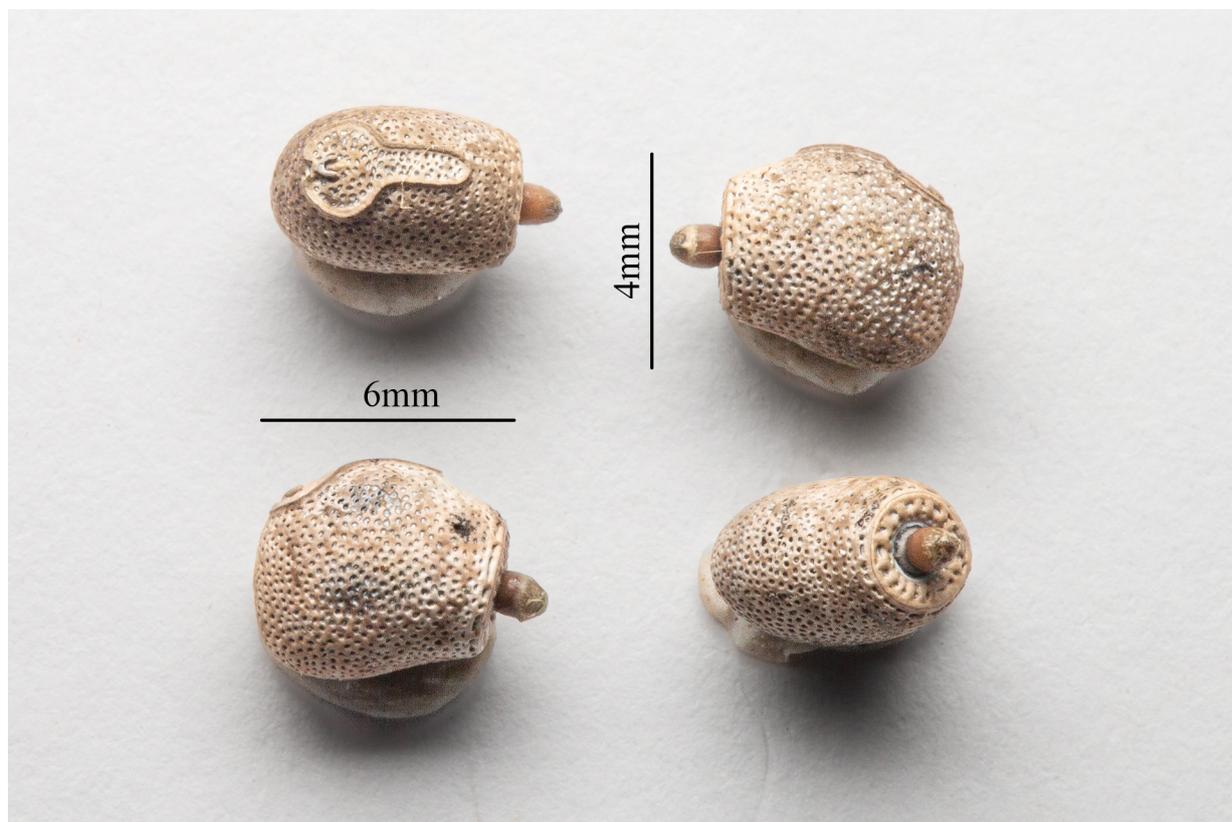
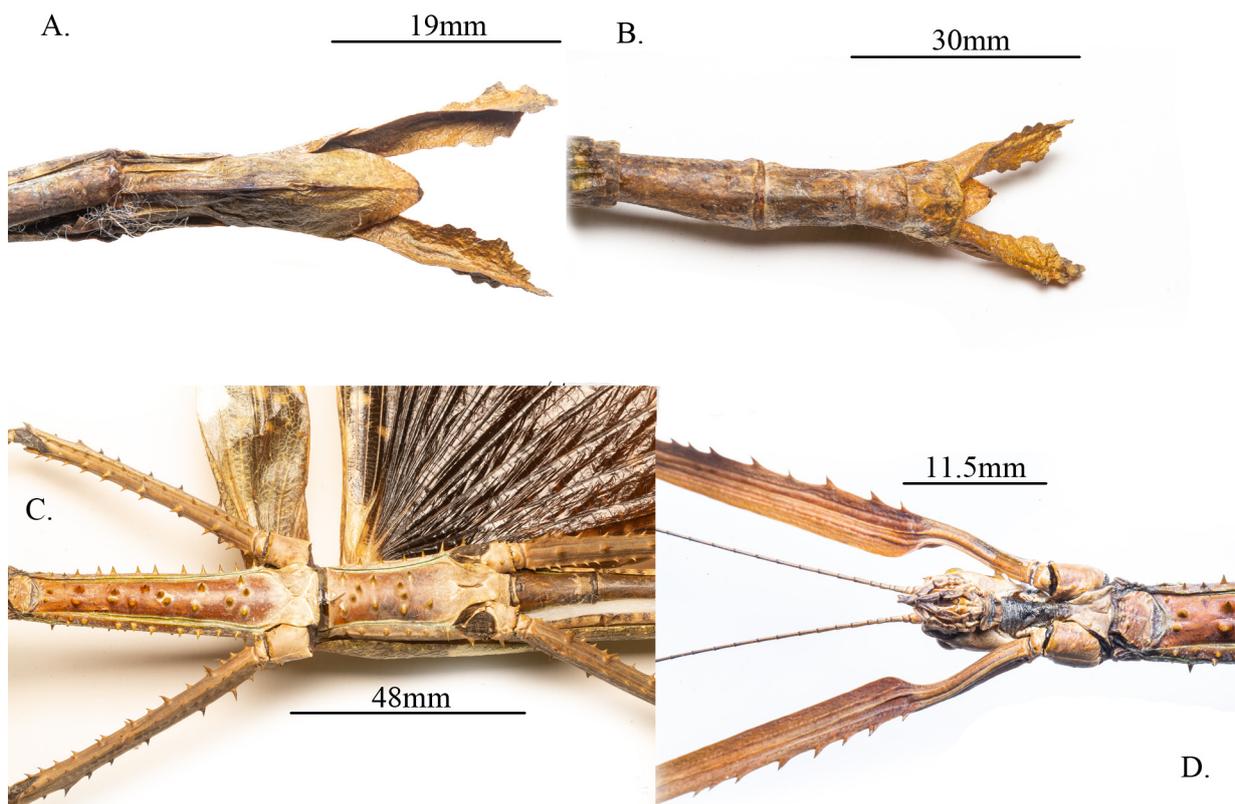


FIGURE 4. Several eggs laid by ♀ holotype. Image: Angus J. Emmott.

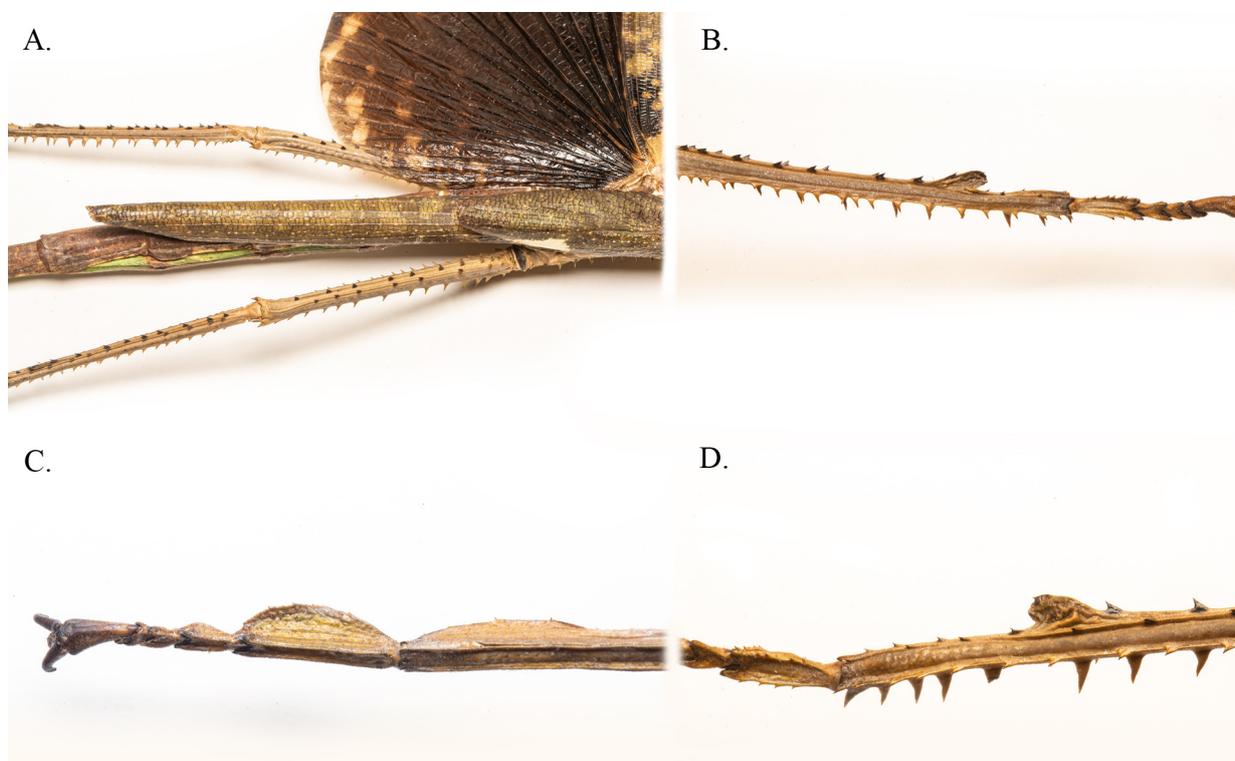
Legs: Profemora very long, robust and flanged with large serrations on outermost edges. Inner edges smooth, consistent with largely smooth protibiae. Slightly laterally lobed on distal-facing protarsal segments (Fig. 6C). Metafemora, mesofemora and associated tibiae heavily spinose with dark spines on outer edges, tending to lighter spines on inner edges. Conspicuous, single lateral lobe present on lower, outer carina of both metatibiae and mesotibiae (Fig. 6B, D). This feature is unique among the known Australian *Acrophylla* sp..

Measurements [mm]: For holotype female (first), then paratype female. Note: paratype missing left foreleg. Length of body: 255, 260. Head: 11.5, 15.5. Antennae: 54, 54. Pronotum: 12.5, 12.3. Mesonotum: 48, 48.5. Metanotum: 20, 20.4. Forewing: 59.3 x 20.5, 60 x 17. Pre-anal portion of hindwing: 124.5 x 15.4, 122.7 x 17.4. Alae: 124.5 x 69.2, 118 x 70. Profemora: 63.3, 63. Mesofemora: 50, 52.5. Metafemora: 55.3, 59.7. Protibiae: 60.6, 68. Mesotibiae: 48.7, 51. Metatibiae: 55.8, 62.5. Cerci: 19, 20.3. Total length with prolegs outstretched: 410, 425 (Figs. 3A, B. & 7A, B). Unladen weight taken for paratype when alive, 34g. Another female individual examined (but not collected) (Renee and Wayne Young pers. comm. February 2025) measured 275mm from head to tip of cerci, total length including profemora 410mm. This individual weighed an impressive 44g unladen weight (Fig. 10). These measurements would suggest that *A. alta* **sp. nov.** may be the heaviest known insect in Australia, surpassing the Giant Burrowing Cockroach, *Macropanesthia rhinoceros* (Saussure, 1895), (Matsumoto, T., 1992). For comparison, a mature female of the large Goliath Stick-insect, *Clemacantha goliath* (Gray, 1834) plump with eggs, was found to weigh 21g (Sarah and Lewis Silvio pers. comm. March 2025).

**Note.** Colour and spine density appear to be somewhat variable characters within this species. It may be the case that older specimens exhibit darker green accents on the abdominal dorsolateral margins and are of darker brown colouration overall. Examination of specimens in future studies would help to clarify the degree of variation found within the species.



**FIGURE 5.** *Acrophylla alta* sp. nov. ♀ holotype. **A.** Ventral surface of operculum. **B.** Dorsal surface of cerci and end of abdomen. **C.** Ventral surfaces of mesonotum and metanotum. **D.** Dorsal surface of head and pronotum. Images: Angus J. Emmott.



**FIGURE 6.** *Acrophylla alta* sp. nov. **A.** ♀ paratype dorsolateral view of abdomen and metafemora. **B.** ♀ holotype metatibia showing distal-facing lateral lobe. **C.** ♀ holotype protibia showing distal-facing flanges. **D.** ♀ holotype mesotibia with distal-facing lateral lobe. Images: Angus J. Emmott

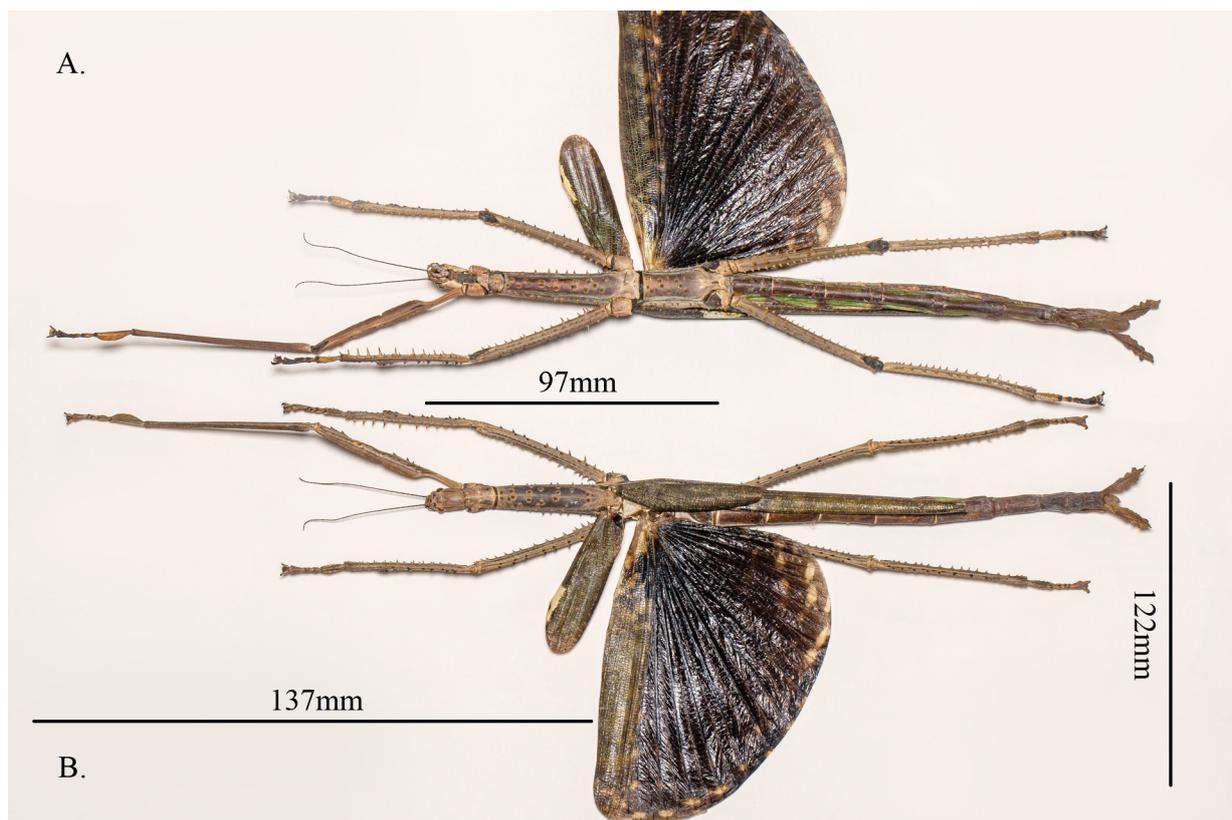


FIGURE 7. *Acrophylla alta* sp. nov. ♀ paratype, ventral (A.) and dorsal (B.) surfaces. Note: left proleg missing. Images: Angus J. Emmott.

**Differential diagnosis.** The following notes are important to consider when comparing morphologically similar adult females of species within the genus *Acrophylla*. *A. alta* sp. nov. may appear superficially similar to *A. titan*, but features lobes on the mid and hind legs and more pronounced, dense spines on the forelegs and thoracic segments. The colouration also differs, with *A. alta* sp. nov. having conspicuous, green accents to the abdomen and lacking the stout, purple spines of *A. titan*. Note also that these two species occur at a significant geographic disparity (see table 1.). *A. wuelfingi* has similar colouration and size to *A. alta* sp. nov. and may occur concurrently at some locations, i.e. Danbulla, Qld. However, the mesonotum and legs are much less spinose in *A. wuelfingi* and the end of the abdomen (cerci and operculum) differ greatly in form and structure (see notes in table 1.). The egg morphology, if available, is also an important consideration when identifying species, with notable differences in the prominent features.

**Egg.** (Fig. 4) Pale cream colour with some light brown accents and greyish areas, featuring densely-spaced, shallow pitting on surfaces. Rounded base with slightly ovate sides and flat, circular, pitted operculum with prominent capitulum. Capitulum largely cylindrical, 1mm long and rounded at tip. Capitulum grey in colour at base, tending to orange/brown at middle with a greyish tip featuring some sculpturing. Large micropylar plate with much enlarged, rounded base portion, indented at apex. Edges of micropylar plate raised with well-defined ridge. Measurements: 5.8–6.1mm long, 3.8–4mm x 3.3–3.5mm wide.

**Notes on male and sub-adult female individuals.** So far, only a single image of what we believe constitutes a male of *A. alta* sp. nov. has been available for study (Fig. 9). The individual was observed at a location (Danbulla, Qld) where a likely sub-adult female was also photographed and uploaded to iNaturalist. Observations: <https://www.inaturalist.org/observations/254477430> and <https://www.inaturalist.org/observations/253973769> respectively. Note: long cerci apparently present in both individuals, which differentiates them from *A. wuelfingi*, a species also known to occur in the area. From the angle of the photograph, the specific morphology of the cerci and other features cannot be clearly distinguished. The male appears to feature prominent dark mottling of the pre-anal portions of the hindwings and is of generally elongate, slender form. There are white edges to the forewings which is a common

feature among male *Acrophylla* species. While apparently not particularly spinose, there are several low spines or tubercles on the mesonotum and the profemora appear somewhat serrate. There may also be a dark dorsal line along the length of the mesonotum; if so, an unusual feature, not known from other *Acrophylla* species. Future searches of suitable habitat may yield male(s) for study.



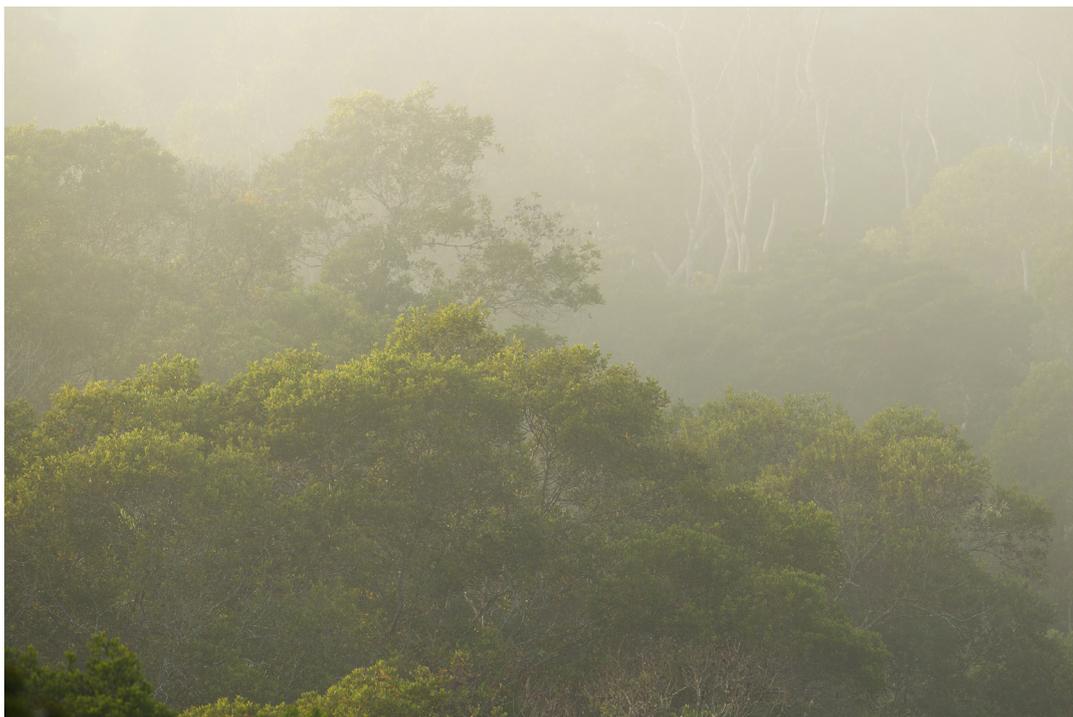
**FIGURE 9.** Likely male individual of *A. alta* sp. nov., from Danbulla, Queensland. Photo: Anya Hoepfinger

The sub-adult female's general form is consistent with that of other species within the genus. That is, features such as spines and serrations are reduced but key characters remain, which are sufficient for identification to species level. There is more uniform colouration on sub-adult individuals than that found on adults and this is true of the insect in the observation, which appears to be of an overall brown/green colour. The apparent large size of the individual and developed form of the wing buds suggests it is approaching its final moult.

**Etymology.** Named on account of this species apparently occurring only in areas at high altitude with suitable habitat.



**FIGURE 10.** A female individual of *A. alta* sp. nov. from Topaz, Queensland, showing an unladen weight of 44g. Photo: Rennee Young



**FIGURE 11.** Typical rainforest canopy habitat found at altitude on the Atherton Tablelands, featuring frequent, heavy fog. Photo: Ross Coupland.

**Distribution.** So far only recorded from a handful of localities on the upland areas of the Wet Tropics Bioregion, Queensland. These locations include Mt Lewis National Park, Evelyn Tablelands (likely including the Maalan National Park), Topaz, Upper Barron, Mt Hypipamee and Danbulla.

**Habitat and foodplants.** Currently known to occur in areas featuring ‘Simple to complex notophyll vine forest of cloudy wet highlands on basalt’, Qld Government Regional Ecosystem ID’s 7.8.4 and 7.12.16. This species has been found feeding on *Syzygium sp. cf. smithii*, Myrtaceae, also noted on *S. papyraceum*, although may have been knocked from another tree as it was found on a low limb and in apparently poor condition, (Stephen Hey pers. comm. November 2024). Readily feeds on Guava, *Psidium guajava*, Mrytaceae in captivity. Likely to feed on other, local rainforest trees within suitable habitat types. In nature, *A. alta sp. nov.* is extremely well camouflaged despite the large mass of the females, the colouration and subtle patterning being well matched to the vegetation.

## Discussion

Infrequent observations of *A. alta sp. nov.* may be attributed to several factors which are discussed. Fragmentation of suitable habitat may result in a low population density, by means of reducing genetic viability (Schlaepfer, D. R. *et al.*, 2018). Such fragmentation and land clearing on The Tablelands was/is largely to facilitate logging, dairy farming and other agriculture (Gilmore, M.A., 2005). More recently, land clearing for housing and urban expansion has become a major factor in habitat degradation (Prof. Peter Valentine, pers. comm. April 2025). It may also be the case that this species has a naturally occurring low population density throughout remaining tracts of suitable habitat and has simply been overlooked as a result. *A. alta sp. nov.* apparently feeds on leaves at the canopy level, where it would almost certainly remain unnoticed in most cases. The preferred habitat of this sp. is largely inaccessible to naturalists. This being very wet rainforest at altitude, wherein the study of canopy-level fauna can be challenging. These environments are often characterised by relatively cool temperatures, consistently high humidity with a low dewpoint, resulting in persistent, heavy fog. Such conditions can make searching for insects by sight during night or day difficult, as visibility is limited to only a few metres, with tree canopies often obscured from view.

Cooler temperatures experienced in such climates may be a contributing factor to the large size of *A. alta sp. nov.* Bergmann’s rule states that the body mass of homeothermic animals increases with cooler environments, to

limit thermal loss. There have been limited studies to prove or disprove the rule in insects (Alcantara, M. & F. *et al.*, 2024). Effective thermal regulation and mitigated heat loss may be beneficial for egg development in a female phasmid with a large body mass. The egg morphology may suggest an association with ants, as is the case with other known species within *Acrophylla* (Brock, P.D. & Hasenpusch, J.W., 2009). Capitulum is formed from lipids (Clark, J., 2008) which are attractive to foraging worker ants and the general form of the eggs may resemble seeds of local plants or trees.

The holotype male of *Hirtuleiodes caprellus* is noted as having lobed tarsi. Although the authors have been unable to obtain a male specimen of *A. alta* **sp. nov.** for study, coincidentally, the female types figured herein also exhibit lobes on the outer carina of the lower mid and hind legs (Fig. 6B, C, D.) which is unique among the known Australian *Acrophylla* species. The single image (Fig. 9) of what we believe to represent a male of *A. alta* **sp. nov.**, is of insufficient quality to determine whether the aforementioned lobes are present in male individuals. It should be noted that males and females of the same species of stick-insect may exhibit variability in the presence of such characters.

We believe the distinct morphology of the females and eggs studied, coupled with the specific habitat preferences and geographic disparity from other morphologically similar species in the genus is sufficient evidence to warrant the species description.

The discovery of such a large, new species of insect is testament to the importance of protecting remaining, biologically diverse habitats and ecosystems, as there may be further species of phasmid and other insects awaiting discovery and description therein.

There are ongoing efforts by Government, non-Governmental and volunteer organisations such as ‘TREAT’ (Trees for the Evelyn and Atherton Tablelands) to restore and connect ecologically important forest communities within the Wet Tropics Bioregion (Freeman, 2021). Furthermore, studies on the genus *Acrophylla* are warranted and encouraged, to establish the phylogenetic placement of *A. alta* **sp. nov.**

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