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Phyllium (Phyllium) letiranti sp. nov. (Phasmida: Phylliidae)
a new leaf insect from Peleng Island, Indonesia

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Phyllium (Phyllium) letiranti sp. nov. (Phasmida: Phylliidae) a new leaf insect from Peleng Island, Indonesia

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Abstract. A new species of leaf insect, *Phyllium (Phyllium) letiranti* Cumming and Teemsma, **new species** (Phasmida: Phylliidae), is described from a series of males, females, and eggs from Peleng Island, Indonesia. This new species is the first record of the family Phylliidae on the island and is here differentiated from congeners. Keys to males, females, and eggs of the *Phyllium* species of Sulawesi and Peleng islands are included within.

Key words. Taxonomy, walking leaf, Phasmatodea, Sulawesi, sexual dimorphism.

Introduction

Sulawesi is one of the four largest islands in Indonesia in land area, with a wide range of phasmid species recorded (Hennemann 1998). Surprisingly, it has had only two phylliid species recorded to date, *Phyllium (Ph.) mamasaense* Gröber, 2008 and *Phyllium (Ph.) celebicum* de Haan, 1842. This is unusual when compared to the thirteen species (Cumming et al. 2017b) currently recorded from the island of Borneo, which is only separated from Sulawesi by the Makassar Strait. Despite the proximity of these two large islands, to date no overlap in phylliid diversity has been recorded. With Borneo being several times larger than Sulawesi, it is not surprising that a greater diversity has been recorded from the large island. However, island size has been shown not to be as closely linked to phylliid diversity as one might expect, with the much smaller island of Luzon, Philippines having ten species currently known to occur throughout the moderately sized island (Cumming et al. 2017a). Further examination of Sulawesi's phylliid diversity is expected to reveal several additional species.

Peleng Island, off the eastern coast of Sulawesi, appears to be the starting point for this fresh look into the local phylliid diversity. *Phyllium (Phyllium) letiranti* Cumming and Teemsma, **new species** is recorded as the small island's first *Phyllium* species. Specimens from Peleng Island were initially thought to represent a range expansion of *Phyllium (Ph.) mamasaense* Gröber, 2008, which is currently known from Mamasa, Southern Sulawesi (Gröber 2008). However, after the eggs of the Peleng population were compared with the eggs of *Ph. (Ph.) mamasaense* illustrated in the species original description, it was markedly clear that the Peleng population represented a new, undescribed *Phyllium* species.

The similar general structure of females of the two species is surprising because of significant morphological differences of the eggs. However, upon greater examination of the holotype *Phyllium (Ph.) mamasaense*, numerous significant differences became apparent. Even with this new Peleng population exhibiting a rather broad range of morphological variations, none overlapped with those distinguishing features of *Phyllium (Ph.) mamasaense*.

Due to the sexual dimorphism of the leaf insects, the keys to species of Sulawesi and Peleng have been separated into males and females. Also, with eggs for all three species present on the islands known, a key to eggs was made possible.

Materials and Methods

All photos except those used in Figures 2A, 2E, and 3F were taken at the San Diego Natural History Museum using a Canon 5D Mark II and a MP-E 65mm macro lens and stacked using Zerene photo stacking software, version 1.04, 64-bit. Photos for Figures 2A, 2E, and 3F were taken by Angelika Weirauch under direction of Stephan Blanke at the Senckenberg German Entomological Institute Müncheberg using a Nikon D7200 digital camera and a Nikon Micro Nikkor 105 mm f/2.8 G ED objective. Lightning was from the Yongnuo Digital Speedlight YN 560 IV reflected by the inner surface of a styrofoam box set up around the specimen. A grey card was used for white balance. Composite images with an extended depth of field were created using the software StackShot Macro Rail Package (Cognisys Inc., U.S.A.) and Zerene Stacker (release November 7, 2017; Zerene Systems LLC, U.S.A.).

Measurements of all specimens were made to the nearest 0.1 mm using digital calipers. Morphological examinations were done with a Leica ZOOM 2000 stereomicroscope. The pars stridens of three females were examined [Coll RC 17-017, 033, and 244], because all three had the same number of teeth no more were examined.

The holotype *Phyllium (Phyllium) letiranti* Cumming and Teemsma, **new species** is deposited in the Montreal Insectarium type collection with paratypes deposited in the collections of both authors, within Stephane Le Tirant's personal collection, the personal collection of Frank H. Hennemann, the Montreal Insectarium type collection, the California Academy of Sciences collection, the Senckenberg German Entomological Institute Müncheberg, and the San Diego Museum of Natural History collection.

All eggs examined (except for a single egg) were removed from the abdomens of paratype females and only those with fully developed pinnae were kept, all underdeveloped eggs were discarded. The one egg not removed from an abdomen was one pulled from between the subgenital plate and the gonapophyses of paratype female Coll. RC 17-170 where it appears to have been left right before being laid. Egg orientation terminology follows that of Clark (1978).

Results

Phyllium (Phyllium) letiranti Cumming and Teemsma, new species

(Fig. 1A–D, 2B–D, F–G, 3A–E, 4A–D, 5A–D, 6A–C)

Holotype. Female: INDONESIA, Peleng Island, Tinagkung Utara, near Luksagu Village: December, 2016: ~60 m. elv. 1°17' S 123°25.4' E [Coll RC 17-015]: deposited in the Montreal Insectarium type collection.

Paratypes. [19 Females, 6 Males, 14 Eggs]: INDONESIA: [2 Females, 3 Males, 5 Eggs]: Peleng Island, Tinagkung Utara, near Luksagu Village: Dec., 2016-Jan., 2017: ~60m.elv. 1°17' S 123°25.4' E [Coll RC 17-170, 171, 187, 189, 190, 310, 311, 312, 313, 314]; [17 Females, 2 Males, 8 Eggs]: Peleng Island, Tinagkung Utara, near Luksagu Village: December, 2016: ~60 m. elv. 1°17' S 123°25.4' E [Coll RC 17-007, 008, 010, 011, 016, 017, 018, 021, 022, 023, 025, 026, 027, 032, 033, 055, 056, 242, 244, 306, 307, 308, 357, 358, 359, 360, 361]; [1 Male]: Peleng Island, Tinagkung Utara, near Luksagu Village: April, 2017: ~60 m. elv. 1°17' S 123°25.4' E [Coll RC 17-229]; [1 Egg]: Peleng Island, Tinagkung Utara, near Luksagu Village: Dec., 2016-Jan., 2017: ~60 m. elv. 1°17' S 123°25.4' E: removed from the gonapophyses of paratype Coll. RC 17-170 [Coll RC 17-381].

Deposition of paratype material

Montreal Insectarium type collection: [Coll RC 17-017, 033, 187, 359, 361]

San Diego Natural History Museum: [Coll RC 17-081, 312]

California Academy of Sciences type collection: [Coll RC 17-023, 306, 308]

Senckenberg German Entomological Institute Müncheberg: [Coll RC 17-007]

Personal collection of Royce T. Cumming (California, USA): [Coll RC 17-008, 010, 011, 025, 027, 056, 170, 171, 190, 229, 242, 244, 307, 313, 314, 357, 358, 381]

Personal collection of Sierra N. Teemsma (California, USA): [Coll RC 17-016, 032, 055, 311]

Personal collection of Stephane Le Tirant (Quebec, Canada): [Coll RC 17-021, 026, 189, 310]

Personal collection of Frank H. Hennemann (Freinsheim, Germany): [Coll RC 17-022, 360 / coll. FH 1008-1 & E]

Differentiation. Males have an exterior lobe of the profemora which is thinner than the interior lobe, females have tibiae lacking lobes and rudimentary alae, and eggs have long pinnae on the margins and an operculum which is flat. Features of both sexes agree that *Phyllium (Phyllium) letiranti* **new species** falls within the *siccifolium* species-group as described by Hennemann et al., (2009).

Phyllium (Phyllium) letiranti **new species** morphologically is most similar to *Phyllium (Ph.) mamasaense* Größer, 2008, *Phyllium (Ph.) siccifolium* (Linnaeus, 1758), *Phyllium (Ph.) philippinicum* Hennemann et al., 2009, and *Phyllium (Ph.) bourquei* Cumming and Le Tirant, 2017. Their morphology is similar in the females all being larger species with broad exterior lobes of the profemora (of approximately the same width as the interior lobe), prominent spination of the thorax (including a prominent spine on the mesopraescutum anterior margin), and gently rounded abdominal lobes VII-VIII. Males are most similar to *Phyllium (Ph.) siccifolium* (Linnaeus, 1758) because of the broad rounded abdomens (not spade shaped like in many other *Phyllium (Phyllium)*, including *Ph. (Ph.) philippinicum*, and *Ph. (Ph.) bourquei* males), the prominent spination of the thorax, which includes a clear mesopraescutum crest along the sagittal plane and prominent spine on the mesopraescutum anterior margin. It is likely that male *Phyllium (Ph.) letiranti* **new species** will share more morphological similarities to the currently unknown *Ph. (Ph.) mamasaense* males.

Based on female morphology, *Phyllium (Phyllium) letiranti* **new species** appears to be most closely related to *Phyllium (Ph.) mamasaense* Groesser, 2008, which is also the species most closely situated geographically, with *Ph. (Ph.) mamasaense* known from Southern Sulawesi. The female *Phyllium (Ph.) letiranti* **new species** can be differentiated by their ten segmented antennae (nine in *Ph. (Ph.) mamasaense*), by the meso- and metacoxae lacking colored markings (black interior markings on *Ph. (Ph.) mamasaense*), an interior lobe of the profemora with four prominent teeth and a smaller minor tooth proximally (two prominent teeth with two-three small, minor teeth between or adjacent to those in *Ph. (Ph.) mamasaense*), and a pars stridens with 35 teeth (40-46 in *Ph. (Ph.) mamasaense*). Unfortunately the male *Ph. (Ph.) mamasaense* is currently unknown, but due to the female similarity the male is presumed to be of a similar structure to *Phyllium (Ph.) letiranti* **new species**. Features are summarized in Table 1.

Table 1. Summary of distinguishing features between female *Phyllium (Phyllium) letiranti* **new species**, and *Phyllium (Ph.) mamasaense* Größer, 2008.

Feature (Female)	<i>Phyllium (Ph.) letiranti</i>	<i>Phyllium (Ph.) mamasaense</i>
Antennae	Ten segments, pars stridens with 35 teeth	Nine segments, pars stridens with 40–46 teeth
Meso- and Metacoxae	Lacking colored markings	Black interior markings
Interior lobe of Profemora	Four prominent teeth, one smaller tooth proximally	Two prominent teeth, two–three smaller teeth interspersed

Female *Phyllium (Ph.) letiranti* **new species** can be differentiated from *Phyllium (Ph.) siccifolium* (Linnaeus, 1758) by the pars stridens of antennomere III having 35 teeth (30-32 teeth in *Ph. (Ph.) siccifolium*), abdominal segment VIII more strongly lobed (gently rounded in *Ph. (Ph.) siccifolium*), the interior lobe of the profemora with four large teeth (six slender triangular teeth in *Ph. (Ph.) siccifolium*), and the interior lobe of the protibiae with a broad distinct triangular lobe (interior lobe of the protibiae of a moderate width and roundly triangular in *Ph. (Ph.) siccifolium*). Male *Phyllium (Ph.) letiranti* **new species** can be differentiated from *Phyllium (Ph.) siccifolium* (Linnaeus, 1758) by mesopleurae that are not particularly wide and that only start to diverge after about half way through their length along the mesopraescutum and lateral margins with three to four major tubercles in the center, and generally two slightly smaller tubercles anterior and posterior to them (in *Ph. (Ph.) siccifolium* mesopleurae distinctly

and gradually diverging throughout their length and marked with five prominent but blunt spines). Many other features of the males of these two species were very similar and due to the intraspecific variation of *Phyllium (Ph.) letiranti* **new species** other morphological features could not be confidently used; only the features of the mesopleurae were consistent and notable enough to be useful. Features are summarized in Table 2.

Table 2. Summary of distinguishing features between male and female *Phyllium (Ph.) letiranti* **new species**, and *Phyllium (Ph.) siccifolium* (Linnaeus, 1758).

Feature (Female)	<i>Phyllium (Ph.) letiranti</i>	<i>Phyllium (Ph.) siccifolium</i>
Pars stridens of antennomere III	35 teeth	30–32 teeth
Abdominal segment VIII	Strongly lobed	Gently rounded
Profemora interior lobe	Four large triangular teeth	Six slender triangular teeth
Protibiae interior lobe	Broad, distinct triangular lobe	Moderate width and roundly triangular
Feature (Male)	<i>Phyllium (Ph.) letiranti</i>	<i>Phyllium (Ph.) siccifolium</i>
Mesopleurae shape	Not particularly wide, only start to diverge about half way through their length along the mesopraescutum	Distinctly and gradually diverging throughout their length
Mesopleurae lateral margins	With three to four major tubercles in the center, and generally two slightly smaller tubercles anterior and posterior to them	With five prominent but blunt tubercles

With *Phyllium (Ph.) philippinicum* Hennemann et al., 2009, and *Phyllium (Ph.) bourquei* Cumming and Le Tirant, 2017 likely adelphotaxa sharing many morphological features, *Phyllium (Ph.) letiranti* **new species** is compared against both simultaneously. Female *Phyllium (Ph.) letiranti* **new species** can be differentiated by the pars stridens of antennomere III with 35 teeth (40–42 teeth in *Ph. (Ph.) philippinicum*), by the four large triangular teeth of the interior lobe of the profemora (five to seven small saw-like teeth of the interior lobe of the profemora of *Ph. (Ph.) philippinicum* and *Ph. (Ph.) bourquei*), and the width of the protibiae interior lobe at least twice the width of the protibiae shaft itself and distinctly angular (protibiae interior lobe narrow and gently rounded, at most 1.5× the width of the protibiae shaft itself in *Ph. (Ph.) philippinicum* and *Ph. (Ph.) bourquei*). Male *Phyllium (Ph.) letiranti* **new species** can be differentiated by the protibiae interior lobe that reaches end to end in a smooth scalene triangle, broadened on the distal end (protibiae interior lobe a smooth arc, not distinctly triangular in *Ph. (Ph.) philippinicum* and *Ph. (Ph.) bourquei*), and an abdomen that is wide in the center giving the abdomen a broad ovular appearance (slender and with converging sides in *Ph. (Ph.) philippinicum* and *Ph. (Ph.) bourquei* giving the abdomen a slender spade shaped appearance). Eggs of *Phyllium (Ph.) letiranti* **new species** are more morphologically similar to *Ph. (Ph.) philippinicum*, with their lateral surfaces covered in short pinnae and longitudinal rows of circular markings, than compared to the eggs of *Ph. (Ph.) mamasense*. Unfortunately, the eggs of *Ph. (Ph.) bourquei* are currently unknown, but due to the morphological similarity of adults to *Ph. (Ph.) philippinicum*, they are assumed to be very similar. Features are summarized in Table 3.

Female

Coloration. All coloration descriptions are based on preserved specimens, not from live individuals, which we expect are more vibrant in life. Two main color forms have been observed, a green form (Fig. 1A) and a yellow/orange form (Fig. 1B). In both color forms the antennae are of a slightly darker color than the rest of the body and with the terminal three segments with more dense setae and a general darker color than the other antennae segments. Eyes of both forms are generally of a cherry red to rich reddish brown.

Table 3. Summary of distinguishing features between *Phyllium (Phyllium) letiranti* **new species**, and *Phyllium (Ph.) philippinicum* Hennemann et al., 2009, and *Phyllium (Ph.) bourquei* Cumming and Le Tirant, 2017.

Feature (Female)	<i>Phyllium (Ph.) letiranti</i>	<i>Phyllium (Ph.) philippinicum</i> and <i>Phyllium (Ph.) bourquei</i>
Pars stridens of antennomere III	35 teeth	40–42 teeth*
Profemora interior lobe	Four large triangular teeth	Five to seven small saw-like teeth
Protibiae interior lobe	Width of the protibiae interior lobe at least twice the width of the protibiae shaft itself and distinctly angular	Width narrow and gently rounded, at most 1.5× the width of the protibiae shaft itself
Feature (Male)	<i>Phyllium (Ph.) letiranti</i>	<i>Phyllium (Ph.) philippinicum</i> and <i>Phyllium (Ph.) bourquei</i>
Protibiae interior lobe	Reaches end to end in a smooth scalene triangle, broadened on the distal end	Smooth arc, not distinctly triangular
Abdominal shape	Wide in the center giving the abdomen a broad ovular appearance	Slender and with converging sides giving the abdomen a slender spade shaped appearance

*40–42 teeth in *Ph. (Ph.) philippinicum*, the number of teeth on the pars stridens of *Ph. (Ph.) bourquei* is not yet known.

In the green form, there can be solid green individuals with all surfaces of the same color as the rest of the body. More commonly in the green form however, the protibiae, interior lobe of the profemora, and abdominal segments VIII–X can be marked with varying degrees of brown.

In the yellow/orange form, it is clear that the entire body is a natural golden color (not simply a green specimen that has lost the green color and turned yellow due to improper drying). This color form is also marked with tegmina that have veins that are of a dark orange to red in color.

Morphology. Head capsule slightly longer than wide, vertex smooth, with the only markings being a distinct pit on each side of the sagittal plane near the center which likely represents the connection point of the tentoriofrontalis anterior muscle (Friedemann et al. 2012). The posteromedial tubercle is broad, but not prominent, only slightly raising from the posterior of the head capsule. Frontal convexity broad and stout, slightly shorter than the length of the first antennomere, and with five to seven setae, at least two of which are about twice as long as the other setae present. Antennae consisting of ten segments, with the terminal segment approximately the same length as the previously two segments combined (Fig. 3E). Antennomeres I–VII sparsely marked with small transparent setae, the terminal three antennomeres are covered in dense, stout, brown setae. The pars stridens of antennomere III has 35 teeth (Fig. 3D). Compound eyes not large, only slightly protruding from the head capsule (Fig. 2F and 2G). Ocelli absent. Antennal fields wider than the first antennomere but not protruding back farther than the frontal suture. Pronotum with anterior margin slightly concave and lateral margins that are relatively straight, converging to a narrow, straight posterior margin that is about half the width of the anterior rim (Fig. 2F and 2G). The pronotum surface is smooth, with only a prominent pit in the center, and slight furrows anterior and lateral to the pit. The pronotum has a prominent anterior rim and moderate lateral rims, posterior smooth, lacking a rim. Prosternum and the anterior half of the mesosternum with prominent nodes, with those on the mesosternum larger along the sagittal plane. Metasternum rather smooth, with only slight granulation. Mesopraescutum approximately as long as wide, but because of the longitudinal nodes along the sagittal plane, the lateral rims with prominent tubercles, and the lateral pits running parallel to the lateral rims, the mesopraescutum optically appears to be longer than wide. Lateral rims with nine prominent tubercles ranging in size from medium to large, small granulation is absent. Mesopraescutum anterior rim prominent with a large tubercle with the remainder of the rim smooth. Mesopraescutum crest (excluding the tubercle of the anterior rim) with four to seven prominent nodes unevenly spaced but with a size that varies little. The mesopraescutum crest is made less prominent due to the smooth surface of the mesopraescutum that rises up to meet it,

making the crest not much more than the nodes along the sagittal plane (Fig. 2F and 2G). Mesopleurae evenly diverging; lateral margin with seven to nine major tubercles and one to two nodes throughout on the anterior three quarters, the posterior quarter lacks features and is smooth (Fig. 2F and 2G). Face of the mesopleurae smooth, with two faint divots, one on the anterior margin and one closer to the center. Tegmina with slight variation in length, ranging in length from half way through abdominal segment VII to at most reaching about half way into segment VIII. Alae rudimentary, only about 4.4mm in length. Abdominal segments II through the anterior two thirds of IV diverging, posterior third of IV through VII gently converging. Segment VIII is rounded and converges more acutely than the previous segments, giving the slight impression of a gentle lobe, and the posterior margin is notably narrower than the anterior margin. Segments IX–X are notably narrower than the previous segments and converge uniformly with the anal abdominal segment ending in a broad rounded apex. Subgenital plate starts at the anterior margin of segment VIII and extends into segment X, ending in a fine point. Length of the subgenital plate was somewhat variable, ranging from the shortest, reaching halfway through X (Fig. 3A and 3C) to slightly longer, about three quarters through X (Fig. 3B). Gonapophyses are also slightly variable, either reaching the posterior margin of segment X (Fig. 3B and 3C) or not quite reaching the posterior margin (Fig. 3A) leaving a small portion of the ventral aspect of segment X exposed. Cerci relatively flat not strongly cupped, with a lumpy surface and numerous thin clear setae throughout the surface. Profemora exterior lobes broad, slightly wider than the width of the interior lobe, and with an obtuse exterior angle. Edge of the exterior profemora lobe with five to eight serrate teeth. These teeth can be finely serrate in moderately lobed individuals (Fig. 2B and 2C) or they can be more prominent in more robust individuals (Fig. 2D). Interior lobe of the profemora wide with approximately a right angle and marked with four large triangular teeth. These large four teeth have a slightly wider gap in the center, and proximally to these four large teeth is generally a smaller tooth (Fig. 2B-D). Interior lobe of mesofemora arcs from end to end and has six to seven serrate teeth distributed on the distal half. Interior and exterior lobes can be of a similar width (Fig. 1A), or in more robust individuals the interior lobe can be slightly broader (Fig. 1B). Exterior lobe of the mesofemora evenly arcs end to end three to four teeth only on the distal half of the arc. Mesofemora interior lobe slightly wider than exterior lobe, with slightly greater widths distally. Both exterior and interior lobes have serrate teeth situated on the distal half, generally three teeth on the exterior lobe, and six to seven teeth on the interior lobe. Metafemora interior lobe arcs end to end and has seven to eight serrate teeth pointing distally. Metafemora exterior lobe is thin and smooth, hugging the metafemora shaft. Protibiae lacking an exterior lobe. Protibiae interior lobe spans the entire length of the protibiae and is about twice the width of the protibiae shaft itself. The protibiae interior lobe is shaped as an isosceles triangle in moderately lobed individuals (Fig. 2B) and more scalene with the wider portion on the distal end in more robust individuals (Fig. 2D). Mesotibiae and metatibiae lacking exterior and interior lobes.

Male

Coloration. All coloration descriptions are based on preserved specimens, not from live individuals, which we expect are more vibrant in life. Overall coloration green to straw yellow throughout (although the males that are more yellow appear as though this is due to the drying method and not a natural yellow form like the yellow females). Compound eyes of a rusty brown color. The antennae are of a darker color than the head capsule, slightly darkening towards the apex. All males observed had brown markings on the protibiae, with these similar brown markings variable throughout the rest of the body. The males with the least amount of brown only had the protibiae and a small portion of the interior lobe of the profemora marked in this color and occasionally a small patch of color on the mesofemora (Fig. 6B). Whereas the males that are more darkly marked have the brown markings throughout the profemora (both interior and exterior lobes) and can have the entire mesofemora marked in this brown (Fig. 6A). Males also show various intermediate forms with profemora showing one half to one third of the profemora colored and one third to one half of the mesofemora colored as well. Abdominal segment V can be without an eyespot or occasionally with a faint light brown eye spot which varies in width.

Morphology. Head capsule approximately as long as wide, with a vertex that is rather smooth. Frontal convexity stout with sides that evenly converge to the point, sparsely covered in thin transparent setae.

The posteromedial tubercle is not particularly broad, but is distinctly raised from the posterior of the head capsule. Antennae consisting of 23-25 segments (including the scapus and pedicellus), all segments except the scapus and pedicellus and terminal four are covered in moderately dense dark setae that are as long as the antennae segment is wide. The terminal four segments are covered in dense short setae and the scapus and pedicellus are marked with sparse thin transparent setae. Compound eyes large and bulbous, notably protruding away from the head (Fig. 4A and 4B). Ocelli are present but appear to be only moderately developed (Fig. 4A and 4B). Antennal fields of approximately the same width as the scapus but not notably large. Pronotum with anterior margin distinctly concave and lateral margins that are slightly convex and converging to a straight posterior margin that is about half the width of the anterior rim. Anterior margin of the pronotum has a distinct rim, lateral margins have moderate rims, and the posterior margin lacks a rim. Face of the pronotum is marked by a distinct furrow and pit and a smooth surface (Fig. 4A and 4B). Prosternum is granulose throughout with nodes of slightly uneven size and uneven spacing. Mesosternum surface marked with small nodes along the sagittal plane and more strongly on the anterior margin, posterior margin relatively smooth. Mesopraescutum slightly longer than wide, with lateral margins only slightly converging to the posterior. Lateral rims with seven to eight tubercles of varying size, with most rather prominent. Mesopraescutum crest along the sagittal plane only with five to eight small nodes of uniform size and uneven spacing (Fig. 5A and 5B). The surface of the mesopraescutum rises up to meet the crest with a face that is relatively smooth. Mesopraescutum anterior margin marked with a prominent tubercle, several times larger than any of the nodes along the crest (Fig. 5A and 5B). Mesopleurae not particularly wide and only start to diverge after about half way through their length. Lateral margin with three to four major tubercles in the center, and generally two slightly smaller tubercles anterior and posterior to them (Fig. 4A and 4B). Face of the mesopleurae smooth except for two faint divots, one on the anterior third and one on the posterior third. Tegmina long, extending to the anterior margin of abdominal segment IV. Alae well developed in an oval fan configuration, long, reaching into abdominal segment IX and occasionally half way through X. Abdominal segments II through the anterior half of IV gradually diverging in a gentle curve, posterior half of IV through VI, parallel to subparallel giving the abdomen a broad appearance. Segments VII through X uniformly converging to the apex. Poculum starting halfway through abdominal segment VIII, broad, and ends in a broad rounded apex that slightly passes the anterior margin of segment X (Fig. 4C and 4D). Cerci long and slender, extending from under the anal abdominal segment, slightly cupped, covered in a number of thin transparent setae and a granulose surface. Vomer stout and broad with sides evenly converging, the single apical point is broad and hooks upwards into the paraproct (Fig. 4C and 4D). Profemora exterior lobe about half the width of the interior lobe, marked with three to six small fine teeth, and hugs the curve of the profemora shaft itself. Profemora interior lobe rounded without a strong angle and marked with five to six prominent serrate teeth which are evenly spaced. Exterior lobe of the mesofemora arcs end to end, lacking a strong angle but is slightly more prominent on the distal end which is marked with two to four finely serrate teeth. Interior lobe of mesofemora, which can be of an equal width to the exterior lobe or slightly wider, is broader on the distal end and is marked with five to six serrate teeth. Exterior lobe of metafemora lacks dentition, relatively straight against the metafemora shaft. Metafemora interior lobe gently arcing with eight to nine small serrate teeth on the distal half. Protibiae lacking exterior lobe, interior lobe reaching end to end in a smooth scalene triangle, broadened on the distal end. Meso- and metatibiae simple, lacking lobes completely.

Description of egg (Fig. 1C–D). The lateral surfaces are flattened and the dorsal surface slightly convex, which gives the egg a slight bend. When viewed from the lateral aspect, the anterior width of the capsule is of a similar width to the posterior width, with the center width slightly wider near the posterior, but not much wider than general width of the capsule. When viewed from the lateral aspect, along the anterior and posterior margins each are set with a row of long pinnae each ending in a single branch. Lateral surfaces with three relatively parallel rows of small circular impressions, with the space between densely covered with short pinnae. Micropylar plate reaching approximately less than half of the overall length, situated mostly on the posterior half. Micropylar plate in a teardrop shape, with most of the width as wide as the micropylar cup. Micropylar cup of moderate size and placed on the posterior third of the capsule. Pinnae on the dorsal margin about half of the length of those found on the posterior and anterior margins. Dorsal pinnae only covering about half of the length of the capsule.

Operculum ovular, with the outer margin with a row of pinnae similar to those along the posterior edge of the capsule. Overall color tan to light brown.

Measurements including the extended pinnae [mm]. Length (including operculum) 5.5–6.2, maximum width of capsule when viewed from lateral aspect 3.5–3.7 mm, length of micropylar plate 1.5–1.7 mm.

Measurements of holotype and paratypes [mm]. See Table 4 for measurements of the holotype female. For the paratype series a minimum and maximum range and average measurements are given for both males and females.

Table 4. Measurements of *Phyllium (Phyllium) letiranti* **new species**, holotype female, paratype males and females. All measurements made to the nearest 0.1mm. Measurements for paratypes are given with a minimum to maximum range, followed by the average in parentheses.

Feature	Holotype Female	Paratype Females	Paratype Males
Length of body*	90.5	86.6–91.2 (87.9)	57.6–62.2 (60.7)
Length/greatest width of head	7.8/7.1	7.4–8.4/6.5–7.3 (7.9/6.9)	3.5–3.8/3.4–3.6 (3.7/3.5)
Pronotum	5.4	5.1–5.5 (5.3)	2.3–2.9 (2.8)
Mesonotum	8.3	7.2–8.6 (8.2)	4.2–5.1 (4.6)
Length of tegmina	54.3	52.3–57.9 (55.0)	20.0–22.2 (21.1)
Length of alae	—	4.4**	42.5–45.4 (44.3)
Greatest width of abdomen	39.2	32.2–39.0 (35.1)	15.7–18.8 (17.0)
Profemora	18.0	16.8–18.6 (17.4)	11.6–13.1 (12.6)
Mesofemora	15.9	14.4–16.6 (15.3)	10.7–11.8 (11.3)
Metafemora	20.3	19.8–21.0 (19.6)	13.4–15.1 (14.2)
Protibiae	11.1	10.6–12.5 (11.2)	7.9–8.6 (8.2)
Mesotibiae	11.3	10.4–12.2 (11.1)	7.1–8.1 (7.5)
Metatibiae	16.7	14.6–16.7 (15.7)	10.0–10.7 (10.4)
Antennae	5.3	5.1–5.6 (5.4)	35.2–35.9 (35.6)

*Including cerci and head, excluding antennae.

** Only one female specimen [Coll RC 17-010] had the alae exposed to measure.

Distribution. Currently only known from Peleng Island, Indonesia. With *Ph. (Ph.) mamasaense* Größer, 2008 currently known from the south west region of Sulawesi and *Ph. (Ph.) letiranti* **n. sp.** from Peleng, it would be interesting to know if *Ph. (Ph.) mamasaense* is distributed throughout Sulawesi. Also, with Peleng's close proximity to Sulawesi, it would be interesting to know if *Ph. (Ph.) letiranti* **n. sp.** occurs across the narrow stretch of water on the north shore of Sulawesi or if it is endemic to Peleng. Hopefully, future collections in the area will illuminate the distribution of these adelphotaxa.

Etymology. This species is named to honor Stephane Le Tirant, collections manager of the Montreal Insectarium and good friend to the authors. Le Tirant is well known as a passionate entomologist who has worked with many different groups of insects over the years and has always had a fondness for the Phylliidae. Le Tirant's passion has shown to be much more than that however, with his leaf insect collection proving a valuable research tool with several new species of leaf insect contained within. It is appropriate that a new species of leaf insect be named in his honor and paratypes deposited in his extensive collection.

Keys to known *Phyllium* (*Phyllium*) species of Sulawesi and Peleng islands

Key to known females

1. Alae developed: [celebicum species group] ***Ph. (Ph.) celebicum* de Haan, 1842**
- Alae rudimentary: [siccifolium species group] **2**
2. Antennae with 9 segments; pars stridens of antennomere III with 40–46 teeth; meso- and metacoxae with conspicuous black marking; interior lobe of the profemora with two prominent teeth with two–three small, minor teeth between or adjacent to them ***Ph. (Ph.) mamasaense* Größer, 2008**
- Antennae with 10 segments; pars stridens of antennomere III with 35 teeth; meso- and metacoxae the same color as the rest of the legs, no markings; interior lobe of the profemora with four prominent teeth and a smaller minor tooth proximally ***Ph. (Ph.) letiranti* Cumming and Teemsma, n. sp.**

Key to known males*

1. Exterior lobe of the profemora a greater width than the interior lobe: [celebicum species group] ***Ph. (Ph.) celebicum* de Haan, 1842**
- Exterior lobe of the profemora thinner than exterior lobe: [siccifolium species group] ***Ph. (Ph.) letiranti* Cumming and Teemsma, n. sp.**

*Male *Ph. (Ph.) mamasaense* Größer, 2008 currently unknown.

Key to known eggs

1. Operculum flat; pinnae long on the margin of operculum and posterior carinae of the capsule: [siccifolium species-group] **2**
- Operculum conically raised; pinnae short, spread throughout the capsule and operculum with a similar height throughout: [celebicum species group] ***Ph. (Ph.) celebicum* de Haan, 1842**
2. Lateral surface with short pinnae, notably shorter than the pinnae of the posterior and anterior ends ***Ph. (Ph.) letiranti* Cumming and Teemsma, n. sp.**
- Lateral surface with two rows of long pinnae, of a similar length to the pinnae of the posterior and anterior ends ***Ph. (Ph.) mamasaense* Größer, 2008**

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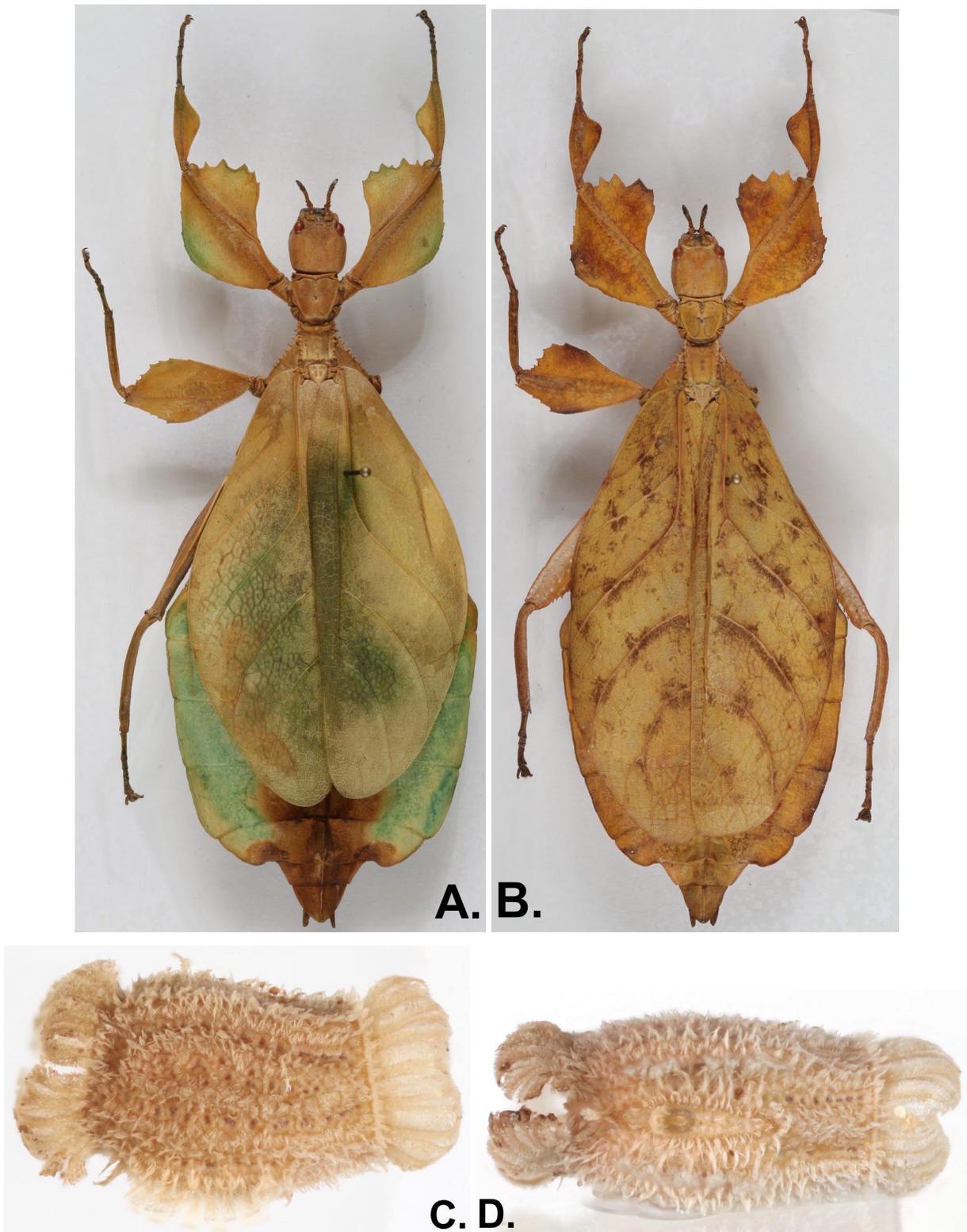


Figure 1. *Phyllium (Ph.) letiranti* new species. **A)** Dorsal, holotype [Coll RC 17-015]. **B)** Dorsal, paratype [Coll RC 17-008]. **C)** Lateral, paratype egg [Coll RC 17-314]. **D)** Dorsal, paratype egg [Coll RC 17-314].

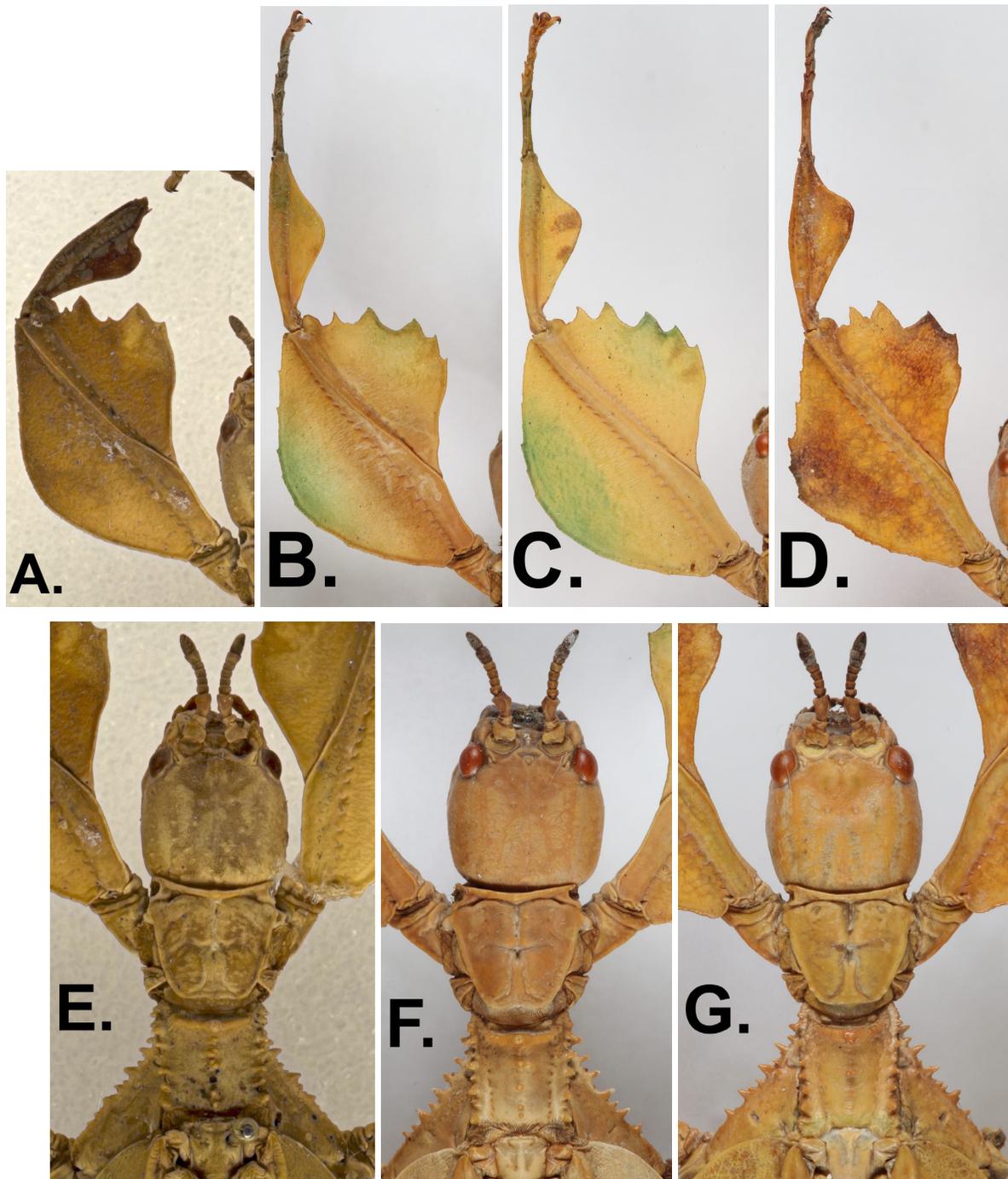


Figure 2. *Phylium* spp., females. **A–D)** Female left profemora. **A)** Holotype *Ph. (Ph.) mamasaense* Größer, 2008. **B)** Holotype *Ph. (Ph.) letiranti* **new species** [Coll RC 17-015]. **C)** Paratype *Ph. (Ph.) letiranti* **new species** [Coll RC 17-016]. **D)** Paratype *Ph. (Ph.) letiranti* **new species** [Coll RC 17-008]. **E–G)** Female closeup of antennae, head, and thorax. **E)** Holotype *Ph. (Ph.) mamasaense* Größer, 2008. **F)** Holotype *Ph. (Ph.) letiranti* **new species** [Coll RC 17-015]. **G)** Paratype *Ph. (Ph.) letiranti* **new species** [Coll RC 17-008].

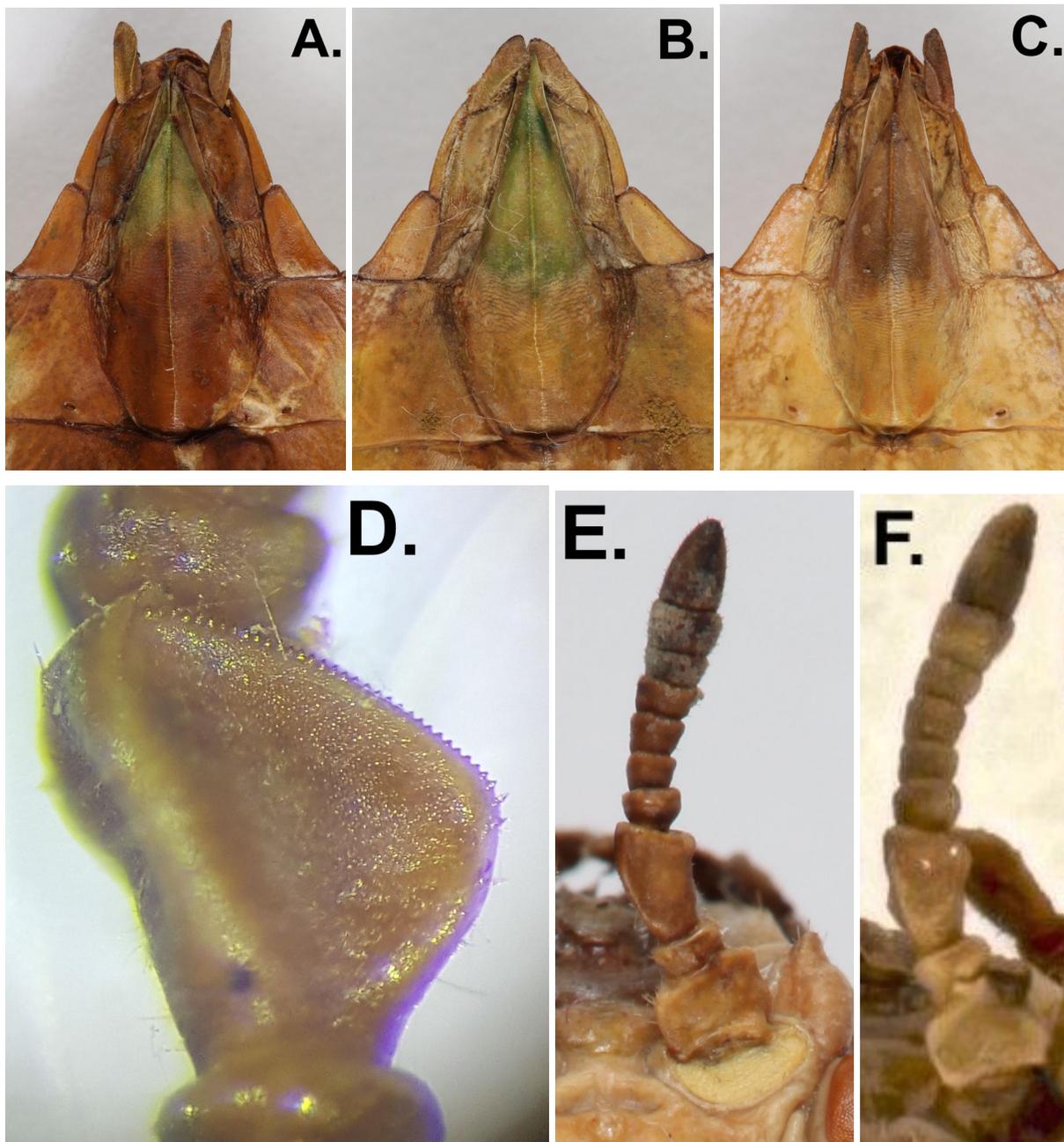


Figure 3. *Phyllium* spp. **A–C)** Ventral, genitalia closeup. **A)** Holotype *Ph. (Ph.) letiranti* new species [Coll RC 17-015]. **B)** Paratype *Ph. (Ph.) letiranti* new species [Coll RC 17-016]. **C)** Paratype *Ph. (Ph.) letiranti* new species [Coll RC 17-008]. **D)** Antennomere III, showing pars stridens [Coll RC 17-033]. **E)** Antenna of paratype *Ph. (Ph.) letiranti* new species [Coll RC 17-008]. **F)** Antenna of holotype *Ph. (Ph.) mamasense* Gröber, 2008.

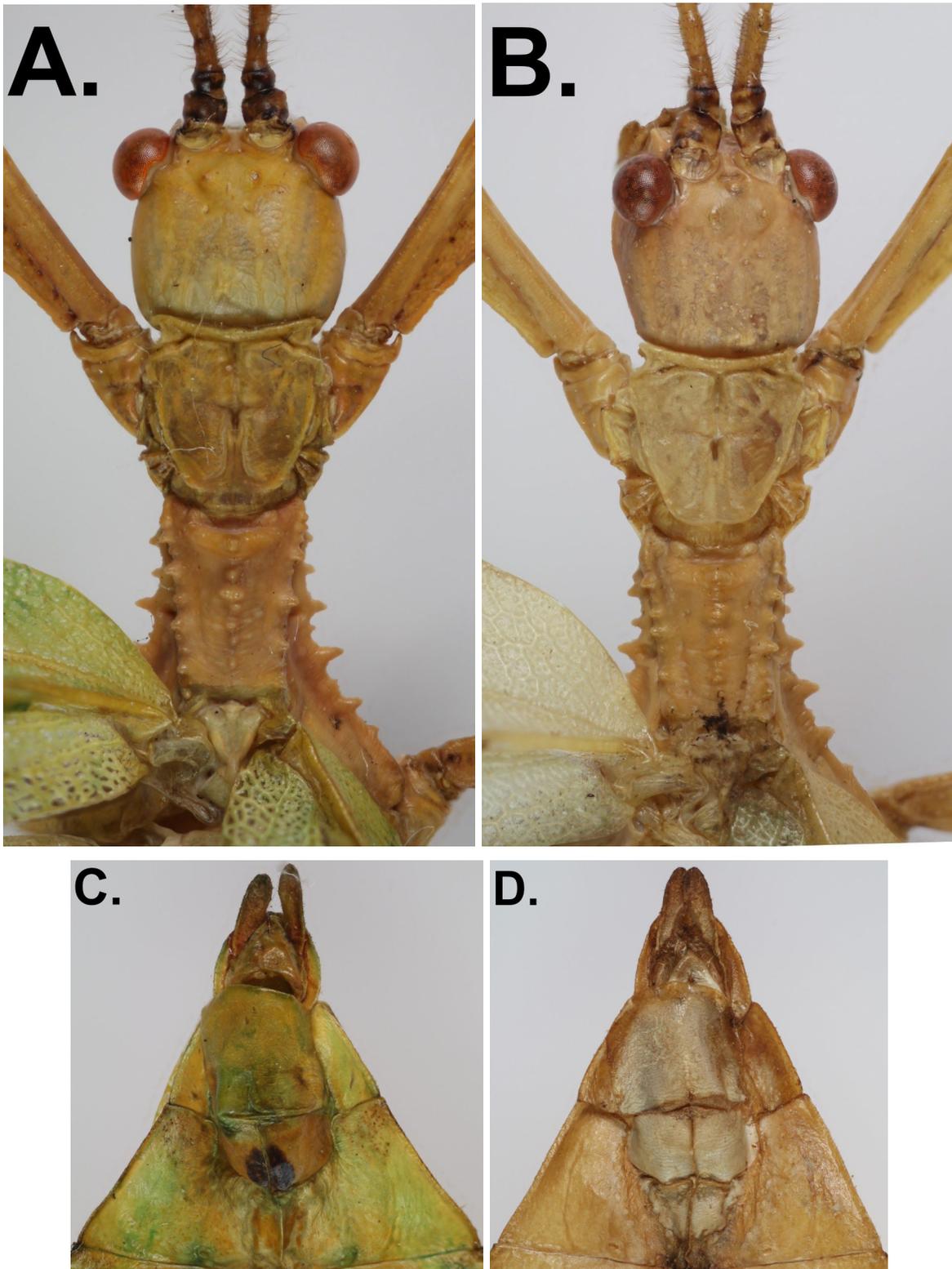


Figure 4. Paratype males, *Ph. (Ph.) letiranti* new species. **A-B)** Closeup of base of antennae, head, and thorax. **A)** [Coll RC 17-190]. **B)** [Coll RC 17-056]. **C-D)** Ventral view of genitalia. **C)** [Coll RC 17-190]. **D)** [Coll RC 17-056].

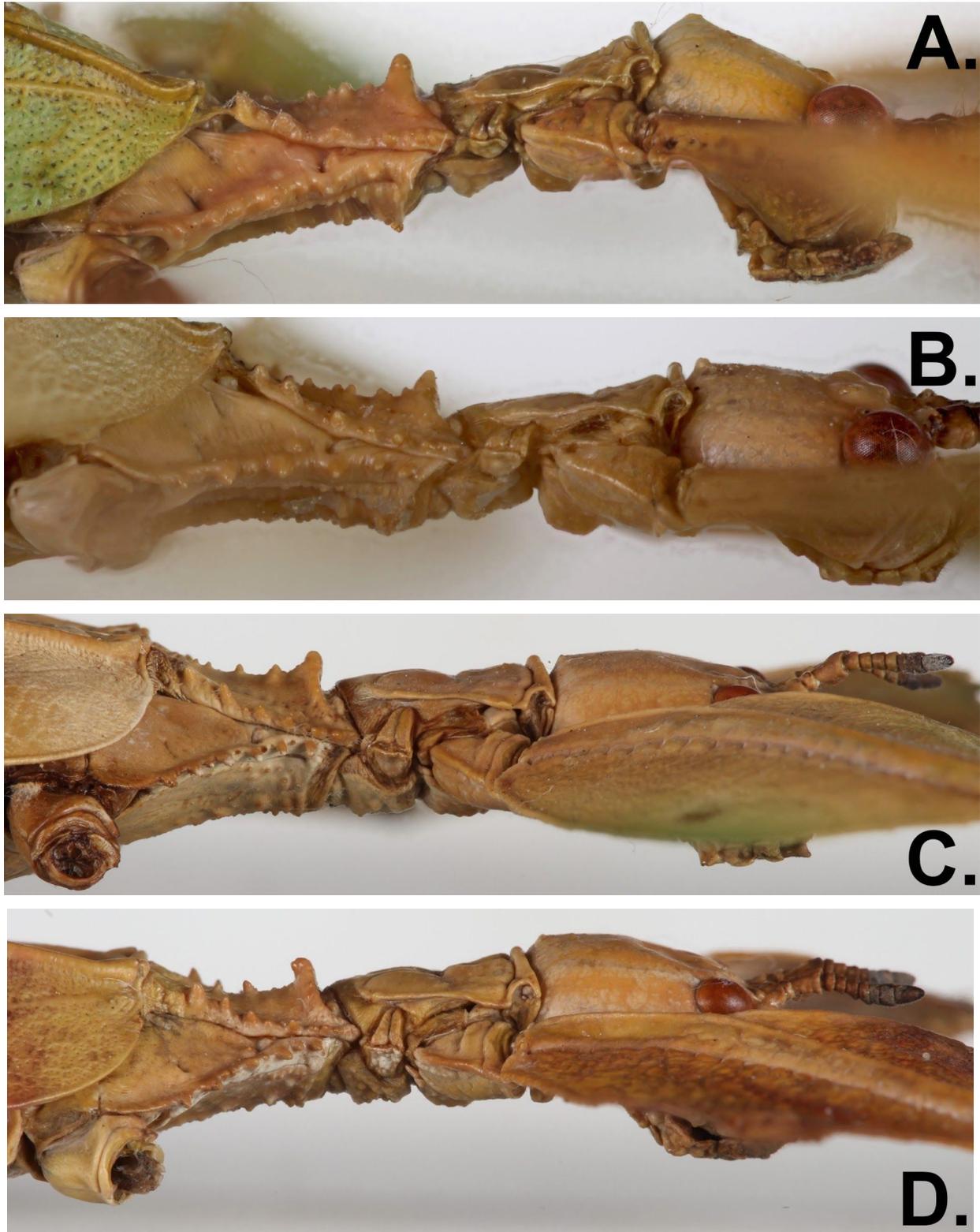


Figure 5. Side views of *Ph. (Ph.) letiranti* new species. A–B) Paratype males. A) [Coll RC 17-190]. B) [Coll RC 17-056]. C) Holotype female [Coll RC 17-015]. D) Paratype female [Coll RC 17-008].

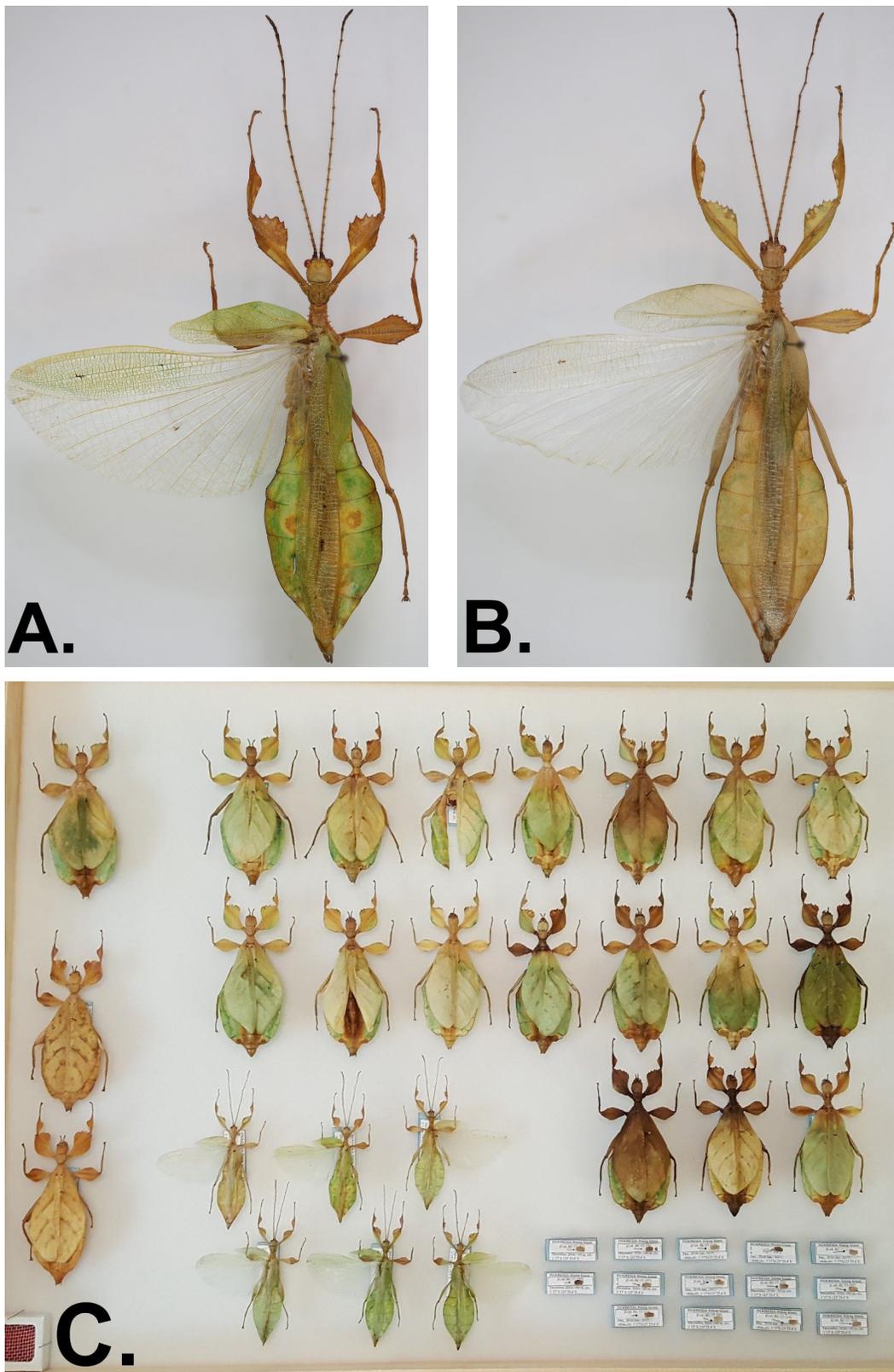


Figure 6. *Phylium (Ph.) letiranti* new species. A-B) Paratype males. A) [Coll RC 17-190]. B) [Coll RC 17-056]. C) Type series of *Ph. (Ph.) letiranti* new species, holotype in the upper left.