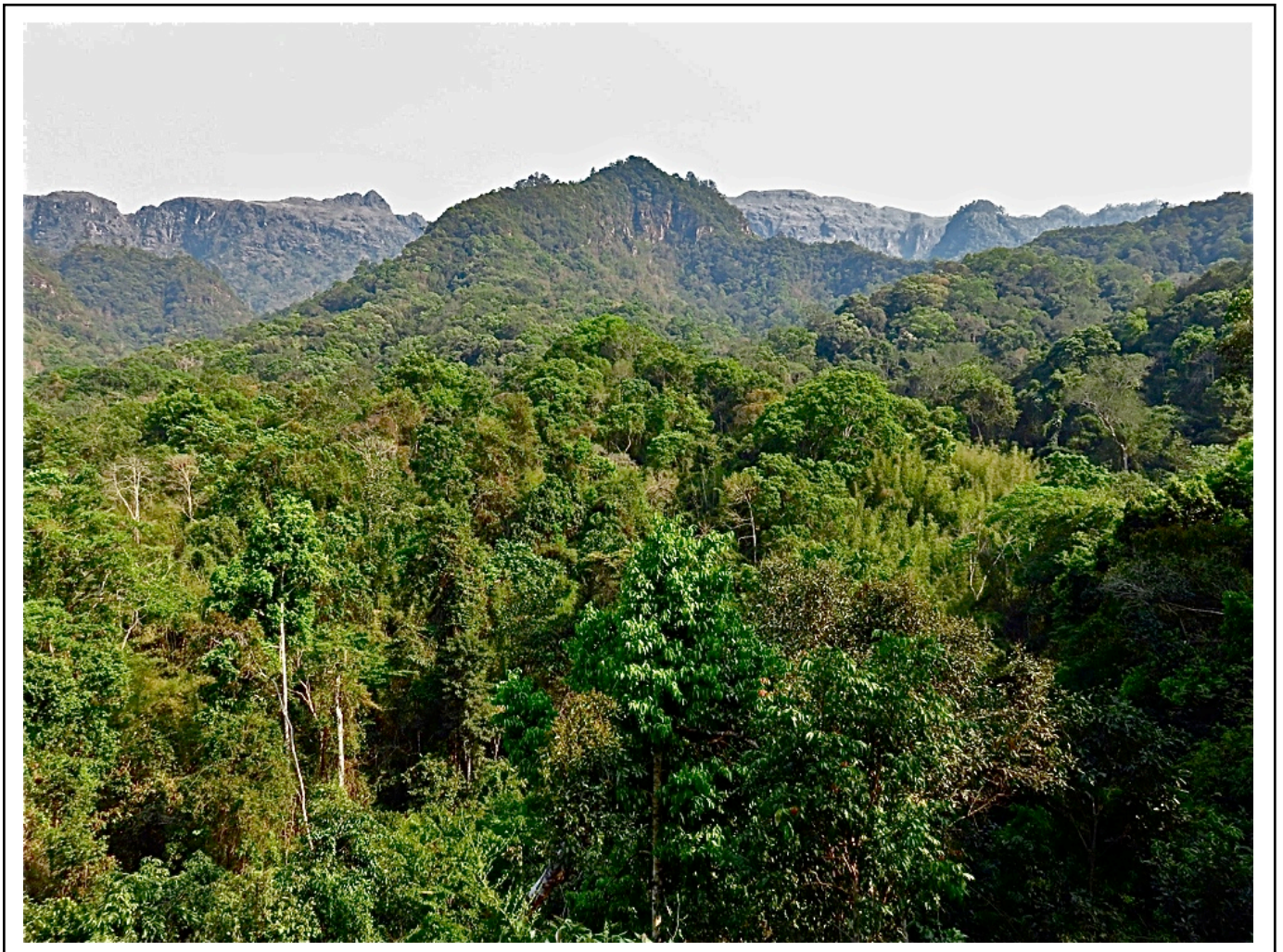


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# A new species of *Phyllium* Illiger, 1798, from the *celebicum* species group native to Laos (Phasmida: Phylliidae)

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- ZooBank : <http://zoobank.org/A9391F8A-15D7-4D3B-9E3F-7123BA27EA2E>

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*oyae* ;  
*celebicum* ;  
Taxonomy ;  
description ;  
new species.

**Abstract.** – Review of leaf-insects collected in Northeastern Laos has revealed a previously unnamed species, which we here describe as *Phyllium (Phyllium) oyaе* species nova. This new species falls within the *celebicum* species group as described in Hennemann et al. (2009) due to the presence of well developed alae in females and males with a wide exterior profemoral lobe. Upon a review of congenics, we find that *Phyllium (Phyllium) drunganum* Yang, 1995 is misplaced and transfer it from the *siccifolium* species group to the *celebicum* species group based on the presence of developed alae in females. With so many of the species in this group only known from a single sex, we differentiate *Phyllium oyaе* n. sp. from all species. The species name *Phyllium rayongii* Thanasinchayakul, 2006 is determined to be a nomen nudum and therefore **unavailable** according to ICZN Article 16.4.1. To conclude, we present dichotomous keys to males and females known within the *celebicum* species group.

Cumming R. T. & Le Tirant S., 2020. – A new species of *Phyllium* Illiger, 1798, from the *celebicum* species group native to Laos (Phasmida: Phylliidae). *Faunitaxys*, 8(4) : 1 – 9.

ZooBank : <http://zoobank.org/318DC3DF-A047-4812-AB6C-45D23242310A>

## Introduction

To date, only infrequent records of Phylliidae from Laos have surfaced and made their way into publications or into museum collections, creating a rather insufficient view of the phylliid diversity of the country. It is not surprising that Phylliidae are only rarely collected in the wild as their incredible leaf-like crypsis likely allows them to evade visually oriented predators (and entomologists alike, Fig. 1). In a preliminary review of numerous museum collections and more recently fresh specimens sent to the authors for identification, it became apparent that there were at least two species of *Phyllium* Illiger, 1798 present in Laos.

The first noted specimens are those which are morphologically identical to *Phyllium westwoodii* Wood-Mason, 1875 which were collected in northern Laos along the same latitude as records of specimens from northern Thailand. This northern Thailand population is readily available for sale to collectors in large quantities each year from breeders in Thailand and is well known. Currently, molecular analysis of specimens from northern Thailand and northern Laos are being conducted to confirm/correct this identification as *Phyllium westwoodii*.

A second species was also identified but infrequently collected until larger series of bred specimens became available from Steeve Collard (Laos, September, 2013 to present) and Johnson Sau (Malaysia, August, 2018), who sent specimens to the authors. Upon first review, we thought they could represent a range expansion for *Phyllium drunganum* Yang, 1995 which is known from Drung-Nu Autonomous County, China. After reviewing in detail the material we received from Laos however, it became apparent that the structure of the antennae was consistently different from *Phyllium drunganum*, and the Laos population



Fig. 1. Live female *Phyllium oyaе* n. sp. photographed in the wild.

instead represented an undescribed species. This species is compared below to all members within the *celebicum* species group as described by Hennemann, et al., 2009 and is named *Phyllium oyae* n. sp. after Steeve Collard's wife as he first sent us specimens of this new species and has been incredibly helpful in supplying fresh material and photographs of the habitat (Fig. 2).

## Materials and Methods

Photographs of specimens were taken by René Limoges of the Montreal Insectarium using a Nikon D810 DSLR camera with Nikon Micro-Nikkor 200mm f/4 lens on Manfrotto 454 micrometric positioning sliding plate. Lighting was provided by two Nikon SB-25 flash units with a Cameron Digital diffusion photo box. Adobe Photoshop Elements 13 was used as post processing software. Photos of the holotype and a paratype female were taken by Frank Hennemann (Germany) using a Nikon D7000 camera equipped with a Nikon DX AF-S Micro 40 mm lens and a wireless Nikon SU-800 dual speed light system. Background lighting was provided by a 18W 6000K LED panel light plate. Measurements of the holotype were made to the nearest 0.1 mm using digital calipers. Egg orientation terminology follows the terminology presented by Clark (1978). The holotype specimen is deposited in the Montreal Insectarium type collection.

## Abbreviations

- **IMQC**: Insectarium de Montréal, Montréal, Québec / Canada.
- **Coll RC**: Private collection of Royce T. Cumming / U.S.A.
- **Coll SLT**: Private collection of Stéphane Le Tirant / Canada.

## Taxonomy

### *Phyllium (Phyllium) drunganum* Yang, 1995

**Remarks.** – Since the original description, where *Phyllium drunganum* was not placed within a particular subgenus (Yang, 1995 & Chen, 1999), there has been significant confusion about the taxonomic placement of this species. Some authors have placed *Phyllium drunganum* within *Phyllium (Pulchriphyllium)* based on all tibiae with small exterior lobes (Zompro, 2004; Größer, 2008) and others in the *Phyllium (Phyllium)* subgenus (Otte & Brock, 2005; Hennemann, et al., 2009; Chen & He, 2008).

Most recently with the arrangement of species groups by Hennemann et al. (2009), *Phyllium drunganum* was returned to the *Phyllium (Phyllium)* subgenus, but unfortunately it was placed within the *siccifolium* species group without morphological justification. The authors were relying on the figure and English summary of the description provided by Yang (1995) but did not translate the morphological description in its entirety and assumed that because the illustration did not show developed alae, that there were none.

Fortunately, we were able to translate the morphological description in its entirety. To do so we used the most recent version of the phone based app “Google Translate” (offered by Google LLC: version 6.2.0.RC07.268294262) to translate the morphological description of *Phyllium drunganum*. We found that the second line on page 19 of the description translates to “The rear/posterior wing is thin and transparent, extending only to 1/3 of the sixth abdominal section” (Yang, 1995). The presence of developed alae is a feature which helps to define the *celebicum* species group as described by Hennemann et al. (2009), therefore we here note the correct placement of *Phyllium drunganum* to be within the *celebicum* species group, not within the *siccifolium* species group.

Besides this important morphological feature now known to be present in *Phyllium drunganum*, there are other morphological features which additionally help to justify the transfer. One is the profemoral exterior lobe which is broad and rounded (which is a feature found in all female *celebicum* species group members but also in some *Phyllium*



**Fig. 2.** Steeve Collard (center) with locals in Hua Phan Province where they collected the holotype of *Phyllium oyae* n. sp. and where the paratype series was bred.

(*Pulchriphyllium*) members as well so it is not an exclusive feature, but helpful to differentiate the *celebicum* species group from the *siccifolium* species group). Also, all tibiae have small distal exterior lobes, a feature which is also seen in *Phyllium tibetense* Liu, 1993. Additionally, the fourth antennal segment is flattened and disk-like, a feature unique to and seen in all members of the *celebicum* species group, except the Philippine *Phyllium bonifacioi* Lit & Eusebio, 2014 and *Phyllium ericoriai* Hennemann et al., 2009 which lack this disk-like segment. Based on these morphological features, we here transfer *Phyllium (Phyllium) drunganum* to the *celebicum* species group as described by Hennemann et al. (2009).

### *Phyllium (Phyllium) oyae* Cumming & Le Tirant n. sp.

(Fig. 1, 3A-C, 4A-D, 5A-E, 6A-D, 7A-C)

ZooBank : <http://zoobank.org/0F657962-4BB8-488A-9C75-D35C5AA053B2>

**Holotype**, ♀. – NE-Laos, Mount Phu Phan, 2060 m, IX.2013. Ex: Frank H. Hennemann private collection / Germany. Deposited in the Montreal Insectarium type collection. (Fig. 3B).

**Paratypes** [250 ♀♀, 44 ♂♂, 25 eggs]. – LAOS, N.Eastern. Bred locally in Laos. See below deposition data for individual data.

### Depositions.

– 2 ♀♀, 1 ♂ [Royce Cumming private collection, California / United States, Coll RC 18-423 — 18-425: LAOS, N.Eastern, Hua Phan Prov., Xamnuen District, Ban Saleui, VIII.2018. Local Collector].

– 14 ♀♀, 6 ♂♂, 2 subadult ♀♀, 2 subadult ♂♂ [Royce Cumming private collection, California / United States, Coll RC 19-063 — 19-086: LAOS, N.Eastern, Hua Phan Prov., Xamnuen District, Ban Saleui, VIII.2018].

– 3 ♀♀ [Royce Cumming private collection, California / United States 19-170 — 19-172: LAOS: Mt Phu Phan 2060m VI.2019 N-E Laos].

– 17 eggs [Royce Cumming private collection, California / United States, Coll RC 19-183 — 19-199: LAOS, Ban Saleuy, from Bruno Kneubuhler, Switzerland, December, 2019].

– 190 ♀♀, 16 ♂♂, 4 eggs [Stéphane Le Tirant private collection, Québec / Canada]. LAOS, N.Eastern, Hua Phan Prov., Xamnuen District, Ban Saleui, VIII.2018.

– 10 ♀♀, 10 ♂♂, 1 egg [Insectarium de Montréal collection, Montréal, Québec / Canada] LAOS, N.Eastern, Hua Phan Prov., Xamnuen District, Ban Saleui, VIII.2018.

– 5 ♀♀, 5 ♂♂, Ban Saleuy, Xamnuen, Houaphan Province, NE Laos, [Oskar V. Conle private collection, Bolsterlang / Germany].

– 4 ♀♀ [Frank H. Hennemann private collection / Germany. NE-Laos, Mount Phu Phan, 2060 m, IX.2013] [coll. FH, No's 1060-1 — 1060-4].

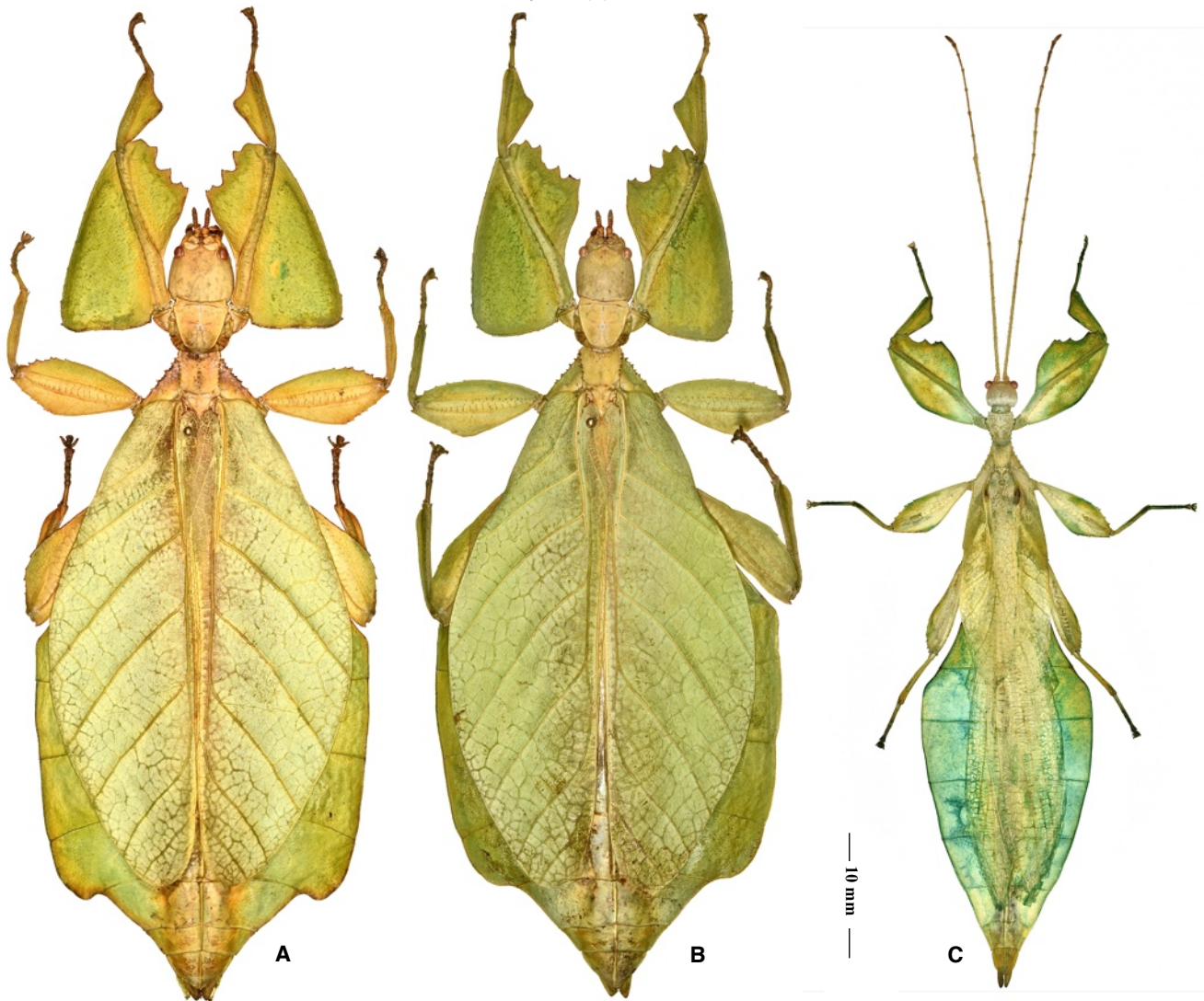


Fig. 3. Dorsal view of *Phyllium oyaie* n. sp. A. Female paratype. B. Female holotype. C. Male paratype.

- 2 ♂♂ [Frank H. Hennemann private collection / Germany. NE-Laos, Mount Phu Phan, 2060 m, VI.2019] [coll. FH, No's 1060-5 — 1060-6].
- 10 ♀♀ [Frank H. Hennemann private collection / Germany. LAOS, N.Eastern, Hua Phan Prov., Xamnuen District, Ban Saleui, VIII.2018.] [coll. FH, No's 1060-7 — 1060-16].
- 3 eggs [Frank H. Hennemann private collection / Germany, ex: Royce Cumming private collection (Coll RC 19-200—19-202). LAOS, Ban Saleuy, from Bruno Kneubuhler, Switzerland, December, 2019] [coll. FH, No's 1060-E].
- 1 ♀ [California Academy of Sciences, San Francisco, California / U.S.A.] LAOS, N.Eastern, Hua Phan Prov., Xamnuen District, Ban Saleui, VIII.2018. Local Collector.
- 2 ♂♂, 1 ♀: [Royal Belgian Institute of Natural Sciences / Belgium, Coll. I.R.Sc.N.B.]. Laos, NE, Mt Phu Phan, vi.2019, local collectors, I.G.: 34.159.
- 2 ♀♀: [Royal Belgian Institute of Natural Sciences / Belgium, Coll. I.R.Sc.N.B.]. Laos, NE, Mt Phu Phan, ix.2019, local collectors, I.G.: 34.159.
- 1 ♀ [Lyman Entomological Museum, McGill University, Québec / Canada] LAOS, N.Eastern, Hua Phan Prov., Xamnuen District, Ban Saleui, VIII.2018. Local Collector.
- 1 ♀ [Museum National d'Histoire Naturelle, Paris / France] LAOS, N.Eastern, Hua Phan Prov., Xamnuen District, Ban Saleui, VIII.2018. Local Collector.
- 1 ♀ [The Natural History Museum United Kingdom, London / United Kingdom] LAOS, N.Eastern, Hua Phan Prov., Xamnuen District, Ban Saleui, VIII.2018. Local Collector.
- 1 ♀ [San Diego Natural History Museum, San Diego / U.S.A.] LAOS, N.Eastern, Hua Phan Prov., Xamnuen District, Ban Saleui, VIII.2018. Local Collector.
- 1 ♀ [Alexandre Banko private collection, Québec /Canada] LAOS, N.Eastern, Hua Phan Prov., Xamnuen District, Ban Saleui, VIII.2018. Local Collector.
- 1 ♀ [Tetsuo Miyashita private collection / Japan] LAOS, N.Eastern, Hua Phan Prov., Xamnuen District, Ban Saleui, VIII.2018. Local Collector.

**Differentiation.** – Because the *celebicum* species group is poorly known with many species from mainland Asia only known from a single sex, we discuss all species in the group in order to sufficiently differentiate and place *Phyllium oyaie* n. sp. taxonomically.

First, we can differentiate *Phyllium oyaie* n. sp. from all species that have females with mesopleurae margins which do not reach from the posterior of the mesopraescutum completely to the anterior margin (*Phyllium oyaie* n. sp. has mesopleurae which span the entire length, Fig. 4D). This simple and clearly observed feature differentiates *Phyllium oyaie* n. sp. from: *Phyllium athanysus* Westwood, 1859; *Phyllium celebicum* de Haan, 1842; *Phyllium westwoodii* Wood-Mason, 1875; and *Phyllium chrisangi* Seow-Choen, 2017.

Next, two species which can easily be differentiated based on their antennae are *Phyllium bonifacioi* Lit and Eusebio, 2014 and *Phyllium ericoriai* Hennemann et al., 2009 which have the fourth antennal segment of a similar length and shape to the following segments (not short and disk-like as observed in *Phyllium oyaie* n. sp. and all other species in the *celebicum* species group, Fig. 4C).

Another species easily differentiated is *Phyllium yapicum* Cumming & Teemsma, 2018. This species has the unique feature of a protibial interior lobe which is only distributed on the proximal half, while the distal half is thin and almost lacking a lobe. *Phyllium oyaie* n. sp., like the other species in the group, has a protibial lobe which is fully spanning the protibial length.

The remaining three species with morphologically similar females are discussed individually as one of these species is likely the sister species to *Phyllium oyaie* n. sp. based on morphology and geographic distribution.

*Phyllium tibetense* Liu, 1993. Major form females of *Phyllium oyaie* n. sp. share the most morphological similarities to *Phyllium tibetense* such as

more prominent abdominal segment VII lobes and small but developed tibial exterior lobes on the distal fifth of the tibia, a feature which is clearly noted and illustrated in the description of *Phyllium tibetense* Liu, 1993. Also, a shared feature between the two species is the antennal morphology, with the terminal segment longer than and nearly as wide as the preceding segment which was uniformly observed throughout the paratype series of *Phyllium oyae* n. sp. (Fig. 4C). A simple feature to differentiate *Phyllium tibetense* and *Phyllium oyae* n. sp. is the length of the female subgenital plate, which at most reaches three quarters through segment X in *Phyllium oyae* n. sp., but in *Phyllium tibetense* is clearly longer and exceeding the apex of segment X (a feature which helps to differentiate *Phyllium tibetense* from all other species group members).

*Phyllium rarum* Liu, 1993 (only known from the female sex). Features which are similar between *Phyllium rarum* and *Phyllium oyae* n. sp. are the structure of the genitalia, mesopleurae which span the full length of the mesopraescutum, and an alae length reaching the posterior margin of the sixth abdominal segment. Although not the most common form, there are occasionally female *Phyllium oyae* n. sp. with a profemoral exterior lobe having a 90 degree angle (see Fig. 5A for a paratype with such a shape) as observed in *Phyllium rarum*. An easy feature to differentiate the two species is the abdominal shape, with *Phyllium rarum* lacking a lobed seventh abdominal segment and having a spade shaped abdomen instead. Abdominal shape is generally a feature which we wish to avoid when differentiating between different species. However, with such a large paratype series, we are confident in the degree of variation within female *Phyllium oyae* n. sp. with even the most slender form having a boxy abdomen with segment VI parallel sided and not converging as seen in *Phyllium rarum*.

Based on the female alone, *Phyllium oyae* n. sp. appears to be most morphologically similar to *Phyllium drunganum* Yang, 1995 known from Drung-Nu Aut. Co., China, a distance of nearly 1,000 kilometers from the *Phyllium oyae* n. sp. type locality. Features which are shared

between the two species are: mesopleurae which span the full length of the mesopraescutum (Fig. 4D), small tibial exterior lobes on all legs on the distal most end, a subgenital plate which does not exceed the apex of the abdomen (Fig. 4B), and gently lobed abdominal segment VII (Fig. 3A). The only feature which easily separates these two species is the morphology of the antennae (which Yang (1995) highlighted as an important feature to differentiate *Ph. drunganum* from *Ph. tibetense* also) with the terminal segment shorter and narrower than the preceding segment, not longer and nearly as wide as the preceding segment observed in *Phyllium oyae* n. sp. (Fig. 4C). Unfortunately, we do not yet know male and egg morphology for *Phyllium drunganum* which might prove to be important differentiation features, once known.

The two species with only males known which are most morphologically similar to *Phyllium oyae* n. sp. are *Phyllium yunnanense* Liu, 1993 (described from Mongla, Yunnan Province, China, just over 400 kilometers from the type locality of *Phyllium oyae* n. sp.) and *Phyllium parum* Liu, 1993 (described from Baisha, Hainan Island, China, almost 600 kilometers from the type locality of *Phyllium oyae* n. sp.). From *Phyllium yunnanense*, *Phyllium oyae* n. sp. can be differentiated by the width of the profemoral exterior lobe which is thinner and arches smoothly from end to end in *Phyllium yunnanense* (only about three times the width of the profemoral shaft itself) versus *Phyllium oyae* n. sp. which possesses a wider profemoral exterior lobe with a maximum width up to five times the width of the profemoral shaft and a distinct but rounded angle in the center of the span (Fig. 6C).

From *Phyllium parum*, *Phyllium oyae* n. sp. can be differentiated by the length of the tegmina; only reaching the middle of the third abdominal segment in *Phyllium parum* and longer in *Phyllium oyae* n. sp. reaching the middle of the fourth abdominal segment. The mesopleurae are also slightly different with the margins in *Phyllium oyae* n. sp. almost perfectly straight (Fig. 6A), versus *Phyllium parum* with a gentle bend giving the anterior margin a thinner appearance.

Feature	Holotype ♀	Paratypes ♀♀	Paratypes ♂♂
Length of body*	89	82.1 - 94.2	73.0 - 74.8
Length/greatest width of head	7.9 / 6.4	5.5 - 6.4 / 6.5 - 7.3	3.6 - 3.8 / 3.8 - 3.9
Pronotum	5.2	4.0 - 6.0	3.5 - 3.7
Mesonotum	7.0	6.7 - 7.1	3.8 - 4.0
Length of tegmina	52.3	42.1 - 53.2	27.0 - 28.9
Length of alae	**	17.5 - 18.0	51.0 - 53.2
Greatest width of abdomen	40.0	32.0 - 36.6	22.1 - 22.5
Profemora	18.5	13.1 - 18.5	15.0 - 15.3
Mesofemora	13.9	11.2 - 12.5	11.5 - 12.1
Metafemora	16.2	14.6 - 15.4	13.3 - 13.7
Protibiae	10.2	7.7 - 10.2	8.9 - 9.1
Mesotibiae	9.7	7.3 - 9.8	7.6 - 7.7
Metatibiae	13.8	11.4 - 13.8	9.3 - 9.5
Antennae	4.2	3.2 - 4.1	42.8 - 46.5

**Table 1.** Measurements of *Phyllium oyae* n. sp., 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.

\* Including cerci and head, excluding antennae.

\*\* Only a subset of paratypes had their tegmina opened to measure the alae, the holotype was not measured.

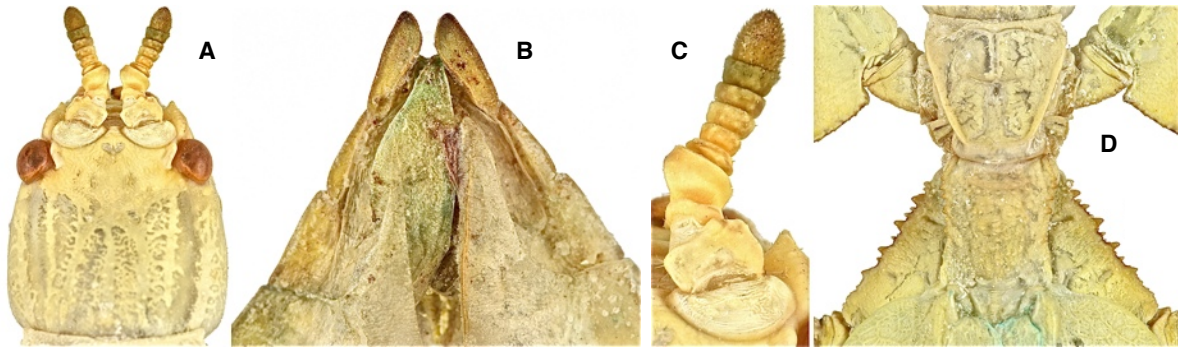


Fig. 4. *Phyllium oyaе* n. sp. female paratype details. A. Detail of head and antennae, dorsal. B. Genitalia ventral (note that the subgenital plate is split in half from the gutting process). C. Antennae detail, dorsal. D. Thorax dorsal.

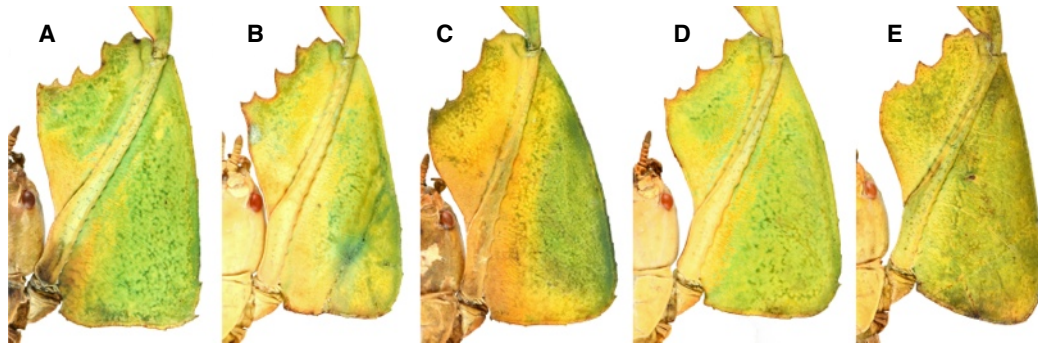


Fig. 5. *Phyllium oyaе* n. sp. female paratypes, profemoral lobes showing the variation observed within a large series of this species.

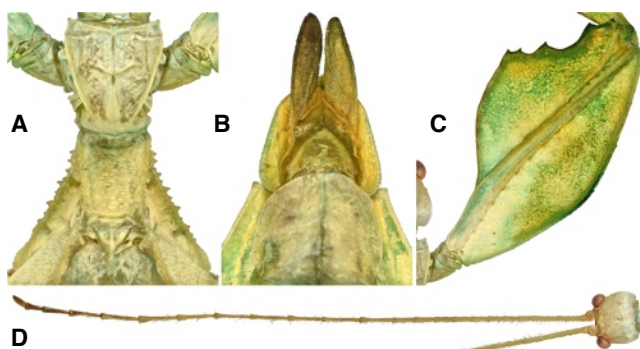


Fig. 6. *Phyllium oyaе* n. sp. male paratype detail photos. A. Thorax dorsal. B. Genitalia ventral. C. Profemoral lobes dorsal. D. Antennae and head capsule.

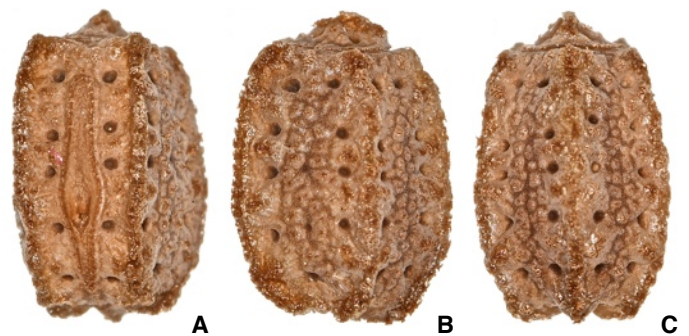


Fig. 7. *Phyllium oyaе* n. sp. egg. A. Dorsal view showing the micropylar plate. B. Lateral view. C. Ventral view.

### Morphological description of the female.

**Coloration.** – The coloration description is based on photographs of live individuals and well preserved specimens. To date only a green color form has been observed (Fig. 1) with all paratypes nearly identical in coloration and no variable brown patches of color as are sometimes observed on other *Phyllium* species. The base color of the entire individual is a lime green with several features highlighted with tan to yellow coloration. These features are the antennae, eyes, posteriomedial tubercle, margins of the pronotum, spination of the thorax, and the venation of the tegmina.

### Morphology

**Head.** – *Capsule* longer than wide, *vertex* with slight granulation, the posteromedial tubercle is not much more prominent than the granulation on the head capsule (Fig. 4A). Frontal convexity broad and stout; at the longest, it is half of the length of the first antennomere. – *Antennae* consisting of nine segments, with the terminal segment slightly longer than the previous two segments combined and just as wide, not notably narrower (Fig. 4C). Antennomere IV is notably shorter than V, VI, or VII and is instead compact and disk-like. Antennomere I through the first half of VIII sparsely marked with small tan setae; the distal half of VIII and antennomere IX are covered in dense, stout, dark setae. – *Compound eyes* are not particularly large, only slightly protruding from the head capsule and taking up about one quarter of the length of the capsule (Fig. 4A). – *Ocelli* absent. – *Antennal fields* only a little wider than the first antennomere but not protruding back farther than the frontal suture.

**Thorax.** – *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. 4D). The pronotum surface is slightly lumpy but lacking any notable granules or wrinkles, with only a prominent pit in the center, and weak furrows anterior and lateral to the pit. The pronotum has a prominent anterior rim which is marked with small granulation, moderate lateral rims which are relatively smooth, and a posterior margin that is smooth, lacking a rim (Fig. 4D). – *Prosternum* and the mesosternum with granulation throughout, and a metasternum which only has granulation on the lateral margins with the center relatively smooth. – *Mesopraescutum* approximately as long as wide with the posterior margin faintly narrower than the anterior margin. Lateral rims with nine to ten rounded tubercles ranging in size from small to medium, with only minor granulation between tubercles. – *Mesopraescutum anterior rim* without a prominent sagittal spine, instead the anterior rim has a granular surface throughout, none very large. – *Mesopraescutum crest* not prominent, only slightly raised above the mesopraescutum face and with only minimal granulation throughout (Fig. 4D). – *Mesopleurae* evenly diverging with straight margins; *lateral margin* with five to six major tubercles and six to seven minor tubercles spread amongst the major tubercles (Fig. 4D). Face of the mesopleurae wrinkled and with slight granulation, and the surface has two faint divots, one on the anterior third and one on the posterior third. – *Tegmina* with slight variation in



Fig. 8. Habitat in Hua Phan Province where Steeve Collard frequently collects various insects.

length, ranging in length from one-third the way through abdominal segment VII to at most reaching about one-third of the way into segment VIII.

**Alae.** – Well developed, about 17.5–18.0 mm in length, almost reaching to the tip of the tegmina.

**Abdomen.** – *Abdominal segments* II through the anterior one-third of IV diverging, posterior two-thirds of IV through VI subparallel, only gently converging. Segment VII is slightly variable, either only gently rounded or can be moderately rounded, but to date we have not seen a strongly lobed individual. Segments VIII through X are notably narrower than segment VII 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 about halfway into segment X, ending in a fine point. – *Gonapophyses* reach the posterior margin of segment X and are quite broad, each about as broad as the subgenital plate projection is wide (Fig. 4B). – *Cerci* only gently cupped, with a lumpy surface and numerous thin brown setae mostly situated along the margins leaving the center relatively bare.

**Legs.** – *Profemoral lobes* variable, but the exterior lobe is always wider than the interior lobe. – *Profemoral exterior lobe* can be nearly a 90 degree angle at the smallest (Fig. 5A), or more commonly is an acute angle with the proximal margin straight and the distal margin slightly convex (Fig. 5E), but this feature is variable and continuous, not with discrete forms. Edge of the exterior profemoral lobe with three to six serrate teeth with those at the bend in the angle presenting as the largest teeth, and those on the margins smaller. – *Profemoral interior lobe* wide and angular, always with an obtuse angle and marked with five looping teeth arranged in a 2-1-2 pattern with the central tooth generally the largest or even in size to the two closest to the protibial shaft (Fig. 5). – *Mesofemoral interior lobe* arcs from end to end evenly and has five to six serrate teeth distributed on the distal half. The interior lobe is slightly thinner than the exterior lobe, and the interior lobe is always a smooth arc without an angle, while the exterior lobe is slightly wider and has a distinct rounded bend near the center and can be without small teeth or occasionally has one to two small teeth on the distal half. – *Metafemoral interior lobe* arcs end to end and has five to six serrate teeth pointing distally. – *Metafemoral exterior lobe* is thin and smooth, hugging the metafemoral shaft. – *Protibial interior lobe* spans the entire length of the shaft, in a scalene triangle with the thicker end on the distal half and is about three times as wide as the protibial shaft itself. – *Mesotibiae and metatibiae* lacking interior lobes. – *Pro-, meso-, and metatibiae* with slender small exterior lobes on the distal fifth only. These small lobes can be slightly variable and are more easily observed on broader females.

### Morphological description of the male.

**Coloration.** – All coloration descriptions are based on preserved specimens, not from live individuals. After reviewing photographs of live females compared with dried females, we expect the males to be a more vibrant green in life like their female counterparts. Overall coloration pale green to olive green, with touches of yellowing throughout (likely due to the specimen preservation process), but particularly notable on the antennae, tegmina, legs, and thorax. Compound eyes of a rusty brown color. Although uncommon, we did observe a few males with variable brown coloration on the protibiae (one half to three quarters colored) and on the same males half or slightly more than half of the mesofemora were also colored.

### Morphology

**Head.** – *Capsule* about as long as wide, with a vertex that is rather smooth (Fig. 6D). Frontal convexity stout with sides that evenly converge to the point, sparsely covered in thin transparent setae. The posteromedial tubercle is not particularly broad, and is only slightly raised on the posterior of the head capsule. – *Antennae* consisting of 28 segments (including the scapus and pedicellus), all segments except the scapus and pedicellus and terminal three are covered in a moderately dense dark setae that are generally as long as the antennae segment is wide (Fig. 6D). The terminal three segments have dense dark setae throughout the surface. – *Compound eyes* large and bulbous, notably protruding away from the head capsule. – *Ocelli* are absent. – *Antennal fields* of approximately the same width as the scapus but not notably broad.

**Thorax.** – *Pronotum* with anterior margin gently concave and lateral margins that are nearly straight and converging to the posterior margin which is less than half of the width of the anterior (Fig. 6A). Anterior and lateral margins of the pronotum have distinct rims, and the posterior margin lacks a rim. Face of the pronotum with a slightly wrinkled surface and marked by a distinct medial and perpendicular furrow and a central pit. – *Prosternum* and *mesosternum* are granulose throughout with nodes of somewhat even size and regular spacing. – *Metasternum* lacking the nodes which are common across the surface of the pro- and mesosternum and instead has a surface covered in wrinkles throughout. – *Mesopraescutum* slightly longer than wide, with lateral margins which only slightly converge to the posterior (Fig. 6A). Lateral rims with eight to ten medium sized tubercles of slightly varying size, but none notably smaller or larger than those around them giving the margins a uniform serrate texture. The surface of the mesopraescutum rises up to slightly along the sagittal plane with a face that is marked with uniform granules throughout. Mesopraescutum anterior margin with a granular surface. – *Mesopleurae* wide for a male, starting to diverge near the anterior margin and uniformly diverging throughout their length (Fig. 6A). Lateral margin with six to seven medium sized tubercles spread throughout the length, with six to seven smaller tubercles/nodes intermixed throughout the more prominent tubercles. Face of the mesopleurae wrinkled and marked with two faint divots, one on the anterior third and one on the posterior third. – *Tegmina* long, extending half way through abdominal segment IV.

**Alae.** – Well developed in an oval fan configuration, quite lengthy reaching half way onto abdominal segment VIII, and occasionally extending further onto abdominal segment IX.

**Abdomen.** – *Abdominal segments* II through the anterior half of IV gradually diverging in a gentle curve, posterior half of IV through X

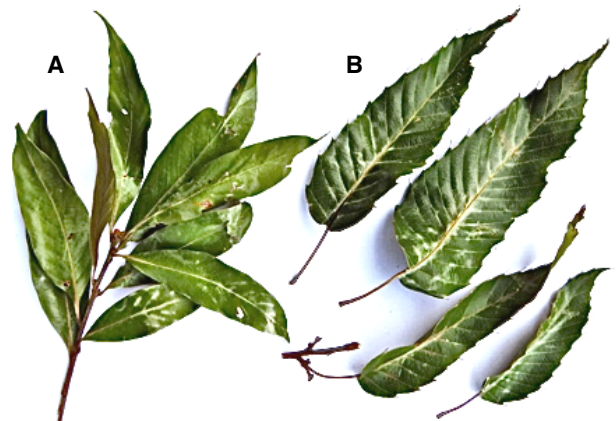


Fig. 9. Leaf samples of the local host plants specimens which *Phyllium oyae* n. sp. has been collected feeding on A. *Castanopsis* sp. B. *Quercus* sp.



### Key to known females in the *Phyllium* (*Phyllium*) *celebicum* species group

Adapted from key in Cumming & Teemsma (2018). *Phyllium* (*Phyllium*) *parum* and *Phyllium* (*Phyllium*) *yunnanense* females unknown/ undescribed and are therefore excluded.

1. Fourth antennal segment approximately as tall as it is wide, not short and disk-like ..... 2  
— Fourth antennal segment short and disk-like, several times wider than tall ..... 3
- 2(1). Abdominal segment VII lateral margin with distinct lobe; angle of profemora exterior lobe approximately 90 degrees; *Philippines* (*Luzon Is., Batan Is., Marinduque Is., Catanduanes Is.*) ..... *Ph. (Ph.) ericoriai* Hennemann et al., 2009  
— Abdominal segment VII lateral margin with indistinct lobe and converging posteriorly; angle of profemora exterior lobe obtuse; *Philippines* (*Northern Luzon Is.*) ..... *Ph. (Ph.) bonifacioi* Lit and Eusebio, 2014
- 3(1). Metatibia with exterior lobe across the full length of the shaft; Sri Lanka ..... *Ph. (Ph.) athansys* Westwood, 1859  
— Metatibiae simple (lacking an exterior lobe) or in a few species the distal fifth of the metatibia has a small lobe, never with a full lobe across the entire length ..... 4
- 4(3). Protibiae interior lobe unevenly distributed, almost entirely on the proximal half, with the distal half greatly reduced; *Micronesia, Yap Is* ..... *Ph. (Ph.) yapicum* Cumming and Teemsman, 2018  
— Protibiae interior lobe distributed across the entire length of the shaft, either with even weighting on the distal and proximal halves, or with the weighting towards the distal half not on the proximal half ..... 5
- 5(4). Subgenital plate long and thin with the apex exceeding the length of the terminal abdominal segment; *China: Tibet, Xizang* ..... *Ph. (Ph.) tibetense* Liu, 1993  
— Subgenital not projecting past the apex of the abdominal segment X, only reaching one-quarter to three-quarters of the length through abdominal segment X ..... 6
- 6(5). Mesopleurae reaching from the posterior to only about one-half to three-quarters of the way to the anterior margin of the mesopraescutum, with gently concave margins creating a slender appearance ..... 7  
— Mesopleurae reaching from the posterior to the anterior of the mesopraescutum, with straight margins, creating a prominent triangular appearance ..... 9
- 7(6). Profemoral exterior lobe recurved, due to a concave proximal margin and convex distal margin; *Indonesia* (*Sulawesi*) ..... *Ph. (Ph.) celebicum* de Haan, 1842  
— Profemoral exterior lobe with a right angle or nearly right angle (with straight distal and proximal margins, neither concave), or with a roundly obtuse angle (with both distal and proximal margins convex) ..... 8
- 8(7). Alae about half the length of the tegmina, only reaching abdominal segments III or IV; *Singapore* ..... *Ph. (Ph.) chrisangi* Seow-Choen, 2017  
— Alae nearly as long as the tegmina, reaching abdominal segments VI or VII; *Myanmar, Thailand, Laos* ..... *Ph. (Ph.) westwoodii* Wood-Mason 1875
- 9(6). Abdominal segments VI and VII distinctly converging, VII without lobes, giving the abdomen a spade shaped appearance; *China: Guangxi-Zhuang* ..... *Ph. (Ph.) rarum* Liu, 1993  
— Abdominal segments VI and VII with parallel or only slightly subparallel margins and segment VII with a smooth but noteworthy lobe ..... 10
- 10(9). Terminal antennal segment shorter and narrower than the preceding segment; *China: Yunnan Prov, Gongshan Drury-Nu, Auct. Co.* ..... *Ph. (Ph.) drunganum* Yang, 1995  
— Terminal antennal segment longer and nearly as wide as the preceding segment; *Laos* ..... *Ph. (Ph.) oyae n. sp.*

converging to the apex, giving the abdomen a spade shaped appearance. – *Poculum* broad, and ending in a rounded apex that slightly passes the anterior margin of segment X (Fig. 6B). – *Cerci* long and slender, protruding prominently from under the anal abdominal segment, gently cupped, and covered in numerous stout dark setae and a granular surface throughout. Vomer stout and broad with convex sides converging to two apical hooks (one larger, the other smaller) pointing upwards into the paraproct (Fig. 6B).

**Legs.** – *Profemoral exterior lobe* almost as wide as the interior lobe with a rounded but notable bend instead of smoothly arcing end to end, and marked with three to four small serrate teeth (Fig. 6C). – *Profemoral interior lobe* without a strong angle and marked with five to six prominent serrate teeth with a large looping gap between the third and fourth teeth (Fig. 6C). – *Mesofemoral exterior lobe* arcs end to end, and lacks a strong angle, but it is slightly thicker on the distal half which is marked with two to three finely serrate

teeth. – *Mesofemoral interior lobe* is equal in width to the exterior lobe and similarly shaped but with six to seven fine serrate teeth on the distal half instead. – *Metafemoral exterior lobe* lacks dentition and hugs the shape of the metafemoral shaft. – *Metafemoral interior lobe* gently arcs end to end with seven to eight small serrate teeth on the distal half. – *Protibial exterior* with only a faint expansion of a slight lobe on the distal fifth, which is occasionally highly reduced, with the remainder of the protibiae lobeless. – *Protibial interior lobe* reaching end to end in a rounded scalene triangle, thickest on the distal third. – *Meso-* and *metatibiae* simple, lacking lobes completely.

#### Description of Egg (Fig. 7A-C).

Angular; pentagonal in cross section. – *Capsule* about two times longer than wide, the lateral and ventral surfaces are flat or only slightly convex, posterior surface slightly concave. Almost the entire capsule surface is

### Key to known males in the *Phyllium (Phyllium) celebicum* species group

*Phyllium tibetense*, *Phyllium athanyusis*, *Phyllium rarum*, *Phyllium drunganum*, and *Phyllium yapicum* unknown/ undescribed and are therefore excluded.

1. Tegmina long, reaching at least past the anterior margin of abdominal segment IV ..... 2
- Tegmina short, only reaching into abdominal segment II or III ..... 3
- 2(1). Profemoral exterior lobe that is thinner and smoothly arcing from end to end, only about three times the width of the profemoral shaft itself; *Yunnan Prov.* ..... *Ph. (Ph.) yunnanense* Liu, 1993
- Profemoral exterior lobe that is wider with a maximum width up to five times the width of the profemoral shaft and with a distinct but smooth angle in the center of the span; *Laos* ..... *Ph. (Ph.) oyae* n. sp.
- 3(1). Profemoral exterior lobe notably wider than the interior lobe; exterior lobe with almost a right angle; *Indonesia (Sulawesi)* ..... *Ph. (Ph.) celebicum* de Haan, 1842
- Profemoral exterior lobe the same width as the interior lobe; exterior lobe with a notably obtuse angle ..... 4
- 4(3). Mesopraescutum surface black in color; Philippines (*Luzon Is., Batan Is., Marinduque Is., Catanduanes Is.*) ..... *Ph. (Ph.) ericoriai* Hennemann et al., 2009
- Mesopraescutum surface of a similar color to that of the surrounding area, not black ..... 5
- 5(4). Triangular protibial interior lobe an isosceles triangle, with the widest point in the center of the span; *China: Hainan Province, Daling-Baisha* ..... *Ph. (Ph.) parum* Liu, 1993
- Triangular protibial interior lobe a scalene triangle with the widest portion on the distal third, not in the center of the span ..... 6
- 6(5). Profemoral exterior lobe about two to two and a half times the width of the profemoral shaft; *Philippines (Northern Luzon Is.)* ..... *Ph. (Ph.) bonifacioi* Lit and Eusebio, 2014
- Profemoral exterior lobe three or more times the width of the profemoral shaft ..... 7
- 7(6). Mesopraescutum surface long and thin, about the length of the pronotum; *Singapore* ..... *Ph. (Ph.) chrisangi* Seow-Choen, 2017
- Mesopraescutum surface thin but not as long as the pronotum, slightly shorter in length; *Myanmar, Thailand, Laos* ..... *Ph. (Ph.) westwoodii* Wood-Mason 1875

covered with short moss-like pinnae which are slightly longer along the ribs of the capsule, and less prominent on the dorsal surface around the micropylar plate. – Capsule lateral and ventral surfaces are set with two parallel lines of small circular pits running the length of the capsule near the longitudinal margins of each surface. Each row of circular pits have four to six pits (the number of which is almost always mirrored on the parallel running row on the same surface). – *Micropylar plate* long and thin, running about 80 to 90% of the length of the dorsal surface with the widest portion around the micropylar cup which is situated around the posterior third of the capsule with the remainder of the micropylar plate thinner than the micropylar cup width. – *Operculum* roundly conical, circular in cross-section with several pits of a similar size and shape to those found along the longitudinal surfaces of the egg. – *Coloration* caramel to tawny brown, the moss-like pinnae of a slightly paler brown than the capsule itself.

#### Measurements [mm].

- lateral length (including operculum): 4.2
- lateral length (excluding operculum): 3.7
- width of dorsal surface: 2.6
- width of lateral surface: 3.0
- length of micropylar plate: 2.8

**Distribution and habitat.** – To date this species has only been confirmed from the Hau Phan Province of Northeastern Laos, although this species can likely be found elsewhere in nearby mountain ranges or provinces. This region is classified by the Köppen-Geiger climate classification index as a temperate region with a dry winter and a warm to hot summer, with rainfall ranging from only a few mm in the dry season to 200+ mm or more in the wet season. Average elevation in the area for this new species was found to range from 850 to 2,060 meters and is widely lush with thick foliage (Fig. 8, 10).

Steeve Collard was also kind enough to share with us photos of the local host plant that wild specimens of *Phyllium oyae* n. sp. have been found on. Two of which were identified to the genus were *Castanopsis* sp. and *Quercus* sp., both of which are in the beech tree family Fagaceae (Fig. 9A-B).

**Etymology.** – Patronym, named after the wife of Steeve Collard, Mme Oy Houngsavath. Steeve has been a very important collaborator of the Montreal Insectarium (Canada) for many years. He is now established permanently in Laos and supplies many important new species to various specialists. He is also trying to establish an Insectarium in Laos, as well as helping to create a butterfly farm. His presence in the contemporary entomology community of Laos is prominent.

#### Note on the unavailable name *Phyllium rayongii* Thanasinchayakul, 2006

The species name *Phyllium rayongii* Thanasinchayakul, 2006 is determined to be a nomen nudum and therefore **unavailable** according to ICZN Article 16.4.1. (ICZN, 1999). Article 16.4.1 requires the “explicit fixation of a holotype, or syntypes, for the nominal taxon” (ICZN, 1999), a simple yet absent requirement from Sorpongpaisal & Thanasinchayakul (2006). To date, no authors have validated the name *Phyllium rayongii* by providing a holotype designation, and therefore the name is unavailable. Hopefully, future authors working on the Phylliidae of Thailand will review specimens from throughout Thailand to determine if the population referenced in Sorpongpaisal & Thanasinchayakul (2006) is in fact a valid taxon. With the original description of *Phyllium rayongii* vague and describing features which apply to nearly all Phylliidae species, we presently see no reason to believe this population is novel and speculate it might simply be a southern range expansion of *Phyllium westwoodii*.

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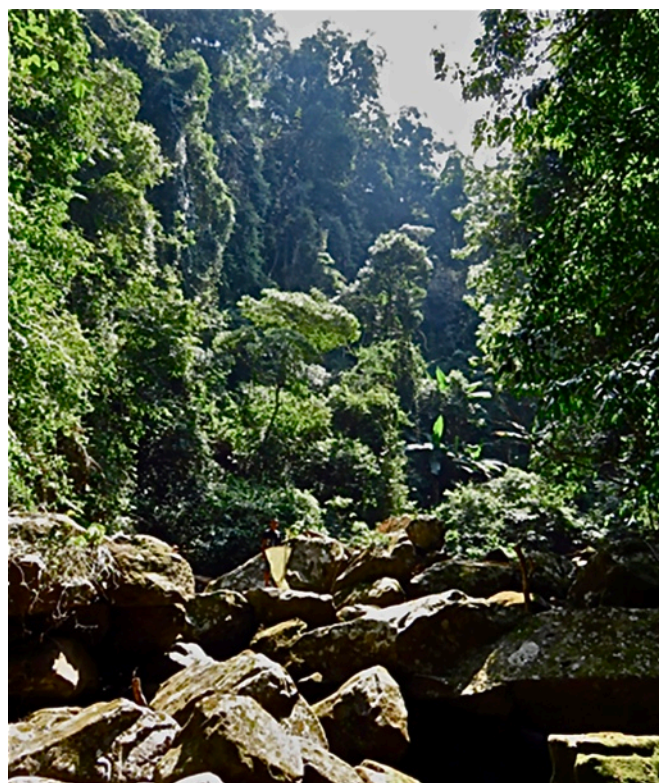


Fig. 10. Habitat in Hua Phan Province where Steeve Collard frequently collects various insects.

## Résumé

Cumming R. T. & Le Tirant S., 2020. – Description d'un nouveau *Phyllium* Illiger, 1798 du groupe *celebicum*, native du Laos (Phasmida : Phylliidae). *Faunitaxys*, 8(4) : 1 – 9.

L'étude d'un lot d'insectes feuilles, collectés dans le nord-est du Laos, a révélé la présence d'une espèce nouvelle, que nous décrivons sous le nom de *Phyllium* (*Phyllium*) *oyae* n. sp. Elle fait partie du groupe de *celebicum* suivant Hennemann et al. (2009), en raison de la présence d'ailes bien développées chez les femelles et d'un large lobe profémoral extérieur chez les mâles. Nous constatons ensuite que *Phyllium* (*Phyllium*) *drunganum* Yang, 1995 est mal placé, et nous le transférons du groupe *siccifolium* au groupe *celebicum*, en raison de la présence d'ailes développées chez les femelles. Puis nous différencions *Phyllium* *oyae* n. sp. de toutes les autres espèces. Enfin nous considérons *Phyllium* *rayongii* Thanasinchayakul, 2006 comme étant un *nomen nudum* et n'est donc pas disponible selon l'article 16.4.1 de l'ICZN. Pour conclure, nous présentons des clés dichotomiques pour les mâles et les femelles des espèces du groupe *celebicum* connues à ce jour.

Mots-clés. – Phasmatodea, Phasmida, Phylliidae, Phylliini, *Phyllium*, Asie du Sud-Est, Laos, *oyae*, *celebicum*, taxonomie, description, espèce nouvelle.

# Faunitaxys

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**Illustration de la couverture:** Forêt du Laos.

**Cover photo:** Forest of Laos.

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