

Short Communication:

A new species of tarantula of the genus *Orphnaecus* Simon, 1892 (Araneae: Theraphosidae) from the Province of Dinagat Islands, Philippines

JULIUS JOHN DP. SALAMANES^{1,✉}, JHAYSON MARK J. SANTOS¹, ELEANOR S. AUSTRIA¹,
GIL GABRIEL S. VILLANCIO^{1,2}

¹Biology Department, College of Science, Adamson University. 900 San Marcelino St. Ermita, 1000 Manila, Philippines.

Tel./fax.: +63-9612142318, ✉email: julius.john.salamanes@adamson.edu.ph

²School of Environmental Science and Management, University of the Philippines. Los Banos, Laguna, Philippines

Manuscript received: 6 June 2022. Revision accepted: 2 August 2022.

Abstract. Salamanes JJDP, Santos JMJ, Austria ES, Villancio GGS. 2022. Short Communication: A new species of tarantula of the genus *Orphnaecus* Simon, 1892 (Araneae: Theraphosidae) from the Province of Dinagat Islands, Philippines. *Biodiversitas* 23: 4283-4288. *Orphnaecus adamsoni* sp. nov., a new species of tarantula of the genus *Orphnaecus* Simon, 1892 is described and illustrated based on the specimens collected from the Province of Dinagat Islands, Philippines. It closely resembles *O. kwebaburdeos* (Barrion-Dupo, Barrion & Rasalan, 2015). However, it can be easily distinguished by having a rounded carapace, shorter leg segments, more clavate-paddle shaped maxillary lyra, and a different habitat. This mygalomorph spider discovery constitutes the fifth species described for *Orphnaecus* and the fourth record in the Philippines.

Keywords: Araneae, mygalomorph, Province of Dinagat Islands, tarantula, taxonomy

INTRODUCTION

The Philippines is regarded as one of the world's biodiversity hotspots in terms of high species richness and endemism (Myers et al. 2000). Despite this, the Philippines accounts for less than 2% of all recognized tarantula species (Barrion-Dupo et al. 2015). These mygalomorphs are medium to large-sized, often hairy spiders that live in silk-lined burrows on the ground (Foelix 2011). Tarantulas are members of the speciose Theraphosidae family, which includes 970 species in over 130 genera and is mostly found in tropical and subtropical regions (World Catalog Spider 2017). In the Philippines, only 11 Theraphosidae species have been identified: *Melognathus dromeus* Chamberlin, 1917 (Chamberlin 1917; Smith 1987; Schmidt 2003; Gabriel and Sherwood 2019); *Orphnaecus kwebaburdeos* Barrion-Dupo, Barrion & Rasalan, 2015 (Barrion-Dupo et al. 2015; Nunn et al. 2016); *O. pellitus* Simon, 1892 (Simon 1892; West et al. 2012); *O. philippinus* Schmidt, 1999 (Schmidt 1999; West et al. 2012); *Phlogiellus baeri* Simon, 1877 (Simon 1877; West et al. 2012; Nunn et al. 2016); *P. bundokalbo* Barrion & Litsinger, 1995 (Barrion and Litsinger 1995; Schmidt 2010); *P. insularis* Simon, 1877 (Simon 1877; Nunn et al. 2016); *P. johnreylazoi* Nunn, West & von Wirth, 2016 (Nunn et al. 2016); *P. mutus* Giltay, 1935 (Giltay 1935; Schmidt 2010); *Selenocosmia peerboomi* Schmidt, 1999 (Schmidt 1999) and *S. samarae* Giltay, 1935 (Giltay 1935; Schmidt 1999). This figure may not accurately reflect the true diversity of Philippine tarantulas because these spiders

are understudied in the country. The recognized gap, as well as the threat of destructive anthropological activities such as deforestation and poaching, necessitates additional research and conservation.

Genus *Orphnaecus* was described by Eugène Louis Simon in 1892 with the type species was *O. pellitus* Simon, 1892 discovered in Calapnitan Caves in Camarines Sur Province, Philippines. By West et al. 2012, this genus was considered a senior synonym of *Chilocosmia* Schmidt and von Wirth, 1992 and of *Selenobrachys* Schmidt, 1999. Currently, there are four recognized *Orphnaecus* species (Table 1), three of which are restricted to the Philippines; however, it is believed that there are numerous unidentified species (Nunn et al. 2016). The recently discovered *Orphnaecus* species from Burdeos, Polilio Island in Quezon Province, *O. kwebaburdeos* was originally described as *Phlogiellus kwebaburdeos* but was transferred to the genus *Orphnaecus* by Nunn et al. 2016 due to the presence of three long and three short clavate paddle-shaped setae and >250 spiniform setae that are absent in the lyrate arrangement of *Phlogiellus* as well as the color difference *in situ* of the genus.

A cryptic Theraphosidae species was collected as part of a floral and faunal diversity assessment in the unexplored province of Dinagat Islands in the Philippines. In this study, the morphological characteristics of the collected tarantula species were compared to the four identified *Orphnaecus* species. We found no similarities with the existing species, so a new *Orphnaecus* species is hereby described.

Table 1. List and geographic distribution of known *Orphnaecus* species

Species	Geographic Distribution (Type locality)
<i>Orphnaecus dichromatus</i> (Schmidt & von Wirth, 1992)	New Guinea (Papua)
<i>Orphnaecus kwebaburdeos</i> (Barrion-Dupo, Barrion & Rasalan, 2015)	Philippines (Quezon Province)
<i>Orphnaecus pellitus</i> Simon, 1892	Philippines (Camarines Sur Province)
<i>Orphnaecus philippinus</i> (Schmidt, 1999)	Philippines (Negros Island)

MATERIALS AND METHODS

Field Sampling.

The specimens were collected through opportunistic sampling, which involved searching for tarantula burrows and trapping them in 5-liter plastic containers on the forest grounds of Mt. Magkuno (N 10°24'19.2" E 125°37'39.5"), Municipality of Loreto, and Mt. Arayat (N 10°07'30.4" E 125°37'03.9"), Municipality of Basilisa-Cagdianao in the Province of Dinagat Islands, Philippines.

Preservation of specimens

The collected tarantula specimens (3 males including the holotype and 4 females) were preserved in 80% ethyl alcohol, placed in plastic jars, and completely labeled with the following information: Country, Province, Municipality, Collection Numbers, Collector Name, Method and Date of Collection, and Habitat.

Examination of male pedipalp and female spermathecae

The male palpal bulb was detached from the cymbium to allow for a detailed examination of its shape and structure, specifically the keel and the embolus curvature and tip. In the female specimen, the abdomen was isolated, and an incision was made with a scalpel from the anterior lateral side of the abdomen to the posterior lateral side. After that, the isolated abdomen was cleared in KOH for 1 to 2 hours. The spermathecae were examined and compared to photos and descriptions of previously described species. The spermathecae were examined with a Nikon stereomicroscope, and photographs were taken with a 24-megapixel Nikon D3-200 camera.

Type depositary and morphometric measurements.

The type species were deposited at Manila's National Museum of Natural History. The specimen's morphology was measured using a Nikon dissecting microscope and a digital caliper. All measurements are given in millimeters (mm). The sum of the carapace and abdomen lengths is the total length (TL) (excluding the chelicerae and spinnerets). Total leg length (TLL) is the sum of the lengths of the femur, patella, tibia, metatarsus, and tarsus. The femur, patella, tibia, and tarsus are all part of the total pedipalp length (TPL). Leg formula 4123 denotes the longest leg first, followed by the shortest, Leg IV, Leg I, Leg II, and Leg III.

RESULTS AND DISCUSSION

Taxonomy

Order Araneae

Infraorder Mygalomorphae Pocock, 1892

Family Theraphosidae Thorell, 1869

Subfamily Selenocosmiinae Simon, 1889

Genus *Orphnaecus* Simon, 1892

In synonymy:

Chilocosmia Schmidt & von Wirth, 1992
= *Orphnaecus* Simon, 1892 (West,
Nunn & Hogg, 2012: 23)

Selenobrachys Schmidt, 1999 =
Orphnaecus Simon, 1892 (West, Nunn &
Hogg, 2012: 33)

Orphnaecus adamsoni Salamanes, Santos, Austria & Villancio **sp. nov.** (Figure 1-2).

Male Holotype (PNM 14889): (in mm) TL 30.43 CL 13.93, CW 12.67, CH 7.26. AbL 16.50, AbW 10.2, AbH 8.45 (Figure 1.A-B).

Carapace. The carapace is black to brown, rounded, 1.09x longer than wide, and covered with shorter hairs dorsally with dense light brown long hairs along margins. The cephalic area is larger than the thoracic area. The transversely oblongate ocular tubercle possesses eight eyes in two rows, and relatively thick long hairs in the clypeus and mid posterior PME area are present. Fovea, 3.2 mm, is deeply concave and slightly longer than AME diameter. Chelicerae are convex, horizontally extending, hairy dorsally and ventrally, and have a flat inner side. Chelicerae promargin bears 10 teeth (Figure 2.D). Retromarginal rows are bordered with orange-red scopulae and have 45-50 intercheliceral stridulatory spines or strikers between rows of teeth and retromarginal rows. The poison-release hole on the fang's subapicodorsal side is thinly oblong in form and has a crescent-shaped, highly pointed tip. Ventrobasal sclerotized plate of the fang is triangular with a strongly rebordered anterior margin, a transversely rugose median area, and a subbasal area with a longitudinal scar resembling a fovea medially and a dip pit sublaterally. The palpal bulb and embolus are reddish brown, the pedipalp is dark brown, and the cymbium has two lobes of light brown to cream scopulae.

Maxillae are reddish orange (Figure 1.D), 1.82 times longer than wide, and have an inner basolateral third that has more than 300 cuspules. The inner edges have orange scopulae. Maxillary lyra (Figure 2.F) has a ca. more than 250 spiniform setae, 7 clavate-paddle spines that gradually rise in size from 1.2 to 1.6 (proximal to distal), and this is in a direct line with the margin of the oral fringe. Labium (Figures 1.F, 2.C), 1.15 times broader than long, with >250 cuspules covering the apical one-third, is reddish orange on the anterior one-third and reddish black on the posterior two-thirds. Sternolabial juncture or groove is prominent and rather large. Sternum (Figures 1.E, 2.C) is brownish orange in color, with a median area displaying two browns, finely reticulated, connected concave markings, but none of the three arms extend into the sternolabial groove. Two sigilla are present near coxa III.

Eyes. All eight eyes (Figures 1.C, 2.A-B) are born on a 4.5 mm brown to black transverse tubercle with thicker, longer, and shorter hairs posterior to the AME and between the PME. Eyes are dim to pale yellow. AER is somewhat longer and more procurved than PER. Eye diameter is as follows: AME (0.59), ALE (0.41), PLE (0.34), and PME (0.3); height vs. diameter is as follows: ALE (0.64 x 0.41), AME (0.58 x 0.59), PLE (0.34), and PME (0.3). (0.52 x 0.3). PLE-ALE (0.17) > AME-ALE (0.15) > PME-AME (0.13) > PME-PLE. In terms of eye separation, PME-PME (1.29) > AME-AME (0.31) > PME-ALE (0.19) > PLE-ALE (0.17) (0.07).

Legs. Legs have relatively thick, long hair that is brownish black in color. The longest dorsobasal hair on tibia I is two times as long as the tibia I's diameter. With at least 2-3 longitudinal rows of spines in the metatarsus IV and 4-6 irregular rows in the tarsus IV, the metatarsi and tarsi have thick scopulae mid longitudinally separated. The median spine slides to the hairless and finely reticulated ventrobasal part of the tarsus, and the ventroapical tip of metatarsus IV contains three robust spines. Tarsus IV's ventral scopulae are transversely split just above midlength. Each superior claw on the tip of the fourth tarsus has a blunt tip and three-minute ventrobasal tubercles. Leg equation is 4123.

Abdomen. It is oblong, grayish brown, 1.62x longer than wide and heavily hirsute on the ventral, lateral, and dorsal surfaces. A brown bell-shaped patch with two long brown longitudinal sigilla is present in the ventrobasal region just anterior to the epigastric furrow. Segments I (2.85), II (3.32), and III (3.32) of the posterior lateral spinnerets (PLS) are brownish and upwardly curving (2.10 mm). Segments I and III are basal segments. The posterior lateral spinnerets are only slightly longer than the lengths

of metatarsus IV and metatarsus I. Segment III of the posterior spinnerets' posterior median spinnerets is nearly half its length.

Palpal organ. The organ is globose, dark crimson, with a blackish edge to the bulb (Figures 1.G, 2.G). The embolus, which is quite lengthy (Figures 1.G, 2.G), has a single, sturdy retrolateral keel, which is concave and partially twisted to form a long, midlength tube that resembles a triangle and has a flat, bifurcated tip. Embolus length and bulb length are about 0.54 times and 1.25 times longer than the tarsus, respectively. On tibia 1, there is no male tibial spur.

Female Allotype. (PNM 14888) TL 39.49. CL 20.2, CW 16.08, CH 11.65. AbL 19.29, AbW 14.01, AbH 7.85.

Carapace. It is dark brown, 1.26 times length (CL) than wide (CW), and 1.14 times wider (CW) than the abdominal width, and is coated in a thick mat of pale-yellow hairs (AbW). All eight eyes are on the tubercle, and the cephalic region is higher than the thoracic region. The hairs on the AME and between the PME have a pattern comparable to that of a male. The deeply concave fovea is 3.8 times longer than the AME diameter. Chelicerae are identical to those of a male, that is, parallel-sided, 8.2 mm long, 2.96 mm wide, frontally coated with strong setae dorsally and retrolaterally, prolaterally flat. It is sparingly bordered with thin setae medially and long curled hairs along the area of the promarginal teeth. Cheliceral promargin bears 10 teeth, and the retromargin possesses orange-red scopulae. As seen in males, the fang is robustly black with a sharply pointed tip, the dorsobasal half has 18 transverse lines, the dorsomedian base is rough and file-like, and the ventrobasal plate is longer than wide and heavily sclerotized. Maxillae, labium, and sternum are identical to males, but there is no double concave groove mid posterior to the labiosternal junction. The maxillae's inner face has a central mat of red-orange hairs, pointed spines, and seven club sizes in a transverse line.

Eyes. The transverse oblongate tubercle contains all eight eyes. AER is a tiny bit longer and more procurved than PER. Eye diameter and height (mm) are as follows: PLE (0.62 x 0.32) > PME (0.62 x 0.64) > ALE (0.66 x 0.48) (0.60 x 0.39). ALE is irregularly oblong. PME is an ovoid, 2.01 times longer than wide, and posteriorly narrowed. Eye separation are as follows: anterior AME-ALE (0.28) > AME-PME (0.15) > PME-PLE > posterior AME-ALE (0.68) > AME-AME (0.42) > ALE-PME (0.40) > ALE=PLE (0.3) (0.12).

Table 2. Leg measurements (mm) of holotype male

Leg no.	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
I	15.06	4.78	13.09	9.35	5.05	47.33
II	12.33	3.26	10.57	8.68	5.03	39.87
III	9.53	2.66	8.6	8.72	4.33	33.84
IV	14.17	3.98	12.22	15.25	5.44	51.06
Pedipalp	8.27	4.06	6.51	-	2.3	21.14

Legs. Legs are brown and thickly hirsute, with two rows of bald, dark reddish-brown bands running from the femur to the tarsus, but thinly separated by a row of long hairs dorsobasally and short hairs apicodorsally along the longitudinal axis. Metatarsus III has a single dorsal subapical median spine, while metatarsus IV has three ventroapical spines and two laterodorsal subapical spines. The ventral scopulae of the fourth toe are divided by an uneven number of spines in longitudinal rows, and the ventrobasal fifth has an oblongally bald groove. Tarsus IV is slightly wider than the metatarsus IV. Leg portions are covered in long golden and short dark brown hairs. The longest dorsal hairs on the tibiae and metatarsals are roughly 1.5-2 and 2.65-3.1 times longer than the diameter of the leg segment, respectively. Leg formula is 1423.

Abdomen. The abdomen is oblong, brownish gray, darker near the spinnerets, with a wide yellow-brown patch in the middle. It is 1.38 times wider than it is long and has a subtruncated posterior end. The venter is brownish brown with a very long posterior projection of the posterior median and posterior lateral spinnerets. Spinnerets on the back of the foot are around 0.72 times longer than metatarsals I and IV combined. Segment II posterior spinnerets are nearly as long as the anterior spinnerets.

Spermathecae. With concave mid-inner borders and converging, rounded apical ends, they are "foot-like" (Figure 2.H), and 2.24 times length than wide (1.9: 0.85). The spermathecal diameter separates the tips of the bean-shaped spermathecae from one another dorsally approximately 0.93 times. A little portion of the spermathecae is covered by the triangular, rounded-sided uterus externus.

Material examined. Holotype male (PNM 14889), PHILIPPINES, Province of Dinagat Islands, Municipality of Loreto, Mt. Magkuno, 20 October 2018, Jhayson Mark J. Santos and Gil Gabriel S. Villancio; paratypes: 4 females Mt. Arayat, Municipality of Basilisa-Cagdianao, 12 November 2018 and Mt. Magkuno) and 2 males (from Mt. Magkuno).

Etymology. The specific epithet is so named in honor of the institution where the researchers are affiliated.

Diagnosis. This species is a member of the Order Aranea, which consists of eight-legged air-breathing arthropods with chelicerae that can typically inject venom and spinnerets that can eject silk (Cushing 2008). Because they are medium- to large-sized, hairy spiders that dwell in silk-lined ground tunnels, they are known to be members of the Theraphosidae family (Platnick 2013). The presence of 45-50 intercheliceral black with very stout bases stridulatory spines or strikers present between promarginal tooth and retromarginal rows, maxillary lyra with clavate-paddle shaped setae, male embolus with single strong retrolateral keel, and female spermathecae basally swollen suggest that the specimen belongs to the genus *Orphnaecus* (Simon 1892; West et al. 2012; Nunn et al. 2016). A total of four species of *Orphnaecus* have been recorded, namely *O. dichromatus*, *O. kwebaburdeos*, *O. pellitus*, and *O. philippinus*. Of these four species, *Orphnaecus adamsoni* sp. nov. closely resembles *O. kwebaburdeos*. However, this new species can be easily distinguished by having a rounded carapace vs. oblongate, shorter leg segments, in mm (Leg I: 47.33; Leg 2: 39.87; Leg 3: 33.84; Leg 4: 51.06 vs. Leg I: 51.70; Leg 2: 45.48; Leg 3: 37.86; Leg 4: 52.26), more clavate-paddle shaped maxillary lyra (7 vs. 6) and different habitat (mountain forest ground vs. in caves. It differs from the type species *O. pellitus* in terms of the carapace and leg segments III and IV length, in mm, (Carapace: 13.93 vs. 15.5; Leg 3: 33.84; Leg 4: 51.06 vs. Leg 3: 30; Leg 4: 48) and by having shorter abdomen in females (19.29 vs. 22). The species is unique from *O. philippinus* by its color (brownish vs. orange) and fovea (deeply concave vs. procurved) as well as possessing setae on the retrolateral face of chelicerae. It can be separated from *O. dichromatus* distributed in New Guinea by the number (45-50 vs. 30) and shape of coxal strikers (clavate-paddle vs. scimitar).

Table 3. Leg measurements (mm) of allotype

Leg no.	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
I	18.09	8.31	15.44	11.67	6.48	59.99
II	14.98	7.83	11.28	9.18	5.98	49.25
III	10.92	4.46	8.61	9.01	5.89	38.89
IV	17.12	5.62	14.12	15.82	6.15	58.83
Pedipalp	11.11	5.16	9.01	-	7.16	32.44

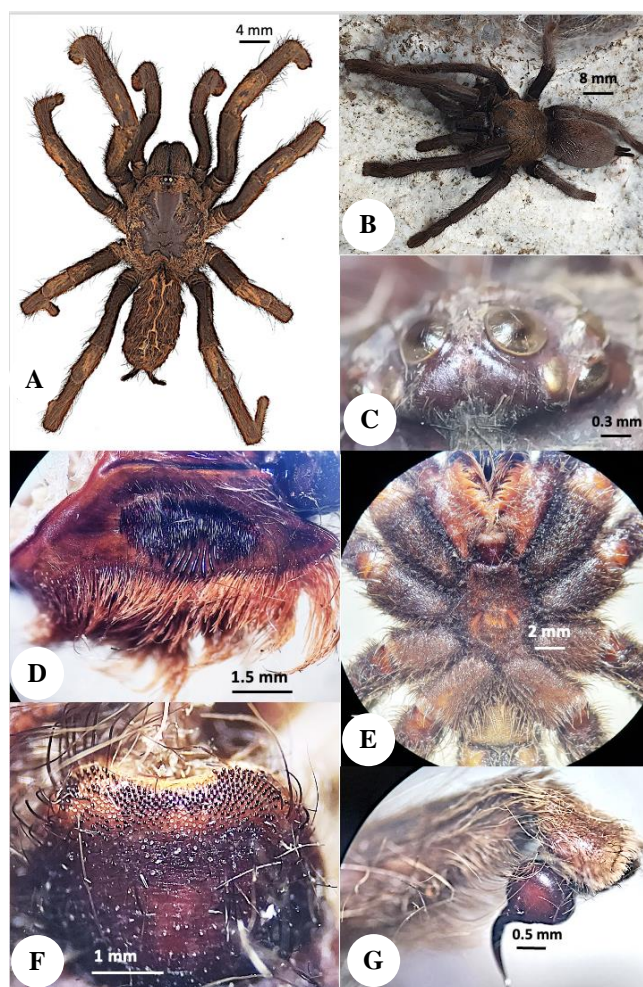


Figure 1. *Orphnaecus adamsoni* sp. nov., holotype male. A. habitus, dorsal view (preserved); B. habitus, dorsal view (living); C. eyes, dorsal view; D. maxilla, ventral view; E. sternum and mouth parts; F. labium, ventral view; G. pedipalp showing palpal bulb and embolus, retrolateral view

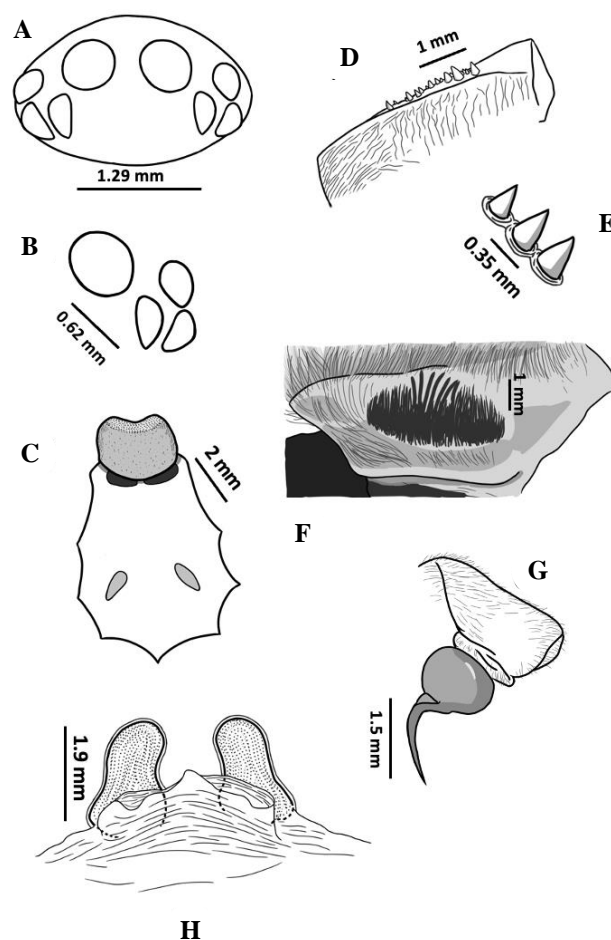


Figure 2. Line drawings of *Orphnaecus adamsoni* sp. nov., A-G. holotype, male. A. eyes, dorsal area; B. close-up of AME, ALE, PME, and PLE; C. labium and sternum; D. promarginal teeth with T1-T3 (E); F. maxillary lyra; G. palpal organ, prolateral view; H. spermathecae of female paratype

ACKNOWLEDGEMENTS

The authors acknowledge the funding support of Discovery-Applied Research & Extension for Trans/Inter-Disciplinary Opportunities (DARE TO) Grants-in-Aid of the Commission on Higher Education (CHED). We are also grateful to Adamson University's Center for Research Development (CRD) for its assistance with research monitoring and implementation. The researchers are grateful to Mr. Ray Ian Blason for his assistance with the line drawings. Finally, we would like to express our heartfelt gratitude to the local government of the Province of Dinagat Islands for granting us the necessary permit to conduct the fieldwork, as well as to the field guides who assisted the researchers in collecting specimens.

REFERENCES

- Barrion AT, Litsinger JA. 1995. Riceland spiders of South and Southeast Asia. CAB International, Wallingford, UK.
- Barrion-Dupo ALA, Barrion AT, Rasalan JB. 2015. A new cave-dwelling mygalomorph spider of the genus *Phlogiellus* Pocock, 1897 (Araneae: Theraphosidae: Selenocosmiinae) from Burdeos, Polillo Island, Quezon province, Philippines. *Philipp J Syst Biol* 8 (2014): 1-15.
- Chamberlin RV. 1917. New spiders of the family Aviculariidae. *Bull Mus Comp Zool* 61: 25-75.
- Cushing PE. 2008. Spiders (Arachnida: Araneae). In: Capinera JL (eds). *Encyclopedia of Entomology*. Springer.
- Foelix RF. 2011. *Biology of Spiders*. New York. Oxford University Press.
- Gabriel R, Sherwood D. 2019. The revised taxonomic placement of some arboreal Ornithoctoninae Pocock, 1895 with description of a new species of *Omothymus* Thorell, 1891 (Araneae: Theraphosidae). *Arachnology* 18 (2): 137-147. DOI: 10.13156/arac.2018.18.2.137.
- Giltay L. 1935. Liste des arachnides d'Extrême-Orient et des Indes orientales recueillis, en 1932, par S. A. R. le Prince Léopold de Belgique. *Bull Mus R Hist Natl Belg* 11 (20): 1-15.
- Myers N, Mittermeier RA, Mittermeier, CG, De Francesca GAB, Kent J. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403: 853-858. DOI: 10.1038/35002501.
- Nunn SC, West RC, Von Wirth V. 2016. A revision of the Selenocosmiine tarantula genus *Phlogiellus* Pocock 1897 (Araneae: Theraphosidae), with description of four new species. *Intl J Zool* 54: 9895234. DOI: 10.1155/2016/9895234.

- Platnick NI. 2013. The world spider catalog, version 9.5. American Museum of Natural History. [Accessed 2022 July 11]. <http://research.amnh.org/entomology/spiders/catalog/index.html>
- Smith AM. 1987. The Tarantula: Classification and identification guide (second ed.). Fitzgerald Publishing, London.
- Schmidt G. 1999. *Selenobrachys philippinus* gen. et sp. n. (Araneae: Theraphosidae: Selenocosmiinae), eine neue Theraphosidae sp. von der Insel Negros (Philippinen). Arachnologisches Magazin 7 (5/6): 1-13.
- Schmidt G. 2003. Die Vogelspinnen: Eine weltweite Übersicht. Neue Brehm-Bücherei, Hohenwarsleben.
- Schmidt G. 2010. Bestimmungsschlüssel für die Weibchen der südostasiatischen Zwergvogelspinnengattung *Yamia* (Araneae: Theraphosidae: Selenocosmiinae). Tarantulas World 142: 42-47.
- Schmidt G, Wirth V von. 1992. Beschreibung des Weibchens von *Chilocosmia dichromata* gen.n. sp.n. und des Männchens von *Chilocosmia arndsti* (Schmidt & von Wirth) 1991 (Araneida: Theraphosidae: Selenocosmiinae). Arachnologischer Anzeiger 3 (11): 9-16.
- Simon E. 1877. Etudes arachnologiques. 5e Mémoire. IX. Arachnides recueillis aux îles Phillipines par MM. G. A. Baer et Laglaise. Ann Soc Entomol Fr 7 (5): 53-96.
- Simon E. 1892. Arachnides. In: Raffrey A, Bolivar I, Simon E (eds). Etudes cavernicoles de l'île Luzon. Voyage de M. E. Simon aux îles Phillipines (mars et avril 1890). 4e Mémoire. Ann Soc Entomol Fr 61: 35-52.
- West RC, Nunn SC, Hogg S. 2012. A new tarantula genus, *Psednocnemis*, from west Malaysia (Araneae: Theraphosidae), with cladistic analysis and biogeography of Selenocosmiinae Simon 1889. Zootaxa 3299: 1-43. DOI: 10.11646/zootaxa.3299.1.1.
- World Spider Catalog. 2017. World Spider Catalog. Natural History Museum Bern. Version 17.5. [accessed 2022 May 28] <http://wsc.nmbe.ch>.