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Short Communication: Spiders of Sabah: Fifty new records including the description of a new *Leucauge* species

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Abstract. *Nasir DM, Wong CX, Bakri A, Rahim F, Yusoff NR. 2016. Short Communication: Spiders of Sabah: Fifty new records including the description of a new* Leucauge *species. Biodiversitas 17: 799-807.* This paper is the second part of a continuing series, with the main objective of compiling and recording the spider species that can be found in Sabah, Malaysia. Based on the specimens collected during this field trip, a total of 50 new records of spider species from 11 families and 37 genera have been found. This includes one newly discovered spider species, the *Leucauge sabahan* sp. nov which is described based on a female specimen. It is hoped that this inventory can be used to assist in the knowledge about the spider species for this stage. In summary, an increment of 18% from the total number of spider species has contributed to a total of 272 recognized spider species recorded in Sabah, Malaysia.

Keywords: Araneae, checklist, diversity, distribution, Borneo

INTRODUCTION

Spiders are one of the most diverse orders that can be found in almost all types of habitats, ranging from forests to human settlements, including buildings and gardens (Jongkar 2004). These predatory arachnids have the capability to successfully adapt and thrive in a wide range of temperatures and environmental conditions**.** Different spider species can co-exist simultaneously in the same habitat. Unfortunately, despite their widespread existence, proper documentation of our local spider species is still lacking in Malaysia. Currently, only 644 spider species from Peninsular Malaysia (Norma-Rashid and Li, 2009; Dzulhelmi et al. 2014a), 247 spider species from Sarawak (Koh et al. 2013; Dzulhelmi et al. 2016), and 222 spider species from Sabah (Dzulhelmi et al. 2014b) have been formally recognized and documented. However, these records are compilations of commonly found species only. Deeleman-Reinhold et al. (2016) mentioned an approximately 749 morpho-species in 36 families with many of the undescribed species are found in Sabah. In addition, newly described spider species such as *Cebrenninus berau* and *Crockeria kinabalu* (Benjamin 2016), *Depreissia decipiens* (Deeleman-Reinhold et al. 2016) and *Myrmarachne* species (Yamasaki and Ahmad 2013) warrants the need to nurture interest in the spider study in Sabah state.

Sabah is the second largest state in Malaysia and one of the two Malaysian states located on the Island of Borneo. With more than 50% of its land mass under forest cover, more attention should be given to exploring and researching the rich and diverse spider species present in this large state. As far as can be determined, knowledge about the different types of the spider fauna that can be found in Sabah is very limited. This paper is the second report based on a series of field research conducted. Its long-term objective is to discover and record the myriad of unique spider species presenting the state of Sabah. This research is a concerted effort to improve the lack of knowledge and to provide an in-depth and broader view about the spider diversity of Sabah, Malaysia.

MATERIALS AND METHODS

Spider specimens were collected by hand-picking and stored in 75% ethanol during fieldtrips to Sabah in January and May 2015 in selected localities in Sabah (Figure 1). The specimens were examined and categorized according to the following classification: gender (male: ♂, female: ♀), date collected, condition of the spider, and location. Specimens collected were viewed under SMZ-U stereo microscope (Nikon, Japan) or under 50x dissecting microscope (AmScope, USA). Species identification was carried out using the following literatures and references therein where applicable: Koh (1989), Barrion and Litsinger (1995), Sebastian and Peter (1999), Song et al. (1999), Murphy and Murphy (2000), Anonymous (2011), Lau et al. (2011), Koh and Ming (2013), Dzulhelmi and Suriyanti (2015) and World Spider Catalog (2015). The following abbreviations are used throughout the text: anterior lateral eyes (ALE), anterior median eyes (AME),

posterior lateral eyes (PLE), posterior median eyes (PME). All morphological measurements are in millimeters (mm).

RESULTS AND DISCUSSION

A total of 50 species from 11 families and 37 genera were successfully collected and identified. Most of the collected specimens were from the family Araneidae (15 species from nine genera), Tetragnathidae (eight species from eight genera) and Salticidae (eight species from eight genera). Family Oxyopidae, Pholcidae, Scytodidae, Uloboridae and Zodariidae were represented by a single species each. About 18% of the newly recorded species were found with male specimen, while others were based on female specimens. Although these specimens collected are categorized as very common spider species, they have never been formally recorded in the inventory list of spider species of Sabah. In addition, the first spider inventory list was based on documented findings from previous field studies which included a few areas from the southern part of the Sabah state. This study investigates on the spider fauna collected from the northern and western regions of Sabah.

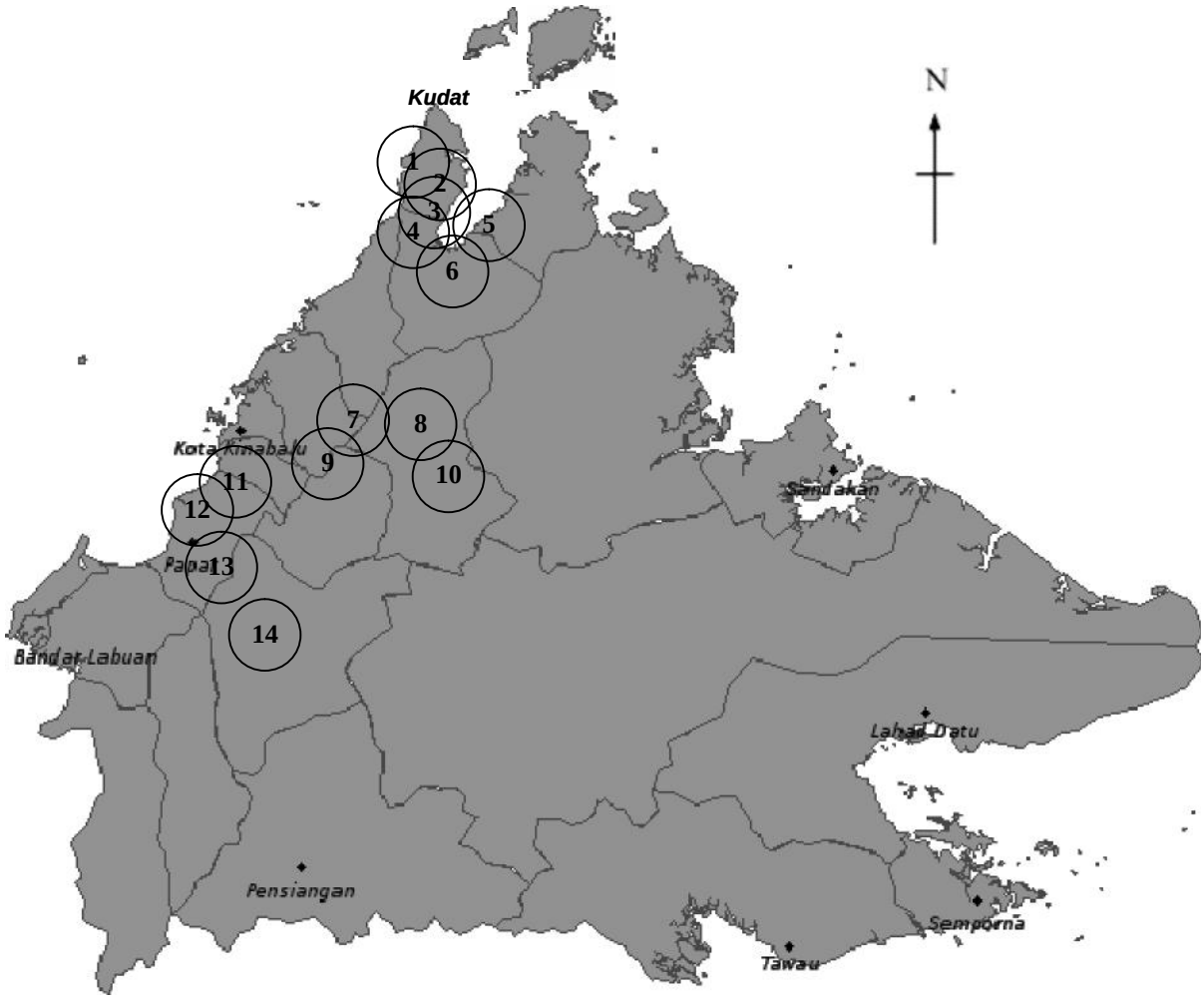


Figure 1. Study sites in Sabah state where spider specimens were collected. 1, Simpang Mengayau at Tips of Borneo, Kudat, 7°01'16"N, 116°44'34"E, beach forest, 13-15 February 2015; 2, Pantai Bak Bak, Kudat, 6°56'50"N, 116°50'22"E, beach forest, 16-18 February 2015; 3, Kudat Golf and Country Resort, Kudat, 6°53'21"N, 116°51'22"E, garden, 19-21 February 2015; 4, Esplanade Kudat, Kudat, 6°52'44"N, 116°51'18"E, building, 22-24 February 2015; 5, Kampung Bangkau-bangkau, Pitas, 6°43'14"N, 116°59'50"E, rubber plantation, 10-12 January 2015; 6, Kampung Korongkom Laut, Kota Marudu, 6°30'26"N, 116°46'50"E, oil palm plantation, 7-9 January 2015; 7, Mesilau Resort Nature Reserve, Ranau, 6°02'5"N, 116°34'55"E, dipterocarp forest, 16-18 May 2015; 8, Poring Hot Spring Nature Reserve, Ranau, 6°2'35"N, 116°42'7"E, dipterocarp forest, 22-24 May 2015; 9, Kinabalu National Park, Ranau, 6°01'16"N, 116°32'43"E, montane forest, 19-21 May 2015; 10, Sabah Tea Garden, Ranau, 5°56'2"N, 116°48'5"E, tea plantation, 13-15 May 2015; 11, Kota Kinabalu Wetland Centre, Kota Kinabalu, 5°59'14"N, 116°5'20"E, mangrove forest, 7-9 April 2015; 12, Signal Hill, Kota Kinabalu, 5°59'3"N, 116°4'44"E, disturbed forest, 13-15 April 2015; 13, Sri Kinabalu Resort, Kota Kinabalu, 5°57'43"N, 116°36'14"E, garden, 10-12 April 2015; 14, Crocker Range National Park, Tambunan, 5°58'5"N, 116°08'2"E, montane forest, 25-27 May 2015.

List of newly recorded spiders in Sabah

ARANEIDAE

Acusilas coccineus Simon, 1895

Material examined: ♀, 17.02.2015, inside rolled leaf, Pantai Bak Bak.

Notes: This spider normally builds its web inside rolled leaves of plants.

Anepsion depressum (Thorell, 1877)

Material examined: ♀, 18.05.2015, spiders were found at the chalet, Mesilau Resort Nature Reserve.

Notes: This small size spider with flat abdomen constructs very small webs in-between the leaves of small shrubs.

Araneus inustus (Koch, 1871)

Material examined: ♀, 20.02.2015, the spider was found at the center of its orb-web, in a shrub in the gardens of Kudat Golf and Country Resort.

Notes: This spider normally constructs an orb-web in garden shrubs.

Araneus mitificus (Simon, 1886)

Material examined: ♀, 10.04.2015, the spider was found inside their silken retreat, Sri Kinabalu Resort.

Notes: They always rest inside their silken retreat and will only crawl out to their web when a prey is trapped.

Argiope reinwardti (Doleschall, 1859)

Material examined: ♀, 20.05.2015, the spider was found under the ceiling of a hut situated along the trail, Kinabalu National Park.

Notes: This spider will drop from their web when disturbed and will pretend to be lifeless.

Argiope perforata Schenkel, 1963

Material examined: ♀, 22.05.2015, the spiders were found at the center of their webs, Poring Hot Spring Nature Reserve.

Notes: Orb-web is decorated with various patterns of silk stabilimentum.

Argiope pulchella Thorell, 1881

Material examined: ♀, 18.05.2015, the spiders were found at the chalet, Mesilau Resort Nature Reserve.

Notes: This spider will escape to the opposite side of the web if disturbed.

Cyrtophora cylindroides (Walckenaer, 1841)

Material examined: ♀, 18.05.2015, the spiders were found building their webs on a tree near a chalet, Mesilau Resort Nature Reserve (Figure 3.B).

Notes: This spider builds large webs that are constructed to face direct sunlight during the day. They are normally found in heath forests and in cooler areas at higher elevation.

Cyrtophora moluccensis (Doleschall, 1857)

Material examined: ♀, 22.05.2015, the spiders were found at the center of its web, Poring Hot Spring Nature Reserve.

Notes: This spider can be found in dipterocarp forests and in gardens.

Lipocrea fusiformis (Thorell, 1877)

Material examined: ♀, 25.05.2015, the spider was found crawling on a fine thread amongst the shrubs, Crocker Range National Park.

Notes: They are commonly found in agricultural sites, but can also be found in secondary forests.

Neoscona nautica (Koch, 1875)

Material examined: ♀, 16.02.2015, the spider was found constructing its web in a small bush, Pantai Bak Bak; ♀, 15.05.2015, the spider was found resting under tea leaves, Sabah Tea Garden.

Notes: This common species is found in gardens, mangrove forests, human settlements and also inside buildings. They prey on the Homoptera (i.e. Cicada).

Neoscona theisi (Walckenaer, 1841)

Material examined: ♀, 23.02. 2015, the spider was found eating its prey, Esplanade Kudat; ♀, 18.05.2015, the spider was found building its web in a shrub near a chalet, Mesilau Resort Nature Reserve.

Notes: Common species found in agricultural and garden areas.

Neoscona vigilans (Blackwall, 1865)

Material examined: ♀, 21.05.2015, the spider was found resting at the center of its web in a shrub, Kinabalu National Park.

Notes: This common species is found in gardens, the forest fringe and human settlements. It hides in rolled leaves during the day (Yong 2009).

Parawixia dehaani (Doleschall, 1859)

Material examined: ♀, 25.05.2015, the spider was resting at the center of the orb-web in a shrub, Crocker Range National Park.

Notes: The spider will free-fall if disturbed, and will then climb back to the center of the web. It can be found in mangrove forests, dipterocarp forests, disturbed habitats and rural settlements.

Zygiella calyptrata (Workman & Workman 1894)

Material examined: ♀, 13.02.2015, the spider was found walking on its fine silk thread in a shrub, Simpang Mengayau

Notes: The spider usually waits under the tip of the leaves at the edge of its web

LYCOSIDAE

Pardosa pseudoannulata (Bosenberg & Strand, 1906)

Material examined: ♀, 27.05.2015, the spider was found walking on sand, Crocker Range National Park.

Notes: This common spider species is found near water in agricultural areas and ponds.

Pardosa pusiola (Thorell, 1891)

Material examined: ♀, 25.05.2015, the spider was found resting in a shrub amongst the undergrowth, Crocker Range National Park.

Notes: Sometimes, this spider retreats from threats by running on the water surface. This common spider is found in gardens and human settlements.

OXYOPIDAE

Oxyopes birmanicus Thorell, 1887

Material examined: ♂♀, 17.02.2015, female mount on the back of the male, Pantai Bak Bak.

Notes: The female was mounting on the back of the male during the night time. There was also another female of conspecific about 20 cm away on the same branch.

PHOLCIDAE

Physocyclus globosus (Taczanowski, 1874)

Material examined: ♀, 12.04.2015, ceiling corner, Sri Kinabalu Resort.

Notes: Commonly found resting in their tangled webs in ceiling corner.

SALTICIDAE

Bavia sexpunctata (Doleschall, 1859)

Material examined: ♀, 09.01.2015, on shrubs, Kampung Kerongkom Laut; ♀, 10.01.2015, on shrubs, Kampung Bangkau; ♀, 22.05.2015, spiders was found on chalet wall, Poring Hot Spring Nature Reserve.

Notes: This common spider is found inside buildings, human settlements and gardens.

Epocilla calcarata (Karsch, 1880)

Material examined: ♀, 23.05.2015, on leaves, Poring Hot Spring Nature Reserve.

Notes: This spider is normally found in gardens, dipterocarp forests, and human settlements.

Hyllus lacertosus (Lucas, 1858)

Material examined: ♀, 09.04.2015, on railing, Kota Kinabalu Wetland Centre.

Notes: It will jump onto nearby fingers or camera lens due to its curiosity and braveness.

Mantisatta trucidans Warburton, 1900

Material examined: ♀, 10.01.2015, on leaves, Kampung Bangkau; ♀, 10.04.2015, on leaves, Sri Kinabalu Resort.

Notes: This species can also be found resting inside its constructed silk nest on mango trees.

Orsima ichneumon (Simon, 1901)

Material examined: ♀, 14.04.2015, crawling on trail railings, Signal Hill.

Notes: Can be found resting on the upper part of a leaf of shrubs.

Parabathippus petrae (Proszynski & Deeleman-Reinhold, 2012)

Material examined: ♀, 19.05.2015, walking on rock, Kinabalu National Park.

Notes: The spider sleeps under leaves in shelter made of silk during the night (Koh and Ming 2013).

Portia labiata (Thorell, 1887)

Material examined: ♂, 24.05.2015, on rock, Poring Hot Spring Nature Reserve.

Notes: Can be found near webs of other spiders waiting to prey on the web owners.

Viciria praemandibularis (Hasselt, 1893)

Material examined: ♀, 14.04.2015, walking on rock, Signal Hill.

Notes: Rather than retreat, this spider often observes with curiosity at the collector when found.

SCYTODIDAE

Scytodes fusca Walckenaer, 1837

Material examined: ♀, 15.05.2015, resting under house, Sabah Tea Garden (Figure 3.C).

Notes: This spider is found inside buildings and human settlements.

TETRAGNATHIDAE

Leucauge argentina (Hasselt, 1882)

Material examined: ♂♀, 22.05.2015, constructing web near tree bark, Poring Hot Spring Nature Reserve; ♀, 26.05.2015, resting at center of web, Crocker Range National Park.

Notes: the orb-web is usually found close to the ground. It is found in gardens, heath forests and montane forests at higher elevations and in cooler areas.

Leucauge celebesiana (Walckenaer, 1841)

Material examined: ♀, 19.05.2015, eating, Mesilau Resort Nature Reserve; ♂♀, 25.05.2015, spider constructing web in long grasses, Crocker Range National Park.

Notes: Normally found constructing orb-webs in groups in gardens and montane forests at higher elevations and in cooler areas. The species was found eating prey from Diptera (*Nematoceran* sp.) and Formicidae (*Oecophylla* sp.).

Leucauge decorata (Blackwall, 1864)

Material examined: ♂♀, 25.05.2015, spiders constructing webs in long grasses in groups. Crocker Range National Park.

Notes: This spider constructs orb-webs in grassy areas. It is normally found at higher elevations and in cooler areas in montane forests.

Leucauge liui Zhu, Song & Zhang, 2003

Material examined: ♀, 18.05.2015, resting at center of web, Mesilau Resort Nature Reserve; ♀, 25.05.2015, constructing web in lower shrubs, Crocker Range National Park.

Notes: This spider constructs orb-webs between 25 to180 centimeters from the ground.

Leucauge sabahan Dzulhelmi, sp. nov.

Type material: Female holotype (PHS033) from Poring Hot Spring Nature Reserve, Sabah (6°2'35"N, 116°42'7"E) was collected by hand picking at 2100 hours on 22st May 2015. Holotype specimen is stored in the Museum of Zoology, University of Malaya.

Etymology: The specific name is a noun, referring to the location where the holotype was collected.

Diagnosis: The *L. sabahan* resembles *L. tesellata* and *L. taiwanica* with the presence of dense hairs on tibia IV. The *L. sabahan* can be differentiated based on the following: **Abdomen** (1) The *L. sabahan* has an oval-shaped abdomen while *L. tessellata* has an elongate-shape abdomen. (2) The *L. sabahan* abdomen does not overhang the carapace, and does not extend posteriorly above the spinnerets as in *L. taiwanica*. **Coloration** (3) The abdomen of *L. sabahan* has a leaf-like shape pattern, with no pairs of anterior and posterior black spots, that differs significantly from the abdomen patterns and coloration of *L. taiwanica*.

Description: **Male.** Unknown. **Female.** Total length 7.06; **Carapace:** 2.83 long, 2.13 wide, carapace orange-brown in colour, carapace is longer than it is wide (Figure 2A-B), cephalic area markedly narrower in the thoracic area, sternum heart-shaped slightly wider than it is long with a similar colour to the carapace (Figure 2E); **Eyes:** diameters AME 0.15, ALE 0.10, PME 0.13, PLE 0.10; inter-distances AME-PME 0.15; AME-AME 0.11, AME-ALE 0.28, PME-PME 0.13, PME-PLE 0.28, PLE-PLE 0.05; clypeus 0.15 high; lateral eyes loosely contiguous or almost so, eight eyes in two slightly recurved rows, distance between PME-PME greater than between AME-AME, PME slightly smaller than AME, AME size one times the distance between them, PME size about one times the distance between them, distance between PME and PLE are about twice the PME eye size, clypeus height one times the AME size (Figure 2D); **Chelicerae**: promargin with 3 teeth, retromargin with 4 teeth; **Abdomen**: 4.19 long, 3.35 wide; oval-shaped light-brown abdomen, abdomen does not overhang carapace, the dorsal abdomen is covered with leaf patterns with silver pigments, two silvery line markings on the ventral abdomen (Figure 2C); **Spinnerets**: spinnerets pointing downwards and exceed abdomen end (Figure 2F); **Legs**: leg measurements (femur/ patella/ tibia/ metatarsus/ tarsus/ total): leg I (6.17/1.15/5.87/6.77/1.64/21.60), leg II (4.65/1.01/4.18/4.53/1.14/15.51), leg III (2.69/0.77/1.69/1.76/0.97/7.88); leg IV (4.75/1.02/3.39/3.58/1.24/13.98); legs are darker-brown in color with black annulations, leg formula (I-II-IV-III), Short spines on legs, Leg I: femur with 8-10 spines, tibia I with 1-3 spines, Leg II: femur II with 6-8 spines, tibia II with 6-8 spines, Leg III: femur III with 6-8 spines, tibia III with 6-8 spines, Leg IV: femur IV with 6-8 spines, tibia IV with 6-8 spines, long dense brush of hairs covering more than one-third of the tibia, metatarsus IV has dense brush of hairs, two rows of long trichobothria covering more than one-third of the prolateral femur IV. **Epigyne**: simple and weakly sclerotized, spermathecae round in shape with short copulatory duct (Figure 2G-H).

Distribution: It is known from the type locality in the dipterocarp forest in Poring Hot Spring Nature Reserve in Sabah. This species had been recorded in Kubah National Park and Gunung Gading National Sarawak, Malaysia (Dzulhelmi et al. 2016). It may be found in the Borneo rainforest (Figure 3.A).

Natural history: Nocturnal. Specimen is found resting at the center of the web during the night. The web was constructed at 70° angle between two shrubs in an open space above 100 cm from the ground which was covered with soil.

Taxonomic: There are currently more than 170 recognized *Leucauge* species (World Spider Catalog 2015), and some of the *Leucauge* species have dense brush of hairs on tibia IV, which resembles the *Opadometa* species. Yoshida (2009) classified *L. taiwanica* (Yoshida 2009), *L. tessellata* (Thorell, 1887), and *Opadometa fastigata* (Simon, 1877) into one genus group. Recently, two new *Opadometa* species, *O. sarawakensis* and *O. kuchingensis* were described (Dzulhelmi et al. 2015). Taxonomic revision of the tetragnathid species which have dense hairs on tibia IV should be done in the future.

Mesida gemmea (Hasselt, 1882)

Material examined: ♀, 22.05.2015, constructing web in lower shrubs, Poring Hot Spring Nature Reserve.

Notes: This spider constructs orb-web at 0° to 60° web orientation. It is found at dipterocarp forests.

Tylorida striata (Thorell, 1877)

Material examined: ♂♀, 25.05.2015, constructing web on grass on hill slope, Crocker Range National Park.

Notes: By 1000 hours, this spider takes about two minutes to dismantle its web by rolling it into a ball and consume it, while leaving the main frame. It is a common spider that is found on the forest fringe and in gardens.

Tylorida tianlin Zhu, Song & Zhang, 2003

Material examined: ♂♀, 18.05.2015, wrapping preys, Mesilau Resort Nature Reserve; ♀, 23.05.2015, construct web at lower shrubs, Poring Hot Spring Nature Reserve.

Notes: Prey wrapped by the spiders was from Coleoptera, Diptera (*Nematoceran* sp.).

THERIDIIDAE

Chikunia nigra (Pickard-Cambridge, 1880)

Material examined: ♀, 22.05.2015, spider was found under shrubs, Poring Hot Spring Nature Reserve.

Notes: This spider is often found hiding under leaves in dipterocarp forest.

Janula bubalis Yoshida & Koh, 2011

Material examined: ♂♀, 17.05.2015, both spiders on the same web, Mesilau Resort Nature Reserve.

Notes: This spider was found hiding under a leaf.

Parasteatoda mundula (Koch, 1872)

Material examined: ♀, 02.2015, resting on web, Pantai Bak Bak; ♀, 19.05.2015, resting under branch, Kinabalu National Park.

Notes: This common spider is found inside rolled leaves in gardens and forests.

Parasteatoda tapidariorum (Koch, 1841)

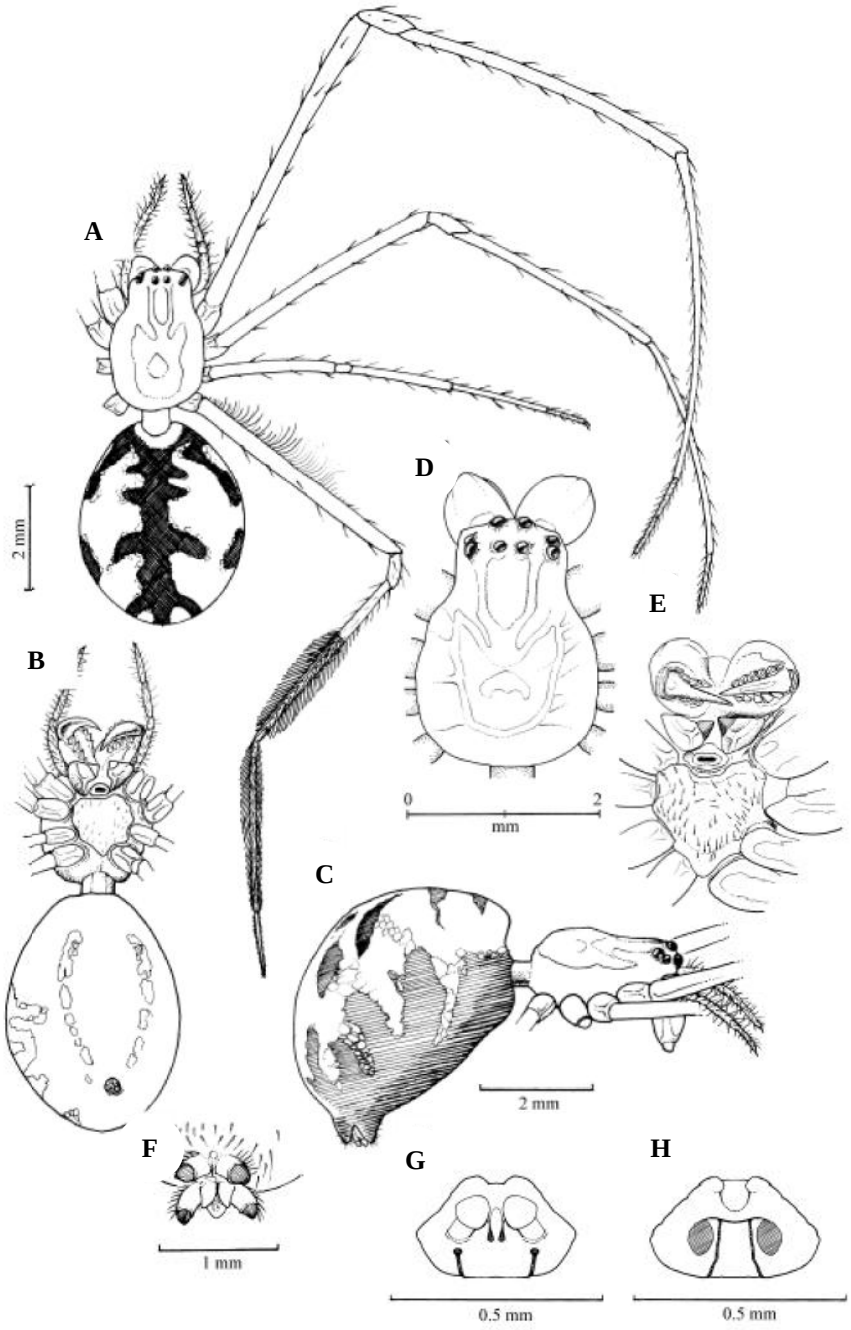
Material examined: ♀, 20.05.2015, build webs under railings, Kinabalu National Park.

Notes: This spider usually build tangled webs near human settlements.

Phoroncidia lygeana (Walckenaer, 1841)

Material examined: ♀, 23.05.2015, on leaves, Poring Hot Spring Nature Reserve (Figure 3.D).

Notes: This spider would rest using a fine silk from its spinnerets and attaching it to the tip of the leaves. It is commonly found in heath forests.



Figures 2. Female *Leucauge sabahan* new species. Body: (A) dorsal view, (B) ventral view, (C) lateral view; eye pattern: (D) dorsal view; (E) sternum; (F) spinnerets; epigyne: (G) dorsal view (internal), (H) ventral view (outer).

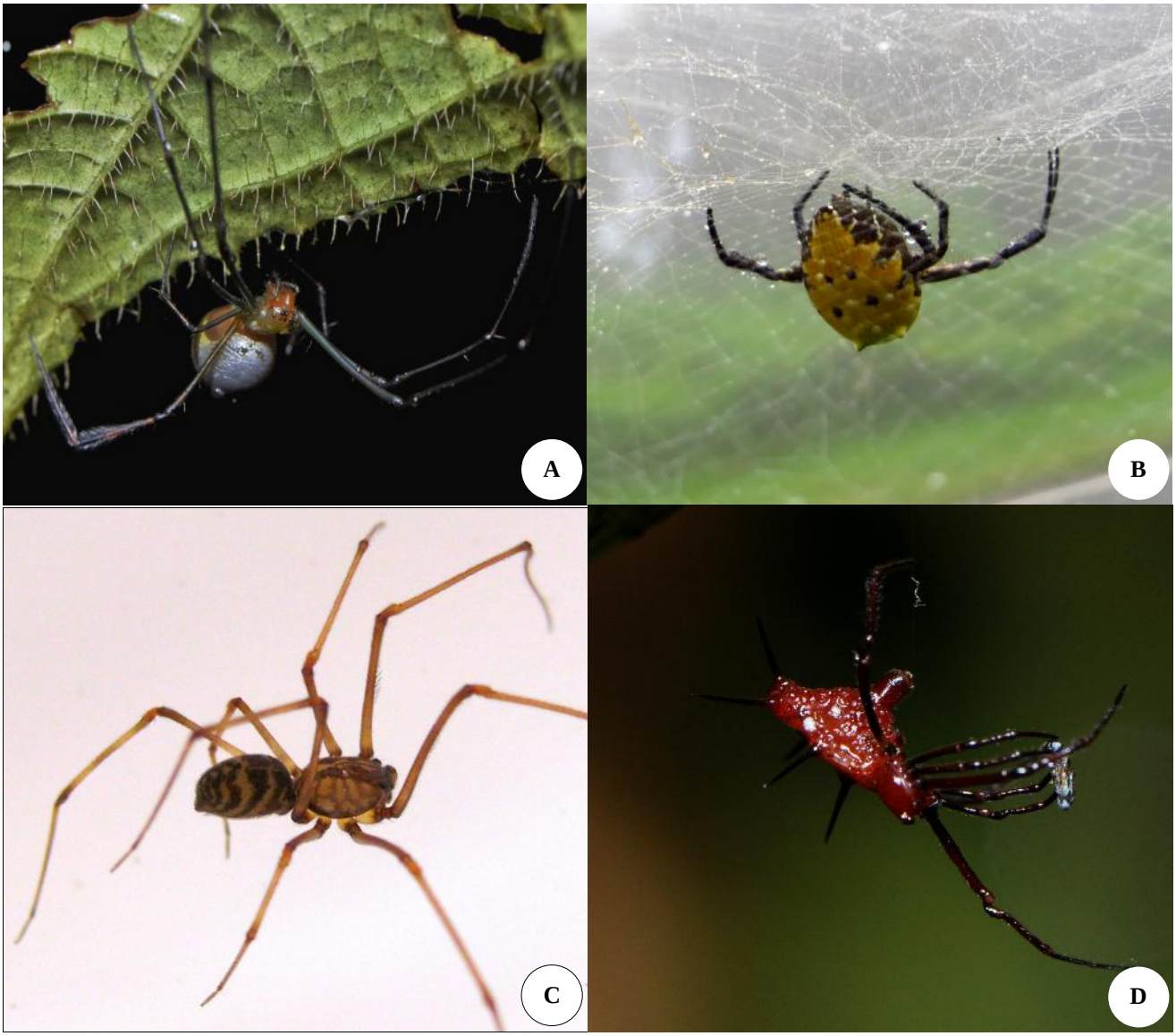


Figure 3. A. Tetragnathidae, *Leucauge sabahan* sp. nov,. B. Araneidae, *Cyrtophora cylindroides*, C. Sytodidae, *Scytodes fusca*, D. Theridiidae, *Phoroncidia lygeana*

THOMISIDAE

Amyciaea forticeps (Cambridge, 1873)

Material examined: ♀, 13.04.2015, on railing, Signal Hill.

Notes: This spider have the ability to mimic *Oecophylla smaragdina* ants before preying on them.

Lycopus rubropictus Workman, 1896

Material examined: ♀, 13.04.2015, on leaves, Signal Hill.

Notes: Female is sometimes found guarding their eggs inside their nest.

Mastira bipunctata Thorell, 1891

Material examined: ♀, 25.05.2015, spider was moulting, Crocker Range National Park.

Notes: This spider is normally found in flowers in gardens. During molting, it takes about five minutes for the exoskeleton to harden after the spider emerges and starts to move.

Platythomisus octomaculatus (Koch, 1845)

Material examined: ♀, 22.05.2015, on leaves, Poring Hot Spring Nature Reserve.

Notes: This cryptic species usually rest in-between leaves of the lower shrubs.

Stephanopis altifrons Cambridge, 1869

Material examined: ♀, 12.04.2015, on tree bark, Sri Kinabalu Resort.

Notes: This spider camouflages on lichen-covered wood during the night.

Thomisus guangxicus Song & Zhu, 1995

Material examined: ♀, 14.05.2015, on leaves, Sabah Tea Garden.

Notes: Normally found in agricultural areas.

Tmarus orientalis Schenkel, 1963

Material examined: ♀, 19.05.2015, resting on twigs, Kinabalu National Park.

Notes: Normally it blends itself with twigs by stretching both leg I and II frontward. This spider can be found in gardens and dipterocarp forests.

ULOBORIIDAE

Uloborus plumipes Lucas, 1846

Material examined: ♀, 24.05.2015, spider was found under shrubs, Poring Hot Spring Nature Reserve.

Notes: This spider constructs a horizontal orb-web which is placed under leaves. It is normally found in gardens and dipterocarp forests.

ZODARIIDAE

Mallinella annulipes (Thorell, 1892)

Material examined: ♂, 11.01.2015, on rock, Kampung Bangkau

Notes: Usually hunt on the base of the tree trunk, possibly feed on ants.

Discussion

The state of Sabah, as an integral part of the hugely unexplored island of Borneo, is already internationally well-known to contain a truly huge assortment of fascinating and diversified habitat types. These habitats are able to support and sustain the existence of a myriad of fascinating creatures in Borneo's vast tropical jungles, including countless variations of Malaysia's very own indigenous spider species. It is highly probable that these habitats are still hiding many more mysterious new spider species which at present still remains unknown. The current official record certainly does not do justice to, nor reflect the true biodiversity present throughout the enormous range of habitat types present in Sabah.

A proper and accurate documentation of the spider species present is very important. More than 90% of the newly recorded species are common spider species which can be found in many parts of South East Asian countries (e.g. Barrion and Litsinger 1995; Murphy and Murphy 2000; Song et al. 2002; Jager et al. 2012). From the newly recorded list of spider species, about 28% had only just recently been recorded in Sarawak (i.e. Dzulhelmi et al. 2016), while 64% of the newly recorded species have been recorded in the neighboring country, Brunei (i.e. Koh and Ming 2013). Among the newly recorded species, *Leucauge liui* (Tetragnathidae) and *Stephanopis altifrons* (Thomisidae) represent newly discovered spider species in this country. In addition, the new *Leucauge* species found shows a very strong indication of the existence of many other unrecorded spider species in the state. However, there were also many specimens collected in this study which could not be identified, which had affected the total number of newly recorded spider species for this paper.

Therefore, there is a definite need for a continuous and sustained research effort in order to more accurately determine the number of spider species present in Sabah. This would undoubtedly contribute greatly to increasing the number of spider species recorded in the current inventory. Since the diversity and distribution of the spider species in the state of Sabah and Malaysia is so poorly known, each study is an important step forward and a scientific contribution to increasing the knowledge of the spider fauna for this country.

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