TECHNICAL PAPERS

AGRICULTURAL SCIENCES

SPIDER SYSTEMATICS AND DIVERSITY IN RICE AND NON-RICE HABITATS IN SOUTH AND SOUTHEAST ASIA

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ABSTRACT

The spiders of rice and non-rice habitats in South and Southeast Asia with emphasis on the Philippines are described and illustrated.[1] A total of 341 species belonging to 131 genera under 26 families are recognized. Of these, 257 species and 8 genera are new to science – Theraphosidae (1 genus and species), Barychelidae (1 species), Uloboridae (2 species), Dyctinidae (1 species), Oonopidae (1 species), Salticidae (1 genus, 28 species), Clubionidae (2 genera, 41 species), Gnaphosidae (9 species), Thomisidae (1 genus, 31 species), Philodromidae (2 species), Eusparassidae (15 species), Mimetidae (3 species), Zodariidae (2 species), Oxyopidae (7 species), Hahniidae (2 species), Pisauridae (5 species), Lycosidae (22 species), Theridiidae 92 genera, 34 species), Linyphiidae (4 species), Theridiosomatidae (1 species), Tetragnathidae (6 species), Metidae (9 species), and Araneidae (1 genus, 30 species). No new species are recorded in families Pholcidae, Scytodidae, and Hersiliidae.

Five most dominant families (in terms of species) are Araneidae (59 species), Clubionidae (43), Theridiidae (940), Thomisidae (38), and Salticidae (36), accounting for 63.3% of the entire collection. The moderately abundant families – Lycosidae (27 species), Eusparassidae (16), Metidae (14), Tetragnathidae (13) and Gnaphosidae (10) - shared for 23.5%. The rest (13.2%) belongs to the least preponderant families with only 9 species or less per family.

Keys to the families, genera, and species, including distribution maps for individual species, and a classification scheme for Philippine riceland spiders are provided.[1]

Spider diversity (H^1) and guild composition in three Philippine rice environments – upland (U), rainfed wetland (RW), and irrigated wetland (I) at two crop stages, 31 and 65 days after seeding (DAS) are compared. Species richness and diversity increased with crop age and the order of rank in decreasing pattern is I > RW > U.

[1]Available from the author in a separate publication.

INTRODUCTION

Spiders are among the most omnipresent and numerous predators in both agricultural and natural ecosystems, and without them insect pest populations would be out of control. Their potential as biological control agents can only be appreciated through a greater understanding of their identities, abundance, and species composition in different ecological systems. There is therefore a great need for literature providing guidance on spider identification.

The spider fauna of several cultivated crops, in a number of regions of the world, have been well documented. There have been some previous attempts to record the spider fauna of rice plants in South and Southeast Asia, but these are scattered in journal literature. This work provides a comprehensive illustrated guide that can be used by specialists and novices to identify these spiders. The majority of the species covered were collected from a diversity of habitats in the Philippines. South and Southeast Asian materials were treated too. The bulk of the guide consists of keys to the identification of families, genera, and species of spiders, illustrated by more than 1000 line drawings and 100 color photographs. A total of 341 species belonging to 131 genera within 26 families are recognized. Of these, 257 species and 8 genera are new to science. Distribution maps for individual species and a classification scheme for Philippine riceland spiders are also provided. Overall, the work represents a major contribution to the literature for those interested in spiders or more generally in biological control and crop protection.

EXTERNAL ANATOMY

Unlike many other arachnids, the body of a spider consists mainly of two regions – the cephalothorax (anterior part) and the abdomen (posterior part) connected by a slender waist structure known as the pedicel. The cephalothorax or prosoma is divided into the cephalus and thorax, the cephalus bearing the eyes, palps, and mouthparts and the thorax the legs, while the abdomen or opisthosoma contains the respiratory openings, reproductive and digestive systems, anal tubercle, and spinnerets (Fig. lab).

Cephalothorax

The cephalothorax (Fig. 1a) is covered dorsally by a unsegmented convex hard shield called the carapace. The carapace usually has a small depression or pit known as the thoracic groove (fovea) and from that pit radiate four shallow furrows (striae) that extend to the carapace margin. The anterior pair of furrows (cervical groove) when present demarcates the U-shaped head outline from the thorax. The

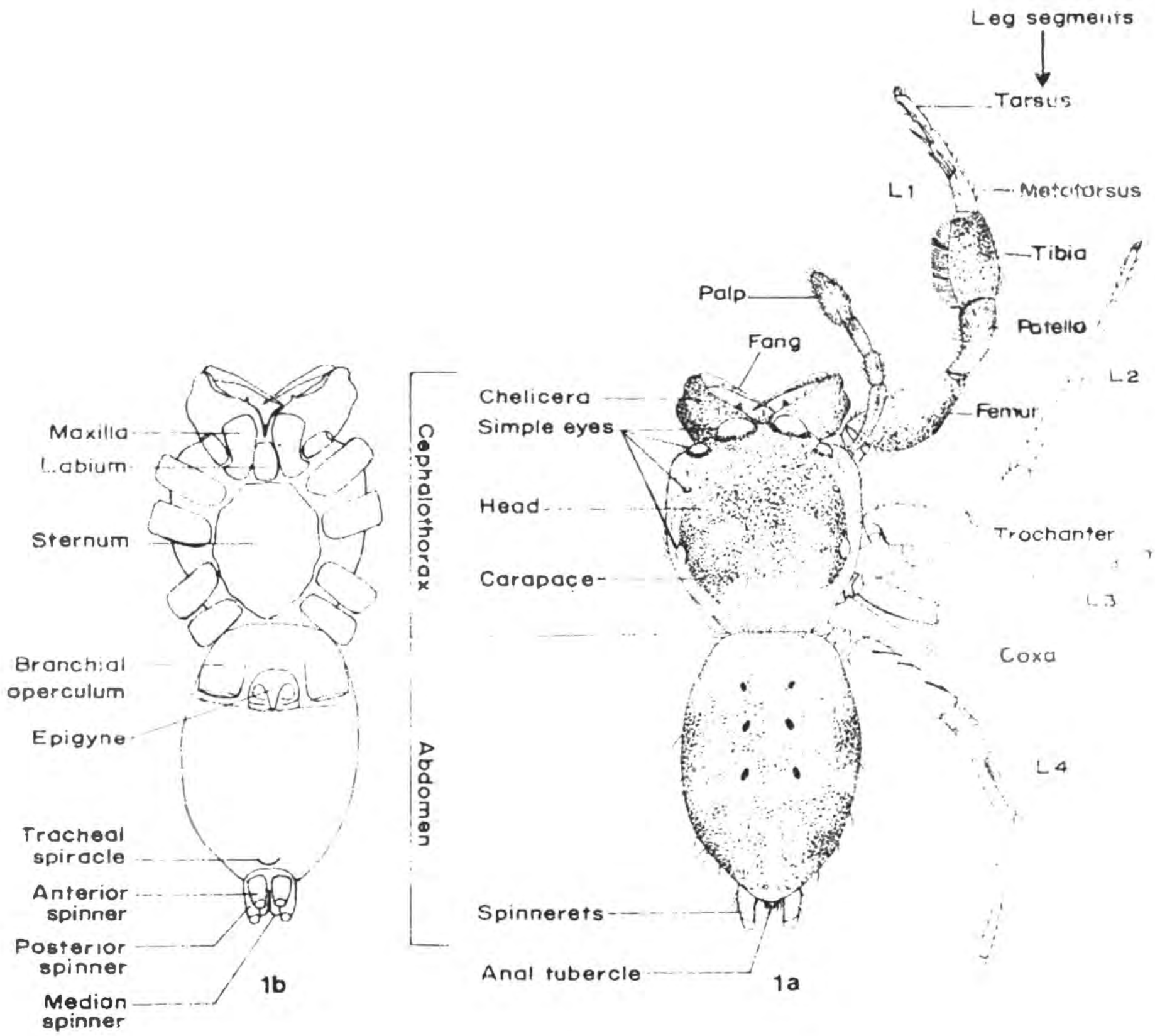

Figure 1. External morphology of spiders showing the dorsal (a) and ventral views (b).

region between the anterior eye row and the frontal margin of the carapace is the clypeus. Its height is the distance between the anterior median eyes (AME) and the anterior margin of the carapace expressed in units relative to the width of eyes, usually the AME (viz. 1.25 AME diameter) when present.

Eyes

At the front edge of the carapace are the simple eyes, ranging from six to eight in two or three rows. Most spider families retain the primitive number eight, although others have six. Generally, there are four eyes per row. The eyes are of taxonomic importance, viz. relative size, spacing, arrangement or position, and number, in defining not only the largest taxonomic groups (families) but also species. They are denoted as AME, anterior lateral eyes (ALE), posterior median eyes (PME), and posterior median eyes (PLE) (Fig. 2a). Collectively, the AME and ALE comprise the anterior eyes (AE) in row 1, while the PME and PLE comprise the posterior eyes (PE) in row 2 (Fig. 2a), except in salticids where the PME are in row 2 and the PLE in row 3 (Fig. 2b). Likewise, LE are the lateral eyes and ME the median eyes. AER-L is the length of the anterior eyes and PER-L the length of the posterior eyes. The area encircled by the AME and PME is called the median ocular area or quadrangle (MOQ), while in Salticidae, where the eyes are in three rows, the whole region covered by the eyes is termed ocular area and used in a similar way. In the MOQ, anterior width is noted as MOQ-AW, posterior width as MOQ-PW, and length as MOQ-L. MOQ-AW > MOQ-PW means the MOQ is wider in front than behind; the reverse is MOQ-AW < MOQ-PW (Fig. 2ac). Eye curvature, viz. procurved, recurved, or straight, and color are also equally important. The eye row is procurved (Fig. 2c) when the outer ends of the line drawn through the eye row approach the front end of the carapace and recurved (Fig. 2c) when the outer ends are far (opposite situation) (Fig. 2c). If the eyes are all alike they are described as homogeneous (Fig. 2abd), and heterogeneous (Fig. 2c) if they differ in color, viz. light and dark. The AME belong to the first somite of the head and are characterized by having a direct retina, but these are the ones that are absent in species with reduced eye number (Fig. 2d). The rest of the eyes belong to the second somite with an indirect retina.

Mouthparts

The chelicerae (Fig. 3a) are preoral structures situated below the clypeus and termed porrect if projected forward or geniculate when the proximal base is stout and they are directed forward for a distance before the main portion bends down vertically. They are used in the capture and killing of prey, courtship and mating display, and defense. Each chelicera consists of a stout basal segment, the paturon, and a slender curved or sickle-shaped apical segment, the fang. The paturon may have a boss or lateral condyle near the base on the outer surface. Near the fang's

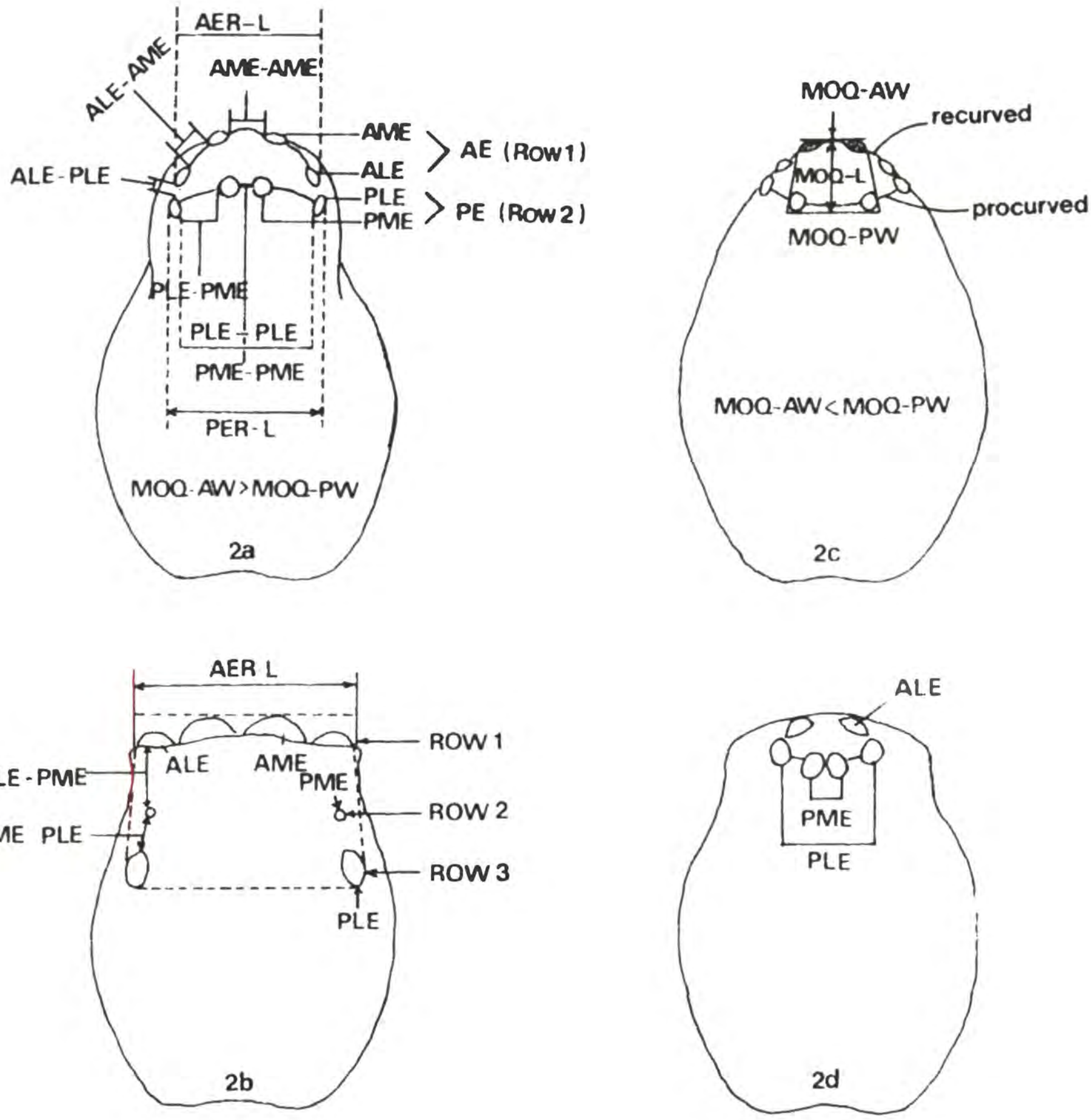

Figure 2a-d. Eye morphology and eye patterns showing 8-eye type (a,b,c) and 6-eye type (d).

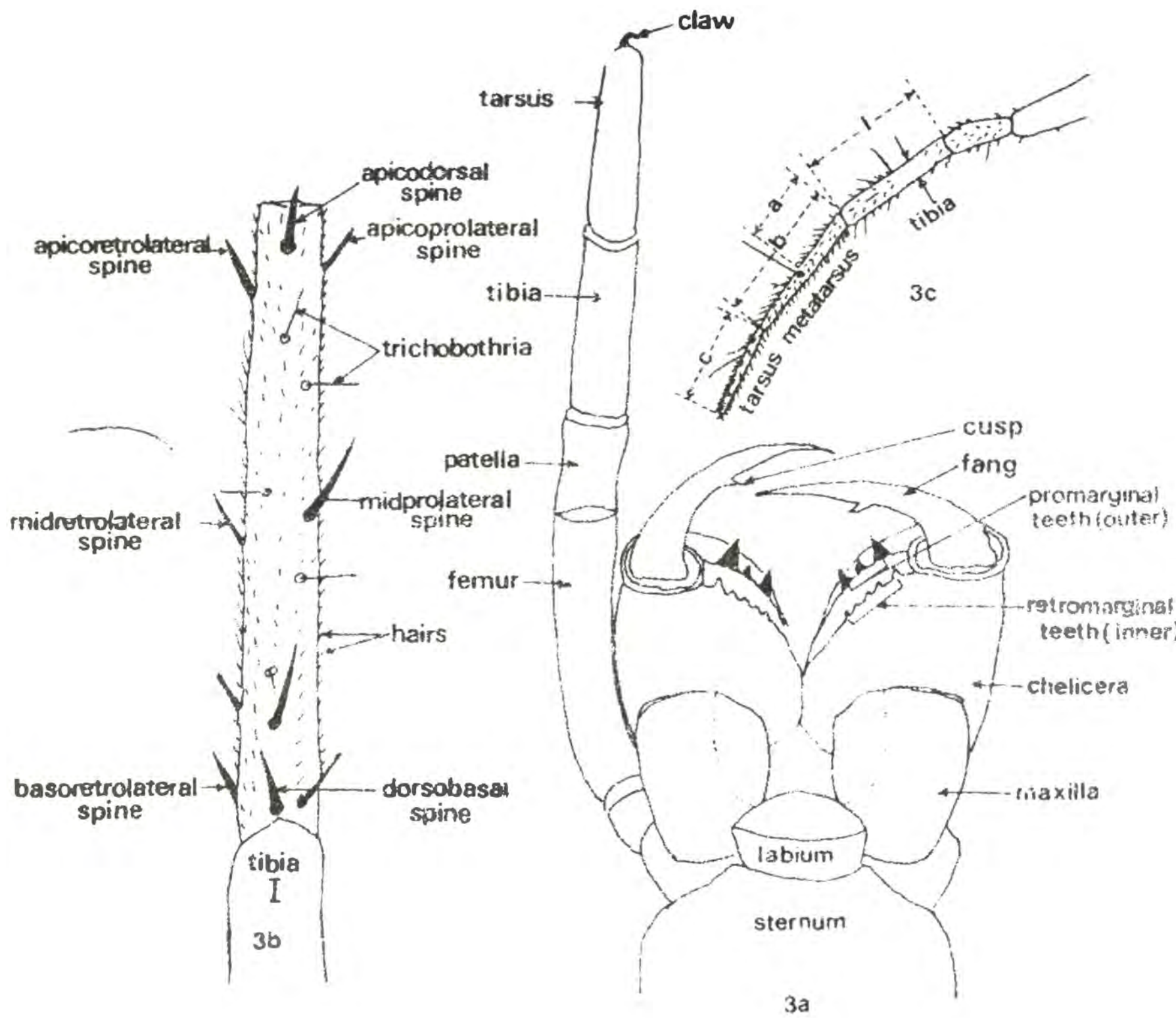

Figure 3a-c. Mouthparts (a): leg components: hairs, trichobothria, and spines and spine positions (b); and leg measurement attributes (c). Note: tibial diameter = d taken at widest width, ratio of metatarsus and tarsus = b/c, and ratio of trichobothria position in metatarsus I = a/b.

distal tip is the duct aperture of the poison gland. The fang at rest lies in a groove termed the cheliceral furrow provided with teeth in both outer and inner margins. The outer part represents the promargin and the inner is the retromargin, which is absent in some species. In most spiders, the fang moves in and out in a plane transverse to the longitudinal plane of symmetry of the body and chelicerae, such a condition is said to be diaxial. However, it is paraxial in the primitive and the mygalomorph spiders (trap-door and funnel-web species) where the fang moves up and down in a plane parallel to the longitudinal plane of symmetry of the body and chelicerae. Some spiders have a group of short stout spines, collectively called a ratellum, above the fang base, which is used primarily for burrowing.

Pedipalps

The pedipalps (Fig. 3a) represent the second pair of appendages of the cephalothorax, which are leg-like but possess only six segments -- coxa, trochanter, femur, patella, tibia, and tarsus. They are often called palps and they differ in male and female spiders (Fig. 4a-i). In mature males, the tarsal segment is enlarged, complicated, and modified to form an intromittent organ for transmission of sperm to the reproductive system of the female during mating. It is simple in the female and immature male and comparable to a small leg without a metatarsus. Each tarsus is usually single-clawed.

Maxillae

The proximal segment of each palp is the maxilla; the broad and cushion-shaped paired lobes are each furnished with scopulae of long hairs on the anterior and dorsal surfaces along each side of the labium. A row of small tooth-like serrula is borne on the distal end of each maxilla (Fig. 3a).

Labium

The so-called lower lip underneath the head region dorsad of the sternum is the labium (Fig. 3a). It varies in shape among species, being more or less oval or conical and rebordered. The labium is freely movable in most cases though immobile when fused to the sternum. It is sometimes armed with short blunt spines called cuspules in the mygalomorphs.

Sternum

The sternum is an oval, shield-like to heart-shaped structure occupying the greater part of the lower surface of the cephalothorax (Fig. 1b). It is sometimes marked with shallow scar-like depression known as sigilla.

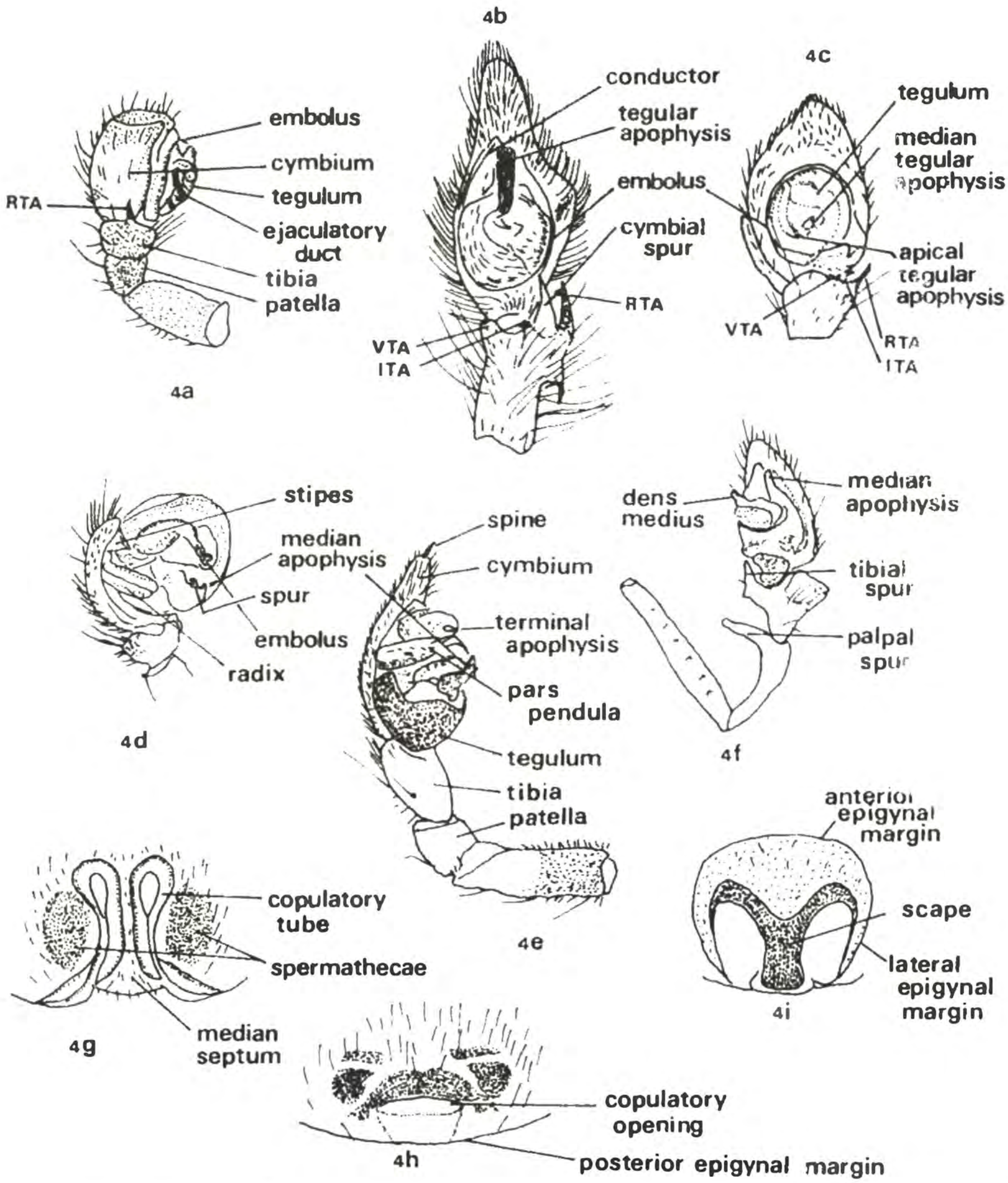

Figure 4a-i. Morphology of the palpal organ in family Salticidae (a), Clubionidae (b) Thomisidae (c), Araneidae (d), Lycosidae (e), Linyphiidae (f), and the epigyne of Salticidae (g), Clubionidae (h), and Araneidae (i).

Legs

All normal spiders bear four pairs of legs (Fig. 1a), designated anterior to posterior as I, II, III, and IV. They are termed prograde if movement is only backward or forward and laterigrade if sideways. Each leg is composed of seven segments, namely, coxa, trochanter, femur, patella, tibia, metatarsus, and tarsus. The tarsal segments are either two- or three-clawed, if three-clawed the outer pair is called superior or upper claws and the median pair inferior or lower claws. The claws can be smooth or provided with file-like teeth. Some species, viz. web spinners, possess auxiliary or accessory claws in the form of stout serrated spines for holding silk threads. Spiders that spin webs or walk on silk threads have three claws. Many hunting species, which do not spin webs, have only two claws, the small claw being replaced by a tuft of hairs. This kind of hair or claw tuft adheres to the water film covering most surfaces, enabling the spider to grip and walk on smooth areas vertically or upside down. The legs (Fig. 1, 3) are usually covered with hairs and a variable number of bristles or setae. Some are stout, rigid, and capable of becoming erect to serve a defensive function. They are called spines, which in some families are of definite and characteristic arrangement. The length, thickness (particularly in the tibia), and number of spines vary greatly among families. The positions of the spines with all the legs held forward are of four kinds: (i) dorsal (noted as d) representing spine(s) found on top of a leg segment, (ii) ventral (v), located at the bottom; (iii) prolateral (p), directed towards or near the body; and (iv) retrolateral (r), directed away from the body.

Other hairs are thin, long, and delicately slender, arising from small cup-like depressions of certain leg segments and palpi. They are called trichobothria and are believed to be sound receptors; they can be present singly or in rows, straight or curved. A dense brush of hairs occurs in the chelicerae, maxillae, and legs; these are termed scopulae and in some species can be very thick proximal to the tarsi, metatarsi, and palps.

In the Theridiidae, tarsus IV has a serrated ventral row of strong, curved, and toothed setae (hence they are called comb-footed spiders). These are used in flinging the silk over the struggling prey. Spiders with a spinning organ, known as a cribellum, also have a single or double row of curved hairs on the dorsal surface of the hind metatarsi, referred to as a calamistrum. The latter designs the very characteristic web built by cribellate spiders.

The leg formula represents the lengths of each leg in descending order from the longest to the shortest, e.g., 4123. The spination formula, on the other hand, is represented by the notation (d-v-p-r), e.g., 3-6(2-2-2)-0-3. This means that a tibia, say, of leg I has three dorsal (d) spines, six ventral (v) spines with a pair reach at the distal, median, and proximal end, none in the prolateral (p) position and three in the retrolatera (r) position.

Abdomen

The abdomen (Fig. lab) is the posterior region of a spider's body, with remarkable variation in both size and form. It may be soft to entirely hard or provided only with sigilla or scuta. The dorsal surface of the abdomen may have numerous patterns, e.g., a series of chevrons, longitudinal or horizontal stripes, humps, a leaf-like pattern with defined edges called a folium, or sclerotized to form hard plates. Ventrally lie the reproductive and respiratory systems and the spinnerets. The ventral surface immediately posterior to the pedicel is highly chitinized and extends up to the epigastric furrow; this area is known as the epigastrium. Above the midepigastric furrow is the epigynum – the female genital organ. It is, however, absent in mygalomorph spiders. The epigynum is a highly complex chitinized structure and is of extreme taxonomic value, like the male's palpal tarsus (tarsal bulb). The book lungs or lung covers of the first pair of lungs are found above the epigastric furrow on either side of the epigynum. Their openings, called lung slits, are located at the extreme ends of the epigastric furrow. Except for the mygalomorphs, most spiders have one pair of lungs but bear extra respiratory organs (tracheae). Their openings are called tracheal spiracles and are located dorsally to the anterior spinnerets. In Dysderidae and Segestriidae, a pair of tracheal spiracles occurs ventrally to the lung slits. The second pair of book lungs is below each end, proximally, of the epigastric furrow in the mygalomorphs. The spinnerets are located along the posteroventral end of the abdomen in most spiders. However, some species have their spinners positioned midventrally. Regardless of location, they are arranged in three pairs: anterior (ventral set), median (center pair), and posterior (dorsal set). The spinnerets extrude the silk threads through tiny spigots. The median pair is often small and usually covered by the anterior and posterior pairs. Certain families of spiders may have an additional spinning organ known as a cribellum, which makes fine flocculent silk; it is found in front of the anterior spinnerets. Spiders with a cribellum also have a calamistrum, on metatarsus IV, which is used to pull and comb out the silk. Other groups have a colulus, a slender or pointed appendage immediately in front of the anterior spinnerets. Dorsad of the posterior spinners is the anus with an opening in the anal tubercle.

LIFE HISTORY

All spiders are dioecious and the females are oviparous. Many species lay eggs enclosed in an egg sac or egg cocoon made of silk, e.g., *Argiope catenulata* (Doleschall), or inside their retreats called egg nests as in *Cubiona japonicola* (Boesenberg and Strand). The shape of the cocoon depends on the species and may be oval, spherical, fusiform, or bell-shaped. Usually, the cocoons are studded on top with camouflaging plant or soil particles so that they blend well with their surroundings. For instance, the egg cocoons of the common rice-inhabiting long-

jawed spiders *Tetragnatha* spp. are all camouflaged and left in the host unguarded. Their camouflage is characteristic of a species and can be used in species diagnosis, but this needs great familiarity with a group. The same is true in the araneid *A. catenulata,* with its egg cocoon left attached in the web or on the plant foliage. Others have no camouflage but are usually guarded, the female spider sitting on top of the egg cocoon, as in the lynx spider *Oxyopes javanus* Thorell, or the female sitting beside the egg sac inside the nest chamber, as in *Araneus inustus* (L. Koch), *Neoscona theisi* (Walck.), *Clubiona japonicola, Chiracanthium* spp. and the crab spiders, *Thomisus* and *Runcinia.* Some are even carried by the mother, this being typical of the lycosids – *Pardosa* (=*Lycosa*) *pseudoannulata* (Boesenberg and Strand), *Pardosa birmanica* Thorell, and *Archtosa janetscheki* Buchar – while the eggs are underneath the abdomen or underneath the cephalothorax in the nursery web spider *Dolomedes* spp.

The inside of each cocoon is divided by a horizontal wall or cover plate into two distinct chambers: an egg chamber and a molting chamber. Thin and rather flat egg cocoons have a small dorsal molting chamber; one of the longer lateral ends of the cocoon is used either as a nest or a molting chamber. The number of eggs in a cocoon varies; usually, bigger spiders have more than small ones. The range is from 15 in *Hyctia* (now *Marpissa*) to ca. 1500 eggs in *Argiope.* Eggs hatch after a span of 3-4 1/2 weeks, thereafter, the young spiderlings leave the egg chamber and stay sedentarily in the more spacious molting chamber for ca. 1-2 weeks. A few days after first molt inside the chamber, the most agile spiderlings cut a circular opening into the cocoon wall and in a few minutes the spiderlings crawl out of the cocoon one after another. Outside, every individual keeps moving, climbing the tallest part of the plant where the egg cocoon was fastened, e.g., rice leaf, spike of grass, etc. Once at the summit, they face the direction of the air current and prepare for ballooning. Prior to take-off, the first pair of legs is stretched forward while the other pairs are attached to the substrate. The latter pairs give the necessary leap for the spiderlings to adventurously discover new frontiers. Others walk continuously, seemingly without a definite direction, and disperse through ballooning following the wind direction.

In the lycosids, however, the female spider cuts the rim of her cocoon with the chelicerae 1-3 days prior to hatching to facilitae the spiderlings' exit from the cocoon. Without such help, the spiderlings would be unable to emerge from the sac. Upon exit, the spiderlings ride on the mothers's back clinging to the abdominal dorsum. Some 100-300 tiny spiderlings in several layers remain on the mother lycosid's back for 5-8 days prior to their dispersal, thriving exclusively on their reserve yolk supply. Spiderlings drink 'water' and the mother spider provides it by chewing the cocoon held by the celicerae. In such a crowded ride, a number of spiderlings fall and must survive thereafter on their own.

Generally, the life history of spiders differs according to species. Smaller ones require fewer molts while larger species usually molt more times, having longer developmental periods to reach sexual maturity.

MATERIALS AND METHODS

Collection Sites

Spiders were collected from 48 locations in 25 provinces throughout the Philippines from 1977 to 1990. Of these, 25 were in Luzon, four in Palawan, ten in the Visayas, and nine in Mindanao. Other collection sites here in Bangladesh (two sites; June to August 1977 and October 27 to November 7, 1984); Indonesia (four sites: August 15-31, 1989); Thailand (two sites: July 24 to August 10, 1989); Vietnam (five sites; August 3-22, 1990), and Cambodia (four sites: October 10-26, 1989). Spiders from rice plants were also received from India and Malaysia.

Sampling Techniques

To ensure collection of a wide array of spider species from the collection sites, sampling was made using four different techniques (Barrion and Litsinger 1984). In addition, pitfall and malaise traps were set up in some sites. Pitfall traps made of polyvinyl tubes three fourths filled with 10% picric acid were set in site L_4 in 1979, site M_1 in 1983, in L_{16} and L_{17} in 1984-85, and M_4 in 1986 (see Table 1). The pitfall samples were sieved weekly from the trap using a wire strainer with a 38 mm (1.5-in) mouth diameter and 2 mm mesh diameter. Collected spiders were temporarily kept in 80% alcohol and finally transferred to Oudeman's preservative in the laboratory. Malaise traps were set in ricefields and the grasslands dominated by cogon, *Imperata cylindrica* (L.) Beauv. and *Themeda triandra* Forskal in site M_4 in 1986 and in the weedy fallow adjacent to wetland rice in site L_1 in 1981. Samples were collected daily every afternoon and put directly into Oudeman's preservative along with labels. All pertinent labels – host, type of rice environment, collection site(s), date and methods of collection, and collector(s) – where recorded and incorporated in the vial.

Preservation of Specimens

Being soft-bodied, spiders cannot be preserved satisfactorily in a dry state, as they shrivel. Therefore Oudeman's preservative was used: 85 parts 70% ethyl alcohol, 5 parts glycerin, and 5 parts glacial acetic acid. Care was taken not to place too many specimens in the preservative which was changed after 1-2 days, as it becames diluted with body fluids. The specimens were kept in vials with the same preservative for permanent storage. If other preservatives are not available, 80% alcohol can be used.

Table 1. Collection sites with corresponding rice environments (I = irrigated, RW = rainfed wetland, U = upland).

Sites			Type of rice environments
A. PHILIPPINES			
Luzon (L) Island			
L_1	--	Calauan, Laguna	I
L_2	--	Caliraya, Laguna	U
L_3	--	Kalayaan, Laguna	I
L_4	--	Liliw, Laguna	I
L_5	--	Los Baños, Laguna	I
L_6	--	San Pablo, Laguna	I
L_7	--	Sta. Maria, Laguna	I
L_8	--	Sta. Rosa, Laguna	I
L_9	--	Siniloan, Laguna	I
L_{10}	--	Victoria, Laguna	I
L_{11}	--	Lian, Batangas	I
L_{12}	--	Lipa, Batangas	U
L_{13}	--	Sto. Tomas, Batangas	U
L_{14}	--	Tanauan, Batangas	I
L_{15}	--	Alfonso, Cavite	U
L_{16}	--	Cabanatuan, Nueva Ecija	I
L_{17}	--	Guimba/Zaragoza, Nueva Ecija	I
L_{18}	--	Bongabong, Nueva Viscaya	I
L_{19}	--	Bani, Pangasinan	I
L_{20}	--	Manaoag, Pangasinan	RW
L_{21}	--	Anayan, Abra	I
L_{22}	--	Bangued, Abra	I
L_{23}	--	Salapadan, Abra	I
L_{24}	--	Alcala, Cagayan	I
L_{25}	--	Patapat, Cagayan	RW
L_{26}	--	Solana, Cagayan	I
L_{27}	--	Alicia, Isabela	I
L_{28}	--	Bontoc, Mt. Province	I
L_{29}	--	Banawe	I
L_{30}	--	Kiangan, Ifugao	I
L_{31}	--	Lagawe, Ifugao	I
L_{32}	--	Real, Quezon	U
L_{33}	--	Daet, Camarines Norte	I
L_{34}	--	Iriga, Camarines Sur	I
L_{35}	--	Naga, Camarines Sur	I
L_{36}	--	Legaspi, Albay	I
L_{37}	--	Sorsogon/Matnog, Sorsogon	I
L_{38}	--	Masinloc, Zambales	RW
Mindoro (MO) Island			
MO_1	--	San Jose, Mindoro Oriental	I

Cebu (C) Island

C_1	--	Bogo, Cebu	U
C_2	--	Cebu City, Cebu	U
C_3	--	Toledo, Cebu	U

Bohol (BO) Island

BO_1	--	Carmen, Bohol	I

Leyte (LY) Island

LY_1	--	Palo, Leyte	I
LY_2	--	Baybay, Leyte	I
LY_3	--	Maasin, Leyte	I
LY_4	--	Ormoc, Leyte	I

Panay (PY) Island

PY_1	--	Dumarao, Capiz	RW
PY_2	--	Oton, Iloilo	RW
PY_3	--	Pototan, Iloilo	RW
PY_4	--	Tigbauan, Capiz	I

Palawan (P) Island

P_1	--	Aborian, Palawan	RW
P_2	--	Batarasa, Palawan	i
P_3	--	Brooke's Pt., Palawan	I
P_4	--	Iwahig, Palawan	I
P_5	--	Narra, Palawan	I
P_6	--	Puerto Princesa City, Palawan	U

Mindanao (M) Island

M_1	--	Koronadal, S. Cotabato	I
M_2	--	Lake Sebu, S. Cotabato	U
M_3	--	Tupi, South Cotabato	U
M_4	--	Del Monte, Agusan del Sur	RW
M_5	--	Pangantukan, Bukidnon	U
M_6	--	Claveria, Misamis Oriental	U
M_7	--	Mat-i, Misamis Oriental	U
M_8	--	Villanueva, Misamis Oriental	I
M_9	--	Betinan, Zamboanga del Sur	U
M_{10}	--	Margosatubig, Zamboanga del Sur	I
M_{11}	-	Molave, Zamboanga del Sur	I
M_{12}	-	Pagadian, Zamboanga delSur	I

B. BANGLADESH

B_1	--	BRRI, Joydevpur	I
B_2	--	Mymensingh	I

C. THAILAND

C_1	--	Prachinburi	I
C_2	--	Chanchaensao	I

D.	VIETNAM		
V_1	--	Plant Protection Research Farm, Hanoi	I
V_2	--	Sang Phuong, Hanoi	I
V_3	--	Long Dinh, Chau Thanh, Tien Giang	I
V_4	--	Cay Lay, Tien Giang	I
V_5	--	Ba Ria (Cie Be), Long Thanh,Vung Thau	RW/I
E.	CAMBODIA		
CA_1	--	Bati, Takeo I	
CA_2	--	Kampung Spe, Prey Pdau	I
CA_3	--	Prey Veng Barai, Proteach Tlain	I
CA4	--	Ta Saang, Suay Reng	I
F.	INDONESIA		
I_1	--	Blabak, Magelang, C. Java	I
I_2	--	Soko, Magelang, C. Java	I
I_3	--	Kaliurang, Yogyakarta	I
I_4	--	Klaten, Yogyakarta	I
I_5	--	Wisma Bethesda, Yogyakarta	I
G.	BURMA (Myanmar)		
B_1	--	Mwabi, Rangoon	I
B_2	--	Hmawbi, Rangoon	I
H.	INDIA		
IN_1	--	Madurai, Tamil Nadu	I
I.	CHINA		
CH_1	--	Canton district, Canton	I

Photographing and Preparation for Illustrations

Newly collected specimens were anesthetized with either ether, ethyl acetate, or CO_2 and then posed dry on host plants, viz. rice or other weeds. This was promptly done while the spider was still immobilized but with flexible legs and palpi. For morphological examination, most specimens came from the preserved state except when indicated in the description. They were illustrated with the aid of a stereoscopic microscope (50-400x) total magnification indicated). In order to facilitate the viewing of different angles clearly, the whole spider was stretched either on cotton or white beach sand submerged in the medium. The epigynes were drawn based on natural (uncleared) and cleared conditions. They were carefully removed from the abdomen by lifting the midepigastric furrow using a no.1 insect pin mounted in a small wooden handle. While at this point, the margins of the epigyne were pricked as close to each other as possible with a minute needle and prepared as above; when completed the entire shield was detached using fine forceps. The epigynes were cleared in 2.5 cm diameter petri dishes using KOH or NaOH pellets. The number of pellets and duration of clearing varied depending on the size and degree of sclerotization of the epigynum. A less sclerotized epigynum requires 20-28 h with five pellets in 10 ml of water. Harder ones take longer, usually 48-62 h, with the same ratio as above. Clearing can be hastened to within 24-46 h by doubling the pellets to a 1:1 ratio. Each dish was provided with data available inside the vial. Male pedipalps wee bloated in 3-5 h in a 1:1 cold mixture of KOH or NaOH pellets and water.

Classification

The study of Philippine spiders is still in a neonate stage and many new genera and species await discovery particularly from the numerous caves, mountain ranges and forests, and small, fragmented isolated islands not ventured into. While this is true, we proceeded with the writing of this guide and followed a system of classification where the arrangement of higher systematic divisions and families is one of convenience adopted as a practical expedient for utilization. However, we would like to caution the user that the dichotomous key to the families and subsequent generic keys encompassed only adults of South and Southeast Asian species in IRRI's collection, with emphasis on Philippine spiders, and may not apply to continental or world fauna. For the first time, a key to the spiderlings of some 18 species commonly encountered from samples, viz. D-Vac, FARM-COP, yellow pan trap, etc., was developed to aid ecologists, IPM workers, etc. in the identification of immatures. For instance, many new genera described from New Zealand a decade ago had not been reported elsewhere (Forster and Wilton 1968, 1973; Forster 1970).

Measurements

Unless otherwise indicated, all measurements are in millimeters (mm). Body and leg measurements, including trichobothria, were made according to the methods of Locket and Millidge (1951, 1953); Mascord (1970); Heiss and Allen (1986); and Yaginuma (1986a).

1. *Spider length* refers to body length measured from the chelicera to the tip of visible spinnerets.

2. *Eyes.* The spider's eyes are simple ocelli. Most species have eight eyes (the primitive number), arranged in two or three rows. Their sizes, arrangement, diameter, distance between eyes, and length of eye row vary greatly and these features were used extensively in separating taxa. The common eye arrangement is two rows, the first four in front are the anterior eye row (AER) and the other four behind are the posterior eye row (PER). The length of an eye row, e.g., AER-L, refers to the distance or length of the anterior eyes from tip to tip (Fig. 2ab). The same technique applies in taking the length of the PER. The AER consists of two groups: the pair of middle eyes (AME) and the pair of lateral eyes (ALE). The distance between eyes, e.g., AME-AME, means the interspace or separation between the eyes expressed in relation to the AME diameter. Likewise, the posterior eye row has a middle pair (PME) and lateral pair (PLE). The area enclosed by the AME and PME is referred to as the median ocular quadrangle, while in some families, such as the jumping spiders (Family Salticidae), where the eyes are in three rows, the entire region occupied by the eyes is called the ocular area and is used in a similar way (Fig. 2b).

Eye rows have two patterns. It is termed procurved if the outer ends of the line drawn along the eye row are nearer to the front end of the carapace and recurved in the opposite direction (Fig. 2c).

The region between the AER and the anterior margin of carapace is the clypeus. The height of the clypeus is the distance between the AER and the anterior margin of the carapace is the clypeus. The height of the clypeus is the distance between the AER and the anterior margin of the carapace expressed in units related to the diameter of the AME.

3. *Legs.* The position of a dorsal tibial spine if considered, was expressed in a similar way to the position of the trichobothrium in the metatarsus; that is, it was expressed as a ratio of a/b, where a is the distance between the spine or trichobothrium and the base of the tibia or metatarsus, respectively, and b is the total length of tibia or metatarsus. The length of a tibial spine is also expressed as a ratio: the length of a tibial spine is also expressed as a ratio: the length of the spine (1)/the diameter of the tibia at the point of spine insertion (d). Meta I/tar is the ratio of the length of metatarsus I/length of tarsus I (Fig. 3c). The spines on the legs were used in species determination. Four major positions were used in counting spines, namely dorsal (d), ventral (v), prolateral (p), and retrolateral (r). Prolateral spines are nearest the body in legs I and II, and farthest from it in legs III and IV.

Retrolateral spines are the reverse. The system of spination is simply coded as dvpr. For instance, dvpr = 0-3-3-5 means that there are no dorsal spines, three each in the ventral and prolateral areas, and five in the retrolateral. Positions of the spines, such as apical, basal, median, and other variations – subapical, sublateral, etc. – are discussed in the species descriptors. For instance, 0-7(3-2-2)-0-2 means seven ventral spines are present, three basal and two each in the middle and apical part.

4. *Reproductive organs*. The length of the pedipalp was taken in both sexes, whenever present. The compositions of the male's pedipalp are presented in Fig. 4: Saticidae (a), Clubionidae (b) Thomidae (c), Araeidae (d), Lycosidae (e), and Linyphidae (f). Similarly, the epigynes of some families are drawn – Salticidae (4g), Clubionidae (4h) and Araneidae (4i).

REARING METHODS

For the life history studies, adult male and female spiders of each of the 17 species presented here were collected from ricefields, border habitats, and fallows, and held in cylindrical plastic canisters 15.4 x 36 cm (6 x 14 in) or mylar film provided with a 35-45 day-old rice plant as a substrate. Some twigs or small bamboo sticks were also added to serve as additional substrate. Egg masses and cocoons were cut from the foliage, kept separately by species in 1 x 6 cm glass vials provided with moist cotton wads at the bottom and capped with dry cotton wads. Egg cocoons laid on the inside surfaces of the mylar films were also cut and placed individually in glass vials or in 1.5 x 9 mm plastic petri dishes. Similar provisions were made in this set-up to avoid drying and desiccation of the eggs. Spiderlings that emerged were individually isolated using a camel hair brush in 7.6 x 12.8 cm (3 x 5 in) plastic vials provided inside with freshly cut stem or leaves of rice, partly dried straw or small twigs of any plant available and a nylon mesh window on top. Each mesh was secured by either a tape or rubber band on the mouth of the vial. The vegetation served as substrate for clinging and walking. After first molt, in which almost all stored food (yolk) had been utilized, the spiderlings were fed with a variety of diets: first-instar nymphs of cicadellids and delphacids, Collembola, *Drosophila* flies, *Hydrellia* adults, and chironomids. The food, except Collembola, was partially crushed to help spiderlings feed. Drinking water was provided inside the cell in the form of an inverted film-tube filled with water, the lid of which was pricked with a pin no. 3 to allow water to ooze out slowly and wet the layer of cotton on its floor. After two or three molts, each immature of the tetragnathid, *Tetragnatha* spp. was again transferred to a bigger cylindrical cage (12 x 15 in) with two mesh windows and a top vent. Similarly, longer branches of sticks were placed inside each chamber along with a hanging cotton ball wet with water. In addition, an inverted film-tube or plastic vial provided with water as described above was placed on the floor of the rearing cell. It provided an additional source of drinking

water as well as cooling the spider. The larger cage provided more space for the *Tetragnatha* to construct a web. A similar rearing methodology was used in *Argiope, Araneus,* and *Neoscona*. The rest – the lycosids, oxyopids, etc. – were reared in smaller cells or tubes (2 x 5 in). The bottom end of each rearing cell plugged with a cotton ball rested on the floor of a rectangular or circular pan lined with wet paper towel. Cut rice stems or leaves and some dry straws were placed inside the tube as additional substrate for the spider. The top end had a nylon mesh secured by rubber bands. As the spiders grew, more and more food had to be added. A diverse diet was continuously provided them to attain success in molting. These were reared to the adult stage.

For the egg parasitoids, egg cocoons were collected two or three times a week in the field from the ricefields, levees or bunds, weedy fallows, etc. These were individually placed in 2.5 x 9.5 cm glass tubes for parasite emergence. The mouth of the vial was covered by a lid provided with a wire mesh vent (0.25 mm diameter). In the absence of the parasitoids, the hatched spiderlings were used in the life history studies.

CLASSIFICATION OF THE SPIDER FAMILIES

There are approximately 34,000 species of different kinds of spiders in the world today (Platnick 1989), and a systematic study of the diversity of all these animals needs a proper scheme of classification or grouping. The scheme adopted here is based largely on the inferences of several arachnologists, i.e., Dondale and Redner (1978), Heimer and Nentwig (1982), Levi (1983), Platnick (1989), and Platnick *et al.*, (1991). However, some subfamily ranks are taken from Shears (1986).

Order Araneae

Suborder Opisthothelae – spiders with six or less spinnerets and unsegmented abdomen

Infraorder Mygalomorphae

Characters:

a. Two pairs of book lungs
b. Cheliceral fangs parallel to each other
c. Pedipalps long and leg-like
d. Paired sigilla present on sternum
e. Four spinnerets, sometimes six anterior median absent, and basal lateral spinnerets semidivided
f. Haplogyne vulva
    1. Family Theraposidae Thorell, 1869
    2. Family Barychelidae Pocock, 1897
    3. Family Dipluridae Pocock, 1897

Infraorder Araneomorphae
Characters;

a. One pair of book lungs or absent
b. Cheliceral fangs diaxial, opposing each other
c. Pedipalps short
d. Sigilla rare
e. Six spinnerets common, with cribellum or colulus representing anterior median spinnerets often absent and basal segment of posterior lateral spinnerets not divided
f. Haplogyne or entelegyne vulva

Section Cribellatae
Division Neocribellatae
Superfamily Dinopoidea
4. Family Uloboridae Cambridge, 1871
Superfamily Agelenoidea
5. Family Amaurobiidae Bertkau, 1878
Superfamily Dictynoidea
6. Family Dictynidae Cambridge, 1871

Section Ecribellatae
Division Haplogynae
Superfamily Dysderoidea
7. Family Oonopidae Simon, 1890
Superfamily Scytodoidea
8. Family Tetrablemmidae Cambridge, 1873
9. Family Scytodidae Blackwall, 1852
Superfamily Pholcoidea
10. Family Ochyroceratidae Fage, 1912
11. Family Pholcidae Koch, 1850

Division Entelegynae
Branch Dionycha
Superfamily Dictynoidea
12. Family Anyphaenidae Bertkau, 1878
Superfamily Lycosoidea
13. Family Ctenidae Keyserling, 1876
Superfamily Salticoidea
14. Family Salticidae Blackwall, 1841
Superfamily Clubionoidea
15. Family Clubionidae Wagner, 1888
16. Family Prodidomidae Simon, 1894
17. Family Gnaphosidae Pocock, 1894
Superfamily Thomisoidea
18. Family Thomisidae Sundeval, 1833
Superfamily Philodromoidea

19. Family Philodromidae Walckenaer, 1826
20. Family Eusparassidae Simon, 1903

Branch Trionycha

Superfamily Dictynoidea

21. Family Hahniidae Bertkau, 1878

Superfamily Lycosoidea

22. Family Oxyopidae Thorell, 1869
23. Family Pisauridae Simon, 1890
24. Family Lycosidae, Sundevall, 1833

Superfamily Palpimanoidea

25. Family Mimetidae Simon, 1890
26. Family Palpimanidae Cambridge, 1871
27. Family Zodariidae Thorell, 1869

Superfamily Eresoidea

28. Family Hersiliidae Thorell, 1869

Superfamily Araneoidea

29. Family Theriidae Sundevall, 1833
30. Family Linyphiidae Blackwall, 1859
31. Family Theridiosomatidae Vellard, 1924
32. Family Tetragnathidae Menge, 1866
33. Family Metidae C.L. Koch, 1836
34. Family Araneidae Dahl, 1912

A KEY TO IDENTIFICATION OF FAMILIES OF PHILIPPINE SPIDERS

1 Two pairs of book lungs. Cheliceral fangs parallel to each other or paraxial. Anterior median spinnerets absent; anterior lateral spinnerets rarely present; basal segment of posterior lateral spinnerets partially divided. Pedipalps leg-lile. Paired sigilla present in the sternum. MYGALOMORPHAE, the trap-door spiders 2

– One pair of book lungs, occasionally absent. Cheliceral fangs opposing each other or diaxial to occasionally oblique. ARANEOMORPHAE 3

2 Claw tufts present; last joint of lateral spinnerets long and pointed; tarsi two-clawed. ..... THERAPHOSIDAE

– Claw tufts present; last joint of lateral spinnerets short and rounded. .... BARYCHELIDAE

– Claw tufts absent. Tarsi with a small median and two large lateral claws. Each chelicera without a rastellum. Posterior spinnerets very long with three sub-equal segments. Thoracic groove a circular pit. ..... DIPLURIDAE*

*Families reported in the Philippines but not collected during the study.

3 Six spinnerets. Cribellum and calamistrum present. Anal tubercle normally with single segment 4
– Six, four, or two spinnerets. Cribellum and calamistrum absent 6
4. Femora II-IV with trichobothria, ventral row of erect macrosetae on tarsi IV, prolateral metatarsal concavity adjacent to calamistrum. Each chelicera without a boss. Eyes homogeneously black. ..... ULOBORIDAE
– Femora without trichobothria. Prolateral surfaces of metatarsus IV normal... 5
5 One or two rows of tarsal trichobothria increasing in length distally. Colulus, if present, anterior spinners well separated. Cribellum divided .... AMAUROBIIDAE*
– Tarsal trichobothria reduced or absent. Cribellum entire or normal with one segment. Each chelicera with boss. AME dark, other eyes pale. Eyes in two rows, PME facing upwards. Male chelicerae indented prolaterally. ....DICTYNIDAE
6 Six-eyed and without epigynum. A pair of tracheal spiracles just behind book lungs. Two claws present. Leg III directed backwards. Tarsal claws pectinate in double row. Female palp without claw. Often sclerotized with dorsal abdominal scutum. .... OONOPIDAE
– Eight-eyed or if with six then epigynum present and male palpal organ complex. A single posterior tracheal spiracle or none. 7
7 Abdomen with dorsal scutum, four ventral and three or four narrow lateral and posterior scuta. Eyes six or less. No posterior spiracle. .... TETRABLEMMIDAE*
– Abdomen without sclerotized plates as above, occasionally small anterior dorsal scutum present. Posterior spiracle present but often difficult to see ... 8
8 Female genital opening unsclerotized or lightly sclerotized. Male pedipalps simple without apophysis 9
– Sclerotized epigynum on which insemination ducts open (except Tetragnathidae and some Metidae). Each male pedipalp usually with apophysis 11
9 Spiracle well forward of spinnerets. Genital groove or opening extended laterally on abdomen in females. Small spiders ca. 1-2 mm with proportionally long legs ..... ●CHYROC TIDAE*
– Spiracle just in front of spinnerets. Median lamella terminates distally to a tooth-like process. Both are long-legged spiders 10
10 AME, if present, small. Rest of eyes in two triads. Male pedipalp with prominent porcursus (paracymbium). ..... PHOLCIDAE
– Six eyes in three diads. Paracymbium absent. Chelicerae fused. Cepahlothorax dome-shaped. Tarsi each three-clawed, pectinate in double rows. Pair of ventral pits in female behind genital groove. Spitting spiders. SCYTODIDAE
11 Legs with two claws. 12
– Legs with three claws 20
12 Eight eyes arranged in three rows. 13
– Eight eyes arranged in two rows 14

13 Each chelicera with boss. Anterior row of eyes on same level as other eyes and relatively small. AME smaller than PME, ALE between PME and PLE. Five pairs of ventral spines on each anterior tibia. Epigynum with lateral teeth. ..... CTENIDAE*

– Each chelicera without boss. Eyes in three rows (anterior row of four eyes, followed by two rows of two eyes each). Anterior row of eyes on more or less vertical face with the median pair (AME) the largest and directed forwards. Jumping spiders. ..... SALTICIDAE

14. Legs in prograde position. 15

– Legs in the laterigrade position 18

15 Anterior spinnerets conical contiguous at base or nearly so, slightly sclerotized than posterior spinnerets. Coxal lobes of pedipalp without depression. Posterior median eyes (PME) usually round 16

– Anterior spinnerets separated or wide apart. 17

16 Trachial spiracle prominently anterior to spinnerets. ..... CLUBIONIDAE

– Trachial spiracle at the middle of venter between epigastric furrow and spinnerets or close to the epigastric furrow. ..... ANYPHAENIDAE*

17 Chelicerae diverging, spread and long. Eyes in three rows (anterior row of four eyes followed by two rows of two eyes each), C-shaped or deeply recurved. ..... PRODIDOMIDAE*

– Chelicerae touching each other, nearly straight sided. Eyes in two rows of four each with PME slanted (somewhat 'cross eyed'), endites concave and slightly constricted medially. ..... GNAPHOSIDAE

18 Anterior tarsi without scopulae. Crab-like spiders. Legs I and II longer than III and IV. Eyes often outlined in white. The crab or flower spiders. .... THOMISIDAE

– Anterior tarsi with scopulae 19

19 Medium-sized spiders (2.0-8.2mm). Eyes never tuberculate. Body covered with squamose hairs. ..... PHILODROMIDAE

– Large to very large spiders. Eyes often tuberculate. Soft membrane at tip of each metatarsus permits extention of each tarsus beyond axis of leg .... EUSPARASSIDAE

20 Each tibia and metatarsus of legs I and II with a row of long spines in the prolateral surface with shorther curved spines in the intervals. .... MIMETIDAE

– Legs without this arrangement of spines. 21

21 Tarsi and metatarsi each with trichobothria. 22

– Tarsi each without trichobothria. 27

22 Anterior pair of spinnerets largest and carried up largest and carried up during walking, the other two pairs very small and difficult to see. .... PALPIMANIDAE*

– Anterior spinners characteristically different. 23

23 Chelicerae each without a boss. Maxillae triangular and directed across labium. Legs equally thick. Spinerets two or more. ..... ZODARIIDAE

– Chelicerae each with boss. Maxillae not as above 24

24 Eyes hexagonal, anterior row strongly procurved and posterior row strongly recurved. Clypeus very high. Leg spines long and prominent. ..... OXYOPIDAE
– Eggs never hexagonal, if approximately close then clypeus narrow. 25
25 Six spinnerets arranged in a transverse row, posterior spiracle far from spinnerets. ..... HAHNIIDAE
– Spinnerets not in transverse row. 26
26 Trochanters strongly notched. Eyes four, two, two or four, four. Usually no more than three pairs of ventral spines on tibiae and metatarsi I and II 27
– Trochanters not notched 28
27 Eyes four, four. Posterior row of eyes only slightly recurved and appears in one row. One row of trichobothria on each tarsus. Male pedipalp with tibial apophysis. Eggs carried by the female on ventral surface of cephalothorax held by chelicerae and pedipalps. ..... PISAURIDAE
– Eyes in three rows (anterior row of four eyes and two rows of two eyes each). Posterior eye row so strongly recurved as to form two rows (PME and PLE). Usually two rows of trichobohria on tarsi. Male pedipalp without tibial apophysis. Eggs carried by the female behind spinnerets. Young carried on female's dorsum. Lower claw with two or three teeth each. Hair plumose. ..... LYCOSIDAE
28 Posterior spinnerets enormously long, usually longer than abdomen, with spinning tubes along the length of the inside edge. ..... HERSILIIDAE
– Posterior spinnerets much shorter, never longer than abdomen. 29
29 Tarsus IV each with a comb of serrated setae ventrally, may be poorly developed in males. Labium not rebordered. ..... THERIDIIDAE
– Tarsus IV each without such comb. Labium reborded. 30
30 Chelicerae with stridulating ridges. Male paracymbium a separate sclerite. .... LINYPHIIDAE
– Chelicerae without stridulating ridges. 31
31 Tiny (1-2 mm) spiders. Sternum broadly truncate. Abdominal pattern nonfoliate. Female pedipalps without claws. A pair of anterior sternal indentations present. ..... THERIDIOSOMATIDAE
– Small-large spiders (2.0-20 mm). Sternum cordate. Abdominal pattern often foliate. Female pedipalps with claws. Orb weavers. 32
32 Nonsclerotized female genital aperture. Abdomen elongate and chelicerae long. Male with clasping spurs. Femora with trichobothria. .... TETRAGNATHIDAE
– Sclerotized or partially sclerotized female genital plate. Abdomen rarely elongaged 33
33 Abdomen ovoid, occasionally with humps. Paracymbium usually leaf-like and often divided ..... METIDAE
– Abdomen variable often with humeral, dorsal, or posterior humps. Chelicerae without stridulating ridges. Femora without trichothria. Usually colorful spiders. ..... ARANEIDAE

CHECKLIST OF TAXA

Family Theraphosidae Thorell
Baccallbrapo new genus
Baccallbrapo bundokalbo n. gen. & sp.

Family Barychelidae Pocock
Genus *Idioctis* Koch
Idioctis sierramadrensis n. sp.

Family Uloboridae Cambridge

Key to the Uloborid Genera and Species

Genus *Zosis* Walckenaer
Zosis geniculatus (Olivier)

Genus *Miagrammopes* F.O.P. Cambridge
Miagrammopes maigsieus n. sp.
Miagrammopes brooksptensis n. sp.

Family Dictynidae Cambridge

Genus Dictyna Sundevall
Dictyna siniloanensis n. sp.

Family Oonopidae Simon

Genus *Opopaea* Simon
Opopaea batangueña n. sp.

Family Pholcidae Koch

Key to the Pholcid Genera and Species

Genus *Artema* Walckenaer
Artema sp.

Genus *Pholcus* Walckenaer
Pholcus phalangioides (Fuesslin)

Family Scytodidae Blackwall

Genus Scytodes Latreille
Scytodes thoracica (Latreille)

Family Salticidae Blackwall

Key to the Salticid Genera and Species

Genus *Spartaeus* Thorell
Spartaeus uplandicus n. sp.

Genus *Phaeacius* Simon
Phaeacius mainitensis n. sp.

Genus *Emathis* Simon
Emathis astorgasensis n. sp.
Emathis makilingensis n. sp.

Genus *Myrmarachne* Macleay
Myrmarachne bidentata Banks
Myrmarachne markaha n. sp.
Myrmarachne pinakapalea n. sp.
Myrmarachne vulgarisa n. sp.
Myrmarachne calirarya n. sp.
Myrmarachne onceana n. sp.
Myrmarachne pinoysorum n. sp.

Genus *Bianor* Peckham and Peckham
Bianor hotingchiehi Schenkel

Genus *Gangus* Simon
Gangus manipisus n. sp.

Genus *Hyllus* C.L. Koch
Hyllus maskaranus n. sp.

Genus *Epeus* Peckham et Peckham
Epeus edwardsi n. sp.
Epeus parangalbogauttatus n. sp.

Genus *Cosmophasis* Simon
Cosmophasis estrellaensis n. sp.
Cosmophasis parangpilota n. sp.
Cosmophasis trioipina n. sp.

Genus Phintella Strand
Phintella bunyiae n. sp.
Phintella piatensis n. sp.

Genus *Mantisatta* Warburton
Mantisatta longicauda Cutler & Wanless

Genus *Telamonia* Thorell
Telamonia masinloc n. sp.
Telamonia parangfestiva n. sp.

Genus *Plexippus* C.L. Koch
Plexippus calcuttaensis (Tikader)
Plexippus petersi (Karsch)
Plexippus paykulli (Audouin)

Genus *Thiania* C.L. Koch
Thiania viscaensis n. sp.

Genus *Rhene* Thorell
Rhene hinlalakea n. sp.
Rhene habalhumpa n. sp.

Genus *Harmochirus* Simon
Harmochirus brachiatus (Thorell)

Genus *Hasarius* Simon
Hasarius adansoni (Audouin)

Genus *Gambaquezonia* n. gen.
Gambaquezonia timana n. gen. & sp.

Genus *Chalcotropis* Simon
Chalcotropis luceroi n. sp.

Genus *Simaetha* Thorell
Simaetha damongpalaya n. sp.
Simaetha makinanga n. sp.

Family Clubionidae Wagner

Key to the Clubionid Genera and Species

Genus *Clubiona* Latreille
- *Clubiona drassodes* F.O.P. Cambridge
- *Clubiona charlenei* n. sp.
- *Clubiona gallagheri* n. sp.
- *Clubiona japonicola* Boesenberg & Strand
- *Clubiona pahilistapyasea* n. sp.
- *Clubiona pototanensis* n. sp.
- *Clubiona kapataganensis* n. sp.
- *Clubiona topakea* n. sp.
- *Clubiona hugisva* n. sp.
- *Clubiona victoriaensis* n. sp.
- *Clubiona dikita* n. sp.
- *Clubiona unanoa* n. sp.
- *Clubiona krisisensis* n. sp.
- *Clubiona katioryza* n. sp.
- *Clubiona paranghinlalakirta* n. sp.
- *Clubiona venusae* n. sp.
- *Clubiona maysangarta* n. sp.
- *Clubiona hugispaa* n. sp.
- *Clubiona leonilae* n. sp.
- *Clubiona zandstrai* n. sp.
- *Clubiona parangunikarta* n. sp.
- *Clubiona unikarta* n. sp.
- *Clubiona manipisea* n. sp.

Genus *Clubionoides* Edwards
- *Clubionoides kawitpaaia* n. sp.
- *Clubionoides bukaea* n. sp.
- *Clubionoides turongdaliriana* n. sp.

Genus *Kakaibanoides* n. gen.
- *Kakaibanoides paranga* n. gen. & sp.

Genus *Cheiracanthium* C. Koch
- *Cheiracanthium daquilium* n. sp.
- *Cheiracanthium liplikeium* n. sp.
- *Cheiracantium payateus* n. sp.
- *Cheiracantuium itakeus* n. sp.
- *Cheiracanthium ligawsolanum* n. sp.
- *Cheiracanthium tigbauanensis* n. sp.
- *Cheirancanthium tingilium* n. sp.

Cheiracanthium bikakapenalcolium n. sp.
Cheiracanthium hugiscium n. sp.
Cheiracanthium catindigi n. sp.

Genus *Alaeho* n. gen.
Alaeho linoi n. gen. & sp.

Genus *Castianeira* Keyserling
Castianeria tiranglupa n. sp.

Genus *Agroeca* Westring
Agroeca klitina n. sp.

Genus *Phrurolithus* C.L. Koch
Phrurolithus ulopatulisus n. sp.

Genus *Scotinella* Banks
Scotinella tinikitkita n. sp.

Family Gnaphosidae Pocock

Key to the Gnaphosid Genera and Species

Genus *Micaria* Westring
Micaria siniloana n. sp.

Genus *Zelotes* Gistel
Zelotes capili n. sp.
Zelotes caveleriei Schenkel

Genus *Poecilochroa* Westring
Poecilochroa dayamibrookiana n. sp.
Poecilochroa otonensis n. sp.
Poecilochroa alcala n. sp.
Poecilochroa paraṇgunifascigera n. sp.

Genus *Geodrasus* Chamberlain
Geodrassus elleni n. sp.

Genus *Scotophaeus* Simon
Scotophaeus leoi n. sp.
Scotophaeus cecilia n. sp.

Family Thomisidae Sundevall

Key to the Thomisid Genera and Species

Genus *Borboropactus* Simon
Borboropactus mindoroensis n. sp.
Borboropactus umaasaeus n. sp.
Borboropactus bangkongeus n. sp.

Genus *Cupa* Strand
Cupa kalawitana n. sp.

Genus *Tharrhalea* L. Koch
Tharrhalea mariae n. sp.

Genus *Stiphropus* Gerstaecker
Stiphropus sangayus n. sp.

Genus *Loxobates* Thorell
Loxobates kawilus n. sp.
Loxobates masapangensis n. sp.

Genus *Tmarus* Simon
Tmarus dostinikus n. sp.

Genus *Monaeses* Thorell
Monaeses habamantinikus n. sp.
Monaeses aciculus (Simon)

Genus *Runcinia* Simon
Runcinia sangasanga n. sp.
Runcinia albostriata Boesenberg & Strand
Runcinia acuminata (Thorell)

Genus *Thomisus* Walckenaer
Thomisus italongus n. sp.
Thomisus okinawensis Strand
Thomisus iswadus n. sp.
Thomisus ilocanus n. sp.

Genus *Taypaliito* n. gen.
Taypaliito iorebotco n. gen. & sp.

Genus *Camaricus* Thorell
Camaricus florai n. sp.
Camaricus formosus thorell
Camaricus parisukatus n. sp.

Genus *Misumenoides* F.O.P. Cambridge
Misumenoides matinikus n. sp.
Misumenoides pabilogus n. sp.

Genus *Misumena* Latreille
Misumena maputiyana n. sp.
Misumena tapyasuka n. sp.
Misumena menoka Tikader

Genus Xysticus C.L. Koch
Xysticus palawanicus n. sp.

Genus *Diaea* thorell
Diaea carangali n. sp.
Diaea tadtadtinika n. sp.

Genus *Synaema* Simon
Synaema globosum (Fabricius)
Synaema batarasa n. sp.

Genus *Lysiteles* Simon
Lysiteles umalii n. sp.
Lysiteles sorsogonensis n. sp.
Lysiteles suwertikos n. sp.
Lysiteles boteus n. sp.
Lysiteles magkalapitus n. sp.

Genus *Misumenops* F.O.P. Cambridge
Misumenops maygitgitus n. sp.

Family Philodromidae Walckenaer

Genus *Philodromus* Walckenaer
Philodromus kianganensis n. sp.

Genus *Thanatus* C.L. Koch
Thanatus parangvulgaris n. sp.

Family Eusparassidae Simon

Key to the Eusparassid Genera and Species

Genus *Heteropoda* Latreille
Heteropoda cyperusiria n. sp.
Heteropoda garciai n. sp.
Heteropoda venatoria (Linnaeus)

Genus *Olios* Walckenaer
Olios paalongus n. sp.
Olios mahabangkawitus n. sp.
Olios perezi n. sp.

Genus *Thelctocopis* Karsch
Thelcticopis huyoplata n. sp.
Thelcticopis kianganensis n. sp.
Thelcticopis simplerta n. sp.
Thelcticopis kaparanganensis n. sp.

Genus *Isopeda* L. Koch
Isopeda sungaya n. sp.
Isopeda igraya n. sp.
Isopeda catmona n. sp.
Isopeda pseudokumanga n. sp.
Isopeda tuhodnigra n. sp.
Isopeda bicolana n. sp.

Family Mimetidae Simon

Key to the Mimetid Genera and Species

Genus *Mimetus* Hentz
Mimetus marjorieri n. sp.

Genus *Ero* C.L. Koch
Ero salittana n. sp.
Ero luzonensis n. sp.

Family Zodariidae Thorell

Key to the Genera and Species of Ant-Eating Spiders

Genus *Asceua* Thorell
Asceua gruezoi Barrion & Litsinger

Genus *Langbiana* Hogg
Langbiana panchoi Barrion & Litsinger
Langbiana pricei n. sp.
Langbiana slaburuptica n. sp.
Langbiana calilungae Barrion & Litsinger

Family Oxyopidae Thorell

Key to the Genera and Species of Oxypid Spiders

Genus *Peucetia* Thorell
Peucetia myanmarensis n. sp.

Genus *Oxyopes* Latreille
Oxyopes biakaeus n. sp.
Oxyopes tienganensis n. sp.
Oxyopes javanus Thorell
Oxyopes matiensis n. sp.
Oxyopes aspirasi n. sp.
Oxyopes pingasus n. sp.
Oxyopes lineatipes (C.L. Koch)
Ocyopes delmonteensis n. sp.

Family Hahniidae Bertkau

Genus *Hahnia* C.L. Koch
Hahnia tuybaana n. sp.

Genus *Neoantistea* Gertsch
Neoantitea kaisaisa n. sp.

Family Pisauridae Simon

Key to the Genera and Species of Nursery Web Spiders

Genus *Pisaura* Simon
Pisaura putiana n. sp.
Pisaura parangbusta n. sp.

Genus *Perenethis* L. Koch
Perenethis kawangisa n. sp.
Perenethis unifasciata (Doleschall)

Genus *Thalassinus* Simon
Thalassinus bottrelli n. sp.
Thalassinus balingkinitanus n. sp.
Thalassinus albocinctus (Doleschall)

Family Lycosidae Sundevall

Key to the General and Species of Wolf Spiders

Genus *Venonia* Thorell
Venonia gabrielae n. sp.

Genus *Hippasa* Simon
Hippasa partita (Cambridge)
Hippasa holmerae Thorell

Genus *Artoria* Thorell
Artoria luwamata n. sp.

Genus *Pirata* Sundevall
Pirata luzonensis n. sp.
Pirata blabakensis n. sp.

Genus *Scizocosa* Chamberlain
Schizocosa cotabatoana n. sp.

Genus *Arctosa* C.L. Koch
Arctosa tanakai n. sp.

Genus *Trochosa* C.L. Koch
Trochosa alviolai n. sp.
Trochosa canapii n. sp.

Genus *Pardosa* C.L. Koch
Pardosa pseudoannulata (Boesenberg & Strand)
Pardosa sumatrana (Thorell)
Pardosa irriensis n. sp.
Pardosa birmanica Simon
Pardosa patapatensis n. sp.

Pardosa apostoli n. sp.
Pardosa magkasalubonga n. sp.
Pardosa caliraya n. sp.
Pardosa daniloi n. sp.
Pardosa sacayi n. sp.
Pardosa hawakana n. sp.
Pardosa warayensis n. sp.
Pardosa santamaria n. sp.
Pardosa mabinii n. sp.
Pardosa pahalanga n. sp.

Genus *Hogna* Simon
Hogna rizali n. sp.
Hogna bonifacioi n. sp.

Family Hersiliidae Thorell

Genus *Hersilia* Audouin
Hersilia clathrata Thorell

Family Theridiidae Sundevall

Key to the Genera and Species of Comb-Footed Spiders

Genus *Phoroncidia* Westwood
Phoroncidia bukolana n. sp.

Genus *Chrysso* F.O.P. Cambridge
Chrysso argyrodiformis (Yaginuma)
Chrysso anei n. sp.
Chyrsso tiboli n. sp.
Chrysso isumbo n. sp.

Genus *Coleosoma* F.O.P. Cambridge
Coleosoma octomaculatum (Boesenberg & Strand)
Coleosoma blandum Cambridge
Coleosoma caliothripsum n. sp.
Coleosoma saispotum n. sp.
Coleosoma pabilogum n. sp.
Coleosoma matinikum n. sp.

Genus *Achaearanea* Strand
Achaearanea brookesiana n. sp.

Achareayopa new genus
Achaearyopa pnaca n. gen. & sp.

Landoppo new genus
Landoppo misamisoriensis n. gen. & sp.

Genus *Theridion* Walckenaer
Theridion bitakum n. sp.
Theridion necijaensis n. sp.
Theridion kambalium n. sp.
Theridion ischagosum n. sp.
Theridion antheae n. sp.
Theridion otsospotum n. sp.
Theridion punongpalayum n. sp.
Theridion lumabani n. sp.

Genus *Anelosimus* Simon
Anelosimus salaensis n. sp.
Anelosimus nigrobaricus n. sp.

Genus *Dipoena* Thorell
Dipoena ruddai n. sp.
Dipoena tuldokguhitanea n. sp.

Genus *Latrodectus* Walckanaer
Latrodectus mactans (Fabricius)

Genus *Argyrodes* Simon
Argyrodes saganus (Doenitz & Strand)
Argyrodes bonadea (Karsch)

Genus *Steatoda* Sundevall
Steatoda ngipina n. sp.

Genus *Enoplognatha* Pavesi
Enoplognatha philippinensis n. sp.
Enoplognatha kalaykayina n. sp.
Enoplognatha yelpantrapensis n. sp.
Enoplognatha cariasoi n. sp.
Enoplognatha malapahabanda n. sp.
Enoplognatha pulatuberculata n. sp.
Enoplognatha maysanga n. sp.
Enoplognatha apaya n. sp.

Family Linyphiidae Blackwall

Key to the Genera and Species of Sheet-Web Spiders

Genus *Bathypanthes* Menge
?Bathyphantes tagalogensis n. sp.

Genus *Atypena* Simon
Atypena adelinae n. sp.
Atypena thailandica n. sp.

Genus *Erigone* Audouin
Erigone malvari n. sp.
Erigone bifurca Locket

Family Theridiosomatidae Vellard

Genus *Wendilgarda* Keyserling
Wendilgarda liliwensis n. sp.

Family Tetragnathidae Menge

Key to the Genera and Species of Long-Jawed Spiders

Genus *Dyschiriognatha* Simon
Dyschiriognatha hawigtenera n. sp.

Genus *Pachygnatha* Sundevall
Pachygnatha ochongipina n. sp.

Genus *Tetragnatha* Latreille
Tetragnatha javana (Thorell)
Tetragnatha desaguni n. sp.
Tetragnatha Ilavaca n sp.
Tetragnatha virescens Okuma
Tetragnatha vermiformis Emerton
Tetragnatha okumae n. sp.
Tetragnatha iwahigensis n. sp.
Tetragnatha maxillosa Thorell
Tetragnatha ceylonica Cambridge
Tetragnatha mandibulata Walckenaer
Tetragnatha nitens (Auduoin)

Family Metidae C.L. Koch

Key to the Genera and Species of Metid Spiders

Genus *Phonognatha* Simon
Phonognatha guanga n. sp.

Genus *Meta* C.L. Koch
Meta baywanga n. sp.
Meta tiniktirika n. sp.

Genus *Tylorida* Simon
Tylorida striata Thorell

Genus *Mesida* Kulzynski
Mesida realensis n. sp.
Mesida matinika n. sp.

Genus *Leucauge* White
Leucauge parangscipinia n. sp.
Leucauge decorata (Blackwall)
Leucauge mahabascapea n. sp.
Leucauge fastigata (Simon)
Leucauge argentina (Van Hasselt)

Leucauge bontoc n. sp.
Leucauge celebesiana (Walckenaer)
Leucauge iraray n. sp.

Family Araneidae Dahl

Key to the Genera and Species of Araneid Spiders

Genus *Gasteracantha* Sundevall
Gasteracantha janopol n. sp.
Gasteracantha mammosa C.L. Koch
Gasteracantha parangdiadesma n. sp.
Gasteracantha diadesma (Thorell)
Gasteracantha kuhlii C.L. Koch

Genus *Nephila* Leach
Nephila maculata (Fabricius)
Nephila antipodiana (Walckenaer)

Genus *Nephilengys* L. Koch
Nephilengys kenmorei n. sp.
Nephilengys malabarensis (Walckenaer)

Genus *Gea* C.L. Koch
Gea subarmata Thorell
Gea zaragoza n. sp.

Genus *Argiope* Audouin
Argiope catenulata (Doleschall)
Argiope luzona (Walckenaer)
Argiope aemula (Walckenaer)
Argiope sapoa n. sp.

Genus *Poltys* C.L. Koch
Poltys illepidus C.L. Koch

Genus *Cyrtarachne* Thorell
Cyrtarachne tulapedilachna n. sp.

Genus *Parawixia* F.O.P. Cambridge
Parawixia dehaani (Doleschall)

Genus *Acusilas* Simon
Acusilas dahoneus n. sp.

Genus *Cyrtophora* Simon
Cyrtophora exanthematica (Doleschall)
Cyrtophora parangexantematica n. sp.
Cyrtophora unicolor (Doleschall)
Cyrtophora koronadalensis n. sp.

Genus *Cyclosa* Menge
Cyclosa ipilea n. sp.
Cyclosa banawensis n. sp.
Cyclosa mulmeinensis (Thorell)
Cyclosa parangmulmeinensis n. sp.
Cyclosa krusa n. sp.
Cyclosa insulana (Costa)
Cyclosa otsomarka n. sp.
Cyclosa dusbukolea n. sp.
Cyclosa parangtarugoa n. sp.

Cyclosa baakea n. sp.
Cyclosa bifida (Doleschall)

Genus *Singa* C.L. Koch
Singa hilira n. sp.

Genus *Hyposinga* Ausserer
Hyposinga pygmaea (Sundevall)

Genus *Larinia* Simon
Larinia fusiformis (Thorell)
Larinia phthisica (L. Koch)
Larinia parangmata n. sp.

Genus *Neoscona* Simon
Neoscona dostinikea n. sp.
Neoscona yptinika n. sp.
Neoscona usbonga n. sp.
Neoscona oriemindoroana n. sp.
Neoscona theisi (Walckenaer)
Neoscona molemensis (Tikader & Bal)
Neoscona nautica (L. Koch)
Neoscona rumpfi (Thorell)

Genus *Araneus* Clerck
Araneus inustus (C.L. Koch)
Araneus dospinolongus n. sp.
Araneus tatsulokeus n. sp.
Araneus mitificus (Simon)
Araneus ellipticus (Tikader & Bal)
Araneus santacruziensis n. sp.

Genus *Eriovixia* Archer
Eriovixia laglaizei (Simon)
Eriovixia excelsa (Simon)

Tukaraneus new genus
Tukaraneus palawanensis n. gen. & sp.
Tukaraneus mahabaeus n. gen. & sp.
Tukaraneus patulisus n. gen. & sp.

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