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## Taxonomic Notes on the Armored Spiders of the Families Tetrablemmidae and Pacullidae

WILLIAM A. SHEAR<sup>1</sup>

### ABSTRACT

The spider families Tetrablemmidae and Pacullidae are surveyed, and their relationships assessed. At present it is unclear whether the families are closest to the "dysderoids" or to the "scytodoids"; much more morphological and taxonomic data are needed on these putative superfamilies of spiders.

The following species are described as new: *Tetrablemma extorris*, *Monoblemma browni*, *M. muchmorei*, *Matta mckenziei*, *M. atoma*, *Ablemma berryi*, *A. aiyura*, *A. sedgwicki*, *Singaporemma singularis*, *Brignoliella beattyi*, *B. sarawak*, *Paculla kraui*, *P. cameronensis*, and *P. negara*. *Singa-*

*poremma* is established as a new genus based on *S. singularis*, and *Fallablemma* as a new genus based on *Hexablemma castaneum*. The genus *Hexablemma* Berland is considered a synonym of *Tetrablemma*. The new name *Brignoliella* is provided for the preoccupied *Polyaspis* Simon. Tetrablemmidae is divided into two subfamilies: Tetrablemminae O. P.-Cambridge and Brignoliellinae, new. *Diblemma* O. Pickard-Cambridge is considered a synonym of *Opopaea* (Oonopidae), and *Gossiblemma yapensis* Roewer a synonym of *Pseudanapis aloha* Forster (Anapidae).

### INTRODUCTION

The armored spiders of the families Tetrablemmidae and Pacullidae make up a little-known group of animals distributed throughout the world tropics. Species have been described from the West Indies, Mexico, Central and South America, Africa, India and Sri Lanka, Nepal, Southeast Asia, the East Indies, Australia, and many Pacific islands. Information concerning them has appeared mainly as scattered descriptions of new species which, in many cases, have made no reference to previous work. A notable exception is Brignoli's fine treatment of a large collection from Angola (Brignoli, 1974).

To the best of my knowledge, no modern arachnologist has ever made any prolonged observations on live spiders belonging to these two families. As a consequence, we know little or nothing of their biology, except that most tetrablemmids have been collected from litter and soil, including the "hanging soils" associated with epiphytic orchids and bromeliads, and that some of them live in caves. A few of the cave species show the typical suite of adaptations found in troglobitic spiders, but loss of eyes and weak sclerotization are also seen in some of the soil inhabitants. The pacullids, being four to five times larger than the

<sup>1</sup>Research Associate, Department of Entomology, the American Museum of Natural History; Associate Professor, Department of Biology, Hampden-Sydney College, Hampden-Sydney, VA. 23842.

tetrablemmids, are probably not soil-dwellers *per se*, but may live beneath stones or other objects lying on the ground. One of the new species of *Paculla* described below was collected in a termite nest but its relationship, if any, to the termites is not known. No web has been recorded for any member of either family.

Species within each of the two families appear to be well differentiated, but this may be an artifact of limited collecting, with most forms only known from a few specimens found at a single locality. Exceptions are the species from Angola described by Brignoli (1974), and *Matta sbordonii* (Brignoli), of which I have seen many specimens from numerous places in Mexico. The problems lie in grouping the species into genera, as in any families in which the full range of species remains unknown. Pacullidae at present contains only the type genus, *Paculla*, the name of which was provided by Simon, though the concept was first elaborated by Thorell, under the preoccupied name *Phaedima*. Thorell's type specimens of this group have remained inaccessible. They were deposited in the Museo Civico Storia Naturale in Genoa; the collection was partially destroyed and disordered by the flood of 1970 (Brignoli, 1972a). The administration of the museum also will not allow type material to be loaned out of Italy. Simon (1889, 1893), evidently without studying Thorell's descriptions closely, described a few species of *Paculla* and synonymized the generic names *Polyaspis* Simon and *Perania* Thorell under *Paculla*. In recent years, Roewer (1963b) and Brignoli (1972a, 1974) have described species under the name *Paculla*, partially guided by Simon's writings. But the species described by Simon, Roewer, and Brignoli do not seem to be true pacullids, at least not as the genus was conceived by Thorell; they are instead tetrablemmids belonging to two genera in different subfamilies. The Museum of Comparative Zoology and the American Museum of Natural History contain specimens from Malaysia that conform in nearly every respect to Thorell's original description of *Paculla* (as *Phaedima*). The accounts of the new species below thus represent the first twentieth-century observations on the genus (*sensu* Thorell) derived from specimens.

Brignoli, basing his reasoning on his and Simon's concept of *Paculla* (Brignoli, 1972a, 1974), placed Pacullidae as a subfamily of Tetrablemmidae. Although the two families are closely related to each other, my studies indicate that they should be kept apart until more definitive evidence for combination can be found. The differences between the two families are discussed in detail below. Simon's synonymy of both families with the Theridiidae (1894) has been refuted by Levi and Levi (1962) who also dealt with Roewer's 1963 attempt to place Tetrablemmidae and Pacullidae under Hadrotarsidae (Levi, 1968).

My own interest in these families was stimulated by the appearance of dozens of specimens of *Matta sbordonii* in Berlese samples taken by Dr. Stewart Peck in Mexico in 1969. At first, I had planned to call attention to the presence of a species of the family Tetrablemmidae in Mexico, but as years went by and the numbers of specimens and apparent species represented by them grew, I became more ambitious. To present this work as a full-scale revision would be misleading. I have not studied material of several species, some because the types were unobtainable and others, such as those well described by Brignoli in recent years, have not been dealt with in detail because I could add little or nothing to the published accounts. However, what follows is a full revision of the New World forms and a rearrangement of the entire family Tetrablemmidae.

#### ACKNOWLEDGMENTS

I am very grateful to Drs. Norman Platnick and Willis Gertsch of the American Museum of Natural History for continuing to forward specimens of tetrablemmids and pacullids to me as they came dribbling into their collection; Dr. H. W. Levi of the Museum of Comparative Zoology, Cambridge, did likewise. I thank Dr. John Kethley and Mr. Henry Dybas of the Field Museum of Natural History. I also thank Dr. Paul Arnaud and Mr. Vincent Lee of the California Academy of Sciences. Type material from the British Museum (Natural History) was lent by Mr. F. Wanless, and by Dr. M. Hubert from the Musée National d'Histoire Naturelle. Dr. M. Grasshoff of the Senckenberg Museum,



Frankfurt am Main, and Dr. S. Tuxen of the Universitetets Zoologiske Museum, Copenhagen, also lent types from the collections under their care. Special thanks to Dr. JoAnn Tenorio of the Bernice P. Bishop Museum, Honolulu, who went to considerable trouble to track down several elusive Roewer types. Dr. J. A. Beatty furnished valuable new material from his Micronesian spider survey. A discussion of spider evolution with Drs. Ray Forster and H. W. Levi was most valuable; Dr. Forster also has my gratitude for allowing me to publish four scanning electron micrographs taken by him, and for lending me important specimens from the Otago Museum. Dr. Paul Jagasich of Hampden-Sydney College was a great help in making translations from several languages.

Finally, I thank the Faculty Research Committee of Hampden-Sydney College and the Mednick Fund (acting through the Virginia Association of Independent Colleges) for financial support.

#### ABBREVIATIONS

AMNH, the American Museum of Natural History, New York

MCZ, Museum of Comparative Zoology, Harvard University, Cambridge

FMNH, Field Museum of Natural History, Chicago  
CAS, California Academy of Sciences, San Francisco

#### EVOLUTIONARY RELATIONSHIPS

Roewer (1963b) erroneously placed Tetrablemmidae and Pacullidae in the quite unrelated Hadrotarsidae; his discussion has been effectively countered by Levi (1968). The real relationships of these families lie elsewhere; most commonly mentioned are the Oonopidae and Dysderidae. Petrunkevitch (1923) placed the tetrablemmids as loricated oonopids. However, the sclerotization of the abdomen is entirely different (figs. 22, 24) from that found in any known oonopid, the paired claws have a single row of teeth (figs. 43, 112), and the posterior respiratory organs are absent, though evidently represented by the vestiges of a common posterior spiracle quite different from the paired posterior spiracles of the oonopids. Respiratory organs in spiders are notoriously subject to

adaptive modification (Levi, 1967), but Forster (1970) has argued persuasively that major patterns of respiratory organ development are still valuable as evidence of relationships. On that basis, the tetrablemmids and pacullids seem quite different in their pattern from the oonopids and dysderids. On the other hand, Forster (personal commun.) has studied a sense organ of unknown function on the tarsi of spiders and has found that the Oonopidae (fig. 2) and Tetrablemmidae (fig. 3) share a unique type not found as yet in any other spider families.

The Plectreuridae (Gertsch, 1958), while rather large spiders, lack claws on the female pedipalps and seem to have no posterior respiratory organs; the latter is also true of the Pholcidae. Does this argue for the relationship of these families to each other or to the tetrablemmids and pacullids?

The Caponiidae do not seem to me to be related to the tetrablemmid-pacullid line, if for no other reason than the retention of the anterior median eyes (the "main eyes" of Homann); these are the first to be lost in the other haplogyne groups, if eight is taken as the primitive eye number.

Brignoli (1975) has drawn attention to the fact that the chelicerae of the Tetrablemmidae and Pacullidae have median lamellae (figs. 28, 113), and that the female genital system incorporates two receptacles. These are characteristics of the "scytodoids" rather than the "dysderoids." Thus, the tantalizing possibility arises that the tetrablemmids and pacullids are developments in the "scytodoid" line parallel to the oonopids and dysderids in the "dysderoid" line: heavily sclerotized, ground-dwelling spiders not obviously reliant on silk for capture of prey.

A crucial problem in modern arachnology is the heterogeneity of the old "Haplogynae." When it became clear, once and for all, through the work of Lehtinen (1967), Baum (1972), and others, that cribellate and ecribellate species could occur in the same families and even in the same genera, the time was ripe for the reexamination of other cherished arachnological dogma. But we must remember that before the higher system can be reconstructed, carefully worked-out revisions and morphologi-

cal studies on all the included forms are needed. Glatz (1972); Platnick and Shadab (1974); Platnick (1975a); and Brignoli (1975) have made a start in the right direction. What has been discovered so far suggests that the haplogyne condition represents a grade, not a clade, and may be found independently in entirely different lines. Thus, my reluctance to state in dogmatic terms the position of the Pacullidae and Tetrablemmidae may be read as a forecast of much future confusion and debate over the evolution of the haplogyne spiders.

Platnick (1975b, and elsewhere) has argued for the application of cladistic methods to the study of relationships among spider groups. Without entering the ongoing debate on the validity of such methods, I have made an attempt to draw a cladogram of the Tetrablemmidae and Pacullidae according to the

procedures of Hennig (1966). To me, the most interesting point made by the result was its correspondence to my intuitive assessment of the relationships of these spiders. The cladogram, based on the characters given in table 1, is depicted in figure 1.

The polarity of the transformation series of the characters listed in table 1 was determined in most cases by outgroup comparison; characters found in most "haplogyne" families were adjudged primitive. Modifications of the male chelicerae are assumed to be derived for the family Tetrablemmidae (character 5); the parallel loss of the modifications in *Fallemma* and *Matta* (character 14) seemed the most parsimonious assessment of this situation. It will also be noted that a trichotomy in the cladogram was made necessary because of my inability to find any derived character states

TABLE 1  
Characters Used in Figure 1

Character	Primitive State	Derived State
1. Abdomen	Soft	Sclerotized plates in typical pattern
2. Posterior respiratory organs	Present	Absent
3. Size	Medium (4-10 mm.)	Very small (0.8-2 mm.)
4. Anterior respiratory organs	Large, functional	Much reduced
5. Male chelicerae	Without projections	With projections
6. Male genital pore	In fold behind pulmonary plate	Opening through margin of pulmonary plate
7. Sternal apophysis	Absent	Present
8. Cuticle of carapace	Coarsely roughened	Smooth
9. Female genital pore	In fold behind pulmonary plate with sclerotized fingers from plate lateral to pore	Opening through margin of pulmonary plate
10. Eye arrangement	Recurved row	Compact group
11. Cuticle of ventral plates	Smooth	With characteristic circular punctations
12. Bulb of male palpus	Pyriform	Flattened subspheroid
13. Male clypeus	Smooth	With projections
14. Male chelicerae	With projections	Projections lost
15. Male carapace	Posterior rim of cephalic area lacking thorn or projection	Posterior rim of cephalic area with thorn or projection
16. Embolus	Terminal	Arising from side of bulb
17. Male palpal tibia	Similar in bulk to femur	Thicker than femur
18. Male eye area	Smooth	With projections
19. Male palpal femur	Longer than tibia	About same length as tibia
20. Conductor	Absent	Present
21. Position of male eyes	Front of carapace	Middle to back of carapace
22. Embolus	Long, straight	Short, thick, curved



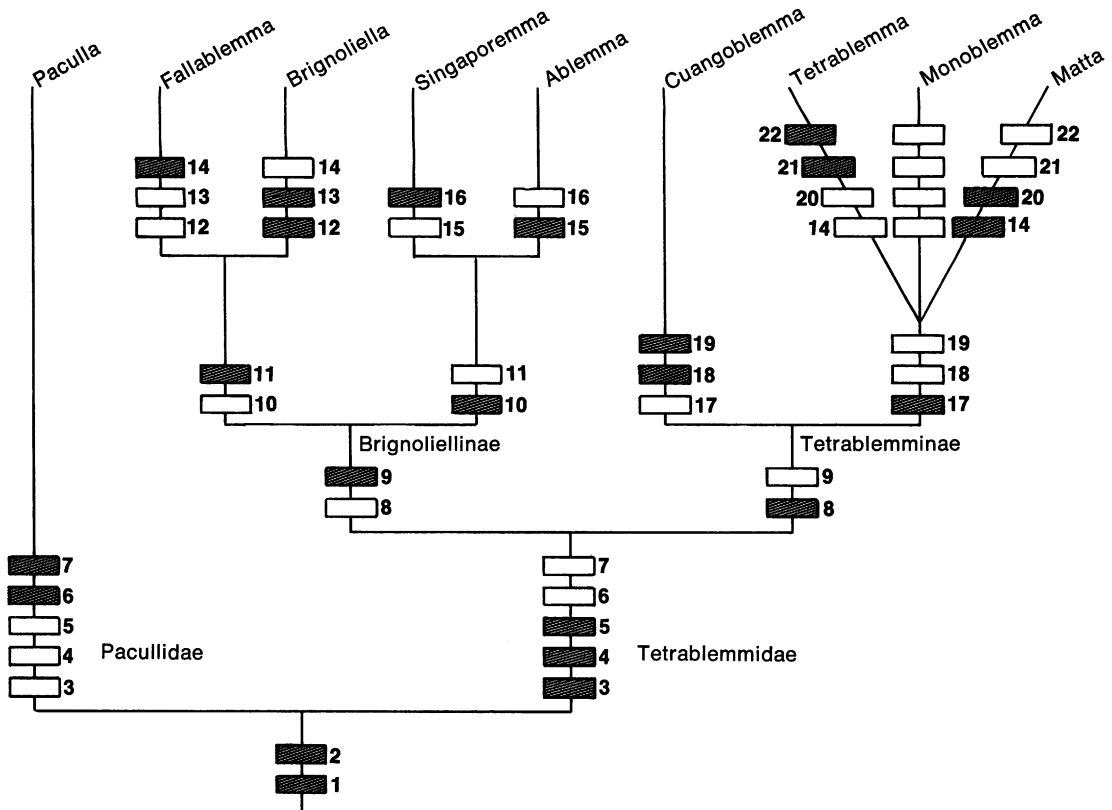


FIG. 1. Cladogram of tetrablemmid and pacullid genera, prepared using characters listed in table 1. Open blocks indicate plesiomorphic character states, shaded blocks apomorphic character states.

distinguishing species of *Monoblemma* from those of *Matta* and *Tetrablemma*. These genera are closely related and may require some changes in the future.

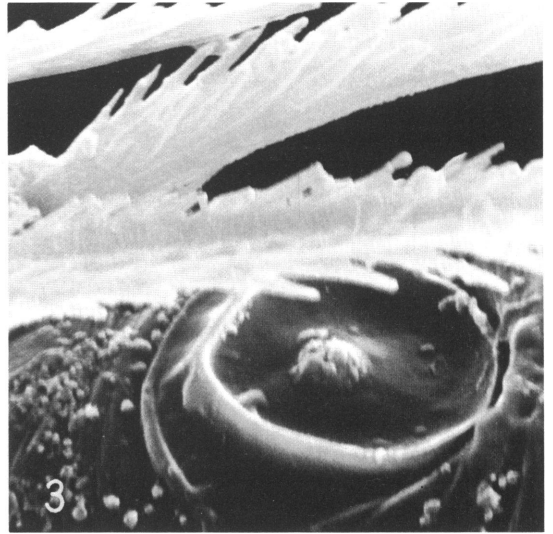
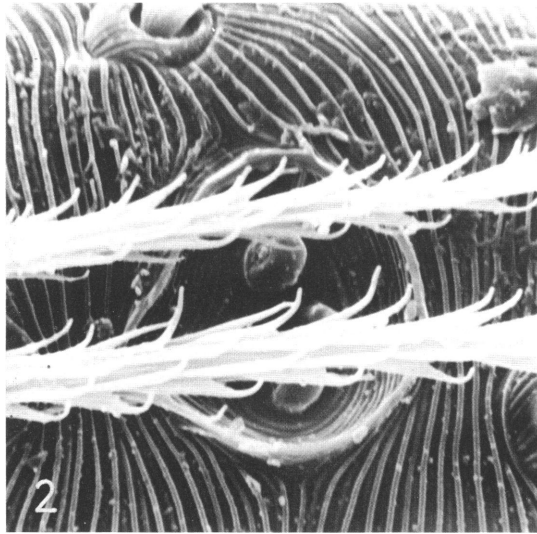
**BIOGEOGRAPHY**

I offer now only a few speculative comments on the biogeography of these two spider families, since there are obviously many more genera and species to be discovered, which may drastically change our thinking about them.

The tetrablemmids and pacullids are essentially tropical; only *Matta sbordonii* could be said to penetrate the fringes of the austral North Temperate Zone. Therefore, we face the same problems in attempting to clarify the histories of their distributions as in any tropical fauna:

the lineages are ancient and have probably existed in place for long periods of time. A further difficulty lies in our manifestly incomplete knowledge of the full-range of genera and species in the two families. Many highly suitable tropical regions have not been collected in for tiny, soil-dwelling animals, and when they are, we should expect to find very many new species and even genera of tetrablemmids. This was certainly the case with *M. sbordonii*, which Berlese sampling revealed to be extremely common over large areas of subtropical and tropical Mexico. Although only one species is known from the Amazon basin, careful collecting in the Caroline Islands has revealed two species of *Tetrablemma*, two of *Brignoliella*, and one of *Ablemma*.

Table 2 summarizes the distributional information available for the known species. A



FIGS. 2, 3. Tarsal sensory organ of unknown function, scanning electron micrographs, 3000 $\times$ . 2. *Ischnothyreus* sp. 3. *Fallablemma castaneum*. Scanning electron micrographs by Ray Forster.

quick perusal reveals that 22 species are found in Southeast Asia and in associated island groups, seven in Africa and Madagascar, seven in tropical America (one of these is probably introduced from Asia), three in New Guinea and Australia, two in India and Sri Lanka, and one in Nepal.

Clearly, the center of diversity of this group as presently understood is in Southeast Asia, with 22 of the 42 species. This is in spite of the fact that Southeast Asia is not a particularly well-surveyed region for spiders, so we might be justified in believing that present data reflect the true situation with regard to the center of diversity.

Using the vicariance paradigm (see Cracraft, 1974, for an excellent review), present distributions suggest a separation of the subfamily Tetrablemmidae (Gondwanan) from the Pacullidae and Brignoliellinae (Laurasian?) in the early Cretaceous, ca. 105 million years ago. Diversification of this subfamily may then have taken place concurrent with subsequent continental separations, as well as a variety of distributional events. But because *Monoblemma* and *Tetrablemma* both still occur in Africa, the origin of these stocks probably predates the separation of Africa and South America (at ca.

65-70 million years ago). However, the *Monoblemma* species found in America are moderately well differentiated from the African ones, suggesting a long period of separation. *Matta* appears to have originated in South America after the separation of that land mass from Africa.

The presence in Asia of a well-defined group of *Tetrablemma* species, representatives of which also occur in India, allows speculation that the genus reached Asia via the movements of the Indian subcontinent, or perhaps Australia-New Guinea, where the genus is also found.

*Paculla* and *Ablemma*, on the other hand, probably moved into New Guinea from Asia, but we do not know enough about the range of species in either genus to be certain.

## SYSTEMATICS

### TETRABLEMMIDAE O. PICKARD-CAMBRIDGE

- Tetrablemmides O. Pickard-Cambridge, 1873, p. 114 (type genus *Tetrablemma* O. Pickard-Cambridge).  
 Tetrablemmidae: Simon, 1894, p. 573. Brignoli, 1973, p. 86 (not including subfamily Pacullinae), 1974, p. 182.  
 Hadrotarsidae: Roewer, 1963b, p. 122 (in part, not



of Thorell, 1881, and not including *Hadrotarsus*, *Gmogala*, and *Gossiblemma*).  
 Pacullidae: Brignoli, 1972a, p. 95 (not of Thorell, 1898).

TABLE 2  
 Geographic Distribution of Species

TETRABLEMMIDAE	
Tetrablemminae	
<i>Tetrablemma medioculatum</i>	Sri Lanka
<i>T. deccanensis</i>	India
<i>T. alterum</i>	Saipan, Palau
<i>T. unicornis</i>	Palau
<i>T. samoensis</i>	Samoa
<i>T. pugnax</i>	Guadalcanal
<i>T. okei</i>	Australia
<i>T. cataphractum</i>	Africa (Kenya)
<i>T. viduum</i>	Africa (Angola)
<i>T. rhinoceros</i>	Africa (Angola)
<i>T. extorris</i>	Trinidad (introduced?)
<i>Cuangoblemma machadoi</i>	Africa (Angola)
<i>C. astaroth</i>	Africa (Angola, Congo)
<i>Monoblemma browni</i>	Madagascar
<i>M. thorelli</i>	Africa (Angola)
<i>M. unicum</i>	Panama
<i>M. muchmorei</i>	Virgin Islands, Colombia
<i>Matta cambridgei</i>	Cuba, Jamaica, Central America
<i>M. sbordonii</i>	Mexico
<i>M. mckenziei</i>	Mexico (troglobitic)
<i>M. atoma</i>	Central America (Belize)
Brignoliellinae	
<i>Ablemma baso</i>	Sumatra (troglobitic)
<i>A. berryi</i>	Palau
<i>A. aiyura</i>	New Guinea
<i>A. sedgwicki</i>	Borneo (Sarawak)
<i>A. shimojanai</i>	Okinawa (troglobitic)
<i>Singaporemma singularis</i>	Singapore, Malaysia
<i>Fallablemma castaneum</i>	Samoa
<i>Brignoliella acuminata</i>	New Caledonia
<i>B. bicornis</i>	Phillipine Islands
<i>B. quadricornis</i>	Kusai (Caroline Islands)
<i>B. beattyi</i>	Palau
<i>B. sarawak</i>	Borneo (Sarawak)
<i>B. martensi</i>	Nepal
PACULLIDAE	
<i>Paculla picae</i>	Sumatra
<i>P. nigra</i>	Sumatra
<i>P. armata</i>	Sumatra
<i>P. granulosa</i>	New Guinea
<i>P. birmanica</i>	Burma
<i>P. kraui</i>	Malaysia
<i>P. cameronensis</i>	Malaysia
<i>P. negara</i>	Malaysia

**DIAGNOSIS:** Small spiders (less than 4 mm. long) with a characteristic pattern (figs. 24, 27) of abdominal sclerotization shared with the Pacullidae; differing from that family in their smaller size, having greatly reduced or absent book lungs, the strongly modified carapaces of the males, and in lacking a knobbed apophysis projecting from the posterior margin of the sternum. Distinguished from the Oonopidae by the absence of posterior respiratory organs and the presence of only a single row of teeth on the paired claws; from the Dysderidae by the generally smaller size, the characteristic abdomen, and in having three claws, and the absence of posterior respiratory organs; from the Caponiidae by the absence of the direct (anterior median) eyes.

**DESCRIPTION:** Cribellum and calimistrum lacking. Genitalia of the "haplogyne" type, but with certain modifications in the females suggesting an epigynum. Posterior respiratory organs absent; anterior ones represented by book lungs with only one or two leaves, or not functional. Spiracles of book lungs removed some distance posteriad (fig. 36) of the lung plates; in those species without functional lungs, the spiracle leads into a short, blindly ending tube. Posterior median spiracle represented in some species, but only as a small sclerotized internal knob on the preanal plate. Spinnerets six, very small, all evidently single-segmented. Colulus present, small and sclerotized. Chelicerae independent, with a subtriangular lamina meeting the tip of the fang, cheliceral teeth absent. Labium triangular, free from sternum, broader than long. Endites of the pedipalps strongly convergent over the labium, nearly touching each other. Sternum broad, subcordate, frequently shallowly excavate behind, near the pedicel; sternum joined between coxal sockets to carapace. Carapace sexually dimorphic in most species, in males commonly raised to a height nearly equaling the length of the carapace; in these cases the eyes are borne on the raised part. Eyes all indirect, with the following possible numbers and arrangements: six, in a sharply recurved transverse row (fig. 77) or a compact group (fig. 103); four, in a U-shaped row (fig. 26) or a compact group (fig. 8); two, rather widely separated (fig. 40); one, in the midline of the carapace (fig. 47). A few

species are eyeless. Abdomen with a characteristic pattern of sclerotization (figs. 24-27), dorsally covered by a single large plate; ventrally with a large semicircular pulmonary plate surrounding the pedicel and bearing the lungs and sometimes the genital openings, followed posteriorly by two broad but short plates, the postgenital and preanal plates, and finally with a conical anal plate surrounding the spinnerets and anal tubercle. Laterally, three pairs of straplike lateral plates (designated  $l_1$ ,  $l_2$  and  $l_3$  dorsal to ventral) and three straplike posterior plates ( $p_1$ ,  $p_2$ , and  $p_3$ ) intervene between the dorsal plate and the ventral series. An anterior plate, when present, begins anterior to  $l_1$  and extends posteriorly for varying distances in different species. In addition, there may be small perigenital plates lateral to the postgenital plate. Claws three, paired claws with a single row of teeth (fig. 43). Tibiae with two trichobothria, metatarsi with one. Female palp without a claw. Male palpal organ a simple bulb with or without a conductor sclerite at the base of the embolus; male palpal tibia sometimes enlarged but otherwise not modified. Female genitalia with a single opening taking various forms, usually with internal sclerotized supporting structures and two membranous seminal receptacles.

INCLUDED GENERA: *Tetrablemma*, *Ablemma*, *Matta*, *Monoblemma*, *Brignoliella*, *Singaporemma*, *Cuangoblemma*, *Fallablemma*.

MISPLACED SPECIES: *Diblemma donisthorpei* O. Pickard-Cambridge (1902) is a two-eyed species of the oonopid genus *Opopaea* (personal commun., A.M. Chickering). *Gossiblemma yapensis* Roewer (1963b) is a synonym of *Pseudanapis aloha* Forster (Anapidae; types in Bishop Museum, Honolulu, examined). Some complicated nomenclatural problems are posed by the misplacement of a number of tetrablemmid species belonging to *Tetrablemma* and *Brignoliella* in the Pacullidae. These are dealt with below in the species accounts.

NOTE ON ETYMOLOGY: The family name is improperly formed, but an amendment to the International Code of Zoological Nomenclature (Art. 29d) prohibits changing it.

## KEY TO SUBFAMILIES

1. Female genitalia opening through a pore in the posterior margin of the pulmonary plate (figs. 71, 75, 87, 102) ..... *Brignoliellinae*  
Female genitalia opening behind the posterior margin of the pulmonary plate (figs. 10, 18, 21) ..... *Tetrablemminae*

### SUBFAMILY TETRABLEMMINAE O. PICKARD-CAMBRIDGE

DIAGNOSIS: With the characteristics of the family, and in addition: Female genitalia opening in a membranous fold behind the pulmonary plate, with an internal sclerotized structure attached to the posterior dorsal margin of the plate; in brignoliellines the female genital pore comes through the margin of the pulmonary plate. Sternum always lacks regular, round punctations found in some brignoliellines, and the carapace always lacks surface teeth.

TYPE GENUS: *Tetrablemma* O. Pickard-Cambridge.

INCLUDED GENERA: *Tetrablemma*, *Monoblemma*, *Matta*, *Cuangoblemma*.

## KEY TO GENERA

1. Male palpus with a conductor ..... *Matta*  
Male palpus without a conductor, though a blunt apophysis may be present near the base of the embolus ..... 2
2. All segments of male palpus proximal to cymbium no more than three times as long as wide; median pair of eyes of males strongly projecting, or clypeus with two short horns; Africa ..... *Cuangoblemma*  
At least the femur of the male palpus five times as long as wide; male eyes not modified, though clypeal horns may be present in a few species ..... 3
3. Carapace of male strongly elevated; eyes at transverse midline or behind midline ..... *Tetrablemma*  
Carapace of the male only slightly elevated, or about as in female; eyes at front of carapace ..... *Monoblemma*

### TETRABLEMMA O. PICKARD-CAMBRIDGE

*Tetrablemma* O. Pickard-Cambridge, 1873, p. 114 (type species *T. medioculatum*, by original designation)



nation). Simon, 1894, p. 573. Bonnet, 1959, p. 4313. Roewer, 1963b, p. 125.

*Hexablemma* Berland, 1920, p. 167 (type species *H. cataphractum* Berland, by original designation). Simon and Fage, 1922, p. 542. Brignoli, 1974, p. 182. NEW SUBJECTIVE SYNONYMY.

*Indonops* Tikader, 1975, p. 175 (type species, *I. deccanensis* Tikader, by original designation). Brignoli, 1976, p. 211.

**DIAGNOSIS:** Close to *Monoblemma*, from which it differs in the more strongly elevated male carapace, with eyes carried at the rear of the elevation rather than at the front. In addition, the chelicerae are strongly modified and the palpal embolus is usually short and curved rather than long and straight. Differing from *Matta* in lacking a palpal conductor, and from *Cuangoblemma* in having the palpal femur longer and thinner than the tibia, the embolus more slender, and the eyes of the males at the rear of the elevated region of the carapace.

**DESCRIPTION:** With the characters of the subfamily, and in addition: eyes four, carapace of males very strongly elevated, often presenting a conical profile when seen laterally. Eyes of males on apex of cone, or at the rear of the elevated region, close to the central seta. Male palpus with tibia swollen, tarsus attached ventrally; bulb pyriform, embolus short, curved, in some cases with outgrowths at base or near middle. Female genital openings commonly with complex internal sclerotized structures.

**DISTRIBUTION:** Africa, India and Sri Lanka, Southeast Asia, Pacific Islands (largely Micronesia), Australia, and Trinidad (probably introduced).

**NOTE:** As I have been unable to examine material of all the species so far described, no key is presented at this time.

*Tetrablemma medioculatum* O. Pickard-Cambridge

*Tetrablemma medioculatum* O. Pickard-Cambridge, 1873, p. 114-115, figs. 1a-h.

**TYPE:** Male holotype from Ceylon (Sri Lanka), collected in 1871 by J. H. K. Thwaites, deposited in Hope Department of Entomology, Oxford, not seen.

This species may be distinguished from most other *Tetrablemma* species by the transverse row of small teeth on the clypeus (Pickard-Cambridge, 1873).

*Tetrablemma deccanensis* (Tikader)

*Indonops deccanensis* Tikader, 1975, p. 175-176, figs. 1-8.

*Tetrablemma deccanensis*: Brignoli, 1976, p. 211.

**TYPES:** Female holotype and numerous male and female paratypes from Poona, Maharashtra, India, collected in August-September 1974, by B. K. Tikader and others, deposited in the collection of the Zoological Survey of India, Calcutta, not seen.

Tikader (1975) mistakenly described this species as the type of a new genus of Caponiidae.

*Tetrablemma rhinoceros* (Brignoli), new combination

*Hexablemma rhinoceros* Brignoli, 1974, p. 182-184, figs. 1-15.

**TYPES:** Male holotype and male and female paratypes from Salazar, Angola, collected March 17, 1973 by A. de Barros Machado, deposited in Museo do Dundo, Lisbon, not seen.

Even though this species is a perfectly typical *Tetrablemma*, judging from Brignoli's illustrations, he placed it in *Hexablemma*. The small projection at the base of the embolus relates the species to *T. alterum*.

*Tetrablemma viduum* (Brignoli), new combination

*Hexablemma viduum* Brignoli, 1974, p. 184-185, figs. 16, 17.

**TYPE:** Female holotype from Lobito, Angola, collected December 30, 1948 by A. de Barros Machado, deposited in Museo do Dundo, Lisbon, not seen.

Males are unknown, but the female genitalia illustrated by Brignoli (1974) are quite typical of *Tetrablemma* species. The differences between this species and *T. rhinoceros* are slight.

*Tetramblemma okei* Butler

*Tetramblemma okei* Butler, 1931, p. 111-112, figs. 1-6.

**TYPE:** Female holotype from Bairnsdale, Victoria, Australia, collected June 1930 by L. Butler, deposited in the Victoria Museum, Australia, not seen.

Dr. Ray Forster (Otago Museum, Dunedin, New Zealand) kindly lent me a male *Tetramblemma* collected in Gladesville, New South Wales. This may be a male of *T. okei*, but the two localities are remote from each other, so I hesitate to describe it as such. The carapace of the Gladesville specimen is highest in front of the eyes; the palpus has a definite spur at the base of the embolus, as in *T. rhinoceros* and *T. alterum*.

*Tetramblemma samoensis* Marples

*Tetramblemma samoensis* Marples, 1964, p. 400-401, fig. 1.

**TYPES:** Marples described a male and a female but did not formally designate them as types. They came from Malololelei Road, Upolo, Samoa, and were collected July 9, 1940 by E. C. Zimmerman. After this manuscript had been completed I learned that they are in the British Museum (Natural History); I have not examined them.

*Tetramblemma unicornis* Roewer

Figures 4-7

*Tetramblemma unicornis* Roewer, 1963b, p. 126-127, figs. 7a-f.

**TYPES:** Male holotype and three female paratypes from Koror, Palau, Caroline Islands, collected November 1947 by H. Dybas, deposited in Field Museum of Natural History; at present in Bernice P. Bishop Museum, Honolulu, examined.

**DIAGNOSIS:** Only *T. medioculatum* is also reported to have a modified clypeus in the male, but in that species the modification takes the form of a row of small teeth, not a blunt horn as in *T. unicornis*.

**MALE:** Total length, 0.77 mm. Carapace 0.37 mm. long, 0.30 mm. wide, yellow-or-

ange, oval, smooth, raised about 50 percent of length. Eye row 0.09 mm. wide, eyes four, in a group with central seta at rear of raised area (fig. 4). Clypeus with median decurved horn (fig. 5). Chelicerae with large frontal apophyses curved inward and upward (fig. 5). Abdomen orange, anterior plate very short, perigenital plates absent. Palpi of male not present in type vial, palpus described by Roewer (1963b) as having a swollen tibia, pyriform bulb, and short, curved embolus.

**FEMALE:** Total length, 0.94 mm. Carapace (fig. 6) 0.43 mm. long, 0.35 mm. wide, eye row 0.09 mm. wide. Form as in male, except for carapace modifications and chelicerae. Female genitalia evidently with a complex internal sclerotized apparatus (fig. 7).

**DISTRIBUTION:** Known only from the type locality.

**NOTES:** Roewer described the male as "ohne Frontalhörnchen" in writing of the chelicerae, but these characteristic apophyses are indeed present. Roewer also described the females as only 0.7 mm. long, with a carapace length of but 0.25 mm.

*Tetramblemma alterum* Roewer

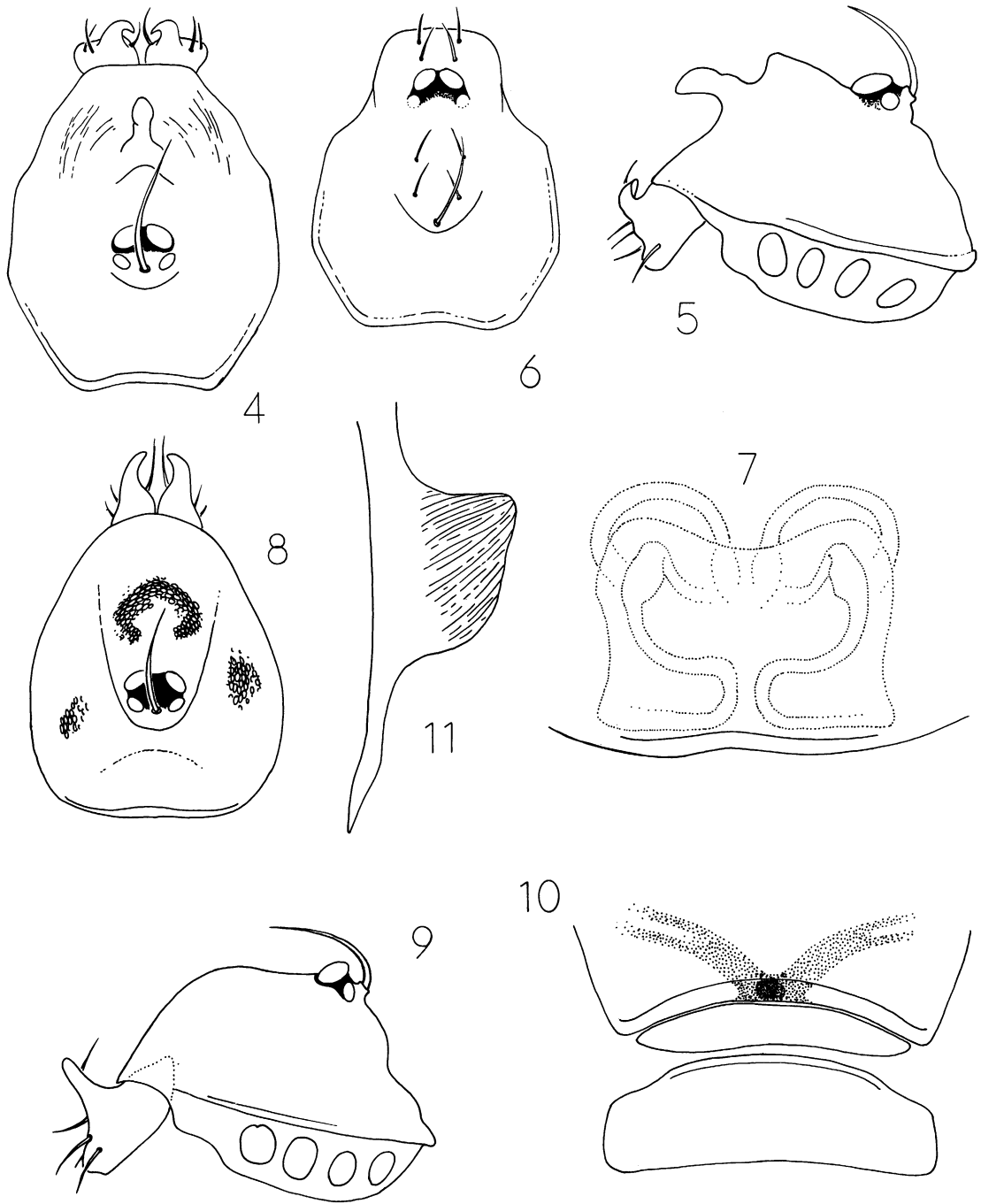
Figures 8-13

*Tetramblemma alterum*, Roewer 1963b, p. 124-126, figs. 7g-k, 8a.

**TYPES:** Male holotype and two female paratypes from Sadog Talofoto, Saipan, Mariana Islands, collected February 13, 1945 by H. Dybas, deposited in Field Museum of Natural History, at present in Bernice P. Bishop Museum, Honolulu, examined.

**DIAGNOSIS:** *T. rhinoceros* shares with this species the outgrowth at the base of the embolus; the former is from Africa.

**MALE:** Total length, 1.11 mm. Carapace 0.49 mm. long, 0.43 mm. wide, orange, oval, raised about 70 percent of its length, cuticle roughened as small hexagonal cells (figs. 8, 9). Eye area 0.09 mm. wide, four eyes in compact group at rear of raised area, with central seta. Clypeus unmodified. Chelicerae with long, straight frontal apophyses curving inward slightly at tips (figs. 8, 9). Abdomen orange, anterior plate very short, limited to anterior



FIGS. 4-11. *Tetrablemma* spp. 4-7. *T. unicornis*. 4. Carapace of male, dorsal view. 5. Carapace of male, lateral view. 6. Carapace of female, dorsal view. 7. Female genitalia, cleared in clove oil, ventral view. 8-11. *T. alterum*. 8. Carapace of male, dorsal view. 9. Carapace of male, lateral view. 10. Female genitalia, ventral view. 11. Tip of embolus, anterior view.

face of abdomen, perigenital plate a single oval with two smaller plaques laterally. Palpus (fig. 13) with swollen tibia, bulb pyriform, embolus (fig. 12) relatively long, straight, with winglike outgrowth.

**FEMALE:** Total length, 1.13 mm. Carapace 0.51 mm. long, 0.43 mm. wide. As in male, except in sexual characters; female genitalia as in figure 10.

**DISTRIBUTION:** Roewer (1963b) recorded the species from Palau, as well as several places on Saipan. The Palau record is based on a female and may not be *T. alterum*. Extensive collecting on Palau by J. A. Beatty and J. Berry did not turn up *T. alterum*.

**NOTE:** Again, my measurements do not agree with those published by Roewer (1963b), who gave the lengths of both sexes as 0.7 mm., with carapace lengths of 0.3 mm.

***Tetrablemma extorris*, new species**

Figures 14-17, 19

**TYPES:** Male holotype and two male paratypes from Trinidad, collected by N. A. Weber (label undated), deposited in the Museum of Comparative Zoology, Cambridge.

**ETYMOLOGY:** The specific epithet is a noun in apposition, meaning exile, referring to the distance separating this species from related forms.

**DIAGNOSIS:** No other *Tetrablemma* species as yet described has the male cheliceral apophyses as in figure 16.

**MALE:** Total length, 0.82 mm. Carapace 0.35 mm. long, 0.31 mm. wide, light yellow, nearly round (fig. 14), strongly elevated to a height about 50 percent of the carapace length, cuticle smooth and shining. Eyes four, in compact group at posterior edge of raised part of carapace (fig. 15) with central seta, other setae of carapace not observed. Chelicerae bearing long apophyses that appear knobbed at low magnification (fig. 15); at high magnification they can be seen to be hooked terminally (fig. 16). Abdomen transparent yellow-white, perigenital and anterior plates absent; spiracles not seen, lung covers nearly obsolete. Palpus (fig. 17) with femur basally swollen, tibia much enlarged, bulb pyriform, embolus (fig. 19) moderately long, curved.

**FEMALE:** Unknown.

**DISTRIBUTION:** In the absence of further locality data, it can only be assumed that the species occurs somewhere on Trinidad. Its presence there, halfway around the world from all its congeners, is likely explained by the vigorous commerce of Trinidad's many citizens of East Indian descent.

*Tetrablemma cataphractum* (Berland), new combination

Figures 18, 20

*Hexablemma cataphractum* Berland, 1920, p. 6-7, figs. 205-210. Simon and Fage, 1922, pp. 542-543, fig. VII.

**TYPE:** Female holotype from Blue Post Hotel, "pays Kikuyu," Kenya, elevation 1520 m., collected January 1, 1912 by Allaud and Jeannel, deposited in Musée National d'Histoire Naturelle, Paris, examined.

**NOTES:** The description of the female given by Berland needs no amplification. However, the correct placement of the male described by Simon and Fage is in question. They did not illustrate the eyes, which are crucial in this case. The original name, *Hexablemma*, made reference to the supposed six eyes of this species, illustrated by Berland as being in a compact group (fig. 20). In my opinion, it is questionable that the poorly defined structures behind the median eyes really represent a third pair. They are only small bumps in the cuticle, and have no tapetum or pigmented retina behind them. An attractive hypothesis is that these structures are the final stage in the reduction of the small eyes found in some *Ablemma* species, thus providing further evidence in another genus for the idea that the eyes in this family aggregate into a compact group before being reduced from six to four.

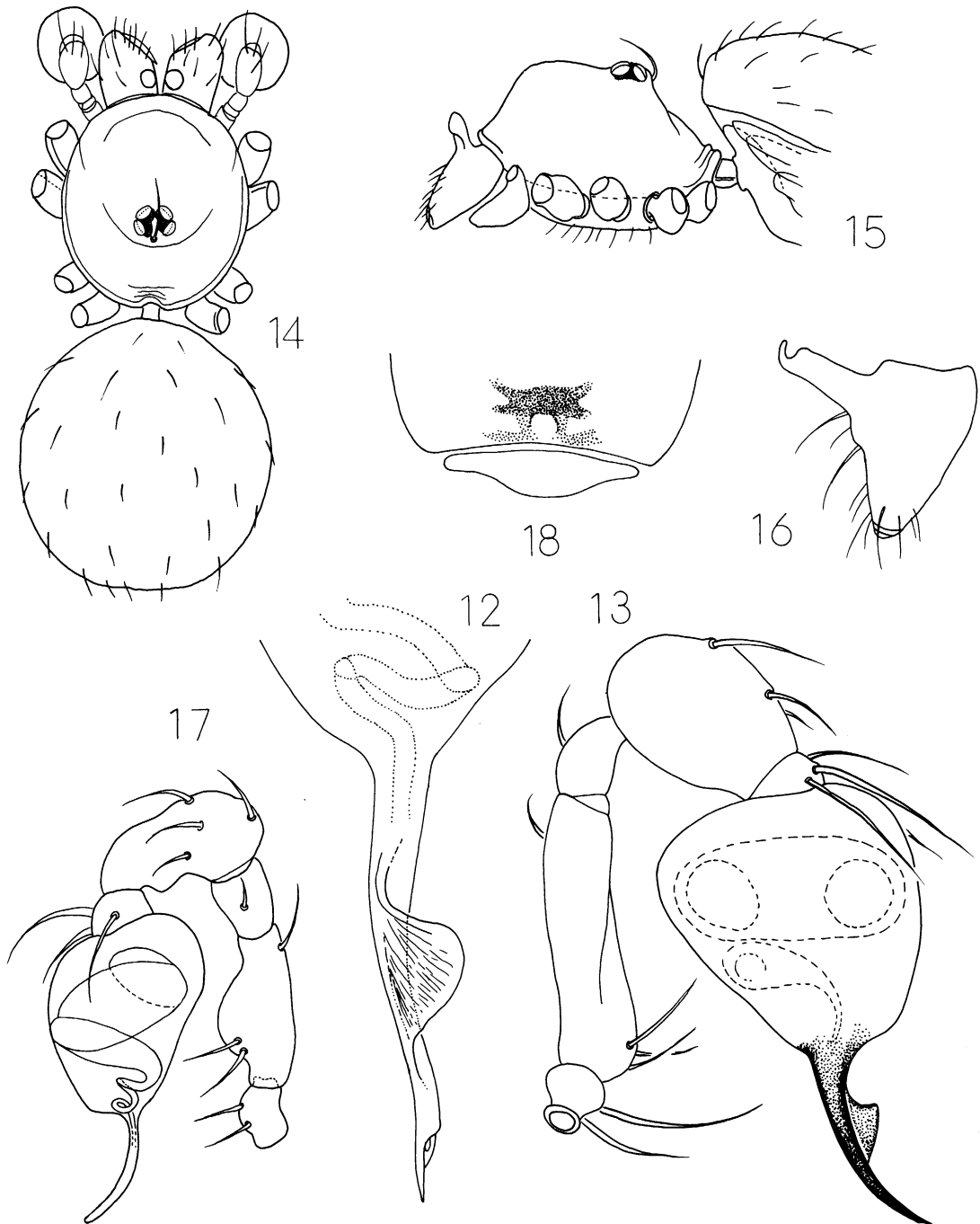
The biogeography of the situation and the structure of the female genitalia (fig. 18) argue for the placement of this species in *Tetrablemma*.

*Tetrablemma pugnax* Brignoli

Figure 21

*Tetrablemma pugnax* Brignoli, 1973, p. 79-82, figs. 1-8.

**TYPE:** Female holotype from Guadalcanal,



FIGS. 12-18. *Tetrablemma* spp. 12, 13. *T. alterum*. 12. Palpus of male, mesal view. 13. Embolus, lateral view. 14-17. *T. extorris*. 14. Male, dorsal view. 15. Anterior part of male, lateral view. 16. Left chelicera of male, lateral view. 17. Right palpus of male, mesal view. 18. Female genitalia of *T. cataphractum*, ventral view.



Solomon Islands, Honiara, collected August 4, 1962 by members of the *Noona Dan* Expedition, deposited in the Zoologisk Museum, Copenhagen, examined.

NOTES: Brignoli's detailed description of the type specimen differs from my findings in two important respects. According to Brignoli, the specimen has six eyes arranged in a compact group (no illustration was provided). The carapace of the specimen has been badly mangled; the eye area has been torn in two and evidently a part of the clypeus is missing. Nonetheless, in examining the fragments, I cannot find evidence for anything more than the usual four eyes found in *Tetrablemma*. New, intact specimens are required to resolve this discrepancy. Likewise, my impressions of the female genital region do not agree with Brignoli's figure 3 (see fig. 21, this paper). Brignoli's illustration suggests a large sclerotized plate behind which is a single median receptacle. I mounted the abdomen of the specimen in glycerine on a microscope slide, and was able to discern two lateral, poorly sclerotized ducts leading from the typical *Tetrablemma* vulva. Similarly, the two circular openings depicted by Brignoli in his figure 1 are actually small pockets in the posterior lateral corners of the preanal plate. This suggests species of *Brignoliella*, but the other diagnostic features of that genus are absent. The discovery of males would answer many questions about this species.

#### MATTA CROSBY

*Matta* Crosby, 1934, p. 19 (type species, *M. hambletoni* Crosby, by original designation).

DIAGNOSIS: Species of *Monoblemma* and *Tetrablemma* are Neotropical, but lack a conductor sclerite on the male palpus.

DESCRIPTION: With the characters of the family, and in addition: eyes four, two or none, carapace of males only moderately raised to a flat plateau on top, eyes (when present) at anterior edge of raised area. In four-eyed species, eyes in a compact group; in two-eyed species, eyes separated by at least one diameter of one of them. Central seta and lateral row setae of carapace in both sexes of normal form. Embolus of male palpus various, with conductor

sclerite (figs. 23, 31) projecting from near its base and partially sheathing embolus. Cheliceral apophyses of males very much reduced, present only as a low swelling or a small tooth. Female genitalia opening behind the margin of the pulmonary plate.

DISTRIBUTION: Mexico, Central America, West Indies, Brazil, Colombia.

#### KEY TO SPECIES

1. Eyes two or four ..... 2  
Eyes absent ..... 5
2. Eyes two ..... 3  
Eyes four ..... 4
3. Eyes separated by two diameters .....  
..... *hambletoni* Crosby  
Eyes separated by one diameter .....  
..... *atoma*, new species
4. Conductor and embolus of male palp as in fig. 31; Cuba, Jamaica, Costa Rica, Panama (?) .....  
..... *cambridgei* (Bryant)  
Conductor and embolus as in fig. 35; Mexico .....  
..... *sbordonii* (Brignoli)
5. Conductor sclerite with branches (fig. 39) .....  
..... *mckenziei*, new species  
Conductor sclerite as in fig. 31 .....  
.. eyeless populations of *sbordonii* (Brignoli)

#### *Matta hambletoni* Crosby

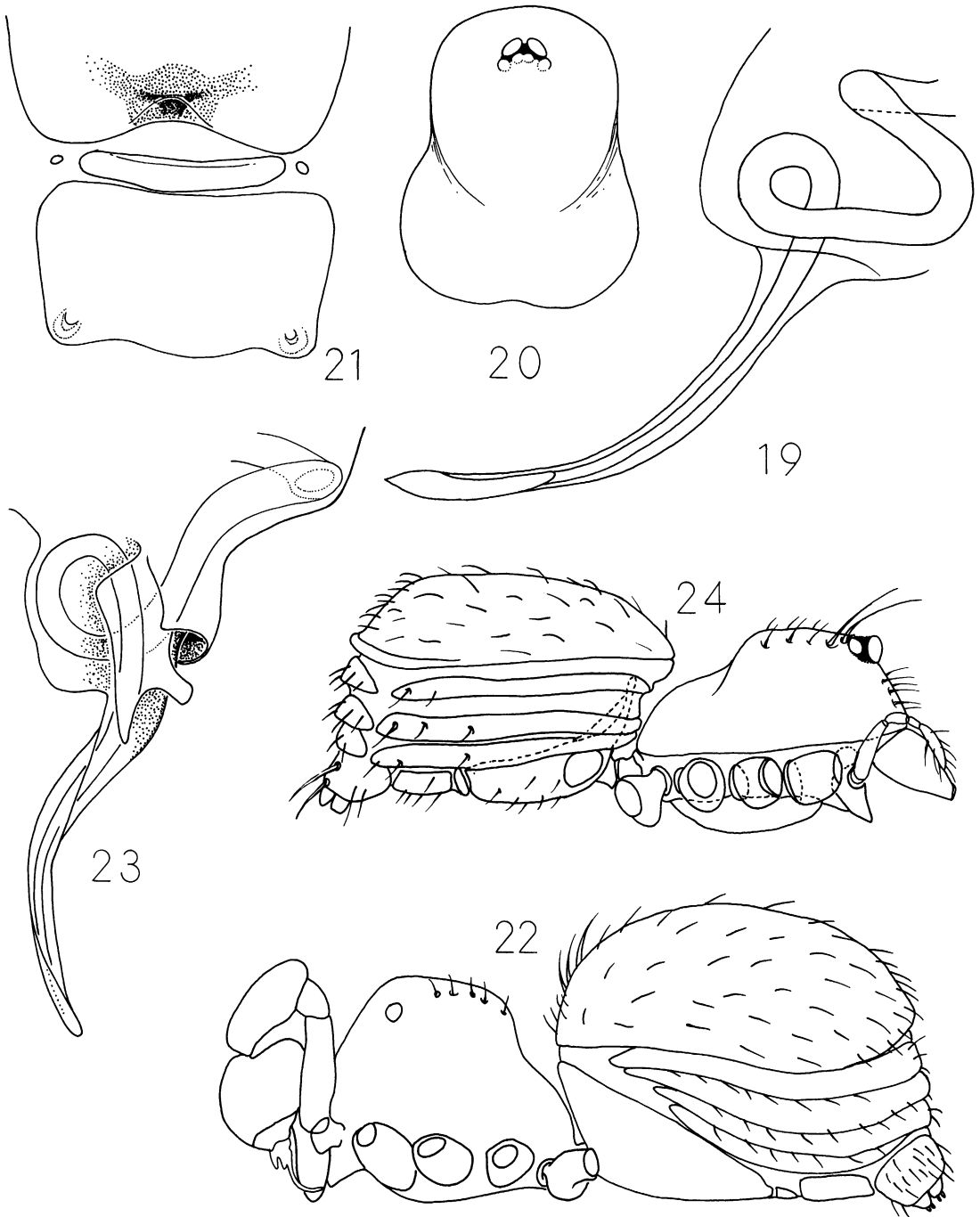
Figures 22, 23

*Matta hambletoni* Crosby, 1934, p. 20-23, figs. 1-8.

TYPES: Male holotype and female paratypes from Viçosa, Minas Gerais, Brazil, collected May 12, 1930 by E. J. Hambleton, deposited in the American Museum of Natural History.

DIAGNOSIS: *Matta atoma* also has two eyes, but they are separated by about one diameter, as opposed to two diameters in the present species. There are also significant differences in the male palpi of *M. hambletoni* (fig. 23) and of *M. atoma* (fig. 45).

The description of the species given by Crosby (1934) is good and I have nothing to add from my study of the same specimens, except to suggest that Crosby's illustration of the cheliceral modification in the male is somewhat misleading. Instead of the decurved process he shows, I noted that a small conical tooth caps the usual swelling found in other *Matta* species. It by no means recalls the



FIGS. 19-24. *Tetrablemma* and *Matta* spp. 19. Embolus of *T. extorris*, mesal view. 20. Carapace of female *T. cataphractum*, dorsal view. 21. Female genitalia of *T. pugnax*, ventral view. 22, 23. *M. hambletoni*. 22. Male, lateral view. 23. Embolus, lateral view. 24. *M. cambridgei* female, lateral view.

apophyses seen in *Tetrablemma* and *Mono-blemma*. I provide here a more detailed view of the embolus and conductor (fig. 23).

**DISTRIBUTION:** Known only from the type locality. Numbers of male and female specimens from the same place, taken over a three-year period, are in the American Museum of Natural History.

*Matta cambridgei* (Bryant), new combination  
Figures 24-32

*Tetrablemma cambridgei* Bryant, 1940, pp. 269-270, figs. 8-10, 13.

**TYPES:** Male holotype and female paratypes from Soledad, Cuba, collected July 8, 1932 by Bates and Fairchild, in Museum of Comparative Zoology, examined.

**DIAGNOSIS:** *Matta cambridgei* is closely related to *M. sbordonii*, but there are several consistent differences between the two populations. *Matta cambridgei* has a substantially longer embolus and a conductor of different shape. The two species are also zoogeographically distinct, *Matta* stocks having entered Central America and the Antilles from the south and speciating perhaps in the mid-Tertiary, with the movement of the Antilles and nuclear Central America away from northern Central America and Mexico (see Rosen, 1975, for an excellent discussion of Caribbean historical biogeography).

I cannot add anything of substance to Bryant's original description, but provide illustrations of the cephalothorax and abdomen (figs. 24-26) of both sexes, the chelicerae of the male (figs. 28, 29) and of the male palpus (figs. 30, 31) and female genitalia (fig. 32).

**DISTRIBUTION:** JAMAICA: *Trelawney*, May 15, 1956, C. Hoff, ♀ (MCZ). *St. Catherine*: Port Henderson, July 1, 1956, A. M. Chickering, ♂ (MCZ). *St. Andrew*: NW part of Long Mountain, May 8, 1956, C. Hoff, 5♂, 4♀ (MCZ), 1 mi. W of junction of Red Hills and Spanishtown Roads, November 1957, A. M. Chickering, ♂ ♀ (MCZ). COSTA RICA: Guanacaste, 9 km. W of Bagoies at Palo Verde, 40 m. elevation, April 9, 1973, J. Wagner and J. Kethley, ♂ (FMNH). PANAMA. Barro Colorado Island, July 1969, J. Lawrence, T. Hlavac, ♀ (MCZ).

**NOTES:** The Costa Rican male is large (1.10 mm. long), has a larger conductor and may represent a new species. However, because of the long embolus and close resemblance to *cambridgei*, I include it here. Because of the difficulty of separating females of *M. cambridgei* and *M. sbordonii*, the Panama record is dubious, though suggested by biogeography.

*Matta sbordonii* (Brignoli), new combination  
Figures 33-36

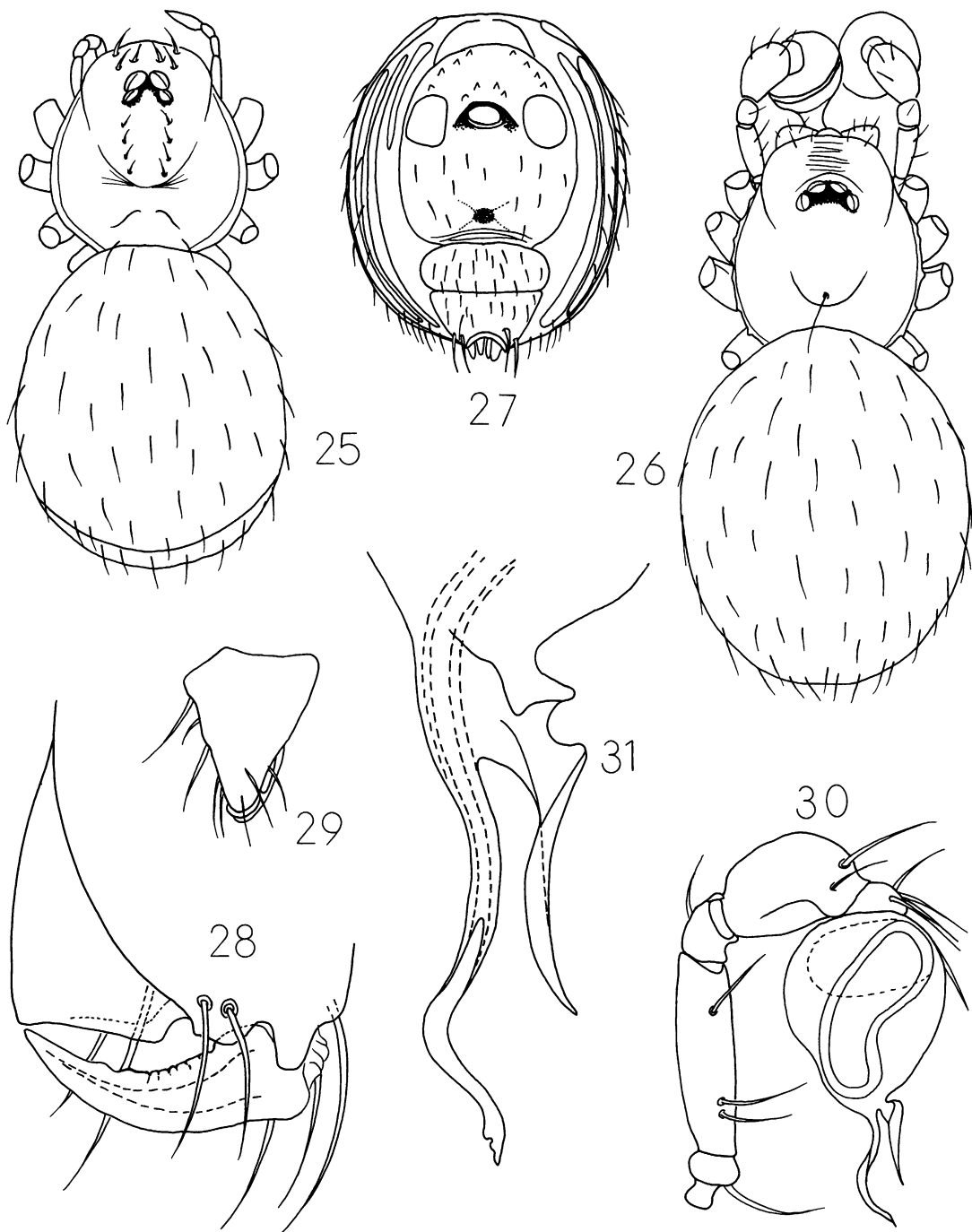
*Tetrablemma sbordonii* Brignoli, 1972b, p. 130-134, figs. 1-5.

**TYPE:** Male holotype from Cueva de Ojo de Agua de Tlilapan No. 1, Veracruz, Mexico, collected November 7, 1969 by V. Sbordoni, deposited in the Zoological Institute of the University of Rome, not seen.

**DIAGNOSIS:** *Matta sbordonii* is closely related to *M. cambridgei* but can be distinguished from that species by a comparison of the embolus and conductor (figs. 31, 35) of each. Eyeless populations of *M. sbordonii*, such as that found at the type locality, differ from *M. mckenziei* in showing a lesser degree of troglitic adaptation—they have shorter legs and are more darkly pigmented.

Brignoli (1972b) described the species in detail from the eyeless type; I have little to add from a study of topotypical specimens. There is surprisingly little variation in the genitalic characters of the species, considering its wide distribution. There is, however, variation in the form of the eyes, but this variation is dependent on habitat and does not reflect any geographic trend. The types come from an eyeless troglitic population; two populations with reduced lateral eyes (fig. 33) are found at Atoyac in Veracruz and near Chiapa, Chiapas.

**DISTRIBUTION:** MEXICO: *San Luis Potosi*: Tamazunchale, April 19, 1963, W. Gertsch, W. Ivie, ♀ (AMNH), El Pujal, April 4, 1942, 5♂ 4♀ (AMNH). *Tamaulipas*: Antigua Morelos, Berlese of sabal-thorn forest litter (B167), July 9, 1969, S. and J. Peck, 2♂ 3♀ (MCZ), La Cueva del Nacimiento del Rio Frio, 7 km. S of Gómez Farias, February 18, 1973, C. McConnell, ♂ (AMNH). *Hidalgo*: 6.7 mi. W of Chapulhuacan, Berlese of cloud forest litter,



FIGS. 25-31. *Matta cambridgei*. 25. Female, dorsal view. 26. Male, dorsal view. 27. Female abdomen, ventral view. 28. Female right chelicera, posterior view. 29. Male left chelicera, lateral view. 30. Male palpus, mesal view. 31. Embolus, mesal view.

August 16, 1969, S. and J. Peck, ♂ ♀ (MCZ). *Queretaro*: 25 mi. E of Landa de Matamoros, Berlese of sweet gum litter, July 14, 1969, S. and J. Peck, 2 ♀ (MCZ). *Oaxaca*: 15 mi. S of Valle Nacional, Berlese leaf litter (B204), elevation 4000 ft., May 21, 1971, S. Peck, 4 ♂ 4 ♀ (FMNH), 6 mi. S of Valle Nacional, Berlese leaf litter, 2000 ft. elevation, May 19, 1971, S. Peck, 4 ♂ 2 ♀ (FMNH), Cueva del Guyabo, 12 km. N of Valle Nacional, December 29, 1972, J. Reddell, D. McKenzie, S. Murphy, 3 ♀ (AMNH). *Campeche*: Campeche, July 5-6, 1951, L. Stannard, 3 ♂ 5 ♀ (AMNH). *Veracruz*: Atoyac, May 30, 1941, October 12, 1941, F. Bonet, 4 ♂ 5 ♀ (AMNH), Cordoba, Paraje Nueve, Nacimiento, Berlese of tropical evergreen forest litter (B176), August 7, 1969, S. and J. Peck, 3 ♂ 3 ♀ (MCZ), Volcan San Martin, elevation 3500 ft, July 14, 1953, C. Goodnight, 2 ♂ 5 ♀ (AMNH), Fortin des Flores, Canyon Rio Metlac, Berlese of evergreen tropical forest litter, August 5, 1969, S. and J. Peck, 2 ♂ ♀ (MCZ), Cueva de Ojo de Agua de Tlilipan, Tlilipan, August 4, 1967, J. Reddell, J. Fish, T. Evans, ♂ (AMNH), Cordoba, August 4, 1969, S. and J. Peck, 7 ♂ 9 ♀ (MCZ), 1.2 mi. S of Huatusco, 1344 m. elevation, Berlese of cloud forest litter, July 2, 1969, S. and J. Peck, 3 ♂ 7 ♀ (MCZ). *Yucatan*: 3 km. S of Calchetok, April 18, 1973, J. Reddell, ♂ (AMNH), ruins of Mayapan, August 14, 1973, J. Reddell, ♀ (AMNH), Actun Xpukil, sink entrance, March 18-19, 1973, J. Reddell, 2 ♀ (AMNH), Chichen Itza, August 8, 1973, J. Reddell, ♂ (AMNH), pyramid at Izamal, August 10, 1973, J. Reddell, ♀ (AMNH). *Chiapas*: Palenque, March 2-24, 1975, C. Alteri, 2 ♂ 3 ♀ (AMNH), hillside 5 mi. NE of Chiapa, August 22, 1966, J. and W. Ivie, ♂ (AMNH). GUATEMALA: "ex orchids," 2 ♂ 4 ♀ (CAS), from *Tycaste cruenta* plants in quarantine at San Francisco, April 1, 1944, ♂ (CAS).

***Matta mckenziei*, new species**

Figures 37-39

**TYPES:** Male holotype from Grutas de San Ignacio, Chencedro, 15 km. N of Bolochenticul, Campeche, Mexico, collected June 25, 1975 by D. McKenzie, A. Grubb, and R. W. Mitchell, Jr.; female paratype from Actun

Halmensura, 5 km. E of Cumpich, Campeche, Mexico, collected October 31, 1974 by D. McKenzie, J. Reddell and S. Wiley, both deposited in the American Museum of Natural History.

**ETYMOLOGY:** The species epithet honors David McKenzie.

**DIAGNOSIS:** Differs from the sympatric *M. sbordonii* in the form of the embolus and conductor (compare figs. 35 and 39) of the male palpus.

**MALE:** Total length, 1.15 mm. Carapace 0.51 mm. long, 0.42 mm. wide, translucent yellow, oval, moderately raised. No trace of eyes. Central seta and lateral row setae small. Chelicerae with very slight modifications (fig. 37), apophyses more obvious in dorsal view. Abdomen typical, translucent yellow, with scattered long setae; lung covers present, but no spiracle could be detected. Palpus (figs. 38, 39) with a large pyriform bulb bearing a short, curved embolus and a two-part conductor.

**FEMALE:** Total length, 1.23 mm. Carapace 0.51 mm. long, 0.38 mm. wide. Similar to male in all nonsexual characters. Female genital region like that of *M. cambridgei* (fig. 32).

**DISTRIBUTION:** Known only from the two type localities.

**NOTES:** This species is a highly adapted troglomite, with weak sclerotization and unusually long legs; the palpal conductor is so different from that of *M. sbordonii* as to suggest a long, separate history.

***Matta atoma*, new species**

Figures 40-46

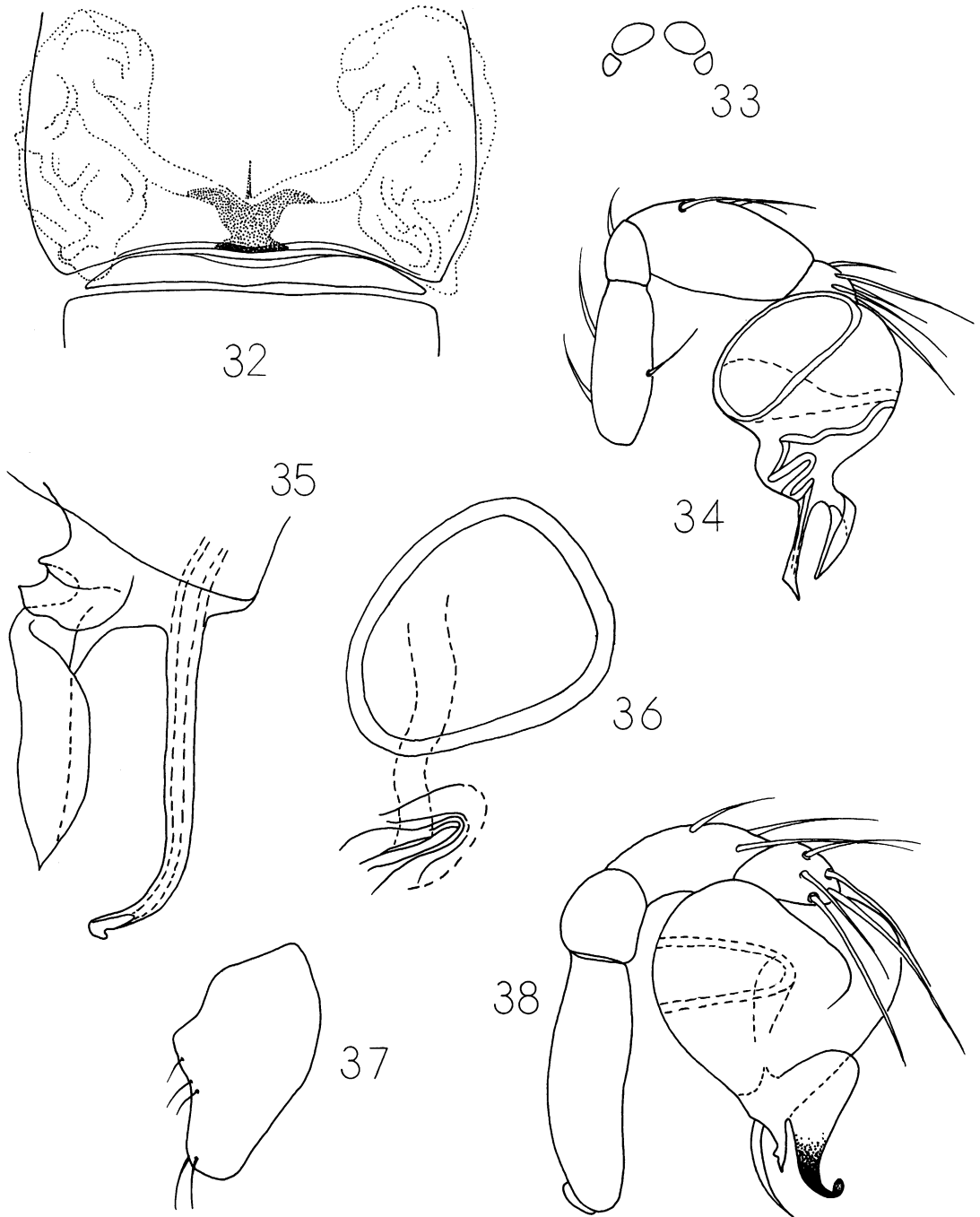
**TYPES:** Male holotype and six female paratypes from 2.5 mi. S of Belmopan, Belize, collected August 4, 1972, by S. and J. Peck, deposited in the Canadian National Collection. Eight male and many female paratypes are in the collection of the Field Museum of Natural History, Chicago.

**ETYMOLOGY:** The species epithet refers to the small size of the species.

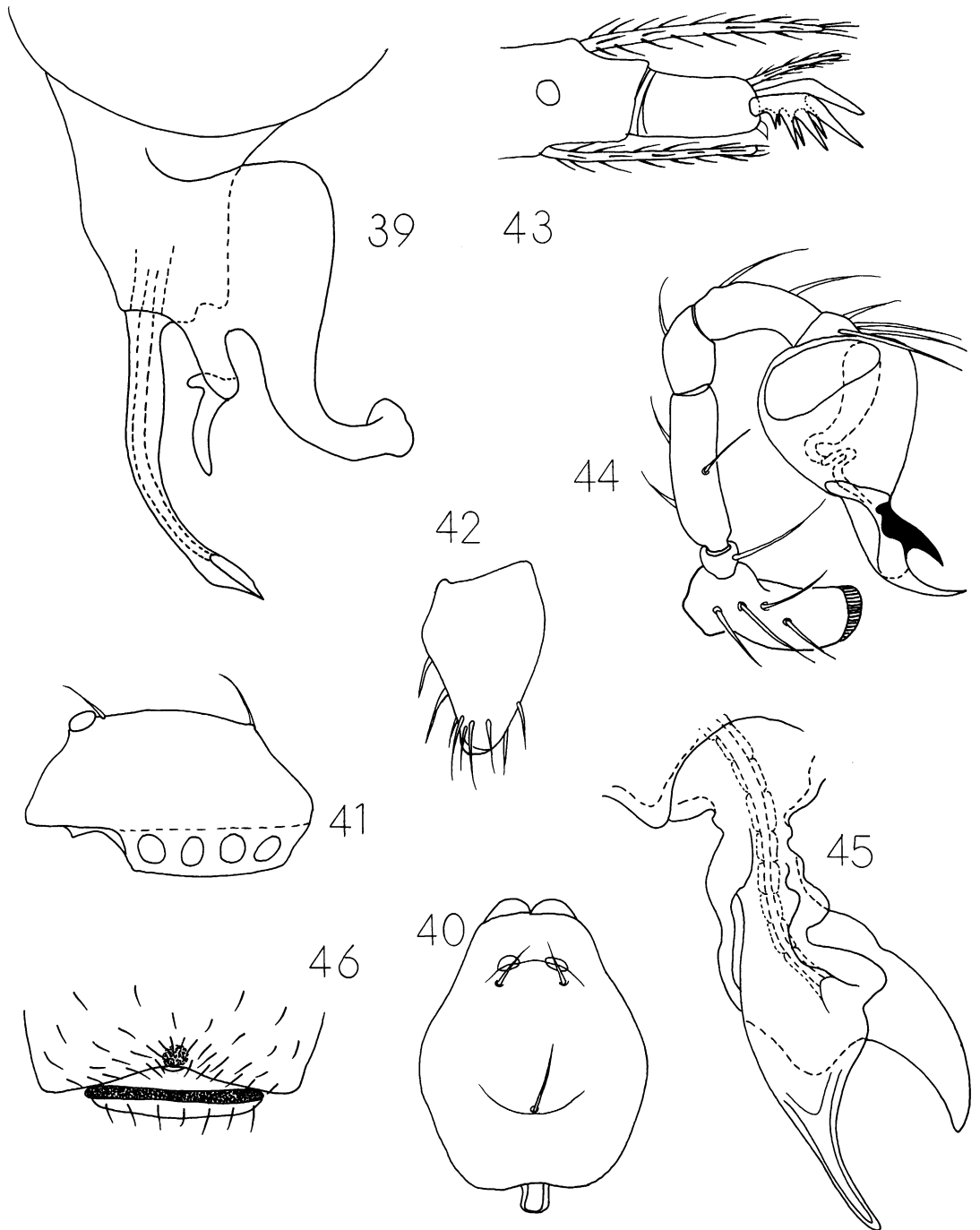
**DIAGNOSIS:** *Matta hambletoni* also has two eyes, but in *M. atoma* they are much closer together.

**MALE:** Total length, 0.94 mm. Carapace 0.39 mm. long, 0.31 mm. wide, orange, oval, cuticle slightly roughened; domed, widest op-





FIGS. 32-38. *Matta* spp. 32. Female genitalia of *M. cambridgei*, ventral view. 33-36. *M. sbordonii*. 33. Eyes of specimen from near Tuxtla Gutierrez, dorsal view (anterior above). 34. Left male palpus, mesal view. 35. Embolus, lateral view. 36. Spiracle and lung cover, ventrolateral view (anterior above). 37, 38. *M. mckenziei*. 37. Male left chelicera, lateral view. 38. Left male palpus, mesal view.



FIGS. 39-46. *Matta* spp. 39. Embolus of *M. mckenziei*, mesal view. 40-46. *M. atoma*. 40. Male carapace, dorsal view. 41. Male carapace, lateral view. 42. Male left chelicera, lateral view. 43. Tip of fourth leg, lateral view. 44. Male right palpus, lateral view. 45. Embolus, lateral view. 46. Female genitalia, ventral view.

posite second coxae, posterior declivity quite steep (figs. 40, 41). Eyes two, separated by one diameter, eye area 0.10 mm. wide; one seta just posterior to each eye. Central seta about the same size as eye setae, lateral row setae not observed. Chelicerae not obviously modified (fig. 42), but slightly expanded anterobasally. Abdomen orange, typical; spiracular opening rather large and displaced dorsoposteriorly of lung plate margin. Palpus (figs. 44, 45) typical of genus, but expansion of tibia suppressed; bulb pyriform, embolus and conductor large.

**FEMALE:** Total length, 0.96 mm. Carapace 0.37 mm. long, 0.31 mm. wide; eye area 0.12 mm. wide. Similar to male in all nonsexual characters, carapace only slightly lower. Female genital region as in figure 46.

**DISTRIBUTION:** Known only from the type locality.

#### MONOBLEMMMA GERTSCH

*Monoblemma* Gertsch, 1941, p. 8 (type species, *M. unicum* Gertsch by original designation).  
*Paculla*, Brignoli, 1974, p. 189 (not of Simon, 1887; only *P. thorelli* Brignoli).

**DIAGNOSIS:** The embolus is longer and thinner than is usual in *Tetrablemma* and *Cuan-goblemma* species; the eyes of the males are never modified and are situated at the front of the carapace. Males of *Matta* have a palpal conductor.

**DESCRIPTION:** With the characters of the family, and in addition: eyes six, four or one; carapace of male only moderately raised, carapace of female slightly less so. Eyes of male at front of raised region. Central seta of carapace similar to lateral row setae. Clypeus with one or two pairs of setae. Male chelicerae not modified, or with short, curving frontal apophyses. Bulb of the male palpus pyriform, embolus long, thin, straight or very slightly curved. Female genitalia similar in form to those found in species of *Matta*.

**DISTRIBUTION:** Panama, Colombia, Virgin Islands, west Africa, and Madagascar.

**NOTES:** Gertsch's original proposal of *Monoblemma* (Gertsch, 1941) was evidently based on the single eye present in the holotype of *M. unicum*; the name is retained here to cover a group of species presenting a combination of

characters excluding them from both *Matta* and *Tetrablemma*. *Monoblemma muchmorei*, with its minute size and typical embolus, is obviously close to *M. unicum*. The inclusion of the African species described as *Paculla thorelli* by Brignoli (1974) will be more controversial, as will that of a new species from Madagascar, *M. browni*. But the four species show a concordance of characters that cannot be ignored; all have a long, thin, straight embolus, eyes at the front of the carapace, and chelicerae with slight modifications or none (in the males). The embolus of *M. thorelli* is shorter than that of any other species in the group, but I do not believe that this warrants a monotypic genus for it, and as a tetrablemmid it cannot stay in *Paculla*.

#### KEY TO SPECIES

1. Six eyes ..... *thorelli* (Brignoli)  
Four eyes, or one median eye..... 2
2. One median eye ..... *unicum* Gertsch  
Four eyes ..... 3
3. Embolus about half as long as bulb (fig. 55);  
Colombia and U.S. Virgin Islands .....  
..... *muchmorei*, new species  
Embolus about as long as bulb; Madagascar  
..... *browni*, new species

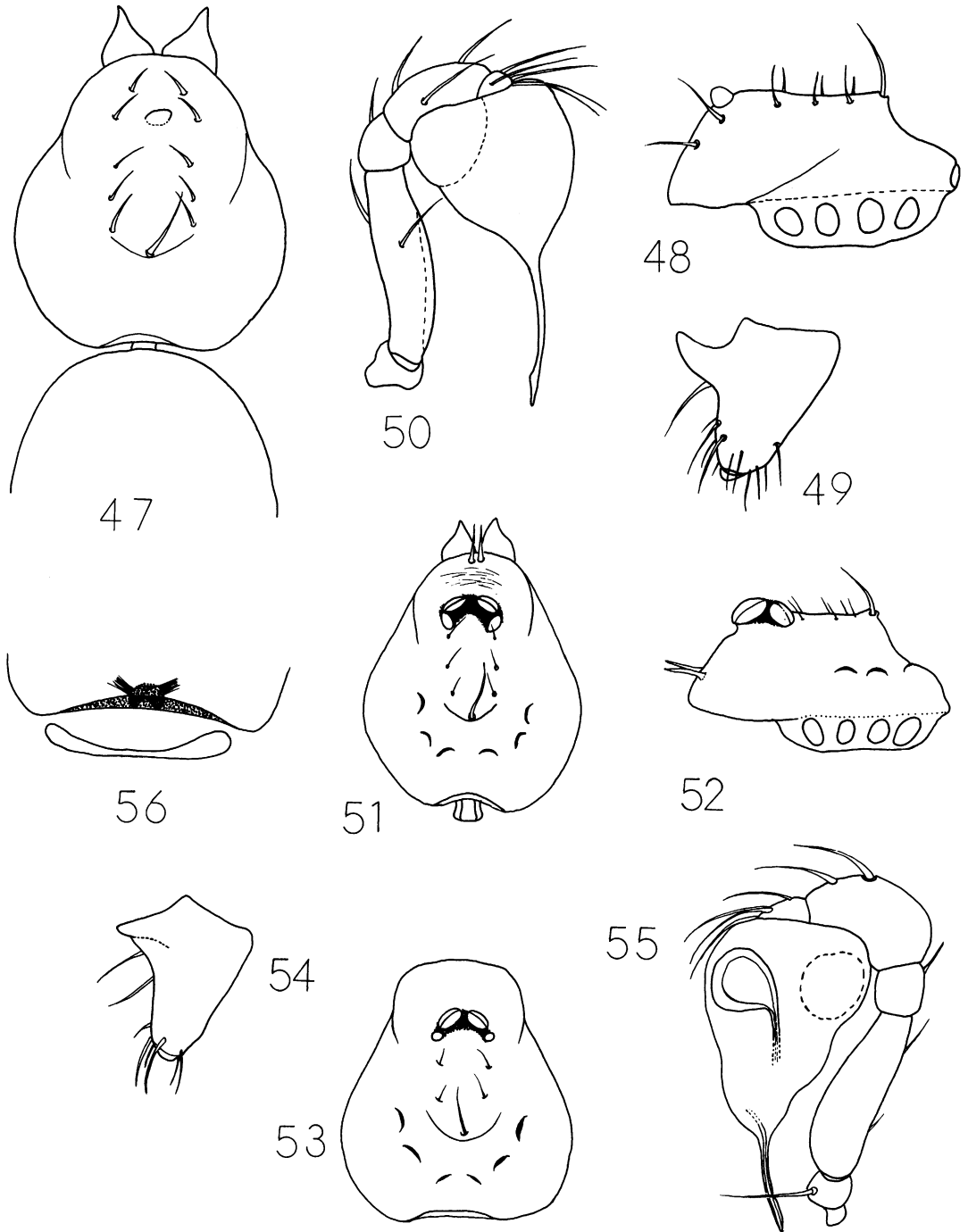
#### *Monoblemma unicum* Gertsch Figures 47-50

*Monoblemma unica* Gertsch, 1941, p. 10, figs. 9-12.

**TYPES:** Male holotype from Barro Colorado Island, Canal Zone, Panama, collected July 9, 1938 by E. G. Williams, Jr., deposited in the American Museum of Natural History, examined.

**DIAGNOSIS:** No other known species of spider has a single median eye.

**DESCRIPTION:** Gertsch's excellent description needs little supplementary material; my measurements of the type matched his almost exactly (total length, 0.08-0.81 mm., carapace 0.35 mm. long, 0.30 mm. wide). The single median eye (fig. 47) is irregular, slightly protruding (fig. 48) and about 0.01 mm. in width. The central seta is only a little larger than the lateral row setae (three of these on each side), and there are two pairs of setae on the clypeus, with the posterior pair just below the eye. The



FIGS. 47-56. *Monoblemma* spp. 47-50. *M. unicum*. 47. Male carapace, dorsal view. 48. Male carapace, lateral view. 49. Male left chelicera, lateral view. 50. Male right palpus, lateral view. 51-56. *M. muchmorei*. 51. Male carapace, dorsal view. 52. Male carapace, lateral view. 53. Female carapace, dorsal view. 54. Male left chelicera, lateral view. 55. Male right palpus, mesal view. 56. Female genitalia, ventral view.

palpus is as in figure 50, the chelicera as in figure 49. The perigenital and anterior plates are absent from the abdomen. The sclerotized parts of the animal are medium yellow, whereas the bulb of the palpus is pure white, presenting a strong contrast.

**FEMALE:** Not collected.

**DISTRIBUTION:** Known only from the type locality.

**NOTE:** I changed the spelling of the specific epithet to agree with the gender of the generic name.

*Monoblemma thorelli* (Brignoli)

*Paculla thorelli* Brignoli, 1974, p. 189, figs. 36, 37, 40, 43, 44.

**TYPES:** Male holotype, male and female paratypes from Dundo, Angola, collected February 25, 1948, by A. de Barros Machado, deposited in Museu do Dundo, Lisbon, not examined.

**NOTES:** Brignoli's description of the species, based on numbers of specimens, would be difficult to improve upon. I place the species here because the eyes are at the front of the carapace, and the embolus is thin, though curved and rather short. This, however, could simply represent part of a transformation series leading in the direction of *Tetrablemma* species, whereas the lack of cheliceral modifications suggests *Matta*.

**DISTRIBUTION:** In addition to the localities given by Brignoli (1974): TANZANIA: 13 mi. S of Babati, 1550 m. elevation, November 18, 1957, E. S. Ross and R. E. Leech, ♀ (CAS).

***Monoblemma muchmorei*, new species**

Figures 51-56

**TYPES:** Male holotype and female paratype from St. John, U. S. Virgin Islands, collected June 6, 1974 by W. Muchmore, deposited in the American Museum of Natural History.

**ETYMOLOGY:** The specific epithet honors the collector, an internationally known authority on pseudoscorpions.

**MALE:** Total length, 0.94 mm. Carapace 0.39 mm. long, 0.34 mm. wide, oval, bright orange, raised about 50 percent of the carapace length in the cephalic area (fig. 52), cuticle smooth and shining. Eyes four, at anterior edge

of raised area, anterior eyes touching each other and the lateral eye of each side, but forming a sharply recurved row 0.13 mm. wide (fig. 51). Central seta slightly larger than those of the lateral rows, three setae in each lateral row, clypeus with a prominent pair of large setae. Thoracic region of carapace with three pairs of distinct crescentic dimples. Chelicerae as in figures 51 and 54. Abdomen bright orange, perigenital plates small, oval, other plates typical of the family. Palpus (fig. 55) with femur slightly swollen at base, tibia considerably enlarged, bulb pyriform, embolus about half the length of the bulb, straight and thin.

**FEMALE:** Total length, 1.06 mm. Carapace 0.44 mm. long, 0.36 mm. wide, eye row 0.13 mm. wide. Nonsexual characters as in male. Female genital region as in figure 56.

**DISTRIBUTION:** *Virgin Islands:* Little Thatch Island, August 16, 1965, Island Project Staff, University of Puerto Rico (IPS/UPR), prosoma of ♂, Angelica Rock off Cooper Island, May 26, 1966, IPS/UPR, ♀. *COLOMBIA:* *Meta:* Villavincencio, elevation 500 m., March 1-4, 1972, 3♂ 10♀ (FMNH).

**NOTES.** The specimens from Colombia are comparable in all respects to the Virgin Islands forms, except that the males have slightly smaller cheliceral apophyses, suggesting a tendency toward their reduction, leading in the direction of *Matta* species. The types came from Berlese sampling at the base of *Anthuriums* in a garden, the Colombian material from a Berlese sample of forest litter.

***Monoblemma browni*, new species**

Figures 57-61

**TYPE:** Male holotype from Périnet, Madagascar, collected March, 1969, by W. L. Brown, deposited in the American Museum of Natural History.

**ETYMOLOGY:** The specific epithet honors the collector, a prominent entomologist and an authority on ants.

**MALE:** Total length, 1.33 mm. Carapace 0.58 mm. long, 0.44 mm. wide, dark orange-brown, round-oval, cuticle minutely but obviously and regularly roughened, cephalic area raised as in figure 58. Eyes four, in a curved row 0.14 mm. wide at anterior margin of raised



area (figs. 57, 58), lateral eyes about one-half diameter of median eyes, median eyes separated by about a radius of one of them. Central seta and lateral row setae not observed, but clypeus with a prominent pair of setae (fig. 57). Chelicera (fig. 59) with a moderately long, upward curving apophysis. Abdomen dark orange, typical, but anterior plate broken up on its posterior part (which extends ventral to  $I_3$ ) into a series of small plaques, each with a single seta. Palpus (fig. 60) with an enlarged tibia, bulb pyriform, embolus long and thin.

FEMALES: Not collected.

NOTES. They type was taken from rain forest leaf litter. Unlike the preceding species, this one has quite a large cheliceral apophysis, while retaining the typical long embolus of the American forms.

CUANGOBLEMMMA BRIGNOLI

*Cuangoblemma* Brignoli, 1974, p. 185 (type species *C. machadoi* Brignoli, by original designation).

DIAGNOSIS: As illustrated by Brignoli (1974), all segments of the male palpus are short and stout, the tibia being about equal to the femur in length and bulk; the bulb is pyriform and the embolus rather heavy and sharply curved. Ocular modifications in the males, with some of the eyes protruding and hornlike, suggest *Ablemma*, particularly the six-eyed species. The chelicerae have long apophyses.

INCLUDED SPECIES: *Cuangoblemma machadoi* Brignoli, *C. astaroth* Brignoli.

DISTRIBUTION. West Africa.

NOTES: This genus seems most closely related to *Tetrablemma* within its own subfamily, but the palpal embolus and the peculiar eyes recall *Ablemma* species of the Brignoliellinae. But *Ablemma* females have the female genitalia opening through the margin of the pulmonary plate, not behind it, as in the present genus. Because Brignoli's treatment of the genus (Brignoli, 1974) was exhaustive, I did not examine specimens.

SUBFAMILY BRIGNOLIPELLINAE, NEW

DIAGNOSIS: With the characteristics of the family, and in addition: female genitalia open-

ing through a pore in the posterior margin of the pulmonary plate (figs. 71, 87). Bulb of male palpus sometimes a flattened spheroid. Ventral plates, but not always including the sternum, usually with regular, round punctations (fig. 73). Carapace sometimes with surface teeth (fig. 64)

TYPE GENUS: *Brignoliella* Shear.

INCLUDED GENERA: *Brignoliella*, *Fallemma*, *Ablemma*, *Singaporemma*.

NOTES: This subfamily is established for a group of genera around *Brignoliella*, all of which are found in southeast Asia and Oceania. *Brignoliella* species retain a number of conservative characters suggesting close affinity to *Paculla*; compare the descriptions of these two genera. However, peripheral species like *B. martensi* have lost some of these characters, which are further reduced in number in *Fallemma castanea*. *Ablemma* species appear more like Tetrablemmineae, but still have the diagnostic form of the female genitalia, while *Singaporemma singularis*, with its unique male palpus, suggests a line of development away from the tetrablemmineae.

KEY TO GENERA

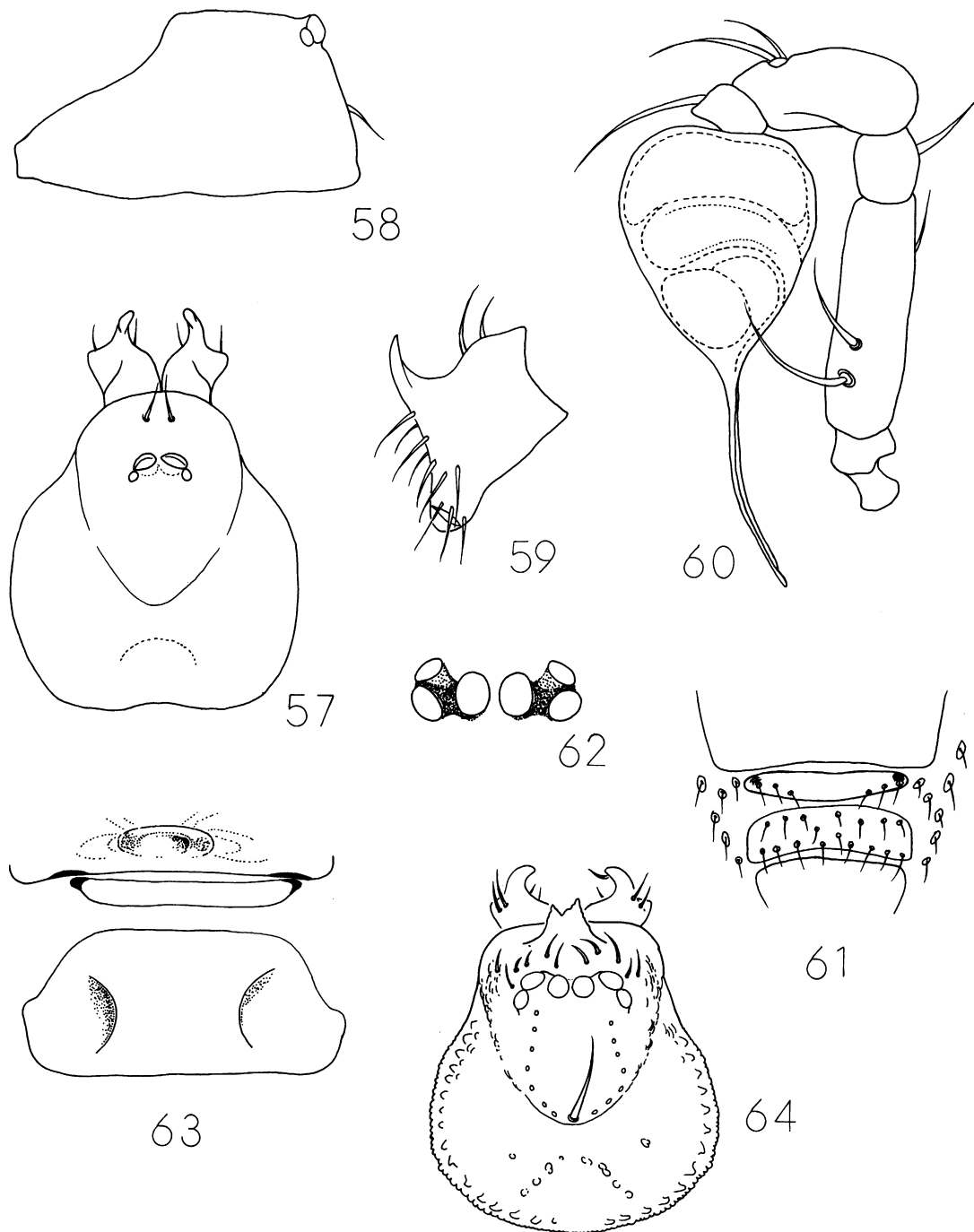
1. Sternum with regular round punctations (fig. 73), carapace with surface teeth (fig. 64), bulb of male palpus spheroidal (fig. 66) ..... *Brignoliella*  
Sternum smooth, carapace without teeth, bulb of palpus of male pyriform ..... 2
2. Eyes six, in a transverse recurved row (fig. 77). 3  
Eyes two, four, or absent, or if six, in a compact group ..... *Ablemma*
3. Embolus of male palpus arising at distal end of bulb ..... *Fallemma*  
Embolus of male palpus arising at side of bulb ..... *Singaporemma*

BRIGNOLIELLA, NEW NAME

*Polyaspis* Simon, 1889, p. 244-245 (type species, *P. acuminata* by original designation; name preoccupied in Acarina, Berlese, 1882). Bonnet, 1958, p. 3750.

*Paculla* Simon, 1893, p. 323-324 (in part). Roewer, 1963b, p. 127. Brignoli, 1972a, p. 95.

ETYMOLOGY: The new name of this genus honors Dr. P. M. Brignoli, recognizing his



FIGS. 57-64. *Monoblemma* and *Brignoliella* spp. 57-61. *M. browni*. 57. Male carapace, dorsal view. 58. Male carapace, lateral view. 59. Male left chelicera, lateral view. 60. Male right palpus, mesal view. 61. Portion of ventral abdominal plates of male, ventral view. 62, 63. *B. acuminata*. 62. Female eyes, anterior view. 63. Female genitalia, ventral view. 64. Male carapace of *B. quadricornis*, dorsal view.

work in this group of spiders. It should be considered feminine in gender.

**DIAGNOSIS:** The bulb of the male palpus is a flattened spheroid (fig. 66), not pyriform as in *Fallablemma*; *Singaporemma* and *Ablemma* species lack the round punctations of the sternum.

**DESCRIPTION:** With the characters of the subfamily, and in addition: eyes six, in a recurved row of three dyads. Carapace moderately raised, eyes at anterior margin of raised part, cuticle with characteristic modifications including marginal teeth (fig. 64) and scattered nodules (fig. 72). Male palp with tibia nearly as long as femur, bulb flattened, subspherical (figs. 66, 70), embolus stout, moderately long, conductor absent. Male chelicerae with anterior apophyses large (fig. 65) or small (fig. 69), male clypeus setose, with a strong projection divided at the apex (fig. 64). Ventral plates of abdomen and sternum with characteristic circular punctations (fig. 73), each bearing a seta. Female genitalia opening in a depressed oval (fig. 71) in the posterior margin of the pulmonary plate. Preanal plate of females with lateral deep depressions (figs. 63, 67, 71, 74, 76).

**DISTRIBUTION:** Philippine Islands, New Caledonia, Sri Lanka, Micronesia, Borneo, Nepal.

**NOTES:** Species of this genus have been confused with species of *Paculla* and have been used by Simon (1893), Roewer (1963b) and Brignoli (1972a) to define *Paculla*. Actually, the latter genus, as conceived of by Thorell (his concept should be followed since Simon merely proposed *Paculla* as a new name to replace the original preoccupied *Phaedima*) is quite different; see the description of *Paculla* given later.

The presence of *B. martensi* in Nepal is another interesting example of the faunal connections between the Himalayan region and tropical southeast Asia (Martens, 1977).

It would be premature to present a key to species, since I have not been able to examine specimens of all the species described by Simon, who did not provide illustrations for most of them.

The most interesting characters of this genus are the round punctations of the sternum, which appear to be diagnostic for both sexes, and the unique depressions found on the preanal plates

of the females. It is tempting to think these depressions have something to do with mating behavior, as do the pits found on the heads of many erigonine spiders. In addition, the moderate body size and the form of the bulb of the male palpus relate the genus somewhat to *Paculla*, providing a link between the two families considered in this paper.

*Brignoliella acuminata* (Simon)

Figures 62, 63

*Polyaspis acuminata* Simon, 1889, p. 245.

*Paculla acuminata*: Simon, 1893, p. 26. Bonnet, 1958, p. 3296.

**TYPES:** Female holotype from Nouméa, New Caledonia, deposited in Musée National d'Histoire Naturelle, Paris, examined.

**DIAGNOSIS:** A medium-sized species of *Brignoliella* with a preanal plate longer than that of *B. sarawak*, and with somewhat suppressed depressions (fig. 63)

**FEMALE:** Total length, about 1.63 mm. Unfortunately, the type and only specimen is badly mangled, making measurements of the carapace impossible. The deep, round punctations of the sternum and depressions in the preanal plate place this species in *Brignoliella*.

**DISTRIBUTION:** Known only from the type locality.

*Brignoliella bicornis* (Simon)

*Paculla bicornis* Simon, 1893, p. 26. Bonnet, 1958, p. 3297.

**TYPES:** Male holotype and female paratype from Manila, Philippine Islands, deposited in Musée National d'Histoire Naturelle, Paris.

Unfortunately, I was unable to borrow the type specimens, which were on extended loan to another taxonomist, but Simon's description clearly marks this species as belonging in *Brignoliella*. The length is given as 2.5 mm. for both sexes (Simon, 1893).

*Brignoliella scrobiculata* (Simon)

*Paculla scrobiculata* Simon, 1893, p. 26. Bonnet, 1958, p. 3297.

**TYPES:** Female holotype from Cottowa, Sri Lanka, deposited in Musée National d'Histoire Naturelle, Paris.

Again, I was not able to borrow the type specimen. The female is 3.5 mm. long (Simon, 1893).

*Brignoliella quadricornis* (Roewer)  
Figures 64-67

*Paculla quadricornis* Roewer, 1963b, p. 127-129, figs. 9a-d.

**TYPES:** Male holotype and female paratype from Kusai Island, Caroline Islands, collected April 1953, by J. Clarke, deposited in National Museum of Natural History, Smithsonian Institution (but presently in the Bernice P. Bishop Museum, Honolulu), examined.

**DIAGNOSIS:** Closet to *B. beattyi*, but different in that the male of this species has more highly modified chelicerae (figs. 64-65), and the depressions on the preanal plate of the female are more widely separated (fig. 67).

**MALE:** Total length, 1.19 mm. Carapace 0.54 mm. long, 0.45 mm. wide, round-oval, narrowed in front, dark orange; cephalic area raised about 45 percent of carapace length (fig. 65), rather domed, not flat on top. Carapace cuticle shining but for marginal and submarginal rows of procurved denticles and two rows of tubercles on the posterior declivity (fig. 64), central seta larger than lateral row setae. Eyes six, in a recurved transverse row 0.21 mm. wide, subequal in size. Clypeus with procumbent setae and prominent divided horn. Chelicerae with inward-curving frontal apophyses. Abdomen dark orange, soft cuticle yellow. Anterior plate short, breaking up posteriorly into small plaques; perigenital plate as a few small scattered plaques; all ventral sclerites with round punctations. Palpus (fig. 66) with tibia enlarged and curved, bulb round, flattened, embolus straight.

**FEMALE:** Total length, 1.23 mm. Carapace 0.58 mm. long, 0.46 mm. wide. Eye row 0.20 mm. wide. Nonsexual characters as in male, except as follows: carapace not so raised, marginal denticles larger, more strongly procurved, cuticle entirely smooth. Female genital region as in figure 67.

**DISTRIBUTION:** Roewer (1963b) recorded this species from Kusai, Truk, Yap, Ponape and Palau in the Caroline Islands, and from Taka

and Watwertok in the Marshall Islands. I have seen the following new records, all collections by J. A. Beatty and J. W. Berry. **CAROLINE ISLANDS: Yap Island Group:** Yap Is., woodland litter on road to Fanif, May 31, 1973, 2♂ 2♀, juvs., Giliman Pt., litter in undergrowth in coconut grove, May 29, 1973, ♀, Colonia, on hill behind Protestant Mission, May 31, 1973, 2♀. **Gagil-Tomil Islands:** Litter from mixed forest, May 30, 1973, ♂. The deposition of these specimens has not been settled; at present they are in the care of J. A. Beatty, Carbondale, Illinois.

*Brignoliella beattyi*, new species  
Figures 68-71

**TYPES:** Male holotype, three male paratypes and one female paratype from Arakabesan Island, Palau Island Group, Caroline Islands, collected from litter in a dry tropical forest at an elevation of 374 ft., March 1, 1973, by J. A. Beatty and J. W. Berry, deposited in Bernice P. Bishop Museum, Honolulu.

**ETYMOLOGY:** The specific epithet honors my friend J. A. Beatty of Southern Illinois University, Carbondale, Illinois.

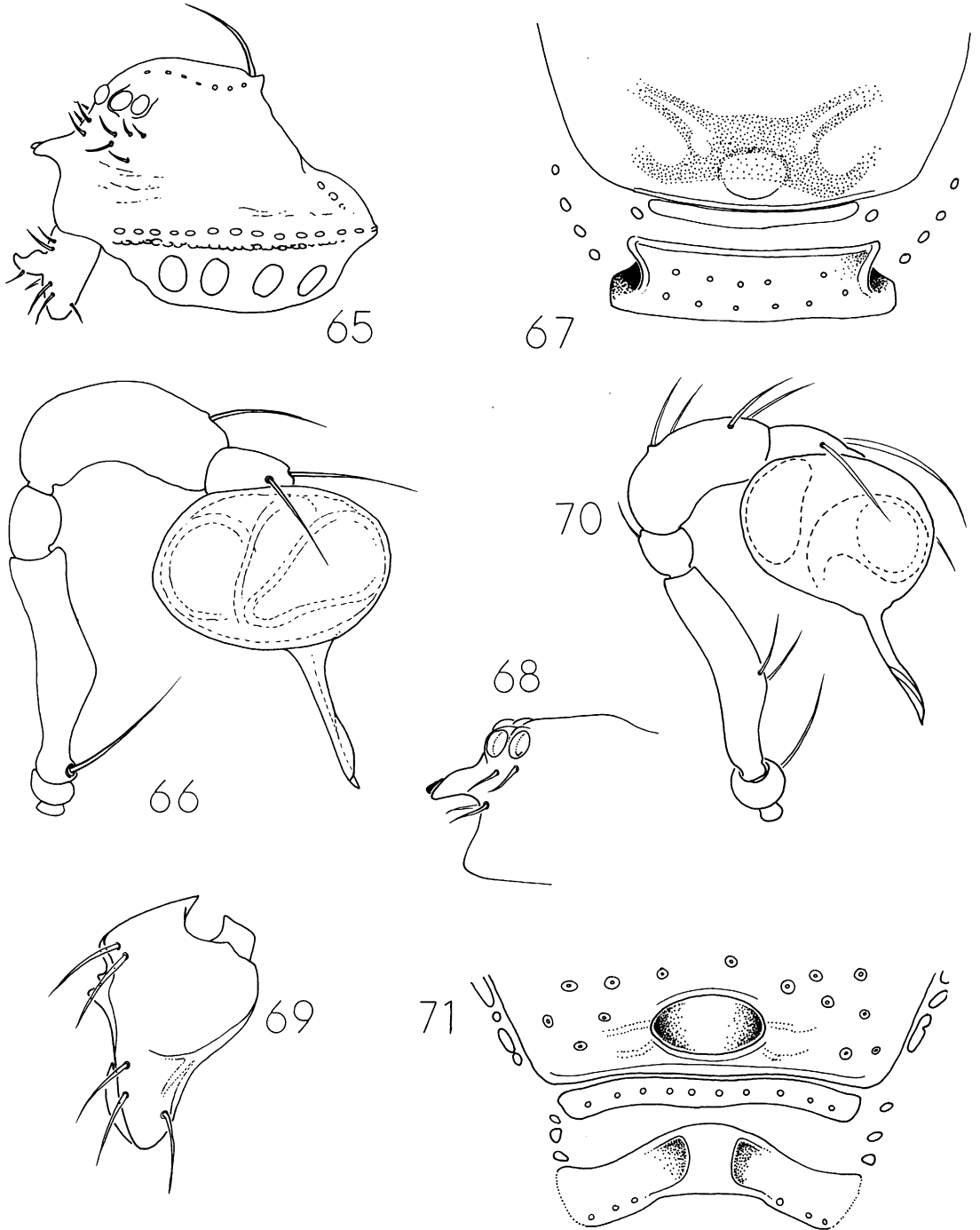
**DIAGNOSIS:** Close to *B. quadricornis*, but the males of the present species lack strongly modified chelicerae (fig. 69); the females have the depressions of the preanal plate close together (fig. 71).

**MALE:** Total length, 1.15 mm. Carapace 0.54 mm. long, 0.43 mm. wide. Nearly identical in general form to *B. quadricornis*, but marginal teeth of the carapace more strongly curved, eye row 0.20 mm. wide. Cheliceral apophyses very much reduced (fig. 69). Anterior plate of abdomen extends farther posteriorly than in *quadricornis*, nearly to margin of pulmonary plate before breaking up into small plaques; perigenital plates small, single plaques. Palpus as in figure 70.

**FEMALE:** Total length, 1.19 mm. Carapace 0.53 mm. long, 0.43 mm. wide, eye row 0.20 mm. wide. Similar to male in all nonsexual characteristics. Genital region as in figure 71.

**DISTRIBUTION:** Known only from the type locality.

**NOTE:** *Ablemma berryi* was taken on this same island, but at a lower elevation (20 ft.).



FIGS. 65-71. *Brignoliella* spp. 65-67. *B. quadricornis*. 65. Male carapace, lateral view. 66. Male left palp, mesal view. 67. Female genitalia, ventral view. 68-71. *B. beattyi*. 68. Anterior part of male carapace, lateral view. 69. Male left chelicera, lateral view. 70. Male left palp, mesal view. 71. Female genitalia, ventral view.



**Brignoliella sarawak**, new species

Figures 72-75

**TYPES:** Female holotype and female paratype from 40 miles upstream from Kapit on the Baleh River, Sarawak, Borneo, collected June 25, 1976 by W. Sedgwick, deposited in the American Museum of Natural History.

**ETYMOLOGY:** The specific epithet is a noun in apposition, the name of the country in which the types were collected.

**DIAGNOSIS:** Known only from females, but distinct from all other species examined in the greater length of the preanal plate (fig. 74) and in the prominent lunules of the carapace (fig. 72).

**FEMALE:** Total length, 1.36 mm. Carapace 0.64 mm. long, 0.53 mm. wide, dark orange, cuticle generally smooth but for prominent raised lunules with setal sockets anterior to them (fig. 72) forming the lateral setal rows and clypeal setation; groups of lunules on thoracic part of carapace do not subtend setae. Marginal teeth of carapace squarish, not sharp and procurved. Central seta larger than lateral row setae. Eyes six in recurved row 0.26 mm. wide, anterior lateral eyes of each side the largest. Abdomen dark orange, typical; anterior plate extends from anterior to  $l_1$  to posterior edge of pulmonary plate; perigenital plates absent. Genital region as in figure 74, internal genitalia nearly all membranous, genital pore a prominent raised oval (fig. 75).

**DISTRIBUTION:** Known only from the type locality.

**NOTE:** *Ablemma sedgwicki* was taken at the same locality.

*Brignoliella martensi* (Brignoli)

Figure 76

*Paculla martensi* Brignoli, 1972a, pp. 95-98, figs. 1-7.

**TYPE:** Female holotype from oak humus, 2500-2730 m. elevation on Mt. Pulchoki, Kathmandu, Nepal, collected August 9, 1970 by J. Martens, deposited in Senckenberg Museum, Frankfurt, examined.

**DIAGNOSIS:** A very small species of *Brignoliella* (1 mm., total length) with a long preanal plate somewhat as in *B. sarawak* and *B.*

*acuminata*, but with the depressions of the plate not extending the full length, and with strongly projecting medial rims (fig. 76).

**NOTES:** Brignoli's description (Brignoli, 1972a) is good, but he did not clearly depict the female genitalia, so I provide a new illustration here (fig. 76). The opening of the female genital pore is strongly projecting with a definite rim, and the depressions in the preanal plate are nearly in the form of sockets, with heavy, well-defined medial rims.

The species reaffirms the faunal connections between the Himalayas and southeast Asia as noted by Martens (1977) and others. This fauna may predate the collision of India with Asia, which caused the Himalayan uplift. The small size and unusual genitalia suggest that *B. martensi* is peripheral to the genus morphologically as well as geographically.

**FALLABLEMMA**, NEW GENUS

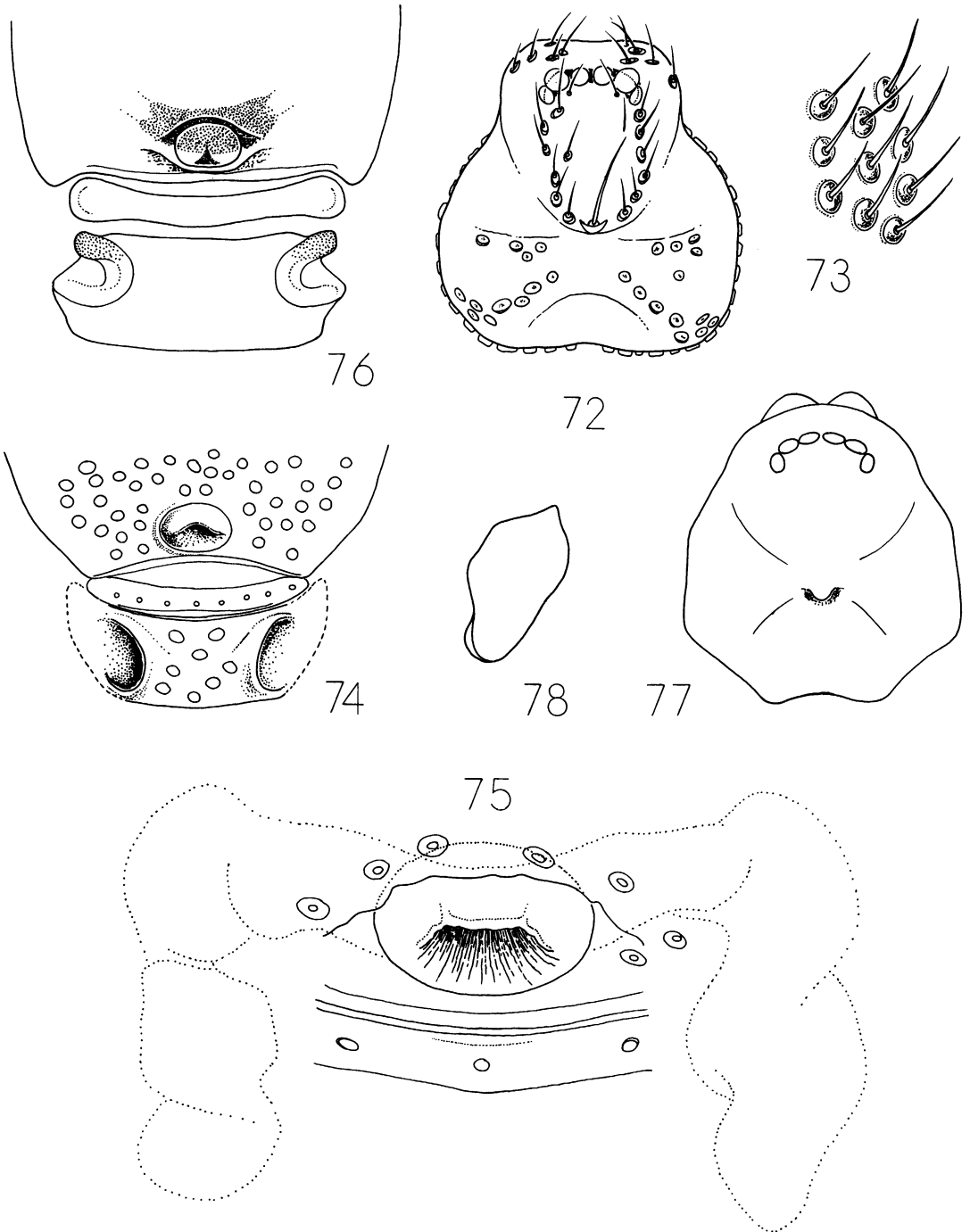
*Hexablemma*, Marples, 1955, pp. 460-462 (not Berland, 1920).

**TYPE SPECIES:** *Hexablemma castaneum* Marples.

**ETYMOLOGY:** From the Latin *fallax*, false, with the combining stem *-blemma*, suggesting the mistaken placement of the type species. The gender is neuter.

**DIAGNOSIS:** The six eyes of the only known species are arranged in a recurved transverse row. The sternum lacks the characteristic round punctations of *Brignoliella*, and the embolus of the male palpus is terminal, not lateral as in *Singaporemma*.

**DESCRIPTION:** With the characteristics of the subfamily and in addition: eyes six, arranged in a recurved transverse row (fig. 77). Carapace very slightly raised in males, eyes at anterior edge of raised part; cuticle of carapace smooth to slightly roughened, without marginal or surface teeth, or lunules. Male palpus with tibia and femur nearly the same length (fig. 79), bulb pyriform, embolus short, curved (fig. 80). Ventral plates of abdomen with round punctations, but such punctations absent from sternum. Male chelicerae only very slightly modified (fig. 78). Female genitalia opening through the margin of the pulmonary plate.



FIGS. 72-78. *Brignoliella* and *Fallablemma* spp. 72-75. *B. sarawak*. 72. Female carapace, dorsal view. 73. Sternal punctures, ventral view. 74. Female genitalia, uncleaned, ventral view. 75. Female genitalia, cleared in clove oil, ventral view. 76. Female genitalia of *B. martensi*, ventral view. 77, 78. *F. castaneum*. 77. Male carapace, dorsal view. 78. Male left chelicera, lateral view.

Prenal plate of female without lateral depressions.

**DISTRIBUTION:** Samoa.

**NOTES:** Originally described in *Hexablemma* because of the six eyes, this species is not congeneric with *H. cataphractum* of Africa, a tetrablemmine now placed in *Tetrablemma*. Therefore a new name is required for it, as it cannot be placed in any of the other brignolielline genera. Forms combining the characteristics of *Brignoliella* and *Fallablemma* may eventually be discovered.

*Fallablemma castaneum* (Marples)

Figures 77-80

*Hexablemma castanea* Marples, 1955, pp. 460-462, figs. 1, 2, 17.

**TYPES:** Marples did not formally designate any of the several specimens he studied as types (Marples, 1955). I could not at first track down the specimens, but learned (J. A. Beatty, personal commun.) after this manuscript had been finished that they are in the British Museum. If these specimens include some labeled by Marples as types, the type locality will have been fixed.

**ETYMOLOGY:** The spelling of the specific epithet has been changed to conform to the gender of the generic name.

**NOTES:** My study was based on specimens from Upolu, Samoa, collected from mosses and epiphytic ferns in a rain forest by T. E. Woodward, January 19, 1956, and deposited in the Otago Museum, Dunedin, New Zealand. I illustrate the carapace of a male (fig. 77), the male chelicera (fig. 78) and the palpus (figs. 79, 80). The scanning electron micrographs are published here through the courtesy of Dr. Ray Forster.

I found Marples's description to be essentially accurate, except that he observed the female genitalia as opening through a "notch" in the pulmonary plate, whereas my study of the females definitely showed a posteriorly closed pore.

**DISTRIBUTION:** Samoa.

*ABLEMMA* ROEWER

*Ablemma* Roewer, 1963a, p. 228 (type species, *A. baso* Roewer, by original designation).

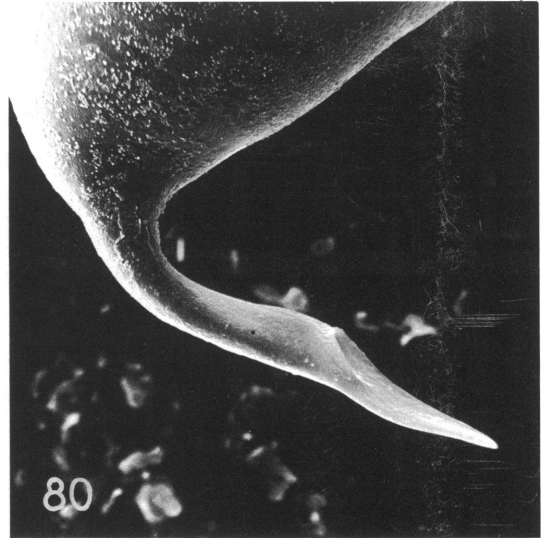
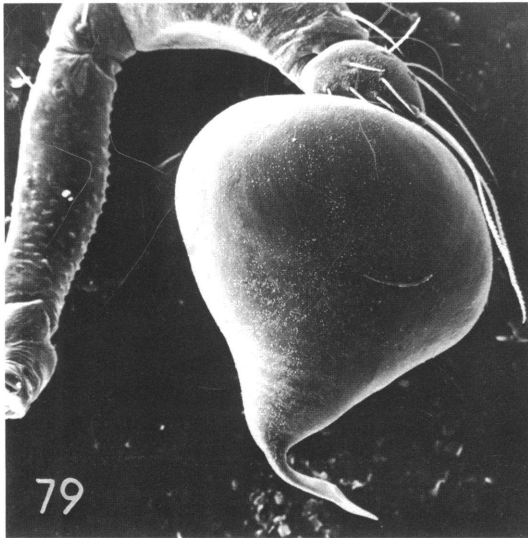
**DIAGNOSIS:** Males have a heavy, right-angled to T-shaped embolus not found in any other tetrablemmids.

**DESCRIPTION:** With the characters of the subfamily, and in addition: eyes six, four, or none, carapace of males of six-eyed species raised to a flat plateau on top (fig. 104), with the six eyes in a compact group at the anterior margin, the posteriormost pair of eyes triangular and projecting upward and backward (fig. 104). Females of these species with moderately raised carapaces and four eyes, so far as is known. Males of four-eyed and eyeless species with the central seta of the carapace obsolete and replaced by a large projection near the midpoint of the carapace (figs. 82, 90); female carapaces in these species not so modified. Embolus of male palpus right-angled to T-shaped. Male chelicerae with a small, downward pointing angular frontal tooth (figs. 85, 105) or unmodified (figs. 92, 99), also with a distinctive flattened process or tooth on the anterior face near the fang articulation (fig. 88). Female genitalia opening from a circular area in the posterior margin of the pulmonary plate (figs. 87, 102).

**DISTRIBUTION:** New Guinea, Borneo, Sumatra, Okinawa.

KEY TO SPECIES

1. Males with six eyes in a compact group (fig. 96), females with four eyes (fig. 98) in a recurved row; central seta of male carapace not replaced by a large projection . . . . . 2  
Males with four eyes, or blind, females likewise; central seta of male carapace replaced by a large projection (fig. 82) . . . . . 3
2. Male cheliceral modifications suppressed, male carapace with two eyelike bosses immediately behind eyes (fig. 96); female genitalia as in figure 102; New Guinea . . . . .  
. . . . . *aiyura*, new species  
Male cheliceral modifications distinct (fig. 105), male carapace without bosses; Sarawak . . . . .  
. . . . . *sedgwicki*, new species
3. Male and female eyeless; male palpus with right-angled part of embolus half the length of the bulb; Baso Caves, Sumatra . . . *baso* Roewer  
Male and female with four reduced eyes (figs. 81, 83) . . . . . 4
4. Male embolus broadly laminate (fig. 94); female with dark pigment around eyes (fig. 91); Car-



FIGS. 79, 80. Male palpus of *Fallablemma castaneum*, scanning electron micrographs. 79. Right palpus, lateral view, 200 $\times$ . 80. Embolus, lateral view, 600 $\times$ . Scanning electron micrographs by Ray Forster.

oline Islands . . . . . *berryi*, new species  
Male embolus not laminate (fig. 86); female  
nearly eyeless, no pigment in eye area;  
Okinawa . . . . . *shimojanai* (Komatsu)

NOTES: The genus *Ablemma* is composed of two distinct species groups. *Ablemma baso*, *A. shimojanai*, and *A. berryi* are distinguished from *A. aiyura* and *A. sedgwicki* by greater sexual dimorphism in the former group, concentrated in the form of the male carapace. However, all the species are united by the common genitalic pattern—the heavy, right-angled or even T-shaped embolus. In addition, the presence of species with six eyes in a compact group (but only in males) shows a degree of intermediacy between the six-eyes-in-a-row of *Brignoliella* species and the four-eyed condition common elsewhere in the family. It also suggests that aggregation of the eyes into a group may have preceded reduction in their number.

*Ablemma baso* Roewer

*Ablemma baso* Roewer, 1963a, p. 229, figs. 9-16.

TYPES: Male holotype and two male and three female paratypes from a cave near Baso, Sumatra, collected October 1913, by E. Jacobsen, deposition not known.

I was unable to track down the type material of this species. Roewer's illustrations, however, clearly show the carapace modification and embolic form which allows the association of the following species with it, the type of the genus.

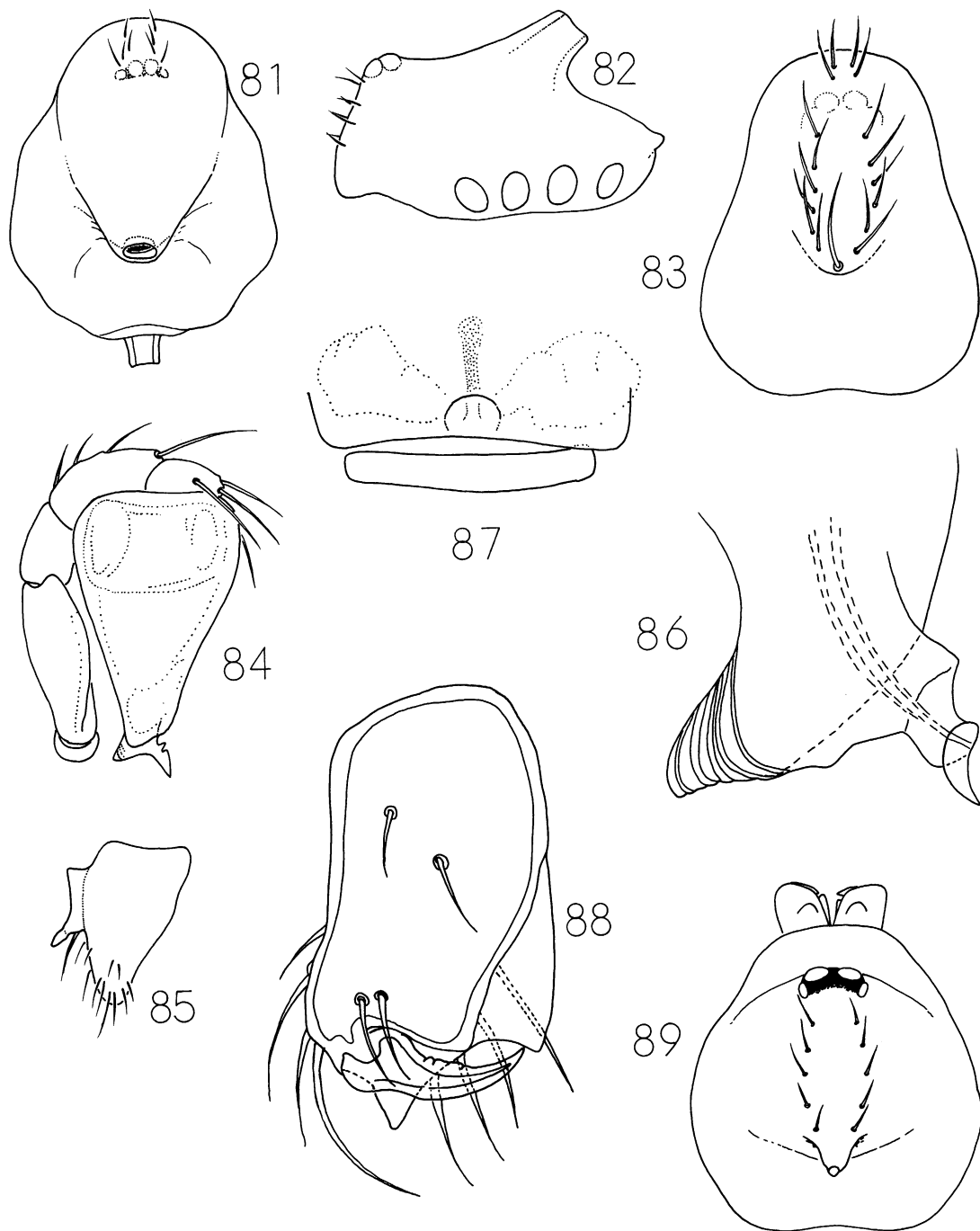
*Ablemma shimojanai* (Komatsu)  
Figures 81-88

*Tetrablemma shimojanai* Komatsu, 1968, p. 35-36, figs. 1-6.

TYPES: Male holotype from Inamiji Cave, Ishikawa-shi Okinawa, collected September 28, 1965 by Matsuei Shimojana, deposition not indicated, type not seen.

DIAGNOSIS: *Ablemma baso* is entirely without eyes, whereas vestiges remain in the present species; *A. berryi* males have similar carapace modifications, but the form of the embolus is quite different (cf. figs. 86 and 94).

MALE: Total length, 1.00 mm. Carapace 0.47 mm. long, 0.36 mm. wide, eye row 0.08 mm. wide. Essentially as described and illustrated by Komatsu (1968), but my specimens are pale yellow, and the eyes are not as clearly delimited as they appear in Komatsu's illustration of them. Evidently the tip of the projection



FIGS. 81-89. *Ablemma* spp. 81-88. *A. shimojanai*. 81. Male carapace, dorsal view, tip of carapace projection broken off. 82. Male carapace, lateral view. 83. Female carapace, dorsal view. 84. Male right palp, lateral view. 85. Left male chelicera, lateral view. 86. Embolus, lateral view. 87. Embolus, dorsal view. 88. Left male chelicera, posterior view. 89. Male carapace of *A. berryi*, dorsal view.

of the carapace was broken off in the male I studied (figs. 81, 82). A more detailed view of the embolus (fig. 86) and chelicerae (figs. 85, 88) are also presented here.

**FEMALE:** Total length, 1.02 mm. Carapace 0.47 mm. long, 0.35 mm. wide. The carapace is of a more normal form than that of the male (fig. 83), but the eyes are more obscure, only the anterior two being visible at moderate magnification (width across these two eyes is 0.06 mm.). There are two parallel rows of five or six setae; the central seta is larger than these. The clypeus has two pairs of setae. The female genitalia (fig. 87) resemble those of *A. aiyura* but because of the poor sclerotization are difficult to study.

**DISTRIBUTION:** JAPAN: *Okinawa*: Cave under Marine Corps Air Station, 1 mi. S of Naha, March 7, 1972, W. Sedgwick, ♂ ♀ (AMNH).

***Ablemma berryi*, new species**

Figures 89-95

**TYPES:** Male holotype and female paratype from Arakabesan Island, Palau Island Group, Caroline Islands, collected from litter in a mixed tropical forest, 20 ft. elevation, February 22, 1973, by J. W. Berry, deposited in the American Museum of Natural History.

**ETYMOLOGY:** The specific epithet honors the collector, J. W. Berry.

**DIAGNOSIS:** Distinct from other four-eyed *Ablemma* species in the laminar embolus (fig. 94) and the form of the female genitalia (fig. 95).

**MALE:** Total length, 0.89 mm. Carapace 0.43 mm. long, 0.37 mm. wide. Carapace yellow, broadly oval, cuticle smooth to minutely roughened, raised as illustrated (fig. 90), with large posterior projection set off at tip as a small tooth. Eyes four, in compact group 0.08 mm. wide at front of raised part of carapace (fig. 89). Chelicerae unmodified (fig. 92). Abdomen yellow, all plates and sternum with minute, seta-bearing punctations. Anterior and perigenital plates absent. Spiracles minute but detectable. Male palpus as in figures 93 and 94; when at rest, embolus fits snugly between chelicerae and palpal endites.

**FEMALE:** Total length, 0.94 mm. Carapace 0.43 mm. long, 0.34 mm. wide (fig. 91), eye

area 0.08 mm. wide. Similar to male, except for unmodified carapace. Female genital region as in figure 95.

**DISTRIBUTION:** Known only from the type locality.

**NOTE:** *Brignoliella beattyi* was collected on the same island, but farther inland, at 374 ft. elevation.

***Ablemma aiyura*, new species**

Figures 96-102

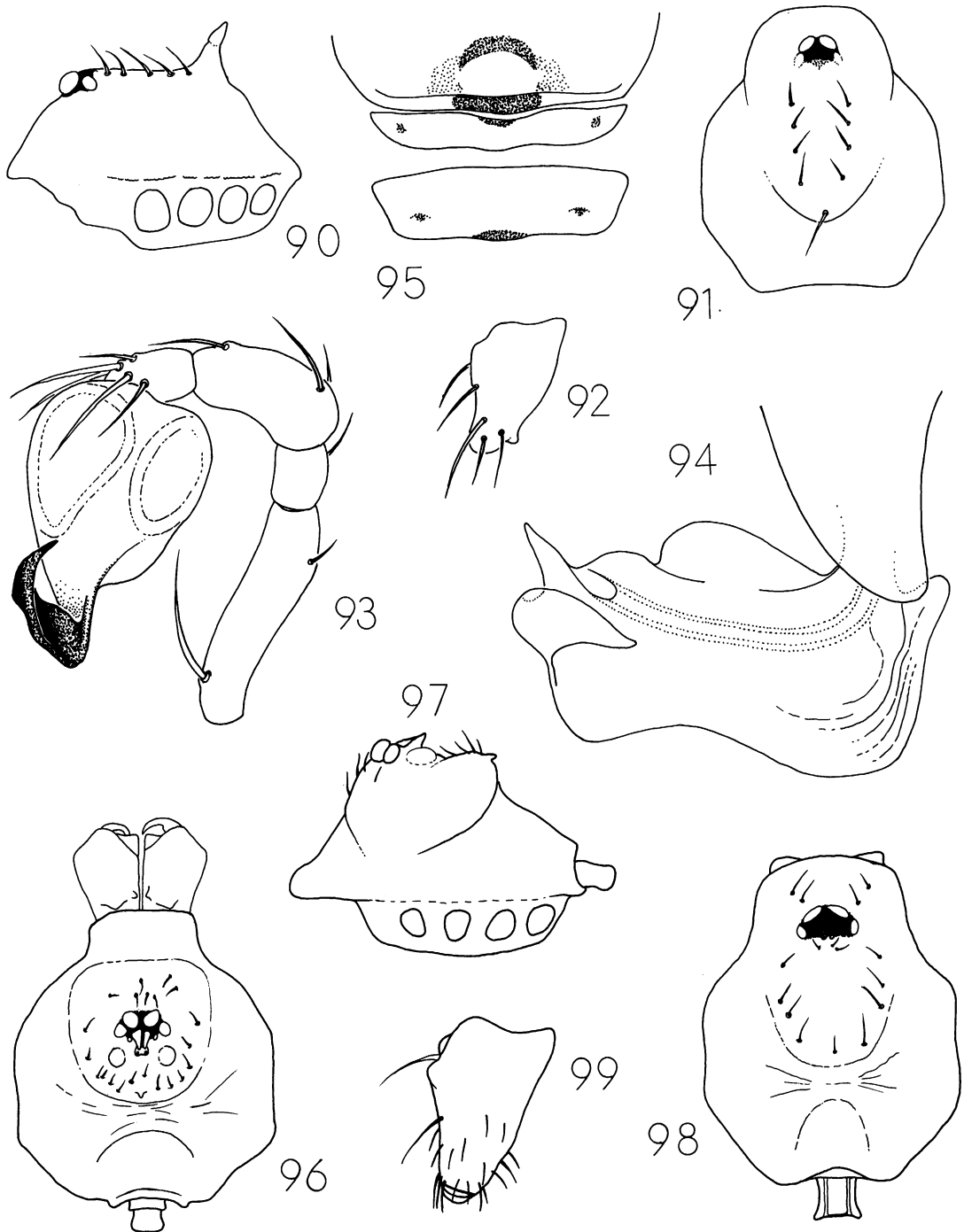
**TYPES:** Male holotype and female paratype from 1900 m. elevation, Aiyura, northeast New Guinea, collected June 1962, by R. W. Taylor, deposited in the Museum of Comparative Zoology.

**ETYMOLOGY:** The specific epithet is a noun in apposition referring to the type locality.

**DIAGNOSIS:** The peculiar bosses on the carapace of the male (fig. 96) distinguish the species from the related *A. sedgwicki*.

**MALE:** Total length, 1.00 mm. Carapace 0.51 mm. long, 0.38 mm. wide, oval, orange cuticle minutely roughened; carapace raised as shown in figure 97. Eyes six, in a compact group 0.13 mm. wide at anterior edge (highest point) of raised region; four round eyes are in front and contiguous in a recurved row, two triangular eyes are in the concavity of the row (fig. 96), with their posterior points raised (fig. 97) and subtended by setal sockets. Definite raised, oval boss on each side just behind the eye area. Cephalic area with numerous small setae, no central seta observed, but a small thorn in that position. Chelicerae only slightly modified (fig. 99). Abdomen orange, cuticle minutely roughened, finely punctate, each puncture with a small seta. Perigenital plates tiny, but anterior plate very large, long, extending from anterior to  $l_3$  nearly to the posterior tip of  $l_3$ . Legs typical, orange, but more robust than in other species. Male palpus (fig. 100) with ridged femur, arcuate tibia not distinctly swollen, bulb pyriform, embolus (fig. 101) heavy, right-angled, opening at tip of angled part.

**FEMALE:** Total length, 1.10 mm. Carapace 0.51 mm. long, 0.39 mm. wide, oval, orange cephalic region set off but raised only a little (fig. 98). Eyes in sharply recurved row of four 0.10 mm. wide, at front of raised region; high



FIGS. 90-99. *Ablemma* spp. 90-95. *A. berryi*. 90. Male carapace, lateral view. 91. Female carapace, dorsal view. 92. Male left chelicera, lateral view. 93. Male right palpus, mesal view. 94. Embolus, posterior view. 95. Female genitalia, ventral view. 96-99. *A. aiyura*. 96. Male carapace, dorsal view. 97. Male carapace, lateral view. 98. Female carapace, dorsal view. 99. Male left chelicera, lateral view.

magnification shows traces of triangular lenses in same position as male's triangular eyes. No bosses behind eyes. Central seta not larger than lateral row setae; two pairs of setae on clypeus. Abdomen as in male. A round, dark sclerotized area is visible without clearing in the posterior margin of the pulmonary plate; cleared in clove oil, a single nearly divided opening can be seen at the posterior margin of this area, which is somewhat depressed. An arcuate bar above the circular area appears to be a ridge on the internal surface of the plate. Two large membranous receptacles, typical of the family, are present (fig. 102).

**DISTRIBUTION:** Known only from the type locality.

***Ablemma sedgwicki*, new species**

Figures 103-107

**TYPES:** Male holotype from the banks of the Baleh River, 40 mi. upstream from Kapit, Sarawak, collected June 25, 1976, by W. Sedgwick, deposited in the American Museum of Natural History.

**ETYMOLOGY:** The specific epithet is an adjective honoring W. (Terry) Sedgwick, an outstanding naturalist and student of the Orient.

**DIAGNOSIS:** Closest to *A. aiyura*, but differing from that species in lacking the bosses of the carapace, and in the details of the embolus.

**MALE:** Total length, 0.88 mm. Carapace 0.38 mm. long, 0.34 mm. wide, bright golden orange, oval cephalic area raised as in figure 104. Eyes six, in a compact group as described for *A. aiyura*. Central seta present, somewhat larger than lateral row setae; clypeus without setae. Chelicerae with a small, downward directed tooth on anterior face (fig. 105). Abdomen golden orange, spiracles not detected, anterior plate short, not extending past midline of  $l_3$ , perigenital plates absent, postgenital plate reduced in size. Lateral plates appear to be fused to the corresponding posterior plates. Legs as usual, but tibiae with one trichobothrium, metatarsi with none, the reduction in number possibly due to the small size of the animal.

**FEMALE:** Unknown.

**DISTRIBUTION:** Known only from the type locality.

**NOTE:** *Brignoliella sarawak* was collected at the same locality.

**SINGAPOREMMA, NEW GENUS**

**TYPE SPECIES:** *Singaporemma singularis*, new species.

**ETYMOLOGY:** Derived by combining the name of the type locality of the type species (Singapore) with the suffix *-emma*. The gender is neuter.

**DIAGNOSIS:** The female genitalia open in the margin of the pulmonary plate, not in a rounded area as in *Brignoliella* and *Ablemma*, but as a small, rimmed pore (fig. 111); the male palp is unusual in that the embolus originates from the mesal side of the bulb (fig. 109). The clypeus and chelicerae of males are unmodified (fig. 108).

**DESCRIPTION:** With the characters of the subfamily, addition: eyes six, in a recurved row. Carapace moderately raised, eyes at anterior margin of raised area. Central seta not different from lateral row setae (fig. 108). Male palp with femur slender, tibia much swollen, bulb oval-pyriform, embolus long, filiform, curved, arising from side of bulb (fig. 109). Female genitalia opening through a small, rimmed pore in posterior margin of pulmonary plate (fig. 111), opening leads immediately through two diverging tubes to a pair of receptacles.

**DISTRIBUTION:** Singapore; probably adjacent Malaysia.

***Singaporemma singularis*, new species**

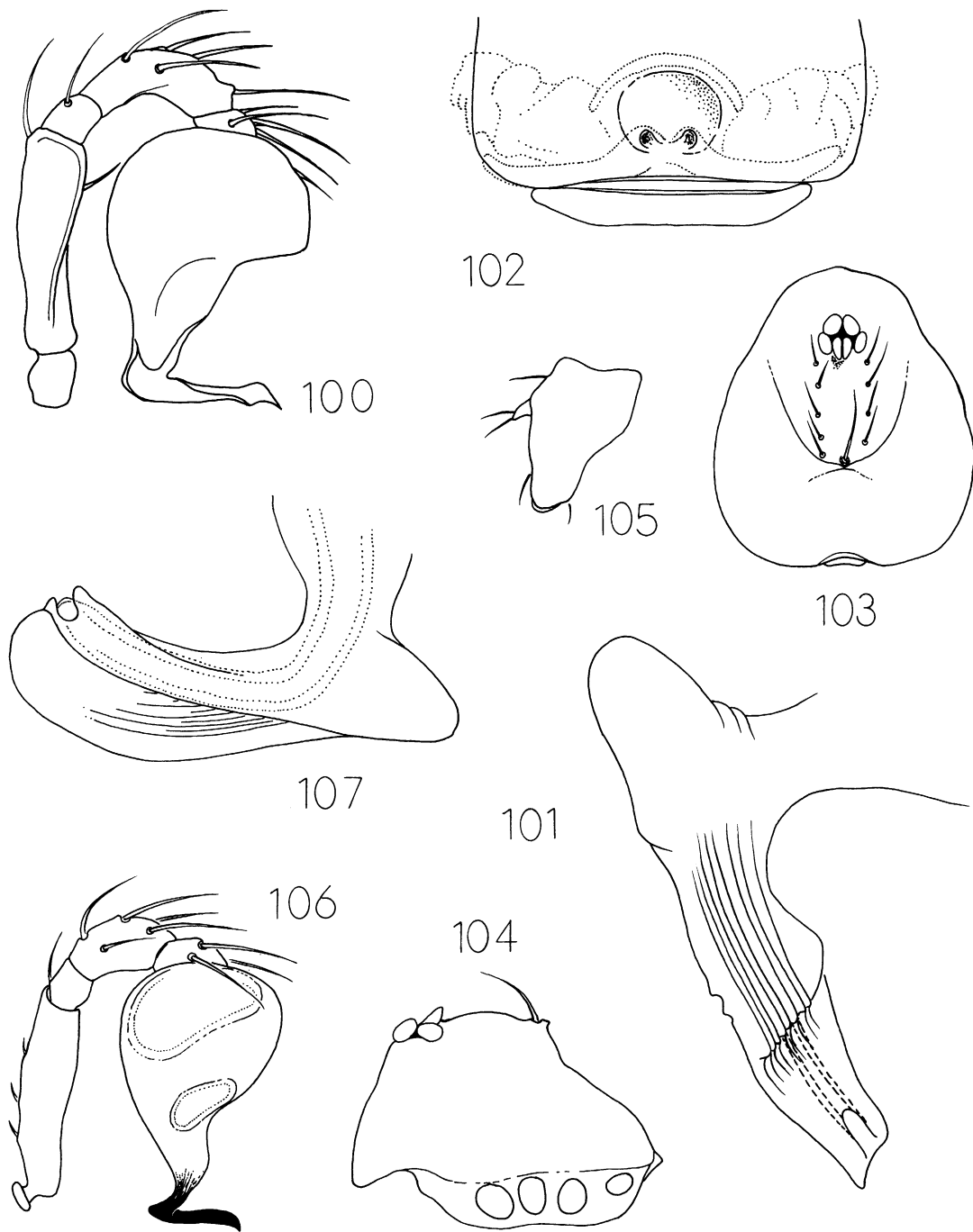
Figures 108-111

**TYPES:** Male holotype, two female paratypes from near McRitchie Reservoir, Singapore, collected October 25, 1950, by M. W. F. Tweedie, male holotype and one female paratype deposited in the American Museum of Natural History, second female paratype deposited in Otago Museum, Dunedin, New Zealand.

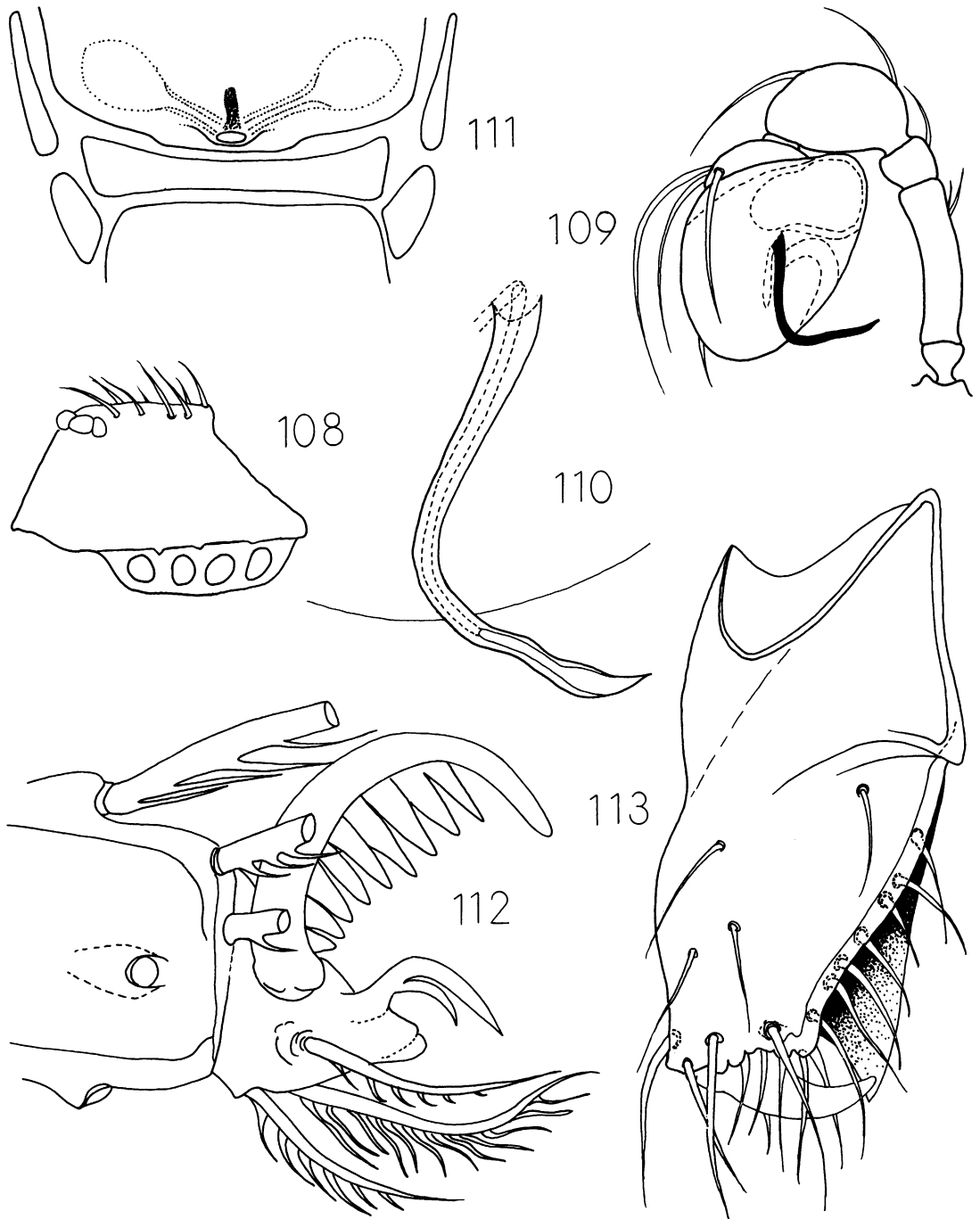
**ETYMOLOGY:** The specific epithet is an adjective, referring to the unusual nature of this species.

**MALE:** Total length, 1.02 mm. Carapace 0.44 mm. long, 0.43 mm. wide, oval, dark orange-brown, raised as in figure 108, cuticle roughened by hexagonal cells with definite rims. Eyes six in a recurved row 0.19 mm.





FIGS. 100-107. *Ablemma* spp. 100-102. *A. aiyura*. 100. Male left palpus, mesal view. 101. Embolus, ventromesal view. 102. Female genitalia, ventral view, cleared in clove oil. 103-107. *A. sedgwicki*. 103. Male carapace, dorsal view. 104. Male carapace, lateral view. 105. Male left chelicera, lateral view. 106. Male right palpus, lateral view. 107. Embolus, mesal view.



FIGS. 108-113. *Singaporemma* and *Paculla* spp. 108-111. *S. singularis*. 108. Male carapace, lateral view. 109. Right male palpus, mesal view. 110. Embolus, mesal view. 111. Female genitalia, ventral view. 112, 113. *P. kraui*. 112. First leg claws, lateral view. 113. Left chelicera of female, posterior view.

wide at anterior edge of raised area. Central seta no larger than lateral row setae, clypeus without setae. Chelicerae not modified. Abdomen dark orange. Anterior part of anterior sclerite absent, posterior part appears as a narrow strip anterior to large, oval perigenital plates (fig. 111). All abdominal plates with same hexagonal cell pattern as carapace, but lung covers smooth and shining. Legs yellow, bulb of palpus and leg patellae strongly contrasting in white. Palpus (fig. 109) with long, slender femur, enlarged tibia, bulb oval-pyriform, with distinct shoulder on posterioproximal side. Embolus (fig. 110) long, thin, arising from mesal side of bulb and curving sharply posteriorly.

**FEMALE:** Total length, 1.15 mm. Carapace 0.44 mm. long, 0.43 mm. wide. Nonsexual characters as in male, but lighter in color (one female paratype is yellow, the other nearly white). Female genitalia as in figure 111.

**DISTRIBUTION:** Known only from the type locality.

#### FAMILY PACULLIDAE SIMON

Phaedimoidae Thorell, 1881, p. 232 (type genus *Phaedima* Thorell).

Paculleae Simon, 1894, p. 569 (type genus *Paculla* Simon).

Pacullidae: Thorell, 1898, p. 281.

Pacullinae: Bonnet, 1958, p. 3297. Brignoli, 1973, p. 87.

**DIAGNOSIS:** Medium-sized spiders (4-9 mm. long) with a characteristic pattern of abdominal sclerotization shared with the Tetrablemmidae, but differing from that family in their large size, functional book lungs with many leaves per lung, the lack of sexual dimorphism in the carapace, and in having a knobbed apophysis projecting posteriorly from the sternum. Distinguished from Dysderidae by the absence of posterior respiratory organs and by having three claws, and from Caponiidae in lacking direct eyes (anterior median eyes) and posterior respiratory organs.

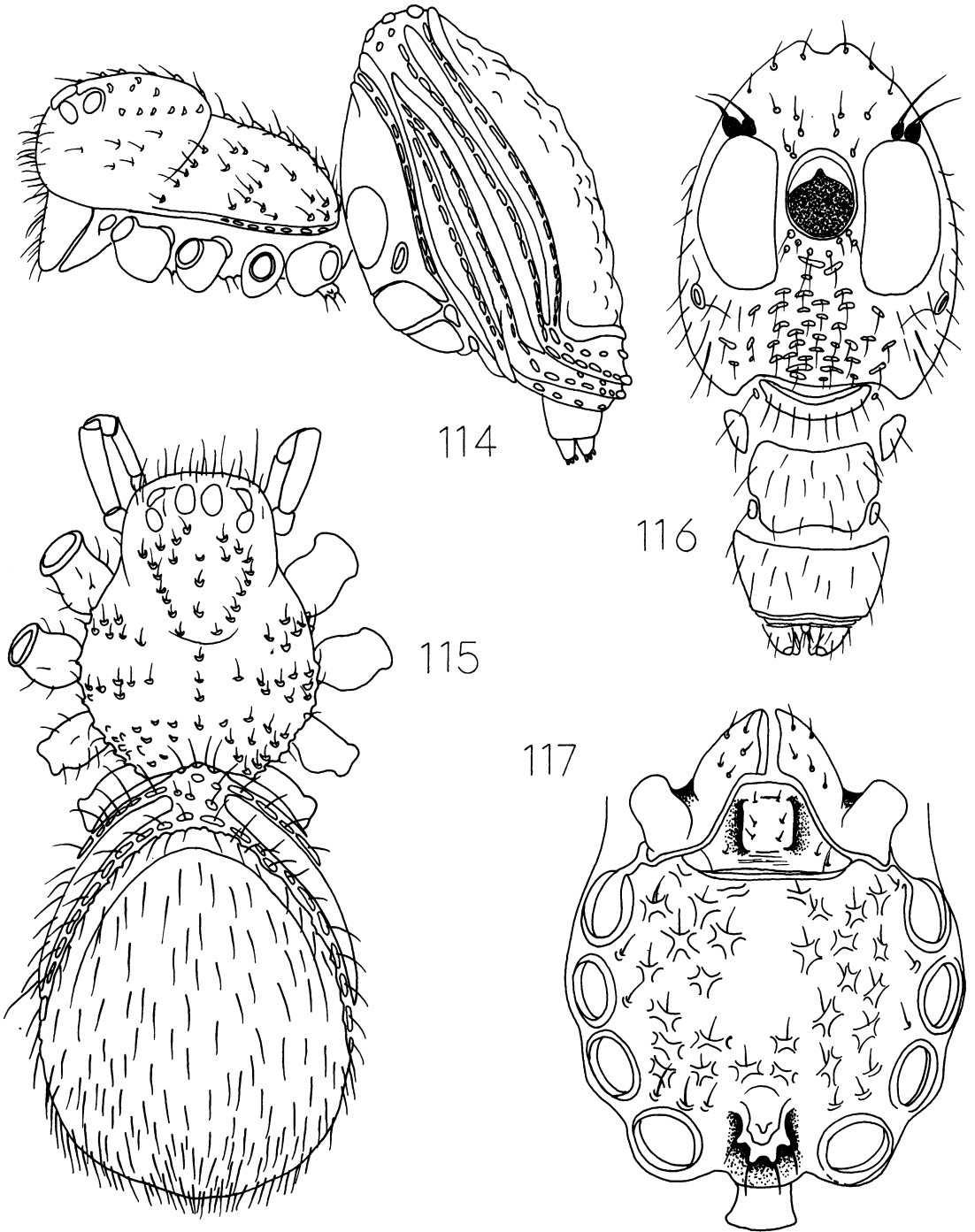
**DESCRIPTION:** Cribellum and calimistrum lacking. Genitalia of the "haplogyne" type, but with modifications in the females suggesting an epigynum. Posterior respiratory organs absent, anterior ones represented by fully functional book lungs with many leaves. Spiracles of

book lungs removed posteriorly (fig. 116) from the lung plates, at the ends of short, raised tubes. Posterior median spiracle represented by a small, sclerotized knob on the preanal plate. Spinnerets six, anterior pair and posterior pair two-segmented, but terminal segment small; median pair single-segmented. Colulus present, small and sclerotized. Chelicerae independent, with subtriangular median lamina meeting tip of fang (fig. 113), cheliceral teeth absent. Labium triangular, free from the sternum, much broader than long (fig. 117). Endites of the pedipalps strongly convergent over labium, nearly touching each other. Sternum broad, subcordate, bearing peculiar cross-shaped raised nodules with small setae in their anteriomedian angles (fig. 117), and a large, stout, knobbed apophysis subtending the pedicel. Sternum joined to carapace around coxal sockets of legs. Carapace with cephalic area raised (fig. 114) equally in both sexes, set with crescentic nodules with their concave sides bearing small setae and facing anteriorly. Eyes six, in a recurved row formed of three groups of two eyes each, at the front of the carapace (fig. 115). Abdominal sclerotization as described for Tetrablemmatidae, but with posterior sclerites lacking and plate  $l_3$  considerably reduced. Dorsal and lateral plates usually subtended by rows of small sclerotized spots, each bearing a single seta. Claws (fig. 112) three, paired claws pectinate in a single row. Female pedipalp without a claw. Male palpal organ a large, simple sub-spherical bulb without a conductor and with a short, stout, curved embolus (figs. 118, 121, 123). Males with the genital pore opening in the margin of the pulmonary plate (fig. 119). Female genitalia with a single opening, leading through a short, sclerotized tube to two membranous receptacles (figs. 116, 120).

**INCLUDED GENUS:** *Paculla* Simon.

**MISPLACED SPECIES:** *Paculla bicornis* Simon and *P. scrobiculata* Simon belong in *Brignoliella*, a tetrablemmid genus, as do *Paculla quadricornis* Roewer and *Paculla martensi* Brignoli. *Paculla thorelli* Brignoli is a tetrablemmid belonging in *Monoblemma*.

The genus *Perania* Thorell, 1881, based on *P. pallida* Thorell, from Sumatra, presents a problem that cannot be solved without a study of the female holotype, which is in the Museo



FIGS. 114-117. *Paculla kraui*. 114. Female, lateral view. 115. Female, dorsal view. 116. Ventral plates of female abdomen, ventral view. 117. Female sternum, ventral view.

Civico Storia Naturale in Genoa. According to Thorell (1881) the abdomen of *P. pallida* is globose and does not have a dorsal plate; the sternal apophysis characteristic of *Paculla* is not mentioned. The only other species described in the genus is *Perania korinchica* Hogg, 1920. The holotype is in the British Museum and was lent to me. It appears to be a composite. The abdomen and prosoma are not joined; the prosoma appears to be that of a species of *Paculla*, but the abdomen is "entelegyne" and belongs to *Leucauge emertoni* (Thorell). Hogg's material came from Sumatra.

NOTES: Since *Phaedima* turned out to be a junior homonym the family name Phaedimidae (emended spelling) is rejected (Art. 39, ICZN). Paculleae was first used by Simon in 1894; Pacullidae by Thorell in 1898.

As I have already mentioned in the notes under Tetrablemmidae, Simon's concept of *Paculla* was not the same as Thorell's; all the species Simon described are too small and lack other characteristics indicated by Thorell. In fact, they are tetrablemmids. I was unable to study the types of any of the species Simon described directly under *Paculla*, because they were on extended loan to another worker. However, Simon (1893) synonymized his own genus *Polyaspis* (type species *P. acuminata* Simon) under *Paculla*, and the two *Paculla* species he described seem congeneric with *P. acuminata*, the female holotype of which I was able to see. It is a tetrablemmid. The name *Polyaspis* was preoccupied in mites so I have supplied the new name *Brignoliella* and transferred the contents of *Polyaspis* to the proper family.

Brignoli (1972a, 1974) has likewise followed Simon, not Thorell. The *Paculla* species he has described are tetrablemmids, too.

Unfortunately, the types of Thorell's species cannot be loaned, and indeed may be destroyed or misplaced (Brignoli, 1972a). But by carefully comparing Thorell's detailed Latin descriptions with specimens on hand, I am convinced that the animals described below are genuine members of the genus *Paculla sensu* Thorell. A more conservative tack might have been not to provide names for these species, since they might possibly fall as synonyms of earlier Thorell names. But Thorell only gave a

vague description of the male palpi for some of his species, which came from Burma, Sumatra, and New Guinea. Considering the fact that three distinct species (those described below) have been collected from one area of Malaysia, it seems unlikely to me that any of Thorell's names cover them. And, of course, there are numbers of differences between the specimens I studied and Thorell's accounts, differences usually considered to be of species significance.

Two morphological peculiarities of the pacullids are worth further discussion. The most obvious is the apophysis of the sternum, which occurs in both sexes. About the only function I can imagine for this structure, which, as far as I know, does not occur in any other spiders, is to support the heavily sclerotized abdomen. A second unusual feature is the male genital opening. Instead of venting in a membranous fold between the book lungs, as is usual in spiders, it has been moved posteriorly by the expansion of the pulmonary plate, and now opens through a round pore in the margin of that plate (fig. 119). This unusual situation is also found in the oonopid genera *Ischnothyreus* (Chickering, 1968a), *Dysderina* (Chickering, 1968b), and *Triaeris* (Chickering, 1968c). It seems to be an adaptation associated with heavy sclerotization of the abdomen, but is not found in the tetrablemmids.

The species described by Thorell (1881, 1890, 1898) are listed in Bonnet (1958, pp. 3296-3297) and in table 2 of this paper.

#### PACULLA SIMON

*Phaedima* Thorell, 1881, p. 232 (type species *P. granulosa* Thorell; name preoccupied).

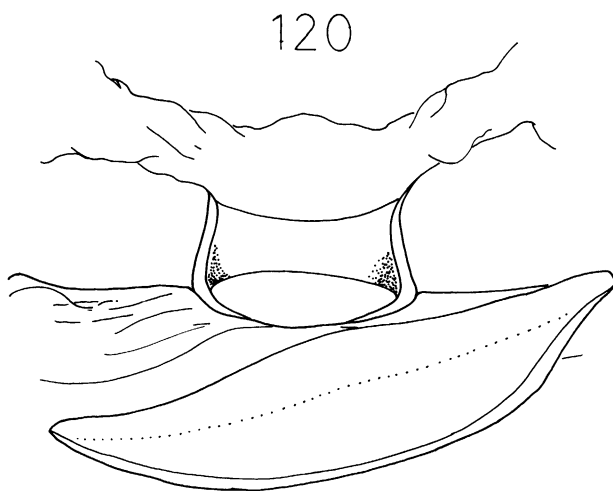
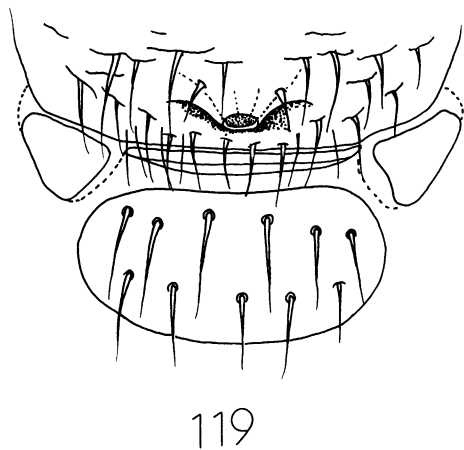
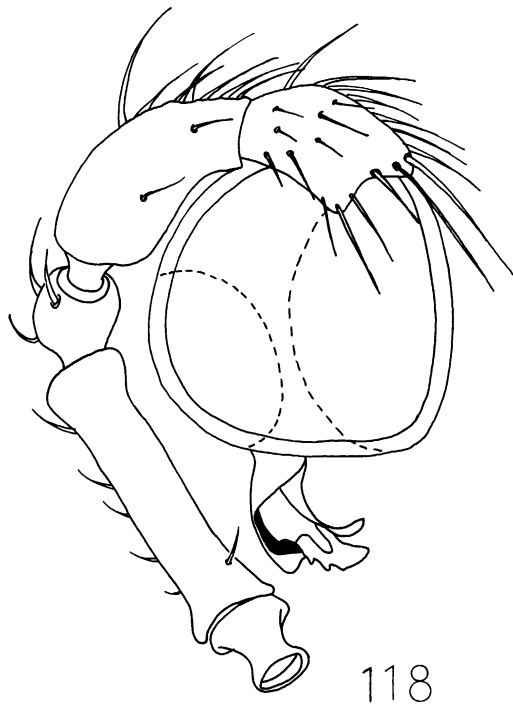
*Paculla* Simon, 1887, p. cxiv (new name for *Phaedima* Thorell), 1893, p. 324.

Since the genus is coextensive with the family (except for the enigmatic *Perania pallida*, which may not belong here) the family description and diagnosis can also serve for the genus. Because my study of the family and genus is far from complete, no key to species is presented here.

#### ***Paculla kraui*, new species**

Figures 112-120

TYPES: Female holotype and male paratype



FIGS. 118-121. *Paculla* spp. 118-120. *P. kraui*. 118. Male left palpus, mesal view. 119. Male genital region, ventral view. 120. Female genitalia, digested in KOH, dorsal view. 121. Male left palpus of *P. cameronensis*, mesal view.

from Krau Reserve, Pahang, Tamerloh District, Malaysia, collected June 30, 1973, by J. Fleagle, deposited in the Museum of Comparative Zoology.

**ETYMOLOGY:** The species epithet refers to the type locality.

**DIAGNOSIS:** Smaller (4-4.5 mm. long) than the species described by Thorell (6-9 mm. long); distinct in the details of the genitalia from the two additional Malaysian species described below.

**FEMALE:** Total length, 4.1 mm. Carapace 1.62 mm. long, 1.13 mm. wide, dark orange-brown, cephalic part raised (fig. 114). Eyes six, subequal in size, eye area 0.75 mm. wide. Carapace with rows of crescentic tubercles, posterior to setal sockets (fig. 115). Sternum (fig. 117) orange-brown, with scattered peculiar cross-shaped tubercles and setae, posterior projection large, with five seta-bearing knobs; coxal sockets distinctly rimmed. Abdomen with typical pattern of sclerotization (figs. 114, 116), perigenital plates large, triangular; pulmonary

plate with two large, black, seta-bearing teeth anterior to lung covers. Legs long, thin, femora somewhat sigmoid. Female genitalia without obvious external modifications (fig. 116), internally (fig. 119) with an open sclerotized tube attached to the posterior margin of the pulmonary plate, common opening leads to two large, membranous seminal receptacles.

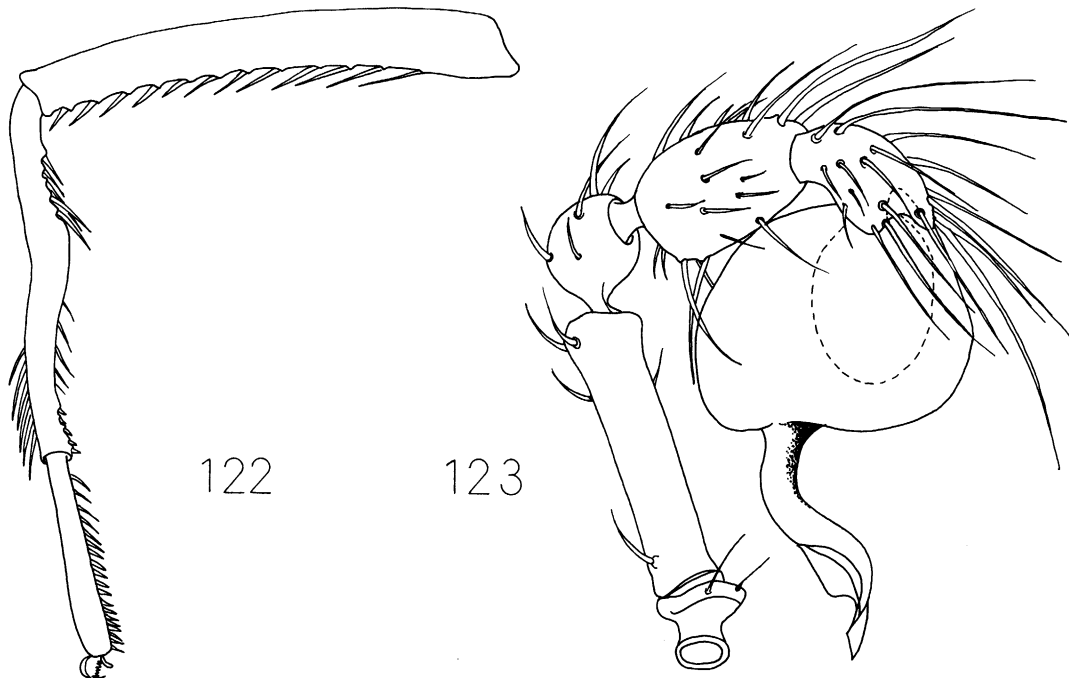
**MALE:** Total length, 3.17 mm. Carapace 1.47 mm. long, 1.11 mm. wide, eye area 0.68 mm. wide. Structure much as in female. First pair of legs and chelicerae without modifications. Male genital pore opening from within posterior margin of pulmonary plate (fig. 119). Palpus as in figure 118.

**DISTRIBUTION:** Known only from the type locality.

***Paculla cameronensis*, new species**

Figures 121, 122

**TYPE:** Male holotype from Cameron Highlands, Pahang, Malaysia, collected July 1948,



FIGS. 122, 123. *Paculla* spp. 122. Male right first leg of *P. cameronensis*, mesal view. 123. Male left palpus of *P. negara*, mesal view.

by N. L. H. Krauss, deposited in the American Museum of Natural History.

**ETYMOLOGY:** The species epithet, an adjective, refers to the type locality.

**DIAGNOSIS:** Differing from *P. kraui* and *P. negara* in the distinct modification of the first metatarsus of the male (fig. 122).

**MALE:** Total length, 4.17 mm. Carapace 2.07 mm. long, 1.53 mm. wide, eye area 0.85 mm. wide. Structure similar in all respects to that of *P. kraui*, with the following differences. Large black teeth anterior to lung covers absent, postgenital plate divided in the midline, first leg metatarsus modified as in figure 122, sigmoid with specialized groups of spines. Male palpus as in figure 121.

**DISTRIBUTION:** Known only from the type locality.

***Paculla negara*, new species**

Figure 123

**TYPE:** Male holotype from Taman Negara, hill near Kampsong, Tehan, Malaysia, collected June 26, 1973, by D. H. Kistner and H. E. Jacobsen, deposited in the Museum of Comparative Zoology.

**ETYMOLOGY:** The species epithet, a noun in apposition, refers to the type locality.

**DIAGNOSIS:** Differing in the male palpus from *P. kraui* and *P. cameronensis*, and also from *cameronensis* in having unmodified male first metatarsi.

**MALE:** Total length, 3.48 mm. Carapace 1.68 mm. long, 1.35 mm. wide, eye area 0.80 mm. wide. Structure similar in all respects to *P. kraui*, with the following differences. Large black teeth anterior to lung covers absent, postgenital plate divided in the midline. First leg metatarsi not modified, but with distinct ventral rows of short, stout macrosetae. Male palpus as in figure 123.

**DISTRIBUTION:** Known only from the type locality.

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