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ABSTRACT

From 2005-2007, we observed 20 species of harvestmen representing nine families, primarily in northern Trinidad. Of these taxa, we collected previously unreported or undescribed species for the families Kimulidae, Samoidae, Sclerosomatidae, and Stygnommatidae. In this paper, we provide a brief summary of the characters and natural history, as well as photographs of each species. The most common and widespread taxa in Trinidad include species in the families Cosmetidae, Cranaidae, Manaosbiidae, and Sclerosomatidae. Species that were less common or had a limited geographic range include representatives from the families Agoristenidae, Kimulidae, Manaosbiidae, Samoidae, Sclerosomatidae, Stygnidae, and Stygnommatidae. A taxonomic key for identification of the 10 families of harvestmen known from Trinidad was developed through the modification of published keys in conjunction with characters that we observed for these taxa.

Key words: Biogeography, Caribbean, Laniatores, neotropical, taxonomy.

INTRODUCTION

The Opiliones (synonym Phalangida) represents the third largest order of arachnids (5,948 described species) and has a worldwide distribution. These animals are commonly referred to as harvestmen, daddy longlegs, or harvest spiders. Presently, four major suborders (Cyphophthalmi, Eupnoi, Dyspnoi, and Laniatores), 45 families and approximately 1,500 genera (Machado *et al*. 2007) are recognized. Although superficially resembling spiders, harvestmen do not have an externally divided prosoma (cephalothorax) and opisthosoma (abdomen). They also do not possess fangs or poison glands (a common misconception about the group) nor do they have the capacity to produce silk (lacking spinnerets). Among arachnids, harvestmen are unique in having direct sperm transfer from male to female (via a male copulatory organ, referred to as a penis) and with regards to digestive physiology. In contrast to other arachnids, harvestmen are not fluid feeders, but ingest solid food particles. Most species are generalist predators and scavengers, feeding upon small invertebrates (worms, snails, aphids, or other harvestmen) and plant tissues, including floral parts and fruits (Adams 1984; Halaj and Cady 2000; Acosta and Machado 2007). Many species of harvestmen have been observed to form mass aggregations of up to several thousand individuals (Holmberg *et al*. 1984; Coddington *et al*. 1990; Machado and Vasconcelos 1998; Machado *et al*. 2000; Machado and Macías-Ordóñez 2007a; Grether and Donaldson 2007). Harvestmen are also well-known for their diverse array of defensive behaviors and adaptations which may include death feigning, leg autotomy, and the secretion of defensive compounds from paired, repugnatory glands (Cokendolpher 1987; Guffey 1998; Machado *et al*. 2005; Gnaspini and Hara 2007).

Most species of harvestmen are nocturnal and remain hidden during the day (Todd 1949; Edgar and Yuan 1968; Curtis and Machado 2007). In temperate environments, the typical lifespan is one year (Machado and Macías-Ordóñez 2007b). The most common life history pattern involves oviposition in the soil, the overwintering of individuals as eggs or larvae, development and maturation in the spring and early summer, mating in late summer or early autumn, with death soon afterwards (Edgar 1971). The life history patterns of tropical species are not well studied. However, individuals of several taxa have been observed to live at least 2 years and may reproduce throughout the year, particularly when conditions (e.g., high humidity and availability of food) are most conducive to activity (Machado and Macías-Ordóñez 2007b).

In forested habitats, harvestmen are among the most commonly encountered arthropods. However, relatively little is known about the ecology or natural history of most species. In the eastern Caribbean and Venezuela, 12 families of the order Laniatores and the sclerosomatid subfamily Gagrellinae (order Eupnoi) are known to occur (Kury 2003). In Trinidad, 24 described species representing 8 families have been documented (Table 1). There are 3 families of harvestmen (Guasiniidae, Icaleptidae, Kimulidae) that occur in Venezuela that have not been previously observed in Trinidad (Giribet and Kury 2007). Similarly, the Caribbean family Biantidae is known from several islands, but has not been reported for Trinidad (Giribet and Kury 2007). Of the species occurring in Trinidad, only *Ethobunus tuberculata* (Zalmoxidae), *Paecilaema inglei* (Cosmetidae), *Phareicranaus calcariferus* (Cranaidae), *Prionostemma insulare* (Sclerosomatidae), *P. vittatum*, *Rhopalocranaus albilineatus* (Manaosbiidae), *Santinezia serratotibialis* (Cranaidae), and *Stygnoplus clavotibialis* (Stygnidae) are known from additional locations, primarily Venezuela (Goodnight and Goodnight 1947; Cokendolpher and Camilo-Rivera 1989; Kury 2003; Pinto-da-Rocha and Kury 2003; Villarreal-M and Rodríguez 2004). In addition, at least one undescribed species of the family Stygnommatidae occurs on the island (Pérez-González 2007).

Very little is known about the biology or distribution of the harvestmen on Trinidad (Cokendolpher and Camilo-Rivera 1989; Kury 2003). Diurnal and nocturnal activity has been observed for an agoristenid species as well as for several cosmetids (Kury and Pinto-da-Rocha 2002). Recently, parental care was reported for both species from the family Cranaidae (Machado and Warfel 2006; Hunter *et al*. 2007). These observations are the first published studies of this behavior for the family. Similarly, the use of tree buttresses by species of cosmetids, manaosbiids, sclerosomatids, and stygnids was also recently examined, and the first report of aggregation behavior for the family Stygnidae was noted (Burns *et al*. 2007).

Over the course of three years (2005-2007), we collected harvestmen from a variety of locations, mostly in northern Trinidad during the wet season (July and early August). On many occasions, we were able to make behavioral observations in the field. Our main objective was to investigate the natural history of these animals. Owing to the rather limited nature of the locality records for most species (Goodnight and Goodnight 1947; Turk 1948; Cokendolpher and Camilo-Rivera 1989; Kury 2003; Pinto-da-Rocha and Kury 2003), we also attempted to assess the relative abundance of species across a variety of habitats.

METHODS

Most of the harvestmen examined in this study were collected during the beginning of the wet season in July and August 2005-2007. Specific dates were 10 July - 3 August, 2005; 9 July - 1 August, 2006 and 4 - 10 July, 2007. For 2005, we collected harvestmen from Mt. Tamana, Grande Tacarib, Petite Tacarib, Lalaja Trace, near Brasso Seco Paria Village, Morne Bleu Ridge and from the intersection of the Lalaja Trace to the summit of Mt. Aripo. For 2006, we sampled these locations again and also collected at Salybia, Tucker Valley, and Hollis Reservoir. Although not permitted to collect, we visited Trinity Hills and Nariva Swamp in 2006 and observed the most common species in the leaf litter. In 2007, we focused our efforts primarily on the summit of Mt. Aripo, but also collected specimens along the Lalaja Trace. In addition to these collections, we discovered five individuals (four adults, one nymph) of a previously unknown samoid species during the course of sorting invertebrate samples collected in May, 2003 from tank bromeliads (*Aechmea nudicaulis*) occurring in the high canopy of mango and sandbox trees near Petite and Grande Tacarib.

The habitats of these areas included crappo-cocorite forest (Petite Tacarib and Grande Tacarib), seasonal deciduous forest (Mt. Tamana, Trinity Hills, Tucker Valley, Salybia, Hollis Reservoir), lower montane rainforest (Lalaja Trace), upper montane rainforest (Morne Bleu Ridge), and elfin woodland (summit of Mt. Aripo). They differ markedly with regards to physical characteristics and vegetation (summary provided by Murphy 1997 based upon Beard 1946). During sampling, harvestmen were found by turning and breaking apart logs, palm frond sheaths, and bamboo (especially in Tucker Valley) and carefully searching the surfaces, crevices, and litter associated with tree buttresses. Along Morne Bleu Ridge and Mt. Aripo, harvestmen were encountered in the sheaths of palm fronds of *Euterpe broadwayi* (Comeau *et al*. 2003). Sampling occurred during daylight hours (0800 to 1730 hrs), although we collected after dusk at several sites including Mt. Tamana, Petite Tacarib, Grande Tacarib, Morne Bleu Ridge, and Mt. Aripo. All harvestmen were captured by hand and immediately placed in 70% ethanol or 10% buffered formalin. Upon our return to the U.S., specimens preserved in formalin were transferred to 70% ethanol for long-term storage. Identifications of adults were made with the aid of the original taxonomic descriptions and from comparisons with holotypes borrowed from the American Museum of Natural History (AMNH). During sampling, we collected mostly adults, however, we found nymphs of species from the Cosmetidae, Cranaidae, Sclerosomatidae, and Stygnidae. We deposited voucher specimens into the collections of the AMNH, Louisiana State Arthropod Museum (LSAM),

Table 1. Locality records for the 24 described species of harvestmen known for Trinidad (Kury 2003). Citations for specific locality records indicate additional records for species that were not specified or listed in the original taxonomic description.

Taxa	Locality Record
Agoristenidae	
Trinella albiornata (Goodnight and Goodnight 1947)	Lopinot Caves (Turk 1948)
Trinella intermedia (Goodnight and Goodnight 1947)	St. Augustine
Trinella leiobuniformis (Šilhavý 1973)	Trinidad, no location specified
Cosmetidae	
Cynortula granulata (Roewer 1912)	Blue Basin, El Tucuche, Sangre Grande, Tucker Valley (Goodnight and Goodnight 1947)
Cynortula modesta (Sørenson 1932)	Port of Spain
Cynortula undulata (Roewer 1947)	Trinidad, no location specified
Libitiosoma granulatum (Roewer 1947)	Trinidad, no location specified
Paecilaema adspersum (Roewer 1947)	Trinidad, no location specified
Paecilaema inglei (Goodnight and Goodnight 1947)	Diego Martin, El Tucuche, St. Anne
Paecilaema paucipustulatum (Roewer 1947)	Trinidad, no location specified
Vonones testaceus (Roewer 1947)	Trinidad, no location specified
Cranaidae	
Phareicranaus calcariferus (Simon 1879)	Tucker Valley (Goodnight and Goodnight 1947)
Santinezia serratotibialis (Roewer 1932)	4 mi. N road to Arima to Blanchisseuse, St. Paul Merchiston (Pinto-da-Rocha and Kury 2002)
Manaosbiidae	
Cranellus montgomeryi (Goodnight and Goodnight 1947)	El Tucuche
Rhopalocranaus albilineatus (Roewer 1932)	Tucker Valley (Goodnight and Goodnight 1947)
Samoidae	
Maracaynatum trinidadense (Šilhavý 1979)	Simla, Point Fortin
Pellobunus longipalpus (Goodnight and Goodnight 1947)	St. Augustine
Sclerosomatidae	
Holcobunus aureopunctata (Roewer 1953)	Trinidad, no location specified
Prionostemma fulginosum (Roewer 1953)	Trinidad, no location specified
Prionostemma insulare (Roewer 1953)	Trinidad, no location specified
Prionostemma referens (Roewer 1953)	Trinidad, no location specified
Prionostemma vittatum (Roewer 1910)	Tucker Valley (Goodnight and Goodnight 1947)
Stygnidae	
Stygnoplus clavotibialis (Goodnight and Goodnight 1947)	Arima Road near Blanchisseuse, Caparo, 1 mi. W Morne Bleu, Piarco, Port of Spain, Sangre Grande, Simla
Zalmoxidae	
Ethobunus tuberculatus (Goodnight and Goodnight 1947)	Tucker Valley

and California Academy of Sciences (CAS).

In the laboratory, specimens were photographed with a digital camera. In addition, we prepared several harvestmen for scanning electron microscopy (SEM). These specimens were dehydrated in a graded ethanol series and chemically dried using hexamethyldisilizane (Nation 1983). Individuals were mounted on aluminum stubs with double stick tape, sputter-coated with 10-15 nm of gold, and examined at an accelerating voltage of 15 kV with the Hitachi S-3000N SEM in the Electron Microscopy Center at the University of Louisiana at Lafayette.

RESULTS AND DISCUSSION

We collected 20 species of harvestmen including representatives of nine families (Table 2). The only family that we did not collect was the Zalmoxidae. The three species from the Kimulidae represent the first reports of this family for Trinidad. A single adult specimen of the largest kimulid species (species 3) was found in 2007 in leaf litter near the summit of Mt. Aripo, and the smaller species were collected from logs near Petite Tacarib in 2005. The undescribed samoid species was collected from tank bromeliads (*Aechmea nudicaulis*) taken from Petite Tacarib and Grande Tacarib in 2003. The third species of *Prionostemma* was only found in elfin woodland near the summit of Mt. Aripo in 2007. Comparisons with published lists (Cokendolpher and Camilo-Rivera 1989; Kury 2003) and descriptions of known species (Roewer 1953; González-Sponga 1987) indicate that this sclerosomatid species has not been formally described. In addition, we also collected an individual for an undescribed, but previously reported species of Stygnommatidae (Pérez-González 2007).

Our results indicate that the most common species in Trinidad are *Cynortula* sp. 1, *Paecilaema inglei*, *Prionostemma vittatum*, and *Rhopalocranaus albilineatus* (Table 2). These species occurred in most habitats and were abundant in several locations. In contrast, we found few individuals for the families Agoristenidae, Kimulidae, Samoidae, Stygnidae, and Stygnommatidae. We only collected *Trinella* sp. and *Cranellus montgomeryi* (Manaosbiidae) in upper montane forest or elfin woodland. The following is a detailed summary of our observations of species for each family. In addition to these descriptions, we developed a taxonomic key (Appendix 1) that can be used to identify harvestmen to family.

Agoristenidae

Members of the genus *Trinella* exhibit a sexual dimorphism with males having relatively large chelicerae (Fig. 1A) in comparison to females. The first leg in both sexes is filiform and narrower than legs II-IV. Individuals superficially resemble in size small species of *Prionostemma*, but differ in having armed and robust pedipalps and two tarsal claws on legs III and IV. We collected individuals for only one species that was common in the leaf litter on Mt. Aripo and active day and night (Table 2). A few individuals were also found in lower and upper montane rainforest (Table 2).

Cosmetidae

We collected four taxa for this family including two species of *Cynortula* (Figs. 1B, 1C) and two species of *Paecilaema* (Figs. 1D-G). In addition, we observed (but did not collect) a fifth species in the Bush-Bush area of Nariva Swamp. In Trinidad, eight species of cosmetids have been described, including three species each for *Cynortula* and *Paecilaema* (Table 1). In *Paecilaema*, but not *Cynortula*, chelicerae are sexually dimorphic (Figs. 1B, 1C). We did not collect specimens of either *Libitiosoma granulatum* or *Vonones testaceus*. Identification of genera and species is difficult owing to the fact that many genera are not well-defined and in many species there can be considerable phenotypic plasticity (Goodnight and Goodnight 1953; Kury and Pinto-da-Rocha 2007). However, in Trinidad, species of *Paecilaema* are much larger than *Cynortula* in scutal length (2-3 mm) and differ in having large posterior spines on the dorsum (Fig. 1G). In addition, the body of *Cynortula* is generally flattened, whereas in *Paecilaema*, the body is sloped, with the abdomen being much higher than the anterior region of the body. The two species of *Cynortula* differ from each with respect to the dorsal pattern (Figs. 1C, 1D). Similarly, in *P. inglei*, the dorsal pattern features small white spots that are absent in *Paecilaema* sp. 2 (Figs. 1D-F). To confirm the identities of the cosmetid species, we will have to examine the holotypes.

With respect to natural history, cosmetids were the most abundant harvestmen in the habitats that we surveyed (Table 2). They are active in the litter day and night, and also occur within or beneath logs, palm frond sheaths, or in bamboo shoots. These harvestmen also occupy crevices in tree buttresses (Burns *et al*. 2007). We collected nymphs for both genera. Immature individuals were recognized by their elongate, non-spatulate (= cylindrical) pedipalps.

Cranaidae

We collected specimens of both cranaid species known for Trinidad (Figs. 1H-L). These species are sexually dimorphic with males having more armature on the femur and tibia of leg IV (Figs. 1H, 1J, 1L). Male *Phareicranaus calcariferus* are smaller in total body length (7.4 - 9.6 mm) than *Santinezia serratotibialis* (9.6 - 11.9 mm) and also lack spines on the ventral surface of coxae IV (Fig. 1K). In addition, male *S. serratotibialis* have more prominent spines on femur IV (Fig. 1H). Female cranaids are difficult to distinguish, although

Table 2. Relative abundance of harvestmen for Mount Tamana (MTT: 10°28’15.5”N, 61°11’50.5”W; WGS84), Petite Tacarib and Grande Tacarib (TAC: 10°47’39”N, 61°13’33”W; WGS84), Lalaja Trace (LTR: 10°44’47”N, 61°15’54”W; WGS84), Salybia (SAL: 10°44’19.3”N, 61°16’16.6”W; WGS84), Trinity Hills (TRI), Tucker Valley (TUV: 10°43’22”N, 61°36’39”W; WGS84), Hollis Reservoir (HOR: 10°41’21.2”N, 61°11’46.6”W; WGS84), Morne Bleu Ridge (MBR: 10°43’53”N, 61°15’08”W; WGS84), and the summit of Mt. Aripo (SMA). +++ = 20+ individuals collected, ++ = 5-20 individuals collected, + = less than 5 individuals.

Taxa	MTT	TAC	LTR	SAL	TRI	TUV	HOR	MBR	SMA
Agoristenidae									
Trinella sp.			+					++	++
Cosmetidae									
Cynortula sp. 1	+++	+++	+++	++	++			++	++
Cynortula sp. 2	+	+++	++			+			
P. inglei	+	+++	+++	+	++	++	+	+	
Paecilaema sp. 2				+			+		
Cranaidae									
P. calcariferus	++	++	+					++	+
S. serratotibialis	+	+	+				+	++	++
Kimulidae									
sp. 1		+							
sp. 2		+							
sp. 3									+
Manaosbiidae									
C. montgomeryi								+++	+++
R. albilineatus	+++	+++	+	++		++	+	+	
Samoidae									
M. trinidadense		+	+						
P. longipalpus			+					+	+
sp. 3		++							
Sclerosomatidae									
P. vitttatum	+++	+++	+		++	++	++	++	++
Prionostemma insulare			++	+			+	+	
Prionostemma sp. 3									+
Stygnidae									
S. clavotibialis	+	+++	+	+			+	+	
Stygnommatidae									
Stygnomma sp.			+						

individuals of *S. serratotibialis* tend to be slightly larger (1-3 mm). With respect to overall body size, cranaids are the largest harvestmen in Trinidad.

Cranaids are inactive during the day, occupying logs or palm frond sheaths. At night, these species climb the vegetation, presumably to forage. Both species reproduce during the wet season and are syntopic. Adults associate with and presumably guard eggs, larvae and nymphs (Hunter *et al.* 2007). We found cranaids to be common in forests with abundant rotting logs or palm frond sheaths and absent from habitats with little ground cover (Table 2).

Kimulidae

We discovered three species for this family in Trinidad. Specimens were collected from leaf litter and decaying logs. Kimulids often exhibit sexually dimorphic traits, with the male possessing a larger, more heavily armed leg IV. Kimulids have a different body shape than samoids and all three species had patterns of alternating light and dark bands (Figs. 2A-E). We are in the process of describing these species. The most useful characters for distinguishing kimulids include spines on the posterior border of the scutum, relative body size, armature on the trochanter and femur of leg IV, and shape of the abdomen. Species 1 (Figs. 2A, 2B) has a pair of spines on posterior margin of the scutum, numerous small spines on leg IV, and a broad abdomen. Species 2 (Fig. 2C) lacks posterior spines on the scutum, has less armature on leg IV and a more elongate abdomen. Species 3 is nearly twice the size (total length = 6.2 mm) of the other kimulids (total length = 3.8 and 3.9 mm, respectively) and has a tapering abdomen with large, prominent spines on the trochanter and femur of leg IV (Figs. 2D, 2E)

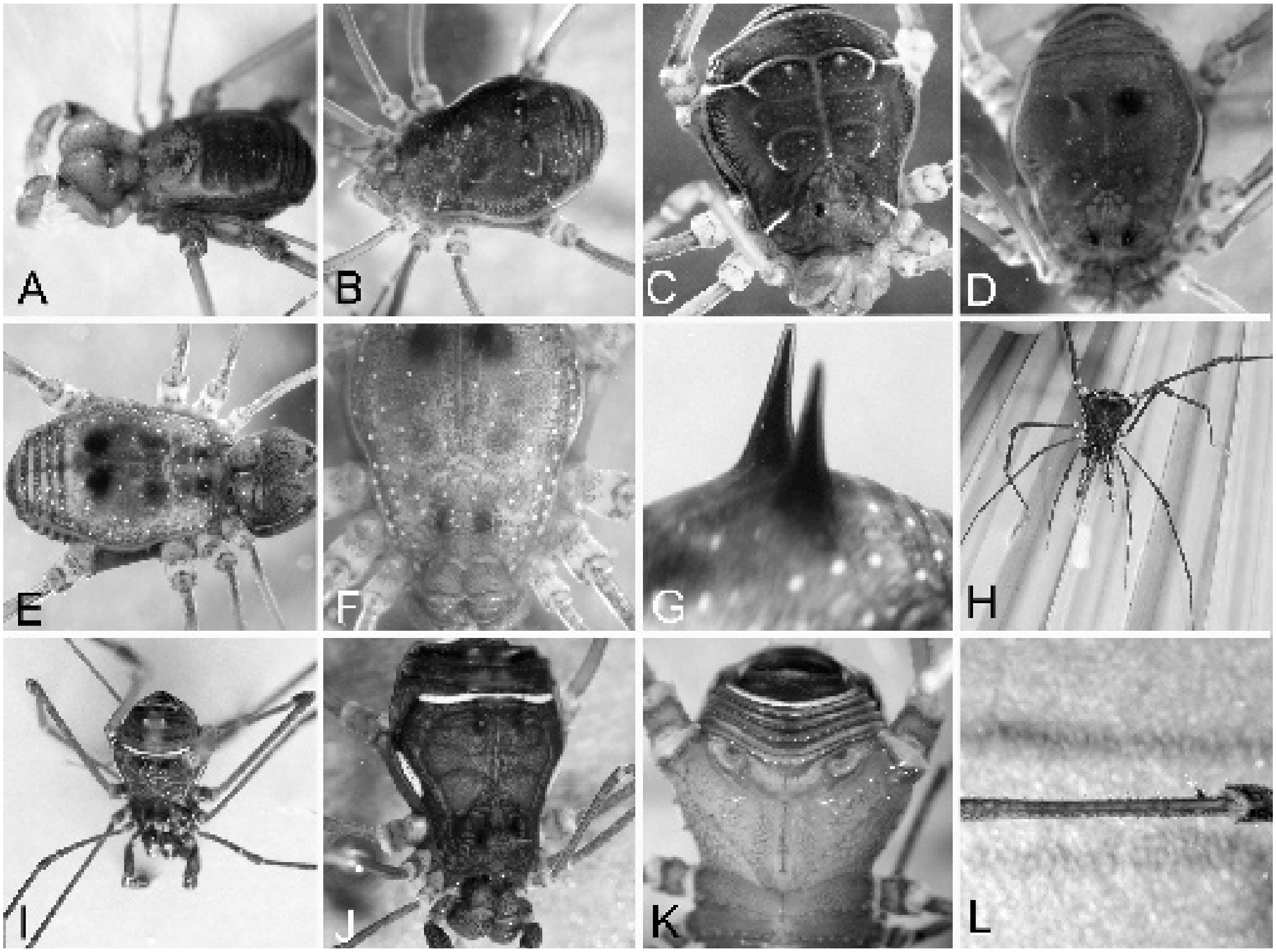

Fig. 1. Photographs of harvestmen from the families Agoristenidae, Cosmetidae, and Cranaidae. **A.** Lateral view of a male *Trinella* sp. (Agoristenidae). **B.** Dorsal view of *Cynortula* sp. 1 (Cosmetidae). **C.** Dorsal view of *Cynortula* sp. 2 (Cosmetidae). **D.** Dorsal view of *Paecilaema* sp. 2 (Cosmetidae). **E.** Dorsal view of a male *Paecilaema inglei* (Cosmetidae). **F.** Dorsal view of a female *P. inglei*. **G.** Lateral view of large spines on the posterior dorsum of a *P. inglei*. **H.** Dorsal view of a male *Santinezia serratotibialis* (Cranaidae). **I.** Dorsal view of a female *S. serratotibialis*. **J.** Dorsal view of a male *Phareicranaus calcariferus* (Cranaidae). **K.** Ventral view of the smooth coxae of leg IV of a male *P. calcariferus*. **L.** Lateral view of tibia IV of a male *P. calcariferus*.

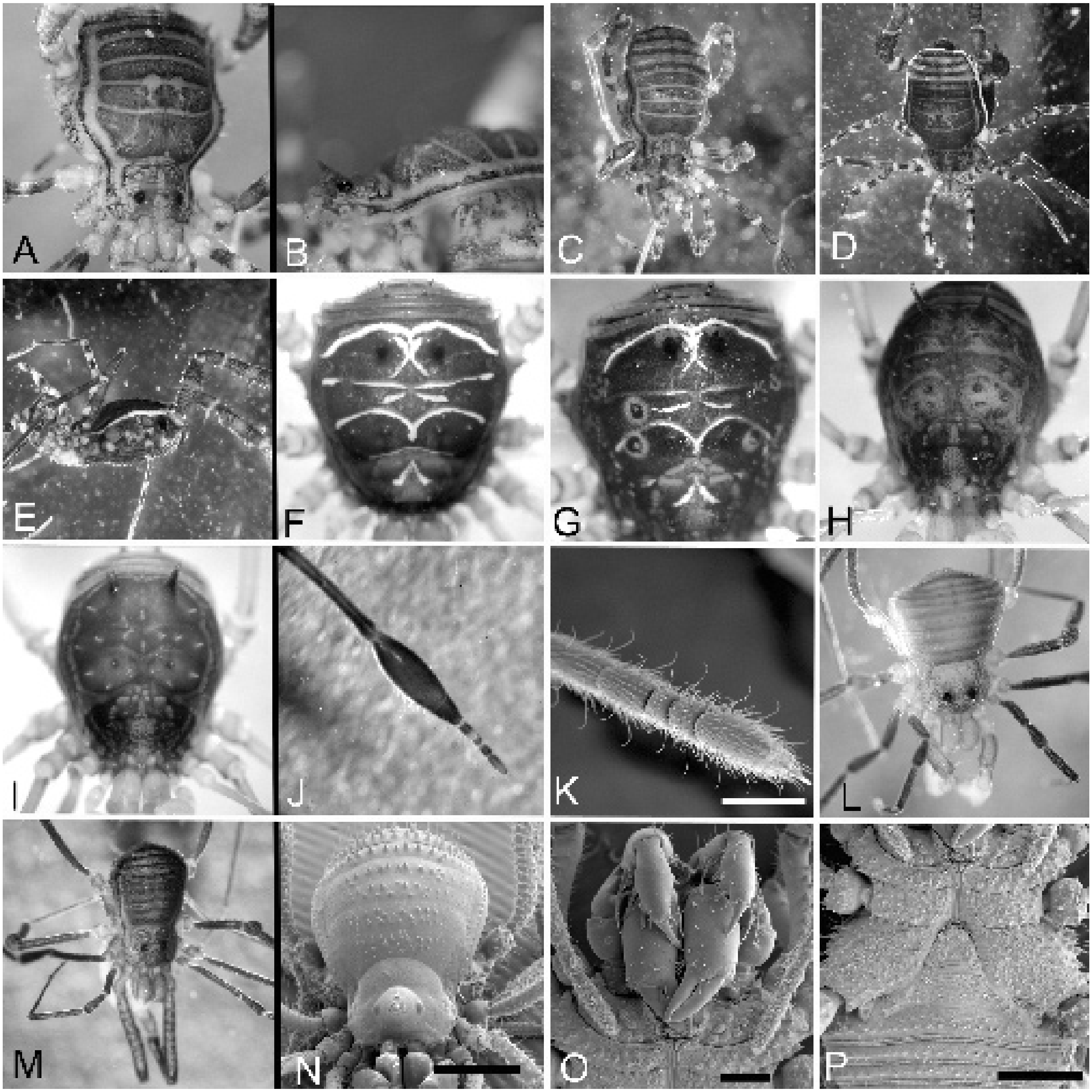

Fig. 2. Photographs and SEM micrographs of harvestmen from the families Kimulidae, Manaosbiidae, and Samoidae. **A.** Dorsal view of undescribed species 1 (Kimulidae). **B.** Lateral view of eye mound and dorsum of kimulid sp. 1. **C.** Dorsal view of undescribed species 2 (Kimulidae). **D.** Dorsal view of undescribed species 3 (Kimulidae). **E.** Lateral view of kimulid sp. 3. **F.** Dorsal view of female *Rhopalocranaus albilineatus* (Manaosbiidae) with typical dorsal pattern. **G.** Dorsal view of male *R. albilineatus* showing unusual pattern (white rings around several dorsal spines) exhibited by individuals captured from Salybia. **H.** Dorsal view of a male *Cranellus montgomeryi* (Manaosbiidae). **I.** Dorsal view of a female *C. montgomeryi*. **J.** Tarsus of leg I of a male *C. montgomeryi* showing spindled morphology. **K.** SEM micrograph of distitarsus of leg I of female *C. montgomeryi*, scale bar = 250 µm. **L.** Dorsal view of *Maracaynatum trinidadense* (Samoidae). **M.** Dorsal view of *Pellobunus longipalpus* (Samoidae). **N.** SEM micrograph of the dorsal view of unidentified species collected from bromeliads (Samoidae), scale bar = 0.5 mm. **O.** SEM micrograph of chelicerae and pedipalps of unidentified samoid, scale bar = 250 µm. **P.** SEM micrograph of the ventral surface of unidentified samoid, scale bar = 0.5 mm.

Manaosbiidae

We collected specimens of both species known for Trinidad (Figs. 2F-K). In this family, the male possess a spindled basitarsus of leg I (Fig. 2J), not exhibited by the female (Fig. 2K). *Rhopalocranaus albilineatus* has a striking pattern or white or yellowish lines on its dorsum. This pattern was consistent across localities with the exception of specimens collected from Salybia (Fig. 2G), which had white rings around 2-3 of the spines, near the mid-dorsum. In contrast, *Cranellus montgomeryi* (Figs. 2H, 2I), has a uniform brown dorsum with light brown legs, and yellowish chelicerae and pedipalps. With respect to distribution, *R. albilineatus* is common (Table 2), whereas *C. montgomeryi* was collected only from Morne Bleu Ridge and the summit of Mt. Aripo (Table 2). In general, we found relatively few manaosbiid nymphs, indicating that these species were not reproducing during our sampling periods or that nymphs occupy microhabitats that were not sampled.

Samoidae

We collected few specimens of both known species for this family as well as five specimens for a third, probably new, species (Table 2). Samoid harvestmen are relatively small (less than 5 mm total body length) and can be differentiated from kimulids on the basis of the armature and relative size of the leg IV. The three samoid species differ with respect to the length of the femur of the pedipalps (Figs. 2L, 2M, 2O). In *Pellobunus longipalpus*, the femur of the tibia is very long (Fig. 2M). *Maracaynatum trinidadense* (Fig. 2L) differs from the unidentified species with respect to eye mound morphology (not cone-shaped) and morphology of leg IV. The unidentified species was collected from canopy bromeliad samples. We are in the process of describing this species.

Sclerosomatidae

We collected *Prionostemma vittatum, P. insulare* and an additional species of *Prionostemma*. Five species for this family are known for Trinidad (Table 1). *Prionostemma vittatum* (Figs. 3A, 3B) differs from others in having lightly colored coxae, with a dark eye mound, and broken or complete black lines on its dorsum. It is one of the most common harvestmen on Trinidad (Table 2). *Prionostemma insulare* (Figs. 3C, 3D) has black coxae and trochanters and a darker dorsum. The undescribed species (Figs. 3E, 3F) was only found at the summit of Mt. Aripo. This species had white patches on the lateral surfaces of the abdomen (Fig. 3E) and the trochanters had four light spots each (Fig. 3G). We did not collect individuals of *Holcobunus*, *P. fulginosum* (gold flecks on its dorsum), or *P. referens*.

We observed *P. vittatum* feeding upon dipteran larvae, conspecifics, fruit and floral parts. This species is active in the litter day and night. We observed one mass aggregation of thousands of individuals beneath the PAX Guesthouse.

Stygnidae

We collected *Stygnoplus clavotibialis* from several locations (Table 2). Males possess large chelicerae (Fig. 3H) in comparison to females (Fig. 3I). The chelicerae of females exhibit a clipper-like morphology (Fig. 3J). In males, they have a pliar-like morphology (Fig. 3K). As in agoristenids, the first leg is filiform (Figs. 3M, 3N), however, in stygnids, the dorsum is adorned with large spines and the eyes are not on a common mound.

Individuals were collected from logs and the surfaces of tree buttresses, but were not found in the leaf litter. We observed two aggregations (25 and 32 individuals) of adults and nymphs in 2005 (Burns *et al*. 2007). At night on the Morne Bleu Ridge, we observed a solitary individual moving to different locations on the underside of a large leaf and remaining still for several minutes at a time. This behavior may indicate active searching for prey or a mate.

Stygnommatidae

We collected a single adult male (Figs. 3L-O) from beneath a log at Lalaja Trace (Table 2). In contrast to other species, *Stygnomma* sp. is unique in having massive chelicerae (Fig. 3M) that tower above the body (Fig. 3N) and robust pedipalps (Fig. 3O) and legs.

Zalmoxidae

We did not collect any specimens for this family during our study. However, we did borrow and photograph the holotype (Fig. 3P) from the AMNH collection. This holotype was either a female or sexually immature.

SUMMARY

Although many species are widely distributed in Trinidad, there were several harvestmen that we found in only one location. These taxa included species from the families Kimulidae, Samoidae, Sclerosomatidae, and Stygnommatidae. Owing to small sample sizes ($n < 10$), inferences regarding the distribution and status of these species are limited. Given our collection methods, we may have undersampled small species in the leaf litter. For taxa that were locally abundant in only a few locations, i.e., *Cranellus montgomeryi*, samoid species 3, *Prionostemma* sp. 3, and *Trinella* sp., we propose the hypothesis that these species may have specific habitat or microhabitat preferences. In addition, the collection of the unidentified samoid species from only tank bromeliad samples, indicates that this spe-

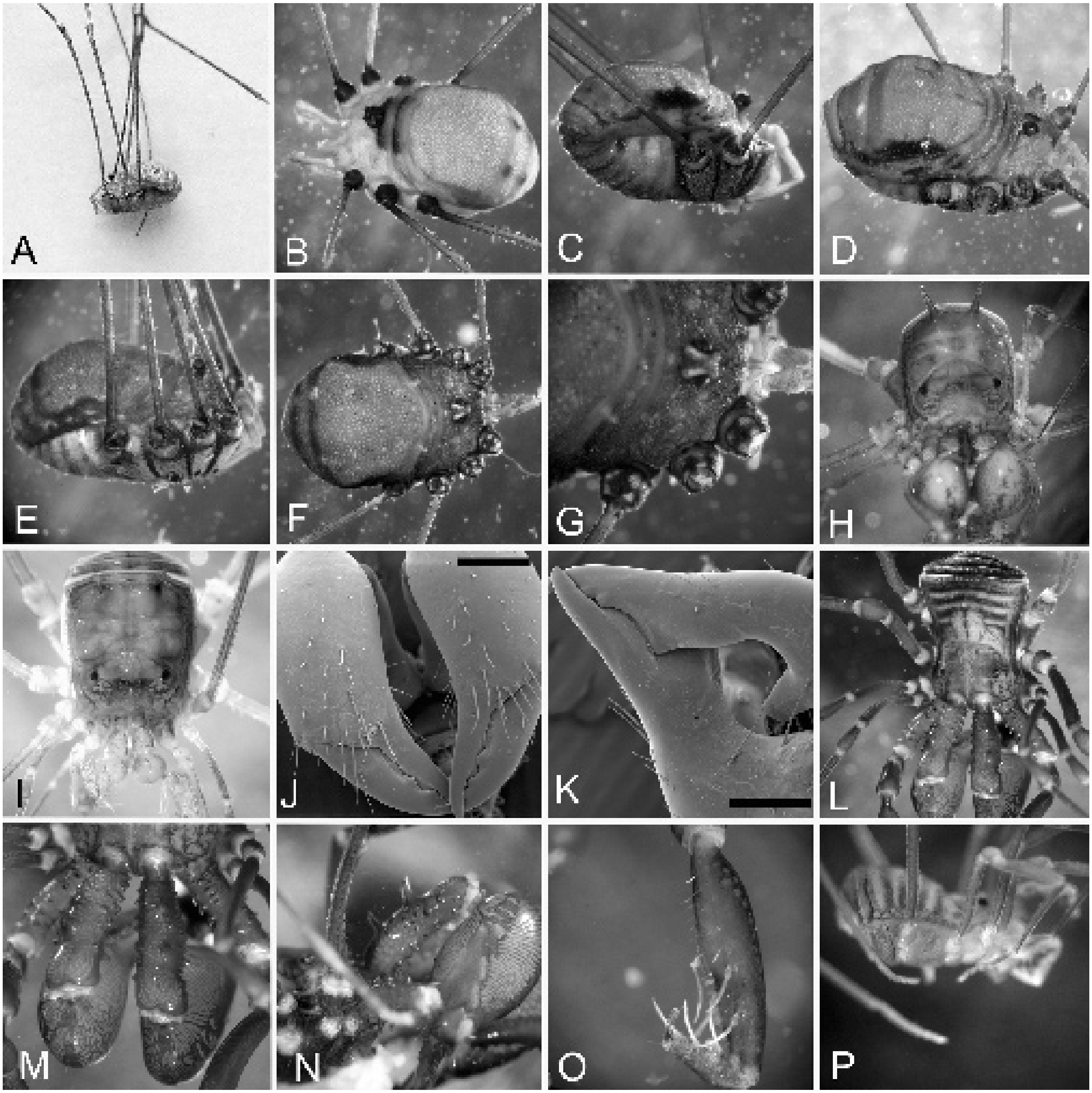

Fig. 3. Photographs and SEM micrographs of harvestmen from the families Sclerosomatidae, Stygnidae, Stygnommatidae, and Zalmoxidae. **A.** Lateral view of *Prionostemma vittatum* (Sclerosomatidae). **B.** Dorsal view of *P. vittatum*. **C.** Lateral view of *P. insulare*. **D.** Dorsal view of *P. insulare*. **E.** Lateral view of undescribed species of *Prionostemma* from Mt. Aripo. **F.** Dorsal view of undescribed sclerosomatid. **G.** Dorsal view of the trochanters of undescribed sclerosomatid. **H.** Dorsal view of a male *Stygnoplus clavotibialis* (Stygnidae). **I.** Dorsal view of a female *S. clavotibialis*. **J.** SEM micrograph of the chelicerae of a stygnid female, scale bar = 250 μm. **K.** SEM micrograph of a chelicera of a stygnid male, scale bar = 0.5 mm. **L.** Dorsal view of *Stygnomma* sp. (Stygnommatidae). **M.** Dorsal view of the chelicerae of *Stygnomma* sp. **N.** Lateral view of the chelicerae of *Stygnomma* sp. **O.** Ventral view of the pedipalp of *Stygnomma* sp. **P.** Lateral view of the AMNH holotype of *Ethobunus tuberculata* (Zalmoxidae).

cies may be a specialist within phytotelmata.

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Appendix

Taxonomic Key to the Families of Harvestmen Occurring in Trinidad and Venezuela

The following is a dichotomous key that can be used to identify harvestmen to family and is based upon those published by Kury and Pinto-da-Rocha (2002), Pinto-da-Rocha and Giribet (2007), and Kury (2007). Of the 13 families included in this key, only 10 are presently known from Trinidad. The families Guasiniidae and Icaleptidae (Kury and González 2007) occur in Venezuela. The family Biantidae is known from several islands in the Caribbean.

1\. Single tarsal claw present on legs I-IV.......... 2
   Single tarsal claw present on legs I and II, two tarsal claws on legs III-IV.......... 3
2\. Legs relatively long and slender, pedipalps slender and unarmed, eyes present on eye mound.......... **Sclerosomatidae**
   Legs shorter, pedipalps short and thick, eyes absent.......... **Guasiniidae**
3\. Eye mound not separated, may have eminence between eyes (Figure 4A).......... 4
   Eye mound separated into 2 distinct parts.......... 11
4\. Tarsal process (legs III-IV) present (Figure 5).......... 5
   Tarsal process absent.......... 7
5\. Eye mound depressed between eyes and armed with large spines (Figure 4B); large body size, 8-13 mm scutal length.......... **Cranaidae**
   Eye mound not depressed (Figure 4C), may be armed; body size 7 mm or less.......... 6
6\. Pedipalps are spatulate (Figure 4D), male basitarsus I not spindled.......... **Cosmetidae**
   Pedipalps are not spatulate, male basitarsus I spindled (Figure 4E).......... **Manaosbiidae**
7\. Dorsal scutum with parallel lateral margins; leg I filiform.......... **Agoristenidae**
   Opisthosoma much wider than prosoma (Figure 4F); leg I not filiform.......... 8
8\. Coxa IV inserted ventrally, eye mound large and unarmed and rises directly from frontal margin of carapace..........**Icaleptidae**
   Coxa IV inserts laterally, eye mound may be armed, not rising from frontal margin..........9
9\. Prosoma slightly shorter than rest of the dorsal scutum; dorsal surface of body and legs without alternating light and dark bands..........**Samoidae**
   Prosoma much shorter than rest of the dorsal scutum; body with alternating light and dark bands..........10
10\. Legs robust with light and dark bands; eye mound armed; coxae of leg IV of male visible from above; total body length 3.8 – 6.2 mm..........**Kimulidae**
   Legs slender and not banded; small body size (2.1 mm total length).......... **Zalmoxidae**
11\. Chelicerae very large (almost equal to body length); dorsum smooth, clock-shaped, unarmed; large, robust pedipalps, no spine between eyes..........**Stygnommatidae**
   Chelicerae large in males only (less than 50% of body length), dorsum may be armed with posterior spines, pedipalps are long and slender..........12
12\. Tarsal process (legs III-IV) present.......... **Stygnidae**
   Tarsal process absent.......... **Biantidae**

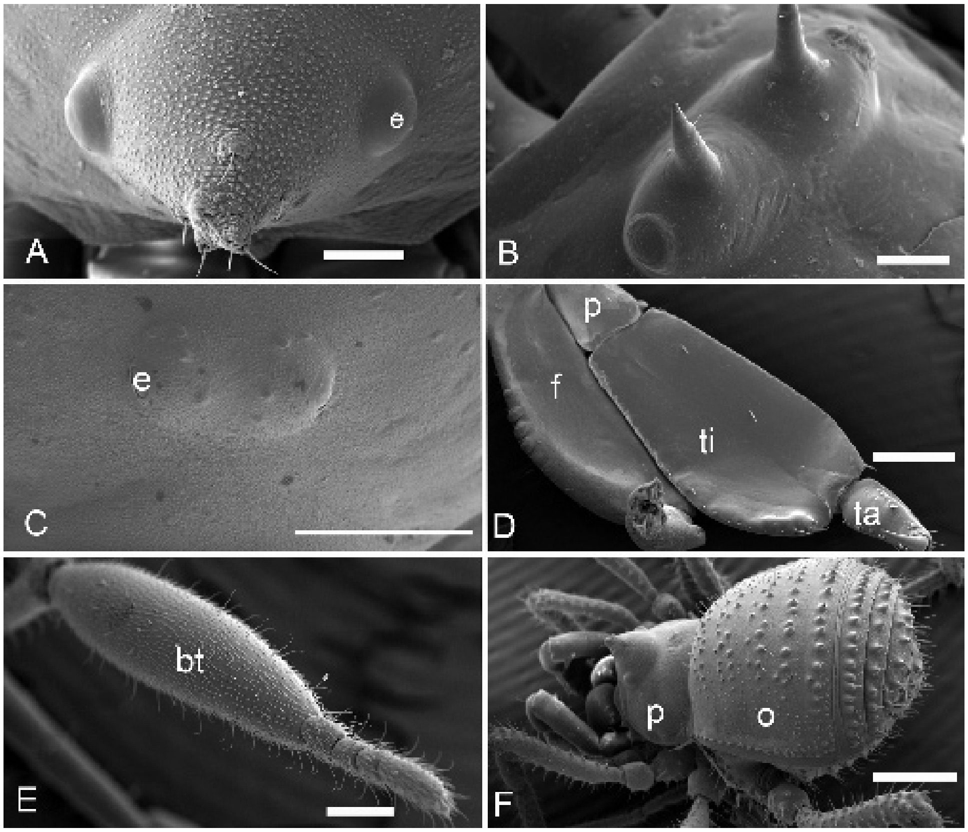

Fig. 4. Scanning electron micrographs of major morphological characters of harvestmen. **A.** Eye mound of a samoid harvestman with eminence between the eyes (e). **B.** Armed eye mound of a cranaid harvestman with a central depression. **C.** Unarmed, smooth eye mound of a cosmetid harvestman (e). **D.** Ventral view of the pedipalp of a cosmetid harvestman revealing the flattened, spatulate condition of the femur (f), patella (p), tibia (ti), and tarsus (ta). **E.** Basitarsus (bt) of leg I of a manaosbiid harvestman. **F.** Lateral view of a samoid harvestman. Note the significant difference in the width of the prosoma (p) and opisthosoma (o). Scale bars are 0.5 mm for C, D, and F; 100 µm for A; 150 µm for B; and 250 µm for E.

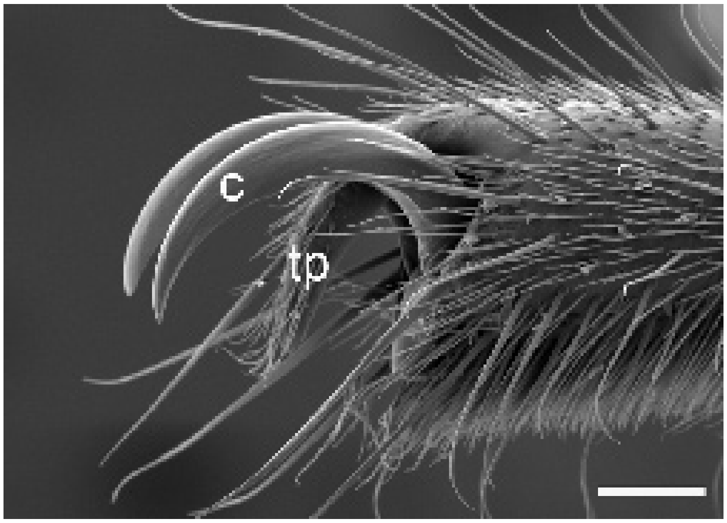

Fig. 5. Scanning electron micrograph of tarsal process (tp) and claws (c) on the third leg of an adult male *Santinezia serratotibialis*. Scale bar = 150 μm.