

NOTES ON THE NEOTROPICAL SPIDER GENUS *MODISIMUS* (PHOLCIDAE, ARANEAE), WITH DESCRIPTIONS OF THIRTEEN NEW SPECIES FROM COSTA RICA AND NEIGHBORING COUNTRIES

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ABSTRACT. Notes on the morphology and natural history of Central American *Modisimus* species are given. Thirteen new species from Costa Rica, Panama and Nicaragua are described. This highlights the greatly underestimated diversity of the genus in the region (only one species has previously been recorded from Costa Rica). New names are: *Modisimus bribri* new species, *M. cahuita* new species, *M. caldera* new species, *M. coco* new species, *M. dominical* new species, *M. guatuso* new species, *M. madreSelva* new species, *M. nicaraguensis* new species, *M. pittier* new species, *M. sanvito* new species, *M. sarapiqui* new species, *M. selvanegra* new species and *M. tortuguero* new species. Seven further species of the genus are redescribed in order to ascertain their distinctiveness from the new species: *M. dilutus* Gertsch 1941 and *M. pulchellus* Banks 1929 from Panama, *M. inornatus* Cambridge 1895, *M. maculatipes* Cambridge 1895, *M. putus* Cambridge 1895 (which is newly synonymized with *M. maculatipes*), *M. propinquus* Cambridge 1896 from Mexico and *M. texanus* Banks 1906 from Texas.

The genus *Modisimus* was established by Simon (1893b) for a single species from the Dominican Republic (*M. glaucus* Simon 1893). Presently it contains some 45 species, mostly from Central America and the West Indies. Only one species has been reported from the USA (*M. texanus* Banks 1906), while all of the five South American species may be either misplaced, introduced, or erroneously assigned to South America (Huber in press b). Thus, the genus appears to be restricted to Central America and the West Indies, but the pholcid faunas of Colombia and other northern South American countries are almost unknown and may well include representatives of *Modisimus*.

The genus is weakly defined by the presence of a prominent eye turret, an elevation of the prosoma that carries the eyes. *Modisimus* is apparently part of a group of genera that share the geographic distribution (North and Central America and the West Indies) and the presence of a pointed and upward projecting apophysis on the male pedipalpal femur ("*Modisimus* group" - Huber in press b). This group includes also the genera *Anopsicus*

Chamberlin & Ivie 1938, *Psilochorus* Simon 1893, *Bryantina* Brignoli 1985, and some species currently misplaced in the genera *Coryssocnemis* Simon 1893 and *Blechnroscelis* Simon 1893. The genus *Hedypsilus* Simon 1893 has been discussed recently (Huber 1996) and no character was found that would distinguish it from *Modisimus*. It was therefore synonymized with *Modisimus* and includes "short-legged" *Modisimus*. *Anopsicus* and *Psilochorus* are also "short-legged", but their eye-regions are hardly elevated, and *Psilochorus* has well developed anterior median eyes (which are missing or reduced to vestiges in *Modisimus*). *Bryantina* might be a synonym of *Modisimus*. Only further study can clarify the phylogenetic relationships within the "*Modisimus* group".

The most recent published checklist of Costa Rican spiders (Zuñiga 1980) includes only one representative of the pholcid genus *Modisimus*: *M. inornatus* Cambridge 1895. This species was originally described from Mexico and was later recorded from Panama (Petrunkevitch 1925) and Costa Rica (Reimoser 1939), but the existing descriptions (Cambridge 1895, 1896, 1899; F. Cambridge 1902) are not sufficient for the great biodiversity we encounter, casting doubt on the identifications

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of later authors. The primary incentive for the present study was the contrast between this single doubtful record and the considerable number of unidentified species in collections. Thus, the focus of this paper is on the diversity of the genus in a comparatively small geographic region, rather than on a clade or a distinctive species group. Although the emphasis is on Costa Rican representatives, some previously described Mexican and Panamanian *Modisimus* species were studied and are redescribed in order to avoid the creation of junior synonyms, because the existing descriptions did not allow their separation from Costa Rican specimens (*M. inornatus*, *M. dilutus*, *M. pulchellus*, *M. texanus*). Moreover, three species originally described from Mexico (*M. maculatipes*, *M. putus*, *M. propinquus*) have also been recorded from Panama (Banks 1929; Nentwig 1993; Chickering 1936), suggesting their occurrence in Costa Rica. It turns out that none of these species has been collected in Costa Rica, and the Panamanian records are probably based on misidentifications. Apart from this, three species from neighboring countries (Panama, Nicaragua) are also newly described. "Short legged" *Modisimus* (= "Hedypsilus", synonymized by Huber 1996) are excluded because they were recently treated elsewhere (Huber 1996—only one species is known from Costa Rica: *M. culicinus* Simon 1893).

METHODS

This study is primarily based on the collections of the Instituto de Biodiversidad, Costa Rica (INBIO), the Escuela de Biología of the Universidad de Costa Rica (UCR), and the author's collection (the latter will eventually be incorporated into the UCR collection). Unless otherwise noted, the material studied is in the author's collection. Types were borrowed from the following institutions: Museum of Comparative Zoology, Cambridge (MCZ), American Museum of Natural History, New York (AMNH), Natural History Museum, London (BMNH), Senckenbergmuseum Frankfurt (SMF), Muséum National d'Histoire Naturelle, Paris (MNHN). In addition to the types of all the species treated in the present paper, I have seen the following: *M. cornutus* Kraus 1955, *M. culicinus* Simon 1893, *M. glaucus* Simon 1893, *M. globosus* Schmidt 1956, *M. palenque* Gertsch 1977. The pub-

lished descriptions of species whose types were not studied were considered sufficient to separate those species from the newly described species.

Descriptions follow the style currently used for pholcid spiders, with the following exceptions: while much emphasis has traditionally been on the pattern of eyes (relative size and position, curvature of eye rows, etc.), this character is of very limited value in closely related species and is usually described only by means of a figure. In contrast, more emphasis is laid on the genitalia, especially the male paracymbium or "procurus", and the male chelicerae that are sexually modified. Drawings of the entire palps are usually accompanied by drawings of details (femur apophysis, bulb, procurus) since small changes in the angle of view may drastically change their shape. The same problem applies to the prosoma (compare Figs. 1 and 2).

Drawings were made with a compound microscope with camera lucida and later completed with a dissecting microscope. Measurements (all in mm) were taken with ocular micrometers in a compound or a dissecting microscope. Averages (arithmetic means) are given for $n \geq 5$. Prosoma length was defined as the distance between frontal face of eye region and posterior border of carapace medially, but it varies widely with the angle at which the prosoma is viewed (it is hardly possible to position the spider in a standard angle unless all the legs are cut off). "Carapace" is referred to as the dorsal part of the prosoma. The most accurate indicators of size are probably prosoma width and tibia length. Total size is simply the sum of prosoma length and opisthosoma length, regardless of the petiolus, and is given as an approximate indication of overall size. For reasons of space, measurements for all segments (except coxa and trochanter) are given only for leg 1. For other legs, only total length is given. The tibia index ("tibind") is the length of the tibia divided by its width at the middle, and is thus a measure of the "slenderness" of the legs. In the diagnoses, species with an average total length of > 3 mm are defined as "large", those smaller than 2.5 mm are "small".

Morphological details (spinnerets, male genital pore, hair structure) were studied with a Hitachi S-570 scanning electron microscope.

Modisimus Simon 1893

Modisimus Simon 1983b: 484–485, figs. 480–482, 485. Type species: *Modisimus glaucus* Simon 1893, in MNHN, examined. Simon 1893a: 322. Gertsch 1971: 66. Brignoli 1973: 219–221. Gertsch & Peck 1992: 1192–1193. Huber 1996: 238–239.

Modisimops Mello-Leitão 1946: 50. Type species: *M. dilutus* Gertsch 1941, in AMNH, examined. Synonymized with *Modisimus* by Brignoli 1973, with *Hedyspilus* by Gertsch & Peck 1992.

Hedyspilus Simon 1893b: 484–486, figs. 483–484, 486. Type species: *H. culicinus* Simon 1893, in MNHN, examined. Simon 1893a: 322. Gertsch & Peck 1992: 1192. Huber 1996: 238–239. Synonymized by Huber 1996.

Diagnosis.—Small to medium sized (1.5–4 mm body length) pholcids with elevated eye region (eye turret; Figs. 46, 149, 183). Usually with six eyes, rarely with punctiform anterior median eyes (Fig. 190), with pointed and upward projecting apophysis on the male pedipalpal femur (Fig. 4). The closest relatives are: *Anopsicus* (six eyes in two triads, no eye turret), *Psilochorus* (eight eyes on weakly elevated eye region), *Bryantina* (possibly a synonym of *Modisimus*), and some probably misplaced Central American “*Coryssocnemis*” and “*Blechroscelis*” (these also lack an eye turret and have eight eyes).

Morphology.—The species treated in the present study are relatively small spiders (about 2–4 mm total length), but their long legs (the first legs of males range from about 18–45 mm each) make them fairly conspicuous. Depending on the habitat (see below) they are either dark (ochre, brown, with black spots) or light (pale ochre-yellow, greenish). The habitus of males and females differs only slightly (Figs. 64–66, 182–184), the female having a smaller prosoma and shorter legs, but often a more globular and larger opisthosoma (depending on the amount of eggs). Sexual dimorphisms occur in the chelicerae (those of the males are equipped with modified hairs) and sometimes the femora of the anterior legs (again, those of the male may be equipped with modified hairs in the form of spines). The most puzzling sexual dimorphism concerns the femora of all legs that are set with high numbers of short (about 50 μm), fine (diameter proximally about 1.5 μm , distally 0.3 μm), erect hairs in males (Fig. 18), while the legs of females have only very few hairs of

this type. These hairs remind one of chemosensitive sensilla (“taste-hairs” - Foelix & Chu-Wang 1973), but the tips are pointed rather than blunt, and it would be very unusual for taste hairs to be located in such densities on the femora while distal leg segments are equipped with much lower densities (see the tibia in Fig. 33). Scanning micrographs of the tips did not reveal any pores. Characteristically curved hairs (Fig. 33) occur on the tibiae and metatarsi of most species, usually both in males and females. They are often restricted to the anterior legs, and this trend is stronger in females than in males.

The male genitalia offer the best characters for species discrimination (Figs. 4, 5). The pedipalpal femur is ventrally equipped with a pointed, sclerotized apophysis. The cymbium bears a prominent paracymbium (in pholcids called procurus) which is usually highly species specific and often carries a dorsal spine (or “flagellum”). The bulb lacks an embolus (which is common in American pholcids - Huber unpubl. data); the sperm duct does not run through any elongated projection but opens near the basis of the bulbal apophysis that is usually set with small denticles and has often been misinterpreted as the embolus (Petrunkevitch 1929; Bryant 1940, 1948). Also the pedipalpal coxae are sexually modified in males: they bear a simple apophysis that stabilizes the palp during copulation (Huber in press b). The female genitalia are marked externally by a more or less sclerotized plate (the “epigynum”) that is diagnostic in only a few species. Internally the simple copulatory chamber (uterus externus) bears dorsally a pair of pore plates that mark the position of the vulval glands, and is connected to the oviduct by a simple “valve” (Huber in press a).

While the function of the erect hairs and spines on the male femora remains to be established, some other sexually dimorphic and genitalic characters have been interpreted functionally (Huber in press b). The modified hairs on the male chelicerae contact the female epigynum during copulation and may provide the male information regarding his position towards the female, or stimulate the female. The procuri are inserted into the female copulatory chamber. The bulbal apophyses are also inserted into the female and their denticles apparently function to increase the friction between male apophysis and the ven-

tral surface of the uterus externus, but might also be involved in stimulation. The pedipalpal femur apophysis hooks into a pouch of the bulb and stabilizes the bulb during copulation.

The spinnerets of three species were studied (*M. guatuso* new species, *M. dominical* new species, *M. culicinus*) and showed little interspecific variation, but differed from *Pholcus phalangioides* (Fuesslin 1775) by having only two spigots on each anterior lateral spinneret (the "widened spigot" and the "pointed spigot" of Platnick et al. 1991; *P. phalangioides* has several "smaller widened spigots" in addition). The male genital pores of the three *Modisimus* species mentioned above lack spigots (in contrast to several other pholcid genera - Huber unpubl. data).

Natural history.—Most of the species treated herein (at least those collected by the author) live in webs whose dominant feature is a dome shaped sheet of silk. The structure of the web has been studied in one species (*M. guatuso* new species - Eberhard & Briceño 1983 under *M. sp. C*; Briceño 1985; Eberhard 1992) but details vary among species (W.G. Eberhard pers. comm.). They occupy a variety of habitats: most species were found in shady, humid places near the ground (the dark species mentioned above), with their webs extended between buttresses of trees, fallen logs, or rocks. A few were found under fallen leaves, in correspondingly tiny webs, while others build their webs higher up in the vegetation (the light species), usually with at least one part of the domed sheet in connection with the underside of a leaf. Most species have only been found in humid forests. Adult males and females occur at any season, but population density may fluctuate significantly (Huber unpubl. data). The spiders are active during the day (several pairs of *M. guatuso* new species were found in copula around noon); their night activities are unknown (cf. nocturnal pholcids in Indo-Australian rainforests - Deeleman-Reinhold 1986).

Some aspects of the reproductive biology have been studied in *M. guatuso* new species (Eberhard & Briceño 1983, 1985 under *M. sp. C*; Huber unpubl. data). Males and females of several species were often found together in one web. In a monthly survey of a *M. guatuso* new species population (Reserva Biol. Leonel Oviedo, Univ. de Costa Rica) over 21 months, I recorded 345 pairs, 296 single females, and

171 single males (cf. similar results in Eberhard & Briceño 1983). This is probably an underestimate of pairs, since the spiders often hide when the nearby vegetation is moved so that I may have overlooked one of the two partners. Males "guard" only females without egg-sacs or spiderlings: in only 2 out of 345 pairs the female was carrying an egg-sac, and in one there were also spiderlings in the same dome. Males were found to be dominant over females, but to be "chivalrous" by frequently ceding prey to the guarded female (Eberhard & Briceño 1983 - their study is based on the same population).

The general pattern of courtship and copulation closely resembles that found in other pholcids (Huber 1994; Uhl et al. 1995; Huber & Eberhard 1997; Huber 1996, 1997, in press b). Of 13 *M. guatuso* new species copulations observed in the laboratory, three started with "flubs", i.e., unsuccessful attempts to couple (two "flubs" each). The spiders copulated in Helversen's (1976) "position of web spiders", the male palps were rotated 180° before copulation, and the genitalia were inserted symmetrically and simultaneously into the female copulatory chamber. Copulations lasted 13.1 min, 14.9 min, 15.8 min and 21.2 min in four pairs with virgin females (the other pairs were freeze-fixed between 2-12 min after coupling). During copulation males performed rhythmic movements with their palps, legs and abdomens. The palps were moved in a lateral direction, and the frequency of this movement slowly decreased from about one movement every 2 sec at the beginning to about one movement every 10 sec at the end of copulation. The movements of right and left palp were asynchronous, with one palp being slightly ahead. The order of first and second palp to move alternated strictly between right and left side. One obvious result of the palpal movements was a rhythmic lateral movement of the female abdomen. Both males and females tapped their partners with the anterior legs during copulation, but usually only during the first minutes. Short bursts of male abdomen vibration accompanied the palpal movements. During the first minutes of copulation the male spinnerets consistently touched the female abdomen, usually anterior to her spinnerets. This caused the male abdomen to move in the same direction, amplitude and frequency as the female abdomen.

No thread was secreted from the male spinnerets.

Many females collected in the field had a "copulatory plug", i.e., a more or less hard globular mass protruding from the copulatory chamber. In a survey of 145 females from 7 species, 59 females (41%) had a plug. This is probably an underestimate of plugged females for three reasons: (1) females lose the plug when laying eggs (confirmed in two cases in *M. guatuso* new species), and 14 of the females without plug had been kept in the laboratory for some time before fixing them and may have laid eggs; (2) in 7 other females without plugs, the epigynum was erected and the uterus externus wide open, suggesting that a plug had been removed (e.g., to study the epigynum); (3) in the field I tended to collect females with egg-sacs in order to be sure to get adults, thus perhaps producing a bias towards unplugged females. In one female (*M. cahuita* new species) the plugged genitalia were serially sectioned, and the protruding mass was simply an extension of the mass inside the uterus externus, consisting of the same mixture of sperm and matrix that is usually found in pholcid genitalia (Uhl 1994). It is worth noting that plugs may repeatedly have been misinterpreted, either as parts of the female genitalia (Cambridge 1895) or as protruding eggs (Petrunkevitch 1929).

As in other studied pholcids (Uhl 1993; Huber in press a, in press b) *Modisimus* females can produce several successive fertile egg-sacs without remating, indicating the ability of storing sperm without having seminal receptacles. Females of *M. guatuso* new species produced up to three fertile egg-sacs in captivity, those of *M. selvanegra* new species up to four. The average number of hatched spiderlings per egg-sac was 13 in *M. guatuso* (22 egg-sacs, range 5–27), 9 in *M. selvanegra* (24 egg-sacs, range 2–17). After producing these fertile egg-sacs, most females continued laying eggs, but no spiderlings emerged from these. Sperm depletion and lab conditions (spiders were only fed *Drosophila* flies) may both be accountable for this observation.

Modisimus bribri new species
(Figs. 1–23)

Type data.—Male holotype and female paratype from forest at sea level on Bocas del

Toro Island, Bocas del Toro Province, Panama, 23 April 1995 (B.A. Huber) (UCR).

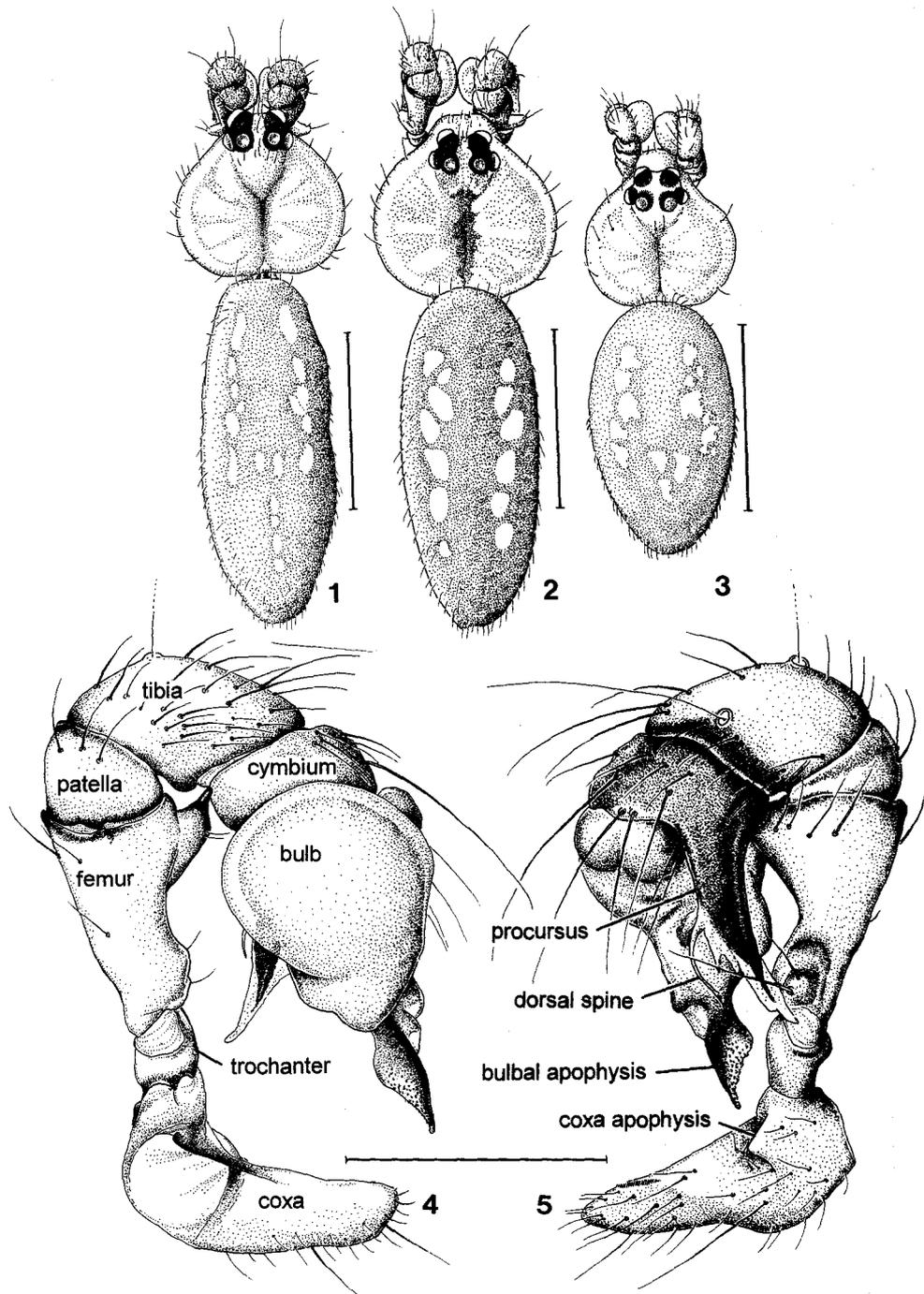
Etymology.—Named for the Bribri, an indigenous Costa Rican people.

Diagnosis.—Light species (pale greenish-yellow) without black spots on opisthosoma (Figs. 1–3), otherwise morphologically similar to *M. guatuso*, and equally variable. Distinguished from light relatives by procurus with long and slender dorsal spine (Figs. 6–8; *M. madreselva* and *M. sanvito* have short dorsal spines: Figs. 95, 122; *M. coco* has a stout dorsal spine: Fig. 50).

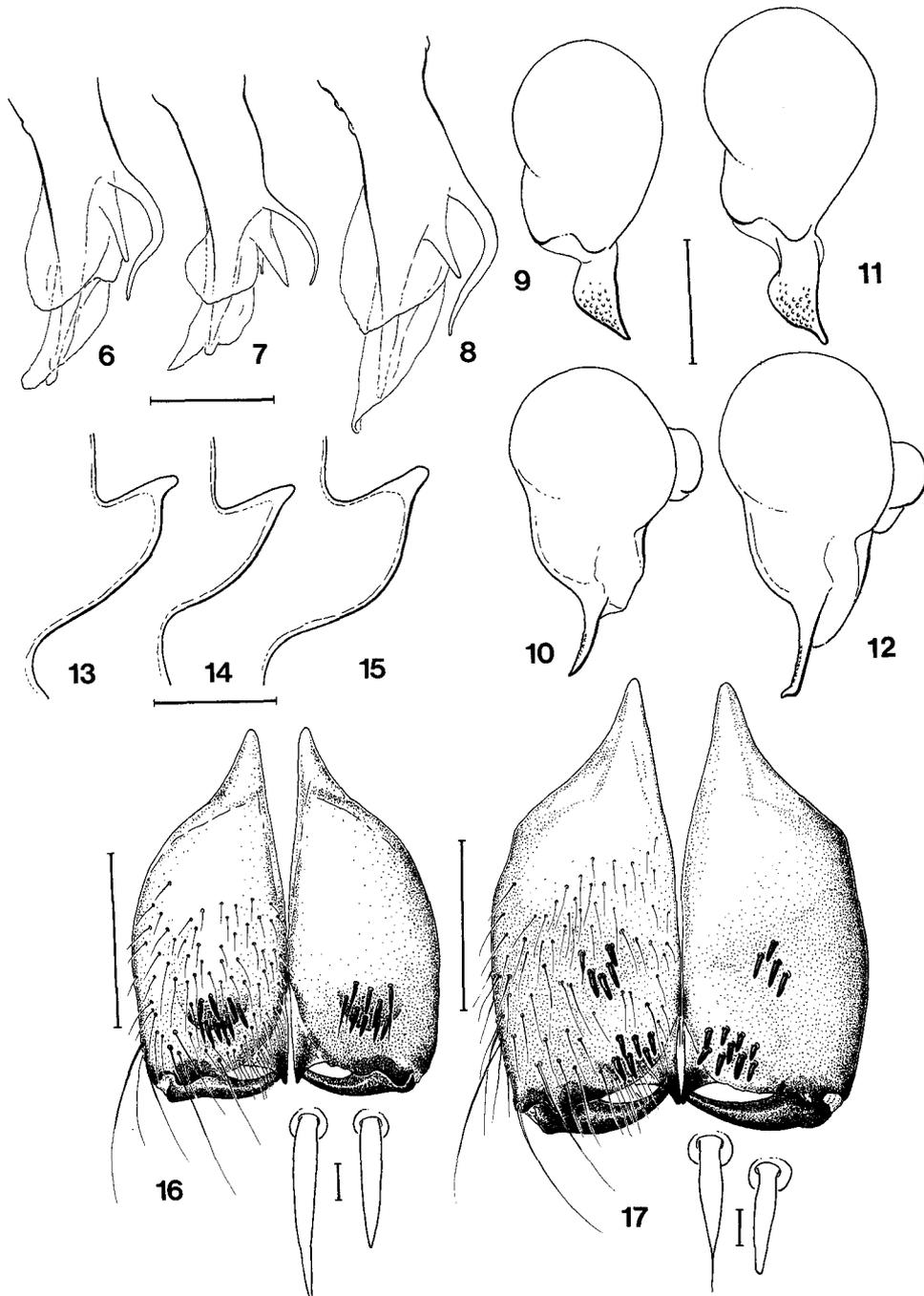
Description.—*Male holotype*: Carapace pale ochre-yellow, with darker median stripe, clypeus white without darker markings, chelicerae and pedipalps pale ochre-yellow, sternum pale orange. Legs ochre-yellow with darker rings at femora (distally) and tibiae (proximally and distally). Distal rings on femora and tibiae followed by light rings. Opisthosoma dorsally bluish-green, with characteristic pattern of white spots dorsally (Fig. 1; these often disappear in alcohol), without black spots; ventrally lighter, only genital plate brownish. Six eyes on eye turret, pedipalps as shown in Figs. 4–5, procurus, bulb and femur apophysis as shown in Figs. 6, 9–10, 13, chelicerae with one patch of modified hairs on each side (Fig. 16). Femora 1 and 2 with a row of spines ventrally (Fig. 18). *Measurements*: Total length: 2.8, prosoma length: 0.9, width: 0.9, opisthosoma length: 1.9; leg 1: fem: 7.7, pat: 0.4, tib: 7.5, met: 14.2, tar: 2.2, total: 32.0, tibind: 79; leg 2: 20.5, leg 3: 14.8, leg 4: 18.0.

Female paratype: Colors mostly as in male, sternum not orange but pale brownish-ochre. Epigynum as shown in Fig. 19, brown. Legs without spines. *Measurements*: Total length: 2.4, prosoma length: 0.8, width: 0.8, opisthosoma length: 1.6; leg 1: fem: 5.0, pat: 0.3, tib: 4.9, met: 8.8, tar: 1.6, total: 20.6, tibind: 62; leg 2: 12.8, leg 3: 9.2, leg 4: 12.0.

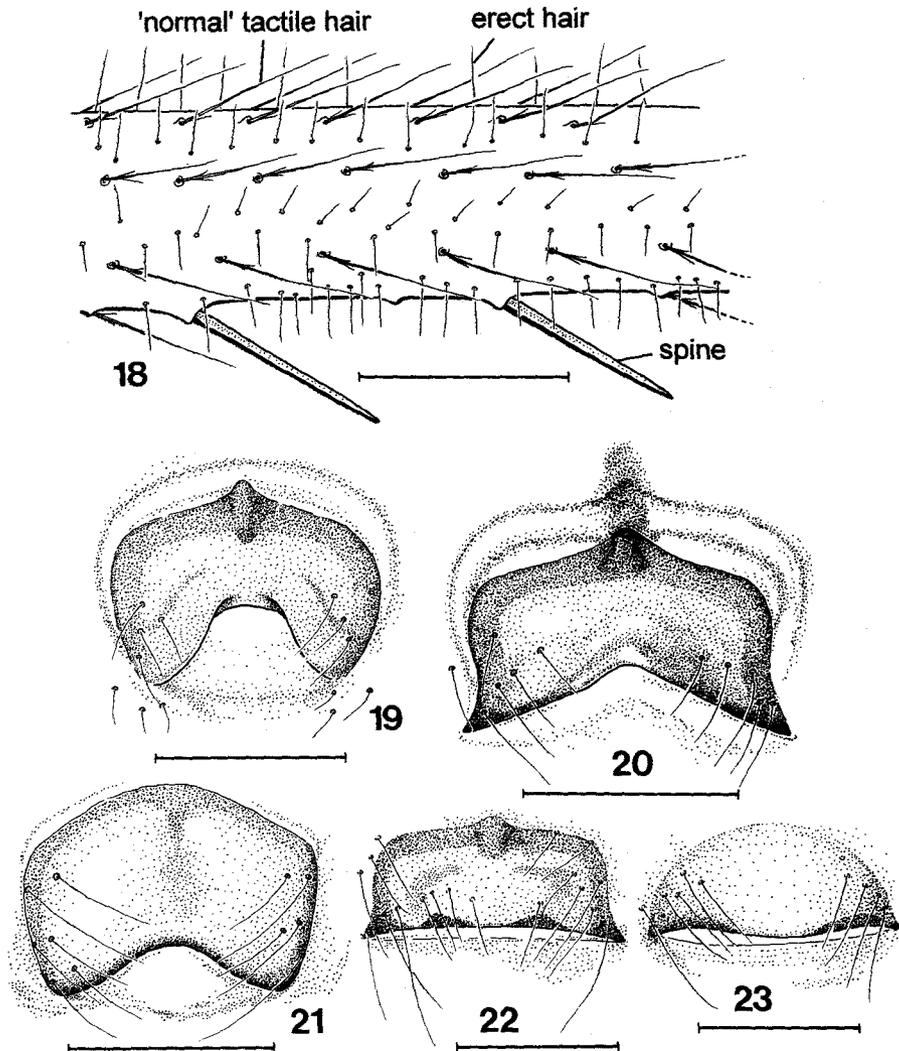
Variation.—As in *M. guatuso* new species there is considerable inter-population variation, whereas variation within populations is usually small. The lack of correlated variation between varying characters and the presence of intermediate forms led to lumping of several populations into one highly variable species. Some populations are included with hesitation (especially from the Costa Rican Pacific slope and Cordillera Central). Only



Figures 1-5.—*Modisimus bribri* new species. 1-3. Males in dorsal view; note the differences in the shape of the prosoma due to slight differences in the angle of view. 1, Bocas del Toro (type locality); 2, Zurquí; 3, La Gamba; 4, Left male pedipalp, slightly extended, bulb rotated, prolateral view; 5, Left male pedipalp, slightly extended, bulb rotated, retrolateral view. Scale bars = 1 mm (1-3); 0.3 mm (4-5).



Figures 6-17.—*Modisimus bribri* new species. 6, Left procursus, prolateral view, Bocas del Toro (type locality); 7, Left procursus, prolateral view, Bajo La Hondura; 8, Left procursus, prolateral view, San Ramón; 9, Left genital bulb, ventral view, Bocas del Toro (type locality); 10, Left genital bulb, prolateral view, Bocas del Toro (type locality); 11, Left genital bulb, prolateral view, San Ramón; 12, Left genital bulb, prolateral view, San Ramón; 13-15, Male palpal femur apophysis. 13, Bocas del Toro (type locality); 14, Bajo La Hondura; 15, Zurquí; 16, 17, Male chelicerae, frontal view, with two modified hairs enlarged. 16, Bocas del Toro (type locality); 17, Zurquí. Scale bars = 0.1 mm (6-8, 13-15); 0.2 mm (9-12, 16-17); 0.01 mm (modified hairs).



Figures 18-23.—*Modisimus bribri* new species. 18, Right femur 1 in retrolateral view, showing spines 11 and 12 out of 20, male from La Selva; 19-23, Epigyna in ventral view. 19, Bocas del Toro (type locality); 20, Cahuita; 21, Zurquí; 22, San Ramón; 23, Uvita. Scale bars = 0.2 mm.

statistical analyses on larger samples and/or biological experiments may eventually justify or reject the present limitation.

Size variation is considerable, though not as extreme as in *M. guatuso* new species. The most common pattern on the opisthosoma is that shown in Figs. 1, 3. A different pattern is shown in Fig. 2. The shape of the opisthosoma is usually elongate (Figs. 1, 2), but can be oval (Fig. 3), especially in smaller individuals. The male femur 1 is usually set with a row of up to about 20 spines; in several populations, however, there are also males without spines

on their femora (Zurquí, Bajo la Hondura, Hitoy Cerere). The male chelicerae are provided with either one or two patches of spines on each side (Figs. 16, 17), or with an intermediate pattern. The spines are never characteristically shaped (as in some other species, Figs. 43, 59, 117).

The male genitalia are strikingly similar to those of *M. guatuso* new species, and show much the same range of variation. The procurus varies both in size and shape (Figs. 6-8). However, some of the variation shown may be artificial, as most of the distal struc-

tures on the procurus are membranous. Apart from variation in size, the bulb shows little variation (Figs. 9–12). However, the bulb of several other species is very similar (Figs. 75–80, 144–145), which renders the bulb of little diagnostic value. The pedipalpal femur apophysis varies as shown in Figs. 13–15. The epigynum never shows any protrusions, but is a simple, though highly variable, sclerotized plate (Figs. 19–23).

Tibia 1 in other material: Bocas del Toro: 7♂: 6.4–8.3 (\bar{x} = 7.5), 12♀: 4.3–5.4 (\bar{x} = 4.8). Cahuita: 5♂: 7.4–8.9 (\bar{x} = 8.3), 6♀: 4.9–5.3 (\bar{x} = 5.2). Hitoy Cerere: 3♂: 8.3, 8.6, 9.3; 2♀: 5.5, 6.2. San Miguel: 1♂: 9.3. Tortuguero: 7♂: 8.2–9.0 (\bar{x} = 8.5); 17♀: 5.1–5.9 (\bar{x} = 5.5). Cariari: 1♀: 5.4. Finca La Selva: 16♂: 7.5–9.6 (\bar{x} = 8.4), 7♀: 5.2–5.7 (\bar{x} = 5.4). Puerto Viejo: 1♂: 9.0. Estacion Barva: 1♂: 6.5; 2♀: 4.6, 4.9. Zurquí: 10♂: 7.0–8.3 (\bar{x} = 7.7), 9♀: 5.2–5.8 (\bar{x} = 5.4). Bajo la Hondura: 7♂: 6.5–7.8 (\bar{x} = 7.1), 2♀: both 4.8. Quebrada González: 5♂: 7.5–8.6 (\bar{x} = 8.3), 1♀: 6.0. San Ramón: 8♂: 7.1–8.7 (\bar{x} = 7.9), 6♀: 4.9–5.7 (\bar{x} = 5.3). Tilarán: 8♂: 8.1–9.1 (\bar{x} = 8.6), 7♀: 4.6–5.5 (\bar{x} = 5.1). El Cedral: 1♀: 4.9. Uvita: 3♂: 6.4, 7.1, 7.2; 2♀: 4.1, 4.7. La Gamba: 5♂: 6.4–7.5 (\bar{x} = 7.0); 3♀: 4.2, 4.3, 4.5.

Other material examined.—PANAMA: 10♂13♀ from type locality (same collection data as types). COSTA RICA: *Prov. Limón:* Cahuita, 500 m S of village, sea level, 7♂6♀, 13–14 June 1995 (B.A. Huber). Hitoy Cerere Biol. Station, elev. 150–200 m, 3♂2♀, 7 September 1996 (B.A. Huber). San Miguel (near Celia), 1♂, July 1996 (R.L. Rodriguez). Tortuguero, at sea level, 4♂7♀, 23 September 1985 (R. Rojas & M. García) (UCR). Cerro Tortuguero, 3♂10♀, 8 August 1996 (B.A. Huber). Cocorí (30 km N Cariari), elev. 100 m, 3♂, January–March 1995 (E. Rojas)(INBIO). Cariari (17 km N Guapiles), 1♀, 3 March 1968 (C.E. Valerio) (UCR). *Prov. Heredia:* Finca La Selva (Biol. Station), elev. about 230 m, 17♂7♀, 10 January 1996 (B.A. Huber). Puerto Viejo, 1♂, 1–15 July 1965 (C.E. Valerio) (UCR). Estacion Barva, 1♂2♀, September 1996 (C. Viquez) (INBIO). *Prov. San José:* Quebrada González (35 km NNE San José), elev. about 500 m, 4♂1♀, 17 January 1996 (B.A. Huber). Zurquí (17 km NNE San José), elev. 1600 m, 14♂9♀, June–September 1995 (B.A. Huber & R.L. Rodriguez). Bajo la Hondura (15 km NE San José), elev. 1200–1500 m, 7♂3♀, 3 November 1995 (B.A. Huber), and 28 March 1981 (R. Briçño) (the latter in coll. UCR). *Prov. Alajuela:* Reserva Biologica San Ramón (25 km NW San Ramón), 8♂7♀, 18–19 March 1996 (B.A. Huber). San

Ramón de Alajuela, elev. 620 m, 1♂1♀, June–July 1994 (G. Hurtado) (INBIO). *Prov. Guanacaste:* Tilarán, 8♂9♀, 1 January 1969 (C.E. Valerio) (UCR). *Prov. Cartago:* El Cedral, Navarro, 1♀, 29 November 1979 (C.E. Valerio) (UCR). *Prov. Puntarenas:* Las Nubes de Sta Elena, Chirripó, elev. 1900 m, 1♂, 20 October 1995 (A. Pierdo) (INBIO). Uvita, Quebrada Colonia, about 3 km E Uvita village, elev. about 20–60 m, 3♂2♀, 14 February 1996 (B.A. Huber). Esquinas Rainforest, La Gamba, 8♂3♀, 2–3 July 1996 (B.A. Huber).

Distribution.—Known only from Costa Rica and Bocas del Toro Island, Panama.

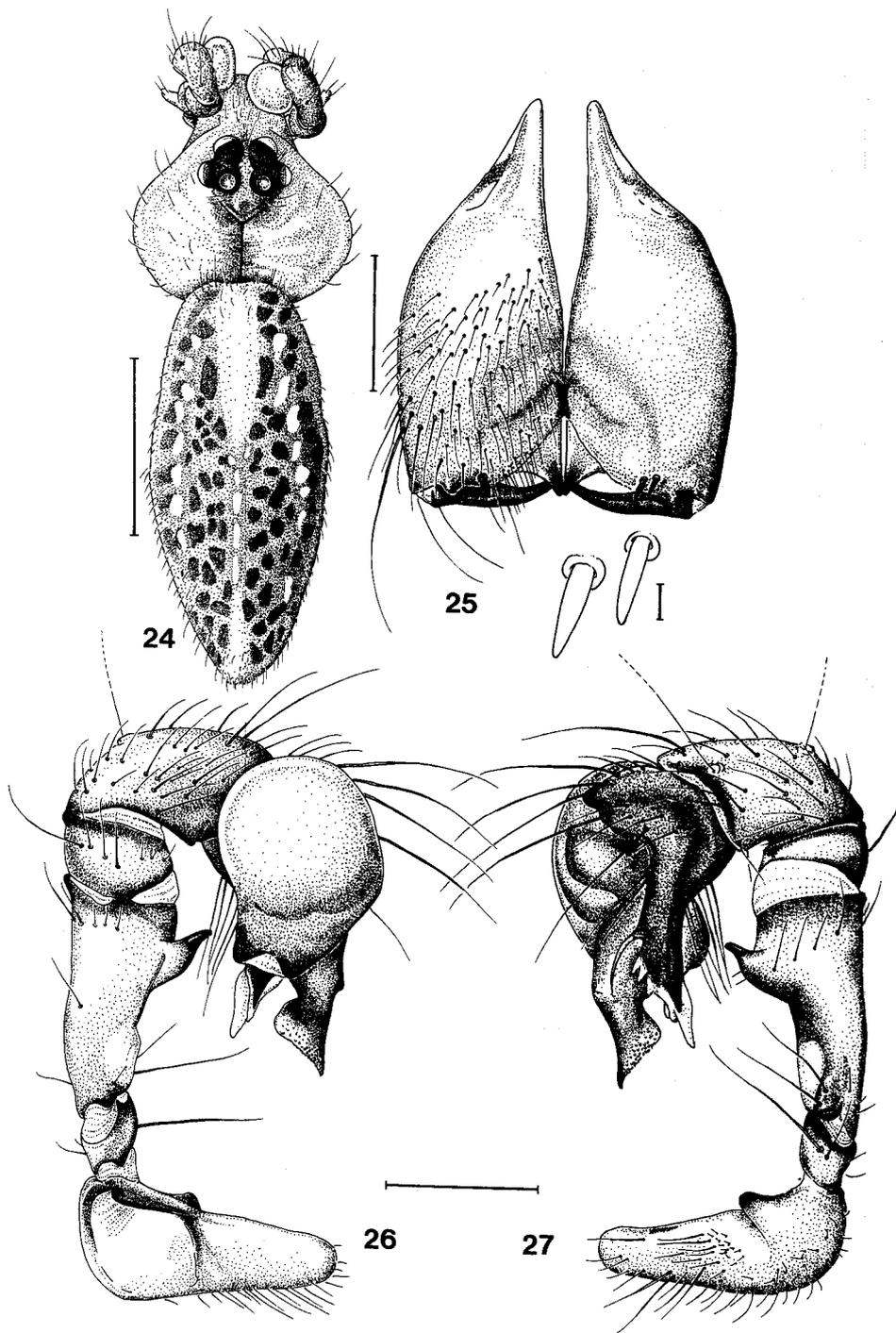
Modisimus cahuita new species
(Figs. 24–35)

Type data.—Male holotype and female paratype from Cahuita, *Prov. Limón*, Costa Rica, 500 m S of village, at sea level, 13–15 June 1995 (B.A. Huber) (UCR).

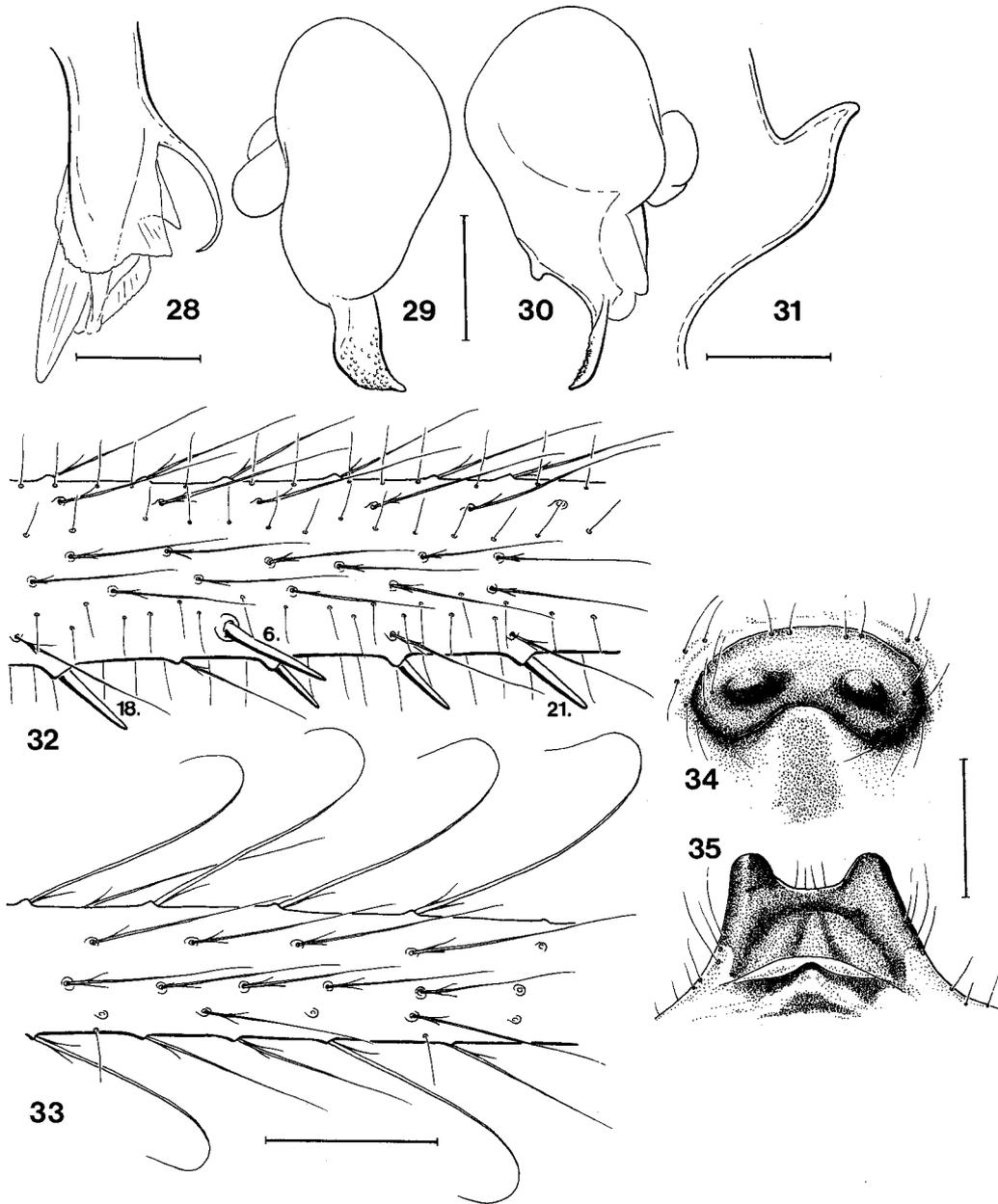
Etymology.—Specific name from type locality.

Diagnosis.—Large dark species, distinguished from close relatives (*M. guatuso*, *M. tortuguero*, *M. sarapiqui*, *M. nicaraguensis*) by the paired protuberances on the epigynum (Figs. 34, 35), the two rows of spines on the male femora 1 and 2 (Fig. 32 - shared by *M. tortuguero*), and the few (0–4) modified hairs on each male chelicera (Fig. 25).

Description.—*Male:* Carapace grayish-ochre, slightly darker medially and on posterior part of eye turret. Clypeus without darker markings. Chelicerae and pedipalps brown. Sternum ochre-brown, lighter at lateral margins and medially. Legs brown, with slightly darker rings at femora (distally) and tibiae (proximally). Dark ring on femur followed by light ring. Tibiae distally yellowish. Opisthosoma dorsally grayish with black and white spots (Fig. 24) (white spots disappear in alcohol), ventrally with brown genital plate, long black stripe behind it, and another black spot before spinnerets. Six eyes on eye turret. Pedipalps as shown in Figs. 26–31, chelicerae with only 0–4 modified hairs on each side (Fig. 25). Femora 1 and 2 with two rows of spines ventrally (Fig. 32 - fem 1: about 30 spines in one row, about 6 in the other; fem 2: about 12 and 2 spines respectively). *Measurements of male holotype:* Total length: 3.2, prosoma length: 1.0, width: 1.2, opisthosoma length: 2.2; leg 1: fem: 9.7, pat: 0.6, tib: 9.3,



Figures 24–27.—*Modisimus cahuita* new species. 24, Male, dorsal view; 25, Male chelicerae, frontal view, with two modified hairs enlarged; 26, Left male pedipalp, slightly extended, prolateral view; 27, Left male pedipalp, slightly extended, retrolateral view. Scale bars = 1 mm (24); 0.2 mm (25); 0.01 mm (modified hairs); 0.3 mm (26, 27).



Figures 28-35.—*Modisimus cahuita* new species. 28, Left procurus, prolateral view; 29, Left bulb in ventral view; 30, Left bulb in prolateral view; 31, Palpal femur apophysis; 32, Male femur 1 in retrolateral view, showing spines 18-21 out of 30 from the prolateral row, and spine 6 out of 12 from the retrolateral row; 33, Male tibia 1 in retrolateral view; 34, Epigynum in ventral view; 35, Epigynum in posterior view. Scale bars = 0.1 mm (28, 31), 0.2 mm (29, 30, 32-35).

met: 17.1, tar: 2.8, total: 39.5, tibind: 65; leg 2: 25.8, leg 3: 19.7, leg 4: 22.4.

Female: Colors as in male, brown epigynum with two characteristic protuberances (Figs. 34, 35). Semithin serial sections of the

epigynum revealed that these are not filled with glandular tissue but with a low epithelium and unspecific filling tissue. Legs lighter than in male. *Measurements of female paratype*: Total length: 3.4, prosoma length: 1.1,

width: 1.1, opisthosoma length: 2.3; leg 1: fem: 6.5, pat: 0.4, tib: 6.4, met: 11.7, tar: 2.0, total: 27.0, tibind: 67; leg 2: 16.8, leg 3: 12.7, leg 4: 14.8.

Tibia 1 in other material: Cahuita: 4♂: 8.4; 8.9; 9.2; 9.2. Hitoy Cerere: 3♂: 10.1; 10.1; 10.3; 3♀: 7.1; 7.2; 7.5.

Other material examined.—6♂2♀, and 1juv from type locality, same collection data as types. Hitoy Cerere Biological Reserve, at Rio Cerere, elev. about 150 m, Prov. Limón, Costa Rica, 3♂3♀, 8 September 1996 (B.A. Huber).

Distribution.—Known only from the two above mentioned localities in south-eastern Prov. Limón, Costa Rica.

Modisimus caldera new species
(Figs. 36–44)

Type data.—Male holotype and female paratype from the bank of Rio Caldera near Caldera, Prov. Chiriquí, Panama, elev. about 800 m, from small dome shaped webs under fallen leaves on the floor of open woodland near the river, 21 April 1995 (B.A. Huber) (UCR).

Etymology.—Specific name from type locality.

Diagnosis.—Small dark species, distinguished from close relatives (*M. coco*, *M. sanvito*) by the dark color, the form of the modified hairs on the male chelicerae (Fig. 43), and the pair of notches in the epigynum (Fig. 44 - the female of *M. coco* is not known).

Description.—*Male:* Carapace ochre with darker median stripe and eye turret. Clypeus brown, sternum ochre with a pair of longitudinal brown stripes. Legs ochre with brown rings on femora (distally), and tibiae (proximally and distally). Distal rings followed by light, almost white rings. Opisthosoma greenish-gray with black and small white spots (Fig. 36), ventrally bluish-gray, with brown genital plate and black spot behind it. Six eyes on eye turret, pedipalps as shown in Figs. 37–38, with distinctive procursi (Fig. 39), bulbs (Figs. 40, 41), and femur apophyses (Fig. 42). Chelicerae with one patch of characteristically formed hairs on each side (Fig. 43). Legs without spines. *Measurements of male holotype:* Total length: 2.2, prosoma length: 0.7, width: 0.8, opisthosoma length: 1.5; leg 1: fem: 4.6, pat: 0.3, tib: 4.5, met: 7.8, tar: 1.3, total: 18.5, tibind: 64; leg 2: 11.9, leg 3: 8.8, leg 4: 10.9.

Female: Colors as in male, epigynum brown, with distinctive notches posteriorly (Fig. 44). *Measurements of female paratype:* Prosoma length: 0.7, width: 0.8, (opisthosoma damaged); leg 1: fem: 3.7, pat: 0.3, tib: 3.7, met: 6.0, tar: 1.1, total: 14.8, tibind: 51; leg 2: 10.0, leg 3: 7.6, leg 4: 9.3.

Tibia 1 in the two other males: 4.8; 5.5.

Other material examined.—2♂ from type locality (same collection data as types).

Distribution.—Known only from type locality.

Modisimus coco new species
(Figs. 45–51)

Type data.—Male holotype from Bahia Wafer, Isla del Coco (Costa Rica), at sea level, May 1994 (Y. Camacho) (INBIO). Other material not known.

Etymology.—Species name from type locality.

Diagnosis.—Small light species, distinguished from light relatives (*M. bribri*, *M. sanvito*) by the stout and long dorsal spine on the procursus (Fig. 50 - *M. sanvito* has a very short dorsal spine: Fig. 122; *M. bribri* has a slender dorsal spine: Figs. 6–8).

Description.—*Male holotype:* Prosoma and opisthosoma pale ochre-yellow, only clypeus and palps slightly darker. Legs same color, without rings. Six eyes on low eye turret (Figs. 45, 46), pedipalps as in Figs. 47–48, procursus and femur apophysis as in Figs. 50–51, chelicerae as in Fig. 49, with short spines. *Measurements:* Total length: 2.0, prosoma length: 0.8, width: 0.9, opisthosoma length: 1.2; legs 1 and 2 missing, leg 3: 12.5, leg 4: 14.6.

Female: Female unknown.

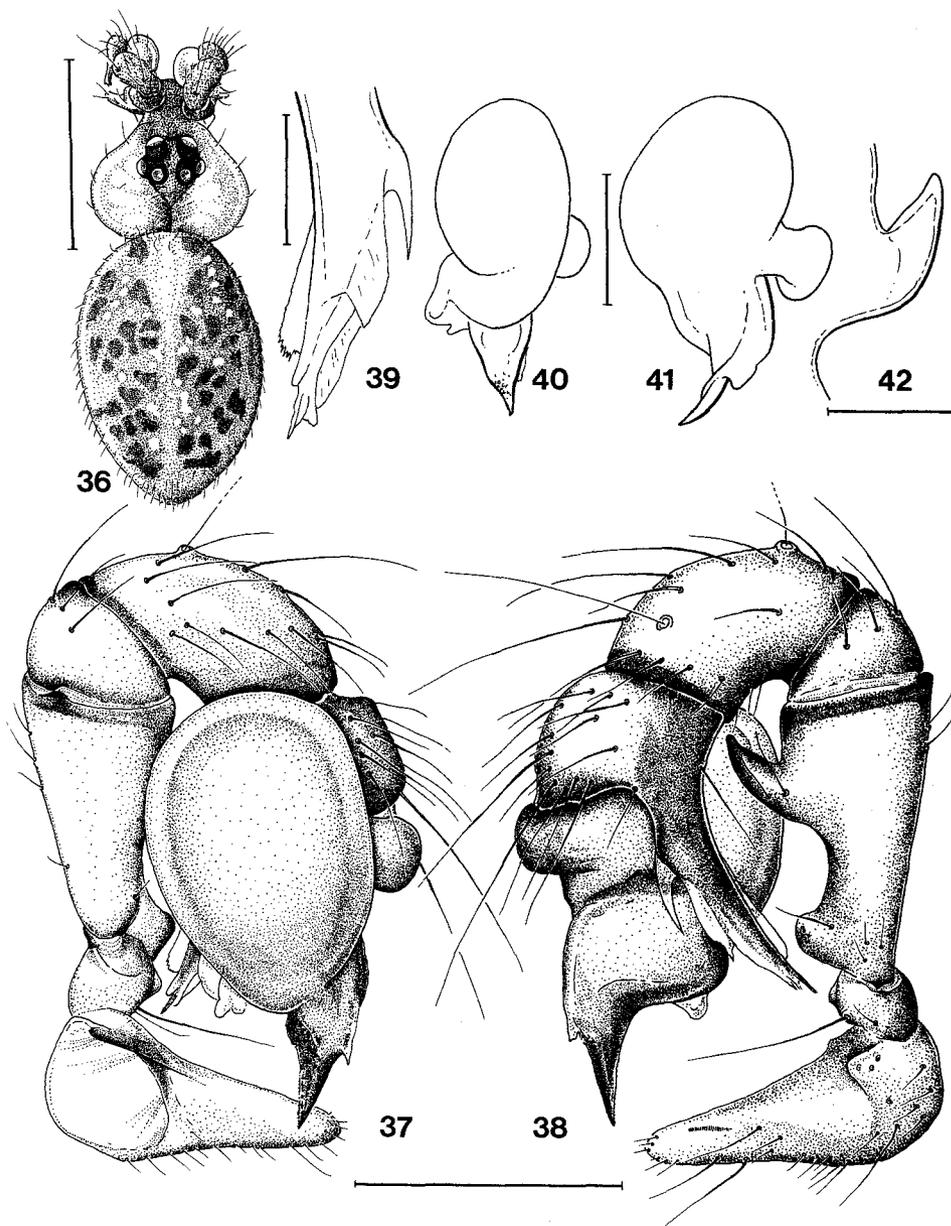
Distribution.—Known only from type locality.

Modisimus dominical new species
(Figs. 52–60)

Type data.—Male holotype and female paratype from forest along creek, near the ground, about 1.5 km N Dominical, Prov. Puntarenas, Costa Rica, elev. about 10–100 m, 15 February 1996 (B.A. Huber, G. Huber, G. Roithinger) (UCR).

Etymology.—Species name from type locality.

Diagnosis.—Large dark species, easily dis-

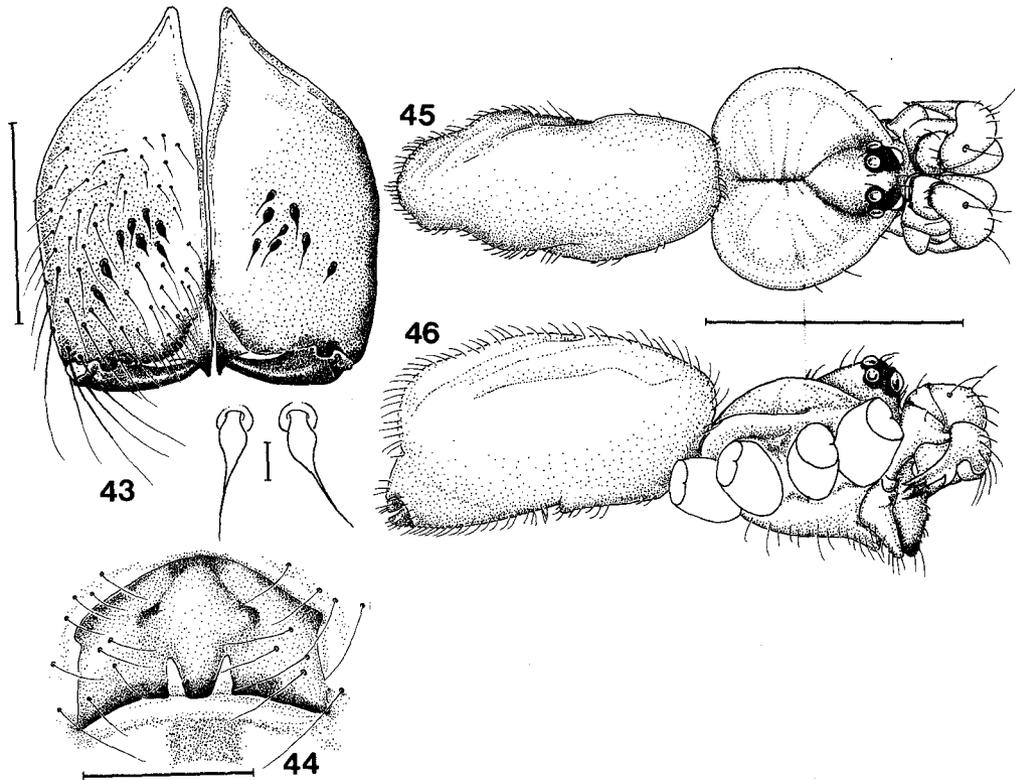


Figures 36–42.—*Modisimus caldera* new species. 36, Male, dorsal view; 37, Left male pedipalp, slightly extended, and bulb rotated, prolateral view; 38, Left male pedipalp, slightly extended, and bulb rotated, retrolateral view; 39, Left procurus, prolateral view; 40, Left bulb in ventral view; 41, Left bulb in prolateral view; 42, Palpal femur apophysis. Scale bars = 1 mm (36); 0.3 mm (37, 38); 0.1 mm (39, 42); 0.2 mm (40, 41).

tinguished from congeners by the procurus that lacks a dorsal spine (Fig. 55), the form of the modified hairs on the male chelicerae (club-shaped - Fig. 59), and the wide epigynum with a pair of dark marks (Fig. 60). The Panamanian *M. pulchellus* is similar in several

aspects, but the epigynum is rather triangular (Fig. 179), and the procurus does not end in two tips and has a small dorsal spine (Fig. 181).

Description.—*Male*: Carapace ochre, darker medially and on posterior side of eye



Figures 43–46.—New species of *Modisimus*. 43, 44. *Modisimus caldera* new species. 43, Male chelicerae, frontal view, with two modified hairs enlarged; 44, Epigynum, ventral view; 45, 46. *Modisimus coco* new species, male. 45, Dorsal view; 46, Lateral view. Scale bars = 0.2 mm (43, 44), 0.01 mm (modified hairs); 1 mm (45, 46).

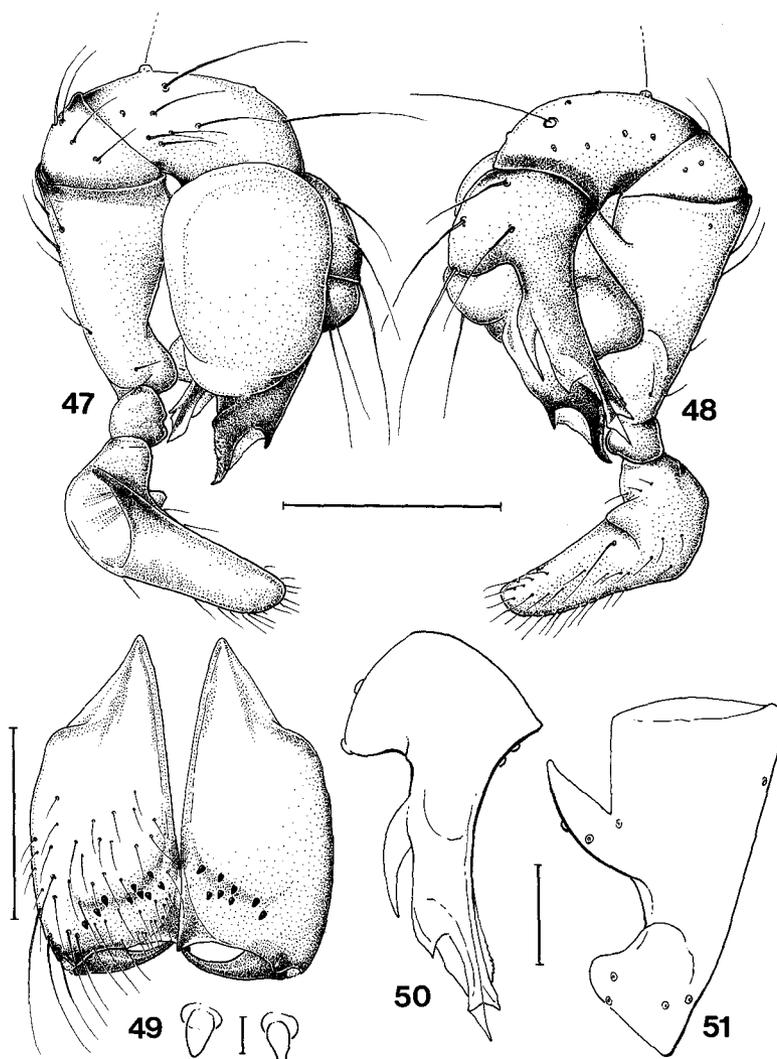
turret, clypeus without markings, sternum brown with lighter ochre lateral margins and median stripe. Pedipalps and chelicerae ochre-brown. Legs ochre, with hardly visible darker rings on femora (distally) and tibiae (proximally and distally). Opisthosoma dorsally greenish-gray, with black and white spots (Fig. 52), ventrally with brown genital plate and black stripe behind it. Six eyes on eye turret, pedipalps as in Figs. 53–54, procurus, bulb and femur apophysis as in Figs. 55–58, chelicerae as in Fig. 59, with two patches of characteristic club-shaped hairs on each side, legs without spines. *Measurements of male holotype*: Total length: 3.1, prosoma length: 1.0, width: 1.3, opisthosoma length: 2.1; leg 1: fem: 10.4, pat: 0.6, tib: 10.1, met: 18.1, tar: 3.0, total: 42.2, tibind: 96; leg 2: 27.3, leg 3: 20.5, leg 4: 24.3.

Female: Colors mostly as in male, rings on legs more pronounced, with light rings follow-

ing the distal dark rings. Opisthosoma ventrally with black stripe behind brown epigynum. Epigynum large, with a pair of dark marks anteriorly (Fig. 60). *Measurements of female paratype*: Total length: 3.5, prosoma length: 1.0, width: 1.1, opisthosoma length: 2.5; leg 1: fem: 6.5, pat: 0.4, tib: 6.7, met: 12.0, tar: 2.8, total: 28.4, tibind: 66; leg 2: 17.8, leg 3: 13.9, leg 4: 17.2.

Tibia 1 in other material: Dominical: 3♂: 8.7; 9.0; 9.4; 2♀: 6.8; 7.5. Uvita: 2♂: 9.3, 10.0, 4♀: 6.5, 6.7, 7.2, 7.4. Rincón de Osa: 2♀: 7.5, 7.8. Conte: 3♀: 6.4, 6.5, 6.8. Esquinas Rainforest: 7♂: 8.4–10.0 (\bar{x} = 9.2); 8♀: 6.6–7.5 (\bar{x} = 6.9). Wilson Gardens: 2♂: 8.6; 8.8; 5♀: 6.3–6.7 (\bar{x} = 6.5). San Vito: 1♀: 6.5.

Other material examined.—COSTA RICA. *Prov. Puntarenas*: 3♂2♀ from type locality, same collection data as types. Uvita, Quebrada Colonia, about 3 km E Uvita village, elev. about 20–60 m, 2♂5♀, 14 February 1996 (B.A. Huber). Esquinas



Figures 47–51.—*Modisimus coco* new species, male. 47, Left palp, prolateral view; 48, Left palp, retrolateral view; 49, Chelicerae, frontal view, with two modified hairs enlarged; 50, Left procurus, retrolateral view; 51, Left palpal femur, retrolateral view. Scale bars = 0.3 mm (47, 48), 0.2 mm (49–51), 0.01 mm (modified hairs).

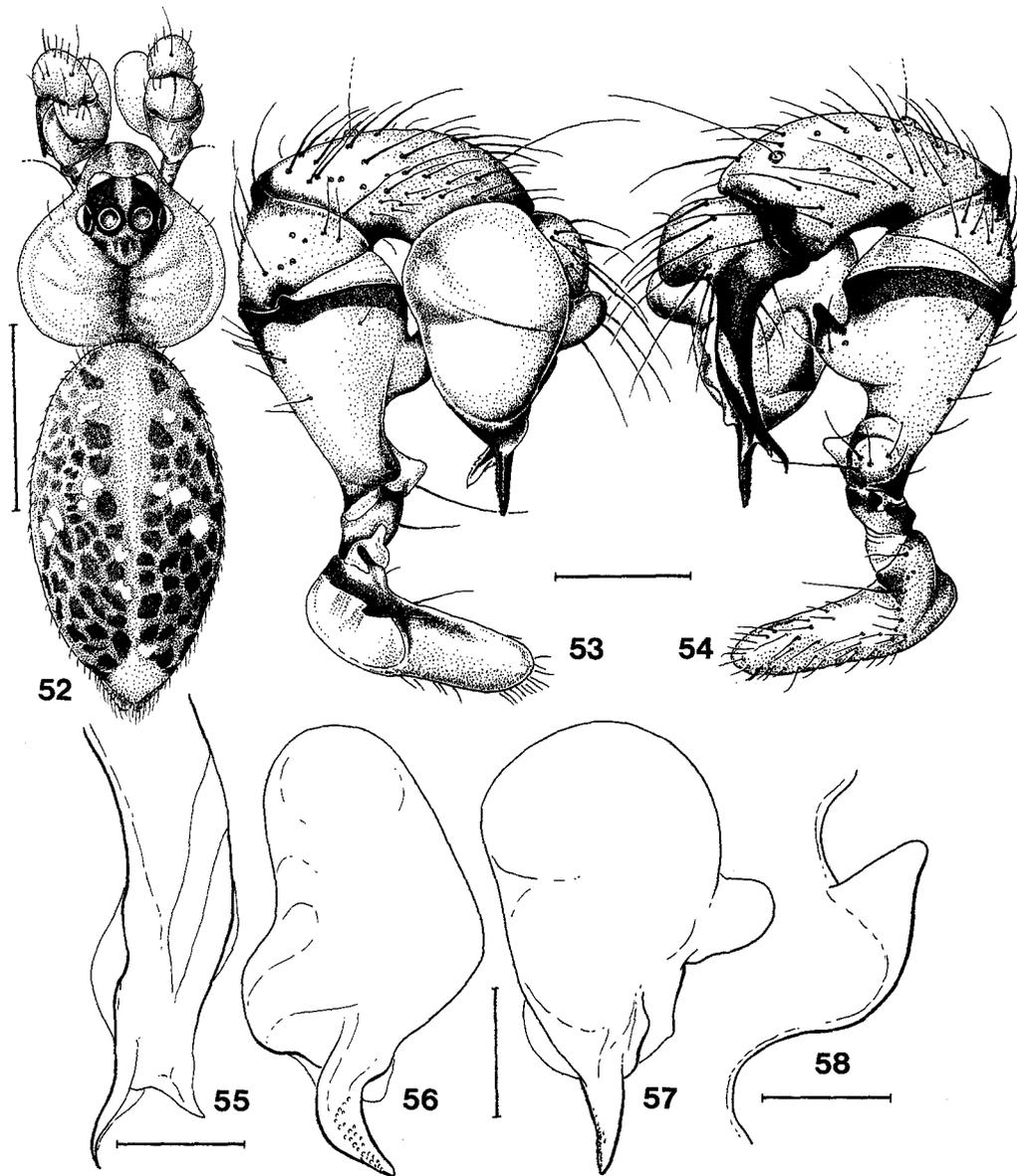
Rainforest, La Gamba, 7♂8♀, 2–3 July 1996 (B.A. Huber), and 2♀ from same locality, 10 August 1995 (R.L. Rodriguez). Wilson Botanical Gardens, 4 km S San Vito de Coto Brus, 4♂5♀, 5 July 1996 (B.A. Huber). San Vito de Coto Brus, 1♀, 1 juv, 4 July 1996 (B.A. Huber). Rincón de Osa, 2♀, 1 juv, 19 February–13 March 1967 (C.E. Valerio) (UCR). Conte, Punta Burica, 1♂3♀, 12–13 July 1984 (C.E. Valerio & R. Solís) (UCR).

Distribution.—Known only from the mentioned localities in southern Prov. Puntarenas, Costa Rica.

Modisimus guatuso new species
(Figs. 61–94)

Type data.—Male holotype and female paratype from forest near Bajo La Hondura (15 km NE San José) Prov. San José, Costa Rica, elev. about 1200–1500 m, near the ground in humid, shaded declivities, April–November 1995 (B.A. Huber & R.L. Rodriguez) (UCR).

Etymology.—Named for the Guatuso, an indigenous Costa Rican people.

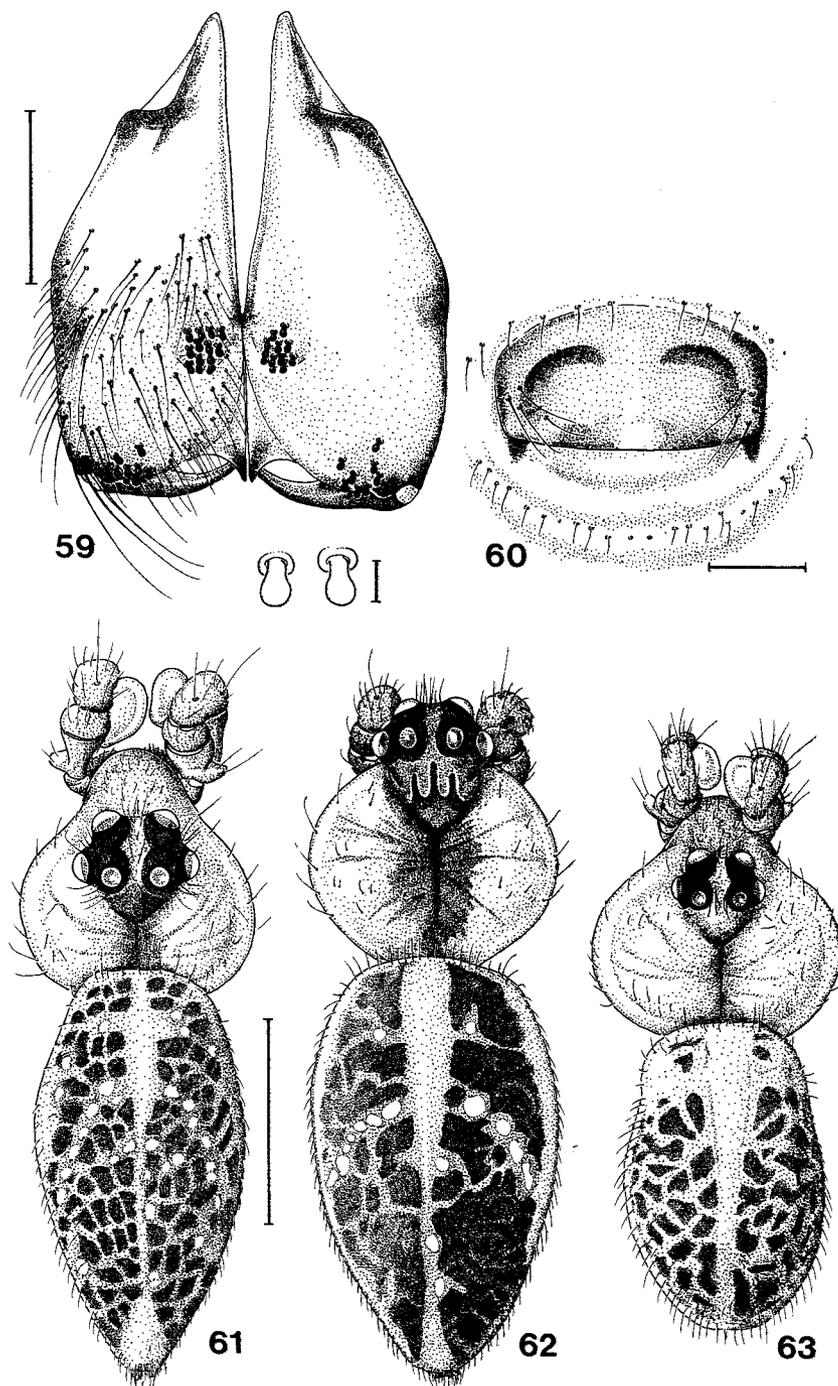


Figures 52–58.—*Modisimus dominical* new species. 52, Male, dorsal view; 53, Left male pedipalp, slightly extended, prolateral view; 54, Left male pedipalp, slightly extended, retrolateral view; 55, Left procurrus, prolateral view; 56, Left bulb, ventral view; 57, Left bulb, prolateral view; 58, Palpal femur apophysis. Scale bars = 1 mm (52); 0.3 mm (53, 54); 0.1 mm (55, 58), 0.2 mm (56, 57).

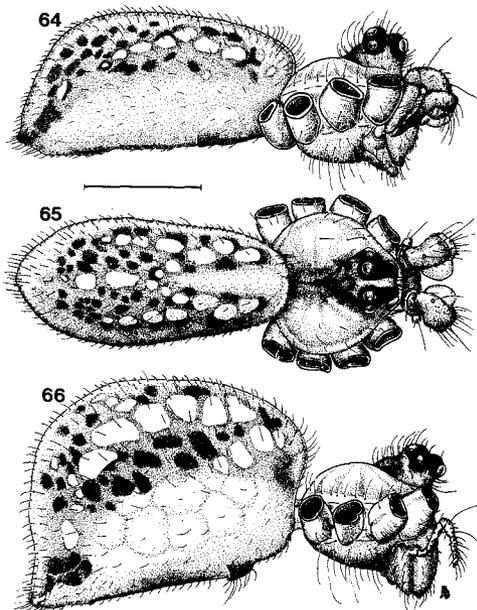
Diagnosis.—Dark species, variable in size and morphology. Morphologically similar to the light *M. bribri*. Distinguished from other close relatives by the simple flat epigynum (Figs. 89–94 - *M. cahuita* and *M. sarapiqui* have projections on the epigynum: Figs. 34, 35, 133, 134; *M. nicaraquensis* has a deep in-

dentation posteriorly: Fig. 109), and the spines on the male femur 1 (missing or up to about 15 in one row; *M. tortuguero* has two rows with a total of about 40 spines).

Description.—*Male holotype*: Carapace ochre-brown, darker medially and on posterior side of eye turret, clypeus as carapace, pedi-



Figures 59–63.—New species of *Modisimus*. 59, *Modisimus dominical* new species, male chelicerae, frontal view, with two modified hairs enlarged; 60, *M. dominical* new species, epigynum, ventral view; 61–63, *Modisimus guatuso* new species, males in dorsal view (note the differences in shape of the prosoma, due largely to differences in the angle of view). 61, Bajo La Hondura (type locality); 62, Lagito (Arenal); 63, Alto Jaramillo. Scale bars = 0.2 mm (59, 60), 0.01 mm (modified hairs); 1 mm (61–63).



Figures 64–66.—*Modisimus guatuso* new species, specimens from Reserva Biol. Leonel Oviedo. 64, Male, lateral view; 65, Male, dorsal view; 66, Female, lateral view. Scale bar = 1 mm.

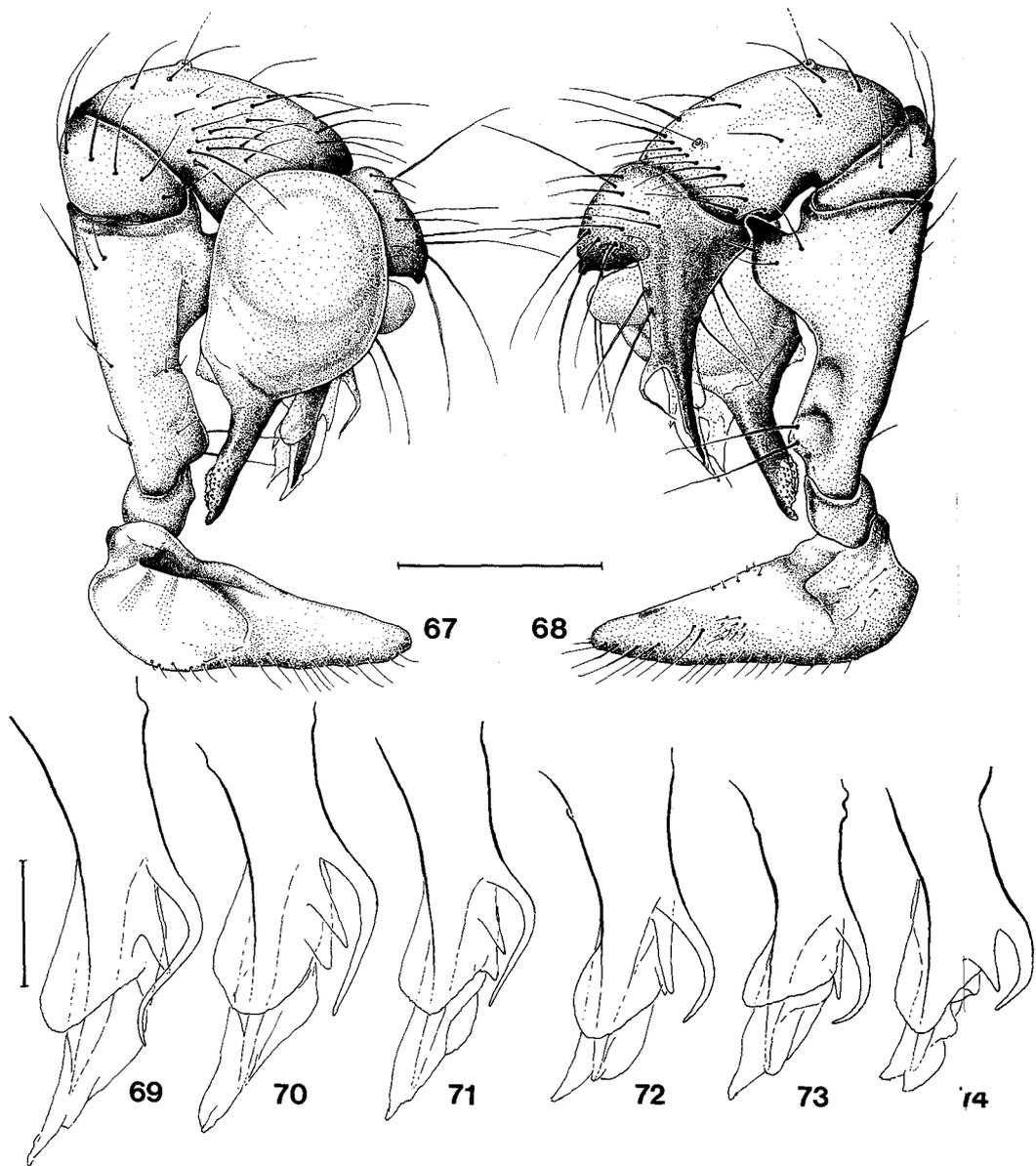
palps and chelicerae brown, sternum brown with lighter ochre lateral margins and median stripe. Legs ochre-brown, with dark rings on femora (distally) and tibiae (proximally and distally). Opisthosoma dorsally greenish-gray with large black and smaller white spots in characteristic pattern (Fig. 61), ventrally with brown genital plate, black stripe behind it and another dark spot before spinnerets. Six eyes on eye turret, pedipalps as shown in Figs. 67–68, procurus, bulb and femur apophysis as in Figs. 69, 75–76, 81. Chelicerae with two patches of modified hairs on each side (Fig. 86). Femora 1 and 2 with a row of a spines ventrally. *Measurements*: Total length: 3.1, prosoma length: 1.1, width: 1.2, opisthosoma length: 2.0; leg 1: fem: 7.2, pat: 0.4, tib: 7.2, met: 12.9, tar: 2.3, total: 30.0, tibind: 65; leg 2: 19.2, leg 3: 15.0, leg 4: 17.2.

Female paratype: Colors as in male, but opisthosoma ventrally only with black stripe behind brown epigynum (Fig. 89). Legs without spines. *Measurements*: Total length: 3.1, prosoma length: 1.0, width: 1.1, opisthosoma length: 2.1; leg 1: fem: 5.9, pat: 0.4, tib: 5.9, met: 10.0, tar: 2.4, total: 24.6, tibind: 49; leg 2: 16.2, leg 3: 12.6, leg 4: 14.9.

Variation.—Variation within populations is usually small and does not pose taxonomic problems, whereas inter-population variation is significant to a degree that originally I ascribed species status to several of the populations now included in this species. The reason to lump them was that the characters showed no correlated variation and several intermediate forms were found by more intense collecting. Still, some populations are included with hesitation (e.g., some Costa Rican Central Valley populations, or that from Alto Jaramillo, Panama), and may well turn out to be reproductively isolated from each other and from the population at the type locality. Only statistical analyses on larger samples and/or biological experiments may eventually justify or reject the present limitation.

Usually the spiders and their webs were found near the ground in humid, shaded habitats between buttresses or other objects. More rarely, the spiders lived in small webs under fallen leaves (Alto Jaramillo), or between twigs in shrubs and small trees about 20–50 cm above the ground (Reserva Biol. Leonel Oviedo). In Turrialba, I found them under corrugated sheet iron, in the grass layer.

Individuals in some populations are among the largest *Modisimus* (e.g., Arenal area, see below), while others are relatively small (e.g., Alto Jaramillo, see below). It must be noted, however, that even within one area, size can vary significantly between collection dates (e.g., Bajo La Hondura, see below), or within a sample from one day (e.g., Cahuita, see below). The most common pattern on the opisthosoma is that shown in Figs. 61–62. Different patterns occur in the Alto Jaramillo (Panama) population (Fig. 63 - it is not clear whether the lack of white spots is an artifact, caused by ethanol), and in some Central Valley (Costa Rica) populations (Fig. 65). Generally, this character is difficult to assess because white spots tend to disappear in ethanol. The male femur 1 is often set with a row of spines, up to about 15, very rarely with two rows, but then with only a few spines in the retrolateral row; in several populations (e.g., Quebrada González, Reserva Biol. Leonel Oviedo), males have no spines on their femora, and in a few (e.g., Bajo la Hondura, Arenal area) there are males with and without spines. The male chelicerae are provided with either one or two patches of spines on each

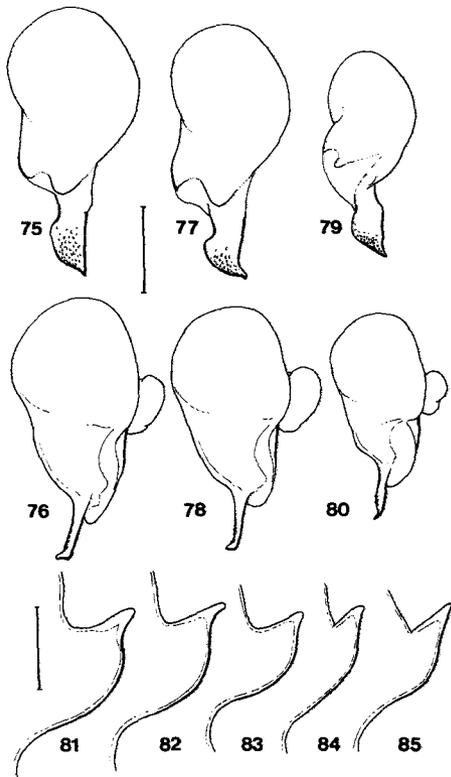


Figures 67-74.—*Modisimus guatuso* new species. Left pedipalp, slightly extended, and bulb rotated. 67, Prolateral view; 68, Retrolateral view; 69-74, Left procurus, prolateral view. 69, Bajo La Hondura (type locality); 70, Tortuguero; 71, Uvita; 72, Reserva Biol. Leonel Oviedo; 73, Cahuitta; 74, Alto Jaramillo. Scale bars = 0.3 mm (67, 68); 0.1 mm (69-74).

side (Figs. 86, 87), or with an intermediate pattern (e.g., Fig. 88). The spines are never characteristically formed (as in some other species, Figs. 43, 59, 117).

The procurus varies both in size and shape (Figs. 69-74). It must be noted, however, that some of the variation shown may be artificial, as most of the distal structures on the procur-

us are membranous. Apart from variation in size, the bulb shows little variation (Figs. 75-80). However, the bulb of several other species is very similar (Figs. 9-12, 144-145), which renders the bulb of little diagnostic value. The pedipalpal femur apophysis varies as shown in Figs. 81-85. The epigynum never shows any protrusions, but is a simple, though



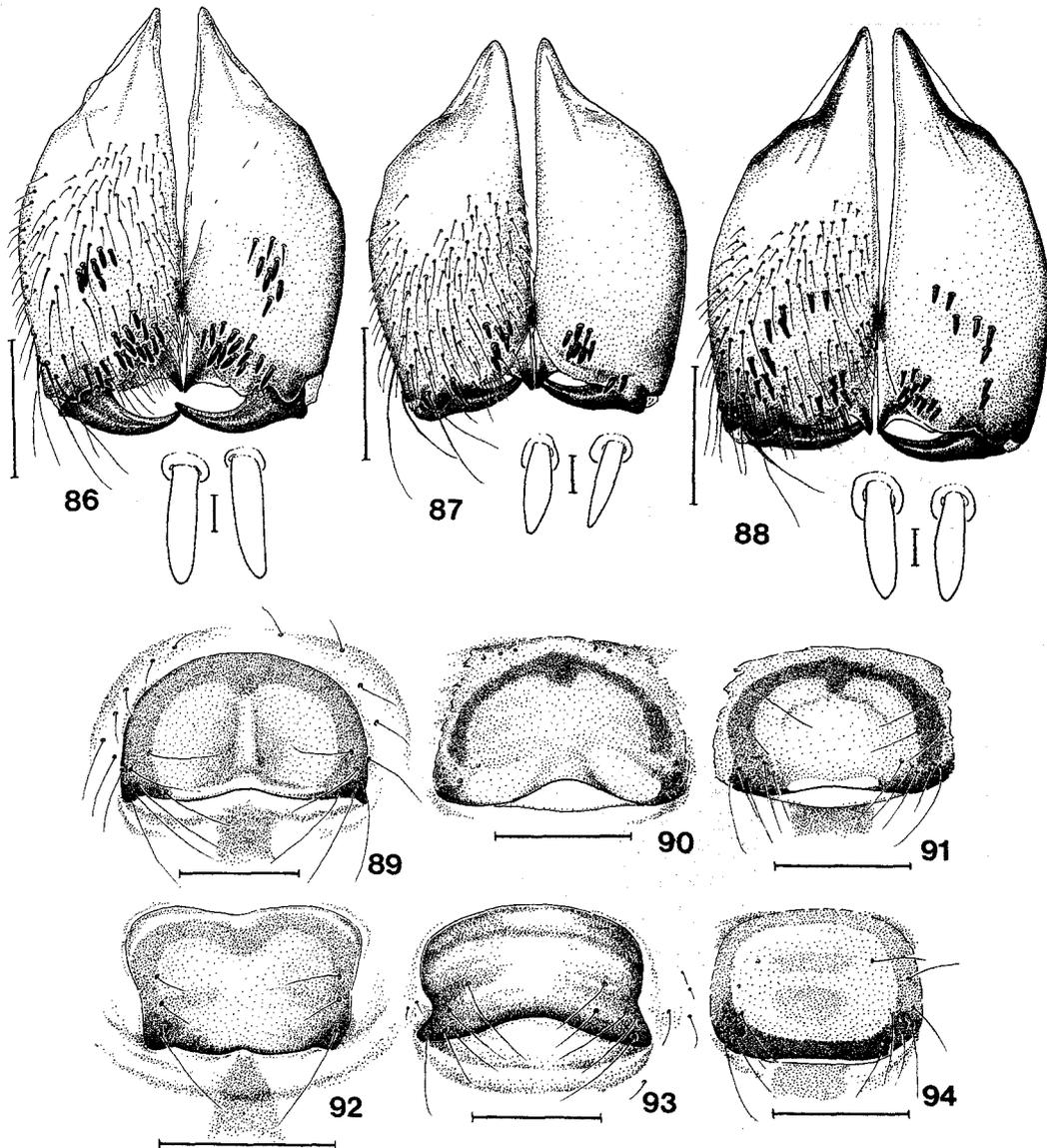
Figures 75–85.—*Modisimus guatuso* new species. 75–80. Left genital bulb in ventral view (above) and retrolateral view (below). 75, 76, Bajo La Hondura (type locality); 77, 78, Volcan Cacao; 79, 80, Turrialba. 81–85. Palpal femur apophysis. 81, Bajo La Hondura (type locality); 82, Tortuguero; 83, Alto Jaramillo; 84, Cahuita; 85, Turrialba. Scale bars = 0.2 mm (75–80); 0.1 mm (81–85).

highly variable, sclerotized plate (Figs. 89–94).

Tibia 1 in other material: Bajo La Hondura (April–November 1995): 8♂: 6.9–7.9 (\bar{x} = 7.3), 7♀: 4.0–5.7 (\bar{x} = 5.2). Bajo La Hondura (28 March 1981): 9♂: 4.6–5.9 (\bar{x} = 5.3), 16 females: 3.2–4.1 (\bar{x} = 3.7). Reserva Biol. Leonel Oviedo: 12♂: 5.3–7.1 (\bar{x} = 6.5), 13♀: 4.1–5.7 (\bar{x} = 4.8). San Antonio de Escazú: 7♂: 6.4–7.8 (\bar{x} = 7.3), 6♀: 4.5–5.6 (\bar{x} = 4.9). Monterrey: 1♀: 4.3. Zurquí: 2♂: 6.5; 7.9, 1♀: 5.3. Quebrada González: 1♂: 7.5; 1♀: 5.2. San Francisco de Dos Rios: 1♂: 5.1. Rio Paraca: 1♀: 5.7. San Ramón: 6♂: 8.0–9.2 (\bar{x} = 8.4), 8♀: 5.4–6.5 (\bar{x} = 5.9). Arenal area (Lagito, Cascada, Tabacon): 13♂: 7.7–9.5 (\bar{x} = 8.7), 5♀: 5.0–6.5 (\bar{x} = 6.0). El Venado: 3♂: 6.8, 7.2, 7.7, 3♀: all 4.8. Bosque Rio La

Hoga: 2♀: 4.8, 4.9. Finca La Selva: 6♂: 6.5–8.8 (\bar{x} = 7.5); 4♀: 5.1; 5.4; 5.4; 5.8. Guayabo and Alto de Varas: 5♂: 6.5–9.1 (\bar{x} = 7.6). Tapantí: 1♂: 6.5; 1♀: 5.2. Turrialba: 1♂: 5.9, 8♀: 3.8–4.2 (\bar{x} = 4.0). Tortuguero: 1♂: 8.0, 2♀: 5.7, 6.4. Siquirres: 1♂: 9.1; 2♀: 6.1, 6.5. Cahuita: 3♂: 9.9; 6.8; 4.3; 2♀: 5.0; 3.6. Puerto Vargas: 1♀: 5.2. Hitoy Cerere: 2♂: 7.9, 10.6; 4♀: 5.1, 5.4, 6.7, 7.0. Carara: 1♂: 7.7, 1♀: 5.4. Uvita: 5♂: 6.7–7.8 (\bar{x} = 7.4); 1♀: 5.4. Manuel Antonio: 10♂: 6.1–7.5 (\bar{x} = 6.9); 7♀: 4.5–5.5 (\bar{x} = 4.9). La Gamba: 4♀: 4.5, 4.8, 4.8, 4.9. Wilson Gardens: 2♂: 7.2, 7.7; 1♀: 5.1. Conte: 1♂: 6.9, 1♀: 4.4. Hacienda La Josefina: 3♀: 4.9, 5.0, 5.4. Volcán Cacao: 3♂: 7.4, 7.8, 8.0; 4♀: 5.0, 5.1, 5.2, 5.7. Bocas del Toro: 5♂: 7.1–9.3 (\bar{x} = 8.2); 6♀: 4.4–5.7 (\bar{x} = 5.1). Alto Jaramillo: 17♂: 4.2–5.3 (\bar{x} = 4.7); 5♀: 3.0–3.6 (\bar{x} = 3.3). Bluefields: 4♂: 6.1, 6.6, 7.0, 7.4; 4♀: 3.8, 4.5, 4.6, 4.6.

Other material examined.—**COSTA RICA:** *Prov. San José:* Numerous ♂ & ♀ from type locality, same collection data as types; and 9♂19♀ from type locality, 28 March 1981 (G. Umaña, M. Santana, V. Zelendon, E. Alvarado, M.M. González) (UCR). Reserva Biol. Leonel Oviedo (“bosquecito”) in the Universidad de Costa Rica, elev. about 1150 m, numerous males and females, February–September 1995 (B.A. Huber). San Antonio de Escazú (about 8 km WSW San José), elev. about 1300–1400 m, 9♂6♀, 30 May 1995 (B.A. Huber). Monterrey, 1♀, 21 April 1967 (C.E. Valerio) (UCR). Zurquí, (17 km NNE San José), elev. 1600 m, 2♂1♀, 14 September 1995 (B.A. Huber). Quebrada González (35 km NNE San José), elev. about 500 m, 1♂1♀, 17 January 1996 (B.A. Huber). Rio Paraca, Villa Colon, 1♀, 2 November 1968 (C.E. Valerio) (UCR). La Colina, San Francisco de Dos Rios, 1♂, May 1981 (C.Gómez) (UCR). *Prov. Alajuela:* Reserva Biol. San Ramón, (25 km NW San Ramón), 7♂8♀, 18–19 March 1996 (B.A. Huber). San Ramón de Dos Rios, 1.5 km N Finca Nueva Zelandia, elev. 620 m, 2♂9♀, February–July 1995 (F.A. Quesada & A. Picado) (INBIO). Around Lagito, a small lake at the northern slope of Volcán Arenal, elev. about 620 m, 4♂4♀, 5 October 1995 (B.A. Huber). La Cascada, 6 km SW Fortuna, elev. about 520 m, 8♂1♀, 4 October 1995 (B.A. Huber). Tabacon, about 6 km WNW Fortuna, elev. about 480 m, 1♀, 3 October 1995 (B.A. Huber). El Venado, San Carlos, 3♂3♀, January 1980 (C.E. Valerio) (UCR). San Ramón de Alajuela, elev. 620–1100 m, 3♂1♀, June 1994–February 1995 (G. Hurtado & G. Carballo) (INBIO). *Prov. Heredia:* Finca La Selva (Biol. Station), elev. about 230 m, 4♂4♀, 10 January 1996 (B.A. Huber). Bosque Rio La Hoga, San Rafael, 3♀, no date (UCR). San Joaquín,



Figures 86–94.—*Modisimus guatuso* new species. 86–88. Male chelicerae, frontal view, with two modified hairs enlarged. 86, Bajo La Hondura (type locality); 87, Alto Jaramillo; 88, Lagito (Arenal). 89–94. Epigyna, ventral view. 89, Bajo La Hondura (type locality); 90, Bocas del Toro; 91, Manuel Antonio; 92, Alto Jaramillo; 93, Reserva Biol. Leonel Oviedo; 94, Tortuguero. Scale bars = 0.2 mm (modified hairs: 0.01 mm).

1♂1♀, 10 July 1995 (C. Viquez) (INBIO). *Prov. Cartago*: Turrialba, elev. about 600 m, about 1 km E of town, along the old railway, 1♂8♀, 15 March 1996 (B.A. Huber). Tapantí, about 3 km S Tapantí village, near the Rio Orosí, elev. about 1400 m, 1♂1♀, 8 January 1996 (B.A. Huber). Tapantí, elev. 1150 m, 1♀, November 1994 (G. Mora) (INBIO). Guayabo and Alto de Varas, 5♂, 18 April and 9 May 1981 (M.M. González and UCR spider course)

(UCR). Grano de Oro, Chirripó, elev. 1120 m, 1♂, September 1993 (P. Campos) (INBIO). Madreselva, Finca Los Lagos, elev. 2000–2600 m, 1♂4♀, September–October 1995 (M.M. Chavarría) (INBIO). *Prov. Limón*: Fila Carbon, about 2 km SW Cahuita, elev. about 10–50 m, 3♂2♀, 15 June 1995 (B.A. Huber). Puerto Vargas, Cahuita, 1♀, 8–14 March 1966 (C.E. Valerio) (UCR). Tortuguero, at sea level, 1♂2♀, 25 November 1985 (R. Rojas) and 4–5 Feb-

ruary 1982 (C.E. Valerio) (UCR). Cerro Tortuguero, at sea level, 1♂6♀, 8 August 1996 (B.A. Huber). Cerro Cocori (30 km N Cariari), elev. 100 m, 1♀, November–December 1994 (E. Rojas) (INBIO). Siquirres, at Rio Pacuare, 1♂2♀, 9 September 1996 (B.A. Huber). Hitoy Cerere Biol. Reserve, elev. 150–200 m, 3♂4♀, 7–8 September 1996 (B.A. Huber), and 1♂ from same locality, January–March 1994 (G. Carballo) (INBIO). Rara Avis, elev. 540–700 m, 1♀, July 1996 (R.L. Rodriguez). *Prov. Puntarenas*: San Luis, Monteverde, elev. 1000–1350 m, 11♂7♀, January 1993–April 1995 (Z. Fuentes) (INBIO). Estacion La Casona, Monteverde, elev. 1520 m, 3♂, July–September 1995 (K. Martinez) (INBIO). Reserva Biologica Carara, elev. about 50 m, 1♂1♀, 12 January 1996 (B.A. Huber), and 30 November–3 December 1982 (A.C. Gómez) (UCR). Altamira, Sendero Educativo, elev. 1150–1400 m, 3♂, November 1994 (R. Delgado & M. Segura) (INBIO). Wilson Botanical Gardens, 4 km S San Vito de Coto Brus, 2♂3♀, 5 July 1996 (B.A. Huber). Cerro Pittier, elev. 1750 m, 6♂6♀, 8 June 1995 (parataxonomist's course) (INBIO). Uvita, Quebrada Colonia, about 3 km E Uvita village, elev. about 20–60 m, 5♂2♀, 14 February 1996 (B.A. Huber). Manuel Antonio, elev. about 20–60 m, 12♂8♀, 13–14 January 1996 and 7 December 1996 (B.A. Huber), and 3♂6♀ from same locality, elev. 10–20 m, December 1990–July 1991 (G. Varela & R. Zuñiga) (INBIO). Esquinas Rainforest, La Gamba, 4♀, 2–3 July 1996 (B.A. Huber). Conte, Punta Burica, 1♂4♀, 12–13 July 1984 (C.E. Valerio & R. Solís) (UCR). Rancho Quemado, Peninsula de Osa, elev. 200 m, 12♂14♀, October 1993–March 1994 (A.L. Marín & A.H. Gutierrez) (INBIO). Estacion Sirena, Sendero Espaveles, elev. 0–10 m, 1♂, April 1995 (B. Gamboa & A. Picado) (INBIO). *Prov. Guanacaste*: Hacienda La Josefina, 6 km SWS Cerro Cacao, elev. about 560 m, 3♀, 19 December 1973 (W. Sibaja, L. Hilje, C.E. Valerio) (UCR). Volcán Cacao, 3♂6♀, July 1996 (R.L. Rodriguez). Pitilla Biol. Station (9 km S Sta. Cecilia), 4♂7♀, May 1994–April 1995 (P. Rios) (INBIO). **PANAMA.** *Prov. Bocas del Toro*: Bocas del Toro Island, in the forest at sea level, 7♂7♀, 23 April 1995 (B.A. Huber). *Prov. Chiriquí*: Alto Jaramillo (near Boquete, 40 km N David), 20♂9♀, 21 April 1995 (B.A. Huber). **NICARAGUA.** *Dept. Zelaya Sur*: Pancasan near Bluefields, 4♂4♀, 6 October 1996 (B.A. Huber).

Distribution.—Known from Nicaragua, Costa Rica, and Panama.

Remark.—The natural history of this species has been studied previously by Briceño (1985), Eberhard & Briceño (1983, 1985 sub "*M. sp. C*") (population at the Reserva Biol. Leonel Oviedo), and Eberhard (1992) (population at La Selva).

Modisimus madreseiva new species
(Figs. 95–100)

Type data.—Male holotype from Madreseiva, Finca Los Lagos, Prov. Cartago, Costa Rica, elev. 2000–2600 m, 28 June–10 July 1993 (M.M. Chavarría) (INBIO 2416).

Etymology.—Specific name from type locality.

Diagnosis.—Small light species, distinguished from close relatives by the short dorsal spine and its position on the procurus (Fig. 95 - *M. bribri* has a long, slender spine; Figs. 6–8; in *M. sanvito* the dorsal spine is situated much more proximally: Fig. 122).

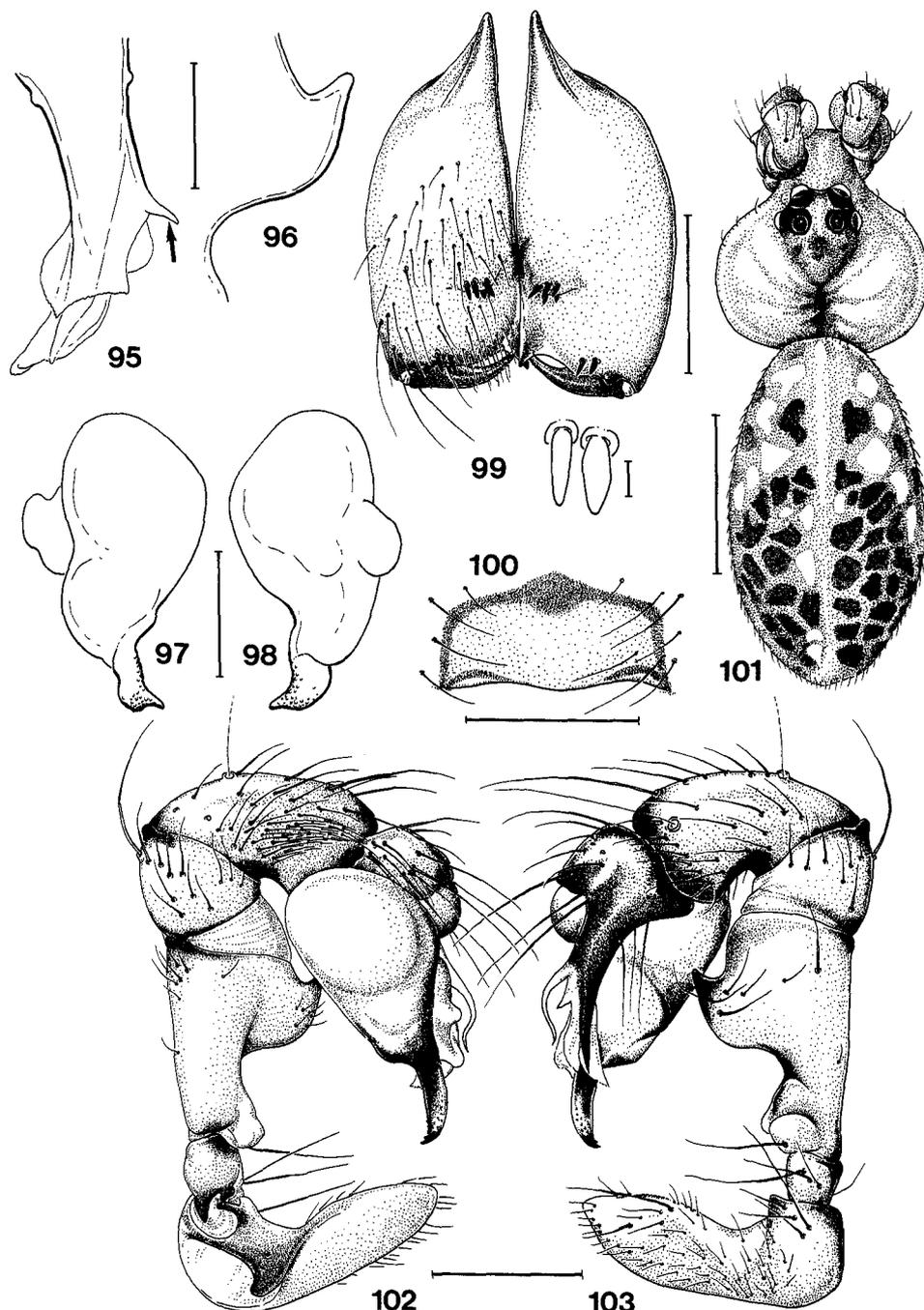
Description.—*Male*: Entire body very light, prosoma and legs ochre-yellow, opisthosoma rather grayish. Legs with darker rings on femora (distally), and tibiae (proximally and distally). Habitus like in *M. sanvito* new species (Fig. 119), with six eyes on eye turret in much the same configuration. Procurus with distinctive dorsal spine (arrow in Fig. 95), palpal femur apophysis as in Fig. 96, bulb as in Figs. 97–98, chelicerae with two sets of modified hairs on each side (Fig. 99). Legs without spines. *Measurements of male holotype*: Total length: 2.4, prosoma length: 0.9, width: 1.0, opisthosoma length: 1.5; leg 1: fem: 6.8, pat: 0.3, tib: 7.0, met: 11.8, tar: 2.0, total: 27.9, tibind: 74; leg 2: 18.6, leg 3: 13.2, leg 4 missing.

Female: Colors as in male, opisthosoma with brown eggs shining laterally through cuticle, epigynum with arch (Fig. 100) that is often greenish. Two of the females have a rather dark opisthosoma, one of these has large white spots dorsally on the opisthosoma. *Measurements of a female* (type locality; INBIO 2894): Total length: 2.0, prosoma length: 0.7, width: 0.8, opisthosoma length: 1.3; leg 1: fem: 4.1, pat: 0.3, tib: 4.1, met: 6.7, tar: 1.6, total: 16.8, tibind: 59; leg 2: 11.5, leg 3: 8.9, leg 4: 10.6.

Tibia 1 in other material: Madreseiva: 1♂: 6.7; 1♀: 4.6. Cuerici: 2♂: 6.2, 7.2; 5♀: 4.8–5.2 (\bar{x} = 5.0).

Other material examined.—2♂4♀ from type locality, July 1993–October 1995, other collection data as in types (INBIO). Cuerici, Prov. Cartago, Costa Rica, elev. 2600 m, 2♂6♀, September 1995–June 1996 (A. Picado) (INBIO).

Distribution.—Known only from the two



Figures 95–103.—New species of *Modisimus*. 95–100. *Modisimus madreseiva* new species. 95, Left procurus, prolateral view (arrow: dorsal spine); 96, Palpal femur apophysis; 97, Left bulb in ventral view; 98, Left bulb in dorsal view; 99, Male chelicerae, frontal view, with two modified hairs enlarged; 100, Epigynum, ventral view. 101–103. *Modisimus nicaraguensis* new species. 101, Male, dorsal view; 102, Left pedipalp, slightly extended, prolateral view; 103, Left pedipalp, slightly extended, retrolateral view. Scale bars = 0.1 mm (95, 96); 0.2 mm (97–100); 0.01 mm (modified hairs); 1 mm (101); 0.3 mm (102, 103).

mentioned localities in the Sierra de Talamanca, Costa Rica.

Modisimus nicaraguensis new species
(Figs. 101–109)

Type data.—Male holotype and female paratype from La Selva Negra, a forest about 12 km N Matagalpa, Dept. Matagalpa, Nicaragua, elev. about 1300 m, in twigs of small undergrowth, about 0.5 m above the ground, 24 July 1995 (B.A. Huber) (UCR).

Etymology.—Named for the Republic of Nicaragua.

Diagnosis.—Large dark species, distinguished from close relatives by the flat epigynum with posterior indentation (Fig. 109 - *M. guatuso* lacks the indentation: Figs. 89–94; *M. cahuita* and *M. sarapiqui* have protrusions on the epigynum: Figs. 34, 35, 133, 134), and by the lack of spines on the male femur 1 (*M. tortuguero* has about 40 spines on each femur 1).

Description.—*Male:* Carapace ochre, darker medially and on posterior side of eye turret, clypeus without markings, sternum unicolor ochre-yellow, pedipalps and chelicerae brown. Legs ochre-brown, with darker rings on femora (distally) and tibiae (proximally and distally). Opisthosoma dorsally very dark, with black and white spots (Fig. 101), ventrally with brown genital plate, black stripe behind it and smaller brown spot before spinnerets. Six eyes on eye turret, pedipalps as in Figs. 102, 103, procurus, bulb and femur apophysis as in Figs. 104–107. Chelicerae as in Fig. 108, legs without spines. *Measurements of male holotype:* Total length: 3.7, prosoma length: 1.3, width: 1.4, opisthosoma length: 2.4; leg 1: fem: 7.9, pat: 0.6, tib: 7.7, met: 13.6, tar: 2.5, total: 32.3, tibind: 56; leg 2: 22.2, leg 3: 16.4, leg 4: 19.6. *Tibia 1 in two other males:* 7.5; 7.9.

Female: Colors mostly as in male, opisthosoma ventrally only with black stripe behind brown epigynum which has a characteristic posterior indentation (Fig. 109). *Measurements of female paratype:* Total length: 3.5, prosoma length: 1.0, width: 1.1, opisthosoma length: 2.5; leg 1: fem: 5.4, pat: 0.4, tib: 5.4, met: 9.1, tar: 2.2, total: 22.5, tibind: 46; leg 2: 15.1, leg 3: 11.7, leg 4: 14.1.

Other material examined.—Two males from type locality, same collection data as types.

Distribution.—Known only from type locality.

Modisimus pittier new species
(Figs. 110–118)

Type data.—Male holotype and female paratype from Cerro Pittier (about 30 km N San Vito de Coto Brus), Prov. Puntarenas, Costa Rica, elev. 1750 m, 8 June 1995 (collected by a parataxonomist's course) (INBIO).

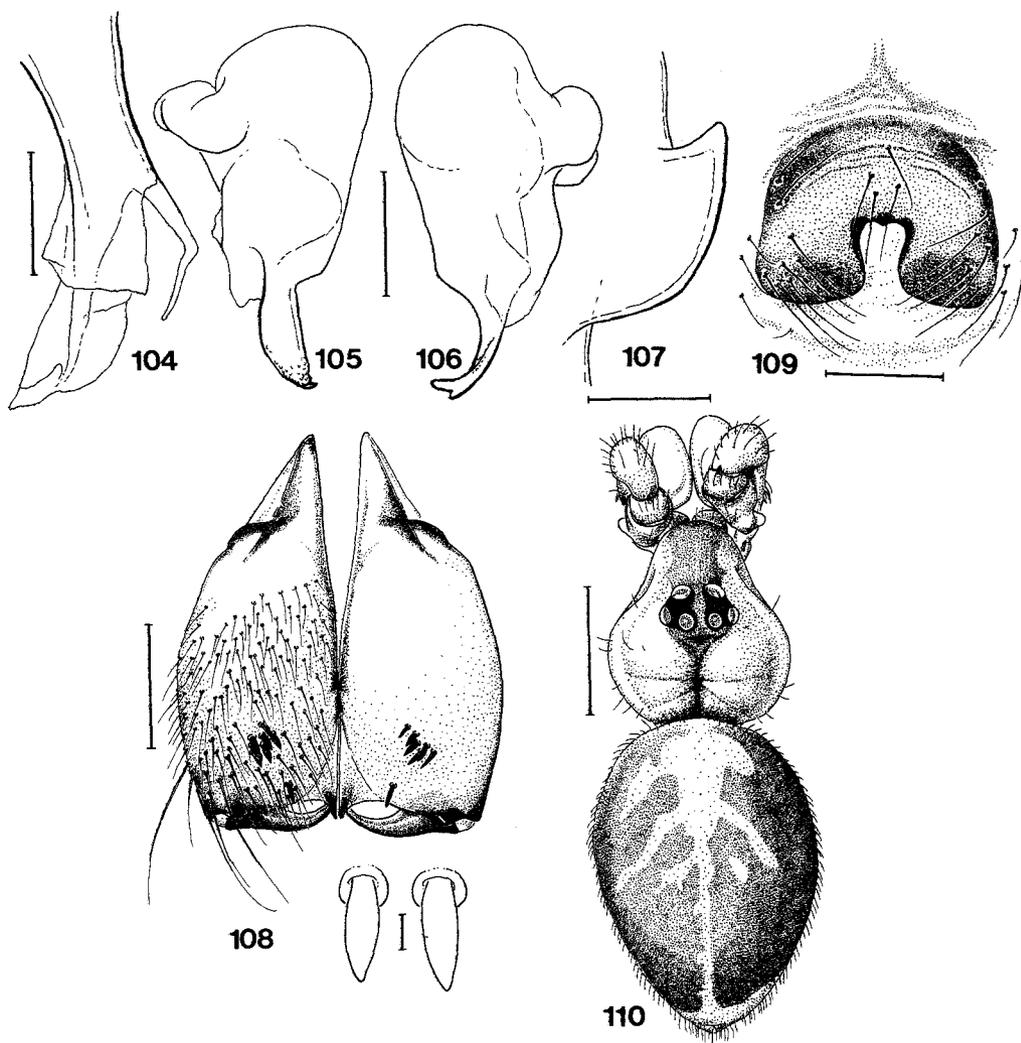
Etymology.—Specific name from type locality.

Diagnosis.—Large dark species, easily distinguished from congeners by the two dorsal spines on the procurus (Figs. 113, 114), the spiral apophysis on the bulb (Figs. 111, 112, 115), and the large epigynum (Fig. 118 - resembling only that of *M. dominical*: Fig. 60).

Description.—*Male:* Carapace grayish-ochre, darker at median line and eye turret. Clypeus with dark stripe (Fig. 110). Chelicerae and pedipalps brown. Sternum ochre-brown, lighter at lateral margins and medially. Legs brown, with slightly darker rings on femora (distally) and tibiae (proximally and distally). Opisthosoma dorsally dark greenish-gray, with light pattern that may originally have been set with white spots (Fig. 110), ventrally with prominent brown genital plate, short black stripe behind it, without black spot before spinnerets. Six eyes on eye turret. Pedipalps as shown in Figs. 111–112, procurus of distinctive shape (Figs. 113, 114), bulb with bulbal apophysis and another, spirally wound apophysis (Figs. 111, 112, 115), chelicerae with characteristically formed modified hairs (Fig. 117). Legs without spines. *Measurements of male holotype:* Total length: 3.4, prosoma length: 1.1, width: 1.5, opisthosoma length: 2.4; leg 1: fem: 10.0, pat: 0.6, tib: 10.0, met: 17.2, tar: 2.9, total: 40.7, tibind: 79; leg 2: 27.2, leg 3: 21.8, leg 4: 26.1.

Female: Colors as in male, with large brown epigynum (Fig. 118). *Measurements of female paratype:* Total length: 3.3, prosoma length: 1.1, width: 1.2, opisthosoma length: 2.2; leg 1: fem: 7.2, pat: 0.5, tib: 7.3, met: 12.2, tar: 2.5, total: 29.7, tibind: 66; leg 2: 20.2, leg 3: 15.9, leg 4: 19.3. *Tibia 1 in female from Alto Jaramillo:* 5.4.

Other material examined.—Alto Jaramillo (near Boquete, 40 km N David, Prov. Chiriquí, Pan-



Figures 104–110.—New species of *Modisimus*. 104–109. *Modisimus nicaraguensis* new species. 104, Left procurus, prolateral view (dorsal spine artificially bent); 105, Left bulb, ventral view; 106, Left bulb, prolateral view; 107, Palpal femur apophysis; 108, Male chelicerae, frontal view, with two modified hairs enlarged; 109, Epigynum, ventral view; 110, *Modisimus pittier* new species, male, dorsal view. Scale bars = 0.1 mm (104, 107), 0.2 mm (105, 106, 108, 109); 0.01 mm (modified hairs); 1 mm (110).

ama), elev. about 1100 m, 1♀, 21 April 1995 (B.A. Huber).

Distribution.—Known only from the two above mentioned localities in the Costa Rican and Panamanian Cordillera de Talamanca.

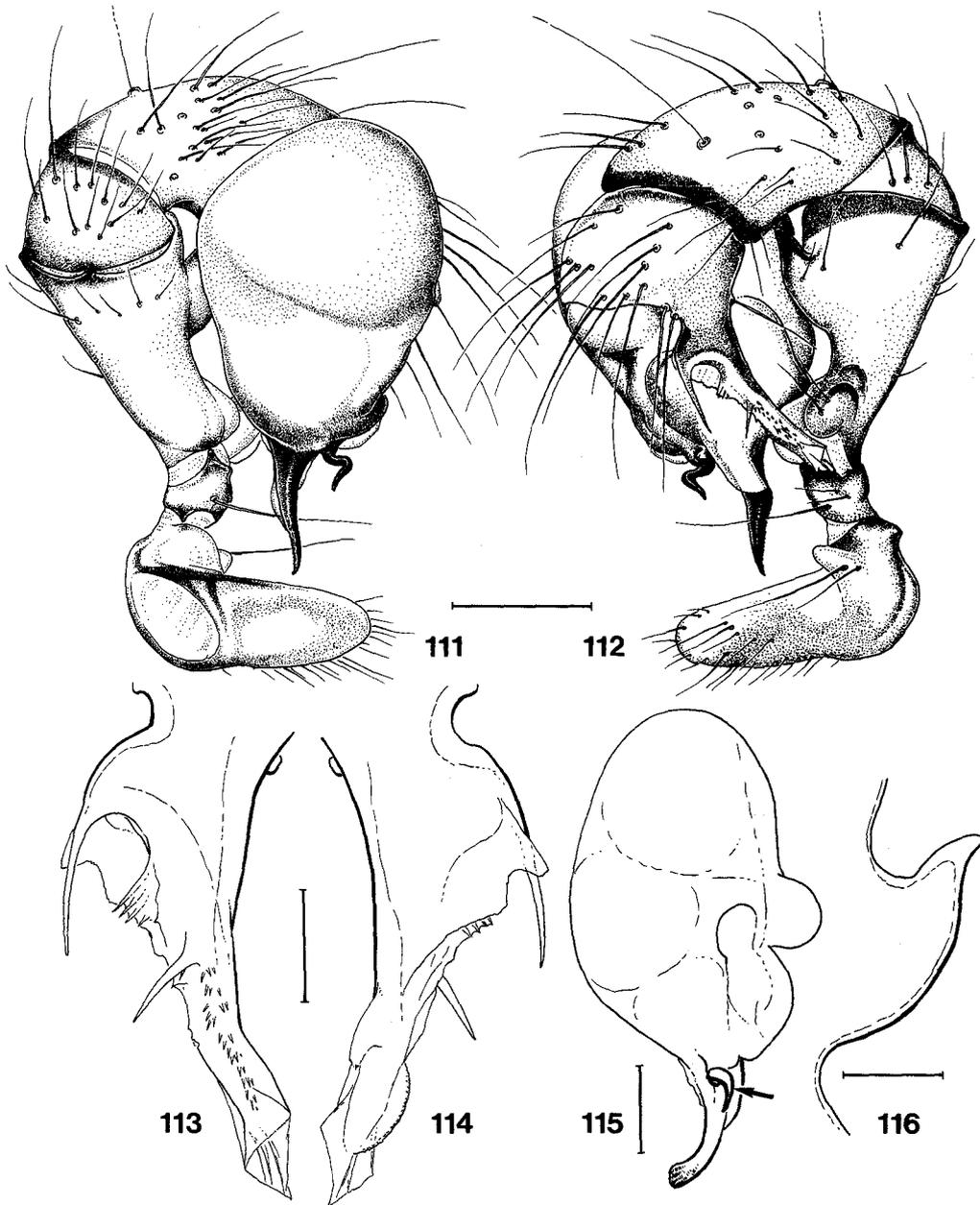
Modisimus sanvito new species
(Figs. 119–127)

Type data.—Male holotype and two female paratypes from San Vito de Coto Brus, Prov. Puntarenas, Costa Rica, 14–20 March

1967 (C.E. Valerio) (UCR). Other material not known.

Etymology.—Species name from type locality.

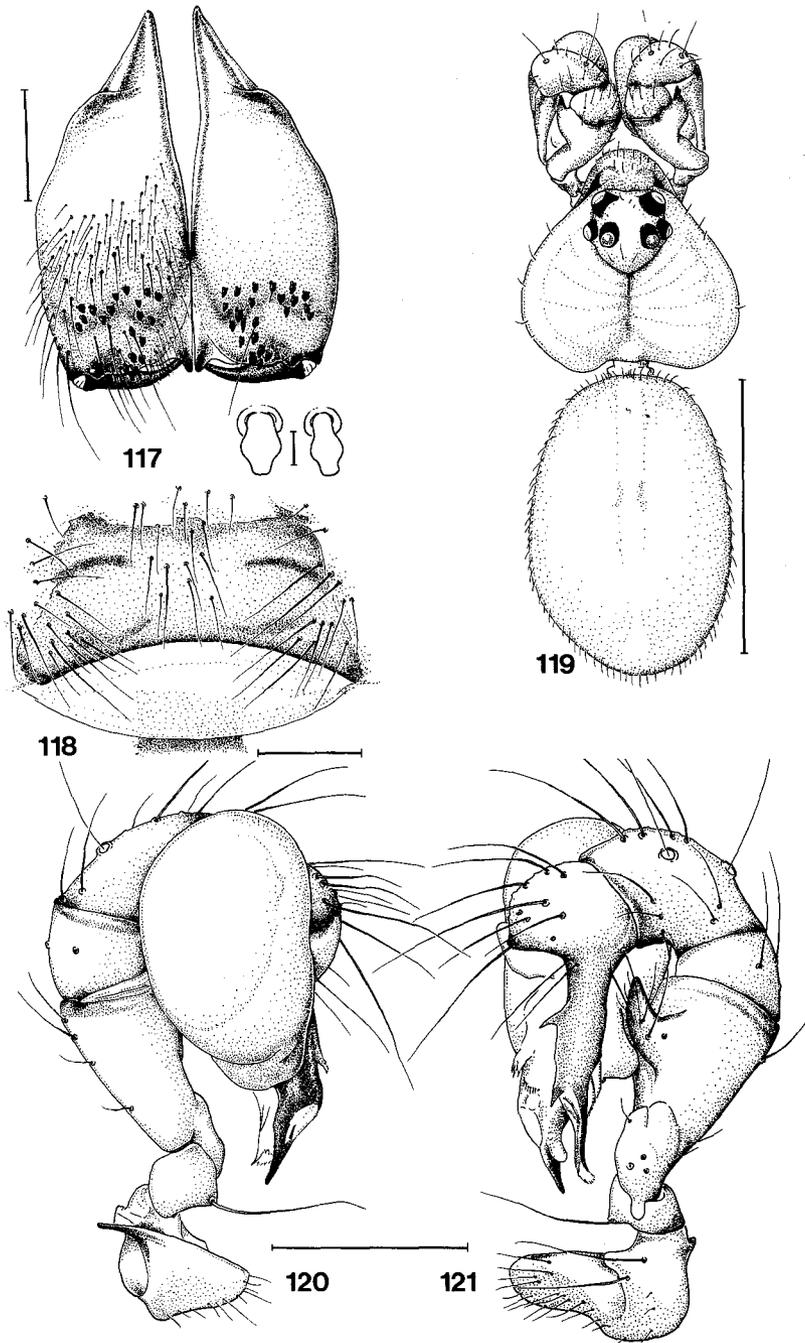
Diagnosis.—Small light species, distinguished from close relatives by separated black rings of eyes (Fig. 119), and the short dorsal spine on the procurus and its position (Fig. 122 - *M. coco* has a long dorsal spine: Fig. 50; *M. madrevelva* has the spine more distally: Fig. 95).



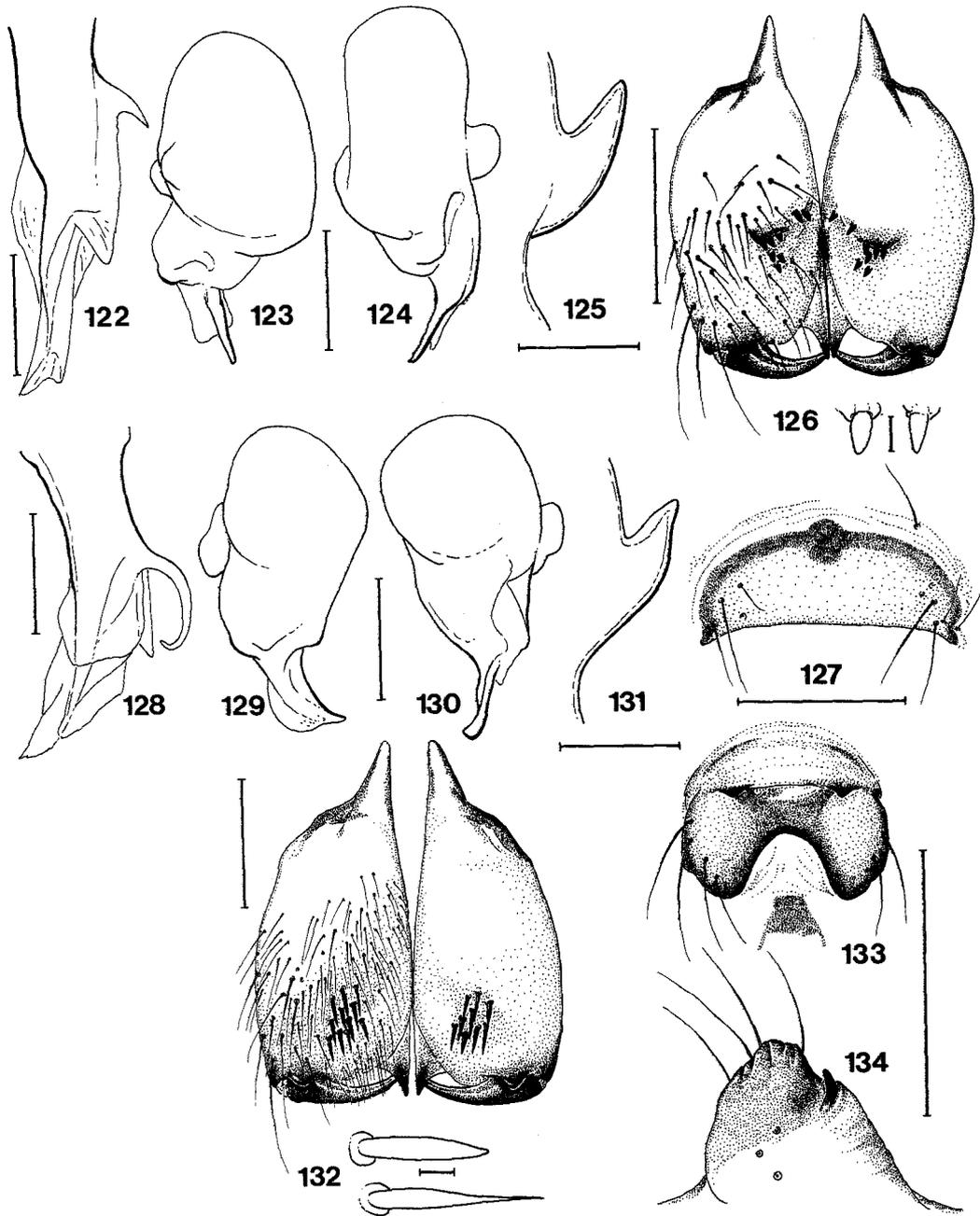
Figures 111–116.—*Modisimus pittier* new species. 111, Left pedipalp in proteral view; 112, Left pedipalp in retrolateral view; 113, Left procurus, retrolateral view; 114, Left procurus, proteral view; 115, Bulb, dorsal view (arrow: spiral apophysis); 116, Palpal femur apophysis. Scale bars = 0.3 mm (111, 112); 0.1 mm (113, 116); 0.2 mm (114, 115).

Description.—*Male*: Prosoma ochre-yellow, only rings around eyes black. Legs ochre-yellow with hardly visible darker rings on femora (distally) and tibiae (proximally and distally). Opisthosoma pale ochre. Six

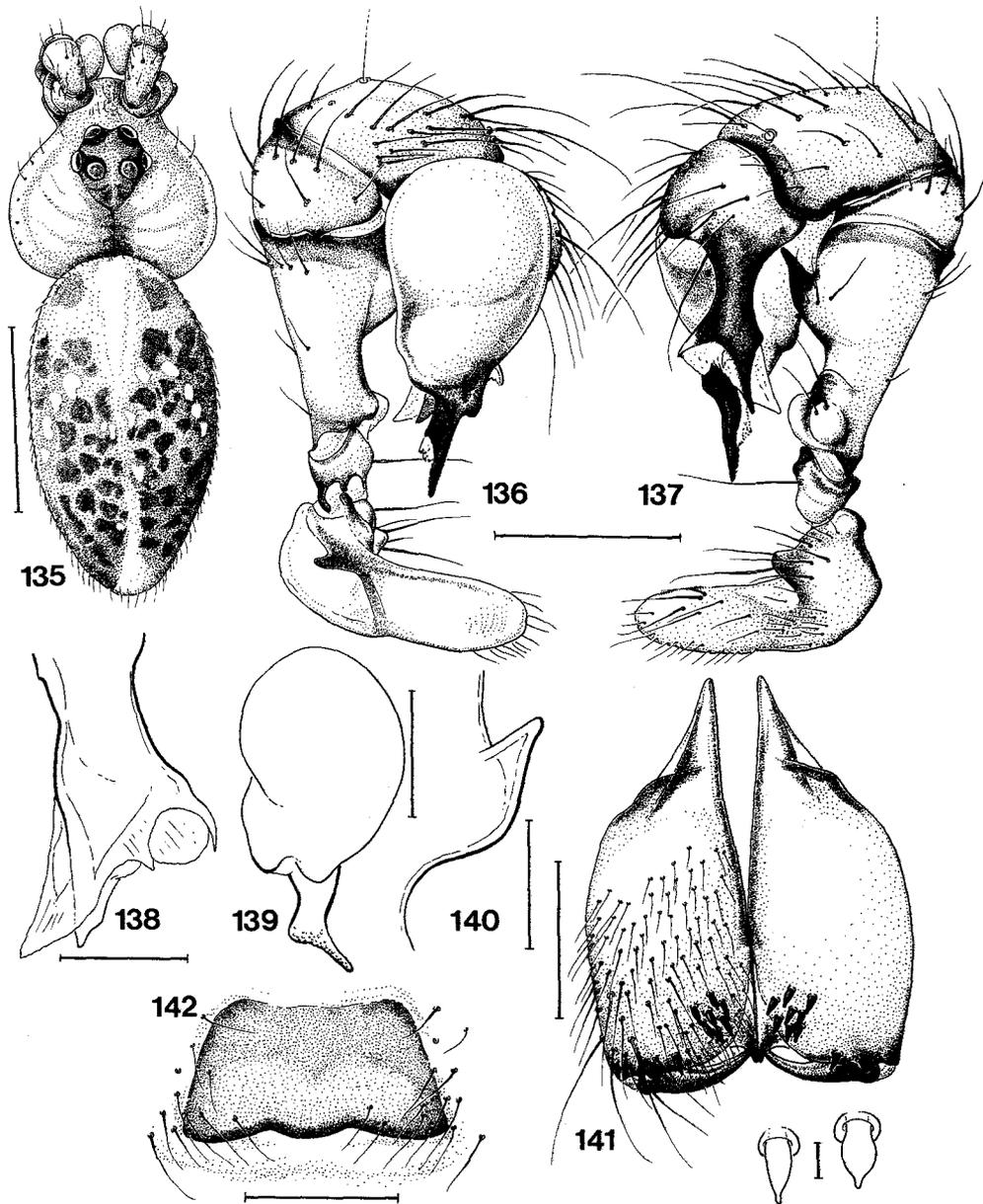
eyes on eye turret. Pedipalps as shown in Figs. 120–121, procurus, bulb and femur apophysis as in Figs. 122–125, chelicerae with 8 small modified hairs of each side, some of which are situated on a sclerotized ridge (Fig.



Figures 117–121.—New species of *Modisimus*. 117, 118. *Modisimus pittier* new species. 117, Male chelicerae, frontal view, with two modified hairs enlarged; 118, Epigynum, ventral view; 119–121. *Modisimus sanvito* new species. 119, Male, dorsal view; 120, Left pedipalp, prolateral view; 121, Left pedipalp, retrolateral view. Scale bars = 0.2 mm (117, 118); 0.01 mm (modified hairs); 1 mm (119); 0.3 mm (120, 121).



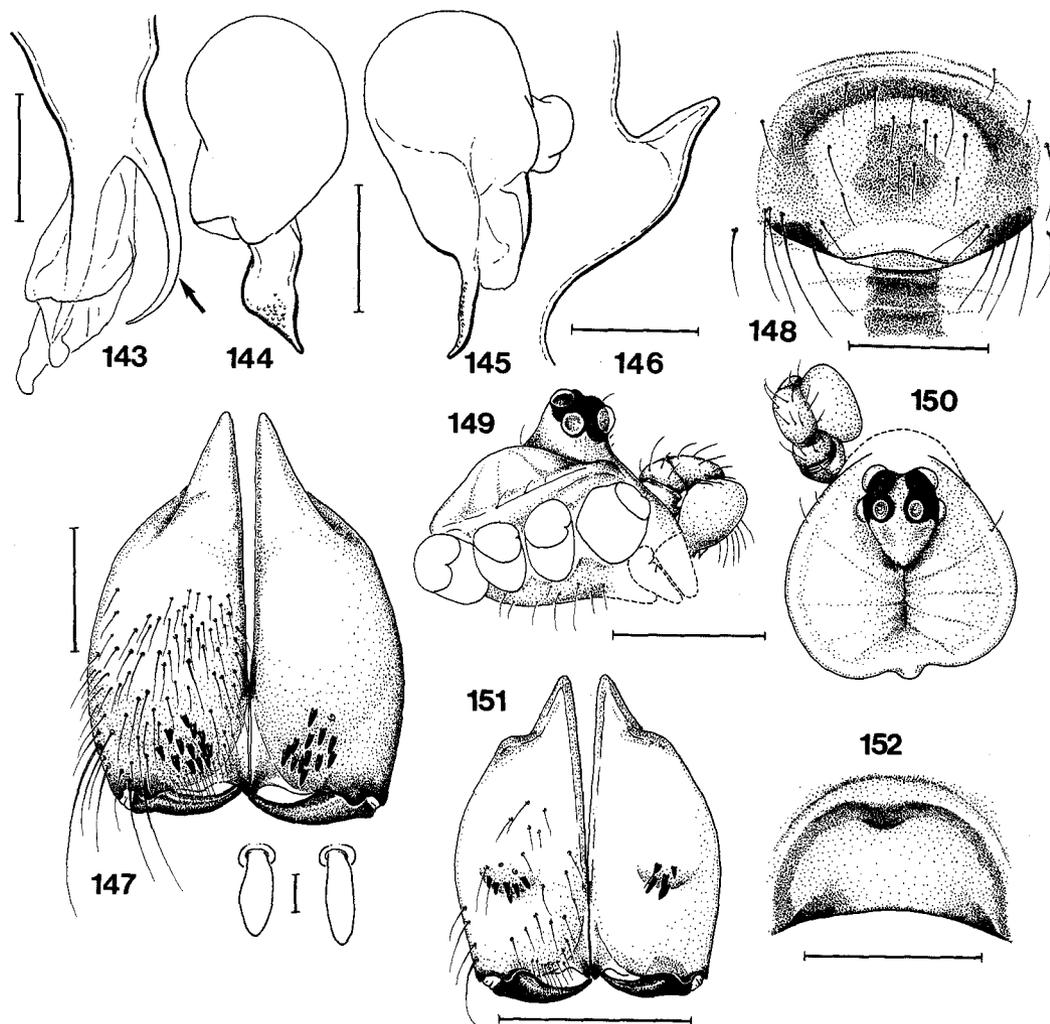
Figures 122–134.—New species of *Modisimus*. 122–127. *Modisimus sanvito* new species. 122, Left procurus, prolateral view; 123, Left bulb in ventral view; 124, Left bulb in prolateral view; 125, Palpal femur apophysis; 126, Male chelicerae, frontal view, with two modified hairs enlarged; 127, Epigynum, ventral view. 128–134. *Modisimus sarapiqui* new species. 128, Left procurus, prolateral view; 129, Left bulb, ventral view; 130, Left bulb, prolateral view; 131, Palpal femur apophysis; 132, Male chelicerae, frontal view, with two modified hairs enlarged; 133, Epigynum, ventral view; 134, Epigynum, lateral view. Scale bars = 0.1 mm (122, 125, 128, 131); 0.2 mm (123, 124, 126, 127, 129, 130, 132–134); 0.01 mm (modified hairs).



Figures 135–142.—*Modisimus selvanegra* new species. 135, Male, dorsal view; 136, Left pedipalp, slightly extended, prolateral view; 137, Left pedipalp, slightly extended, retrolateral view; 138, Left procursorus, prolateral view; 139, Left bulb, ventral view; 140, Palpal femur apophysis; 141, Male chelicerae, frontal view, with two modified hairs enlarged; 142, Epigynum, ventral view. Scale bars = 1 mm (135); 0.3 mm (136, 137); 0.1 mm (138, 140); 0.2 mm (139, 141, 142); 0.01 mm (modified hairs).

126). Legs without spines. *Measurements of male holotype*: Total length: 1.8, prosoma length: 0.7, width: 0.8, opisthosoma length: 1.1; leg 1: fem: 6.4, pat: 0.3, tib: 6.4, met: 12.0, tar: 1.7, total: 26.8, tibind: 81; leg 2: 17.6, leg 3: 11.2, leg 4: 14.3.

Female: Colors as in male. Epigynum (Fig. 127) slightly darker. *Measurements of a female paratype*: Total length: 2.2, prosoma length: 0.7, width: 0.8, opisthosoma length: 1.5; leg 1: fem: 4.8, pat: 0.3, tib: 4.6, met: 7.7, tar: 1.7, total: 19.1, tibind: 66; leg 2: 12.0, leg



Figures 143–152.—Species of *Modisimus*. 143–148. *Modisimus tortuguero* new species. 143, Left procurus, prolateral view (arrow: dorsal spine); 144, Left bulb in ventral view; 145, Left bulb in prolateral view; 146, Palpal femur apophysis; 147, Male chelicerae, frontal view, with two modified hairs enlarged; 148, Epigynum, ventral view. 149–152. *Modisimus dilutus* Gertsch. 149, Male prosoma, lateral view (dashed line: type damaged); 150, Male prosoma, dorsal view (dashed line: type damaged); 151, Male chelicerae, frontal view; 152, Epigynum, ventral view. Scale bars = 0.1 mm (143, 146); 0.2 mm (144, 145, 147, 148, 151, 152); 0.5 mm (149, 150); 0.01 mm (modified hairs).

3: 8.5, leg 4: 10.9. *Tibia 1* in other female: 4.3.

Distribution.—Known only from type locality.

Modisimus sarapiqui new species
(Figs. 128–134)

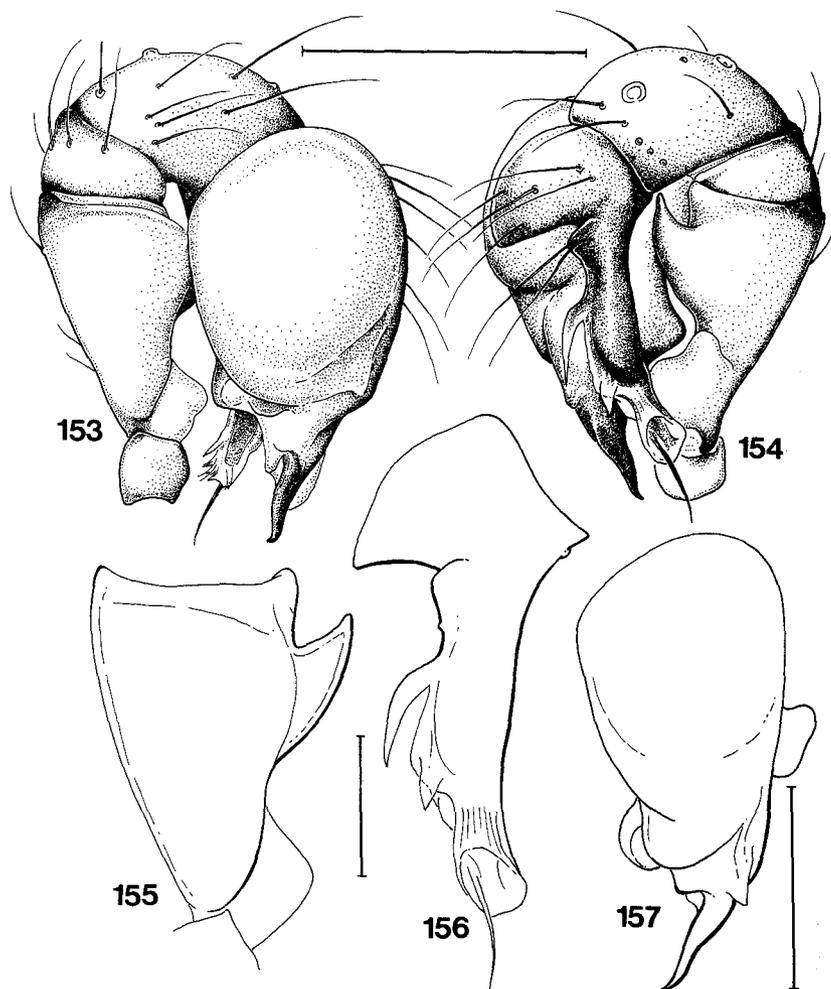
Type data.—Female (!) holotype, male and (damaged) female paratypes from Puerto Viejo de Sarapiquí, Prov. Heredia, Costa Rica,

elev. about 40 m, 1–5 July 1965 (C.E. Valerio) (UCR).

Etymology.—Species name from type locality.

Diagnosis.—Large dark species with characteristic protruding epigynum (Figs. 133, 134). Otherwise similar to *M. guatuso*, *M. tortuguero* and *M. cahuita*.

Description.—*Male paratype*: Carapace ochre-brown, darker medially and on pos-



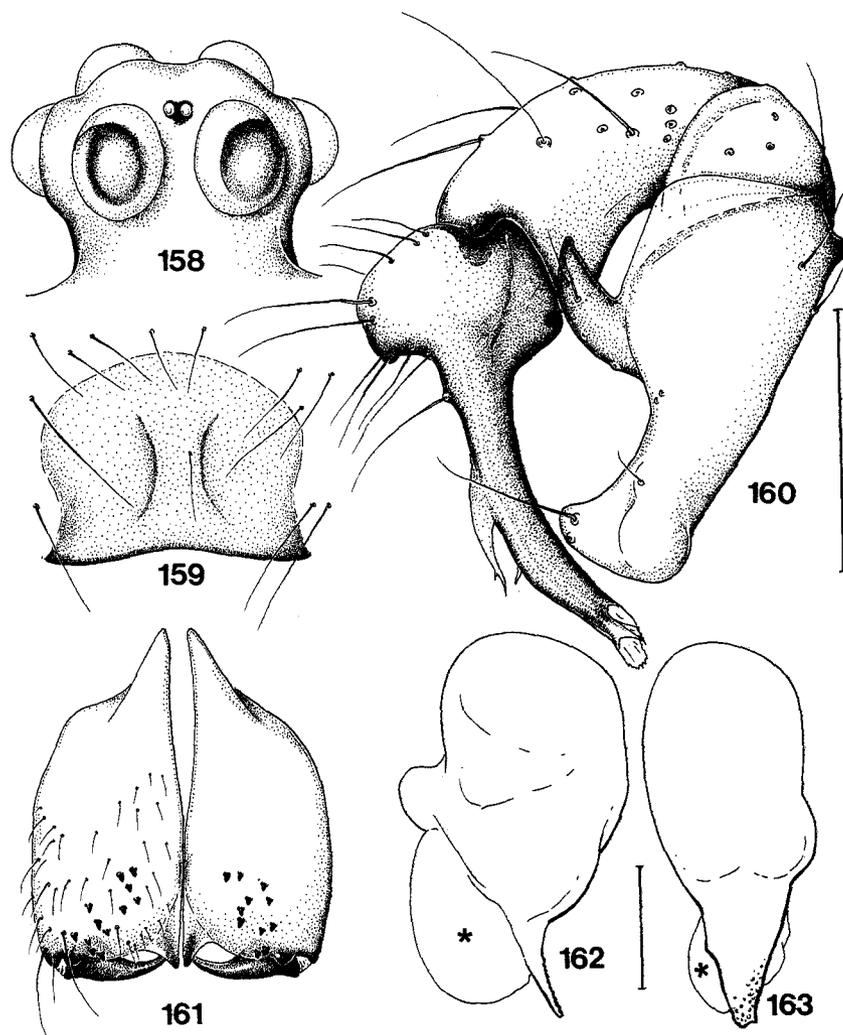
Figures 153–157.—*Modisimus dilutus* Gertsch, left male pedipalp. 153, Prolateral view; 154, Retrolateral view; 155, Femur, prolateral view; 156, Procurrus, retrolateral view; 157, Bulb, dorso-prolateral view. Scale bars = 0.3 mm (153, 154); 0.1 mm (155, 156); 0.2 mm (157).

terior side of eye turret. Sternum and clypeus ochre-brown. Opisthosoma dorsally greenish-ochre with black spots, similar to *M. guatuso* new species (Fig. 61), ventrally lighter, with brown genital plate, another brown spot anterior to spinnerets, and black stripe in between. Legs ochre-brown with slightly darker rings on femora (distally) and tibiae (proximally and distally). Six eyes on eye turret, procurrus, bulb, and femur apophysis as in Figs. 128–131, chelicerae with one patch of modified hairs on each side (Fig. 132), legs without spines. **Measurements:** Total length: 3.0, prosoma length: 1.0, width: 1.1, opisthosoma length: 2.0; leg 1: fem: 8.8, pat: 0.6, tib: 8.6, met:

17.0, tar: 2.6, total: 37.6, tibind: 71; leg 2 missing, leg 3: 18.9, leg 4: 21.2.

Female holotype: Colors mostly as in male, with orange-ochre sternum, brown epigynum with a pair of characteristic black denticles (Figs. 133, 134), back stripe behind epigynum. **Measurements:** Total length: 3.6, prosoma length: 1.0, width: 1.2, opisthosoma length: 2.6; leg 1: fem: 7.6, pat: 0.5, tib: 7.3, met: 13.3, tar: 2.2, total: 30.8, tibind: 57; leg 2 partly missing, leg 3: 15.6, leg 4: 18.0. **Tibia 1 from female paratype:** 7.2.

Other material examined.—1♀ from Rara Avis, Prov. Heredia, Costa Rica, elev. 540–700 m, July 1996 (R.L. Rodriguez).



Figures 158–163.—*Modisimus inornatus* Cambridge. 158, Eye turret of female with tiny anterior median eyes; 159, Epigynum, ventral view; 160, Left male pedipalp, retrolateral view (bulb missing); 161, Male chelicerae, frontal view; 162, Left bulb, retrolateral view (asterisk: sperm mass?); 163, Left bulb, ventral view (asterisk: sperm mass?). Scale bars = 0.3 mm (160); 0.2 mm (162, 163).

Distribution.—Known only from the two mentioned localities in Prov. Heredia, Costa Rica.

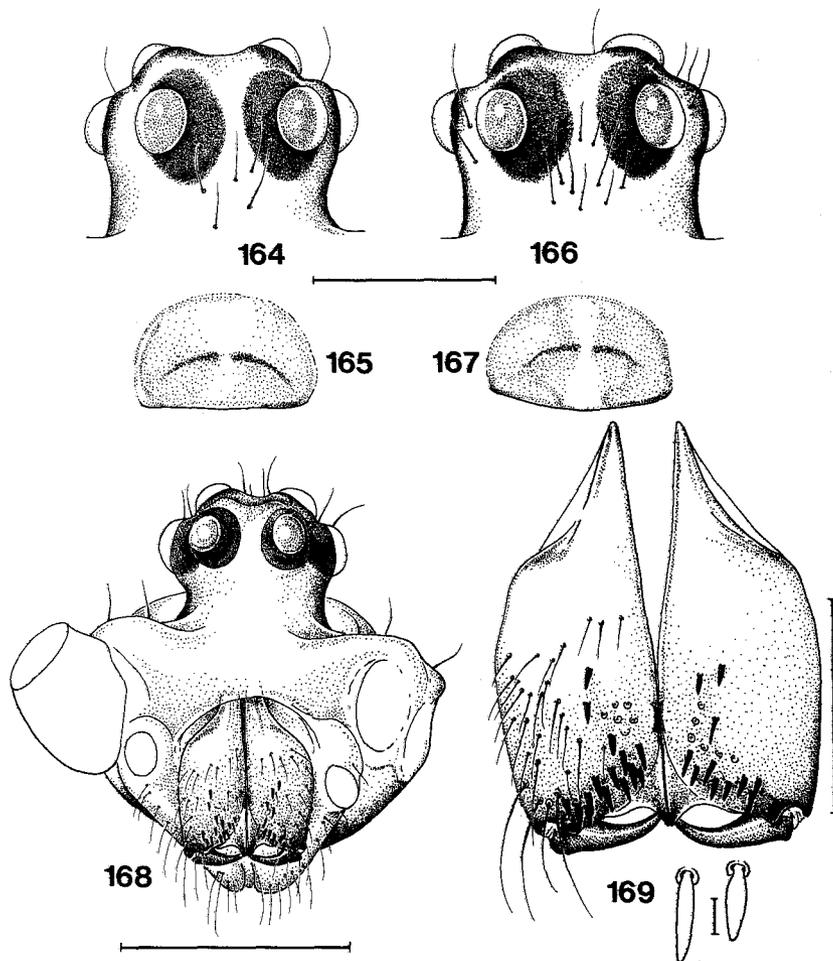
Modisimus selvanegra new species
(Figs. 135–142)

Type data.—Male holotype and female paratype from La Selva Negra, a forest about 12 km N Matagalpa, Dept. Matagalpa, Nicaragua, elev. about 1300 m, from dome shaped webs near the ground, mostly under dead leaves, 24 July 1995 (B.A. Huber) (UCR).

Etymology.—Specific name from type locality.

Diagnosis.—Dark small species with characteristic shape of male pedipalpal procurus (Figs. 137, 138), and characteristically formed spines on male chelicerae (Fig. 141).

Description.—*Male*: Carapace ochre-brown, with darker median stripe, clypeus colored as carapace, sternum ochre-yellow with two darker longitudinal stripes. Pedipalps and chelicerae ochre-brown. Legs ochre-brown, with hardly visible darker rings on femora (distally) and tibiae (proximally and distally). Opisthosoma dorsally greenish-gray with black spots, some small white spots disap-

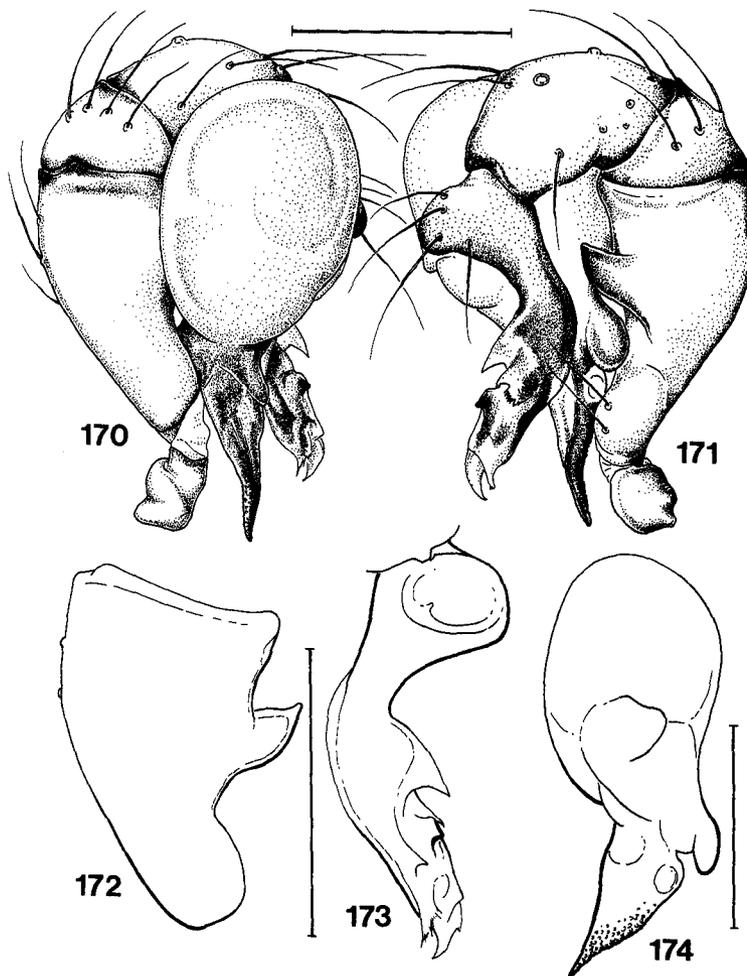


Figures 164–169. Species of *Modisimus*. 164–167. *Modisimus maculatipes* Cambridge. 164, Type of *M. maculatipes*, eye turret, frontal view; 165, Type of *M. maculatipes*, epigynum, ventral view; 166, Type of *M. putus* Cambridge, new synonymy, eye turret, frontal view; 167, Type of *M. putus* new synonymy, epigynum, ventral view. 168, *Modisimus propinquus* Cambridge, male prosoma, frontal view; 169, *Modisimus propinquus* Cambridge, chelicerae, frontal view, with two modified hairs enlarged. Scale bars = 0.2 mm (164–167, 169); 0.5 mm (168); 0.01 mm (modified hairs).

peared rapidly in most specimens, ventrally with brown genital plate, black stripe behind it and smaller brownish spot before spinnerets. Six eyes on eye turret, pedipalp as shown in Figs. 136–140, chelicerae with one patch of characteristically formed modified hairs on each side (Fig. 141 - only some individuals have the single distal modified hair). Legs without spines. *Measurements of male holotype*: Total length: 2.8, prosoma length: 1.0, width: 1.1, opisthosoma length: 1.8; leg 1: fem: 7.0, pat: 0.4, tib: 6.8, met: 11.9, tar: 1.9,

total: 28.0, tibind: 61; leg 2: 17.3, leg 3: 11.8, leg 4: 14.8.

Female: Colors mostly as in male, sternum darker with lighter spot in middle, epigynum brown, as shown in Fig. 142, with a short black stripe behind it. Dark rings on legs more pronounced than in male. *Measurements of female paratype*: Total length: 2.2, prosoma length: 0.7, width: 0.9, opisthosoma length: 1.5; leg 1: fem: 4.0, pat: 0.3, tib: 4.1, met: 6.7, tar: 1.4, total: 16.5, tibind: 48; leg 2: 10.6, leg 3: 7.8, leg 4: 9.9.



Figures 170–174.—*Modisimus propinquus* Cambridge, left male pedipalp. 170, Prolateral view; 171, Retrolateral view; 172, Femur; 173, Procursor, prolatateral view; 174, Bulb, ventral view. Scale bars = 0.3 mm.

Tibia 1 in other material: 17♂: 5.7–6.9 (\bar{x} = 6.3); 12♀: 3.6–4.3 (\bar{x} = 3.9).

Other material examined.—18♂ 13♀ from type locality, same collection data as types.

Distribution.—Known only from type locality.

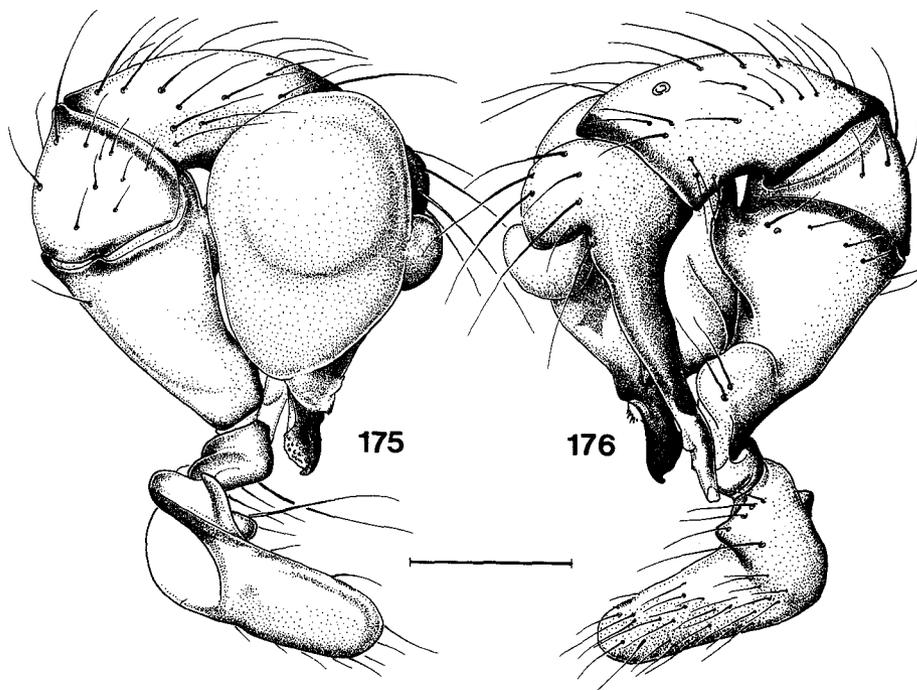
Modisimus tortuguero new species
(Figs. 143–148)

Type data.—Male holotype and female paratype from forest at Cerro Tortuguero (6 km NNW Tortuguero village), Prov. Limón, Costa Rica, at sea level, close to the ground in humid, shaded places, 8 August 1996 (B.A. Huber) (UCR).

Etymology.—Specific name from type locality.

Diagnosis.—Dark species closely related to *M. guatuso* and *M. cahuita*, distinguished from first by high numbers of spines (about 40) in two rows on the male femur 1 (*M. guatuso* has up to about 15 spines on femur 1), from second by flat epigynum (Fig. 148 - *M. cahuita* has a pair of protuberances on the epigynum: Figs. 34, 35).

Description.—*Male*: Carapace ochre-brown, darker on posterior side of eye turret, clypeus colored as carapace, pedipalps and chelicerae brown, sternum brown with ochre lateral margins and median stripe. Legs ochre-brown, with slightly darker rings on femora



Figures 175, 176.—*Modisimus pulchellus* Banks, left male pedipalp. 175, Prolatateral view; 176, Retro-lateral view. Scale bar = 0.3 mm.

(distally) and tibiae (proximally and distally). Opisthosoma greenish-gray, covered dorsally with large black and smaller white spots in the same pattern as *M. guatuso* new species (Fig. 61), ventrally with brown genital plate, black stripe behind it and another dark spot before spinnerets. Six eyes on eye turret, genitalia not distinguishable from those of *M. guatuso* new species, except maybe by the stronger dorsal spine on the procurcus (arrow in Fig. 143). Bulbs and femur apophysis as in Figs. 144–146. Chelicerae with one patch of modified hairs on each side (Fig. 147). Femora 1 and 2 (sometimes also 3) with two rows of spines ventrally (about 40 on femur 1). *Measurements of male holotype*: Total length: 3.3, prosoma length: 1.1, width: 1.3, opisthosoma length: 2.2; leg 1: fem: 7.3, pat: 0.5, tib: 7.5, met: 13.3, tar: 2.0, total: 30.6, tibind: 60; leg 2: 19.4, leg 3: 14.6, leg 4: 16.7.

Female: Colors as in male, but sternum lighter, opisthosoma ventrally only with black stripe behind brown epigynum (Fig. 148). Legs without spines. *Measurements of female paratype*: Total length: 2.9, prosoma length: 1.1, width: 1.1, opisthosoma length: 1.8; leg 1: fem: 6.5, pat: 0.4, tib: 6.4, met: 11.9, tar:

2.5, total: 28.0, tibind: 64; leg 2: 17.6, leg 3: 13.6, leg 4: 16.2.

Tibia 1 in 9 other males: 6.6–8.0 (\bar{x} = 7.4).

Other material examined.—9♂ from type locality, same collection data as types. Tortuguero (not further specified), 1♂, 4–5 February 1982 (C.E. Valerio) (UCR).

Distribution.—Known only from Tortuguero, Prov. Limón, Costa Rica.

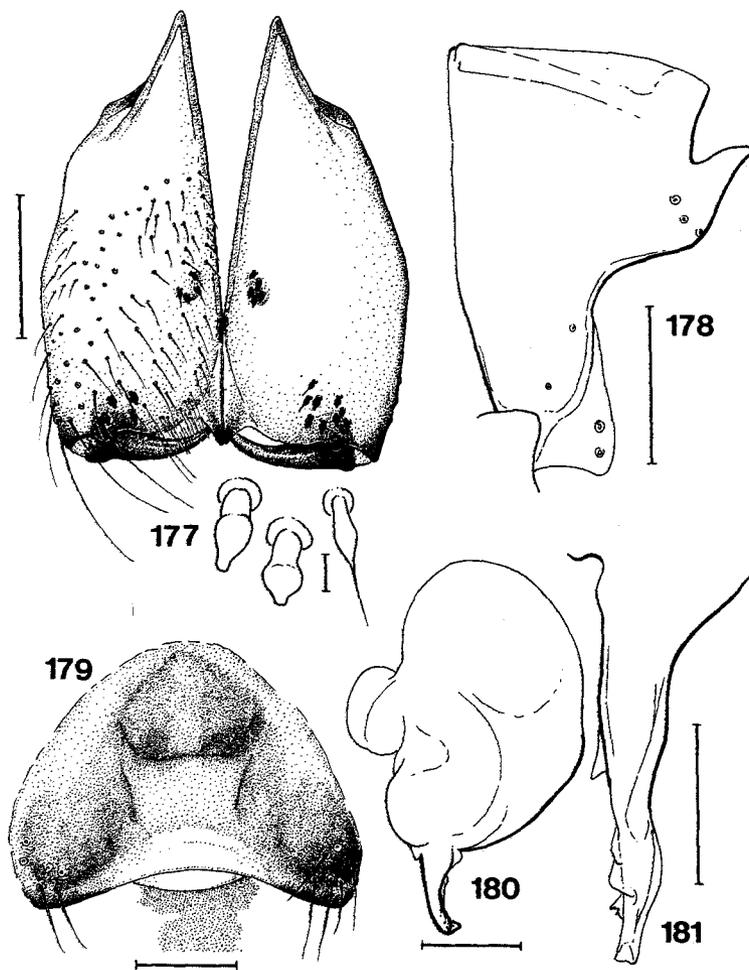
Modisimus dilutus Gertsch 1941
(Figs. 149–157)

M. dilutus Gertsch 1941: 11–12, figs. 29–30; Nentwig 1993: 97.

Type data.—Male holotype, female paratype from Barro Colorado Island, Canal Zone, Panama, 14 & 18 July 1938 (E.G. Williams, Jr.) (AMNH), examined.

Diagnosis.—Small light species, distinguished from congeners by the procurcus (Fig. 156) with its distal flagellum.

Redescription.—Gertsch's (1941) verbal description is detailed and accurate, but the drawings are insufficient and the leg measurements wrong. Procurcus of distinctive shape



Figures 177–181.—*Modisimus pulchellus* Banks. 177, Male chelicerae, frontal view, with three modified hairs enlarged; 178, Male palpal femur; 179, Epigynum, ventral view; 180, Genital bulb, ventral view; 181, Left procurus, retrolateral view. Scale bars = 0.2 mm, 0.01 mm (modified hairs).

(Fig. 156), each chelicera set with one patch of modified hairs (Fig. 151). Prosoma and palps see Figs. 149–150, 153–157. Female epigynum as in Fig. 152. *Measurements of male holotype*: Prosoma length: 0.7, width: 0.7, opisthosoma damaged; leg 1 missing, leg 2: fem: 4.5, other segments missing; leg 3: 12.9, leg 4: 16.3.

Measurements of female paratype: Total length: 1.4, prosoma length: 0.5, width: 0.6, opisthosoma length: 0.9; leg 1: fem: 3.7, pat: 0.3, tib: 3.6, met: 5.5, tarsus missing, tibind: 75; leg 2 partly missing; leg 3: 6.8, leg 4: 8.7.

Distribution.—Known only from the Canal Zone, Panama.

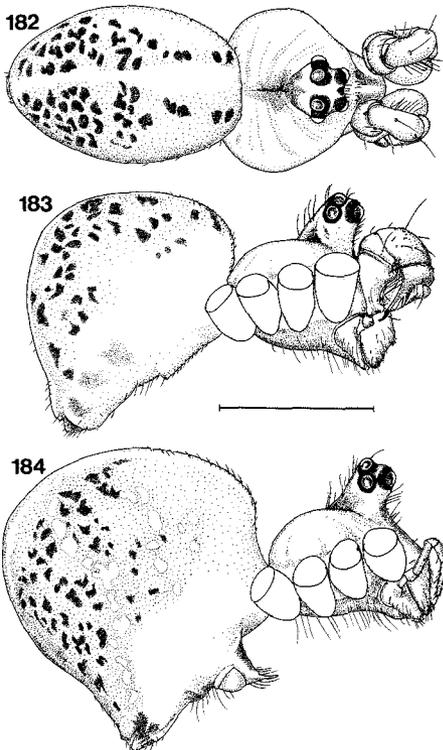
Modisimus inornatus Cambridge 1895
(Figs. 158–163)

M. inornatus Cambridge 1895: 149, pl. 20, figs. 7, 7a-c; Cambridge 1899: 303, pl. 32, figs. 4, 4a-e; F Cambridge 1902: 367, pl. 34, figs. 17, 17a-b, 18; Petrunkevitch 1925: 66; Gertsch & Davis 1937: 5; Reimoser 1939: 334; Gertsch & Davis 1942: 10.

M. propinquus Cambridge 1896: 223 (female only!), pl. 27, fig. 8f (misidentification).

Type data.—2♀ & 1♂, labeled as paratypes, from Teapa, Tabasco, Mexico, no date (H.H. Smith) (BMNH 1905. 4. 28. 1471–2), examined.

Diagnosis.—Medium-sized dark species,



Figures 182–184.—*Modisimus texanus* Banks. 182, Male, dorsal view; 183, Male, lateral view; 184, Female, lateral view. Scale bar = 1 mm.

distinguished from the new species described in this paper by the procurus (Fig. 160: dorsal spine and additional, small spine more distally), and the shape of the femur apophysis (Fig. 160). Epigynum flat and simple (Fig. 159).

Redescription.—*Male*: Apart from the good original verbal description, it must be noted that the large bulge at the bulb (asterisks in Figs. 162, 163) may be an accidental accretion, maybe sperm. The spines on the male chelicerae are short (Fig. 161), procurus and femur apophysis as in Fig. 160. *Measurements*: Total length: 2.7, prosoma length: 1.1, width: 1.0, opisthosoma length: 1.6, legs missing or unmeasurable.

Female: Epigynum as in Fig. 159; the opisthosoma of one female is dorsally covered with small dark spots, in the other one it is unicolorous. In one of the females, the AMEs are present (Fig. 158); they are lacking in the other female and in the male. *Measurements of 'female 1'*: Total length: 2.5, prosoma length: 0.7, width: 0.9, opisthosoma length:

1.8; femur 1: 5.0. *Measurements of 'female 2'*: Total length: 2.5, prosoma length: 0.8, width: 0.8, opisthosoma length: 1.7; femur 1: 4.0. *Measurements of female that accompanies holotype of M. propinquus*: Total length: 2.2, prosoma length: 0.8, width: 0.8; opisthosoma length: 1.4; femur 1: 4.3.

Other material examined.—One female from type locality, same collection data, together with the male holotype of *M. propinquus* (BMNH).

Distribution.—Most records are from Mexico (Tabasco, San Luis Potosí, Tamaulipas) (Cambridge 1895, 1896, 1899; Gertsch & Davis 1937, 1942). The species was also reported from Costa Rica (Reimoser 1939) and Panama (Petrunkevitch 1925). These authors probably did not compare their specimens with the types and provided no drawings. Moreover, the species is not present in any of the collections studied by the author. I have not seen Reimoser's and Petrunkevitch's material, but consider it probable that their identifications are wrong.

Modisimus maculatipes Cambridge 1895
(Figs. 164–167)

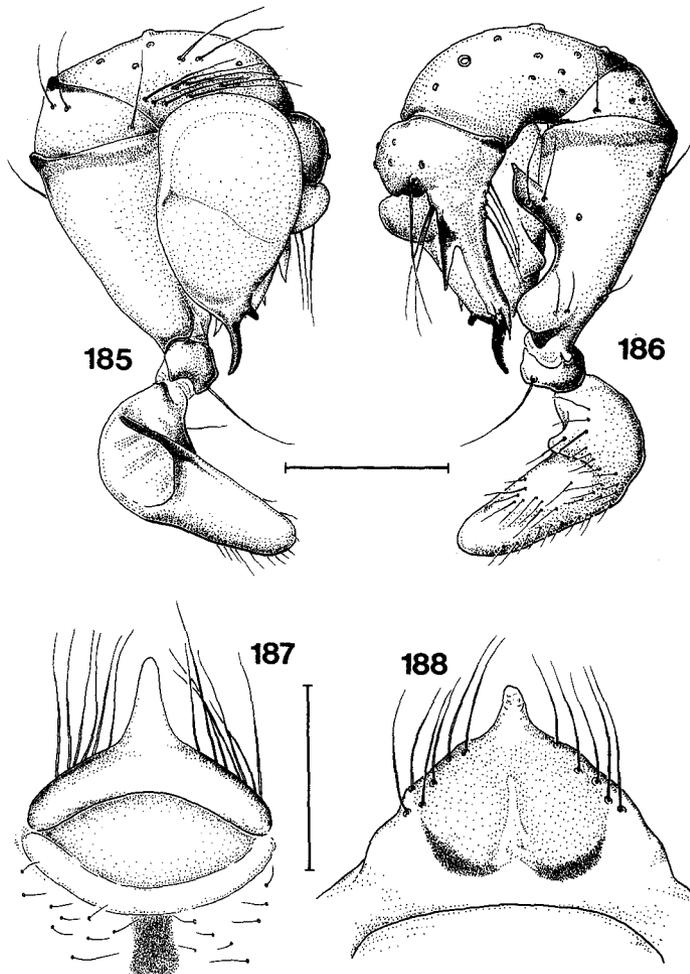
M. maculatipes Cambridge 1895: 148, pl. 20, figs. 5, 5a-c; F. Cambridge 1902: 367, pl. 34, fig. 20; Banks 1929: 56; Gertsch & Davis 1942: 10; Nentwig 1993: 98.

M. putus Cambridge, 1895: 148, pl. 20, figs. 6, 6a-e; F. Cambridge 1902: 368, pl. 34, fig. 21; Chickering 1936: 452. (NEW SYNONYMY).

Type data.—*M. maculatipes*: female labeled as lectotype, from Teapa, Tabasco, Mexico, no date (H.H. Smith) (BMNH 1905. 4. 28. 1473-4-part), examined. *M. putus*: female holotype from Teapa, Tabasco, Mexico, no date (H.H. Smith) (BMNH), examined.

Diagnosis.—Small dark species, with simple, flat epigynum (Figs. 165, 167). Distinguished from the new species described in the present paper by the size and shape of the epigynum.

Redescription.—*Female*: Both specimens are now ochre-yellow, the opisthosoma lacks the pattern from the original description (Cambridge 1895) which is detailed and needs no repetition. The eye turrets and epigyna are practically identical in both specimens (Figs. 164–167). *Measurements of M. maculatipes, female*: Total length: 1.9, prosoma length: 0.7, width: 0.7, opisthosoma length: 1.2; leg 1:



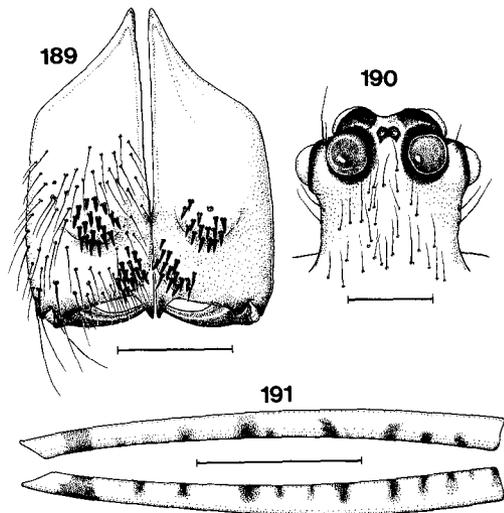
Figures 185–188.—*Modisimus texanus* Banks. 185, Left male pedipalp, prolateral view; 186, Left male pedipalp, retrolateral view; 187, Epigynum, ventro-posterior view; 188, Epigynum, frontal view. Scale bars = 0.3 mm.

fem: 3.2, pat: 0.3, tib: 3.1, met: 5.1, tar: 1.1, total: 12.8, tibind: 33; leg 2: 7.9, leg 3: 5.9, leg 4: 7.6. *Measurements of M. putus, female*: Total length: 2.2, prosoma length: 0.7, width: 0.8, opisthosoma length: 1.5; leg 1: fem: 3.6, pat: 0.3, tib: 3.6, met: 5.8, tar: 1.2, total: 14.4, tibind: 45; leg 2: 8.5, leg 3: 6.5, leg 4: 8.4.

Justification of synonymy.—Cambridge (1895) noted that *M. putus* “closely resembles *M. maculatipes* in all essential characters”. The differences were as follows: the latter was paler, had “some indistinct white spots” on the opisthosoma, the rings on the legs were almost absent, the “genital aperture” was larger and more prominent, and the tarsal ar-

ticulations seemed to be more distinct. None of these characters is appropriate to separate two species: recently molted individuals tend to be paler and to have the rings on the legs less distinct; white spots on the opisthosoma often disappear rapidly in ethanol; and the epigynum is not larger in *M. putus* (Fig. 167), and probably appeared more prominent because of a plug (which is now absent). The eye pattern, often used by previous authors to separate species, is practically identical in the two specimens (Figs. 164, 166). Both specimens are labeled with “Teapa 167” and might even have been collected together.

Distribution.—*M. maculatipes* has been



Figures 189–191.—*Modisimus texanus* Banks. 189, Male chelicerae, frontal view; 190, Eye turret, frontal view; 191, Female femur 3 in both lateral views. Scale bars = 0.2 mm (189, 190), 1 mm (191).

recorded from Mexico (Tabasco and Veracruz) (Cambridge 1895; Gertsch & Davis 1942), and from Panama (Canal Zone) (Banks 1929; Nentwig 1993). The two latter authors provided no drawings, and did probably not examine the type. *M. putus* has also been recorded from Mexico (Tabasco) (Cambridge 1895), and from Panama (Canal Zone) (Chickering 1936). Again, Chickering provided no drawings. Since the species is apparently absent in the large Costa Rican collections studied, it should be regarded as known only from Mexico, and the Panamanian records probably result from misidentifications.

Modisimus propinquus Cambridge 1896
(Figs. 168–174)

M. propinquus Cambridge 1896: 223 (only male!; female see *M. inornatus*), pl. 27, figs. 8, 8a-e; F Cambridge 1902: 367, pl. 34, figs. 19, 19a-b; Gertsch 1973: 149; Brignoli 1973: 217–218; Nentwig 1993: 98.

Type data.—Male holotype from Teapa, Tabasco, Mexico, no date (H.H. Smith) (BMNH), examined. The male is accompanied by a female *M. inornatus* in a second subvial.

Diagnosis.—Small dark species, distinguished from congeners by the bent procurus with an apophysis distal to the dorsal spine

(Figs. 171, 173), and by the bulb with a globular projection near the bulbal apophysis (Figs. 171, 174).

Redescription.—*Male holotype*: The original verbal description is very precise and needs no repetition. Eye turret relatively high (Fig. 168). For details on chelicerae and pedipalps see Figs. 169–174. **Measurements**: Total length: 1.8, prosoma length: 0.6, width: 0.8, opisthosoma length: 1.2; all legs missing.

Distribution.—The species has been reported from Mexico (Tabasco, Chiapas) (Cambridge 1896; Gertsch 1973; Brignoli 1973) and Panama (Canal Zone) (Nentwig 1993). The latter author did probably not compare his specimens with the type, and provided no illustrations. Moreover, the species is absent in the large Costa Rican collections studied by the author, supporting the idea that Nentwig's (1993) Panamanian material may have been misidentified.

Modisimus pulchellus Banks 1929
(Figs. 175–181)

M. pulchellus Banks 1929: 56–57, figs. 16, 21, 68. Nentwig 1993: 98.

Type data.—6♂3♀ & 7juv syntypes from Barro Colorado Island, Canal Zone, Panama, 18–29 July 1928(?), and August 1928(?) (N. Banks) (MCZ), examined.

Diagnosis.—Large dark species, similar in some respects to the Costa Rican *M. dominical* new species, but with triangular epigynum (Fig. 179) and with small dorsal spine on procurus which does not end in two tips (Fig. 181).

Redescription.—*Male*: Habitus essentially as in *M. guatuso* new species (Fig. 61). Carapace ochre-brown, eye turret slightly darker, clypeus without marking, sternum yellowish-brown, darker anteriorly. Legs ochre-brown with dark rings distally on femora and tibiae. Opisthosoma dorsally pale greenish-gray with dark spots (in same pattern as *M. guatuso* new species - Fig. 61), ventrally with short dark stripe behind brown genital plate. Six eyes on eye turret, pedipalps as in Figs. 175–176, with distinctive procurus (Fig. 181). Femur apophysis and bulb as in Figs. 178, 180. Chelicerae with two patches of distinctively shaped hairs (Fig. 177), femora 1 and 2 with one row of spines ventrally. **Measurements of a male syntype**: (from vial labeled "July 18–29") Total length: 3.5, prosoma length: 1.2, width: 1.4,

opisthosoma length: 2.3; leg 1: fem: 7.8, pat: 0.5, tib: 7.8, met: 13.2, tar: 2.2, total: 31.5, tibind: 61; leg 2: 20.7, leg 3 missing, leg 4: 20.6.

Female: Habitus and colors as in male, with large distinctive epigynum (Fig. 179). *Measurements of a female in MCZ:* (collected by A.M. Chickering in 1934): Total length: 2.8, prosoma length: 1.0, width: 1.1, opisthosoma length: 1.8; leg 1: fem: 5.4, pat: 0.4, tib: 5.2, other segments missing, tibind: 55; leg 2: 13.8, leg 3: 11.7, leg 4: 14.1.

Tibia 1 in other material: 2♂: 7.9, 8.6; 4♀: 4.8, 5.3, 5.5, 5.6.

Other material examined.—3♂8♀ & 4juv from type locality, 16 June–7 October 1934 (A.M. Chickering) (MCZ). 2♀ & 2juv from Forest Preserve, Canal Zone, 14 February 1954 (A.M. Chickering) (MCZ).

Distribution.—Known only from the Canal Zone, Panama.

Modisimus texanus Banks 1906
(Figs. 182–191)

M. texanus Banks 1906: 94. Comstock 1912: 327; fig. 319. Gertsch & Davis 1937: 4. Gertsch & Mulaik 1941: 321. Gertsch & Davis 1942: 10. Gertsch 1973: 149.

Type data.—Female holotype from Austin (Texas, USA), March (no year), (J.H. Comstock) (MCZ), examined.

Diagnosis.—Dark eight-eyed species, easily distinguished from all known congeners by the epigynum with its long median projection (Figs. 184, 187–188), and by the dark half-rings ventrally on the femora (Fig. 191).

Redescription.—*Male:* Carapace ochre, darker medially, clypeus with a pair of dark stripes down to chelicerae (Fig. 182), sternum ochre with darker bands laterally. Legs ochre with characteristic darker half-rings and rings on femora (Fig. 191), patella also dark, tibiae with only two rings each (one proximally, one distally). Opisthosoma greenish-gray with dark spots dorsally (Figs. 182, 183), ventrally dark spot between genital plate and spinnerets. Eight eyes on high eye turret (Fig. 190), pedipalps as shown in Figs. 185–186, chelicerae with two patches of modified hairs on each side (Fig. 189), legs without spines. *Measurements of male from Reseca:* (5 mi SE Brownsville, Texas - AMNH). Total length: 2.5, prosoma length: 1.0, width: 1.0, opisthosoma

length: 1.5; leg 1: fem: 5.9, pat: 0.4, tib: 6.2, met: 9.3, tar: 1.4, total: 23.2, tibind: 50; leg 2: 15.0, leg 3: 12.2, leg 4: 14.1.

Female: Colors as in male, in some specimens there are some gray spots visible on the opisthosoma which were probably white in the live spiders (Fig. 184). Epigynum of characteristic shape (Figs. 184, 187, 188), anterior side brown, posterior side pale ochre; legs without spines. *Measurements of female from Reseca:* (AMNH). Total length: 2.8, prosoma length: 1.1, width: 1.0, opisthosoma length: 1.7; leg 1: fem: 5.1, pat: 0.4, tib: 5.2, met: 8.0, tar: 1.2, total: 19.9, tibind: 43; leg 2: 12.5, leg 3: 9.9, leg 4: 12.4.

Measurements of other material: Female holotype: prosoma width: 1.1, fem 1: 4.3. Other material from AMNH: *Tibia 1 in 10♂:* 4.9–8.2 (\bar{x} = 6.8); 15♀: 3.3–6.3 (\bar{x} = 4.5).

Other material examined.—(All in AMNH). USA. Texas: Rio Grande City, 1♀ & 2 juv, July 1934 (S. Mulaik). Llano County, 1♀ & 1juv, 10–12 July 1936 (L.I. Davis). Reseca, 5 mi SE Brownsville, 2♂1♀, 26 September 1937 (L.I. Davis & M. Fones). Edinburg, 1♂1♀, September–December 1933 (S. Mulaik), 2♂8♀ & 6juv, 15–25 May 1935 (S. Mulaik), 3♂1♀, 10 June 1935 (S. Mulaik). Driscoll, 1♀, 23 March 1936 (S. Mulaik). Arroyo Salado, Zapato County, 2♀, 9 February 1935 (S. Mulaik). 19 mi S Kerrville, 1♂, 23 May 1939 (S. Mulaik). Palm Grove, Brownsville, 1♀, 30 May 1939 (S. Mulaik). Cameron County, 1♀, September 1936 (L.I. Davis). 5 mi E Rio Grande City, 1♂, 1 May 1937 (S. Mulaik). Laredo, 2♂3♀, 9 February 1935 (S. Mulaik). La Gringa Reseca, Cameron County, 2♂1♀, 19 September 1937 (L.I. Davis). Brazos River, 5 mi W Hearne, 1♀, July 1938 (L.I. Davis). MEXICO. Nuevo Leon: 28 mi N Monterrey, 1♂1♀, 7 July 1936 (L.I. Davis).

Distribution.—Known from Texas (USA) and north-eastern Mexico (Nuevo Leon, Tamaulipas, San Luis Potosí).

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