

## THE AMBLYPYGID GENUS *PHRYNUS* IN THE AMERICAS (AMBLYPYGI, PHRYNIDAE)

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### ABSTRACT

Collections of *Phrynus* from all available localities from the Americas have been examined. Collections from other parts of the world tropics have also been examined in the search for a better characterization of the three families of amblypygids which lack pulvilli in the tarsi of their ambulatory legs. The genus *Phrynus* has been found to occur only in the Americas and a redefinition of the Phrynidae is given. Of the 24 species of *Phrynus* described for the Americas, 12 species are considered as valid and redescribed. The three species described by Franganillo, *Phrynus pinarensis*, *P. viridescens* and *P. rangelensis* are considered species Incertae Sedis. Three new species are described; one, *P. damonidaensis*, presents a character unique within the family Phrynidae: three tibial segments in leg IV instead of four. Five new synonymies are recognized. Natural history data are presented for some of the species of *Phrynus*.

### INTRODUCTION

Phrynids are medium- to large-sized amblypygids (maximum body length about 45 mm) which occur in the tropical and semitropical areas of the Americas. Their habits are little known. Some are strictly cavernicolous (trogllobites), others epigean, and a third group could colonize either above- or underground habitats. Of the three genera of phrynids, *Paraphrynus* Moreno appears to have a predominance of cave dwellers (trogllophiles) and the only trogllobite species in the Phrynidae (Mullinex 1975, 1979). *Heterophrynus* Pocock and *Phrynus* Lamarck have both epigean and cave dwellers, and *Acanthophrynus* Kraepelin, with a single known species, *A. coronatus* (Butler), appears to be strictly epigean of habits. Sexual dimorphism manifested as a positive allometric growth of the pedipalp length in males, not seen in females is known only from some species of *Heterophrynus* and *Paraphrynus* (Quintero 1979).

The genus *Phrynus* is of interest because of its wide distribution in the Americas and the Caribbean islands, and the numerous poorly characterized species that have been named. The primary objectives of this study were a revision of the genus *Phrynus* and a search for new taxonomic characters to differentiate species; also to compile the known information and add new data pertaining to their biology.

Up to the present, the subfamily Phryninae, here considered a family as did Pocock (1902b), had been defined solely by the presence of four tibial segments on leg IV. All amblypygids without pulvilli on their tarsi and with four tibial segments on leg IV were considered phrynids. One of the most interesting findings of the present work has been the challenge of this narrow definition of the Phrynidae, finding a new species, *Phrynus damonidaensis*, with only three tibial segments on leg IV, but clearly ascribable by other characters to the Phrynidae and the genus *Phrynus* and not to the Damonidae. *Phrynus santarensis* (Pocock) may represent a second case not yet confirmed with this unique segmentation (see discussion under *P. santarensis*). These findings brought a redefinition of the Phrynidae comparable to the redefinition of the Damonidae (see Quintero 1976).

The *Phrynus* - *Tarantula* name polemic is one of the longest standing polemics in zoological nomenclature. It started with the opinion that Linnaeus used for the description of his only amblypygid species, *Phalangium reniforme* L., 1758, the drawing of a specimen from Antigua, West Indies, made by Browne (1789). In fact, it was later demonstrated that Linnaeus had one specimen from the Orient at the Zoological Museum of the Royal University at Uppsala upon which he based his description (Lönnerberg 1897). It was renamed *Phrynichus reniformis* by Karsch (1879) upon removal from the opilionid genus *Phalangium* (type-species of *Phrynichus* by original designation). In the same work, *Phalangium reniforme* L. became, both by subsequent designation, type-species of *Tarantula* Fabricius and *Phrynus* Lamarck.

The amblypygid genus *Phrynus* Lamarck, 1801 was the second established genus within the order Amblypygi, after *Tarantula* Fabricius, 1793, and was the genus used by different authors to accommodate all new taxa for nearly one century, from 1801 to 1893 (e.g., Butler 1873). In 1893 Pocock revived the name *Tarantula* to replace *Phrynus* for American species of amblypygids, ignoring Karsch's work (1879). For Pocock (1893, 1894), until 1902 *Tarantula* was an unresolved blend of *Phrynus* and *Paraphrynus*. When he resolved this blend in 1902, separating *Phrynus* from the then-named *Hemiphrynus*, Pocock used the name *Phrynus*. In a recent petition to the International Commission on Zoological Nomenclature, I have resumed the polemic *Phrynus* - *Tarantula* and asked the Commission to preserve the generic name *Phrynus* Lamarck, 1801 and suppress the generic name *Tarantula* Fabricius, 1793 for the purposes of the Law of Priority, but not for those of the Law of Homonymy, and place it on the Official Index of Rejected and Invalid Generic Names in Zoology (Quintero, in press). *Admetus* C. L. Koch, 1850, and *Neophrynus* Kraepelin, 1895 then fall as junior objective synonyms of *Phrynus*.

The conclusions attained best serve stability of nomenclature for the following reasons:

a. *Tarantula* is hopelessly compromised, having been used with a variety of meaning in Hexapoda and even for a fish, and being associated in the vernacular with a genus far removed from the Amblypygi.

b. *Phalangium reniforme* L., 1758, is now generally used for the eastern species to which Lönnerberg assigned it and for which the generic name *Phrynichus* is generally used (for references see Delle Cave and Simonetta 1975).

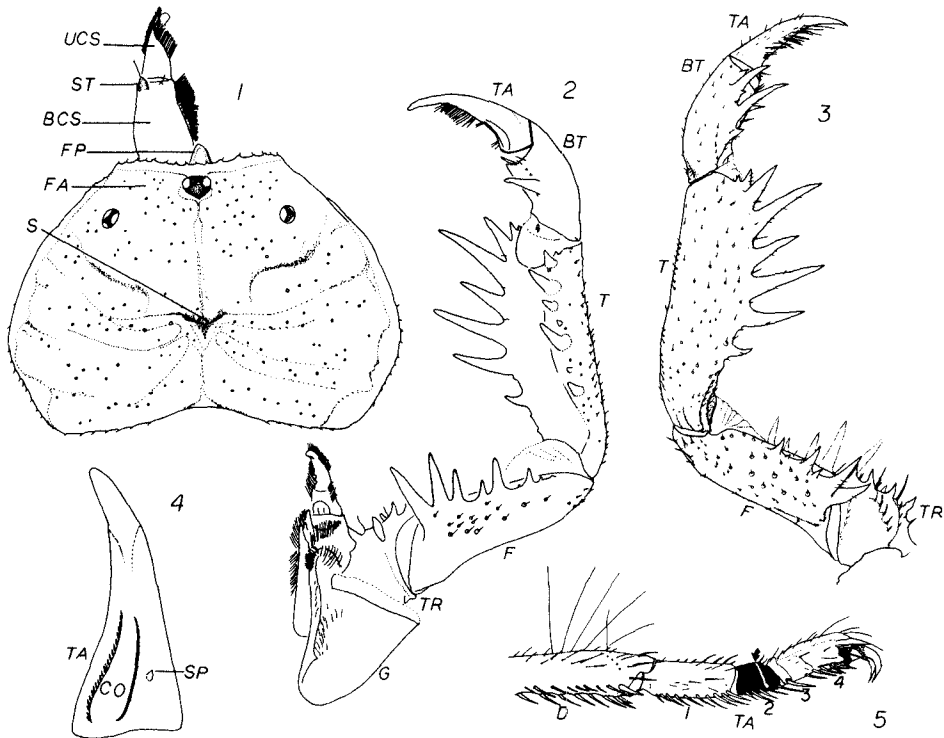
## TAXONOMIC METHODS

For the selection of the diagnostic characters I prepared first a list and checked the taxonomic characters used by Pocock and those pointed out by Weygoldt (1970). In

addition, I later added the cheliceral teeth as suggested by Mullinex for *Paraphrynus* (1975), a series of measurements, and calculated positional ratios for some important trichobothria. The present study is based on the features of preserved specimens, hence species criteria are strictly morphological. The pedipalp spination is very important and full descriptions are given for each species. Names of the different articles follow those used by Weygoldt (1970). For the first time in relation to *Phrynus* the cheliceral dentition, genitalia of males and females, and trichobothria on leg IV have been illustrated.

**Drawings and measurements.**—A few drawings are presented to show the general appearance and structure of the genus (Figs. 1-6). Specimens were measured and illustrated by the use of a standard ocular grid in a binocular dissecting microscope. The magnification varied and thus the limits of accuracy. For larger dimensions the measurements are accurate to  $\pm 0.1$  mm; for the trichobothria, features are accurate to  $\pm 0.01$  mm.

Drawings and measurements were made with the segment in as nearly horizontal a plane as possible. Illustrations were made using magnifications of 60X to 120X for the pedipalps and trichobothria and 250 X for genitalia and cheliceral teeth. Measurements were made as indicated in Figures 14-17.



Figs. 1-5.—*Phrynus tessellatus* (Pocock), from St. Vincent: 1, dorsal view of carapace and left chelicera; 4, inner view of pedipalp tarsus. *Phrynus gervaisii* (Pocock), from Madden Forest Preserve, Canal Zone: 2, ventral view of left pedipalp and chelicera; 3, dorsal view of left pedipalp; 5, part of distitibia and whole tarsus of left leg IV. Abbreviations: UCS, upper cheliceral segment; ST, setiferous tubercle; BCS, basal cheliceral segment; FP, frontal process; FA, frontal area; S, sulcus of carapace; TA, tarsus; BT, basitarsus; T, tibia; F, femur; TR, trochanter; G, gnathocoxa; CO, cleaning organ; SP, spine on dorso-inner lateral surface of pedipalp tarsus; D, distitibia.

**Pedipalp spination.**—Previous work has used almost exclusively the pedipalp spination to separate species. Although the pedipalps are still considered as suppliers of the main diagnostic characters, additional taxonomic characters have been used to sort species and the description of the pedipalp spination has been made more accurate by numbering the spines and illustrating them, following Mullinex (1975). The most reliable spines on the pedipalp appear to be dorsal on the tibia.

The following abbreviations were used when describing the spination of the pedipalps: Fd - femur, dorsal surface; Fv - femur, ventral surface; Td - tibia, dorsal surface; Tv - tibia, ventral surface; Bd - basitarsus, dorsal surface; Bv - basitarsus, ventral surface. Following each abbreviation there is a number which indicates the position of the spine. The spines which I found to be more constant were numbered progressively from proximal to distal end of each pedipalp segment. For example, Td-6 is the 6th spine from the proximal end found on the dorsal surface of the tibia of the pedipalp. Equal numbers do not necessarily mean homologous spines on the same segment. The actual fifth spine on the femur in one individual of a species may not be homologous with the fifth spine on the same segment in another species. Some shorter spines numbered may cause confusion and for this reason it is preferable to refer frequently to illustrations when reading the descriptions.

**Cheliceral dentition.**—It gives valuable information to differentiate species, particularly the teeth on the external margin of the basal cheliceral segment. The right chelicera was dissected and the inner rows of hairs on the basal cheliceral segment that block the view of the external teeth were removed.

No characters of diagnostic value for *Phrynus* species were found on the medial surface of the basal cheliceral segment. In the family Phrynidae, on this surface *Acanthophrynus coronatus* has a stridulatory apparatus (Shear 1970) and *Paraphrynus astes* Mullinex only clavate setae, probably also stridulatory in function (Mullinex 1975). Specimens of nine species of *Heterophrynus* were examined and found to lack either a stridulatory apparatus or clavate setae.

**Genitalia.**—Although it is possible to distinguish species without using genitalic characters, the external female genitalia appear as a source of potentially useful additional characters to distinguish species and should be used in future revisions. I preferred not to introduce newly coined words to describe it and instead have given dorsal illustrations which could serve to help to corroborate identifications. Compared with the male genitalia, they are simpler and easier to study. The sclerites are hard and not likely to change in shape during preservation. The male genitalia are less useful for specific diagnosis, being much more complex and individually subject to frequent variations during preservation, because of their generally soft, muscular nature. Their pale anatomy is difficult to interpret. The dorsal and ventral illustrations of the male genitalia are presented. For the illustrations of the genitalia, it was necessary to dissect the genital operculum from specimens.

According to Weygoldt (1972, 1975), the pair of limb buds of the eighth embryonic segment (second opisthosomal) develops posteriorly the first pair of book lungs and, largely from the upper part of those limb buds, the genital operculum and the genital appendages (gonopods of males and females). Thus Weygoldt (1972, 1975) homologized the erectile bodies of the male and female genitalia with paired abdominal appendages (extremities), homologous to the telopodites and endopodites of the opisthosomal extremities of eurypterids, while the book lungs were considered to have evolved from praepodites. I will refer to the female genitalia, accepting Weygoldt's interpretations, as female gonopods, and will coin a new name for the male genitalia, frequently referred to

incorrectly as penis, notwithstanding their noncopulatory, spermatophore-producing function. The male organs of amblypygids will be named "opisthogeminate organs," from the Greek *opisthen*, meaning backwards, and the Latin *geminatus*, meaning paired, referring to the biconic, backwards protusible organs located posteriorly on the dorsal side of the genital operculum of male amblypygids.

**Color.**—Color descriptions are based upon alcohol-preserved specimens. Amblypygids retain color well in alcohol, as I have found in comparing old museum specimens with recently preserved ones. Coloration patterns of the abdominal tergites proved useful as diagnostic characters, as did the banding on the femora of the ambulatory legs.

**Trichobothria.**—The trichobothria present on leg IV have been an additional character used for the description of species. Lamentably, examination is difficult and awkward because of their position on the distitibia of leg IV. Trichobothria also frequently present anomalies in their position and arrangement, which makes interpretations more difficult.

The information content of future taxonomic work on *Phrynus* can be increased by inclusion of additional data on the trichobothria. At present, an understanding of variability is needed. Species like *Phrynus whitei* Gervais present frequent and significant variations in their trichobothria numbers and ratios, while species like *Phrynus gervaisii* (Pocock), for example, present numbers and ratios rather constant when specimens from Panama are compared with those from several different localities in South America.

The following abbreviations have been used to describe the trichobothria present in each segment of leg IV (Figs. 160-174).

Tibia IV segments	Trichobothria present
1. Proximal tibia	pt - proximotibial
2. Pre-basitibia	none
3. Basitibia	bt - basitibial
4. Distitibia (old names: metatarsus, basitarsus)	bf - basofrontal bc - basocaudal sbf - subbasofrontal stf - subterminofrontal sbc - subbasocaudal sc <sub>1-x</sub> - series caudal and trichobothria present sf <sub>1-x</sub> - series frontal and trichobothria present

The group of three trichobothria placed below the sc and sf rows is the terminal group: tm, terminal medial; tf, terminal frontal; tc, terminal caudal. They are constant in all members of the order Amblypygi and do not show variation.

In *Phrynus damonidaenis* and *P. santarensis* (Pocock), the second tibial segment (pre-basitibia) of leg IV is not present but, as this segment does not have trichobothria, its pattern appears normal.

During development, trichobothria numbers are reduced (Weygoldt 1970). The trichobothria bt, bf and bc are double in immatures (with distal and caudal trichobothria each) but in adults, which are the ones represented in the drawings of the present work, there is only one of each of those trichobothria. The number of trichobothria from the sc and sf rows is also reduced and those trichobothria still present have been numbered from the proximal to the distal end of each row. For example, for *Phrynus levii* sc 1, 2, 6-11 means that hairs 3 to 5 are missing but hairs 1, 2, and 6 to 11 are present on the caudal series.

In order to better locate trichobothria on each segment and to be able to compare quantitatively their positions, I have calculated ratios for the following: pt, bt, bf, sbc, and  $sc_1$ . Each ratio is calculated by dividing the distance of the trichobothria to the proximal end of the segment by the total length of the segment. Higher ratios indicate that the trichobothria is more distally positioned.

**Segmentation of Antenniform Leg.**—The number of segments present on leg 1 (antenniform leg), although subject to frequent abnormalities in segmentation, is rather constant for each species. I have found four groups of species based on the number of segments of leg 1:

1. With 25 tibial segments, patella not included. Only *P. parvulus* Pocock belongs to this group. It has 57 tarsal segments and a total of 82 segments.
2. With 27 tibial segments. Includes three species: *P. levii*, n.sp., *P. damonidaensis*, n.sp., and *P. marginemaculatus* C.L. Koch. They all have 59 tarsal segments and a total of 86 segments.
3. With 29 tibial segments. Includes three species: *P. operculatus* Pocock, *P. asperatipes* Wood, and *P. whitei* Gervais. The numbers of tarsal segments varies from 60 to 63, and the total number of segments from 89 to 92. It is interesting to point out that *Acanthophrynus coronatus* (Butler) has a similar number of segments (Quintero 1980).
4. With 31 tibial segments. All other known species belong to this group. The number of tarsal segments varies from 66 to 68 and the total number of segments from 97 to 99.

**Types depositories.**—Type of two new species, *P. armasi* and *P. damonidaensis*, are being deposited in the Academia de Ciencias de Cuba (ACC). The lectotype of *P. goesii* Thorell is at the Naturhistoriska Riksmuseum of Stockholm. The neotype of *P. asperatipes* Wood is in the Museum of Comparative Zoology (MCZ), Harvard University, and all other type specimens are deposited in the British Museum (Natural History) (BMNH).

### THE DEFINITION OF THE PHRYNIDAE

The family name Phrynidae, as first used by Wood (1863b) to include the single genus *Phrynus*, ranked at the now known level of order. Gervais had previously (1844) created the order Phrynéides, with the single genus *Phrynus*. The name Phrynides was used later for the order rank, and credit was given to Gervais. The name Phrynidae has been cited incorrectly as Prynoidae by L. Koch and as Phrynoidae by Thorell (1889). The second amblypygi family name was Karsch's Tarantuliden (1879), later used as Tarantulidae by Simon (1892) and others. Simon (1892) was the first to subdivide the family Tarantulidae in three subfamilies: Charontinae, Phryniscinae (sic) and Tarantulinae. Kraepelin (1895) renamed Tarantulinae the Phrynichinae of Simon (for oriental species), and Neophryninae the Tarantulinae of Simon (for American species). Kraepelin, in 1899, returned to the use of Simon's names, and included in Tarantulinae Simon the genera *Admetus* C. L. Koch 1841, *Acanthophrynus* new name, and *Tarantula* Fabricius 1793. Pocock (1902a,b) returned to the older name Phrynidae to elevate in rank the subfamily Tarantulinae, and subdivided it into two subfamilies: Phryninae and Heterophryninae. Pocock (1902b) also elevated to family rank the other subfamilies of Simon: Tarantulidae and Charontidae. His work was ignored and posterior usage was of a single family, Tarantulidae, for the whole order Amblypygi. The family name Phrynidae remained unused

until 1975, when Mullinex mentioned it in her work also without designating a type genus. According to the ICZN, art. 23c, the name Phrynidae must be attributed to Wood and not to Pocock, who indicated erroneously he was the author of the name (1902b).

### Family Phrynidae Wood

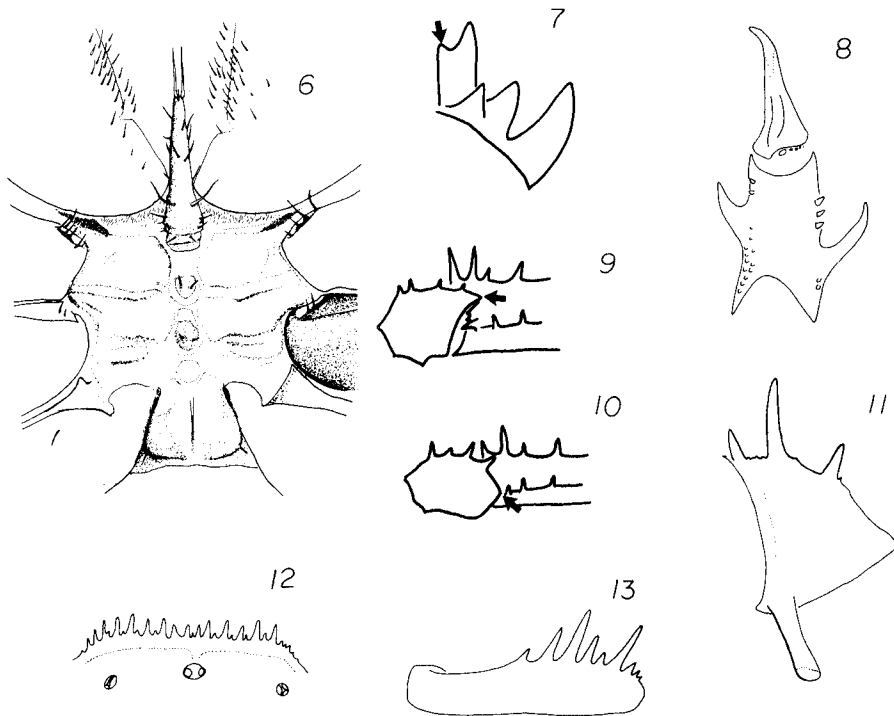
Phrynidae Wood 1863b:375; Pocock 1902b:157-165.

Tarantulinae Simon 1892:50 (in part); Pocock 1894:273; Kraepelin 1899:240.

Neophryninae Kraepelin 1895:8.

Admetinae Pocock 1897:358.

**Diagnosis.**—Amblypygids without pulvilli on the tarsi of ambulatory legs (see Quintero 1975) and with the tibia of leg IV divided into four or three segments; with the proximal cusp of the inner double pointed proximal tooth (Fig. 7, arrow) on the median edge of the basal cheliceral segment being shorter than the distal cusp on the same tooth; the basocaudal row of trichobothria on the distitibia of leg IV is not present. They have basocaudal, basofrontal, subbasocaudal, subbasofrontal and subterminal trichobothria in addition to the caudal and frontal series. The angle of the articulation on the pedipalp



Figs. 6-13.—6, sternites of *Phrynus gervaisii* (Pocock) from Panama; 7, arrow indicates the smaller proximal cusp on the inner double-pointed tooth, typical of all members of the Phrynidae; 8, *Acanthophrynus coronatus* (Butler) of Colima, Mexico, basitarsus and tarsus, inner-lateral view; 9, articulation of pedipalp trochanter-femur, typical of Phrynidae; 10, articulation of pedipalp trochanter-femur of Damonidae; 11, ventral of pedipalp trochanter with subcylindrical sclerotized apophysis projecting posteriorly; 12, anterior edge of carapace of *Acanthophrynus coronatus* (Butler), with long spiniform processes; 13, dorsal of pedipalp tibia of *Paraphrynus laeivifrons* (Pocock) from Panama.

between trochanter and femur is always median and not lateral to the line of dorsal spines on the femur in *Phrynus* and *Paraphrynus* (Fig. 9) but dorsally displaced in *Heterophrynus* and *Acanthophrynus*. Compare their type of articulation with the type present in the Damonidae (Fig. 10), which is similar to the one present in the Phrynichidae, where the articulation trochanter-femur is laterodorsal.

I hereby designate the genus *Phrynus* as the type genus of the Phrynidae. It is the oldest genus within the family and a member of the subfamily Phryninae which lacks the subcylindrical sclerotized apophysis on the ventral surface of the pedipalp trochanter. This apophysis is present in the other subfamily, Heterophryninae (the only genus included, *Heterophrynus*).

#### KEY TO GENERA OF PHRYNIDAE

1. Ventral surface of the pedipalp trochanter with subcylindrical sclerotized apophysis projecting posteriorly (Fig. 11) . . . . . *Heterophrynus*  
 Ventral surface of the pedipalp trochanter without such apophysis (Fig. 2) . . . . . 2
2. Anterior edge of carapace with long spiniform processes (Fig. 12); basitarsus of pedipalp armed with a single long dorsal and ventral spine (Fig. 8) . . . . . *Acanthophrynus*  
 Anterior edge of carapace armed with short denticuliform tubercles or almost smooth (Fig. 1); basitarsus of pedipalp armed, at least dorsally, with more than one long spine (Fig. 3) . . . . . 3
3. Dorsal margin of pedipalp tibia with two spines between the longest spines (Fig. 13) . . . . . *Paraphrynus*  
 Dorsal margin of pedipalp tibia with one spine (Td-4) between the two longest spines (Fig. 3) . . . . . *Phrynus*

#### Genus *Phrynus* Lamarck

*Tarantula* Fabricius 1793:432 (misidentification of *Phalangium reniforme* L.), Karsch 1879:197 (misidentification of *Phrynus pumilio* C. L. Koch, known to be a species of *Heterophrynus*), Pocock 1893:527 (in part), 1894:275 (in part), Kraepelin 1899:241 (in part). Type-species *Phalangium reniforme* L. 1758, syntype lost from Mus. Lud. Ulr. Lönningberg, 1897, virtually designated the syntype as lectotype of *P. reniforme* L. and identified it as an East Indian species of *Phrynichus*.

*Phrynus* Lamarck 1801:175 (in part), C. L. Koch 1841:13 (in part), Gervais 1842:19 (in part), Butler 1873:118 (in part), Pocock 1902a:50, 1902b:161. *Phalangium palmatum* Herbst 1797, type-species, subsequent designation by Pocock 1902a: 50 and 1902b:161. Previous type-species designations very obscure (see Quintero, in press). After lengthy history of misidentifications, having its type lost, presumed destroyed, I have reassessed Herbst descriptions and illustrations and found it to be a synonym of *Phrynus operculatus* Pocock, 1902a. See farther discussions under "On the Identity of *P. palmatum* Herbst".

*Admetus* C.L. Koch 1850:81 (in part), Pocock 1897:358. Type-species *Phalangium palmatum* Herbst, subsequent designation by Simon 1892:51.

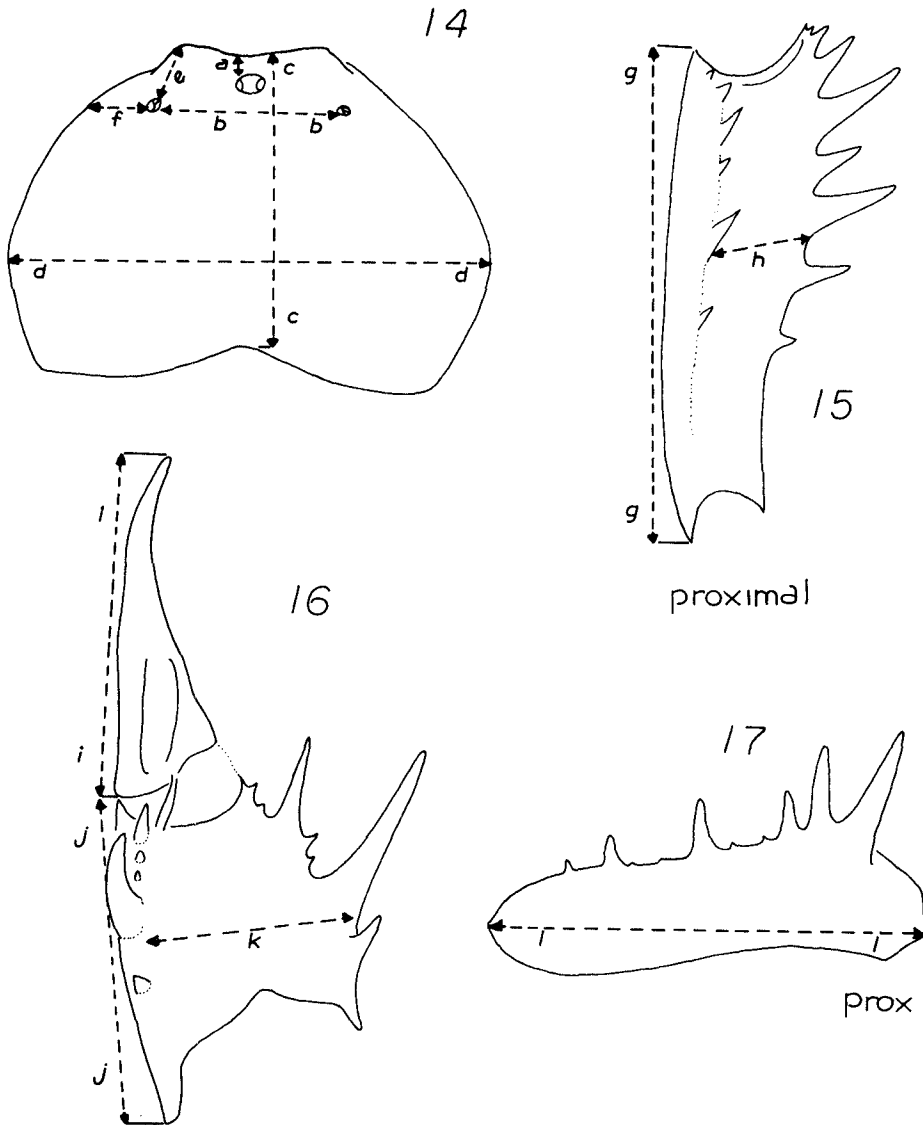
*Neophrynus* Kraepelin 1895:23 (in part). Type-species by original designation *Phalangium palmatum* Herbst (misidentification). *N. palmatus* (Herbst) was a polytypic species formed by lumping seven distinct species.

**Diagnosis.**—Anterior edge of carapace at most weakly denticulated. Pedipalp tibia armed dorsally and ventrally only with marginal spines which tend to cluster distally only in the adult species of *Phrynus whitei*; between the two longest spines (Td-3 and Td-5)



there is one shorter spine (Td-4). This single spine distinguishes *Phrynus* from the closely related genus *Paraphrynus* which presents two spines between the two longest spines. Basitarsus armed dorsally with two to three long spines and ventrally with one to three long spines. The maximum body length measured was 35 mm. The only species of *Acanthophrynus*, *A. coronatus*, reaches a maximum length of 45 mm and has a different basitarsus and frontal edge spination on the carapace.

*matum* Herbst by subsequent designation.



Figs. 14-17.—Diagram of measurements taken: 14, a = distance of median ocular tubercle from anterior edge; b = distance between lateral eyes; c = length of carapace; d = width of carapace; e = distance of lateral eyes from anterior edge; f = distance of lateral eyes from lateral edge. 15, g = length of left pedipalp tibia; h = width of pedipalp tibia. 16, i = length of pedipalp tarsus; j = length of pedipalp basitarsus; k = width of pedipalp basitarsus. 17, l = length of left pedipalp femur.

**Description.**—Carapace: rather uniform in shape, broader than long, moderately high with a distinct sulcus variable in shape, mainly transversely oriented (Fig. 1). Body covered with sharp pointed setae and spines except in *Phrynus parvulus* Pocock which is covered with clubiform setae and blunt spines. Chelicera: consisting of two segments, a basal and a clawlike projection, both articulated (Fig. 1). The clawlike projection or upper cheliceral segment presents a row of four to five teeth of variable length and shapes. The basal segment presents two constant rows of teeth on its anteroventral surface (Figs. 108-122). The inner or medial row has always three teeth, the proximal one is the inner double pointed tooth. The distal cup of this tooth is always larger than the proximal one. The external edge of the basal cheliceral segment may have from one to four teeth. Distal on the anterodorsal edge of this segment, there is in some species a well-developed setiferous tubercle. Frontal process: sclerotized projection of variable shape located above the entrance to the buccal cavity that could be large and project from under the anterior edge and become visible from above. Eyes: a median ocular tubercle well developed in all species, the lateral eye clusters with frequent abnormalities. Variable distance of median ocular tubercle and lateral eye clusters to anterior and lateral edges of carapace. Sternum: prosternum robust, projecting between the base of the gnathocoxae. Meso and pentasternum reduced. Very reduced articulation sclerites on the sternal plate at the points of articulation with the coxae of ambulatory legs (Fig. 6). Genitalia: female and male gonopods originating from the inner wall of the genital operculum (Figs. 123-159). In the female there are two protrusible organs, the female gonopods, each bearing a clawlike sclerite pointing backwards and inwards. Lateral to each sclerite and between the gonopods there are sclerotization areas variable between the species. The male gonopods, the opisthogeminate organs, are pale, muscular and complex, ending each half in a cone posteriorly. Pedipalp: dorsal surface of pedipalp tibia with seven to nine spines. Spine Td-4 always shorter than Td-3 and Td-5, which are the two longest spines on the pedipalp. Tarsus with a cleaning organ consisting of two rows of short bristles (Fig. 4). The dorsomedial row of minute bristles is absent from a single species, *Phrynus asperatipes*. Besides the cleaning organ there is present in some species a small inconspicuous spine situated proximally on the dorso-inner lateral surface of the pedipalp tarsus (Fig. 4). The tarsus and posttarsus are fused except in *P. asperatipes* where a suture separates these two areas (Fig. 20). Legs: the tibia of leg IV presents normally from four to three segments. Rarely an abnormal segmentation of two segments is found. The second tarsomere may present a membranous transverse line distally, extending the width of the segment (Fig. 5). It could be absent in some species. Trichobothria: the ratios of pt, bt, bf, sbc and sc<sub>1</sub> present interesting variations, as do the numbers of the sc and sf rows.

#### KEY TO SPECIES OF *PHRYNUS*

1. A distinct dorsoventral suture line between pedipalp tarsus and post-tarsus (Fig. 20), cleaning organ without dorsomedial row of minute bristles (Fig. 20) . . . *asperatipes*  
 Pedipalp tarsus and post-tarsus fused, no suture line separating these two areas (Fig. 27, 32, 39); cleaning organ with dorsomedial row of minute bristles (Fig. 4) . . . 2
2. Proximal end of dorso-inner lateral surface of pedipalp tarsus with small inconspicuous spine (Figs. 4, 27, 32, 39, 44, 51) . . . . . 3  
 Proximal end of dorso-inner lateral surface of pedipalp tarsus without inconspicuous spine (Figs. 56, 63, 68, 75, 80, 87) . . . . . 7

3. One or three cheliceral teeth on external margin of basal cheliceral segment (Figs. 108, 109, 114, 115), no spine on anterior trochanter face or a short setiferous tubercle not larger than largest tubercle on anterolateral row (Figs. 24, 47) . . . . . 4  
 Two teeth on external margin of basal cheliceral segment (Fig. 117); a well-developed spine or tubercle on the anterior face of the trochanter, always distinctly larger than the largest tubercle present on the anterolateral row (Fig. 35) . . . . . *pulchripes*
4. One tooth on external margin of basal cheliceral segment (Fig. 118); Td-7 with a basal spine (Fig. 26) . . . . . *armasi*  
 Three teeth on external margin of basal cheliceral segment (Figs. 114-116); Td-7 without a basal spine (Figs. 38, 43, 50) . . . . . 5
5. Td-6 with a basal spine (Fig. 43); Td-5 same size or shorter than Td-3; Td-4 longer or same size as Td-2 . . . . . *goesii*  
 Td-6 without a basal spine (Figs. 38, 50); Td-5 shorter than Td-3; Td-4 shorter than Td-2 . . . . . 6
6. Very well-developed frontal process (Fig. 1); femur of leg 1 is 2.3 to 2.7 times longer than medial prosomal length; sbc trichobothria higher than 0.53 (Fig. 170); Bv-1 longer than Bv-3 (Fig. 51) . . . . . *tessellatus*  
 Frontal process concealed; femur of leg 1 is 2.8 to 3.8 times longer than median prosomal length; sbc trichobothria lower than 0.53 (Fig. 172); Bv-1 shorter or same size as Bv-3 (Fig. 39) . . . . . *longipes*
7. Td-4 shorter than Td-2 . . . . . 8  
 Td-4 longer than Td-2 . . . . . 13
8. Anterior face of pedipalp trochanter without a spine (Figs. 59, 60, 71); Bd-1 a very small, inconspicuous spine (Figs. 56, 63, 68) . . . . . 9  
 A well-developed spine at the center of the anterior face of pedipalp trochanter (Figs. 72, 83, 84); Bd-1 a well-developed, distinct, spine at base of Bd-2 (Figs. 75, 80, 87) . . . . . 11
9. Three tibial segments on leg four (Fig. 164) . . . . . *damonidaensis*  
 Four tibial segments on leg four (Figs. 161, 166) . . . . . 10
10. Two teeth on external margin of basal cheliceral segment (Fig. 120); dorsal of cheliceral basal segment lighter than frontal area, rarely of same color, never darker; Fv-1 and Fv-2 with a common base, distinct from Fv-3 (Fig. 64) . . . *marginemaculatus*  
 Three teeth on external margin of basal cheliceral segment (Fig. 121); dorsal of cheliceral basal segment darker than frontal area; separate base for each Fv-1, Fv-2 and F-3 (Fig. 69) . . . . . *levii*
11. Five spines on the edges of the pedipalp trochanter (Fig. 72); Bv-1 a very well-developed spine (Fig. 75); Td-5 shorter than Td-3 (Fig. 74); medial face of pedipalp tibia, completely granular . . . . . *santarensis*  
 Four spines on the edges of the pedipalp trochanter (Figs. 83, 84); Bv-1 short and inconspicuous (Figs. 80, 87); Td-5 distinctly longer than Td-3 (Figs. 79, 86); medial face of pedipalp tibia with a central smooth band . . . . . 12
12. Raised, distinctly delimited frontal area; tergites of abdomen pale yellow-brown scarcely a trace of pattern; eight dorsal spines on the pedipalp tibia (Fig. 79); frontal process visible from above although vertically positioned; a short spine between Fv-5 and Fv-6 (Fig. 81) . . . . . *barbadensis*  
 Poorly defined frontal area, its limits not distinctly set apart from rest of carapace; tergites of abdomen variegated yellow and dark brown; only seven dorsal spines on pedipalp tibia (Fig. 86); frontal process concealed; without spine between Fv-5 and Fv-6 (Fig. 88) . . . . . *gervaisii*

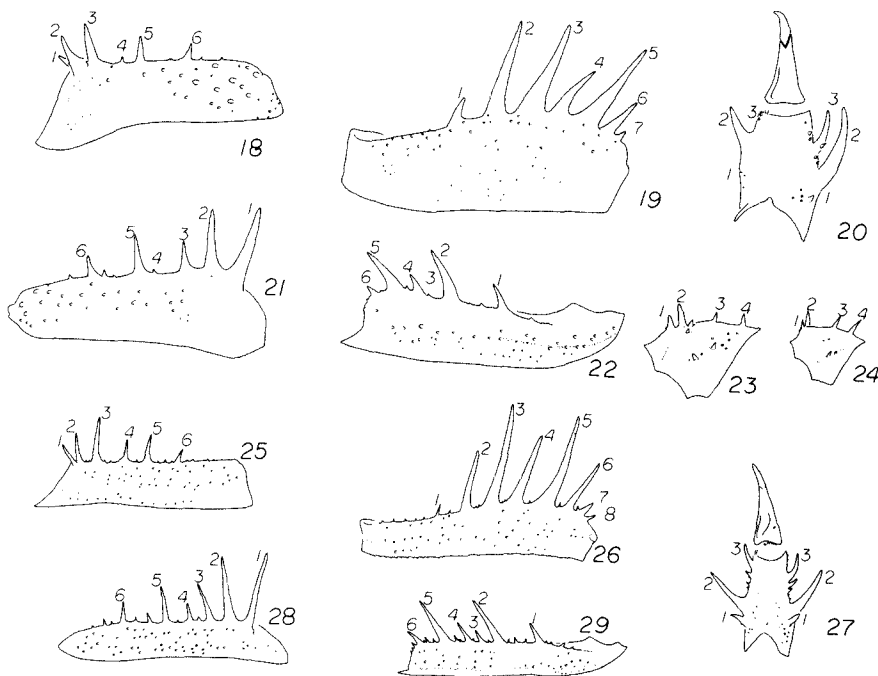
- 13. Td-5 shorter than Td-3 (Fig. 91); Td-2 and Td-6 about same size; two bright spots between lateral eyes; distal displacement of dorsal spines on pedipalp tibia (Fig. 91) . . . . . *whitei*  
 Td-5 and Td-3 about same size (Figs. 98, 104); Td-2 distinctly longer than Td-6; without spots between lateral eyes; normal distribution of dorsal spines on pedipalp tibia, without distal displacement (Figs. 98, 104) . . . . . 14
- 14. Fv-3 shorter than Fv-6 (Fig. 100); with marked banding on femur of ambulatory legs; clubiform setae on carapace, pedipalps and legs; fourth abdominal sternite straight in males; males with small genital operculum . . . . . *parvulus*  
 Fv-3 longer than Fv-6 (Fig. 103); legs of a single color, no banding; sharp pointed setae on carapace, pedipalps and legs; fourth abdominal sternite bent in males; males with large genital operculum . . . . . *operculatus*

*Phrynus asperatipes* Wood  
 Figs. 18-23, 119, 159, 171; Map 1

*Phrynus asperatipes* Wood 1863a:111. Holotype (sex not determined in original description) from Baja California, probably Baja California Sur, Mexico, deposited in Smithsonian Museum (USNM), lost. Examined topotypic specimens, designated a female neotype. Wood 1863b:375-6; Butler 1873:118.

*Neophrynus whitei*: Kraepelin 1895:28-30 (in part).

*Tarantula whitei*: Kraepelin, 1899:242-3 (in part).



Figs. 18-29.—Pedipalps: *Phrynus asperatipes* Wood, female neotype, 18-23; *Phrynus armasi*, new species, male holotype, 24-29. Figs. 18, 25 = femur, dorsal view; 21, 28 = femur, ventral view; 19, 26 = tibia, dorsal view; 22, 29 = tibia, ventral view; 20, 27 = basitarsus and tarsus, inner lateral view; 23, 24 = trochanter, anterodorsal view.

**Neotype.**—Female from La Paz, Baja California Sur, Mexico, 3 February 1965 (V. Roth) deposited in MCZ.

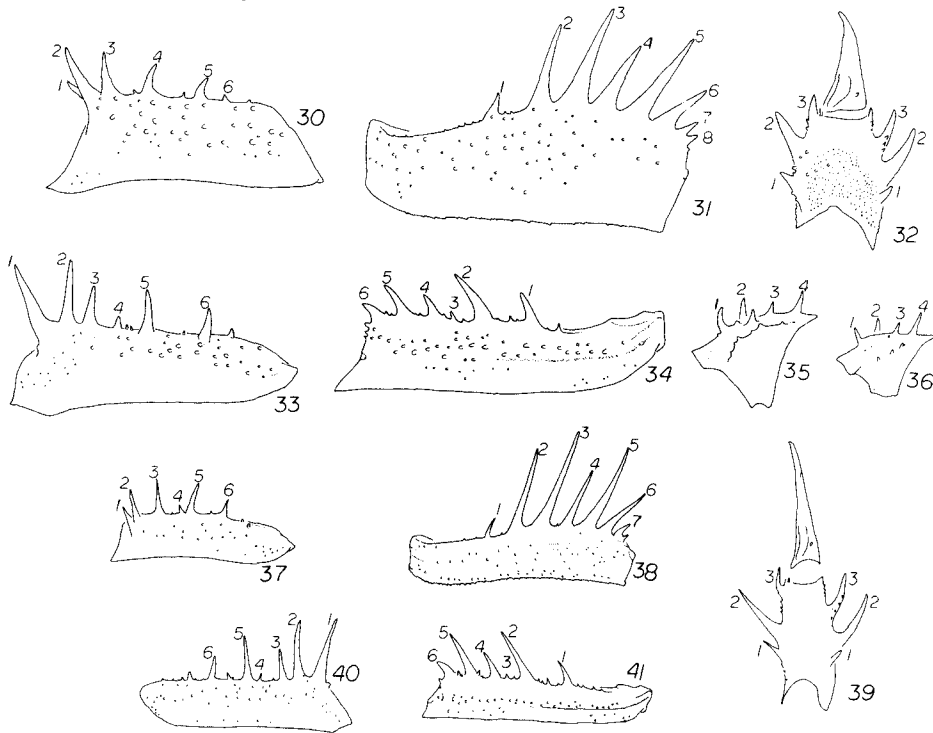
**Diagnosis.**—*Phrynus asperatipes* is a distinctive species easily recognized by its pedipalp tarsus that lacks the dorsomedial row of minute bristles on the cleaning organ and because of its apparent suture between tarsus and post-tarsus. It is also recognized by its yellow-brown color, not seen in other species of *Phrynus*.

**Description Female Neotype.**—Carapace, pedipalps and legs predominantly yellowish-brown. Yellow frontal area with black median ocular tubercle. Orange-brown sulcus besides which there are four dark shallow grooves. Dorsum of abdomen with median orange-brown band, the muscular impressions and dorsal border of tergites are of same color, the rest is yellow. Total length 18.0 mm.

Carapace. Wide, nearly straight, anterior edge. Frontal process concealed. Distance of median ocular tubercle from anterior edge less than double length of tubercle (0.5 mm/0.3 mm). Carapace 7.9 mm long, 10.1 mm wide, 4.1 mm sulcus from anterior edge. Median ocular tubercle 0.5 mm wide. Lateral eyes 3.7 mm from each other, 1.3 mm from anterior edge, 1.0 mm from lateral edge.

Chelicerae. Dorsal surface of basal segment without distal tubercles. A single tooth on external margin of basal cheliceral segment (Fig. 119) and two ridges. The most proximal ridge appears to connect the external tooth with the inner double-pointed tooth.

Genital operculum. 2.4 mm long, 4.8 mm wide. Female gonopods as in Fig. 159. Abdomen 12.4 mm long.



Figs. 30-41.—Pedipalps of male holotypes: *Phrynus pulchripes* (Pocock), 30-35; *Phrynus longipes* (Pocock), 36-41. Figs. 30, 37 = femur, dorsal view; 33, 40 = femur, ventral view; 31, 38 = tibia, dorsal view; 34, 41 = tibia, ventral view; 32, 39 = basitarsus and tarsus, inner lateral view; 35, 36 = trochanter, anterodorsal view.

Trichobothria. As in Fig. 171; ratios: sbc 0.54 and bt 0.25.

Pedipalps. Figs. 18-23. Trochanter with four spines. A setiferous tubercle at center of anterior surface shorter than larger tubercles on antero-external row. Femur Fd-3 same size as Fd-2. Fv-4 same size as Fv-7. Fv-1, Fv-2 and Fv-3 each on a separate base. Tibia, Td-6 longer than Td-1. Td-4 shorter than Td-2, longer than Td-6. Td-3 longer than Td-5. Tv-4 longer than Tv-6. Basitarsus Bd-1 very small, inconspicuous, one-fifth the length of Bd-3. Bv-1 and Bv-3, obsolete, Bv-2 well developed and longer than Bd-3. Pedipalp tarsus and post-tarsus not completely fused, an apparent suture visible dorsally and ventrally. Femur 6.2 mm long; tibia 6.4 mm long, 2.4 mm wide, basitarsus 3.3 mm long, tarsus 3.5 mm long.

Legs. Second tarsomere of all tarsi without light transverse line on distal end. Anterior leg: 16.7 mm, femur; 30.3 mm, tibia; 34.0 mm long, tarsus. Leg II: 10.8 mm, femur; 15.6 mm, tibia. Leg III: 11.6 mm, femur; 17.0 mm, tibia. Leg IV: 10.0 mm, femur; 16.3 mm (6.8/1.2/3.3/5.0), tibia; 2.4 mm (1.1/0.4/0.1/0.8), tarsus.

**Natural History.**—It has been collected from creeks, a palm oasis, under rocks on a hillside and in a sand dune area.

**Distribution.**—Mexico: Baja California Sur.

*Phrynus pulchripes* (Pocock)

Figs. 30-35, 117, 123, 124, 126, 168; Map 2

*Tarantula pulchripes* Pocock 1894:283-4, pl. 7, Fig. 6, male, female. Male holotype from Colombia, in the BMNH, examined. Very fragmented and discolored.

*Neophrynus palmatus barbadensis*: Kraepelin 1895:30-34 (in part).

*Tarantula palmata*: Kraepelin 1899:242-244 (in part).

*Phrynus pulchripes*: Mello-Leitão 1931:40, 43.

*Hemiphrynus corderoi*: Mello-Leitão 1946:1-2, pl. 1, Figs. 1-2, Female holotype from Caracas, Venezuela, in the Rio de Janeiro Museum, examined. **NEW SYNONYMY.**

**Diagnosis.**—Within the group of species that have a small, inconspicuous spine on the proximal end of dorso-inner lateral surface of pedipalp tarsus, *Phrynus pulchripes* is easily recognized by being a medium-size species with only two teeth on the external margin of the basal cheliceral segment and a well-developed spine on the anterior face of the pedipalp trochanter. The female genitalia presents two robust, dark-brown sclerites with a distinct shallow curve near their distal end.

**Description.** Male holotype.—Carapace and pedipalps dark brown. With distinct flavous marginal spots on the carapace. Legs distinctly banded: three yellow bands on the femora of the posterior three pairs of legs. A flavous ring around the muscular impressions of the tergites. Total length 16.8 mm.

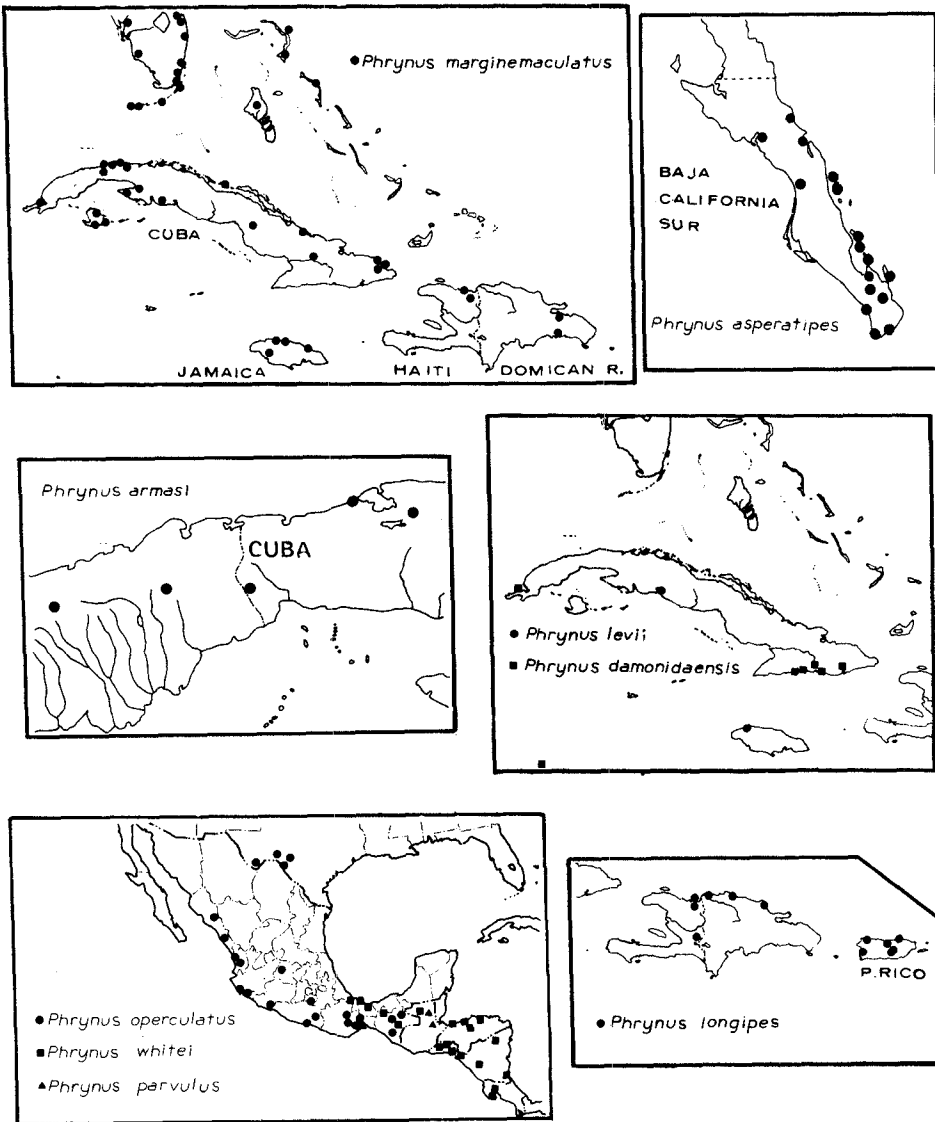
Carapace. With narrow, slightly emarginate anterior edge, with small, even size tubercles. Frontal process concealed from above. Distance of median ocular tubercle from anterior edge shorter than length of tubercle (0.4 mm/0.54 mm). The frontal region gently sloped downward and forward, steeper below the lateral eyes. Carapace 6.6 mm long, 11.1 mm wide, 4.0 mm sulcus from anterior edge. Median ocular tubercle 0.8 mm wide. Lateral eyes 3.6 mm from each other, 1.3 mm from anterior edge 1.5 mm from lateral edge.

Chelicerae. Anterodorsal surface of basal cheliceral segment with the external distal tubercle slightly enlarged. Two teeth on external margin of basal cheliceral segment (Fig. 117).

Genital Operculum. 3.9 mm long, 5.9 mm wide. Opisthogeminate organ as in Figs. 123 and 124. Abdomen 11.8 mm long.

Trichobothria. As in Fig. 168. Ratios: sbc 0.56, bt 0.50.

Pedipalps. Figs. 30-35. Trochanter with four spines, a well-developed spine at center of anterior surface, larger than largest tubercles on antero-external row. Femur, coarsely granular above, Fd-2 longer than Fd-3, Fd-4 longer than Fd-5 and Fd-6. Fv-1, Fv-2 and Fv-3 on a common base. Fv-6 longer than Fv-4. Tibia, Td-6 longer than Td-1 but shorter than Td-2. Td-4 shorter than Td-2 and longer than Td-6. Td-3 longer than Td-5. Tv-4 and Tv-6 are the same size, and shorter than Tv-1. Basitarsus. Bd-1 long, longer than half the



Map 1.—Distributions of *Phrynus armasi*, *P. asperatipes*, *P. damonidaensis*, *P. levii*, *P. longipes*, *P. marginemaculatus*, *P. operculatus*, *P. parvulus*, and *P. whitei*.

length of Bd-3. A short spine distal to Bd-3, shorter than Bd-1. Bv-3 and Bv-1 are the same size. Bv-1 shorter but thicker than Bd-1. Bv-2 and Bd-3 are the same size. Pedipalp tarsus and post-tarsus completely fused. Tarsus with proximal end of dorso-inner lateral surface with small, inconspicuous spine. Femur 7.0 mm long; tibia 7.9 mm long, 2.6 mm wide; basitarsus 3.7 mm long, 2.4 mm wide; tarsus 3.7 mm long.

Legs. Second tarsomere of all tarsi with light transverse line on distal end. Anterior leg: 17.5 mm, femur, rest is missing. Leg II: 13.8 mm, femur; 18.3 mm, tibia. Leg III: 14.4 mm, femur; 20.9 mm, tibia. Leg IV: 12.0 mm, femur; 18.7 mm (9.0/1.5/3.4/4.8), tibia; 2.3 mm (1.0/0.4/0.1/0.8), tarsus.

Female Genitalia (Colombia, Cúcuta). As in Fig. 126.

**Variation.**—Trinidad specimens present a much shorter spine on the middle face of the pedipalp trochanter, sometimes smaller than some of the larger tubercles on the antero-external row. Trinidad specimens also might have a smaller, and more difficult to distinguish, spine on the proximal end of the dorso-inner lateral surface of the pedipalp tarsus. Some Venezuelan specimens present five spines on the trochanter, with an additional spine between spines three and four.

**Natural History.**—In Curaçao, Aruba and Trinidad, *Phrynus pulchripes* has been found inside caves. It has been collected from hollow logs, under rotten bark, under stones, and under coconut husks on a beach.

**Distribution.**—Trinidad (numerous records); Bonaire; Curaçao; Aruba; Venezuela, Rio Panguoza and Rio Toro, Caracas and Caripito; and Colombia, Cúcuta.

*Phrynus armasi*, new species

Figs. 24-29, 118, 125, 127, 128, 174; Map 1

**Types.**—Male holotype, female paratype from Cueva El Mudo, Catalina de Güines, Prov. La Habana, Cuba, March 1966, deposited in the Academia de Ciencias de Cuba. The specific name is a patronym in honor of Luis F. de Armas, in recognition of his numerous collections of Cuban amblypygids and for generously supplying the collected material for its study.

**Diagnosis.**—Distinct from species that have a small inconspicuous spine on the proximal end of dorso-inner lateral surface of pedipalp tarsus for having a single tooth on the external margin of the basal cheliceral segment, no spine on the anterior trochanter face and for having a small spine at the base of Td-7. The female gonopods are quite distinct from all known species, sclerites being pale yellow-brown.

**Description.**—Male holotype. Carapace light reddish-brown with diffuse yellow markings irradiating from sulcus. Narrow yellow band around carapace edges, wider around posterior half. Light reddish-brown frontal area, darker brown around black median ocular tubercle. Yellowish-brown, uniformly colored femora of legs. Pedipalps and dorsum of chelicerae reddish-brown. Total length 26.0 mm. Probably not a full-grown adult as female paratype is 31.7 mm long.

Carapace. Narrow, well-bilobed anterior edge. Frontal process concealed from above. Distance of median ocular tubercle from anterior edge same as length of tubercle (0.5 mm/0.5 mm). Carapace 9.0 mm long, 12.9 mm wide, 5.3 mm sulcus from anterior edge. Median ocular tubercle 0.6 mm wide. Lateral eyes 4.3 mm from each other, 2.0 mm from anterior edge, 1.5 mm from lateral edge.



Chelicerae. Dorsal surface of basal segment without distal tubercles. A single tooth on external margin of basal cheliceral segment and a proximal ridge connecting the inner double-pointed tooth. This ridge presents two small lumps along its edge (Fig. 118).

Genital Operculum. 3.3 mm long, 6.0 mm wide. Opisthogeminate organ as in Figs. 125 and 127. Abdomen 17.7 mm long.

Trichobothria. As in Fig. 174. Ratios: sbc 0.57 and bt 0.38.

Pedipalps. Figs. 24-29. Trochanter with four spines. Anterior surface without a setiferous tubercle. Femur Fd-3 longer than Fd-2. Fd-4 longer than Fd-6. Fv-1, Fv-2 and Fv-3 each on a separate base. Fv-6 longer than Fv-4. Tibia, Td-6 longer than Td-1 and Td-2. Td-4 longer than Td-2, longer than Td-6. Td-3 and Td-5 are the same size. Tv-4 longer than Tv-6, same size as Tv-1. Basitarsus, Bd-1 very well developed, longer than half the length of Bd-3, Bv-3 longer than Bv-1, Bv-1 shorter than Bd-1. Pedipalp tarsus and post-tarsus completely fused. Tarsus with proximal end of dorso-inner lateral surface with small inconspicuous spine. Femur 10.1 mm long; tibia 11.4 mm long, 2.6 mm wide; basitarsus 5.4 mm long, 2.2 mm wide; tarsus 5.4 mm long.

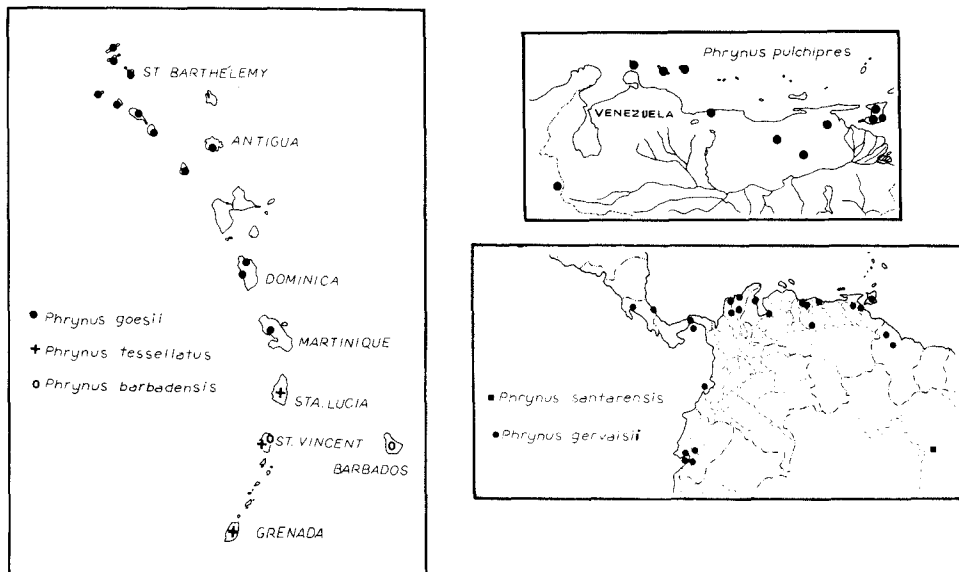
Legs. Second tarsomers of all tarsi without light transverse line on distal end. Antenniform leg: 33.2 mm, femur; 70.3 mm, tibia; 69.0 mm, tarsus. Leg II: 23.0 mm, femur; 36.3 mm, tibia. Leg III: 25.1 mm, femur; tibia missing. Leg IV: 20.7 mm, femur; 38.7 mm (16.8/4.7/7.2/10.0), tibia; 4.6 mm (2.0/0.8/0.2/1.6), tarsus.

Female Genitalia (Cueva El Mudo, Prov. La Habana, Cuba). As in Fig. 128.

Natural History.—It has been collected mostly from caves.

Distribution.—Cuba: Pinar del Rio and La Habana.

Records.—CUBA. *Pinar del Rio*: Cueva El Indio, Viñales, 2 July 1964, 1 female (P. Alayo, and M. L. Jaume, ACC); Rancho Mundito, June 1947, 1 female (F. Zayas, ACC). *La Habana*: unnamed cave near Cayo La Rosa, Bauta, 12 March 1972, 1 male (J. Krecek, ACC); Cueva El Indio, Tapaste, 24 March 1956, 1 male, three females (F. Zayas, G. Silva, and Sánchez, ACC); Loma de Candela, 1 July 1950, 2 females (M. L. Jaume, ACC).



Map 2.—Distributions of *Phrynus barbadensis*, *P. gervaisii*, *P. goesii*, *P. pulchripes*, *P. santarensis* and *P. tessellatus*.

*Phrynus goesii* Thorell

Figs. 42-46, 48, 115, 131, 133, 134, 173; Map 2

*Phrynus goesii* Thorell 1889:530-533. Syntypes (2 males, 2 females, and one specimen without abdomen) from St. Barthélemy, West Indies, coll. Thorell No. 3015, Dr. Middleship, Vegesack 1836, in the Naturhistoriska Riksmuseum, Stockholm, examined. Designated one female lectotype. See Note below.

*Tarantula goesii*: Pocock 1893:542 (citation only as "species unknown to me").

*Tarantula pallasii* Pocock 1893:533-534, pl. 40, Fig. 3, male, female. Male holotype from Martinique believed lost from BMNH. Topotypic specimens examined. Pocock, 1894: 278. **NEW SYNONYMY.**

*Tarantula scabra* Pocock 1893:540. Male holotype from Monserrat, West Indies, in the BMNH, examined. Pocock 1894:278. **NEW SYNONYMY.**

*Tarantula palmata*: Kraepelin 1899:242-244 (in part). Kraepelin characterized *T. palmata* (nec Herbst, 1797) as having Td-4 shorter than Td-2 and erroneously included *P. goesii* in the list of synonyms, species that has Td-4 longer or same size as Td-2.

**Note.**—Thorell indicated the syntypes were "possidet Mus. Zool. Holmiense," collections placed at the Mus. Civ. Storia Nat., Genova, which were in large part destroyed in 1970. Fortunately, Thorell syntypes were not destroyed as they had been transferred to Stockholm. Although Thorell (1889) mentioned he had "exempla pauca," not indicating the exact number of specimens, his description of *P. goesii* only measures and describes a single specimen. The female designed lectotype, corresponds in all details to the specimen that Thorell described.

**Diagnosis.**—*Phrynus goesii*, *P. tessellatus* and *P. longipes* include the largest animals within the genus, body length larger than 32.0 mm. It differs from *Phrynus longipes* in the number of segments in the antenniform leg: 31 tibial, 68 tarsal for *P. goesii* while *P. longipes* has 33 tibial and 71 tarsal segments. *Phrynus goesii* is distinct by the presence of a basal proximal spine in Td-6 and Tv-6 and because it is the only species with three teeth on external margin of basal cheliceral segment in which Td-4 is longer than Td-2. *Phrynus tessellatus* and *P. longipes* have Td-4 shorter than Td-2.

**Description.**—Female lectotype. Carapace dark reddish-brown, pedipalps darker. Legs reddish-brown without banding. Dorsum of abdomen yellowish-brown without distinct marks, darker brown around muscular impressions. Total length 35.0 mm.

Carapace. With narrow, slightly bilobed anterior edge. Frontal process concealed. Distance of median ocular tubercle from anterior edge nearly double length of tubercle (1.2mm/0.7 mm). Carapace 12.8 mm long, 18.4 mm wide, 7.8 mm sulcus from anterior edge. Median ocular tubercle 0.7 mm long, 0.9 mm wide, 1.2 mm from anterior edge. Lateral eyes 7.0 mm from each other, 3.2 mm from anter edge, 3.1 mm from lateral edge.

Chelicerae. Anterodorsal surface of basal cheliceral segment with well-developed tubercle on outer edge. Three teeth on external margin of basal cheliceral segment. (Fig. 115).

Genital Operculum. 4.2 mm long, 8.4 mm wide. Female gonopods as in Fig. 134. Abdomen 23.8 mm long.

Trichobothria. As in Fig. 173. Ratios: sbc 0.49, always lower than 0.53.

Pedipalps. Figs. 42-46, 48. Trochanter with four spines, no spine at center of anterior surface. Femur Fd-4 very small, less than half the length of Fd-6. Fd-3 longer than Fd-2. Fd-4 a denticle. Fv-1 and Fv-2 on a common base distinct from Fv-3. Tibia, Td-6 with a well-developed proximal basal spine. Td-4 longer than Td-2 and Td-6. Td-1 and Td-7 about the same size. Tv-6 with a proximal basal spine. Tv-4 and Tv-6 are the same size.

Three distal well-developed setiferous tubercles. Basitarsus Bd-1 distinct but shorter than Bd-3. Bv-1 slightly shorter than Bv-3. Tarsus dorso-inner lateral surface with a small inconspicuous spine located proximally; tarsus and post-tarsus fused. Femur 13.5 long; tibia 14.2 mm long, 3.8 mm wide; basitarsus 7.1 mm long; tarsus 7.3 mm long.

Legs. Second tarsomere with incomplete membranous line on each side. Antenniform leg: 28.2 mm, femur; 46.0 mm, tibia; 52.0 mm, tarsus. Leg II: 22.0 mm, femur; 33.9 mm, tibia. Leg III: 22.3 mm, femur; 35.0 mm, tibia. Leg IV: 18.2 mm, femur; 32.2 mm (14.8/3.3/5.3/8.8), tibia; 4.8 mm (1.9/0.7/0.4/1.8), tarsus.

Male paratype (St. Barthélemy). Genitalia as in Figs. 131 and 133.

**Variation.**—Frontal margin pronouncedly emarginated and with darker coloration in St. Kitt specimens. Largest size animals in St. Barthélemy.

**Natural history.**—It has been collected from a cave in St. Martin and among the ruins of a sugar mill in Nevis Island.

**Distribution.**—Anguilla, St. Martin, Saba, St. Eustatius, St. Kitts, Nevis, Antigua, Montserrat, Dominica and Martinique.

*Phrynus tessellatus* (Pocock)

Figs. 47, 49-53, 114, 149, 151, 170; Map 2

*Tarantula tessellata* Pocock 1893:531-3, pl. 40, Fig. 2, male and female. Male holotype from St. Vincent, West Indies, in the BMNH, examined. Specimen in poor condition, carapace fractured in two pieces, held by underlying muscles, sternites and gnathocoxae crushed. Pocock 1894:278.

*Tarantula spinimana* Pocock 1893:534-6, pl. 40, Fig. 4. Male holotype discolored and in poor condition, from Haiti, in BMNH, examined. Locality probably erroneous. Pocock 1894:278. **NEW SYNONYMY.**

*Neophrynus palmatus*: Kraepelin 1895:30-34 (in part).

*Admetus palmatus*: Simon 1897:890 (record only).

*Tarantula palmata*: Kraepelin 1899:242-244 (in part).

*Phrynus tessellatus* (sic): Mello-Leitão 1931:41-44.

**Diagnosis.**—*Phrynus tessellatus* is closely related to *Phrynus goesii* and *P. longipes*. They are species of large size (larger than 32.0 mm long) that have three teeth on the external margin of basal cheliceral segment and an inconspicuous small spine on the dorso-inner lateral surface of tarsus. *Phrynus goesii* and *P. longipes* have their frontal process concealed while in *P. tessellatus* the frontal process stands out long and pointed between the chelicerae basis. Most individuals of *Phrynus tessellatus* have a very distinct checkerboard pattern on their abdominal tergites. *Phrynus tessellatus* differs from *Phrynus longipes* in having the femur of the antenniform leg 2.3 to 2.7 times longer than the median prosomal length, the sbc trichobothria higher than 0.53 and Bv-1 longer than Bv-3. *Phrynus longipes* has the femur of antenniform leg 2.8 to 3.8 times longer than medial prosomal length, sbc trichobothria lower than 0.53 and Bv-1 shorter or same size as Bv-3.

**Description.**—Male holotype. Carapace and pedipalps dark reddish-brown. Legs reddish-brown with two ill-defined flavous bands on femur IV. Dorsum of abdomen with a checkerboard appearance of rectangles and squares either reddish-brown or yellow, each tergite bearing approximately 10 spots, 5 anterior and 5 posterior, alternating dark and light spots. Total length 25.8 mm. It is not a full-grown individual, but Pocock selected for description “the largest male that was least fractured” of the eight specimens he had from St. Vincent. The largest specimen that I have seen of this species was 34.0 mm long.

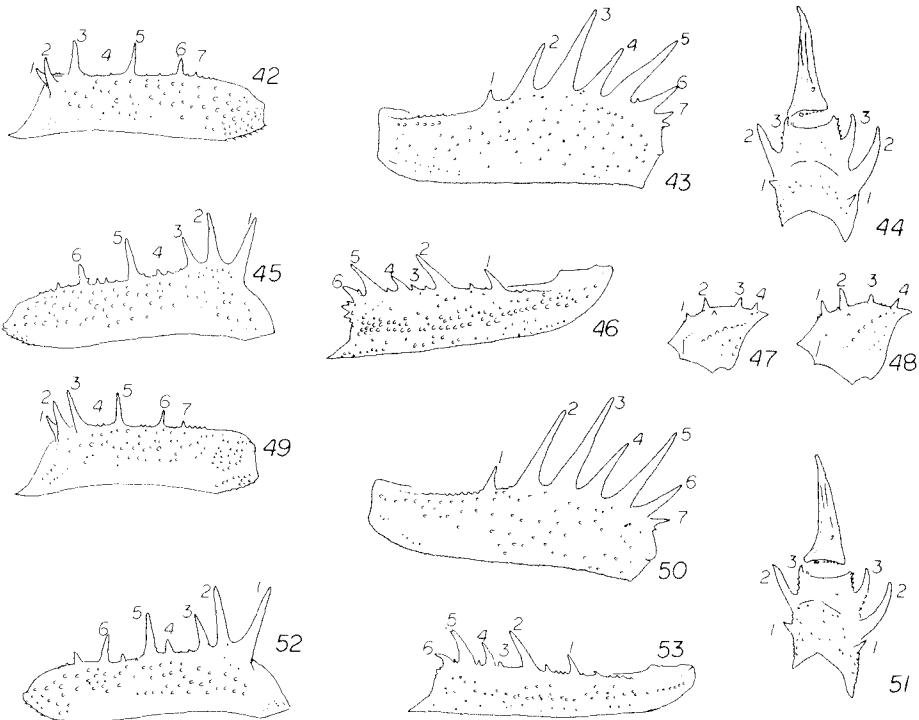
Carapace. With narrow anterior edge, distinctly emarginated and conspicuously dentate. Long and pointed frontal process standing out between the base of chelicerae. Distance of median ocular tubercle from anterior edge more than double length of tubercle (1.9 mm/0.8 mm). Carapace 10.8 mm long, 17.4 mm wide, 6.2 mm sulcus from anterior edge. Median ocular tubercle 1.1 mm wide. Lateral eyes 5.2 mm from each other, 1.9 mm from anterior edge, 2.4 mm from lateral edge.

Chelicerae. Anterodorsal surface of basal cheliceral segment with well-developed tubercle on outer edge. Three teeth on external margin of basal cheliceral segment (Fig. 114).

Genital Operculum. 4.3 mm long, 7.1 mm wide. Male genitalia as in Figs. 149 and 151. Abdomen 17.9 mm long.

Trichobothria. As in Fig. 170. Ratios: sbc 0.57, always higher than 0.53.

Pedipalps. Figs. 47, 49-53. Trochanter with four spines, tubercle at center of anterior surface shorter than largest tubercle on antero-external row. Femur Fd-3 longer than Fd-2, Fd-4 very small. Fv-4 about same size as Fv-7, and more than half the length of Fv-6. Fv-1 and Fv-2 on a common base distinct from Fv-3. Tibia, Td-6 without proximal basal spine. Td-4 shorter than Td-2, longer than Td-6. Td-1 longer than Td-7. Tv-6 without proximal basal spine. Tv-4 longer than Tv-6. Basitarsus Bd-1 well developed, more than half the length of Bd-3. Bv-1 longer than Bv-3. Tarsus dorso-inner lateral surface with a small inconspicuous spine located proximally; tarsus and post-tarsus fused. Femur 12.0 mm long; tibia 13.5 mm long, 3.4 mm wide; basitarsus 5.9 mm long; tarsus 6.0 mm long.



Figs. 42-53.—Pedipalps: *Phrynus goesii* Thorell, female lectotype, 42-46, 48; *Phrynus tessellatus* (Pocock), male holotype, 47, 49-53. Figs. 42, 49 = femur, dorsal view; 45, 52 = femur, ventral view; 43, 50 = tibia, dorsal view; 46, 53 = tibia, ventral view; 44, 51 = basitarsus and tarsus, inner lateral view; 47, 48 = trochanter, anterodorsal view.

Legs. Second tarsomere with incomplete membranous line not reaching ventral edge on each side. Antenniform leg: 28.8 mm, femur; tibia and femur missing. Leg II: 20.6 mm, femur; 25.9 mm, tibia. Leg III: 20.8 mm, femur; 28.8 mm, tibia. Leg IV: 17.6 mm, femur; 28.4 mm (13.1/2.0/4.9/7.4), tibia; 4.2 mm (1.6/0.8/0.2/1.6), tarsus.

**Variation.**—Common differences in the pattern on the abdominal tergites.

**Natural History.**—In St. Vincent, specimens have been taken at altitudes of 150 to 1,000 ft. (45-305 m) by streams (under the bark of stumps) and immatures under stones. In Grenada, one immature was collected under a stone near sea level.

**Distribution.**—St. Vincent, St. Lucia and Grenada.

*Phrynus longipes* (Pocock)

Figs. 36-41, 116, 129, 130, 132, 172; Map 1

*Tarantula longipes* Pocock, 1893:536-7, pl. 40, Fig. 5, male, female. Male holotype from Haiti, in the BMNH, examined. Pocock, 1894:277.

*Tarantula thorellii* Pocock, 1894:282-3, pl. 7, Fig. 7, male. Male holotype with no collecting information in the BMNH, examined. **NEW SYNONYMY.**

*Neophrynus palmatus*: Kraepelin 1895:30-34 (in part).

*Tarantula palmata*: Kraepelin 1899:242-244 (in part).

*Phrynus longipes*: Mello-Leitão 1931:40-42.

**Diagnosis.**—*Phrynus longipes* and *P. pulchripes* are closely associated by their similar spination dorsal of the pedipalp tibia. It differs from *P. pulchripes* by having three teeth, instead of two, on the external margin of the basal cheliceral segment and by lacking the spine on the anterior face of the pedipalp trochanter. It differs from other species with a small inconspicuous spine on the proximal end of the dorso-inner lateral surface of the pedipalp tarsus by its very long femur of the antenniform legs that reaches from 2.8 to 3.8 times the median prosomal length, by having the frontal process concealed and Bv-1 shorter than Bv-3.

**Description.**—Male holotype. Carapace and pedipalps light reddish-brown. Carapace with two diffuse flavous stripes each at its posterior lateral edges. Legs and abdomen lighter colored. Distinct banding on the femora of the walking legs. Abdomen variegated with brown and yellow. Total length 24.0 mm.

Carapace. With wide, nearly straight anterior edge, with small denticles slightly larger at the sides. Frontal process concealed from above. Carapace furnished with only a few coarse granules. Very distinct frontal area, convex in front of lateral eyes. Distance of median ocular tubercle from anterior edge one-third length of tubercle (0.3 mm/0.9 mm). Carapace 9.0 mm long, 13.3 mm wide, 5.7 mm sulcus from anterior edge. Median ocular tubercle 1.0 mm wide. Lateral eyes 4.3 mm from each other, 1.6 mm from anterior edge, 1.5 mm from lateral edge.

Chelicerae. Anterodorsal surface of basal cheliceral segment with two tubercles at the distal border, of which the external is the larger. Both tubercles are small. Three teeth on external margin of basal cheliceral segment (Fig. 116).

Genital Operculum. 3.4 mm long, 5.8 mm wide. Opisthogeminate organ as in Figs. 129 and 130. Abdomen 15.5 mm long.

Trichobothria. As in Fig. 172. Ratios: sbc 0.51, bt 0.57.

Pedipalps. Figs. 36-41. Trochanter with four spines. A small setiferous tubercle at the center of anterior surface, smaller than larger tubercles on antero-external row. Femur

and tibia studded, but not thickly, with small granules. Femur, Fd-2 longer than Fd-3. Fd-4 small, shorter than Fd-5 and Fd-6. Fv-1 and Fv-2 on a common base separate from Fv-3. Fv-4 one-fourth the length of Fv-6. Fv-3 longer than Fv-6. Tibia, Td-6 longer than Td-1 but shorter than Td-2. Td-4 shorter than Td-2 and longer than Td-6. Td-3 longer than Td-5. Tv-4 longer and thinner than Tv-6. Tv-4 and Tv-1 are the same size. Basitarsus, Bd-1 long, longer than half the length of Bd-3. Bv-3 longer than Bv-1. Bv-1 and Bd-1 are the same size. Pedipalp tarsus and post-tarsus completely fused. Tarsus with proximal end of dorso-inner lateral surface with small, inconspicuous spine. Femur 11.0 mm long; tibia 11.3 mm long, 2.4 mm wide; basitarsus 5.9 mm long, 2.4 mm wide; tarsus, 5.5 mm long.

Legs. Antenniform leg: 33.9 mm, femur; rest is missing. Leg II: 21.6 mm, femur; 30.0 mm, tibia. Leg III: 24.2 mm, femur; tibia lost. Leg IV: 20.8 mm, femur; 36.0 (15.1/4.7/6.5/9.7), tibia, all tarsi missing.

Female Genitalia (Puerto Rico, Cueva de los Alfaros). As in Fig. 132.

**Natural History.**—In the Dominican Republic and Puerto Rico, *Phrynus longipes* has been collected from caves. In St. John, Virgin Is., one gravid female was collected from under a rock in a moist forest and two males from a sunny dry to very dry area. In Tortola Is. one male was found at 1,200 ft. in an old water cistern on peak above town.

**Distribution.**—Haiti, Dominican Republic, Puerto Rico, and Virgin Islands: St. John, St. Croix, St. Thomas, and Tortola Island.

*Phrynus damonidaensis*, new species

Figs. 54-59, 122, 135, 136, 137, 164; Map 1

**Types.**—Female holotype from Uvero, El Cobre, Sierra Maestra, Prov. Oriente, Cuba (L. de Armas), 25 May 1972; 3 male, 2 female paratypes from Cayo Dama, Chivirico, El Cobre, under rocks (L. de Armas), 24 May 1972; deposited in the Academia de Ciencias de Cuba. The specific name is a noun after the name of the family Damonidae, having in common only three tibial segments in leg IV.

**Diagnosis.**—*Phrynus damonidaensis* can be easily recognized by its peculiar tibial segmentation, having only three tibial IV segments instead of four segments. The only exception is *Phrynus santarensis* whose exact number of tibial IV segments is not known with certainty because of the asymmetry present in the single known specimen, which presents three segments on left tibia IV and only two segments on right tibia IV. A similar asymmetry was found in the female holotype of *P. damonidaensis*, but all other known specimens present three tibial IV segments.

*Phrynus damonidaensis* is not a member of the Damonidae, as redefined by Quintero (1976) for the following reasons:

1. Its inner proximal double-pointed tooth of the basal cheliceral segment has its distal cusp distinctly larger. In all members of the Damonidae the proximal cusp is the larger of the two cusps.
2. It lacks the baso-caudal row of trichobothria on the distitibia of leg IV. This row of trichobothria is present in all members of the Damonidae.

**Description.**—Female holotype. Carapace light reddish-brown with diffuse yellow markings irradiating from sulcus. Narrow white band around carapace edges, wider around posterior half and on frontal margin. Yellow tubercles scattered on posterior half of carapace and dorsum of abdomen. Darker reddish-brown behind lateral eyes and

yellow lines beside lateral eyes. Dark reddish-brown pedipalps. Yellowish-brown, uniformly colored femora of legs. Dorsal surface of abdomen approximately same color as legs, with a variegated pattern, lighter around muscular impressions. Total length 17.6 mm.

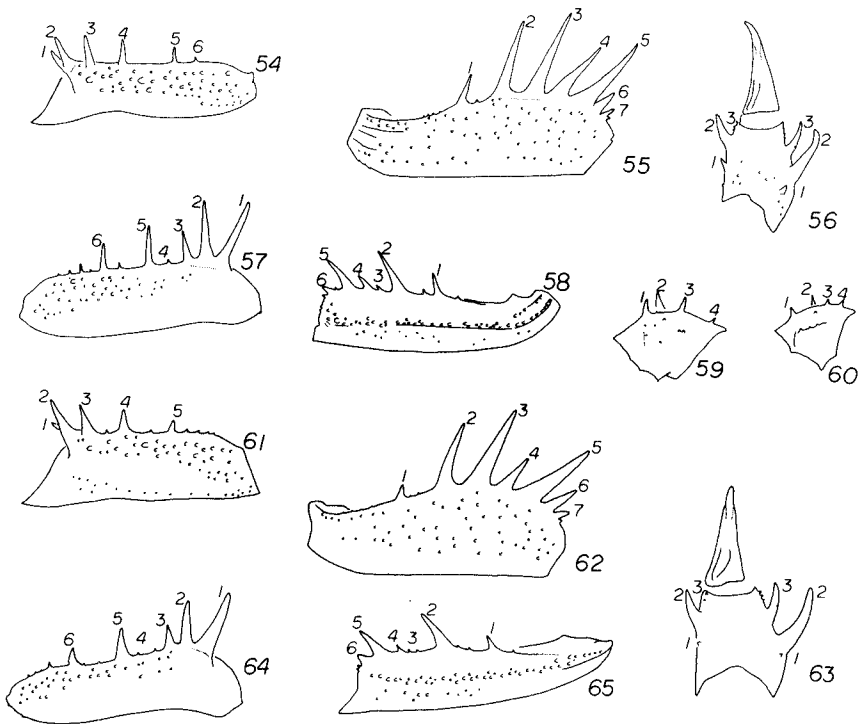
Carapace. Wide, nearly straight anterior edge, with uneven size tubercles, larger at the sides. Frontal process concealed from above. Distance of median ocular tubercle from anterior edge more than double length of tubercle (0.8 mm/0.3 mm). Carapace 6.7 mm long, 9.5 mm wide, 4.0 mm sulcus from anterior edge. Median ocular tubercle 0.6 mm wide. Lateral eyes 4.3 mm from each other, 1.6 mm from anterior edge, 1.0 mm from lateral edge.

Chelicerae. Four teeth on external margin of basal cheliceral segment. Of these teeth, the distal one is located proximally on the lower third of the large ventral, distal tooth. The other three teeth insert on a common base. The proximal one is very small (see comments under Variation) (Fig. 122).

Genital Operculum. 2.3 mm long, 4.3 mm wide. Female gonopods as in Fig. 137. Abdomen 10.8 mm long.

Trichobothria. As in Fig. 164. Ratios: sbc 0.44, bt 0.37.

Pedipalps. Figs. 54-59. Trochanter with four spines. Center of anterior surface without a spine. Femur with numerous coarse granules on its dorsal surface, sparsely granulated ventrally. Femur, Fd-2 longer than Fd-3. Fd-4 longer than Fd-5 and Fd-6. Fv-1, Fv-2 and Fv-3 present on a common base. Fv-4 a small tubercle. Fv-3 longer than Fv-6. Tibia, Td-6



Figs. 54-65.—Pedipalps of female holotypes: *Phrynus damonidaensis*, new species, 54-59; *Phrynus marginemaculatus* C. L. Koch, 60-65. Figs. 54, 61 = femur, dorsal view; 57, 64 = femur, ventral view; 55, 62 = tibia, dorsal view; 58, 65 = tibia, ventral view; 56, 63 = basitarsus and tarsus, inner lateral view; 59, 60 = trochanter, anterodorsal view.

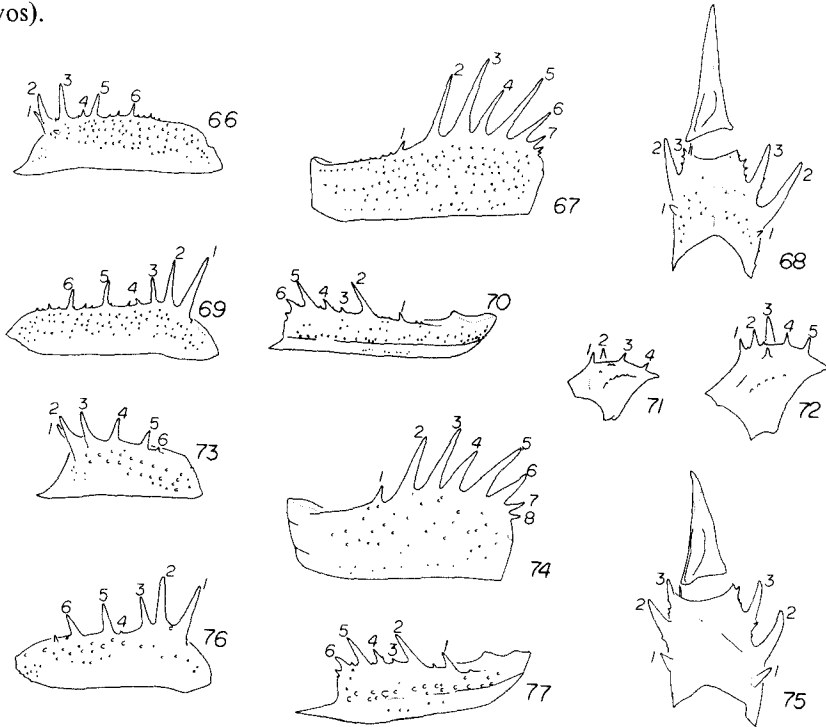
same size as Td-1 and less than half the length of Td-2. Td-4 shorter than Td-2 and longer than Td-6. Td-3 longer than Td-5. Tv-4 longer than Tv-6. Tv-4 shorter than Tv-1. Basitarsus, Bd-1 short, about one-third the length of Bd-3. Bv-3 shorter than Bv-1 and reduced to an inconspicuous tubercle. Bv-1 shorter than Bd-1. Pedipalp tarsus and post-tarsus completely fused. Tarsus without small spine on proximal end of dorso-inner lateral surface. Femur 6.5 mm long; tibia 7.2 mm long, 2.2 mm wide; basitarsus 3.2 mm long; 1.9 mm wide; tarsus 3.4 mm long.

Legs. Second tarsomere of all tarsi with light transverse complete line on distal end. The left side presents a curious asymmetry, the tibia IV divided into only two segments while the right tibia IV has the normal number of segments for this species, three. Antenniform leg: 1.42 mm, femur; 27.0 mm, tibia; 29.0 mm, tarsus. Leg II: 10.0 mm, femur; 14.0 mm, tibia. Leg III: 10.9 mm, femur; 16.0 mm, tibia. Leg IV: 9.3 mm, femur; 15.2 mm (7.1/3.2/4.9), tibia; 2.5 mm (1.1/0.5/0.2/0.7), tarsus.

Male Genitalia (Uvero, El Cobre, Prov. Oriente, Cuba). As in Figs. 135 and 136.

**Variation.**—Adult specimens from Swan Islands, western Caribbean Sea, differ from Cuban specimens in having a darker general appearance. They also differ in having the three proximal teeth on the external margin of the basal cheliceral segment of even size, instead of having the proximal tooth very reduced in size. Two males from Cayo Dama, Prov. Oriente, Cuba, present the fifth abdominal sternite divided with a membranous line along the middle.

**Natural History.**—It has been collected from under rocks in Oriente, Cuba. The number of embryos in six females carrying egg cases was 7, 8, 12, 18, 39 and 50 (mean of 22 embryos).



Figs. 66-77.—Pedipalps: *Phrynus levii* new species, male holotype, 66-71; *Phrynus santarensis* (Po-cock), female holotype, 72-77. Figs. 66, 73 = femur, dorsal view; 69, 76 = femur, ventral view; 67, 74 = tibia, dorsal view; 70, 77 = tibia, ventral view; 68, 75 = basitarsus and tarsus, inner lateral view; 71, 72 = trochanter, anterodorsal view.



**Distribution.**—Cuba, Pinar del Rio and Oriente; Honduras, Swan Islands.

**Records.**—CUBA. *Oriente*: Sierra Maestra, Uvero, El Cobre, 25 May 1972, 2 males (L. de Armas, ACC). Baitiquirí, Guantánamo, under rock, 23 October 1971, 1 male, juvenile (J. de Cruz, ACC). Cayo Dama, Chivirico, El Cobre, under rocks, 24 May 1972, 3 males, 2 females (L. de Armas, ACC). Morro, Santiago de Cuba, 22 May 1972, 1 male (L. de Armas, ACC). Finca El Curoe, S. W. Guantánamo, 26 November 1950, 1 male (P. Alayo and S. de Torre, ACC). Laguna Baconeo, W. Guantánamo, 21 August 1966, 1 male, 3 females (M. L. Jaume, ACC). Margins Siboney R., El Caney, 7 November 1971, 2 males, 1 female (L. de Armas, ACC). Siboney El Caney, 5 November 1971, 2 males, 2 females (L. de Armas, ACC). Juraguá, El Caney, 4 November 1971, 3 males, 3 females (L. de Armas, ACC). *Pinar del Río*: El Veral, Pen. Guanahacabibes, 28 August 1971, 1 male, 2 females (L. de Armas, ACC). HONDURAS: Swan Islands, juvenile, 14 November 1937 (J. S. Colman and M. Y. Rosaura, BMNH), 1 male, 6 females, 17-19 April 1913 (Geo. Nelson, MCZ).

*Phrynus marginemaculatus* C. L. Koch

Figs. 60-65, 120, 141, 142, 144, 166; Map 1

*Phrynus marginemaculatus* C. L. Koch 1841:6-8, Fig. 597. Female holotype form West Indies, no other information, in the BMNH, examined.

*Admetus marginemaculatus*: C. L. Koch 1850:81.

*Phrynus pallasii* Blanchard 1852-64:170, pls. 10 bis and 11. Blanchard does not appear to have left specimens in the Paris Museum, where he worked. He indicated that his specimens came from different localities in the West Indies.

*Tarantula keyserlingii* Pocock 1893:539-540, pl. 40, Fig. 7. The holotype came from an unknown locality, appears to be lost from the BMNH. Male paratype from Cuba, in the BMNH, examined.

*Tarantula latifrons* Pocock 1893:537-9, pl. 40, Fig. 6. Female holotype from Haiti, in the BMNH, examined. Pocock 1894:278.

*Tarantula marginemaculata*: Pocock 1893:541. Pocock indicated that this species was unknown to him, thus he was unable to place it in his key to species. Kraepelin 1899:245, Fig. 89. Muma 1967:24-25, Figs. 18-19. Weygoldt 1969:338-360; 1970:58-85.

*Neophrynus marginemaculatus*: Kraepelin 1895:34-36.

*Phrynus keyserlingi* (sic): Mello-Leitão 1931:42.

**Diagnosis.**—*Phrynus marginemaculatus*, *P. levii* and *P. damonidaensis* are the only species with 27 tibial segments in the antenniform leg. *Phrynus parvulus* has 25 tibial segments and all the other species of *Phrynus* have 29 or more tibial segments in the antenniform leg. *Phrynus marginemaculatus* differs from *P. damonidaensis* in having four tibial segments on leg IV instead of three, they are darker colored animals and have two teeth instead of four on the external margin of the basal cheliceral segment. It differs from *P. levii* in being a smaller, darker colored animal with different ornamentation of the carapace. It has two teeth instead of three on the basal cheliceral segment and has Fv-1 and Fv-2 with a common base, distinct from Fv-3.

**Description.**—Female holotype. Carapace and pedipalps dark reddish-brown. Femora of legs dark brown, uniformly colored. Dorsal of cheliceral basal segment lighter than frontal area. Carapace with two distinct pale yellow spots on each posterior ectal angle, and a yellow line beside each lateral ocular cluster. Carapace and abdomen sprinkled with light tubercles. Each abdominal tergite has one pale yellowish large spot medial to the two dark brown muscular impressions. Total length 12.5 mm. It does not appear to be a full-grown adult, adults reach a maximum size of 18.0 mm.

Carapace. Narrow, well-bilobed anterior border, with very small, uneven size tubercles. Frontal process concealed from above. Distance of median ocular tubercle from anterior

edge slightly larger than length of tubercle (0.5 mm/0.4 mm). Carapace 5.7 mm long, 9.0 mm wide, 3.4 mm sulcus from anterior edge. Median ocular tubercle 0.6 mm wide. Lateral eyes 3.7 mm from each other, 1.6 mm from anterior edge, 0.6 mm from lateral edge.

Chelicerae. Two teeth on external margin of basal cheliceral segment (Fig. 120).

Genital Operculum. 2.0 mm long, 4.0 mm wide. Female gonopods as in Fig. 144. Abdomen 8.3 mm long.

Trichobothria. As in Fig. 166. Ratios: sbc 0.40, bt 0.25.

Pedipalps. Figs. 60-65. Trochanter with four spines. Center of anterior surface without a spine. Femur, Fd-2 longer than Fd-3, Fd-4 longer than Fd-5. Only five spines present. Fv-1 and Fv-2 with a common base separate from Fv-3. Fv-4 obsolete. Fv-3 longer than Fv-6. Tibia, Td-6 longer than Td-1. Td-2 longer than Td-6. Td-4 shorter than Td-2 and longer than Td-6. Td-3 same size as Td-5. Tv-4 about same size as Tv-6 and shorter than Tv-1. Tv-2 longer than Tv-5. Basitarsus, Bd-1 inconspicuous, a basal appendage to Bd-2. Bv-3 and Bv-1 both inconspicuous. Pedipalp tarsus and post-tarsus completely fused. Tarsus without small spine on proximal end of dorso-inner lateral surface. Femur 5.2 mm long; tibia 6.0 mm long, 2.0 mm wide; basitarsus 2.8 mm long, 1.7 mm wide; tarsus 3.0 mm long.

Legs. Second tarsomere of all tarsi with light transverse complete line on distal end. Antenniform leg: 12.0 mm, femur; 24.5 mm, tibia; 30.0 mm, tarsus. Leg II: 8.8 mm, femur; 12.2 mm, tibia. Leg III: 9.0 mm, femur; 12.9 mm, tibia. Leg IV: 8.0 mm, femur; 11.5 mm (5.1/0.8/2.4/4.2), tibia; 2.0 mm (0.9/0.3/0.1/0.7), tarsus.

Male Genitalia (Isla de Pinos, Cuba). As in Figs. 141 and 142.

**Variation.**—The species derives its name from the pale yellowish spots on each posterior ectal angle of the carapace. Unfortunately, this character is also common among other species of *Phrynus* and variable in *P. marginemaculatus*. The marginal spots on the carapace could even be absent. This condition is frequently found among specimens from Isla de Pinos, Cuba.

**Natural History.**—Muma (1967) states that, in southern Florida, *P. marginemaculatus* is found commonly under boards, logs, and trash on the ground, under the bark of dead trees, and on and in houses. Muma maintained living specimens in the laboratory for longer than one year, using termites as food. In six preserved females, the number of embryos carried ranged from 17 to 36 with a mean of 24. Weygoldt (1969) studied the behavior of specimens from Big Pine Key and Key Largo, Florida, and described the mating and ritualistic interactions in this species. He observed that the molting occurs during the night while they hang in an inverted position from a rock. It lasts several hours and is finished in the morning. The species has been collected in timber, among cedar shingles, in Jamaica, and one gravid female under rotten log in New Providence Is., Bahamas.

**Distribution.**—USA. Southern Florida, as far north as Sunniland, Collier County in the center of the state, Martin County on the east coast, and Punta Gorda on the west coast (Muma, 1967). Monrow County up to Dry Tortugas. Bahamas: Six Hills Cay, Abaco, Andros Is., Man O'War Cay, Crooked Is., Great Inagua Is., South Bimini Is., Exuma Is. (Bitter Guana Cay), New Providence Is., Long Is., San Salvador Is. (Watling), Rum Cay, Long Cay (S. of S. Caicos Is.), Turks Is., and Eleuthera Island. Cuba: collected from all six provinces. Jamaica, Haiti, and Dominican Republic.

*Phrynus levii*, new species

Figs. 66-71, 121, 138-140, 161; Map 1

**Types.**—Male holotype, female paratype from Providence Cave, Montego Bay, Jamaica, 5 March 1911, deposited in the BMNH. The specific name is a patronym in honor of Dr. Herbert W. Levi in recognition of the encouragement he gave me to continue work on the taxonomy of *Phrynus*, and his contributions in the field of arachnology.

**Diagnosis.**—*Phrynus levii* belongs to the group of species which lack the small spine on the proximal end of the dorso-inner lateral surface of the pedipalp tarsus and have Td-4 shorter than Td-2. It appears closely related to *P. marginemaculatus*, differing in having three teeth instead of one on the basal cheliceral segment. They are larger animals, 24.0 mm maximum total length found, while the largest *P. marginemaculatus* measured was 18.0 mm. *Phrynus levii*, appears lighter in general body coloration, particularly the abdomen with a plain yellowish-brown look, while *P. marginemaculatus* has it variegated and darker. In *P. levii* the chelicerae are always darker than the frontal area of the carapace while in *P. marginemaculatus* they are lighter, rarely the same color as the frontal area.

**Description.**—Male holotype. Carapace light reddish-brown with diffuse yellow markings irradiating from sulcus. Pedipalps and dorsal of cheliceral basal segment of darker reddish-brown. Frontal area clearly lighter than chelicerae. Yellow lines beside lateral eyes. Wide yellow band around posterior half of carapace edges. Yellowish-brown, uniformly colored femora of legs. Total length 23.5 mm.

Carapace. Anterior edge well bilobed, narrow and evenly denticulated with short tubercles. Frontal process concealed from above. Distance of median ocular tubercle from anterior edge nearly double length of tubercle (0.9 mm/0.5 mm). Carapace 8.9 mm long, 12.9 mm wide, 5.2 mm sulcus from anterior edge. Median ocular tubercle 0.9 mm wide. Lateral eyes 5.4 mm from each other, 2.0 mm from anterior edge, 1.3 mm from lateral edge.

Chelicerae. Dorsal surface of basal segment with medial, distal tubercle enlarged. Three teeth on external margin of basal cheliceral segment (Fig. 121).

Genital Operculum. 3.7 mm long, 6.2 mm wide. Opisthogeminate organ as in Figs. 138 and 139. Abdomen 15.0 mm long.

Trichobothria. As in Fig. 161. Ratios: sbc 0.45 and bt 0.37.

Pedipalps. Figs. 66-71. Trochanter with four spines. Anterior surface without a spine. Femur, Fd-3 longer than Fd-2. Fd-4 shorter than Fd-5 and Fd-6. Fv-1, Fv-2 and Fv-3 without a distinct common base. In place of Fv-4, two short convergent spines. Fv-3 longer than Fv-6. Tibia Td-6 three times the length of Td-1 and more than half the length of Td-2. Td-4 shorter than Td-2 and longer than Td-6. Td-3 longer than Td-5. Tv-4 slightly longer than Tv-6 and Tv-1. Basitarsus, Bd-1 short, inconspicuous, about one-fifth the length of Bd-3. Bv-3 small, shorter than Bv-1. Bv-1 longer than Bd-1. Pedipalp, tarsus and post-tarsus completely fused. Tarsus without small spine on proximal end of dorso-inner lateral surface. Femur 9.0 mm long; tibia 10.4 mm long, 3.0 mm wide; basitarsus 4.3 mm long, 2.8 mm wide; tarsus 5.2 mm long.

Legs. Second tarsomere of all tarsi with light transverse complete line on distal end. Antenniform leg: 26.0 mm, femur; rest is broken. Leg II: 16.3 mm, femur; 24.2 mm, tibia. Leg III: 17.0 mm, femur; 26.3 mm, tibia. Leg IV: 14.8 mm, femur; 30.4 mm (15.1/2.1/5.0/8.2), tibia; 4.2 mm (1.9/0.8/0.3/1.2), tarsus.

Female Genitalia (Providence Cave, Montego Bay, Jamaica). As in Fig. 140.

**Natural History.**—It was collected from a cave in Montego Bay, Jamaica.

**Distribution.**—Jamaica and Cuba.

**Records.**—CUBA: *Las Villas*, Rancho Luna, Cienfuegos. 10 March 1955, 2 males (M. Goenaga, ACC). JAMAICA: Providence Cave, Montego Bay, 5 March 1911, 2 females (BMNH).

*Phrynus santarensis* (Pocock)

Figs. 72-77, 112, 150, 165; Map 2

*Tarantula santarensis* Pocock 1894:284-5, 1 female. Female holotype from Santarem, Brazil, in the BMNH, examined.

*Admetus santarensis*: Pocock 1897:358-9.

*Neophrynus palmatus barbadensis*: Kraepelin 1895:30-34 (in part).

*Tarantula palmata santarensis*: Kraepelin 1899:244.

*Phrynus santarensis*: Mello-Leitão 1931:43.

**Diagnosis.**—*Phrynus santarensis* presents a curious asymmetry in the segmentation of the tibia of leg IV. The right tibia has only two segments while the left one has three segments. The only specimen seen of the species is the holotype, thus it is not possible at the present to know with certainty what is the normal number of segments of tibia IV without examining additional specimens. If the number of segments turns out to be three instead of four, it will be the second species known with only three segments in tibia IV, the other being *Phrynus damonidaensis*. If the number of segments is two, *P. santarensis* will be the only species within the Phrynidae with that number of segments. Not being able to solve this problem I have not used this character for the diagnosis of the species.

*Phrynus santarensis* can be recognized by the five spines on the edges of the pedipalp trochanter, its lack of the inconspicuous spine on the proximal end of the dorso-inner lateral surface of the pedipalp tarsus, by having Td-4 shorter than Td-2 and by the well-developed spine at center of anterior face of the pedipalp trochanter.

**Description.**—Female holotype. Carapace, pedipalps and legs dark reddish-brown. Carapace with diffuse marginal spots on its posterior edges. Abdomen with a ferruginous coloration, with three faintly defined fuscous patches on each tergite, one being median and the others lateral. Total length, 20.0 mm.

Carapace. With narrow, slightly bilobed anterior edge with short, even setiferous tubercles. Short frontal process partially visible from above. Poorly defined frontal area. Carapace very broad and narrow. Distance of median ocular tubercle from anterior edge more than half of length of tubercle (0.4 mm/0.6 mm). Carapace 7.0 mm long, 11.8 mm wide, 4.0 mm sulcus from anterior edge. Median ocular tubercle 0.9 mm wide. Lateral eyes 3.9 mm from each other, 1.5 mm from anterior edge, 1.5 mm from lateral edge.

Chelicerae. Anterodorsal surface of basal cheliceral segment without distal tubercles. One well-developed tooth and a square ridge on external margin of basal cheliceral segment. Square ridge located between external tooth and the inner double-pointed proximal tooth (Fig. 112).

Genital Operculum. 2.4 mm long, 5.0 mm wide. Female gonopods as in Fig. 150. Abdomen 12.0 mm long.

Trichobothria. As in Fig. 165. Ratios: sbc 0.44, bt 0.43.

Pedipalps. Figs 72-77. Robust in appearance. Trochanter with five spines, one additional spine between spines 1 and 2. Femur Fd-2 same size as Fd-3, Fd-4 longer than Fd-5 and Fd-6. Fv-1, Fv-2 and Fv-3 present a common base. Fv-4 inconspicuous, reduced to a small tubercle, Fv-3 longer than Fv-6. Tibia, medial face all granular. Td-6 longer than

Td-1 but shorter than Td-2. Td-4 shorter than Td-2 and longer than Td-6. Td-3 longer than Td-5. Tv-4 longer than Tv-6. Tv-4 same size as Tv-1. Tv-2 and Tv-5 are the same size. Basitarsus, Bd-1 long, more than half the length of Bd-3, Bv-3 longer than Bv-1. Bv-1 shorter than Bd-1. Pedipalp tarsus and post-tarsus completely fused. Tarsus without small spine on proximal end of dorso-inner lateral surface. Femur 6.0 mm long; tibia 6.9 mm long, 2.8 mm wide; basitarsus 3.9 mm long, 2.1 mm wide; tarsus 3.6 mm long.

Legs. Second tarsomere of all tarsi with light transverse complete line on distal end. The right side presents the tibia IV divided into only two segments while the left tibia IV is divided into three segments. It is not known whether this is a normal character for the species or due to an abnormality in development, as suggested by Pocock (1894, p. 285). Antenniform leg: 16.0 mm, femur; 30.2 mm, tibia; tarsus missing. Leg II: 11.2 mm, femur; 15.7 mm, tibia. Leg III: 13.0 mm, femur; 18.0 mm, tibia. Leg IV: 10.0 mm, femur; 16.1 mm, femur; 18.0 mm, tibia. Leg IV: 10.0 mm, femur; 16.1 mm (7.9/2.7/5.5), tibia; 2.5 mm (1.0/0.5/0.2/0.8), tarsus.

Male Genitalia. Not known.

**Natural History.**—In 1897, Pocock reported “many specimens were taken at Santarem (Brazil), one in a house, a few in the forest, and many from a termite’s nest upon the campus.” I was not able to find these specimens at the BMNH.

**Distribution.**—Only known from the type locality, Santarem, Brazil.

*Phrynus barbadensis* (Pocock)  
Figs. 78-83, 111, 153, 169; Map 2

*Tarantula barbadensis* Pocock 1893:529-530, pl. 40, Fig. 1, 1 male, 1 female. Male holotype from Barbados, West Indies, in the BMNH, examined. Specimen in poor condition, legs and pedipalps fractured. Pocock 1894:278.

*Neophrynus palmatus barbadensis*: Kraepelin 1895:30-34 (in part).

*Tarantula palmata barbadensis*: Kraepelin 1899:244 (in part).

*Phrynus barbadensis*: Pocock 1902a:51, pl. 10, Fig. 6; Mello-Leitão 1931:41.

**Diagnosis.**—It is most closely related to *Phrynus gervaisii*. *Phrynus barbadensis* can be recognized by its raised, distinctly delimited, darker frontal area and by the pale, yellowish-brown abdomen with scarcely a trace of pattern. Frontal process broad, visible from above although vertically positioned.

**Description.** Male holotype.—Carapace and pedipalps dark reddish-brown. Carapace with a flavous posterolateral border. Legs paler than pedipalps, with very faintly defined flavous spots dorsal of femora. Abdomen pale yellowish-brown, with scarcely a trace of pattern. Total length 19.0 mm.

Carapace. With wide, distinctly bilobed anterior edge, evenly denticulate. Broad frontal process partially visible from above and vertically positioned. Raised, distinctly delimited frontal area, darker in coloration. Distance of median ocular tubercle from anterior edge nearly half the length of tubercle (0.3 mm/0.5 mm). Carapace 7.0 mm long, 11.1 mm wide, 4.3 mm sulcus from anterior edge. Median ocular tubercle 0.8 mm wide. Lateral eyes 4.5 mm from each other, 1.5 mm from anterior edge, 0.7 mm from lateral edge.

Chelicerae. Scarcely granular above, and without an enlarged terminal tubercle. One well-developed tooth and a blunt ridge on external margin of basal cheliceral segment. Blunt ridge located between external tooth and the inner double-pointed proximal tooth (Fig 111).

Genital Operculum. 3.3 mm long, 5.3 mm wide. I was not able to illustrate the male genitalia because it was poorly preserved and deteriorated. Abdomen 11.3 mm long.

Trichobothria. As in Fig. 169. Ratios: sbc 0.45, bt 0.40.

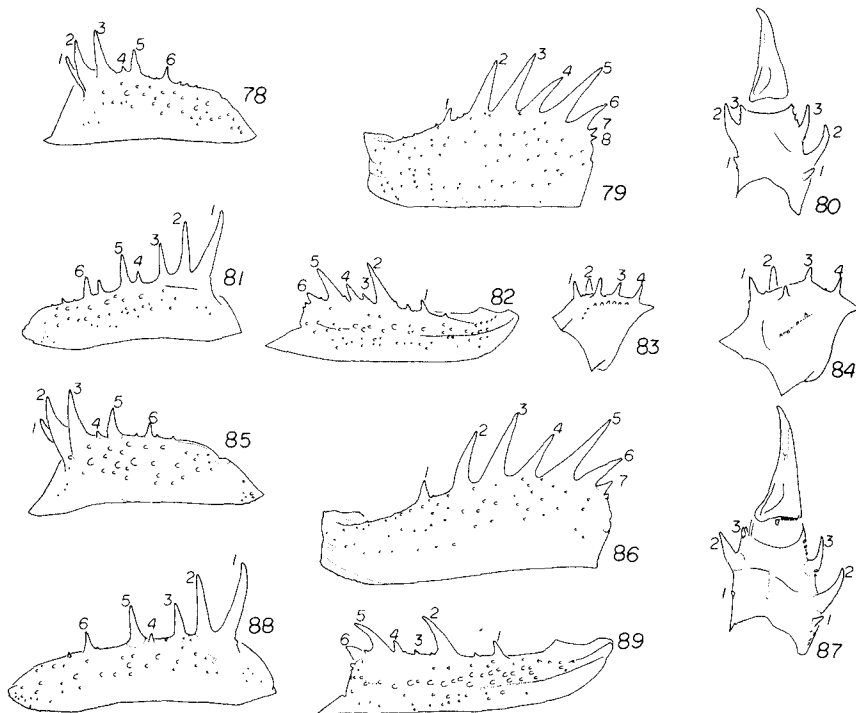
Pedipalps. Figs. 78-83. Robust in appearance. Trochanter with four spines, and a well-developed spine at center of anterior surface. Femur, Fd-2 same size as Fd-3. Fd-4 small, one-third the length of Fd-5, and half the length of Fd-6. Fv-1, Fv-2 and Fv-3 on a distinctly raised common base. Fv-4 more than half the length of Fv-6. Fv-3 same size as Fv-5. Fv-3 larger than Fv-6. A short spine between Fv-5 and Fv-6. Tibia, Td-6 longer than Td-1 but shorter than Td-2. Td-4 shorter than Td-2 and longer than Td-6. Td-3 shorter than Td-5. Tv-4 longer than Tv-6 and Tv-1. Tv-2 longer than Tv-5. Basitarsus, Bd-1 long, more than half the length of Bd-3. Bv-3 longer than Bv-1 but short. Bv-1 less than half the length of Bd-3. Pedipalp tarsus and post-tarsus completely fused. Tarsus without small spine on proximal end of dorso-inner lateral surface. Femur 5.3 mm long; tibia 7.1 mm long, 2.7 mm wide; basitarsus 3.4 mm long, 2.2 mm wide; tarsus 4.0 mm long.

Legs. Second tarsomere of tarsi II and III with light transverse complete line on distal end. Tarsus IV is missing. Antenniform leg: 16.0 mm, femur; rest is missing. Leg II: 11.0 mm, femur; 11.0 mm, tibia. Leg III: 12.0 mm, femur; 12.5 mm, tibia. Leg IV: 10.0 mm, femur; 11.0 mm (4.8/0.8/1.9/3.5), tibia; tarsus is missing.

Female Genitalia (Barbados). As in Fig. 153.

**Natural History.**—Nothing is known of the habits of this species.

**Distribution.**—Barbados and St. Vincent.



Figs. 78-89.—Pedipalps of male holotypes: *Phrynus barbadensis* (Pocock), 78-83; *Phrynus gervaisii* (Pocock), 84-89. Figs. 78, 85 = femur, dorsal view; 81, 88 = femur, ventral view; 79, 86 = tibia, dorsal view; 82, 89 = tibia, ventral view; 80, 87 = basitarsus and tarsus, inner lateral view; 83, 84 = trochanter, anterodorsal view.

*Phrynus gervaisii* (Pocock)

Figs. 84-89, 113, 147, 148, 152, 167; Map 2

*Phrynus palmatus* Koch 1841 (nec Herbst, 1797):13-15, pl. 257. Fig. 601.

*Tarantula gervaisii* Pocock 1894:285-6, pl. 7, Fig. 5. Male holotype from Magdaleine, Colombia, in the BMNH, examined.

*Neophrynus palmatus barbadensis*: Kraepelin 1895:30-34 (in part).

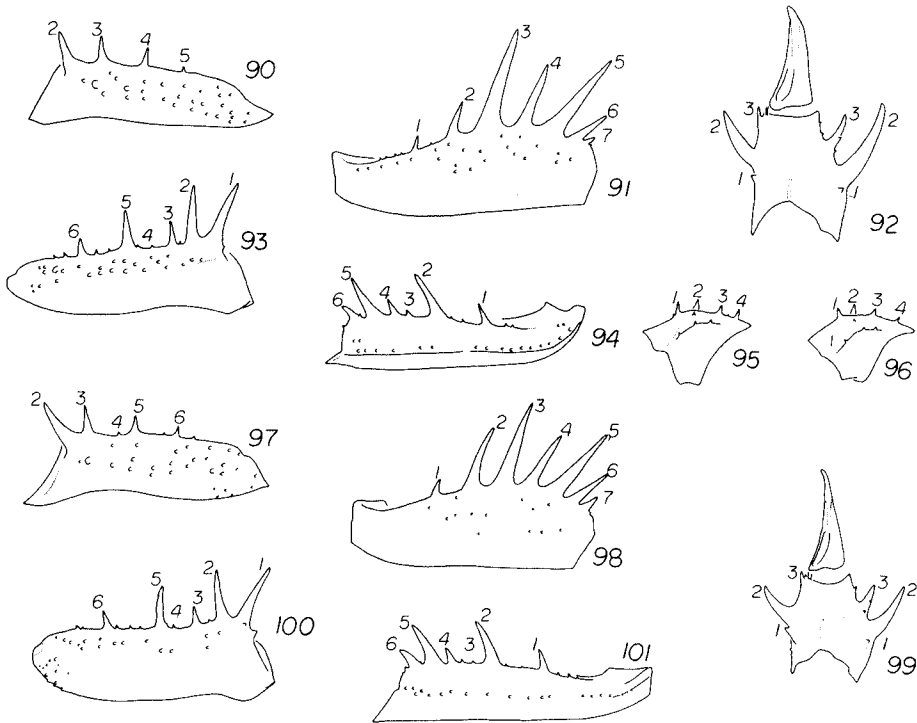
*Tarantula palmata*: Kraepelin 1899:242-244 (in part).

*Phrynus caracasanus* Pereyaslawzewa 1901:117-304. Not Simon. Pereyaslawzewa described only embryo sections. Female at Muséum Nat. d'Hist. Nat., Paris, examined, jar No. 37 labelled "*Phrynus caracasanus* E. Simon TYPE, Caracas, Simon, 1899. Egg sac sent to Pereyaslawzewa." ICZN, art. 9(5), labelling a specimen in a collection does not constitute publication.

*Phrynus gervaisii*: Mello-Leitão 1931:41.

**Diagnosis.**—It is most closely related to *Phrynus barbadensis*. *Phrynus gervaisii* can be recognized by its poorly defined frontal area, its limits not distinct from rest of carapace, and by the dark variegated abdomen. A Trinidad specimen of *P. gervaisii* has a well-defined frontal area, distinct from the rest of carapace, but it is distinguished from *P. barbadensis* by its dark, variegated abdomen; *P. barbadensis* have a pale, yellowish abdomen, with scarcely a trace of pattern.

**Description.**—Male holotype. Carapace and pedipalps dark reddish-brown. Carapace with distinct flavous marginal spots on its posterior edges. Three flavous bands dorsal on



Figs. 90-101.—Pedipalps of male holotypes: *Phrynus whitei* Gervais, 90-95; *Phrynus parvulus* Pocock, 96-101. Figs. 90, 97 = femur, dorsal view; 93, 100 = femur, ventral view; 91, 98 = tibia, dorsal view; 94, 101 = tibia, ventral view; 92, 99 = basitarsus and tarsus, inner lateral view; 95, 96 = trochanter, anterodorsal view.

leg IV, less clearly defined on the other ambulatory legs. Small flavous tubercles scattered on posterior half of carapace of dorsum of abdomen. Two short yellow lines beside lateral eyes. Abdomen variegated, some tergites with a flavous ring around the muscular impressions. Total length 17.3 mm.

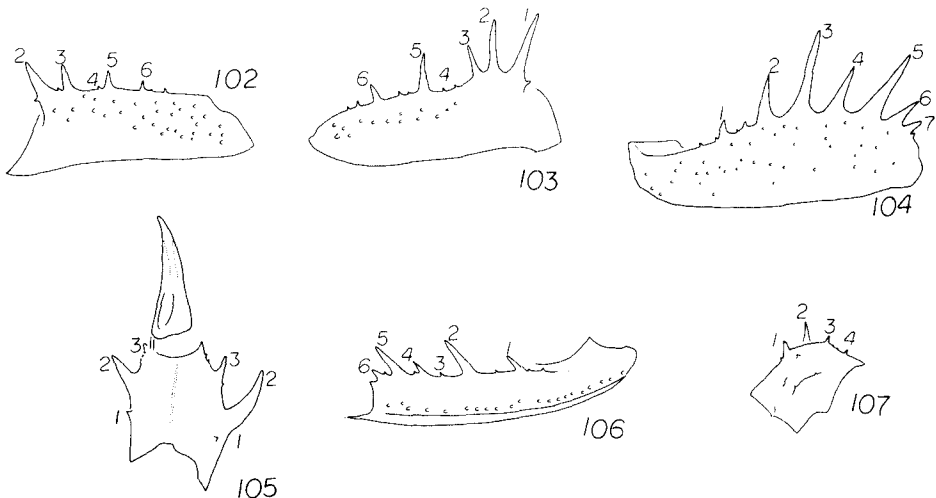
Carapace. With narrow, nearly straight anterior edge with small, even setiferous tubercles. Frontal process concealed from above. Poorly defined frontal area. Distance of median ocular tubercle from anterior edge half the length of tubercle (0.3 mm/0.6 mm). Carapace 6.9 mm long, 11.7 mm wide, 4.2 mm sulcus from anterior edge. Median ocular tubercle 0.7 mm wide. Lateral eyes 4.5 mm from each other, 1.2 mm from anterior edge, 1.3 mm from lateral edge.

Chelicerae. Sparsely granular, anterodorsal surface of basal cheliceral segment with the external distal tubercle slightly enlarged. One well-developed tooth and a strong, uneven surface, sharp-edged ridge on external margin of basal cheliceral segment. Ridge appears to join the external tooth with the inner double-pointed proximal tooth (Fig. 113).

Genital operculum. 3.0 mm long, 5.9 mm wide. Opisthogeminate organ as in Figs. 147 and 148. Abdomen 11.0 mm long.

Trichobothria. As in Fig. 167. Ratios: sbc 0.44, bt 0.37.

Pedipalps. Figs. 84-89. Robust in appearance. Trochanter with four spines, and a well-developed spine at center of anterior surface. Femur with numerous coarse granules on its dorsal surface, sparsely granulated ventrally. Femur Fd-2 longer than Fd-3. Fd-4 small, shorter than Fd-5 and Fd-6. Fv-1 and Fv-2 present a common base separate from Fv-3. Fv-4 one-third length of Fv-6. Fv-3 longer than Fv-6. Tibia, Td-6 longer than Td-1 but shorter than Td-2. Td-4 shorter than Td-2 and longer than Td-6. Td-3 shorter than Td-5. Tv-4 same size as Tv-6 but thinner. Tv-4 shorter than Tv-1. Basitarsus, Bd-1 short, about one-third the length of Bd-3. Bv-3 longer than Bv-1 which is reduced to an inconspicuous tubercle. Bv-1 shorter than Bd-1. Pedipalp tarsus and post-tarsus completely fused. Tarsus without small spine on proximal end of dorso-inner lateral surface. Femur,

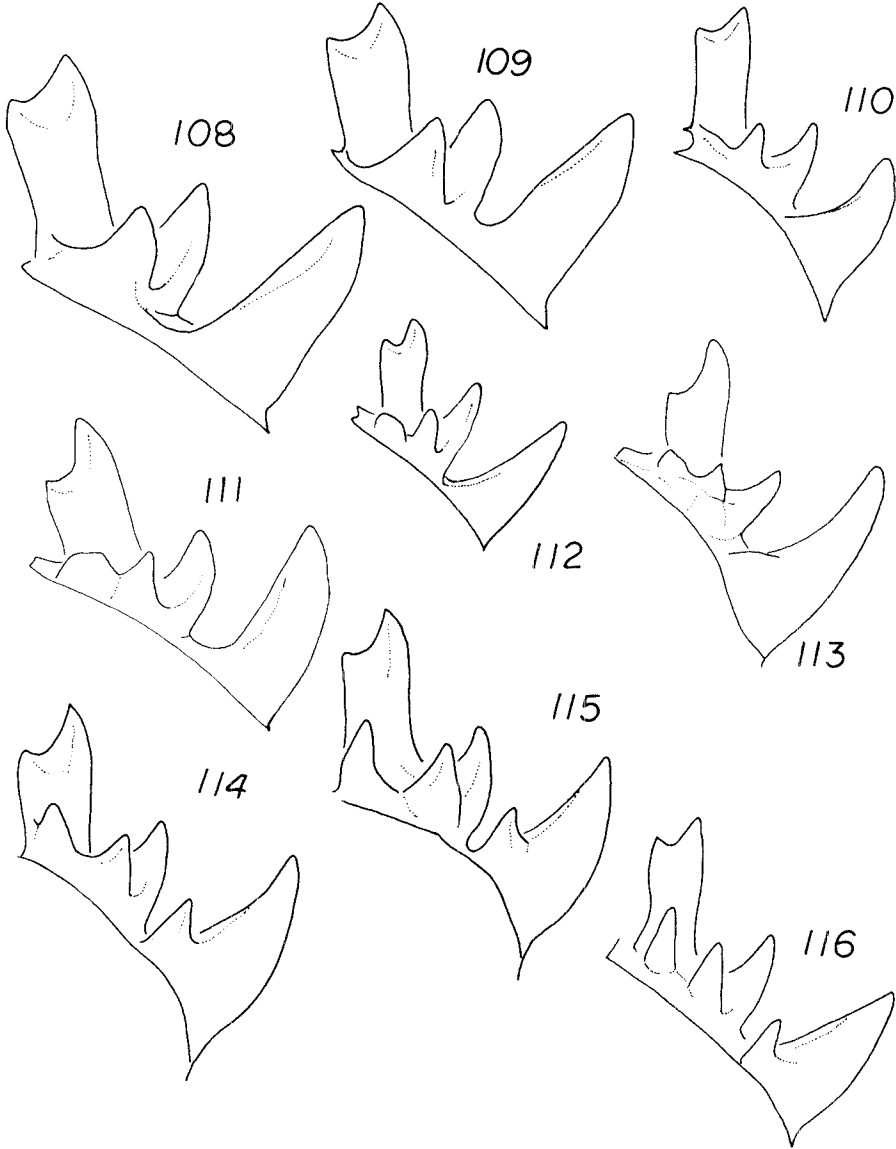


Figs. 102-107.—Pedipalp of male lectotype *Phrynus operculatus* Pocock: 102, femur, dorsal view; 103, femur, ventral; 104, tibia, dorsal view; 105, basitarsus and tarsus, inner lateral view; 106, tibia, ventral view; 107, trochanter, anterodorsal view.



6.9 mm long; tibia, 7.5 mm long, 2.9 mm wide; basitarsus, 3.8 mm long, 2.3 mm wide; tarsus, 4.1 mm long.

Legs. Second tarsomere of tarsus 2 with light transverse complete line on distal end. Tarsi 3 and 4 have been lost. Antenniform leg: 17.4 mm, femur; 28.5 mm, tibia: 31.0 mm, tarsus. Leg II: 12.1 mm, femur; 17.8 mm, tibia. Leg III: 13.0 mm, femur; tibia lost. Leg IV: 10.2 mm, femur; 16.0 mm (7.0/1.2/2.3/5.5), tibia; tarsus lost.



Figs. 108-116.—Teeth on basal cheliceral segment, external view, right chelicerae: 108 *P. operculatus*, Pocock; 109, *P. whitei* Gervais; 110, *P. parvulus* Pocock; 111, *P. barbadensis* (Pocock); 112, *P. santarensis* (Pocock); 113, *P. gervaisii* (Pocock); 114, *P. tessellatus* (Pocock); 115, *P. goesii* Thorell; 116, *P. longipes* (Pocock).

Female Genitalia (Madden Forest Preserve, Canal Zone). As in Fig. 152.

**Natural History.**—Epigeal species found mainly in covered, secondary forests and occasionally associated with abandoned, dark places, moist objects near human dwellings. It has been collected from under boards in trash piles in Venezuela (Edo. Guarico, near Calaboso) and in the Canal Zone. Numerous collections of *Phrynus gervaisii* in Madden Forest Preserve, Canal Zone, found it commonly occult during the day above the forest ground in the narrow space between the broad bases of the fronds and the trunk of the corozo palm, *Scheelea zonensis* Bailey. Adults and immatures have been found under the accumulated pile of fallen corozo fronds and fruits under the palm. It has also been found under the bark of large trees and under fallen, rotten logs near creeks and in the banks of rivers. Few individuals have been collected from the floor of the main chamber of Chilibrillo Cave in Panama, a cave where the top invertebrate predator is *Paraphrynus laevifrons* (Pocock) (personal observations).

About their reproductive biology it is known that they reproduce all year round and that females probably lay one egg case each year. Females carry egg cases with embryos, number varying from 9-24, mean of 15. Larger females generally carry a larger number of embryos. The exact gestation period is not known. Captured females that laid egg cases in captivity had young born in five to six months after being brought to the laboratory.

I have observed their molting in captivity which occurs during the night while hanging in an inverted position from any ledge. Shortly after ecdysis, the animal hides and is very pale (greenish), soft and humid and does not eat for two or three days. The exuvia remains hanging from the ledge.

Nothing is known about their feeding preferences in nature. In captivity adults accept readily roaches and crickets and larval stages have been fed with termites.

**Distribution.**—Costa Rica, Colombia, Ecuador, Venezuela, Guyana, Trinidad, and Panama.

*Phrynus whitei* Gervais

Figs. 90-95, 109, 143, 145, 146, 163; Map 1

*Phrynus whitei* Gervais 1842:19-22. Male holotype erroneously ticketed Burdwan, Bengal, India (Hardwicke's collections) in the BMNH, examined. Gen. Thomas Hardwicke donated his collections in 1835 to the BMNH, it is known his specimen labels include numerous erroneous locations.

Pocock 1902a:50, 52-53, pl. 11, Figs. 1, 1a-c.

*Tarantula whitei*: Pocock 1894:277, pl. 7, Figs. 4, 4a; Kraepelin 1899:243 (in part).

*Neophrynus whitei*: Kraepelin 1895:28-29 (in part).

**Diagnosis.**—The distal displacement of the dorsal spines on the pedipalp tibia and the presence on the carapace of shiny or yellow patches beside the lateral ocular clusters are unique features of *Phrynus whitei*. It differs from *Phrynus operculatus* and *P. parvulus* in having Td-5 shorter than Td-3, and Td-2 and Td-6 about the same size.

**Description.**—Male holotype. Carapace and pedipalps dark reddish-brown. Carapace with a yellow rim, wider at posterior edges, and diffuse yellowish markings irradiating from sulcus. A very distinctive, shiny, silver-yellowish patch on the inner side of each lateral ocular cluster. Abdomen variegated with dark brown muscular impressions and a yellow band behind them. Femora of legs banded. Total length 14.0 mm. It does not appear to be a full-grown adult. Male specimens from La Ceiba, Honduras, reach 22.0 mm long.

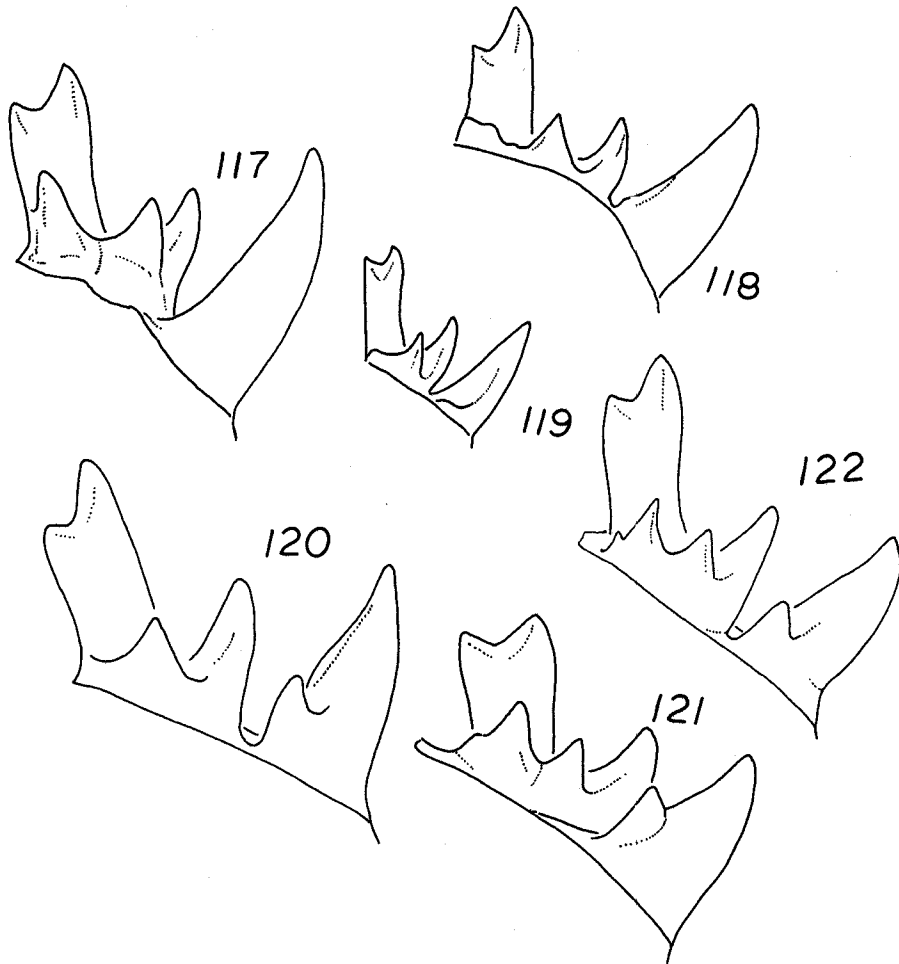
Carapace. Narrow, lightly emarginated anterior border, with very small, uneven size tubercles. Frontal process concealed from above, with sparsely arranged coarse granules. Distance of median ocular tubercle from anterior edge equal to length of tubercle (0.3 mm/0.3 mm). Carapace 5.8 mm long, 8.2 mm wide, 3.3 mm sulcus from anterior edge. Median ocular tubercle 0.7 mm wide. Lateral eyes 2.7 mm from each other, 1.0 mm from anterior edge, 0.7 mm from lateral edge.

Chelicerae. One tooth on external margin of basal cheliceral segment (Fig. 109).

Genital Operculum. 2.8 mm long, 4.2 mm wide. Opisthogeminate organ as in Figs. 143 and 145. Abdomen 9.0 mm long.

Trichobothria. As in Fig. 163. Ratios: sbc 0.62, bt 0.30.

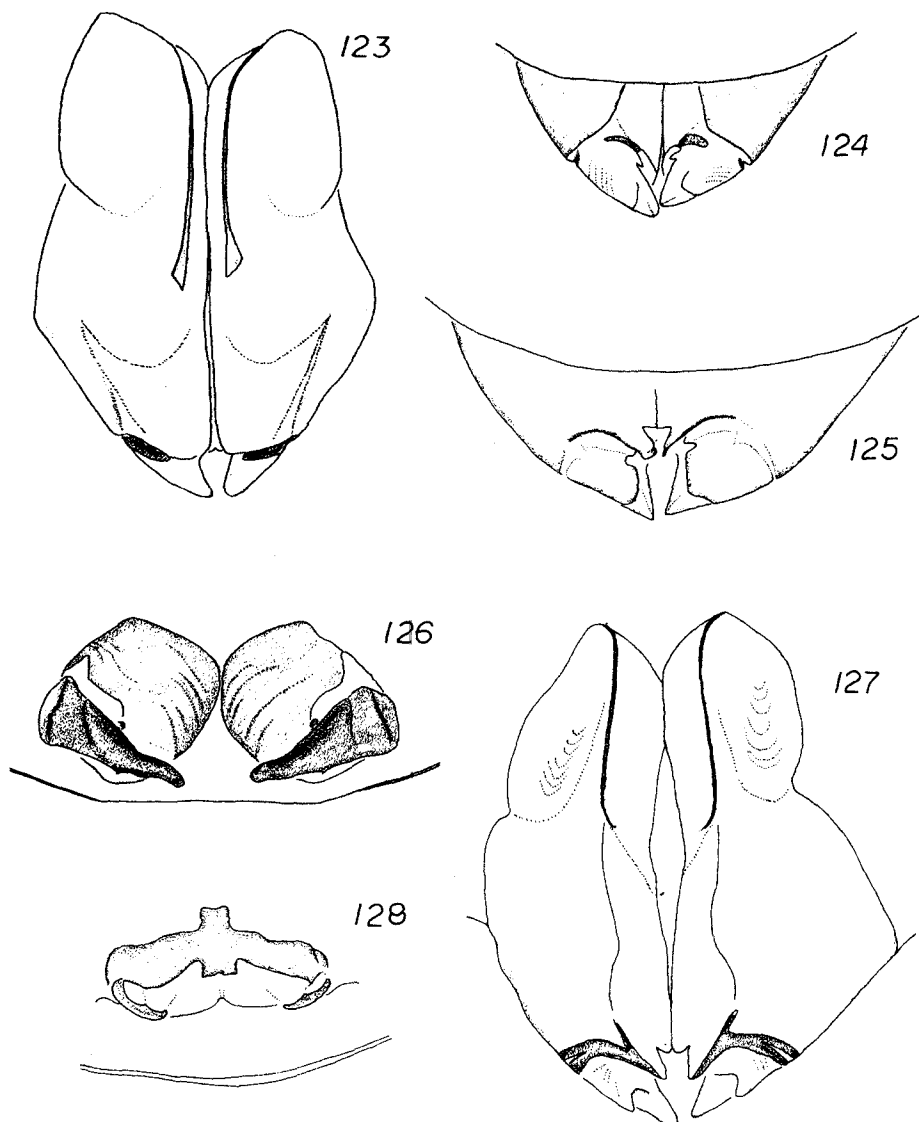
Pedipalps. Figs. 90-95. Trochanter with four spines. Center of anterior surface without a spine. Femur, Fd-1 small, occult by Fd-2. Fd-2 longer than Fd-3. Fd-4 longer than Fd-5. Only five spines present. Fv-1 and Fv-2 with a common base separate from Fv-3. Fv-4 obsolete. Fv-3 same size as Fv-6. Tibia, Td-6 longer than Td-1. Td-2 same size as Td-6.



Figs. 117-122.—Teeth on basal cheliceral segment, external view, right chelicerae: 117, *P. pulchripes* (Pocock); 118, *P. armasi* new species; 119, *P. asperatipes* Wood; 120, *P. marginemaculatus* C. L. Koch; 121, *P. levii*, new species; 122, *P. damonidaensis*, new species.

Td-4 longer than Td-2 and Td-6. Td-3 longer than Td-5. Tv-4 about same size as Tv-6 and shorter than Tv-1. Tv-2 longer than Tv-5. Basitarsus, Bd-1 inconspicuous, a basal appendage to Bd-2. Bv-3 longer than Bv-1, both very reduced in size. Bv-1 longer than Bd-1. Pedipalp tarsus and post-tarsus completely fused. Tarsus without small spine on proximal end of dorso-inner lateral surface. Femur 5.2 mm long; tibia 5.9 mm long, 1.6 mm wide; basitarsus 2.7 mm long, 1.6 mm wide; tarsus 2.9 mm long.

Legs. Tarsi have been lost from all legs. Antenniform leg: 12.7 mm, femur; rest is missing. Leg II: 8.8 mm, femur; tibia broken. Leg III: 10.2 mm, femur; tibia broken. Leg IV: 8.4 mm, femur; 11.9 mm (5.6/1.0/2.1/3.2), femur; tarsus lost.



Figs. 123-128.—*Phrynus pulchripes* (Pocock): opisthogeminate organs, 123 = dorsal view, 124 = ventral view; 126 = female gonopods, dorsal view. *P. armasi*, new species: opisthogeminate organs, 127 = dorsal view, 125 = ventral view; 128 = female gonopods, dorsal view.

Female Genitalia (Guanacaste, R. Santa Rosa, Costa Rica). As in Fig. 146.

**Variation.**—The presence of a light transverse complete line on the distal end of the second tarsomere of all legs is variable and does not appear to be geographically related. The presence of the patch on the inner side of each lateral ocular cluster is a variable character, most specimens either have the shiny yellowish patch or a plain yellow patch; in others, this patch is almost absent or difficult to recognize.

**Natural History.**—It has been collected from under old logs in a pine forest southwest of La Lima, Honduras, and Cueva de Las Pina Ramas, in Chiapas, Mexico.

**Distribution.**—Mexico: states of Jalisco, Veracruz and Chiapas. Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica: Guanacaste and Puntarenas.

*Phrynus parvulus* Pocock

Figs. 96-101, 110, 156, 158, 160; Map 1

*Phrynus parvulus* Pocock 1902a:50-52, pl. 10, Figs. 7, 7a,b. Male holotype from the ruins of Tikal, Peten, Guatemala in the BMNH, examined.

*Tarantula marginemaculata yucatanensis* Werner 1902. Male holotype from "Belize, Yucatan" in Naturhistorisches Museum Wien (type No. 113), examined. Specimen fragmented.

**Diagnosis.**—*Phrynus parvulus* is the only species of *Phrynus* with clubiform setae and one of the most conspicuously variegated species, particularly in the abdominal tergites and legs. It lacks the small spine on the dorso-inner lateral surface of the pedipalp tarsus. It has Td-4 longer than Td-2, although their difference in size is small, particularly in younger specimens. Males of *P. parvulus* can be distinguished from those of *P. operculatus* by their sharp-pointed setae, small genital operculum and by having the fourth abdominal sternite straight.

**Description.**—Male holotype. Carapace and pedipalps dark reddish-brown, carapace ornamented with pale reddish patches on each side of the middle line and with four diffuse yellowish marginal spots. Dorsum of femora of legs conspicuously banded. Tergites yellow along the posterior border, and with a large crescentic yellow patch around the dark-brown muscular impressions. Total length 16.0 mm.

Carapace. Clubiform setae. Narrow, slightly emarginated anterior border, with very small, even-sized tubercles. Frontal process concealed from above. Distance of median ocular tubercle from anterior edge nearly the length of tubercle (0.4 mm/0.5mm). Carapace 6.0 mm long, 8.5 mm wide, 3.9 mm sulcus from anterior edge. Median ocular tubercle 0.7 mm wide. Lateral eyes 2.7 mm from each other, 1.1 mm from anterior edge, 1.0 mm from lateral edge.

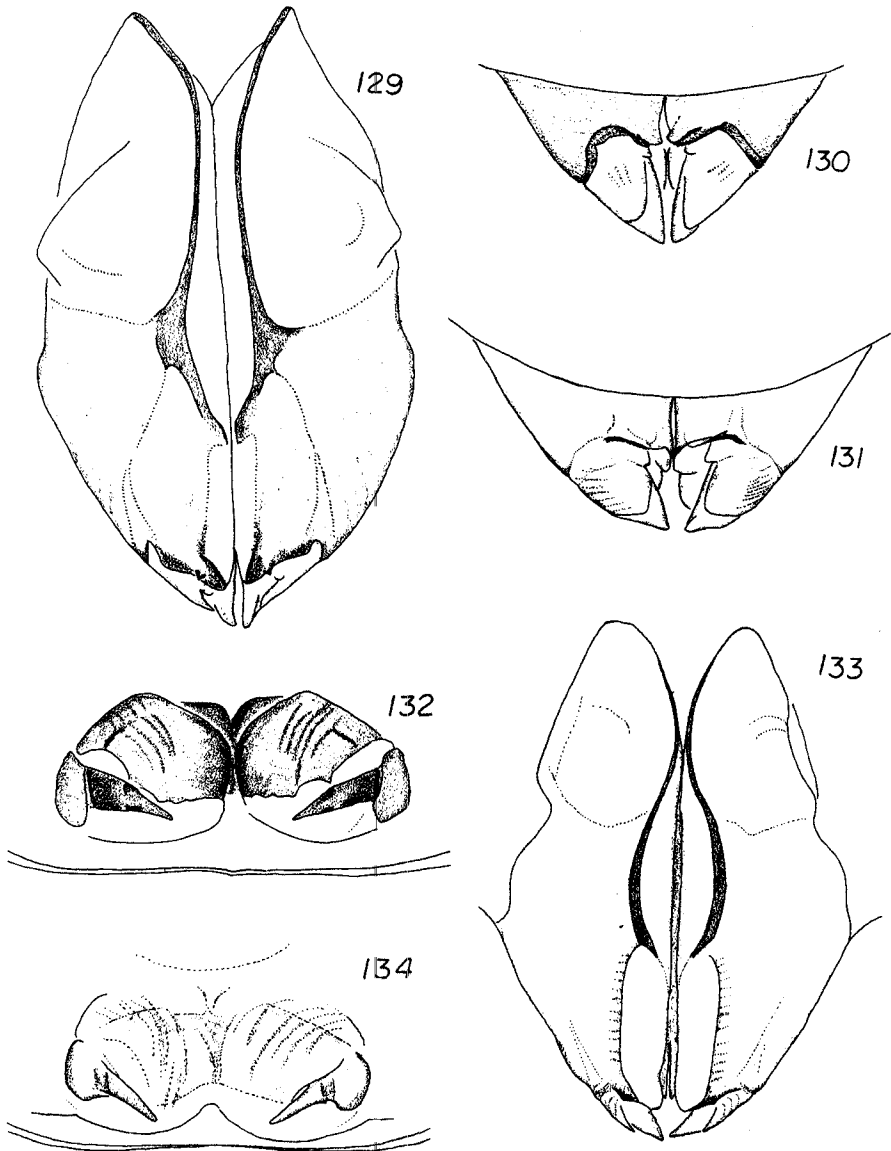
Chelicerae. One tooth and a ridge on external margin of basal cheliceral segment. The ridge appears to connect the external tooth with the inner double-pointed proximal tooth (Fig. 110).

Genital Operculum. Small, fourth abdominal sternite straight, 2.3 mm long, 3.8 mm wide. Opisthogeminate organ as in Figs. 156 and 158. Abdomen 10.2 mm long.

Trichobothria. As in Fig. 160. Ratios: sbc 0.63, bt 0.40.

Pedipalps. Figs. 96-101. Covered with clubiform setae. Surface of femur with fine close granulation. Trochanter with four spines. Center of anterior surface without a spine. Femur, Fd-1 small, occult by Fd-2. Fd-2 longer than Fd-3. Fd-4 a small tubercle. Fd-5 longer than Fd-6. Fv-1, Fv-2 and Fv-3 without a common base. Fv-4 a short tubercle. Fv-3 shorter than Fv-6. Tibia, Td-6 longer than Td-1 and more than half the length of

Td-2. Td-4 longer than Td-2 and Td-6. Td-2 distinctly longer than Td-6. Td-3 same size as Td-5. Tv-4 same size as Tv-1, shorter than Tv-6. Basitarsus, Bd-1 inconspicuous, a basal appendage to Bd-2. Bv-3 longer than Bv-1. Bv-1 longer than Bd-1. Pedipalp tarsus and post-tarsus completely fused. Tarsus without small spine on proximal end of dorso-inner lateral surface. Femur 5.7 mm long; tibia 6.2 mm long, 1.9 mm wide; basitarsus 2.8 mm long, 1.9 mm wide; tarsus 3.0 mm long.



Figs. 129-134.—*Phrynus longipes* (Pocock): opisthogenemate organs, 129 = dorsal view, 130 = ventral view; 132 = female gonopods, dorsal view. *P. goesii* Thorell: opisthogenemate organs, 133 = dorsal view, 131 = ventral view; 134 = female gonopods, dorsal view.

Legs. Covered with blunt spines and clubiform setae. Second tarsomere of tarsi with light transverse complete line on distal end. Antenniform leg: 13.1 mm, femur; 21.3 mm, tibia; 22.4 mm, tarsus. Leg II: 9.5 mm, femur; 13.0 mm, tibia. Leg III: 10.1 mm, femur; 15.1 mm, tibia. Leg IV: 9.2 mm, femur; 14.3 mm (6.4/1.5/2.6/3.8), tibia; 1.9 mm (0.8/0.3/0.1/0.7), tarsus.

Female Genitalia (Tikal, Guatemala). As in Fig. 159.

**Natural History.** Found among ruins of Mayan civilization and in a cave in Trece Aguas, Guatemala.

**Distribution.**—Known from the type locality in Tikal, from Uaxactum, El Peten, Trece Aguas, Guatemala and Belize (British Honduras).

*Phrynus operculatus* Pocock

Figs. 102-108, 154, 155, 157, 162; Map 1

*Phalangium palmatum* Herbst 1797:82-92, pl. 4, Fig. 2. See discussion on its identification at the end of the description.

*Phrynus palmatus*: Latreille 1804:136 (citation only).

*Phrynus operculatus* Pocock 1902a:50, 52, pl. 10, Figs. 8, 8a-c. Male and female syntypes from Guatemala in the BMNH, examined. Lectotype male designated.

**Diagnosis.**—*Phrynus operculatus* is the only species of *Phrynus* having distinct sexual dimorphism in the size of the genital operculum. Males have a large genital operculum and the fourth abdominal sternite bent while females have a normal size genital operculum and the fourth abdominal sternite straight. The female gonopods are very characteristic, with broad-based sclerites ending each in a thin hook bent upwards and ventrally. Males of *P. operculatus* can be distinguished from those of *P. parvulus* by their darker, less variegated look, larger genital operculum, shape of fourth abdominal sternite, and their sharp, pointed setae and spines.

**Description.**—Male lectotype. Carapace and pedipalps dark reddish-brown. There is no red upon the frontal area on the carapace and the legs are uniformly colored reddish-brown, without banding. It lacks the marginal spots on the carapace. Tergites dark looking, with a very diffuse variegated pattern of dark brown and reddish-yellow. Total length 13.0 mm.

Carapace. Covered with sharp, pointed setae. Narrow, almost straight anterior border, with very small, uneven size tubercles. Frontal process concealed from above. Distance of median ocular tubercle from anterior edge equal to length of tubercle (0.4 mm/0.4 mm). Carapace 5.8 mm long, 9.0 mm wide, 3.3 mm sulcus from anterior edge. Median ocular tubercle 0.6 mm wide. Lateral eyes 2.7 mm from each other, 1.3 mm from anterior edge, 1.0 mm from lateral edge.

Chelicerae. One tooth on external margin of basal cheliceral segment (Fig. 108).

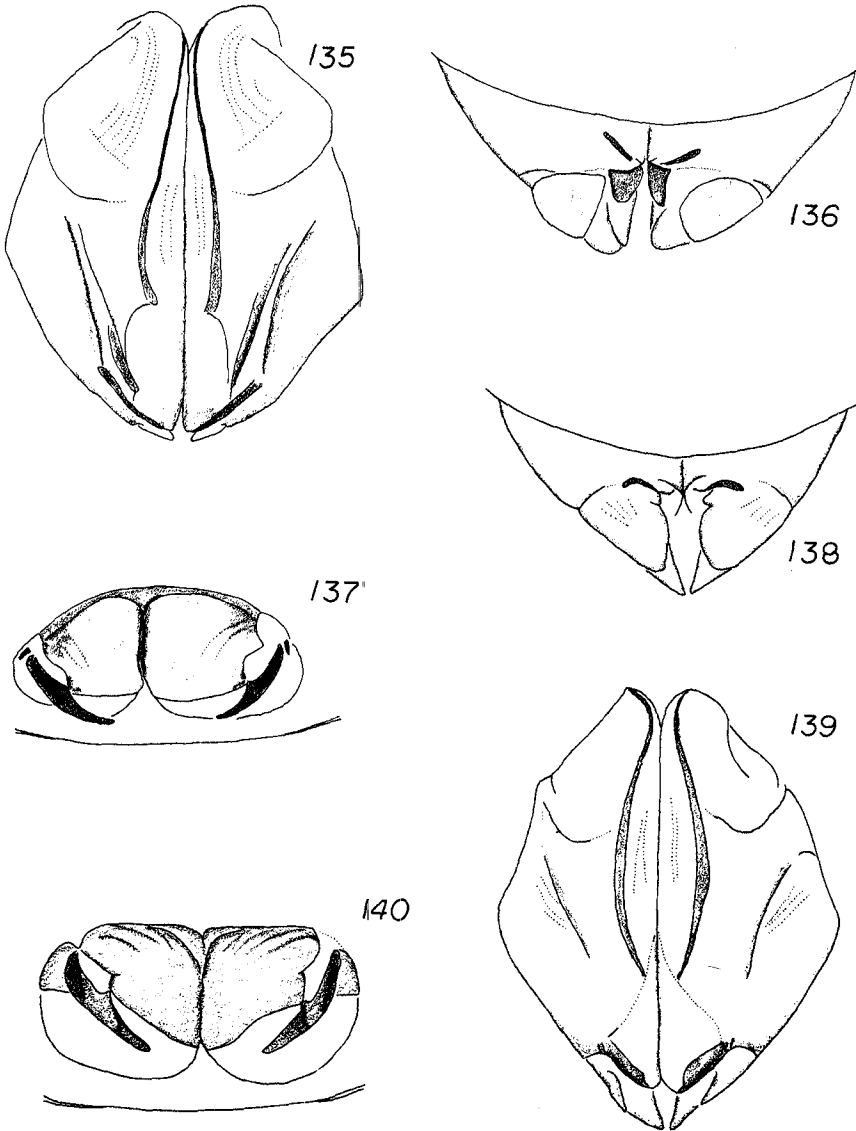
Genital Operculum. Large, fourth abdominal sternite bent. 4.0 mm long, 5.5 mm wide. Opisthogeminate organ as in Figs. 154 and 155. Abdomen 9.8 mm long.

Trichobothria. As in Fig. 162. Ratios: sbc 0.52, bt 0.31.

Pedipalps. Figs. 102-107. Covered with sharp, pointed setae. Trochanter with four spines. Center of anterior surface without a spine. Femur, Fd-1 small, occult by Fd-2. Fd-2 longer than Fd-3. Fd-4 a short tubercle. Fd-5 longer than Fd-6. Fv-1, Fv-2 and Fv-3 without a common base. Fv-4 obsolete. Fv-3 longer than Fv-6. Tibia, Td-6 longer than Td-1 and more than half the length of Td-2. Td-2 distinctly longer than Td-6. Td-4 longer

than Td-2 and Td-6. Td-3 same size as Td-5. Tv-4 shorter than Tv-1 and longer than Tv-6. Tv-2 longer than Tv-5. Basitarsus, Bd-1 inconspicuous, a basal appendage to Bd-2. Bv-3 shorter than Bv-1, both very reduced in size. Bv-1 longer than Bd-1. Pedipalp tarsus and post-tarsus completely fused. Tarsus without small spine on proximal end of dorso-inner lateral surface. Femur 5.2 mm long; tibia 5.9 mm long, 2.0 mm wide; basitarsus 2.9 mm long, 1.4 mm wide; tarsus 3.1 mm long.

Legs. Covered with sharp, pointed spines and setae. Second tarsomere of all tarsi without light transverse complete line on distal end. Antenniform leg: 12.2 mm, femur;



Figs. 135-140.—*Phrynus damonidaensis* new species: opisthogeminate organs, 135 = dorsal view, 136 = ventral view; 137 = female gonopods, dorsal view. *P. levii*, new species: opisthogeminate organs, 139 = dorsal view, 138 = ventral view; 140 = female gonopods, dorsal view.



rest is missing. Leg II: 9.0 mm, femur; 12.4 mm, tibia. Leg III: 10.0 mm, femur; 13.5 mm, tibia. Leg IV: 8.4 mm, femur; 13.0 mm (5.6/0.9/2.3/4.2), tibia; 2.1 mm (0.9/0.3/0.1/0.8), tarsus.

Female Genitalia (Colima, Mexico). As in Fig. 157.

**Natural History.**—It has been collected from under the bark of trees in Oaxaca and Jalisco, Mexico. In Oaxaca it has also been found under rocks in a pine-oak forest, and in a thorn forest under stones and under dead cactus. One female collected in Jalisco, Mexico, was carrying 40 praenymphs and 2 protonymphs, found under bark near a beach. *Phrynus operculatus* appears to be a strictly epigeal species.

**Distribution.**—USA: Texas, Big Bend area. Mexico: states of Nuevo Leon, Sinaloa, Nayarit, Jalisco, Guanajuato, Colima, Michoacan, Guerrero, Morelos, Oaxaca and Chiapas. Guatemala.

### On the Identity of *Phalangium palmatum* Herbst

The identity of *Phalangium palmatum* Herbst, 1797, type species of the genus, has been the source of numerous contradictory opinions mainly because there was no collection place indicated and the diagnostic features given by Herbst had to wait for a revision of the poorly characterized species to be recognized. The type specimen appears lost from the Zoologisches Museum der Humboldt, Berlin (Dr. M. Moritz, personal communication). This was the institution where Herbst worked. I have identified Herbst's *palmatum* as *Phrynus operculatus* Pocock 1902 on the following grounds:

a. It has the typical "palmatus" look that Herbst so well described: "manus palforem glaber, inflatus, quinque spinus palmatus" (p. 82).

b. It has four spines on the dorsal border of the pedipalp femur. Herbst illustration on Fig. 2 of pl. 4 contradicts this point, showing five spines instead of four. I assume the drawing is not accurate in this aspect. Only three *Phrynus* species have four spines on the dorsal border of the pedipalp femur: *P. whitei* with a peculiar silver design behind the eyes and a distal displacement of the spines dorsally on the pedipalp tibia, neither illustrated or stated in Herbst's work; *P. parvulus*, with a distinctive banding on the femora of the ambulatory legs, not stated nor illustrated by Herbst; and *P. operculatus*, that has Td-4 longer than Td-2 and the dorsal spines on the pedipalp tibia not distally displaced, as in Herbst's illustration.

c. Td-3 is slightly shorter or same size as Td-5 in Herbst's illustration. *Phrynus operculatus* has Td-3 same size as Td-5.

The only other species of *Phrynus* that comes close to the above description is *Phrynus goesii*: it has Td-3 slightly shorter than Td-5, Td-4 longer than Td-2, dorsal spines on pedipalp tibia not distally displaced, and no bandings on the femora of the ambulatory legs. But it has five spines on the pedipalp femur, and does not have the "palmatus" look, belonging to the group of the largest body size *Phrynus* species. The specimen illustrated by Herbst appears as a small *Phrynus* (no measurements were given). Because of the difficulty of explaining how a specimen of *Phrynus operculatus* (species that ranges from Texas, USA, to Guatemala) reached "the insectary of Baron von Block" in Kiel (now West Germany), where Herbst purchased specimens, and the contradictions with Herbst's description indicated below, I had originally placed *Phalangium palmatum* as species *incertae sedis*. The contradictory details are:

1. Distally to Td-5, Herbst mentioned there was only one small spine. No *Phrynus* species has only one spine distally to Td-5. *P. operculatus* has two spines, *P. goesii* has three.

2. Basitarsus of pedipalp with two spines dorsally and two ventrally in *Phalangium palmatum*. *P. operculatus* has a third, very small spine both dorsal and ventrally on the basitarsus; *P. goesii* has three spines dorsally and three ventrally on the pedipalp basitarsus.

The Law of Priority indicates that if two names are synonyms, then it is the older name that must be used as the valid name. Thus the name *palmatum* could not be legally rejected in favor of a junior synonym, *operculatus*. But it would have been an incorrect step against stability of nomenclature, as laid down in the preamble of the I.C.Z.N., to rename *P. operculatus* with an older name, one that has often been used incorrectly to identify several species of *Phrynus*, as it has been found on a large number of museum specimen labels, and that has a confused history of misidentifications. The description of *operculatus* has been used correctly for identifications since 1902 and the name describes very well the unique character of the species, male with large genital opercula. The "palmatum" character (digitated dorsal spines on the pedipalp tibia) is present in several species of *Phrynus*. The logic consequence of this argument is to request the Commission to use its plenary powers: (a) to suppress the specific name *palmatum* Herbst, 1797, as published in the binomen *Phalangium palmatum*, for the purpose of the Law of Priority but not for those of the Law of Homonymy; and (b) to set aside all designations of type-species for the nominal genus *Phrynus* Lamarck, 1801, made prior to the Ruling now requested and, having done so, to designate *Phrynus operculatus* Pocock, 1902a, to be the type-species of that genus.

### *Phrynus* Incertae Sedis

*Phrynus pinarensis* Franganillo 1930:48-49. Holotype from Sierra del Cuzco, Cordillera de los Organos, Pinar del Río, Cuba probably unlabeled in the Academia de Ciencias de Cuba.

*Phrynus rangelensis* Franganillo 1938:162, 1 male, 1 female. Syntype from Sierra de Rangel, Pinar del Río and Baracoa, Oriente, Cuba, probably unlabeled in the Academia de Ciencias de Cuba.

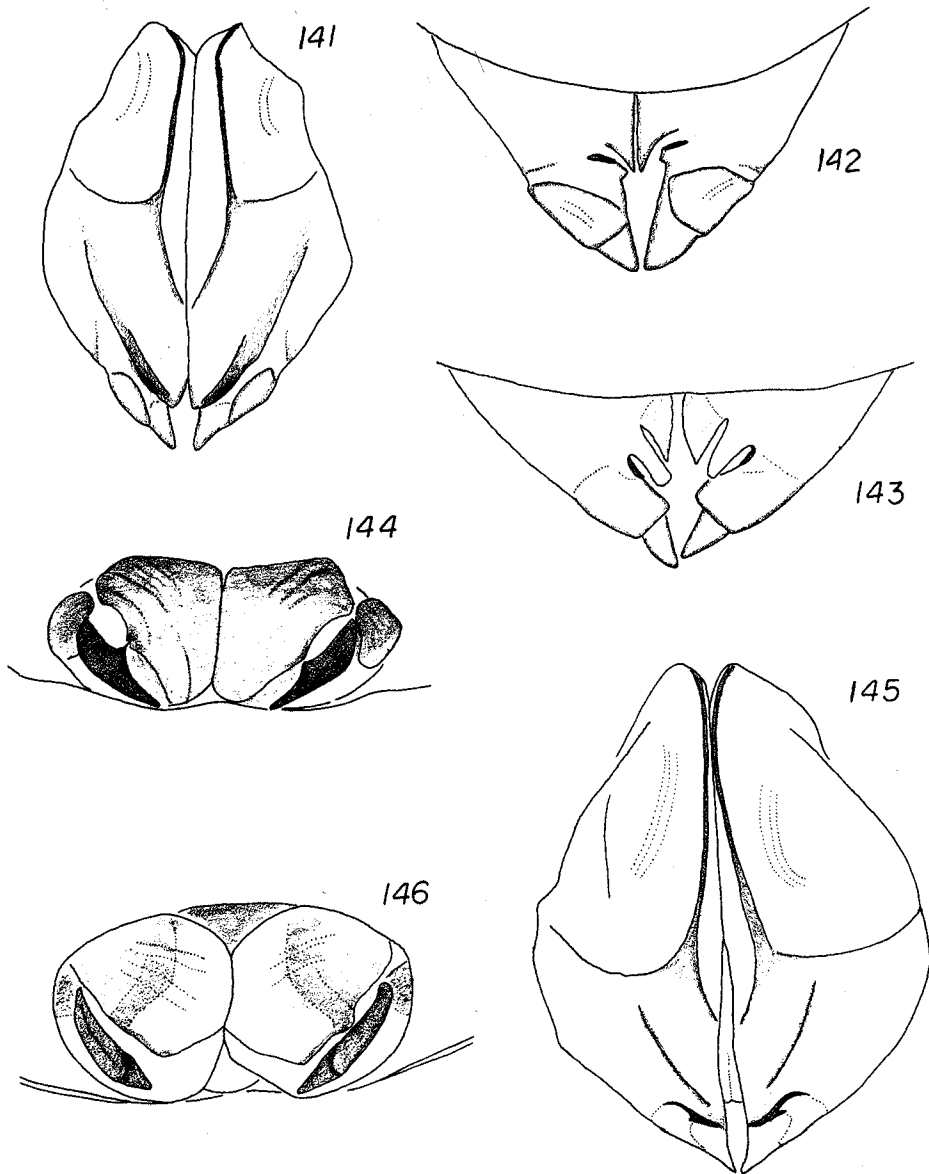
*Phrynus viridescens* Franganillo 1938:162-3. Holotype from Sierra de Rangel, Pinar del Río, Cuba.

I have been unable to examine the type material of Franganillo deposited in the Academia de Ciencias de Cuba because his specimens are unlabeled and marked only with numbers, but the catalogue is lost. Thus it is not possible to determine which specimen is the holotype or syntype. Franganillo descriptions are fragmentary at best and his species cannot be recognized.

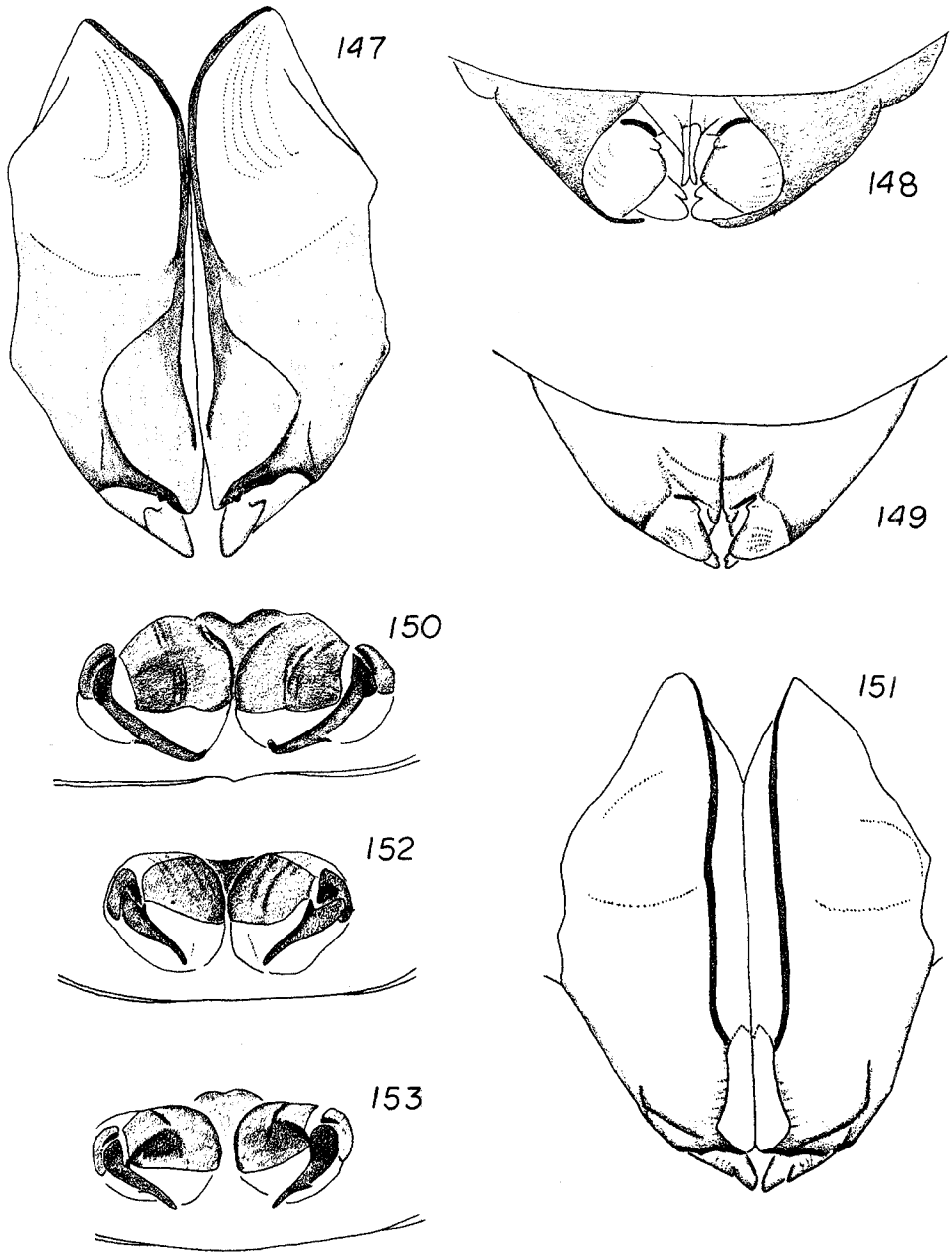
For *Phrynus pinarensis*, Franganillo described only the spination of the pedipalp trochanter and basitarsus and indicated that the subfrontal process was visible from above. The spination of the trochanter and the basitarsus does not allow species recognition. Of the four species described as present in Cuba (*Phrynus armasi*, *P. damonidaensis*, *P. marginemaculatus* and *P. levii*), none has the subfrontal process visible from above.

*Phrynus rangelensis* has the pedipalps black except the distal end of the basitarsus and tarsus which are red. The closest looking species from Cuba is *P. marginemaculatus* because the other species, *P. armasi*, *P. damonidaensis*, and *P. levii* are light colored. Like *P. marginemaculatus*, *P. rangelensis* has Td-4 shorter than Td-2 but differs in having Fv-3 longer than Fv-6 and because *P. marginemaculatus* reaches a maximum length of 18.0 mm while *P. rangelensis* syntype female is 23.0 mm long and the syntype male is 19.0 mm long.

The description of *Phrynus viridescens* is absurd, giving in part a description of a spider and part of an amblypygid.



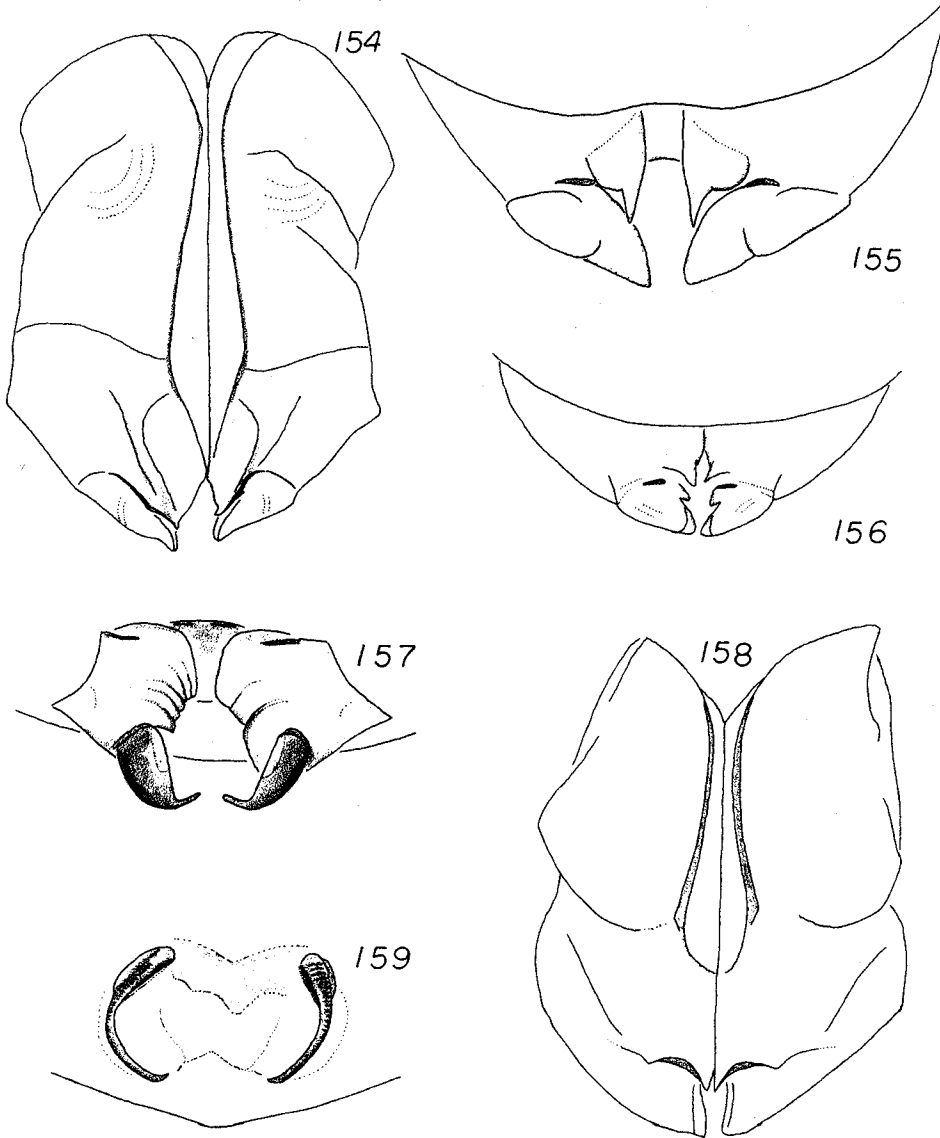
Figs. 141-146.—*Phrynus marginemaculatus* C. L. Koch: opisthogeminate organs, 141 = dorsal view, 142 = ventral view; 144 = female gonopods, dorsal view. *P. whitei* Gervais: opisthogeminate organs, 145 = dorsal view, 143 = ventral view; 146 = female gonopods, dorsal view.



Figs. 147-151.—*Phrynus gervaisii* (Pocock): opisthogeminate organs, 147 = dorsal view, 148 = ventral view; 152 = female gonopods, dorsal view. *P. tessellatus* (Pocock): opisthogeminate organs, 151 = dorsal view, 149 = ventral view. *P. santarensis* (Pocock): 150 = female gonopods, dorsal view. *P. barbadensis* (Pocock): 153 = female gonopods, dorsal view.

NATURAL HISTORY OF *PHRYNUS*

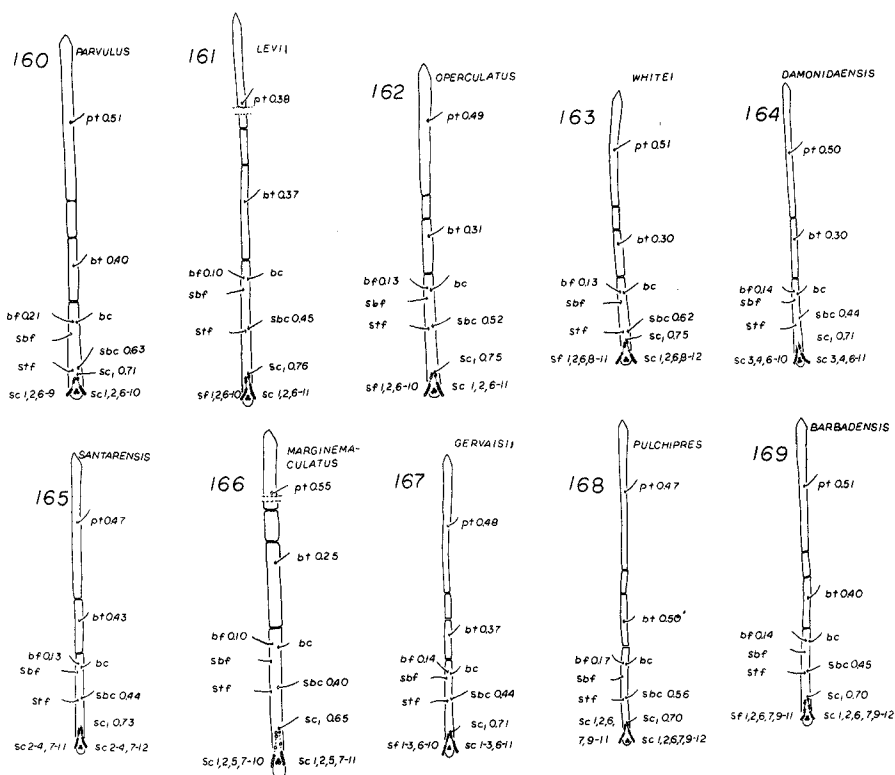
*Phrynus marginemaculatus* C. L. Koch is the only species of *Phrynus* that has some information published on its life history, ecology and behavior (Muma 1967, Weygoldt 1969, 1970, 1972). In the present section, I have summarized the natural history of the genus *Phrynus* and added original information. Most of the body of information has been supplied by collecting labels which lamentably are too frequently incomplete. Because of my own field and laboratory work in Panama, I have been able to learn about the life history of *Phrynus gervaisii* (Pocock).



Figs. 154-159.—*Phrynus operculatus* Pocock: opisthogeminate organs, 154 = dorsal view, 155 = ventral view; 157 = female gonopods, dorsal view. *P. parvulus* Pocock: opisthogeminate organs, 158 = dorsal view, 156 = ventral view. *P. asperatipes* Wood: 159 = female gonopods, dorsal view.

The particular habitat requirements of *Phrynus* appear not to have diversified much among the different species. *Phrynus* species are usually encountered in secluded, humid, and cool habitats. In general, open, sunny and dry places are unfavorable habitats. Collections of *Phrynus asperatipes* Wood from under rocks in a sand dune area (Baja California Sur) represent the most xeric conditions under which a species of *Phrynus* has been found. Within favorable habitats, individuals tend to aggregate and numerous specimens could be collected from a single cave. No information is available on the densities they could reach. In the humid forest of Madden Forest Preserve, Canal Zone, I have found from one to sixteen individuals (average five) of *Phrynus gervaisii* living on the corozo palm, *Scheelea zonensis* Bailey. Seldom are pairs or adults with young found occupying the same space between the trunk and a base of a frond of the palm. They appear to be solitary of habit and this has been cooperated in captivity where each individual prefers to occupy a different refuge inside a cage.

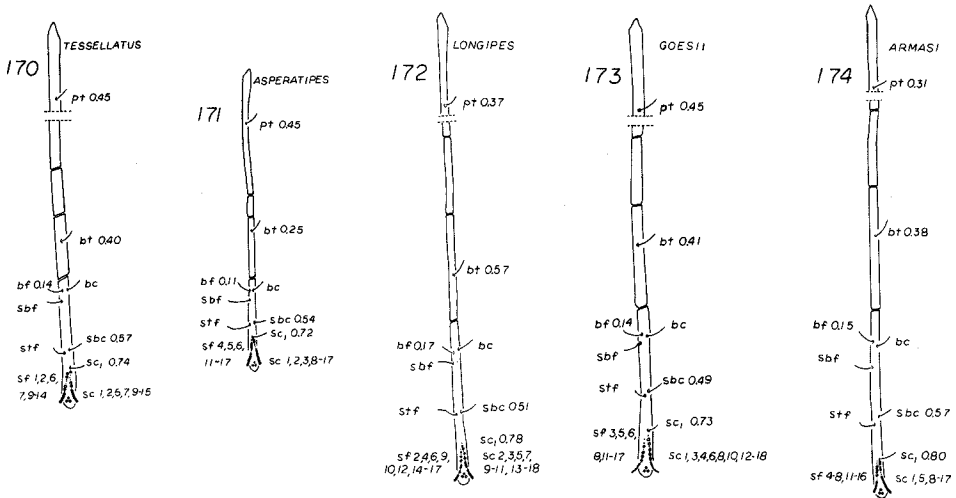
Available information on *Phrynus armasi*, *P. longipes* and *P. levii* suggests that they live in caves and probably are troglophiles. Except for *P. longipes* that frequently occurs outside of caves, it is not known whether or not the other species can also occur outside of caves. All three are light-colored species, but with normal eye formation. The other two light-colored species, *P. asperatipes* and *P. damonidaensis*, appear to be epigeal in habits. Both have been found under rocks and *P. asperatipes* also along creeks and in a



Figs. 160-169.—Tibia of left leg IV, trichobothria present and ratios: 160, *P. parvulus* Pocock; 161, *P. levii*, new species; 162, *Phrynus operculatus* Pocock; 163, *P. whitei* Gervais; 164, *P. damonidaensis*, new species; 165, *P. santarensis* (Pocock); 166, *P. marginemaculatus* C. L. Koch; 167, *P. gervaisii* (Pocock); 168, *P. pulchripes* (Pocock); 169, *P. barbadensis* (Pocock).

palm oasis. The remaining ten species of *Phrynus* are dark colored. Of these, the following four appear to be strictly epigeal in habits: *P. tessellatus*, *P. marginemaculatus*, *P. santarensis*, and *P. operculatus*. *Phrynus marginemaculatus*, *P. santarensis*, and *P. gervaisii* have been collected from occupied houses and particularly *P. marginemaculatus* is found commonly in Florida under abandoned trash left by man. *Phrynus gervaisii* less frequently is found in similar habitats, and occasionally on the floor of the Chilibrillo Cave in Panamá. *Phrynus santarensis* from Santarem, Brazil, is the only species of the Phryniidae that has been collected from a termite's nest. The single record was given by Pocock in 1897. One species of *Charinus* and *Paracharon caecus* Hansen, both members of the Charontidae, have lost their eyes, are pale and live inside termite's nests. *Phrynus whitei* and *P. pulchripes* have been collected from caves and also from under rotten logs in forests. *Phrynus pulchripes* has also been found under stones and under coconut husks on a beach.

*Phrynus* species, like other amblypygids, are nocturnal in habits. During the night they come out from their hideouts in search of food and to mate. Nothing is known about their feeding habits in nature but from caged animals. They are raptorial predators and use their spiny pedipalps like spiny cages to capture and hold the prey, frequently still intact after capture, while they dig into them with their chelicerae and carry out a preoral liquefaction of the prey. For orientation and search for prey and water, they use their antenniform legs to carry sensory information, as whips during aggressive interactions, and during the prolonged courtship (Weygoldt 1969; personal observations on *P. gervaisii*). Although no published data is available on visual acuity, I have carried out some experiments covering the eyes (medial and lateral ocular groups) of *P. gervaisii* and found out that, when offered a prey (cricket or roach), the blindfolded animal can continue to capture prey without apparent difficulty. They frequently autotomise or fragment their antenniform legs without harm to the animal. If both antenniform legs are lost, they cannot capture prey, but such lost legs will be fully regenerated during the nest ecdysis.



Figs. 170-174.—Tibia of left leg IV, trichobothria present and ratios: 170, *P. tessellatus* (Pocock); 171, *P. asperatipes* Wood; 172, *P. longipes* (Pocock); 173, *P. goesii* Thorell; 174, *P. armasi*, new species.

Although adults of *Phrynus* lack pulvilli on the tarsi of their ambulatory legs and thus cannot walk on smooth surfaces, the praenymphs do have pulvillus-like projections on the tarsi of their ambulatory legs. These are the stages that cling around the mother's abdomen after birth. These projections might serve at this stage to get a better grasp of their mother's abdomen (Quintero 1975) and are lost when the protonymphs are formed, leaving their mother to start their free lives.

For a description of the mating behavior of *Phrynus marginemaculatus*, see Weygoldt (1969). My observations on the mating of *P. gervaisii* found it takes place in a remarkably similar way.

Several weeks or months after mating, *Phrynus marginemaculatus* lays a batch of eggs inside a brood sac. This is lentil-shaped and fits between the concave sides of the opisthosoma. The anterior end of the sac is held by the claw-like sclerites of the female gonopods, under the genital operculum. The sac hardens in about 12 hours and becomes gray-brown and with two or three layers. Eggs average 1.5 mm in diameter. The number of eggs varies according to the species and the size of the female. Muma (1967) found it varies from 17 to 36, with a mean of 24, for *Phrynus marginemaculatus*. It varies from 7 to 50, with a mean of 22, for *P. damonidaensis*. For *P. gervaisii* it varies from 9 to 24, with a mean of 15. During the development of the embryos the female is free to walk around and to capture prey. The development of the embryos in *P. marginemaculatus* takes from 91 to 105 days (Weygoldt 1970). The praenymphs, unpigmented, come out of the brood sac, an operation which lasts for several hours and cling to their mother's abdomen. The first free-living stage, the protonymph, leaves immediately the body of the mother after molting. They are still light-green in color.

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## LITERATURE CITED

- Blanchard, E. 1852-1864. L'Organisation du regne animal. 2 Livre, Arachnida, pp. 168-201, pl. 10-11.
- Browne, P. 1789. The Civil and Natural History of Jamaica. London, Vol. 2: 419-420, pl. 41, Fig. 3.
- Butler, A. G. 1873. A monographic revision of the genus *Phrynus*. Ann. Mag. Nat. Hist., 12:117-125.
- Delle Cave, L., and M. Simonetta. 1975. Taxonomic notes on the Amblypygi (Arachnida, Chelicerata) from Ethiopia and Somalia. Monitore Zool. ital. (N.S.), suppl., 6:141-166.
- Fabricius, J. C. 1793. Etomologia Systematica, 2:407-438.
- Franganillo, B. P. 1930. Mas arácnidos nuevos de la isla de Cuba. Mem. Inst. Nac. Invest. Cient. Mus. Hist. Nat., La Habana, 1:45-99, 21 Figs.
- Franganillo, B. P. 1938. Arácnidos Cubanos estudiados desde 1930 hasta 1934. Mem. Soc. Cubana Hist. Nat., 8:145-168, 4 Figs.
- Gervais, M. P. 1842. Sur le genre *Phrynus* et *Solpuga*. Bull. soc. Philomatic, Paris, 5:19-22.
- Gervais, M. P. 1844. Histoire Naturelle des Insectes Aptères. Walkenaer III: 1.
- Herbst, J. F. 1797. Natursystem der ungeflügelten Insecten, 1:65-86, pl. 3-5.
- Karsch, F. 1879. Ueber eine neue Eintheilung der Tarantuliden (Phrynidae aut.). Archiv. f. Natur., 45:189-197.
- Koch, C. L. 1841. Die Arachniden. Nürnberg, 8:1-131, pl. 253-288.
- Kraepelin, K. 1895. Revision der Tarantuliden Fabr. (Phryniden Latr.). Abh. Nat. ver. Hamburg, 13:1-53, 1 pl.
- Kraepelin, K. 1899. Skorpiones und Pedipalpi. Pedipalpi. Das Tierreich, 8. R. Friedländer und Sohn, Berlin. 265 pp.
- Lamarck, J. B. 1801. Systeme des Animaux sans vertebres. Paris. First ed. 432 pp.
- Linnaeus, C. 1758. Systema naturae. 10th ed. Holmiae. 821 pp.
- Lönningberg, E. 1897. Skorpioner och Pedipalper. I. Upsala Universitets Zoologiska Museum. Ent. Tidskr., 18:175-192.
- Mello-Leitão, C. 1931. Pedipalpos do Brasil e algumas notas sobre a Ordem. Arch. Mus. Nac. Rio Janeiro, 33:7-72, 3 pl.
- Mello-Leitão, C. 1946. Nuevos arácnidos sudamericanos de las colecciones del Museo de Historia Natural de Montevideo. Comun. zool. mus. Hist. Nat., Montevideo, 2(35):1-10.
- Mullinex, C. L. 1975. Revision of *Paraphrynus* Moreno (Amblypygida: Phrynidae) for North American and the Antilles. Occ. Papers Calif. Acad. Sci., 116:1-80, 30 figs., 1 table.
- Mullinex, C. L. 1979. A new *Paraphrynus* from Yucatan (Amblypygida, Tarantulidae). J. Arachnol., 7:267-269.
- Muma, M. H. 1967. Scorpions, whip scorpions and wind scorpions of Florida. Arthropods of Florida, Florida Dept. Agric., 4:1-28.
- Pereyaslawzewa, S. 1901. Développement embryonnaire des Phrynes. Annales. Sci. nat., Zoologie (8), 13:117-304.
- Pocock, R. I. 1893. Contributions to our knowledge of the Arthropod fauna of the West Indies. Parts 1 and 3. Scorpiones and Pedipalpi, with a supplementary note upon the freshwater Decapoda of St. Vincent. J. Linn. Soc., Zool., 24:404-409; 527-544, 2 pl.

- Pocock, R. I. 1894. Notes on the Pedipalpi of the family Tarantulidae contained in the collection of the British Museum. *Ann. Mag. Nat. Hist.*, 14(6):273-298.
- Pocock, R. I. 1897. Reports upon the Scorpions and Pedipalpi. *Ann. Mag. Nat. Hist.*, 19(6):357-368.
- Pocock, R. I. 1902a. *Biologia Centrali-Americana: Arachnida, Scorpiones, Pedipalpi, and Solifugae*. Taylor and Francis, London, 71 pp, pl. 1-12.
- Pocock, R. I. 1902b. A contribution to the systematics of the Pedipalpi. *Ann. Mag. Nat. Hist.*, 9:157-165,
- Quintero, D. 1975. Scanning electron microscope observations on the tarsi of the legs of the amblypygids (Arachnida, Amblypygi). *Proc. 6th Int. Arachn. Congr.*, 1974: 161-163, 2 pl.
- Quintero, D. 1976. *Trichodamon* Mello-Leitão and the Damonidae, new Family status (Amblypygi: Arachnida). *Bull. Birt. Arachnol. Soc.*, 3(8):222-227.
- Quintero, D. 1979. Sobre *Paraphrynus emaciatus* Mullinex, *P. leptus* Mullinex (Amblypygi: Phryniidae) y el dimorfismo sexual en los amblypygidos. Cuaderno de Ciencias No. 3:15-24. Ed. Universitaria, Panamá.
- Quintero, D. 1980. Systematics and Evolution of *Acanthophrynus* Kraepelin (Amblypygi, Phryniidae). *Proc. 8th Int. Arachn. Congr.*:341-347.
- Simon, E. 1892. Arachnides des îles Philippines. Appendice. Remarques sur la classification des Pédipalpes de la Famille des Tarantulidae. *Ann. Soc. ent. France*. 61:43-52.
- Simon, E. 1897. On the Spiders of the Island of St. Vincent. Part 3. *Proc. Zool. Soc. London*:860-890.
- Thorell, T. 1889. Arachnidi Arthrogastri Birmani. *Annali Mus. Civico Storia Nat. Genova*, 7(2):521-729, pl. 5.
- Werner, Fr. 1902. Die Scorpione, Pedipalpen und Solifugen in der Zoologisch-vergleichend-anatomischen Sammlung der Universität Wien. "Verhandlungen" der K.K. zool-bot. gesellschaft in Wien, 595-608.
- Weygoldt, P. 1969. Beobachtungen zur Fortpflanzungsbiologie und zum Verhalten der Geisselspinne *Tarantula marginemaculata* C. L. Koch (Chelicerata, Amblypygi). *Z. Morph. Tiere*, 64:338-360.
- Weygoldt, P. 1970. Lebenszyklus und postembryonale Entwicklung der Geisselspinne *Tarantula marginemaculata* C. L. Koch (Chelicerata, Amblypygi) im Laboratorium. *Z. Morph. Tiere*, 67:58-85.
- Weygoldt, P. 1972. Morphologisch-histologische Untersuchungen an den Geschlechtsorganen der Amblypygi unter besonderer Berücksichtigung von *Tarantula marginemaculata* C. L. Koch (Arachnida). *Z. Morph. Tiere*, 73:209-247.
- Weygoldt, P. 1975. Untersuchungen zur Embryologie und Morphologie der Geisselspinne *Tarantula marginemaculata* C. L. Koch (Arachnida, Amblypygi, Tarantulidae). *Zoomorphologie*, 82:137-199.
- Wood, H. C. 1863a. Description of new species of North American pedipalpi. *Proc. Acad. Nat. Sci.*, Philadelphia, 107-112.
- Wood, H. C. 1863b. On the pedipalpi of North America. *J. Acad. Nat. Sci.*, Philadelphia, 5:357-376.

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