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THE GENUS ASTHENOPODES (EPHEMEROPTERA)

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Among specimens collected in field trips organized by the Departments of Zoology and Entomology of the Facultad de Humanidades y Ciencias of Uruguay are several female mayflies and a single male which by reason of wing venation fall into the genus *Asthenopodes*. The male, an imago in excellent condition, seems almost certainly to be of the species *albicans* (Pictet), known up to this time from a single specimen taken in Brazil. This, the type specimen, in the Vienna Museum (ULMER, 1921, 1924), lacks the hind wings, some of the middle and hind legs, the distal joints of the fore legs, and the apical portion of the abdomen. ULMER (1921) studied two male specimens in this museum, both of which were placed under *Campsurus albicans* Percheron, and bore the labels: "Pictet vidit". After careful comparison of these two specimens with Pictet's description and figures of *albicans*, ULMER was convinced that only one of these males fitted the description, but that some of PICTET'S figures may well have been made from the other specimen also. The male which does *not* fit PICTET'S description is, according to ULMER, a species of *Campsurus*, as is also the specimen which PERCHERON described as *Ephemera albicans* (PERCHERON, 1838). These two species under the name *albicans*, —PICTET'S and PERCHERON'S—, are widely separated from one another (Ulmer). The one male which corresponds well with PICTET'S description was redescribed by ULMER, first in the genus *Asthenopus* (1921), but later (1924) transferred by him to the genus *Asthenopodes* which he erected for that species. As of the present time, therefore, *Asthenopodes* is a monotypic genus. In 1950, the writer figured fore and hind wings and genitalia of a male specimen in the Cornell University Entomological Collection—, a specimen which by reason of its venation must be placed in the genus *Asthenopodes*. No specific name could be assigned to this male,

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however, as it was impossible to locate the body of the insect. It seems probable that it represents still another species, since the wing length of 8½ mm. is far too short for that of *albicans,* which has a wing length of about 13 mm. This small male was taken at Kartabo, British Guiana. Further discussion of it appears later in this paper.

A description of the male imago from Uruguay is presented here, along with figures of wings, genitalia and legs. What may at first seem to be discrepancies between this description and that given by ULMER for the type specimen of *albicans* are doubtless due to the fact that the male from Uruguay is in alcohol, whilst the type is a dried specimen. It is worthy of note that neither the hind wing nor the genitalia of this species have been known heretofore. Likewise, females of this genus have not been previously reported. The females taken in Uruguay are designated as *Asthenopodes sp.,* since they differ so much in coloration from the male. It may well be, however, that these are in reality the females of *albicans.* The nymph of the genus *Asthenopodes* is likewise unknown.

ASTHENOPODES ALBICANS (Pitcet) nec Percheron

1843-45 Pictet, Hist. Nat. Ephem.: 149. Pl. 13, Fig. 1 (in Palingenia).

1883 Eaton, Revis. Monograph: 40 (in Campsurus).

1921 Ulmer, Arch. f. Naturg. 87, A (6): 239. Fig. 8 (in Asthenopus).

1924 Ulmer, Konowia 3 (1-2): 26. Genus Asthenopodes erected for this species.

Male imago (specimen in alcohol).

Body 11 mm.; fore wing 12 mm.; fore leg 11 mm., including claws; outer tails 32 mm.

Eyes black; separated by distance 2½ to 3 times the diameter of each eye. Lateral ocelli larger than the median. Head reddish brown above, very heavily shaded with black; all of ventral surface, and region around bases of antennae, yellowish. Antennae pale yellowish white; scape and pedicel each shaded with grayish apically. Thorax yellowish with faint reddish brown tinge; meso - and metanota appear flesh - colored against a white background. Pronotum narrow, with mere indication of a very slight "hump" medially, on anterior margin; posterior margin and median area shaded with gray; blackish markings above base of fore leg. Mesonotal scutellum and triangular area just preceding it, shaded with blackish, as is also scutellum of metanotum. Joinings of principal sclerites of pleural and

sternal regions orange to reddish brown. Thoracic sternum paler than pleura; midlines of meso-and metasterna narrowly paler than adjoining areas.

Black shading on fore coxa. Femur and tibia of fore leg faintly purplish, femur tinged with brown medially, margins yellowish. Tarsus yellowish white, claws yellow to pale orange; joinings of tarsal segments white. Claws of unequal length; each ends in a bulbous structure, as shown in Fig. 4. Tibia about 1 1/3 the length of the femur. Tarsus very long, at least 3½ times as long as tibia. Basal tarsal joint so completely fused with apex of tibia as to be barely distinguishable as a separate joint. Second joint is by far the longest, being approximately equal in length to the third and fourth combined; third slightly longer than fourth; distal (fifth) joint about 3/4 of the fourth. Joints of fore tarsus thus rank in descending order: 2, 3, 4, 5, 1. Lengths of tarsal joints of fore leg do not correspond wholly with ULMER's description (1924) of the type specimen, in which it is stated: "Glied II doppelt so lang wie der Schenkel"— (in the Uruguay male, 2½ times as long); "Glied III so lang wie die Schiene" (not quite as long, in the Uruguay specimen). Middle and hind legs much as in *Asthenopus,* —not flattened and finlike as in *Campsurus.* These legs yellowish; a brownish black spot at apex of third femur, and black streak on third tibia. Legs appear as in Figs. 2 and. 3.

Fore wing whitish; costal margin faintly lavender, stigmatic area opaque whitish. Approximately the outer fourth of fore wing and all of hind wing appear distinctly blue-tinged, opalescent, against black background or when held up against the light; membranes in these areas appear beset with minute bluish granules. Principal longitudinal veins of fore wing faintly lavender in basal and middle regions, white toward outer margin except along costal strip. Cross veins in costal and sub-costal spaces as far as bulla likewise lavender, as are those in space behind R1, almost to wing tip. Behind this, cross veins lavender in basal half of wing only. All veins in outer margin whitish, cross veins thickened, as are also the long marginal intercalaries. Two long intercalaries in space between R 2+3 and fork of sector, as ULMER states; but in addition, shorter intercalaries occur between these longer ones and on each side of them. Stem of Rs relatively long in proportion to the entire length of the sector, being approximately 2/5 the length of sector from fork to outer margin. Second long cubital intercalary converges at base toward first intercalary, but is joined to it only by a cross vein at this point; apically it ends in outer margin just before the anal angle. These two intercalaries lie parallel to one another except at

extreme base; first intercalary arises directly from CuA. Two shorter marginal intercalaries present in this area also; many cross veins; second intercalary joined by a few sinuate veins to anal margin. CuP extends more than half the entire anal margin before ending in this margin; many cross veins also behind CuP. In hind wing, main longitudinal veins faintly lavender in basal half, silvery white toward outer margin; all cross veins pale except those in basal costal space. R 2+3 joined to sector at fork by a cross vein or veins only. Many marginal intercalaries, many cross veins; a network of such veins along anal margin. Venation as shown in Fig. 1.

Abdomen yellow. Dorsum appears to have a brownish median streak, discontinous on basal and middle tergites, widest on tergites 5 and. 6. On tergite 1, a brownish triangle on each side of midline, this triangle based on anterior margin. Two brown transverse marks on each side of midline, on tergite 2. On 3 and 4 these lateral brown marks become triangular, apex of triangle not attaining anterior margin; a faintly dark comma-shaped mark surrounded by a pale area lies anterior to this triangle on each side. On 5, 6 and 7 the dark markings form transverse bands occupying the middle of each tergite, but leaving the lateral margins pale; same small dark marks, somewhat comma-shaped, and surrounded by pale areas, lie within this dark transverse band. On 8, 9 and 10 the dark marks form a rather wide mid-dorsal streak; on 8 and 9, an oblique darker streak extends downward to the stigmatic area. Tergites 8-10 opaque, appear reddish brown. Posterior margins of tergites 1 through 6 narrowly darkened, these margins somewhat wider on 4, 5 and 6. On 8 and 9, the *anterior* margin is narrowly blackish. Sternites yellowish, the prominent "patches' on each side adjoining the pleural fold being deeper yellow. No dark markings ventrally, but ganglionic areas of middle sternites opaque whitish.

Tails smooth; very pale yellowish, not darker at joinings (in basal portions, opaque whitish at joinings); almost 3 times as long as body. Middle tail represented by a very short stub, consisting of 7 white ring-like segments, the most apical of which is drawn out into a fine point distally. Forceps yellowish, basal joint lightly shaded with reddish brown. Genital plate and penes light reddish brown except for paler area between penes and their supporting structures. See Figs. 5 and 6 for appearance of the genitalia.

Specimen collected at Sepulturas, Artigas Province, Uruguay, on January 12, 1952; attracted by light, at night, banks of Cuareim River; Sample Nº 12. Collectors: Mr. Carlos S. Carbonell and his colleagues, in field trips mentioned at the beginning of this article.

ASTHENOPODES SP. Females from Uruguay

Female imagos (specimens in alcohol). Seven specimens.

Body 9-10 mm.; fore wing 16-21 mm.; outer tails circa 4 mm.

These are stout, heavy-bodied insects, almost blackish in color, and with membranes of both wings distinctly brown-tinged throughout. Eyes of moderate size, separated by distance approximately equal to four diameters of eye. Lateral ocelli larger than median, as in male. Head deep reddish brown above, pale beneath; a frontal process beneath base of antenna is dark-margined. Scape and pedicel of antenna concolorous with upper surface of head, the scape somewhat the paler. Filament dusky at base, silvery white beyond.

Thorax deep reddish brown. Pronotum shaded with blackish; blackish streaks on pleura preceding wing roots; a narrow median and two submedian black lines on mesonotum; blackish triangle precedes mesonotal scutellum; membranes on each side of this scutellum much paler, yellowish. Metanotum concolorous with pronotum. Paler areas on pleura between middle and hind leg bases, and a narrow pale midventral line on thoracic sternum.

Fore legs thick, clumsy, ending in odd backwardly directed "mitten-like" parts; background color reddish brown, but with considerable blackish shading longitudinally on entire outer surface of leg. Second leg much thinner; femur black-margined, reddish brown except for yellow area along inner margin, and a reddish brown oblique mark basally; tibia (except a black streak basally on outer margin) and tarsus pale reddish brown. Hind leg much longer than second, with which it is practically concolorous; slightly longer than first. Appearance of legs as in Fig. 7.

Wing membrane distinctly tinged with reddish brown, this color most pronounced along costal border of fore wing. Marginal intercalaries present in nearly all spaces along outer margin, but shorter and attached by fewer cross veins to adjacent longitudinals than fore wing of the male *albicans;* these intercalaries and attaching cross veins rather thin and delicate, not thickened as in the male specimen. Between R2+3 and the long intercalary bisecting fork of sector, two long and two shorter intercalaries, the first and fourth being long; of these two, fourth longer than first. Between them the two shorter veins, subequal in some specimens, in others the first longer than second. Short, inconspicuous marginal intercalaries in all spaces in this area. Cubital intercalaries long, much as in male of *albicans;* second of these attached to anal margin by a series of sinuate veins

some of which are forked, others joined to one another by short secondary cross veins.

Abdomen deep reddish black dorsally; a distinct "keel" on mid-dorsal line of basal tergites. Lateral patches on sternites same color as tergites; remaining parts of sternum yellowish, tinged slightly with reddish brown. Apical tergites darker than those preceding. Small, slightly paler submedian marks are very faintly indicated on basal and middle tergites. Apical sternites slightly more brown tinged than those preceding. Ganglionic areas of basal and middle sternites somewhat opaque, whitish. Subanal plate entire, slightly convex on apical margin. Abdomen widens beyond the middle segments, so that the apical portion flares out laterally. At apex the tergites on six of the seven females appear to be telescoped on one another, and the whole abdomen upturned in an odd manner, as shown in Fig. 9, upper. The seventh female, however, appears in corresponding lateral aspect as in same figure, lower. Outer tails short, black except for a narrow pale tip, beset with fine hairs; middle tail short, yellowish red, 4 to 5 mm. in length, being about as long as the third leg. Eggs taken from several of these females, appear as in Fig. 8b. Some eggs appear to have but one lasso-like chorionic string instead of two. The raised plaques on the surface are small, rounded, quite uniform in size.

Collected at Sepulturas, Artigas Province, Uruguay, January 9, 1952, flying in a swarm over waters of the Cuareim River in mid-afternoon; Sample Nº 19. Collectors: Mr. C. S. Carbonell, et al, as indicated for male of *albicans*. Note that this is but three days earlier than the date of collection of the above mentioned male specimen. If these females are indeed of the species *albicans*, there must be a marked sexual dimorphism, at least as to color, in that species.

ASTHENOPODES SP. Male, incomplete, from British Guiana

1950 Traver, Rev. de Entomología 21 (3): 611-613, figs. 20-22.

As previously stated, this incomplete male appears too small for the species *albicans*. The genitalia differ in certain respects from those of the Uruguayan male described as *albicans*. This is most evident as regards the appearance of the penes. A comparison of the genitalia of these two males leads me to conclude that the interpretation suggested in 1950 was in error. The upright parts of the genitalia, —those described as "barrel-shaped at the base, narrowing to a 'neck' region, upon which is borne a 'head'"—, are quite evidently the penes and not processes of the tenth sternite. Between

penes and forceps base are two pairs of additional structures which apparently correspond to similar parts in the genitalia of *albicans;* both these accessory parts and the penes differ in the two specimens.

ASTHENOPUS VS. ASTHENOPODES

Two Neotropical genera, *Asthenopus* Eaton and *Asthenopodes* Ulmer, are included in the subfamily Asthenopodinae of the family Polymitarcidae (EDMUNDS and TRAVER, 1954), along with the African genus *Povilla* Navas. ULMER (1924) has set forth certain characteristics by which to distinguish these three genera from one another, and from the genus *Campsurus* Eaton of a second subfamily, Campsurinae.

Asthenopodes is represented by a single described species, *albicans* (Pictet). Two species have been described in *Asthenopus—, curtus* (Hagen) Eaton, the type species, from Pará, Brazil, and *amazonicus* (Hagen) from Teffé on the Amazon River. In 1942, ULMER presented additional information on these two species: descriptions and figures of wings and genitalia of *curtus* from specimens taken in Paraguay; hind wing of a female specimen of *amazonicus* from British Guiana; and notes on the distinguishing features of the two. SPIETH (1943) reported that two male specimens taken in Venezuela appear to be of the species *curtus;* however, the total length of fore leg vs. body length, as well as relative lengths of the joints of that leg in these males did not agree too well with ULMER's description. Wings and genitalia of a specimen taken in Surinam, tentatively placed in *amazonicus,* are figured by TRAVER (1950). In this paper the type specimen of *curtus* is erroneously stated to have been taken in Paraguay. DEMOULIN (1955) has figured wings and genitalia of male and wings of female specimens from Brazil, which he also places tentatively in *amazonicus.*

In my personal collection are several specimens of *Asthenopus* from Patagonia, taken in 1949 by S. SCHACHOVSKOY. These specimens, one female and several males, appear to represent still a third species of this genus. By comparison of these Patagonian specimens of *Asthenopus* with the Uruguayan specimens of *Asthenopodes,* and by utilization of the material set forth in the papers cited above, some additions may be made to the list of characters by which *Asthenopus* and *Asthenopodes* may be distinguished. A summary of distinguishing features is herewith presented.

Distinguishing features. *Asthenopus* vs. *Asthenopodes*

Asthenopus	*Asthenopodes*
Fore leg vs. fore wing: male	
Shorter: 3/5 to 4/5 of wing.	Approximately as long as wing; Ulmer says: as long or longer; Uruguay ♂ : 11/12 of wing.
Fore tarsus: male	
2½ times as long as tibia.	At least 3½ times tibia.
2nd joint only slightly longer than joints 3, 4, or 5.	2nd joint very long, approximately equal to 3rd and 4th joints together.
2nd joint only about 2/3 of tibia.	2nd joint about 1½ times tibia.
Legs 2 and 3 vs. Leg 1: male	
Leg 2: not quite twice as long as fore tibia.	Leg. 2: 1 1/3 times as long as fore tibia.
Leg 3: almost twice length of 2nd joint of fore tarsus.	Leg 3: only slightly longer than 2nd joint of fore tarsus.
Stem of Rs (fore wings) vs. length of Rs from fork to margin	
Male: stem equal to ¼ of remainder of Rs.	Male: stem equal to 2/5 of remainder of Rs.
Female: stem equals 1/7 to 1/6 of remainder of Rs.	Female: stem equals 1/3 of remainder of Rs.
Intercalaries between R2+3 and bisector of fork of Rs.	
Number variable (may not be reliable feature):	Ulmer says: 2 long, ♂ ;
curtus: 2 long, ♂ ; ♀ unknown.	Brit. Guiana sp.; 2 long, ♂ ;
amazonicus: Ulmer says, 4 long, ♂ , 3 for ♀ ;	Uruguay specimens: 2 long, also 1 medium and 2 short, ♂ ; 2 long, 2 shorter, ♀ .
only 2 (♂) in figures by Traver & Demoulin.	
Patagonian sp.: 2 long, 2 shorter, ♂ ; 2 long, 2 short, 1 medium, ♀ .	
Fork of Rs in hind wing: male	
Rs forked normally,	Upper branch of Rs appears detached basally.

Two long intercalaries between CuA & CuP, fore wing; both sexes

May diverge slightly toward margin; 2nd may reach margin at anal angle or even in edge of anal margin. 1st and 2nd may run together basally, attached then by cross vein to CuA; or, series of cross veins may occur at bases of 1st and 2nd, attaching 1st and 2nd together and each to adjacent longitudinal veins (Patagonian sp.)	Run parallel to one another. Both end in outer margin. 2nd may arise directly from 1st; or attached to 1st by short cross vein and to CuP by longer one, seeming then to end in membrane.

Marginal intercalaries along outer margin: both sexes

No such intercalaries.	Intercalaries present.

Veins attaching 2nd cubital intercalary to anal margin: female

Straight or only slightly curved; seldom forked; not joined by secondary cross veins.	Most are sinuate; several are forked; some are joined together by short secondary cross veins.

Genitalia

Forceps relatively short, stout. Penes rather stout in basal two-thirds, slender apically.	Forceps relatively longer, more slender. Penes more slender throughout their length.

Tails: male

4 to 5 times as long as body.	2 to 3 times as long as body.

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LAMINAS

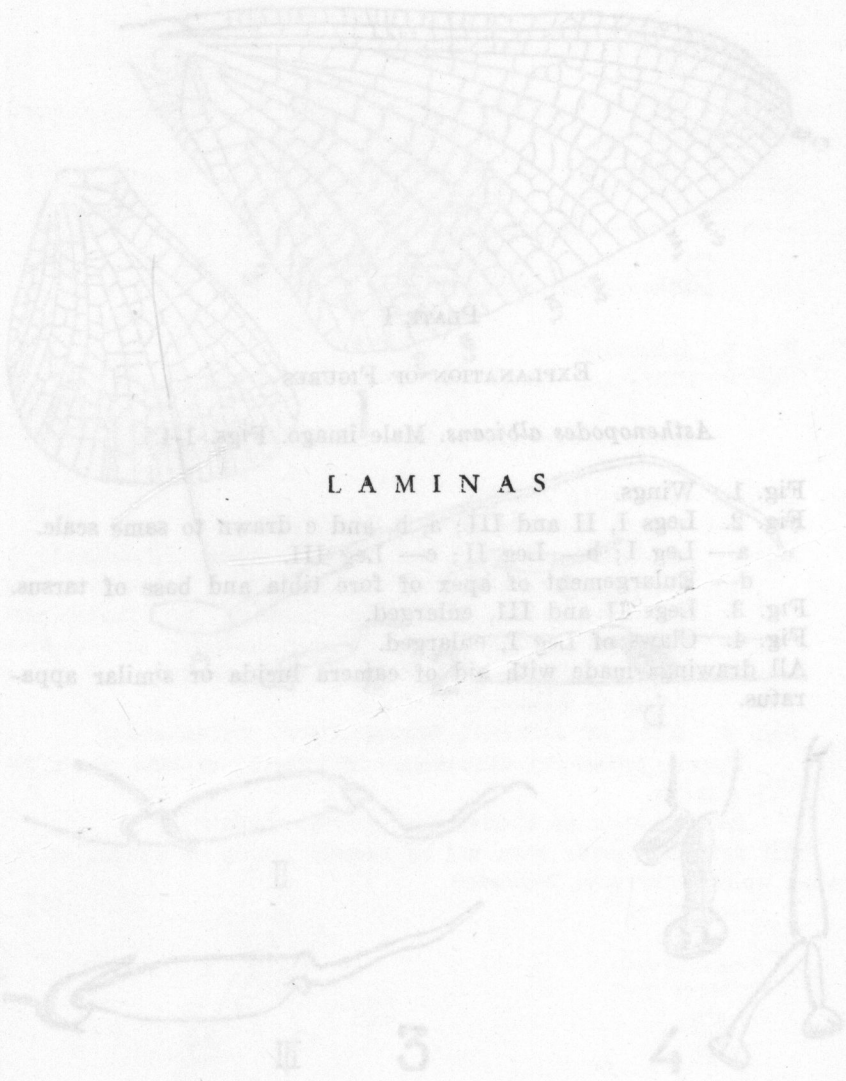
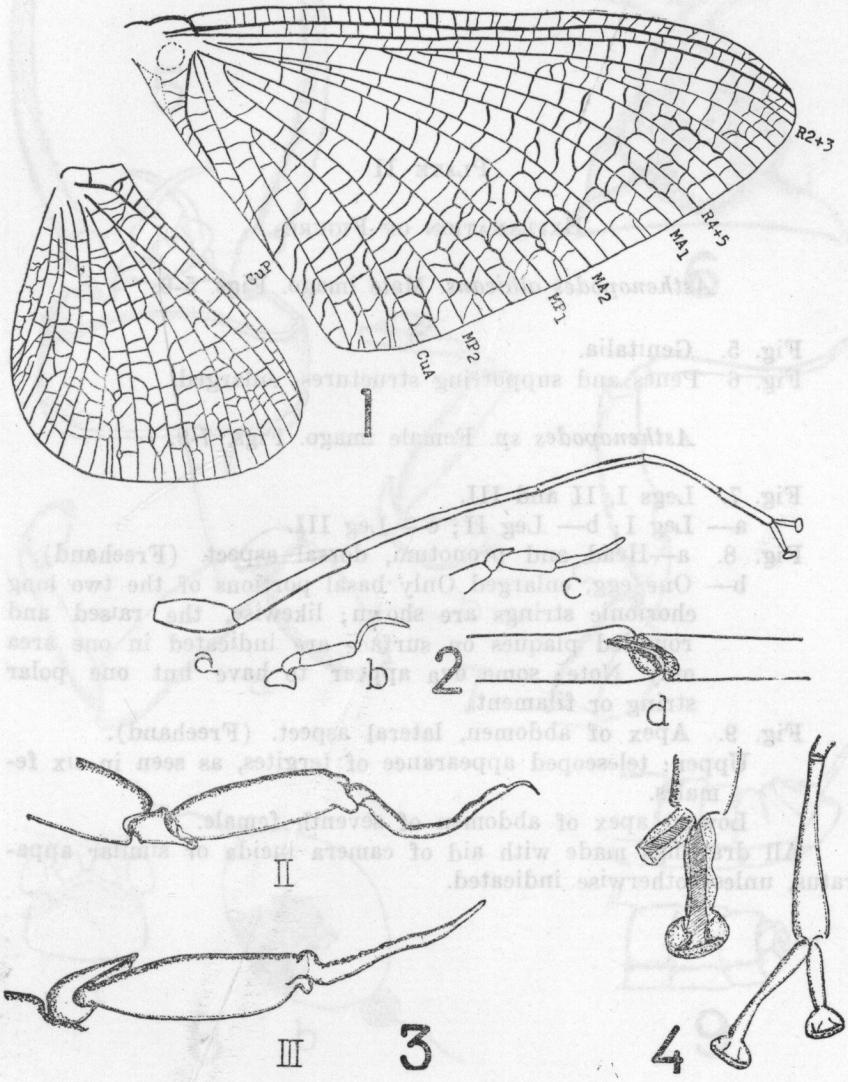


Plate I

Explanation of Figures

Asthenopodes albicans. Male imago. Figs. 1-4.

Fig. 1. Wings.
Fig. 2. Legs I, II and III; a, b, and c drawn to same scale.
a— Leg I; b— Leg II; c— Leg III.
d— Enlargement of apex of fore tibia and base of tarsus.
Fig. 3. Legs II and III, enlarged.
Fig. 4. Claws of Leg I, enlarged.
All drawings made with aid of camera lucida or similar apparatus.


R2+3
R4+5
MA1
MA2
MP1
MP2
CuA
CuP
1
a
b
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II
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Plate II

Explanation of Figures

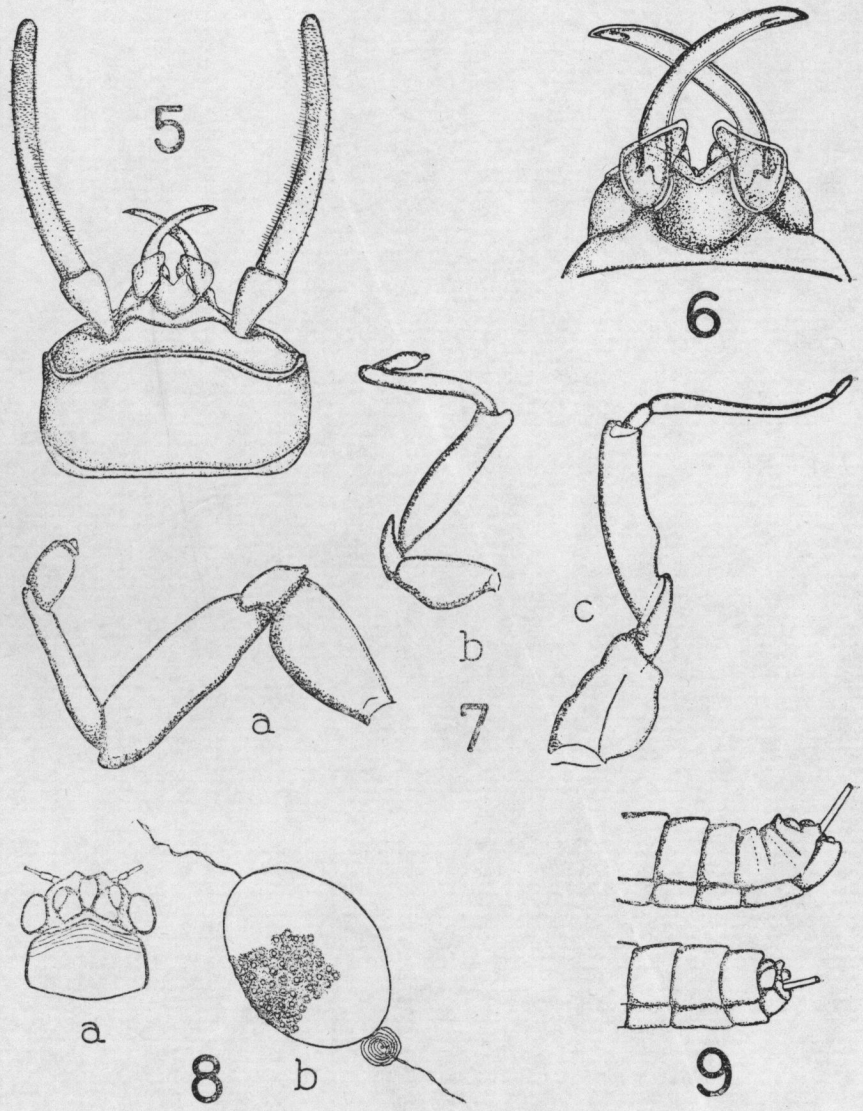
Asthenopodes albicans. Male imago. Figs. 5-6.

Fig. 5. Genitalia.
Fig. 6 Penes and supporting structures, enlarged.

Asthenopodes sp. Female imago. Figs. 7-9.

Fig. 7. Legs I, II and III.
a— Leg I; b— Leg II; c— Leg III.
Fig. 8. a—Head and pronotum, dorsal aspect. (Freehand).
b— One egg, enlarged Only basal portions of the two long chorionic strings are shown; likewise, the raised and rounded plaques on surface are indicated in one area only. Note: some ova appear to have but one polar string or filament.
Fig. 9. Apex of abdomen, lateral aspect. (Freehand).
Upper: telescoped appearance of tergites, as seen in six females.
Lower: apex of abdomen of seventh female.

All drawings made with aid of camera lucida or similar apparatus, unless otherwise indicated.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