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MOSQUITO STUDIES (Diptera, Culicidae)

XXXII. A revision of the genus Haemagogus

By J. Hal Arnell

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MOSQUITO STUDIES (Diptera, Culicidae)

XXXII. A REVISION OF THE GENUS HAEMAGOGUS[1]

by

J. Hal Arnell[2]

INTRODUCTION

The Neotropical genus *Haemagogus* contains several important, if not the principal, vectors of jungle yellow fever. It has been the subject of several relatively recent regional studies (Kumm, Osorno-Mesa and Boshell-Manrique, 1946; Kumm and Cerqueira, 1951a; Levi-Castillo, 1951b) and numerous restricted studies on the taxonomy, ecology and/or disease relations of 1 or more species. However, since Dyar's Mosquitoes of the Americas (1928) the only study encompassing the entire genus, in Lane's Neotropical Culicidae (1953), has a very unsatisfactory coverage. Recently Zavortink (1972:116) enlarged the genus by the transfer of the subgenus *Conopostegus* from the subgenus *Finlaya* of *Aedes*, recognizing 4 species and 4 unnamed forms.

In the present revision I am recognizing only 2 subgenera, *Conopostegus* and *Haemagogus*, the latter including all the generic group taxa listed under the genus *Haemagogus* by Stone, Knight and Starcke (1959). As nothing can be added to the knowledge of the subgenus *Conopostegus* at this time, its treatment is restricted here to its inclusion in the generic description and discussion and in the keys but without consideration of the species. In the subgenus *Haemagogus*, treated in detail, I am recognizing 24 species in 3 sections, the Albomaculatus Section with 14 species, the Tropicalis Section with only the nominate species and the Splendens Section with 9 species. The taxonomy of *Haemagogus* has been based almost entirely on characters of the male genitalia with little regard to the external morphology of the adults or the immature stages. In this study the internal classification of the subgenus *Haemagogus* is based on a consideration of immature stages associated with adults and a critical comparison of usually large series of adults of most species.

I wish to especially thank Pedro Galindo of the Gorgas Memorial Laboratory for discussions allowing me to draw on his considerable experience with and knowledge of the biology, habits and distribution of the Central American *Haemagogus* fauna, and for the loan of specimens. I also wish to thank John N. Belkin for suggesting this study and for reading and criticizing the manuscript; Thomas J. Zavortink for suggestions, advice and many hours of stimulative discussion of the study; Willis W. Wirth for arranging the loan of specimens from the U.S. National

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MATERIAL AND METHODS

The material for this study came primarily from collections made for the project "Mosquitoes of Middle America" (Belkin, Schick et al. 1965) and is deposited at the University of California, Los Angeles [UCLA]. Additional specimens were borrowed from the U.S. National Museum of Natural History [USNM]; the British Museum (Natural History) [BM], including the holotypes of *albomaculatus* and *equinus* and the lectotypes of *obscurescens* and *splendens;* the Staatliches Museum fur Naturkunde in Stuttgart [SMNS], the holotype of *lindneri;* the Faculdade de Higiene e Saude Publica, Sao Paulo [FH], including the holotype of *baresi;* the Centro de Pesquisas Rene Rachou, Belo Horizonte, Brazil [BH]; Gorgas Memorial Laboratory, Panama [GML]; the Department of Biology, University of Utah [Utah]; and the Natural History Museum of Los Angeles County [LACM]. A total of 17,479 specimens was examined, 3088 males, 4296 females, 3830 pupae and 6265 larvae. Included in this total were 2419 individual rearings of which 1326 were larval rearings, 616 were pupal rearings and 477 were incomplete.

The procedures used in this study were primarily those of comparative morphological taxonomy. The form of presentation and terminology and abbreviations used in the descriptions follow Belkin (1962) with later modifications (Belkin, 1968a:72). Descriptions are composites of all available specimens; in 4 instances only a single specimen was available. Illustrations were prepared in general from a single specimen but were corrected to show the modal condition by comparison with most available specimens. On the maps, localities from which I examined specimens are indicated by closed symbols and records from the literature by open symbols. Political subdivisions and locality names in the distribution lists conform to the recommended usage in the Official Standard Names Gazeteers of the United States Board on Geographic Names.

SYSTEMATICS

TAXONOMIC HISTORY. Williston erected the genus *Haemagogus* in 1896 for his new species *splendens* from the island of St. Vincent. Theobald (1901:239) recognized *Haemagogus* as a distinct genus but synonymized *splendens* with *Culex cyaneus* Fabricius, 1805 and later (1903a:308; 1903b:282) added 2 new species described from females only, *albomaculatus* from British Guiana and *equinus* from Jamaica. The genus *Cacomyia* was erected by Coquillett (1906) for the latter 2 species on the basis of wing venation and long palpus in the male, although the

male of *albomaculatus* was unknown and actually has a short palpus. Lutz (1904) described *Haemagogus capricornii* from Brazil and later (1905) placed it in a new genus, *Stegoconops.* In volume 2 (1913) of their monograph, Howard, Dyar and Knab, illustrating male genitalia and larvae, placed 4 species, *equinus, regalis* Dyar and Knab, 1906 (=*albomaculatus,* in part), *capricornii* and *lucifer* n. sp. in Lutz' *Stegoconops* because of the presence of bristles on the postnotum of the type of *Haemagogus splendens* which they referred to the Sabethini. However, in volume 4 of the monograph (1917), they recognized 4 species in the genus *Haemagogus,* dividing it into 2 groups based on wing venation, female claws, male genitalia and larval comb scales: *splendens* (=*lucifer,* in part) and *albomaculatus* (=*regalis,* in part) in one group and *equinus* and *capricornii* in the second group. Dyar (1921), in attempting to correct the confusion in the 2 Howard, Dyar and Knab volumes divided the genus into 2 subgenera, *Haemagogus,* with simple female claws and short male palpus and *Stegoconops,* with toothed female claws and long male palpus. This interpretation was followed in Dyar's Mosquitoes of the Americas (1928). Edwards, in his catalog (1932) recognized that the 2 subgeneric characters were not always correlated and redefined the subgenera strictly on the basis of the male palpus, *Stegoconops* with a long palpus and *Haemagogus* with a short palpus. Antunes (1939) included *Stegoconops,* whose type species, *capricornii,* has a short male palpus in the synonymy of *Haemagogus* and proposed a new subgeneric name for the species with long male palpus. This name was unavailable since no type species was designated. Levi-Castillo (1951b) recognized the same subgenera and proposed the name *Longipalpifer* for the species with long male palpus with *panarchys* Dyar, 1921 as type species. Lane, in his Neotropical Culicidae (1953) recognized 3 "groups" in *Haemagogus,* corresponding, with 1 exception, to the 3 subgenera recognized later by Stone, Knight and Starcke (1959): *Longipalpifer,* with long male palpus; *Stegoconops,* with toothed female claws, short male palpus and larvae with a single row of comb scales; and *Haemagogus,* with simple female claws, short male palpus and larvae with comb scales in a patch.

Haemagogus leucomelas, described in 1904 by Lutz in Bourroul's thesis, was placed in the genus *Aedes* by Dyar and Shannon (1924:484) and since the name *leucomelas* was preoccupied they proposed *leucocelaenus* as a replacement name. Dyar (1925:141) erected the subgenus *Conopostegus* for *leucocelaenus* and subsequently, Edwards, in his catalog (1932) placed *Conopostegus* in the synonymy of *Finlaya.* Zavortink (1972:116), in removing all New World aedines from the subgenus *Finlaya* resurrected the name *Conopostegus* for *leucocelaenus* and related forms and placed *Conopostegus* in the genus *Haemagogus.*

TAXONOMIC CHARACTERS. The genus *Haemagogus* is one of the most highly derived of the Aedini, yet it exhibits a number of primitive characters. It is often difficult to determine if the expression of some character states is primitive or derived, but evaluations can be made by determining the tendency within the taxon and comparing the character states in other aedine groups. Derived characters in the adults include the increase in broad, flat metallic scales, accompanied by a reduction in thoracic chaetotaxy, enlarged pronotal lobes, the enlargement of the hindcoxae and the development of an apical sternomesal scale patch on the sidepiece of the male genitalia. The derived condition is also expressed in the tendency toward short male palpus, setae on the postnotum, simple claws in both the male and female, the absence of setae on tergite IX in the male and female, specialized scales and setae on tergite VIII in the male, and reduced number and length of bristles on the male antenna. In the larvae, the derived condition is the reduction of the ventral brush, fewer comb scales and a reduction in sclerotization.

Adult characters. Studies of the taxonomy of *Haemagogus* have for the most part neglected adult characters, other than the male genitalia. Group characters such as the female claws, wing venation (the ratio of R_{2+3} to R_2; see fig. 18), length of the male palpus and postnotal setae have been recognized but good species characters have often been overlooked. Good specific and sometimes group characters, in addition to the above, used in the present study are: the length of the proboscis as compared to the length of the forefemur, the number of bristles on the male antennal segments, the color of the integument of the coxae and trochanters, the width of the interocular space as measured by ommatidial diameters, the presence or absence of bristles on the lower *stp*, the male claws, and the color and distribution of scales on the head, thorax, legs and abdomen.

The iridescent metallic colors of the scales and their tremendous range of hue presented a special problem. Because definitions of colors are usually a matter of subjective interpretation and rather subtle differences in color are often reliable specific characters in this group, it was necessary to define as accurately as possible some of the hues that appear in *Haemagogus* scales. Comparisons were made with color samples in Ridgway (1912) and, in the interest of simplicity, the terminology was taken from Kelly and Judd (1955), except for the colors which are better described by comparison with the metals silver, gold, copper and bronze, these colors and terms not appearing as such in the above cited references. Gold and silver can be defined simply as having the color of the respective metals. Copper is similar to gold but containing hues of red. Bronze, likewise, is similar to gold but with varying green hues. The colors violet and purple predominate on the proboscis, palpus, wing, legs and often abdomen of most species. Both colors are combinations of dark red and dark blue, in violet the blue predominating and in purple the red being stronger.

Male and female genitalic characters. The species of *Haemagogus* have been separated almost exclusively on the basis of the male genitalia, as this structure is highly derived and, for the most part, exhibits reliable species and group characters. Tergite VIII, often overlooked, is one of the most important male genitalic structures in this group, offering good characters in its shape and in the setae and/or scales on the distal margin. Tergite IX is reduced but exhibits subgeneric and group characters. The distribution of setae, the development of the basal and apical tergomesal lobes and the apical sternomesal scales of the sidepiece are important, and the development of the clasper shows group characters and species differences in the Splendens Section. The aedeagus has a characteristic development in most species, especially in those of the Albomaculatus Section, as does the claspette in nearly all species.

In the subgenus *Conopostegus* and 2 species of the subgenus *Haemagogus, anastasionis* and *chrysochlorus,* the claspette filament is inserted in a distinct alveolus on the apex of the claspette stem, however, in the remaining species the alveolus is either incomplete or entirely absent. The claspette filament is a specialized seta, arising from an alveolus, supplied with a nerve ending and functioning as a sensory organ. In those *Haemagogus* in which no alveolus is present or the alveolus is incomplete there is then no true claspette filament. The membranous structure at the apex of the claspette is only an elaborate development of the claspette stem, possibly without a sensory function, and formed possibly from the failure of the apical portion of the claspette to differentiate completely during ontogenetic development. Although not a true claspette filament in most species, the structure is sufficiently differentiated from the stem to be readily recognizable and will continue to be referred to as the filament.

The female genitalia of species of *Haemagogus* exhibit good group characters in the presence or absence of setae on tergite IX.

Pupal characters. The pupae of the subgenus *Haemagogus* are remarkably uniform in structure and for the most part are difficult or impossible to recognize to species. I have not found any species or group characters sufficiently reliable to prepare a key. However there are several characters that differ somewhat from species to species and since they are of some value they are included in the species descriptions. A few species are recognizable with reasonable certainty and several distinctions can be made within species complexes. These are discussed in the species accounts. The most useful characters are the development of hair 7-C, the relative lengths of the large dorsal hairs 3-II,III,5-IV,V, the position of hair 2-VII and the branching of the paddle hair, 1-P. Hair 1 on segments II to VII varies in development from small and single to very large and dendritic depending on the hairiness of the corresponding larva and is not a taxonomically reliable character.

Larval characters. Species of *Haemagogus* often exhibit a wide range of intraspecific variation in larval hairiness, so much so that the larvae have the appearance of different species. The hairs most often affected are 7,11,14,15-C; 0,4,8,14-P; 1,14-M; 1,3,5,13-T; 1,2,4,5,9,11,13-I; 1,2,5,7,13-II-VI; 1,2,5,6,9,13-VII; 1,3,5-VIII and 1-X, the hairs varying in length, thickness and number of branches. Rosen and Rozeboom (1954) and Colless (1956), discussing hairiness in the *Aedes (Stegomyia) scutellaris* (Walker, 1859) group and *Aedes (S.) albopictus* (Skuse, 1894) respectively, conclude that hairiness is environmentally induced by some physical factor in the treehole or treehole water. This generally would seem to be true in *Haemagogus,* however there are several instances in which both hairy and nonhairy larvae have been taken in the same collection. Hairiness is accompanied, in most cases, by increased sclerotization of the tubercles of several hairs and of the boss of the ventral brush, and in the species with spiculose integument, an increase in the density of spiculation. Hairiness is carried over into the pupa but usually affects only hair 1-II-VII, the hair being small and simple in nonhairy forms and extremely large and dendritic in hairy forms. As in other groups with hairy and nonhairy immatures, all forms give rise to identical adults. Several species examined in this study, in both subgenera, consisted of entirely hairy or nonhairy forms, however in those instances few immatures were available. All species in which a large series of immatures was examined exhibited some variation in hairiness. Because of this variability in larval hairiness, the role of larval chaetotaxy as a taxonomic tool is reduced. However, some of the hairs other than those noted above are not generally affected by variation in hairiness and their relative, rather than absolute, development shows specific differences.

It should be emphasized that the larval illustrations cannot accurately represent the entire range of variability of a species because of the absence of intraspecific constancy in larval chaetotaxy. They should not be used without the keys and species diagnoses in species determinations.

PROPOSED CLASSIFICATION. I am in full agreement with Zavortink's inclusion (1972:111-131) of the subgenus *Conopostegus* in *Haemagogus* and his treatment of the included species, 4 named and 4 unnamed. As noted in the discussion of *Conopostegus* below, this subgenus has retained many primitive characters and is probably closer to the ancestral stock of the genus.

I am including in the subgenus *Haemagogus* all the species formerly placed in the subgenera *Haemagogus, Stegoconops* and *Longipalpifer.* I do not consider the subdivision into the above 3 subgenera to be justified, especially with the inclu-

sion of *Conopostegus* in *Haemagogus*, as the criteria for separating the present subgenera *Conopostegus* and *Haemagogus* are of a different order of magnitude than those for subdividing the subgenus *Haemagogus*. The 24 species included in the subgenus *Haemagogus* form a relatively homogeneous assemblage of species, all having the mesonotum completely covered with broad, flat metallic scales, a single broad band of silver scales on the pleuron, a sclerotized dorsal process on the aedeagus and specialized scales or setae on tergite VIII in the male genitalia, while the subgenus *Conopostegus* has brown and silver mesonotal scales, 3 arcs of silver scales on the pleuron, an aedeagus without a sclerotized dorsal process and no specialized scales or setae on tergite VIII in the male genitalia.

I prefer to recognize 3 sections within the subgenus *Haemagogus*. The Albomaculatus Section of 14 species, with 1 exception, contains the species formerly placed in the subgenera *Stegoconops* and *Longipalpifer*. This section is characterized in the adults by the absence of setae on the postnotum, toothed female claws, a relatively short vein R_2 and a densely plumose male antenna; in the female genitalia by setae on tergite IX; in the male genitalia by setae on tergite IX and a relatively simple clasper and sidepiece; and in the larvae by 5 pair of hairs in the ventral brush and a single row of few comb scales. The Splendens Section of 9 species includes the nominal species formerly placed in the subgenus *Haemagogus*. This section is characterized in the adults by the presence of setae on the postnotum, simple female claws, long vein R_2 and a moderately plumose male antenna; in the female genitalia by the absence of setae on tergite IX; in the male genitalia by the absence of setae on tergite IX and a more complex clasper and sidepiece; and in the larvae by 6 pair of hairs in the ventral brush and numerous comb scales in a double row or triangular patch. One species, *tropicalis*, being annectent between the above 2 sections, with characters of the Albomaculatus Section in the adult and of the Splendens Section in the larva, is placed in the monotypic Tropicalis Section. The interrelations of these sections and the included species are discussed below under the respective sections.

DISTRIBUTION. The distribution of the genus *Haemagogus* is centered in Central America and northern South America and adjacent islands where 19 of the 28 species occur. The genus has a wide distribution in South America to northern Argentina except for the Pacific coast south of the Gulf of Guayaquil and the higher elevations of the Andes, and is found as far north as Sonora, Mexico on the Pacific and Texas on the Atlantic of North America. It is known from the island of Jamaica in the Greater Antilles and several islands of the Lesser Antilles south of Martinique (see fig. 1).

AFFINITIES. *Haemagogus* is one of the more derived genera of the tribe Aedini (in the sense of Belkin, 1962), arising in northern South America or the adjacent Caribbean area where the largest number of species occur today, and undoubtedly derived from the genus *Aedes*, although there is no element of the present New World aedine fauna that shows any obvious affinities to *Haemagogus*.

Members of the Kochi Group of *Aedes (Finlaya)* of Southeast Asia and the South Pacific show remarkable similarities to *Haemagogus* in the male genitalia, especially in the aedeagus and proctiger, the sidepiece including the specialized scales on the distal sternomesal margin, the clasper and the reduction of tergite IX. However there is little in the adults or immature stages to indicate relationship to *Haemagogus*.

A close affinity between *Haemagogus* and the Oriental aedine genus *Heizmannia* has been proposed by Edwards (1922:445) and Mattingly (1957:4), among others.

The statement by Edwards (1922) of relationship was made to clarify the earlier suggestion of Theobald (1910:588) and Howard, Dyar and Knab (1915:50) that *Heizmannia scintillans* Ludlow, 1905 was a sabethine mosquito. Obviously *Heizmannia* is closer to *Haemagogus* than to the Sabethini. There is a striking resemblance in many aspects of the adults of the 2 genera, however the immature stages and the female genitalia show little evidence of close affinity and the male genitalia are remarkably different. The most reliable group characters in the male genitalia of the Aedini are the structure of the phallosome and proctiger according to Belkin (1962:326), with the clasper and basal mesal derivatives of the sidepiece also important. *Haemagogus* has a simple aedeagus and a paraproct with cercal setae while in *Heizmannia* the aedeagus is divided and has toothed lateral plates and the paraproct lacks cercal setae. This divergence in structure indicates that the affinities of the 2 genera lie in 2 separate branches of the Aedini. This interpretation was also that of Edwards (1932:180). The similarities in the structure and ornamentation of the adults may be attributed to convergence, the 2 genera apparently occupying much the same ecological situation, treeholes or bamboo usually in tropical forest with peak biting activity near midday. Many of the same adult characters are found in day flying members of the tribes Sabethini and Toxorhynchitini, such as reduced chaetotaxy, metallic scales and often enlarged *apn* lobes and hindcoxae.

BIONOMICS AND MEDICAL IMPORTANCE

Females of most species of *Haemagogus* attack man readily and with few exceptions usually bite about the lower body. Several species tend to be arboreal in habit, *janthinomys* being strongly arboreal and seldom descending to ground level, and then only when the forest canopy has been disturbed. *Mesodentatus, lucifer* and *equinus* are arboreal but not as strongly as *janthinomys.* Males of several species have been observed near the hosts where they mate with females approaching for a blood meal.

Species of *Haemagogus* breed primarily in treeholes and cut or broken bamboo internodes but are often found in other plant containers such as bromeliads and fallen fruits and occasionally in ground pools and rockholes. Species of this genus are common in tropical rain forest, open deciduous forest and second growth and in coastal mangrove associations, with many species being quite specific in their habitat preferences. For example, *janthinomys* is found almost exclusively in tropical rain forest, *aeritinctus, regalis, chalcospilans* and *boshelli* are restricted to mangrove, and *anastasionis* and *argyromeris* are found primarily in scrub forest and second growth and are somewhat peridomestic. *Equinus* appears to be the most adaptable in terms of habitat utilization, being found commonly in rain forest, scrub and thorn forests, mangrove, and in peridomestic situations.

The genus *Haemagogus* plays a primary role in the transmission of sylvan or jungle yellow fever in Central and South America. In laboratory transmission experiments, all species of *Haemagogus* tested have been found to be capable of harboring the virus or transmitting it by bite. *Janthinomys* is undoubtedly the most important vector and has been repeatedly incriminated in the jungle yellow fever cycle. Other *Haemagogus* species found to be capable laboratory vectors, found naturally infected with yellow fever virus or at least suspected to be involved in the transmission cycle are *leucocelaenus, capricornii, mesodentatus, albomaculatus, soperi, equinus, celeste* and *lucifer.* In addition, *janthinomys* has been found infect-

ed with the Ilheus virus in Panama and *leucocelaenus* has been found infected with the Una virus at Belem, Brazil. The disease relations of all species except *leucocelaenus* are discussed further in the bionomics paragraphs of the species accounts. The role of *leucocelaenus* in yellow fever transmission is discussed by Kumm and Cerqueira (1951b:195-196), and in the transmission of Una virus by Causey, Casals et al. (1961:778).

TAXONOMIC TREATMENT

Genus *HAEMAGOGUS* Williston

1896. *Haemagogus* Williston, 1896:271. TYPE SPECIES: *Haemagogus splendens* Williston, 1896, St. Vincent; monobasic.
For synonymy see under subgenus.

FEMALES. Small to medium-sized species; head, abdomen and legs elongate, predominantly dark scaled; head, thorax and abdomen densely covered with moderately broad to broad flat scales, usually with brilliant metallic reflections; scales of proboscis, palpus, wing and legs with metallic reflections; thoracic chaetotaxy reduced.

Head: Integument dark brown to black. Eyes narrowly to broadly separated above antennae, interocular space usually with broad, flat, silver scales. Frontal bristles absent. Orbital bristles moderately to well developed, numerous, 6-12 pairs. Postgenal bristles moderately developed, numerous. Decumbent scales broad, flat, dark to light dorsally, silver laterally, ventrally and in narrow orbital line. Erect scales confined to single row on occiput, usually dark. Clypeus large, bare. Proboscis slender, about 0.80-1.50 of forefemur, usually entirely dark scaled, with basal bristles. Palpus short, about 0.12-0.21 of proboscis; 3-or 4-segmented, segment 4 small when present; entirely dark scaled; segments 1-3 with bristles. Antenna about 0.50-0.75 of proboscis, torus with fine setae and occasionally small, dark scales mesally; flagellar segment 1 with a few small dark scales, segments 2-13 with basal whorl of usually 6 rather short bristles.

Thorax: Integument dark brown to black. Mesonotum strongly arched. Acrostichal and dorsocentral bristles well developed only on anterior promontory; supraalar bristles numerous and well developed; elsewhere acrostichal and dorsocentral bristles as well as humeral and posterior fossal bristles present but minute and visible only in slide preparations; prescutellar bristles well developed only in *Conopostegus*. Scutellum with 2-4 strong bristles on midlobe and 3-6 on lateral lobes, several weak additional bristles on all lobes. Mesonotum with broad, flat, appressed scales over entire surface or interrupted by rather inconspicuous anterior inner dorsocentral and median and lateral prescutellar bare spaces *(Conopostegus)*. Scutellum covered with broad, flat scales. Paratergite with broad, flat silver scales. *Apn* lobes considerably to greatly enlarged, often nearly meeting at midline. Meron moderately large. Bristles reduced in number on all pleural sclerites; present and well developed on *apn*, moderately to well developed on *ppn, ppl, pra* and upper *mep*, minute to well developed on *psp* and *stp* near base of midcoxa; *Conopostegus* in addition with 2 or 3 well developed setae near middle of *stp; sp, ssp* and lower *mep* bristles absent. Pleuron with broad, flat silver scales forming single broad, vertical band from midcoxa to antealar area with scales on *pra, psp, ssp, mep*

and *stp; pcx, ppl* and *pst* with silver scales, *apn* with silver or dark scales, *ppn* bare or with silver or dark scales; or, in *Conopostegus,* with silver scales forming 3 nearly vertical arcs, the anterior extending from *apn* through *pst* to forecoxa, the middle extending from *ppn* through *ssp* and lower *stp* to midcoxa and the posterior extending from antealar area through paratergite, *psp,* upper *stp,* lower *mep* to hindcoxa. Hypostigial area, anterior *stp* and metameron bare.

Legs: Hindcoxa larger than midcoxa, its base at level of or slightly below upper margin of meron. Legs moderately long to long, forefemur 1.25-1.80 of distance from top of thorax to apex of midcoxa. Integument of coxae uniformly dark brown or dark brown basally grading to yellow apically; all with silver scales, occasionally with additional small patch of dark scales in middle of forecoxa and midcoxa. Trochanters dark brown or yellow, all with silver scales. Femora dark scaled with silver to silvery yellow scales basally on anterior, ventral and posterior surfaces, usually extending apically in short to long streaks; small knee spots of silver scales on apex of midfemur and hindfemur present or absent. Tibiae and tarsi entirely dark scaled or with white to dingy scales on outer surface of basal midtarsal segments. Claws of foreleg and midleg simple or with subbasal tooth, claws of hindleg simple.

Wing: Entirely dark scaled; R_{2+3} about 0.31-1.60 of R_2.

Haltere: Stem usually pale, knob dark scaled with silver scales at tip.

Postnotum: Integument dark brown to black, bristles present or absent.

Abdomen: Tergite I dark scaled dorsally, laterotergite with silver scales. Tergites II-VII with basolateral silver patches, usually extending to distal margins of II-IV or V but constricted distally; restricted to base on V-VII; dorsal silver scales present or absent; VII silver or dark scaled, strongly produced caudad. Sternites II-VII dark scaled with basal silver band or basolateral silver patches; sternite VII with few dark scales laterally.

FEMALE GENITALIA. **Segment VIII:** Tergite narrowed apically; on midline about 0.52-0.71 of tergite VII; distal 0.90 with scales and bristles, or densely scaled with bristles only on apical 0.25-0.33, apical bristles usually well developed. Sternite about 1.30-1.62 of tergite VIII, broader distally; distal margin straight, slightly rounded or with rounded lobe immediately laterad of midline; all but extreme base and basolateral area with bristles, bristles more numerous distally and along midline, predominantly weaker distally, some bristles moderately developed proximally along midline; lateral margin with scales. **Tergite IX:** Well developed, divided distally, V-shaped; about 0.50-0.69 of tergite VIII; moderately to strongly sclerotized; with or without setae. **Insula:** Weakly sclerotized, connected to sigma, with 1 or 2 pairs of weakly developed setae. **Cercus:** Relatively short, about 0.61-0.83 of tergite VIII; apex obliquely truncate in lateral aspect; bristles numerous, several apical ones strongly developed. **Postgenital Plate:** Moderately long and broad, about 0.49-0.67 of tergite VIII; index 1.4-2.2; apex straight, rounded or slightly emarginate in ventral aspect; distal portion with numerous weakly developed bristles and usually 2 stronger ones on distal margin; basal median longitudinal apodeme developed or undeveloped. **Cowl:** Strongly sclerotized. Atrial plates absent. **Sigma:** Connected to cowl; weakly to moderately sclerotized. Basal portion of spermathecal duct strongly sclerotized. Spermathecae 3, strongly sclerotized, spherical, 1 slightly enlarged.

MALES. Generally similar to females except for sexual differences. **Head:** Clypeus smaller than in females. Proboscis slender, about 0.95-1.70 of forefemur. Palpus short, 0.14-0.21 of proboscis, 4-segmented with segment 4 minute to small; or

long, 0.56-0.79 of proboscis, 5-segmented, with segments 2 and 3 ankylosed and long, making up 0.50-0.65 of palpus; entirely dark scaled. Antenna 0.44-0.65 of proboscis; torus moderately to greatly enlarged, without scales or with inconspicuous small setae; flagellum sparsely to strongly plumose, segments 1-12 with 6 to many moderate to long bristles; flagellar segment 1 slightly elongate, with small dark scales; segments 12 and 13 elongate, the 2 combined slightly shorter than total length of first 11 segments. **Legs:** Claws of foreleg and usually midleg enlarged, unequal; larger claw simple or with acute or blunt submedian tooth; smaller claw simple or with acute submedian, subbasal or basal tooth; claws of hindleg small, simple.

MALE GENITALIA. **Segment VIII:** Sternite with apical 0.75 scaled; apex rounded, with several to many well developed setae. Tergite moderately long, about 0.52-0.98 of sternite; apical 0.75 scaled; variously shaped, distal margin rounded, straight or emarginate, with specialized scales or setae apically. **Segment IX:** Poorly developed dorsally; middorsal portion of tergite straight or emarginate, with sclerotization weak or absent; lobes poorly developed, setae present or absent; sternite moderately large, 2-9 small setae distally. **Sidepiece:** Well developed, elongate, mesal surface membranous from base to apex; basal tergomesal area usually not enlarged but sometimes moderately well developed, with long setae or cluster of long flattened attenuate setae proximally; apical lobe present or absent; distal sternomesal area with specialized scales of varied size and shape; lateral half of dorsal surface, ventral surface and lateral surface with scales and setae, setae usually well developed especially laterally and distally on ventral surface. **Claspette:** Well developed; stem long, narrow, usually curved or angled dorsad, spiculose basally, 1 to 3 short to moderately long setae near base; filament simple to highly modified. **Clasper:** Short, length (including spiniform) usually about 0.55-0.67 of sidepiece, usually simple but occasionally hypertrophied; apical spiniform short or long, 0.20-0.61 of clasper. **Phallosome:** Aedeagus moderate to large, tip excavated or with variously developed dorsal process. **Proctiger:** Strongly developed, broad at base, narrowed distally, the basolateral sclerotization nearly horizontal; paraproct well sclerotized, apical knob with fine serrations; cercal setae 2 to 8.

PUPAE. **Cephalothorax:** Weakly to moderately pigmented, usually darker dorsally. Hair 1-C strongly developed, considerably stronger than 2,3-C. Hair 5-C weakly to strongly developed, weaker or stronger than hair 7-C. Hair 8-C usually single, rarely double. **Trumpet:** Moderately to strongly pigmented, light to dark brown, usually lighter apically; usually strongly broadening from base to apex, occasionally fusiform or cylindrical; tracheoid sculpturing weakly developed in basal 0.10; reticulate sculpturing weak to moderate. **Abdomen:** Weakly to moderately pigmented, stronger at base of anterior tergites. Float hair (1-I) displaced mesad. Hair 1-II-VII weakly to very strongly developed, single, branched or strongly dendritic, usually more or less subequal on all segments. Hair 2-VII close to or considerably cephalad of hair 1-VII. Hair 3-II,III moderately to strongly developed, 0.6-1.3 of corresponding tergite; 3-IV usually weak, forked; 3-V-VII weak, single. Hair 5-II,III usually weak, single to triple, rarely well developed; 5-IV-VII well developed, 0.6-3.0 of corresponding tergite, usually single, rarely multiple. Hair 6-II-VI fine, usually subequal on all segments, 6-VII fine to moderately developed, single or double. Hair 9-II-VI short, fine, subequal on all segments, dorsal or ventral; 9-VII at or cephalad of caudolateral margin of tergite, well developed, 1-6b; 9-VIII at caudolateral margin of tergite, with 2-12 long primary branches. Hair

10-VI considerably mesad of hair 11-VI. **Terminal Segments**: Male genital lobe moderately long, 0.95-1.8 of tergite VIII. **Paddle**: Pigmentation varied, often conspicuously darker than remainder of abdomen; shape varied, longer than broad, apex rounded or pointed, rarely emarginate; midrib conspicuous to apex; marginal spicules few or absent. Hair 1-P weakly to strongly developed, single to multiple.

LARVAE. **Head**: Rounded, uniformly moderately pigmented, yellowish to brown, with darker collar and slightly lighter ocular area. Labial plate subquadrate. Hair 1-C stout, blunt, occasionally slightly to conspicuously serrate laterally. Hair 4-C moderately to strongly developed, 8-20b, mesad of hair 1-C and cephalad of or at level of hair 6-C. Hair 5-C single, rarely double, usually laterad of hair 6-C. Hair 6-C single or double, usually distinctly flattened in middle part when single; mesad or laterad of hair 1-C. Hair 7-C 2-11b. Hair 14-C well developed, short, stout, 4-10b. Hair 15-C well developed, long, 2-8b. Mental plate with 8-10(7-12) teeth on each side of median tooth.

Antenna: Relatively short, slender; moderately to strongly pigmented, uniform or lighter distally; with few spicules, more numerous basally. Hair 1-A long, usually single (single or double).

Thorax: Epidermis and fat body without conspicuous pigmentation. Integument with or without spicules. Hairs 1-3-P on common tubercle. Tubercles of hairs 5-7-P free or joined. Hair 1-M, T moderately long, branched. Hair 3-T subequal to 1-T. Hair 5-P 1-5b, hair 5-M single or double. Hair 11-P,M,T moderately developed, 2-5b, subequal to 9-P. Hairs 13-T and 14-M moderately to strongly developed, 2-12b.

Abdomen: Hair 1-I-VII moderately to strongly developed, becoming stronger on more distal segments but somewhat weaker on segments VI and VII. Hair 2-I-VII moderately developed, 2-10b, usually stout and often stellate; usually in line with or laterad of hair 1 of corresponding segment. Hair 3-VII very strongly developed, long, single (very rarely double). Hair 5-I-VI moderately developed, 4-10b. Hair 6 usually triple on I,II, double on III-VI. Hair 7 long, single (1-2b) on I, branched and usually subequal to hair 5 on III-VI. Hair 9-I-VII 2-6b. Hair 12-I present or absent. Hair 13-I-VI moderately to strongly developed, 2-10b, usually subequal to or larger than hair 1 of corresponding segment.

Segment VIII: Hairs 1,5 moderately to strongly developed, 3-8b. Hair 3 strongly developed, 4-10b. Comb scales 4-75, with single sharply pointed to broadly rounded, minutely fringed spine; in single row, irregular double to triple row or large triangular patch.

Siphon: Moderately to strongly pigmented, light to dark brown, with darker basal band. Index about 2.0-3.0(1.7-3.9). Acus distinct, free or attached, or indistinct, fused with base of siphon. Pecten teeth 10-18(6-24), with main spine and 1 to 3 basal denticles; in rather even, straight row on basal half; proximal teeth often not developed. Hair 1-S inserted distad of pecten, on basal 0.50-0.65 of siphon; moderately to strongly developed, 2-4b.

Anal Segment: Saddle extending about halfway around segment; moderately to strongly pigmented, light to dark brown with darker basal band; caudal margin, with spines, short and with multiple teeth laterally, stronger and with fewer teeth dorsally. Hair 1-X strongly developed, longer than saddle, 2-6b(1-10b). Hair 2-X 2-6b. Hair 3-X single. Ventral brush (4-X) moderately to well developed, with 5 or 6 pair of hairs, all hairs but proximal 1 or 2 arising from weakly to strongly sclerotized boss; hair 4a-X 2-8b, long or short. Anal gills 0.45-5.0 of dorsal saddle length; usually tapered distally, occasionally short and bluntly rounded; dorsal gill usually slightly longer than ventral gill.

DISCUSSION. The members of the genus *Haemagogus* can be distinguished from all other New World aedines by the following characters: in the **adults** by the broad, flat, appressed scales, usually with metallic reflections, covering the mesonotum and scutellum, and the pleuron with silver scales in a single broad vertical band or three vertical arcs extending from the mesonotum to the coxae; in the **female genitalia** by the cerci obliquely truncate in lateral aspect and tergite IX well developed, divided distally and V-shaped; in the **male genitalia** by the distal sternomesal area of the sidepiece with a cluster of specialized scales of varied sizes and shapes; in the **pupae** by the alveoli of the float hairs (1-I) conspicuously mesad of the alveoli of hairs 1-II so that the distance between the float hairs is about 0.5 of the distance between hairs 1-II; and in the **larvae** by the combination of (1) hair 3-VII very strongly developed, long and usually single, (2) hair 12-I present and/or hair 7-III-V conspicuously stronger than hair 9 of the corresponding segment and (3) the pecten of the siphon more or less straight and never distinctly arcuate dorsally.

Discussions of the taxonomic history, classification and affinities of the genus as a whole are presented in the chapter on Systematics.

KEYS TO GROUPS AND SPECIES

ADULTS

1. Scales of mesonotum dark brown with silver scales in conspicuous patches or lines in acrostichal, antealar and prescutellar areas; pleuron with 3 vertical arcs of silver scales . . . . . ***(subgenus Conopostegus)***
Scales of mesonotum metallic green, blue, copper or bronze with silver scales only in antealar area; pleuron with single broad vertical band of silver scales (figs. 18,27,38) ***(subgenus Haemagogus)*** 2

2(1). Female fore and midclaws with subbasal tooth; postnotum bare; R_{2+3} usually greater than 0.55 of R_2 (figs. 18,27) 3
Female claws simple; postnotum with 2 small setae posteriorly: R_{2+3} usually less than 0.50 of R_2 (fig. 38) (Splendens Section) 15

Tropicalis Section

3(2). *Ppn* apparently without scales; midclaws of male small, subequal (fig. 36) (Tropicalis Section) . . . . . ***15. tropicalis***
Ppn densely scaled; midclaws of male enlarged, unequal (Albomaculatus Section) 4

Albomaculatus Section

4(3). Midtarsus with white or gray scales on outer surface of proximal 2 or 3 segments . . . . . ***9. mesodentatus***
Midtarsus entirely dark scaled 5

5(4). Proboscis relatively long, 1.50 of forefemur in females, 1.50-1.70 of forefemur in males; eyes widely separated above antennae (4 ommatidial diameters); male palpus long, about 0.75 of proboscis; abdomen with silver scales dorsally on tergites II-VII (fig. 27) . . . . ***11. panarchys***

Proboscis shorter, less than 1.40 of forefemur in females, 1.50 of forefemur in males; eyes narrowly separated above antennae (1 or 2 ommatidial diameters); male palpus short or long, but less than 0.70 of proboscis; abdomen with dorsal silver scales restricted to tergites IV-VII or absent 6

6(5). Conspicuous knee spots of silver scales present anteriorly on apex of mid and hindfemora 7
Knee spots on mid and hindfemora absent 10

7(6). Proboscis short, about 1.10 of forefemur in females, 1.30 of forefemur in males; scales of mesonotum copper; abdominal tergites without dorsal silver scales; male palpus short, less than 0.20 of proboscis . . 8
Proboscis longer, 1.25-1.40 of forefemur in females, 1.35-1.50 of forefemur in males; scales of mesonotum hues of blue or green; abdomen with dorsal silver scales on tergites IV or VI-VII; male palpus long, about 0.60-0.70 of proboscis 9

8(7). Abdominal tergites green or light bronze; decumbent scales of vertex copper . . . . . *5. andinus*
Abdominal tergites blue; decumbent scales of vertex bluish green . . . . . *6. nebulosus*

9(7). R_{2+3} 0.70-0.95 of R_2; abdomen with dorsal silver scales usually restricted to tergites VI,VII. . . . . *12. soperi; 13. acutisentis*
R_{2+3} 1.05-1.25 of R_2; abdomen with dorsal silver scales usually on tergites IV-VII . . . . . *14. equinus*

10(6). Lower *stp* with well developed bristle; larger claw of foretarsus of male with acute submedian or subbasal tooth 11
Lower *stp* without well developed bristle; larger claw of foretarsus of male simple 12

11(10). Hindfemur with silver scales extending nearly to apex anteriorly; dark scales of abdomen usually predominantly purple but with bluish green scales on distal margins of tergites V-VIII; female proboscis 1.10-1.15 of forefemur; large and small claws of foreleg and midleg of male toothed (fig. 18) . . . . . *7. janthinomys; 8. capricornii*
Hindfemur with silver scales not extending beyond basal 0.75 anteriorly; dark scales of abdominal tergites I-VII purple; female proboscis 1.25 of forefemur; larger claw of foreleg of male toothed, smaller claw of foreleg and claws of midleg simple (fig. 25) . . . . *10. albomaculatus*

12(10). Female proboscis short, 1.10 of forefemur; scales of mesonotum primarily dark blue; coxae with conspicuous patches of dark scales; R_{2+3} 0.55 of R_2; abdominal dark scales purple . . . . . *4. baresi*
Female proboscis at least 1.20 of forefemur; scales of mesonotum primarily copper to light bronze; coxae all silver or rarely with dark scales on midcoxa; R_{2+3} 1.20-1.50 of R_2; abdominal dark scales hues of blue, green or gold 13

13(12). *Apn* lobes almost entirely silver scaled; abdominal tergites without silver scales dorsally; *ppn* scales gold to copper, decumbent scales of vertex green to gold . . . . . ***3. spegazzinii***
Apn lobes with few silver scales; abdomen with silver scales dorsally on tergites IV-VII; *ppn* scales blue or light bronze; decumbent scales of vertex copper, blue or bluish green 14

14(13). Decumbent scales of vertex, scales of *ppn* and dark scales of abdomen blue to bluish green; *apn* scales blue; smaller claw of foreleg and midleg of male with submedian tooth (fig. 8) . . . . . ***1. anastasionis***
Decumbent scales of vertex copper, scales of *apn*, and darker scales of abdomen light bronze; all claws of foreleg and midleg of male simple (fig. 36) . . . . . ***2. chrysochlorus***

Splendens Section

15(2). *Ppn* with large patch of scales posteriorly 16
Ppn bare or with very few silver scales posteriorly 17

16(15). Scales of vertex and occiput copper to light green; male antenna sparsely plumose, flagellar segment 4 with about 8-10 bristles (fig. 38) . . . . . ***16. splendens***
Scales blue to violet on vertex, green on occiput; male antenna moderately plumose, flagellar segment 4 with about 18-22 bristles . . . . . ***17. celeste***

17(15). Proboscis shorter than forefemur, 0.80-0.95 of forefemur in females, about 0.90-0.95 in males 18
Proboscis equal to or longer than forefemur, about 0.95-1.20 of forefemur in females and males 19

18(17). Integument of coxae and trochanters yellow; scales of mesonotum usually bronze to copper with distinct purple or occasionally dark blue patch in fossa; abdominal scales usually purple; large claw of foreleg of male with blunt submedian tooth, large claw of midleg simple (fig. 53) . . . . . ***23. chalcospilans***
Integument of coxae and trochanters dark; scales of mesonotum rather uniformly greenish blue; abdominal scales blue to violet; larger claw of foreleg and midleg of male with acute subbasal tooth (fig. 51) . . . . . ***22. argyromeris***

19(17). Proboscis about equal in length (0.95-1.05) to forefemur; eyes narrowly separated above antennae (1 or 2 ommatidial diameters) . . ***24. boshelli***
Proboscis longer than forefemur; eyes widely separated above antennae (3 or 4 ommatidial diameters) 20

20(19). Integument of apex of coxae, trochanters and base of femora yellow; scales purple on vertex, light yellowish brown on occiput; scales of mesonotum copper . . . . . ***19. aeritinctus***
Integument of coxae, trochanters and femora dark; scales of vertex blue to violet; scales of mesonotum bronze to green or blue but rarely copper 21

21(20). Scales of mesonotum usually greenish blue or blue; *apn* lobes blue; abdominal scales blue with median basal silver patches on III or IV-VII . . . . . ***20. regalis***
Scales of mesonotum usually bronze to dark green; *apn* lobes violet to purple; abdominal scales usually purple or violet with median basal silver patches only on VI,VII 22

22(21). *Ppn* bare or with small patch of silver scales posteriorly . . ***18. iridicolor***
Ppn bare, never with silver scales . . . . . ***21. lucifer***

MALE GENITALIA

(*6. **nebulosus*** unknown)

1. Distal margin of tergite VIII without long, lanceolate scales or large spiniform setae mesally; tip of aedeagus excavated, without sclerotized dorsal process . . . . . ***(subgenus Conopostegus)***
Distal margin of tergite VIII with long, lanceolate scales or large spiniform setae mesally; tip of aedeagus with variously developed sclerotized dorsal process ***(subgenus Haemagogus)*** 2

2(1). Sidepiece with apical lobe poorly developed; tergite IX with 1-3 setae . 3
Sidepiece with apical lobe well developed and prominent or represented by dense cluster of well developed setae; tergite IX without setae (Splendens Section) 15

Tropicalis Section

3(2). Distal margin of tergite VIII straight and with large spiniform setae mesally; ventral half of claspette filament large, erect, rugose and bilobed (fig. 36) (Tropicalis Section) . . . . . ***15. tropicalis***
Distal margin of tergite VIII usually emarginate, if not emarginate then with elongate, lanceolate scales mesally; claspette filament without large, bilobed, erect ventral half (Albomaculatus Section) 4

Albomaculatus Section

4(3). Tergite VIII with large spiniform setae mesally; basal tergomesal lobe of sidepiece extending distad to near distal third of sidepiece as slightly raised area with numerous short setae 5
Tergite VIII with elongate lanceolate scales mesally; sidepiece without raised area distad of basal tergomesal lobe 6

5(4). Claspette filament narrowly sickle-shaped; claspette stem broader beyond middle; distal margin of tergite VIII deeply emarginate (figs. 8,36) ***1. anastasionis; 2. chrysochlorus***
Claspette filament broadly sickle-shaped; claspette stem uniform in thickness; distal margin of tergite VIII broadly shallowly emarginate (fig. 10) . . . . . ***3. spegazzinii***

6(4). Tergite VIII short, about 0.50 of sternite VIII, distal margin convex; claspette stem densely pilose from distal fourth to apex (fig. 28) . . . . . ***11. panarchys***

Tergite VIII at least 0.55 of sternite VIII, distal margin shallowly to deeply emarginate; claspette stem without pilosity 7

7(6). Distal half of claspette stem with membrane projecting anteriorly and posteriorly and enclosing basal portion of filament; filament with basal supporting ribs (fig. 34) . . . . . ***14. equinus***
Distal half of claspette stem without membrane; filament without supporting ribs 8

8(7). Aedeagus with apex deeply cleft mesally with an acute sclerotized projection on each slide of cleft (fig. 25) . . . . . ***10. albomaculatus***
Aedeagus with apex pointed or produced distad mesally 9

9(8). Apex of aedeagus produced into long, thin, coarsely serrated carina making up about 0.3 of aedeagus length, dorsum with elliptical opening into which base of carina projects (fig. 23). . . . ***9. mesodentatus***
Apex of aedeagus not produced into long serrated carina, dorsum of aedeagus closed 10

10(9). Tergite VIII relatively short, about 0.55-0.60 of sternite VIII, distal margin very shallowly emarginate 11
Tergite VIII longer, about 0.70-0.85 of sternite VIII, distal margin shallowly to deeply emarginate 12

11(10). Aedeagus with large spicules on venter of apical, beaklike keel; apical knob of paraproct with hooklike process mesally (fig. 19) . . . . . ***7. janthinomys***
Aedeagus with apex slightly incised just laterad of short, heavily sclerotized median keel; apical knob of paraproct without hooklike process mesally (fig. 21) . . . . . ***8. capricornii***

12(10). Tergite VIII broadly emarginate distally; aedeagus with apex pointed . 13
Tergite VIII with distal margin declivous mesally; aedeagus with apical process broad and truncated 14

13(12). Aedeagus with distal fourth broadly triangular, tip with a strongly sclerotized dorsal carina proximad to a small beak; claspette stem sharply angled dorsad at apical third (fig. 14) . . . . . ***6. andinus***
Distal fourth of aedeagus broadly rounded, with very small, weakly sclerotized beak at apex; claspette stem uniformly curved dorsad (fig. 12) . . . . . ***4. baresi***

14(12). Mesal half of sidepiece between basal sternomesal area and distal fourth with moderately developed setae laterally and bare space mesally (fig. 30) . . . . . ***12. soperi***
Mesal half of sidepiece between basal sternomesal area and distal fourth with uniformly distributed, relatively short setae (fig. 32) . . . . . ***13. acutisentis***

Splendens Section

15(2). Clasper cylindrical; spiniform cylindrical, inserted apically 16
Clasper flattened; spiniform spatulate, inserted subapically 17

16(15). Distal sternomesal scales of sidepiece lanceolate to oblanceolate; apical lobe represented by cluster of well developed setae; tergite VIII with distal margin rounded, lateral setae shorter than mesal setae (figs. 39, 41) . . . . . *16. splendens; 17. celeste*
Distal sternomesal scales of sidepiece circular and lanceolate dorsally and sinuous ventrally; apical lobe prominent; tergite VIII emarginate distally, lateral setae much longer than mesal setae (fig. 53) . . . . . *23. chalcospilans*

17(15). Clasper angled sharply inward near middle with elbowlike flap on outer surface distad of angle; sidepiece with large oval area of blunt, peglike setae near middle (fig. 55) . . . . . *24. boshelli*
Clasper broadly curved inward over entire length; sidepiece without peglike setae near middle 18

18(17). Clasper gradually broadened to bulbous apex; claspette stem expanded distally into spatulate knob with seta on posterior margin (fig. 51) . . . . . *22. argyromeris*
Clasper arcuate or pointed distally; claspette stem not expanded into spatulate knob 19

19(18). Claspette stem angled dorsad at middle, narrowed beyond angle; filament a broad, cuneiform leaf inserted distally on stem (fig. 43) . . . . . *18. iridicolor*
Claspette stem angled dorsad at apical third, expanded beyond angle to broad apex or expanded slightly then tapered to acute apex . . . 20

20(19). Claspette stem with apex expanded; filament a flat, expanded leaf inserted distally on stem and terminating in a slightly recurved point (fig. 45) . . . . . *19. aeritinctus*
Claspette stem expanded slightly beyond angle then tapered to acute apex; filament inserted distally on stem and extending posteriorly over distal third of stem as attached, folded membrane 21

21(20). Clasper arcuate and terminating in rounded point; claspette stem uniformly narrow proximad of angle (fig. 47) . . . . . *20. regalis*
Clasper expanded on distal fourth then tapered to sharp point; claspette stem stout, expanded at basal third then constricted beyond middle (fig. 49) . . . . . *21. lucifer*

LARVAE

(*2. chrysochlorus* unknown)

1. Comb scales 5-12 (4-20) in single row, ventral brush with 5 pairs (very rarely 6) of hairs 2

Comb scales 10-50 (6-75) in irregular double row or triangular patch; ventral brush with 6 pairs of hairs (***subgenus Haemagogus***, in part) . . 3

2(1). With the following combination of characters: integument without spicules, hair 12-I present, boss strongly sclerotized, hair 12-II subequal to or weaker than 10-II . . . . . ***(subgenus Conopostegus)***
Not as above; differing in at least 1 of the above characters (***subgenus Haemagogus,*** Albomaculatus Section) 4

Tropicalis Section

3(1). Boss weakly sclerotized or absent; hair 6-C single, rarely double (fig. 37) (Tropicalis Section) . . . . . ***15. tropicalis***
Boss strongly sclerotized; hair 6-C double (very rarely single) (Splendens Section) 15

Albomaculatus Section

4(2). Integument with spicules 5
Integument without spicules 6

5(4). Comb scales attached basally to sclerotized plate; hair 12-I absent (figs. 20,22) . . . . . ***7. janthinomys; 8. capricornii***
Comb scales not attached basally to sclerotized plate; hair 12-I present (fig. 24) . . . . . ***9. mesodentatus***

6(4). Hair 12-I absent 7
Hair 12-I present 11

7(6). Siphon index less than 3.0 8
Siphon index greater than 3.2 9

8(7). Siphon index about 2.8; hair 6-C double; hair 7-II-IV larger than hair 5 of corresponding segment (fig. 13) . . . . . ***4. baresi***
Siphon index about 2.0; hair 6-C single; hair 7-II-IV subequal to hair 5 of corresponding segment (fig. 9). . . . . ***1. anastasionis***

9(7). Siphon index about 3.2-3.4; pecten with 20-24 teeth (fig. 11). . . . . ***3. spegazzinii***
Siphon index usually 3.5 or greater; pecten with about 16-22 teeth . 10

10(9). Siphon index about 3.5 (3.3-3.8); hair 5-C single (1-2b); hair 4a-X 2b (fig. 15) . . . . . ***6. andinus***
Siphon index about 3.8; hair 5-C double (2-3b); hair 4a-X 4-5b (fig. 17) . . . . . ***7. nebulosus***

11(6). Boss strongly sclerotized; tubercles of hairs 5-7-P broadly connected; comb scale spine long, double length of basal, attached portion (fig. 26) . . . . . ***10. albomaculatus***
Boss weakly sclerotized or absent; tubercles of hairs 6-7-P very rarely connected though tubercles of hairs 5-6-P often connected; comb scale spine short, subequal in length to basal, attached portion . . 12

12(11). Hair 1-C conspicuously serrate laterally; hair 6-C double 13
Hair 1-C smooth to apex; hair 6-C usually single, rarely double . . . 14

13(12). Comb scales with broadly rounded to spatulate spine (fig. 31). *12. soperi*
Comb scales with short, sharply pointed spine (fig. 33) . . *13. acutisentis*

14(12). Comb scales usually 10-12 (8-20) in irregular single row; spines on caudal margin of saddle reduced, most very small (fig. 29) . . . *11. panarchys*
Comb scales usually 7-10 (5-13) in single, regular row; spines on caudal margin of saddle well developed, prominent (fig. 35) . . . *14. equinus*

Splendens Section

15(3). Comb scales more than 35; hair 4a-X with at least 6 branches; hair 7-III-VI smaller than hair 5 of corresponding segment 16
Comb scales fewer than 30; hair 4a-X with fewer than 6 branches; hair 7-III-VI subequal to hair 5 of corresponding segment 17

16(15). Comb scales usually 45-55 (40-75); hair 5-M single; hair 4a-X 6-9b (fig. 54) . . . . . *23. chalcospilans*
Comb scales 35-42 (29-49); hair 5-M double; hair 4a-X 6b (fig. 56) . . . . . *24. boshelli*

17(15). Comb scales usually fewer than 22 18
Comb scales usually more than 23 19

18(17). Comb scales 10-13 (6-20); pecten extending to about basal 0.40-0.45 of siphon; hair 4a-X 3-4b (fig. 40) . . . . . *16. splendens*
Comb scales 17-22 (12-27); pecten extending to about basal 0.50 of siphon; hair 4a-X 4-5b (fig. 42) . . . . . *17. celeste*

19(17). Spines on caudal margin of saddle reduced, very short, each with multiple teeth; pecten extending to about basal 0.45 of siphon (fig. 46) . . . . . *19. aeritinctus*
Spines on caudal margin of saddle stronger, several spines long, with single tooth; pecten extending to about basal 0.50 of siphon (figs. 44, 48,50,52). . . . *18. iridicolor; 20. regalis; 21. lucifer; 22. argyromeris*

Subgenus *CONOPOSTEGUS* Dyar

1925. *Conopostegus* Dyar, 1925b:141. TYPE SPECIES: *Aedes leucocelaenus* Dyar and Shannon, 1924; monobasic.

Zavortink (1972:111-131) removed *leucocelaenus* and related species from *Aedes* and placed them in *Haemagogus,* resurrecting the subgenus *Conopostegus* for them. This group of species had remained in *Aedes* since 1924 primarily on the basis of the presence of postspiracular and prescutellar bristles and the absence of these bristles in *Haemagogus.* However, these bristles are present in the metallic *Haemagogus,* though small and poorly developed. Considering the many similarities between *Conopostegus* and the metallic *Haemagogus* in all stages, the main difference being the thoracic scaling of the adults, and their bionomics and distribution, I am confident that these 2 groups constitute a single phylad.

The subgenus *Conopostegus* can be separated from the subgenus *Haemagogus:* as **adults** by the deep brown color of the mesonotal scales, conspicuous patches or lines of silver scales in acrostichal, antealar and prescutellar areas and 3 vertical areas of silver scales on the pleuron; in the **male genitalia** by the absence of large, spiniform setae or long, lanceolate scales mesally on the distal margin of tergite VIII and the aedeagus without a sclerotized dorsal process; in the **pupae** by the strongly developed hairs 5-C and 1-P; and in the **larvae** by the combination of (1) few comb scales in a single row, (2) integument without spicules, (3) hair 12-I present, (4) boss strongly sclerotized, and (5) hair 12-II subequal to or weaker than hair 10-II.

Conopostegus retains several of the more primitive characters not present in the more highly derived subgenus *Haemagogus,* and is undoubtedly closer to the original stock which gave rise to the genus. Among the more primitive characters of *Conopostegus* are the absence of metallic scales on the scutum and scutellum and the well developed prescutellar and postspiracular bristles in the adults, and, in the male genitalia, the absence of specialized scales or setae on the distal margin of tergite VIII and the absence of dorsal sclerotizations on the aedeagus. In the pupae, *Conopostegus* exhibits several unusual specializations not present in the subgenus *Haemagogus* such as the development of hair 1-I (float hair), hair 1-P and the shape of the paddle in 1 species. The larvae of *Conopostegus* and *Haemagogus* are so similar that they are not easily separable.

The subgenus *Conopostegus* and the included species are discussed thoroughly by Zavortink (1972:111-131).

Subgenus *HAEMAGOGUS* Williston

1896. *Haemagogus* Williston, 1896:271. TYPE SPECIES: *Haemagogus splendens* Williston, 1896, St. Vincent; monobasic.

1905. *Stegoconops* Lutz, 1905:83-84. TYPE SPECIES: *Haemagogus capricornii* Lutz, 1904, *in* Bourroul, 1904:66, Brazil; monobasic. Synonymy with *Haemagogus* by Howard, Dyar and Knab (1917:863). As subgenus of *Haemagogus* by Dyar (1921:102-104). NEW SYNONYMY.

1906. *Cacomyia* Coquillett, 1906:25. TYPE SPECIES: *Haemagogus albomaculatus* Theobald, 1903, Guyana; the first of 2 included species, designation by Coquillett (1910:516). Synonymy with *Haemagogus* by Howard, Dyar and Knab (1917:863).

1939. *Cyanoconops* Antunes, 1939:106. NOMEN NUDUM.—As subgenus of *Haemagogus.*

1951. *Longipalpifer* Levi-Castillo, 1951b:11. TYPE SPECIES: *Haemagogus panarchys* Dyar, 1921, Ecuador; original designation.—As subgenus of *Haemagogus.* NEW SYNONYMY.

1955. *Osornomyia* Levi-Castillo, 1955:360. NOMEN NUDUM.—As subgenus of *Haemagogus.*

Haemagogus of Williston (1896:271); Theobald (1901:239; 1903a:308; 1905b:37; 1907:550, in part; 1910:493, in part); Coquillett (1906:25, in part); Howard, Dyar and Knab (1917: 863-877); Kumm, Osorno-Mesa and Boshell-Manrique (1946:13); Vargas (1950:63, in part); Kumm and Cerqueira (1951:169); Komp (1954d:264); Zavortink (1972:111).

Haemagogus (Haemagogus) of Dyar (1921a:105-114; 1928:136-141); Dyar and Shannon (1924: 483); Edwards (1932:179); Antunes (1939:106); Lane (1939:118-120; 1953:779-789); Levi-Castillo (1951b:11,16-31); Stone, Knight and Starcke (1959:217-218).

Haemagogus (Stegoconops) of Dyar (1921a:102-104; 1928:134-135); Dyar and Shannon (1924: 483); Edwards (1932:179); Lane (1953:789-802); Stone, Knight and Starcke (1959:216-217).

Haemagogus (Longipalpifer) of Levi-Castillo (1951b:31-37); Stone, Knight and Starcke (1959: 215-216).

Haemagogus (Osornomyia) of Levi-Castillo (1955:361).

Haemagogus (Cyanoconops) of Antunes (1939:106); Lane (1939:121; 1953:802-810).
Cacomyia of Coquillett (1906:25); Theobald (1907:554; 1910:493-494).
Stegoconops of Lutz (1905:83-84); Howard, Dyar and Knab (1913:figs. 162-165,438,439, pl. 77).
Aedes in part of Dyar and Knab (1906a:190,191,195,202, fig. 18).

FEMALES. Scales of head, thorax and abdomen broad, flat, with brilliant metallic reflections. Light scales silver or silvery white. **Head:** Eyes narrowly to broadly separated above antennae (1 to 5 ommatidial diameters). Proboscis 0.80-1.52 of forefemur. Palpus 4-segmented, segment 4 small. **Thorax:** Mesonotum and scutellum densely covered with broad, flat scales. Prescutellar bristles not developed. *Apn* lobes considerably to greatly enlarged, often nearly meeting at midline; *ppn* with or without scales; setae near middle of *stp* not developed; lower *stp* bristles weakly or strongly developed. Pleuron with broad, flat, silver or silvery white scales forming single broad, vertical band from antealar area to midcoxa with scales on paratergite, *pra, psp, ssp, mep* and *stp; pcx, ppl* and *pst* with silver scales. **Legs:** Hindcoxa with base at level of or slightly below upper margin of meron; midcoxa with single well developed bristle or row of 2-4 well developed bristles laterally; forefemur and midfemur usually with silver scales at base and often extending to basal third or half and occasionally to apex ventrally; hindfemur with silver scales on anterior, ventral and posterior surfaces usually extending to about basal 0.75 anteriorly but not beyond basal half posteriorly; knee spots of silver scales at apex of midfemur and hindfemur present or absent. Claws of foreleg and midleg simple or with subbasal tooth. **Wing:** R_{2+3} about 0.30-1.56 of R_2. **Postnotum:** Bristles present or absent.

FEMALE GENITALIA. **Tergite IX:** Setae present or absent.

MALES. Generally similar to females except for sexual differences. **Head:** Proboscis about 0.95-1.64 of forefemur. Palpus either short or long. Antenna 0.44-0.65 of proboscis with torus moderately to greatly enlarged, flagellum sparsely to densely plumose, segments 1-12 with 6 to many moderate to long bristles. **Legs:** Claws of foreleg enlarged, unequal, tooth present or absent; claws of midleg usually enlarged, unequal, rarely small, subequal, tooth present or absent.

MALE GENITALIA. **Segment VIII:** Tergite with long, lanceolate scales or large spiniform setae mesally. **Segment IX:** Tergite with or without setae. **Sidepiece:** Apical lobe present or absent. **Claspette:** Filament simple or highly modified. **Clasper:** Simple to highly modified; spiniform apical or subapical, short or long, 0.18-0.65 of clasper. **Phallosome:** Aedeagus tip with variously developed dorsal process.

PUPAE. **Cephalothorax:** Hair 1-C considerably stronger than 2,3-C. Hair 5-C weaker than or rarely subequal to 7-C. **Trumpet:** Strongly broadening from base to near apex. **Abdomen:** Hair 1 weakly to very strongly developed, usually weaker on posterior segments. Hair 5-IV-VII 0.4-1.2 of corresponding tergite. **Paddle:** Apex rounded or pointed. Midrib usually considerably darker than remainder of paddle; marginal spicules few. Hair 1-P weakly developed, usually single (1-4b).

LARVAE. **Head:** Hair 5-C single (rarely double). Hair 6-C single or double. **Thorax:** Integument with or without spicules. Tubercles of hairs 5-7-P free or joined. **Abdomen:** Hair 12-I present or absent. **Segment VIII:** Comb scales 6-50 (4-75) with single, minutely fringed spine; in single row, irregular double row or large triangular patch. **Anal Segment:** Spines on caudal margin of saddle strongly or weakly developed. Ventral brush (4-X) with 5 or 6 pair of hairs arising from strongly to weakly sclerotized boss. Hair 4a-X 2-8b, long or short.

DISCUSSION. The subgenus *Haemagogus* can be distinguished from the subgenus *Conopostegus:* in the **adults** by the dense metallic green, blue, copper or bronze mesonotal scales and the single broad vertical band of silver scales on the pleuron; in the **male genitalia** by long lanceolate scales or large spiniform setae on the distal margin of tergite VIII and a variously developed sclerotized dorsal process on the aedeagus; in the **pupa** by relatively weakly developed hairs 5-C and 1-P; and in the **larva** by at least 1 of the following characters: (1) comb scales numerous and in a triangular patch, (2) integument with spicules, (3) a weakly sclerotized boss, (4) hair 12-I absent or (5) hair 12-II stronger than hair 10-II.

As discussed above in the chapter on Systematics, the subgenus *Haemagogus* includes the species formerly included in the subgenera *Haemagogus, Stegoconops* and *Longipalpifer* (Stone, Knight and Starcke, 1959:215-218). The subgenus constitutes a rather homogeneous assemblage of species and I do not consider the subdivision into the above 3 subgenera to be warranted, especially with the inclusion of the subgenus *Conopostegus* in the genus *Haemagogus,* as the criteria for separating the present subgenera *Conopostegus* and *Haemagogus* are of a different magnitude than those for subdividing the subgenus *Haemagogus.* In addition, the species formerly placed in *Longipalpifer,* those with long male palpus, are not a monophyletic group, as this character is found in 3 separate phyletic lines. I prefer, instead, to recognize 3 sections in the subgenus *Haemagogus:* the Albomaculatus Section containing the species formerly placed in the subgenera *Stegoconops* and *Longipalpifer* with the exception of *tropicalis;* the annectent monotypic Tropicalis Section; and the Splendens Section containing the species formerly placed in the subgenus *Haemagogus.*

Although several species complexes are apparent within the subgenus *Haemagogus,* formal species groups are not recognized, primarily because more than half of the species groups would be monotypic, and such an arrangement would probably be unduly cumbersome. The species complexes are discussed under the Section discussion paragraphs and in the systematics paragraphs of the species accounts.

ALBOMACULATUS SECTION

FEMALES. **Head:** Eyes narrowly to broadly separated above antennae (1-4 ommatidial diameters). Proboscis 1.10-1.52 of forefemur. **Thorax:** *Ppn* with scales; single lower *stp* bristle usually well developed. **Legs:** Midcoxa usually with row of 2-4 well developed bristles laterally; forefemur about 1.25-1.60 of distance from top of thorax to apex of midcoxa. Knee spots present or absent. Claws of foreleg and midleg with subbasal tooth. **Wing:** R_{2+3} about 0.55-1.56 of R_2. **Postnotum:** Bristles absent.

FEMALE GENITALIA. **Tergite IX:** Setae (1-3) present.

MALE. **Head:** Proboscis about 1.31-1.64 of forefemur. Palpus either short or long. Antenna 0.55-0.65 of proboscis, with torus much enlarged, flagellum densely plumose, segments 1-12 with very numerous moderate to long bristles. **Legs:** Claws of foreleg and midleg enlarged, unequal; larger claw simple or with submedian tooth; smaller claw simple or with submedian or basal tooth.

MALE GENITALIA. **Segment IX:** Tergite with 1-3 poorly to moderately developed setae. **Sidepiece:** Apical lobe absent. **Claspette:** Filament simple or modified. **Clasper:** Simple, cylindrical, curved inward at apex; seta present near apex of inner surface; spiniform apical, long, about 0.40-0.65 of clasper, slightly curved inward.

LARVAE. **Head:** Hair 5-C usually single (single to triple). Hair 6-C usually single, occasionally double. **Thorax:** Integument with or without spicules. Tubercles of hairs 5-6-P usually joined and hair 7-P free but often with tubercles of hairs 5-7-P either all connected or all free. **Abdomen:** Hair 12-I present or absent. **Segment VIII:** Comb scales 6-12(4-20), with single sharply pointed, minutely fringed spine, in single row. **Anal Segment:** Spines on caudal margin of saddle usually relatively strongly developed and with few teeth dorsally. Ventral brush (4-X) with 5 pairs of hairs, all hairs arising from weakly to strongly sclerotized boss. Hair 4a-X 2-5b, long or short.

DISCUSSION. The Albomaculatus Section can be distinguished from the remainder of the subgenus *Haemagogus:* in the **adults** by the combination of (1) toothed claws on the foreleg and midleg of the female, (2) postnotum without setae, (3) vein R_{2+3} at least 0.55 of R_2 and (4) a dense patch of scales on the *ppn;* in the **female genitalia** by the presence of setae on tergite IX; in the **male genitalia** by (1) 1 to 3 setae on tergite IX and (2) the distal margin of tergite VIII emarginate, or if not emarginate then with lanceolate scales mesally; and in the **larvae** by a single row of comb scales and 5 pairs of hairs in the ventral brush.

The Albomaculatus Section contains, with the exception of *tropicalis,* the species formerly placed in the subgenera *Stegoconops* and *Longipalpifer.* In general this section appears to be the least derived of the subgenus *Haemagogus* in the adults and in terms of numbers of individuals and extent of distribution contains the dominant elements of the *Haemagogus* fauna, *janthinomys, mesodentatus* and *equinus.*

The relationships within the Albomaculatus Section are difficult to determine with the exception of a few obvious species complexes.

The species of the *anastasionis* complex, *anastasionis, chrysochlorus* and *spegazzinii,* share the absence of a well developed lower *stp* bristle in the adults, a simple large claw on the foreleg and midleg of the males, the presence of large spiniform setae in place of elongate scales on the distal margin of tergite VIII in the male genitalia, and, in the larvae, the absence of hair 12-I, single hairs 5,6-C and a strongly sclerotized boss.

The species of the *andinus* complex, *andinus* and *nebulosus,* differ in the adults only in the color of the dark scales of the head, mesonotum and abdomen and in the larvae only by the shorter siphon and fewer branches on hair 4a-X on *andinus.* The relationships of the *andinus* complex are obscure, but it may be related to the *anastasionis* complex through *baresi.* The latter has the male genitalia much like those of *andinus* and lacks a lower *stp* bristle and has a simple large claw on the male foreleg and midleg, characters found in the *anastasionis* complex.

The *capricornii* complex consists of *janthinomys* and *capricornii,* which are apparently indistinguishable except for details of the aedeagus. Possibly closely related to the *capricornii* complex is *mesodentatus,* which also has a spiculose larval integument and an extreme development of the aedeagus, although it differs in details of adult ornamentation and has larval hair 12-I developed, which *janthinomys* and *capricornii* lack. *Janthinomys* and *mesodentatus* have a similar biology and have a basically complementary distribution.

The species of the *soperi* complex, *soperi* and *acutisentis,* differ only in the distribution of setae on the sidepiece of the male genitalia and the shape of the larval comb scales. The *soperi* complex is probably allied to *equinus* with which it shares the long male palpus and several important larval characters, however the male genitalia differ considerably.

The relationships of *albomaculatus* are not clear, and though it is unusual only in the unique development of the aedeagus, it seems not to be particularly closely allied to any other members of the Albomaculatus Section.

Panarchys is, in many respects, the most unusual member of the subgenus and since it retains several primitive characters, it may be annectent to *Conopostegus*. It has no close affinities to any other member of the subgenus *Haemagogus*.

1. Haemagogus (H.) anastasionis Dyar

Figs. 2,8,9

1921. *Haemagogus anastasionis* Dyar, 1921c:155. TYPE. *Lectotype* male (1529) with genitalia slide, Puntarenas, Puntarenas, Costa Rica, 15 July 1921, A. Alfaro [USNM, 24864; selection of Stone and Knight, 1955:287].

1971. *Haemagogus (Stegoconops) dominguezi* Duret, 1971:83-86. TYPE. *Holotype* male (7258) with genitalia slide, Department of Zelaya, Nicaragua, 1961, F. Dominguez [A]. NEW SYNONYMY.

Haemagogus (Haemagogus) anastasionis of Edwards (1932:179); Anduze (1947:353).
Haemagogus (Stegoconops) anastasionis of Stone, Knight and Starcke (1959:216); Cova Garcia, Sutil and Rausseo (1966a:61-62, fig. 120; 1966b:114, fig. 202); Diaz Najera (1966:61).
Haemagogus anastasionis of Komp and Kumm (1938:259); Kumm, Komp and Ruiz (1940: 398); Kumm and Zuniga (1942:404); Hovanitz (1946:40); Kumm, Osorno-Mesa and Boshell-Manrique (1946:17); Woke (1947:365); Trapido and Galindo (1956a:306); Galindo and Trapido (1957:148); Vargas and Diaz Najera (1959:362); Diaz Najera (1960:185).
Haemagogus (Haemagogus) anastationis of Dyar (1928:137); Lane (1939:118); Levi-Castillo (1951b:11,23-24).
Haemagogus (Stegoconops) anastationis of Lane (1953:798-800).
Haemagogus anastationis of Vargas and Martinez Palacios (1953:37); Barreto Reyes (1955:79).
Haemagogus uriartei of Komp (1949:73).

FEMALE. Wing: 3.23 mm. Proboscis: 2.68 mm. Forefemur: 2.05 mm. Abdomen: 2.90 mm. Dark scales of proboscis, palpus, wing and legs primarily violet, with some purple reflections. **Head**: Eyes narrowly separated above antennae (1 ommatidial diameter). Decumbent scales of vertex and occiput blue anteriorly and laterally, bluish green posteriorly. Proboscis relatively long, about 1.30 of forefemur; palpus about 0.15 of proboscis; antenna relatively long, about 0.71 of proboscis. **Thorax**: Scales of mesonotum copper dorsally, more blue anteriorly, laterally and posteriorly, usually blue over supraalar bristles, silver in antealar area; scales on scutellum copper, blue on lobes. *Apn* lobes moderately enlarged, scales blue, often with silver scales anteriorly; *ppn* scales blue to bluish green; lower *stp* without well developed bristle. **Legs**: Midcoxa with patch of violet scales near middle; legs relatively short, length of forefemur about 1.30 of distance from top of thorax to apex of midcoxa. **Wing**: R_{2+3} about 1.25-1.50 of R_2. **Abdomen**: Dark scales blue to bluish green, occasionally with purple reflections; silver scales dorsally on tergites IV-VII, in small basal patches on IV and V and rather broad basal bands on VI and VII.

MALE (fig. 8). Wing: 2.60 mm. Proboscis: 2.45 mm. Forefemur: 1.70 mm. Abdomen: 2.55 mm. **Head**: Proboscis about 1.45 of forefemur; palpus short, about 0.14 of proboscis; antenna about 0.65 of proboscis. **Legs**: Larger claw of foreleg and midleg simple; smaller claw of foreleg with acute submedian tooth, smaller claw of midleg with acute subbasal tooth.

MALE GENITALIA (fig. 8). **Segment VIII:** Tergite about 0.80 of sternite; distal margin rather deeply emarginate, with enlarged spiniform setae. **Segment IX:** Tergite emarginate and weakly sclerotized mesally, lobes usually with 1 or 2 setae. **Sidepiece:** Conical, length about 3.0 times median width; basal tergomesal lobe not enlarged, but extending distad to near distal third of sidepiece as slightly raised area with numerous short setae, basally with numerous setae, the more proximal ones considerably enlarged; apical sternomesal scales lanceolate to broadly lanceolate. **Claspette:** Stem slightly broader beyond middle, slightly angled dorsad at distal third; filament striate, narrowly sickle-shaped. **Clasper:** Broadest at base, spiniform about 0.50 of clasper. **Phallosome:** Aedeagus large, broadly obovate, tip with a dorsal carina proximad to a small beak; venter open except on basal fourth, with heavily sclerotized ridges lateroventrally which are expanded basally but not joined at midline. **Proctiger:** Cercal setae 6; apical knob of paraproct with about 10-15 serrations.

PUPA (fig. 8). Abdomen: about 3.50 mm. Trumpet: 0.45 mm. Paddle: 0.70 mm. **Cephalothorax:** Weakly to moderately pigmented, darker dorsally. Hairs 4,5-C more or less subequal, 1-4b, weaker than 7-C which is single. **Trumpet:** Medium brown, lighter distally, reticulate sculpturing moderate. **Abdomen:** Weakly to moderately pigmented, genital lobe and anterior segments darker. Float hair (1-I) with about 10-12 primary branches and about 2-5 secondary branches. Hair 1-II-VII weakly to rather strongly developed, single, branched or sometimes dendritic. Hair 2-VII short, considerably cephalad of 1-VII. Hairs 3-II,III,5-IV,V more or less subequal. Hair 6-VII slightly stronger than 6-III-VI which are subequal. Hair 9-VII slightly cephalad of caudolateral margin of tergite, single or double, often brush tipped; 9-VIII about 4-7b. **Terminal Segments:** Male genital lobe relatively small, about 0.95 of tergite VIII. **Paddle:** Weakly to moderately pigmented, apex broadly rounded or slightly acuminate. Hair 1-P single.

LARVA (fig. 9). Head: 0.80 mm. Siphon: 0.68 mm. Anal Saddle: 0.33 mm. **Head:** Hairs 5,6-C single. **Thorax:** Integument without spicules. Tubercles of hairs 5-6-P connected, tubercle of hair 7-P narrowly connected to 6-P. **Abdomen:** Hair 12-I absent. **Segment VIII:** Comb scales 6-10, with single sharply pointed, minutely fringed spine, in single row. **Siphon:** Index about 2.0. Pecten teeth about 18(12-22), extending to basal 0.50 of siphon. Hair 1-S double or triple (1-4b), inserted at basal 0.55-0.60 of siphon. **Anal Segment:** Spines on caudal margin of saddle well developed. Hair 4a-X 4b(3-5b), long. Boss strongly sclerotized.

SYSTEMATICS. *Haemagogus anastasionis* is separated from the other members of the Albomaculatus Section: in the **adults** by the combination of (1) absence of well developed lower *stp* bristle, (2) scales of vertex and occiput blue to bluish green, (3) scales of mesonotum copper with blue scales laterally, (4) dark scales of abdomen blue to bluish green with silver scales dorsally at base of tergites IV-VII and (5) simple large claw of foreleg and midleg of male; in the **male genitalia** from all species except *chrysochlorus* by (1) presence of large spiniform setae and absence of large lanceolate scales on distal margin of tergite VIII and (2) narrowly sickle-shaped claspette filament; and in the **larva** by the combination of (1) single hairs 5,6-C, (2) integument without spicules, (3) absence of hair 12-I, (4) hair 12-II weaker than 10-II, (5) short siphon (index about 2.0) and (6) strongly sclerotized boss.

Haemagogus anastasionis is closely allied to *chrysochlorus* and *spegazzinii.* Characters common to this *anastasionis* complex include the absence of a well developed lower *stp* bristle, the simple large claw of the male foreleg and midleg, the distal

margin of tergite VIII of the males with enlarged setae but no elongate scales, and, in the larvae, single hairs 5,6-C, the absence of hair 12-I and a strongly sclerotized boss.

As interpreted here, *anastasionis* is composed of several apparently disjunct populations. I have seen specimens from the Pacific versant of Central America, the upper Magdalena River valley of Colombia, the Zulia River valley of Colombia and Venezuela and the northern coast of Venezuela. In view of the discontinuous distribution of this species. the literature records of *anastasionis* from the Orinoco drainage of Venezuela and the Atlantic coast of Mexico can reasonably be assumed to be valid. The single female specimen from Puerto La Cruz, Venezuela is unusual in the amount of silver scaling on the *apn* and the more greenish hue of the scales of the head and abdomen. I am placing it here until more specimens of all stages can be secured and examined.

Haemagogus dominguezi was described by Duret on the basis of a single male captured in the department of Zelaya, Nicaragua. This specimen appears to be teratological, differing from *anastasionis* in the loss of the claspette filament and in the abnormal coloration of some of the leg scales. It seems to agree in all other aspects with typical males of *anastasionis*.

BIONOMICS. On the Pacific versant of Central America *anastasionis* inhabits primarily scrub forest, second growth and open deciduous forest. The immature stages are most commonly found in treeholes, but have also been taken from bamboo internodes and fruits on the ground. It is apparently peridomestic in some areas. It has been found at elevations up to approximately 500 meters in Nicaragua and Colombia.

DISTRIBUTION (fig. 2). *Haemagogus anastasionis* is known from the Atlantic coast of Veracruz and Campeche, Mexico and the Pacific versant of Central America from Guatemala to San Jose, Costa Rica with one record from the Atlantic slope of Nicaragua. Apparently absent from southern Costa Rica and Panama, it is present in the Caribbean drainage of Colombia and Venezuela, with 1 record from the Orinoco drainage of Venezuela. The records in Stone, Knight and Starcke (1959: 216) reporting *anastasionis* from Curacao and Peru refer to *chrysochlorus* and *obscurescens* (=*janthinomys*) respectively. Material examined: 338 specimens; 36 males, 54 females, 33 pupae, 215 larvae; 33 individual rearings (15 larval, 13 pupal, 5 incomplete).

COLOMBIA. **Cundinamarca**: Girardot (10 km NW), 500 m, 11 Nov 1965, C. Marinkelle (COM 16), 1 P, 19 L [UCLA]. Villeta, 1000 m, 1 M [USNM]; same data (GML), 1 M [UCLA]; same data, H. Kumm, 5 M, 4 F, 4 l [USNM, UCLA]; same data, 1943, G. Boshell-Manrique and H. Kumm, 3 lM gen, 3 M, 1 F, 6 l [USNM]. **Norte de Santander**: Bachaquoro, Zulia, Mar 1947 P. Anduze, 1 M, 1 l [UCLA, USNM].

COSTA RICA. **Guanacaste**: Las Canas, 9 June 1943, H. Kumm, 5 F [UCLA]. Palo Verde, OTS Station, 10 m, 18 Aug 1971, D. Heinemann (CR 445), 1 lpF (445-10) [UCLA]. Santa Cruz, 12 Oct 1937, H. Kumm, 5 M, 5 F, 2 l, 4 L [UCLA, USNM, BM]. **Puntarenas**: Esparta (5 km E), 250 m, 13 Aug 1971, D. Schroeder (CR 355), 1 lP (355-13); same data (CR 358), 1 lpM (358-22) [UCLA]. Las Loras, nr. Puntarenas, F. Knab, 1 F [USNM]. Puntarenas, 15 July 1924, A. Alfaro, 1 M, 3 F [USNM]. **San Jose**: San Jose, F. Knab, 1 F [USNM].

EL SALVADOR. **San Miguel**: San Miguel, 1 Aug 1941, H. Kumm, 1 M gen, 1 F [USNM]. **San Salvador**: Hacienda San Ramon, 17 June 1953 (GML), 1 lpF (01669), 1 lp (01668), 1 l [UCLA].

GUATEMALA. **Suchitepequez**: Patulul, 20 July 1964, P. Cowsill (GUA 57), 1 pF (57-100) [UCLA].

HONDURAS. **Choluteca**: Choluteca, Dec 1945, B. Avila, 1 M, 2 F [UCLA].

NICARAGUA. **Chinandega**: Castanones Peninsula, nr. Corinto, 31 Aug 1944, H. Crowell, 1 F

[UCLA]. Corinto, 24 Oct 1944 (GML), 1 M gen; same data, 18 Sept 1945, H. Crowell, 1 M [UCLA]. **Leon:** Puerto Somoza, 12 June 1964, A. Quinonez (NI 2), 4 lpM (2-101-103,105), 2 lpF (2-104,106), 25 L; same data, 13 June 1964 (NI 4), 3 lpF (4-107,108,111), 1 pM (4-105), 6 pF (4-101-104,110,112), 23 L; same data, 18 June 1964 (NI 20), 1 F [UCLA]. Simonillo (nr. Nagarote), 14 June 1964, A. Quinonez (NI 8), 6 F; same data, 15 June 1964 (NI 10), 1 lpF (10-103), 1 pM (10-101), 1 pF (10-102), 1 P, 40 L; same data, 16 June 1964 (NI 12), 3 lpF (12-105,106,108), 3 pM (12-102,103,107), 1 P, 70 L [UCLA]. **Rivas:** San Juan del Sur, 24 Nov 1943, 1 M, 1 M gen [USNM]. **Department unknown:** Bozbollow, 28 Oct 1953 (GML), 2 F [UCLA].

VENEZUELA. **Anzoatequi:** Puerto La Cruz, 26 Sept 1944, W. Komp, 1 F [UCLA].

LOCALITY UNSPECIFIED. 1 F [USNM].

Additional Records From the Literature

MEXICO. **Campeche:** Campeche (Diaz Najera, 1960:185). **Vera Cruz:** Paso de San Juan (Vargas and Martinez Palacios, 1953:37).

NICARAGUA. **Zelaya** (Duret, 1971:83).

VENEZUELA. **Cojedes:** Galeras del Pao (Cova Garcia, Sutil and Rausseo, 1966b:114). **Zulia:** Sucre district (Anduze, 1947:353).

2. Haemagogus (H.) chrysochlorus Arnell, n. sp.

Figs. 2,36

TYPES: *Holotype* male with genitalia slide (721117-1), Curacao, E. van der Kuyp [USNM]. *Allotype* female, Curacao, E. van der Kuyp [USNM]. *Paratype:* 1 M with genitalia slide (46.V.13^{C}), Curacao, E. van der Kuyp [UCLA].

Haemagogus (Haemagogus) anastasionis of van der Kuyp (1954:54).
Haemagogus (Stegoconops) anastasionis in part of Forattini (1965:32-34).
Haemagogus anastasionis of van der Kuyp (1949a:69; 1949b:142; 1953a:146; 1953b:38).

FEMALE. Wing: 2.70 mm. Proboscis: 2.30 mm. Forefemur: 1.95 mm. Abdomen: 2.45 mm. Dark scales of proboscis, palpus, wing and legs primarily violet with some purple and green reflections. **Head:** Eyes narrowly separated above antennae (1 ommatidial diameter). Decumbent scales of vertex bronze. Proboscis about 1.20 of forefemur; palpus about 0.12 of proboscis; antenna about 0.70 of proboscis. **Thorax:** Scales of mesonotum copper, more green posteriorly, silver in antealar area; scales of scutellum bronze. *Apn* lobes moderately enlarged, scales light bronze, silver anteriorly and laterally; *ppn* scales light bronze; lower *stp* without well developed bristle. **Legs:** Relatively short, length of forefemur about 1.30 of distance from top of thorax to apex of midcoxa. **Wing:** R_{2+3} about 1.50 of R_2. **Abdomen:** Darker scales light bronze with some copper reflections; silver scales dorsally on tergites IV-VII, in basal patches on IV and V and basal bands continuous with lateral silver patches on VI and VII.

MALE (fig. 36). Wing: 2.38 mm. Proboscis: 2.30 mm. Forefemur: 1.70 mm. Abdomen: about 2.25 mm. **Head:** Proboscis about 1.35 of forefemur; palpus short, about 0.13 of proboscis; antenna about 0.65 of proboscis. **Legs:** Larger and smaller claws of foreleg and midleg simple.

MALE GENITALIA (fig. 36). Generally similar to *anastasionis*. Distal margin of tergite VIII with very large spiniform setae.

PUPA. Unknown.

LARVA. Unknown.

SYSTEMATICS. *Haemagogus chrysochlorus* can be distinguished: in the **adults** by (1) conspicuous light bronze color of the darker abdominal scales and basal silver scales dorsally on tergites IV-VII, (2) copper scales on mesonotum and head, (3) absence of well developed lower *stp* bristle, and (4) simple large and small claws of male foreleg and midleg; and in the **male genitalia** from all but *anastasionis* by (1) presence of large spiniform setae and absence of large lanceolate scales on distal margin of tergite VIII and (2) narrowly sickle-shaped claspette filament.

A member of the *anastasionis* complex, *chrysochlorus* is closely allied to *anastasionis* and less closely to *spegazzinii* with both of which it shares the absence of a well developed lower *stp* bristle, the simple large claw of the foreleg and midleg of the male and the absence of elongate scales on the distal margin of tergite VIII of the male. The male genitalia are apparently indistinguishable from *anastasionis*, although the spiniform setae on the distal margin of tergite VIII may possibly be larger and fewer in *chrysochlorus*. It is readily separated from both *anastasionis* and *spegazzinii* by the adult ornamentation and the male claws as indicated above. *Chrysochlorus* undoubtedly arose as an isolate of the *anastasionis* stock.

BIONOMICS. Nothing is known of the bionomics of *chrysochlorus* other than the report by van der Kuyp (1949b:143) of larvae found primarily in treeholes following heavy rains and adults attacking man readily in shade.

DISTRIBUTION (fig. 2). *Haemagogus chrysochlorus* is known only from the islands of Aruba and Curacao in the Netherlands Antilles. Material examined: 3 specimens; 2 males, 1 female.

NETHERLANDS ANTILLES. **Curacao:** type series, see above.

Additional Record From the Literature

NETHERLANDS ANTILLES. **Aruba** (van der Kuyp, 1953:146).

3. Haemagogus (H.) spegazzinii Brethes

Figs. 2,10,11

1912. *Haemagogus spegazzinii* Brethes, 1912:39. TYPE: *Holotype* female (7273) and 2 slides (3028), one with a wing and the other with genitalia, an antenna and a palpus, Jujuy Province, Argentina, adult taken in dense woodland, 1907, D. Carlos Spegazzini [BA]. Synonymized with *capricornii* by Dyar (1921b:150); considered a synonym of *equinus* by Dyar (1923:183); resurrected from synonymy by Cerqueira (1943:10-12) but misinterpreted as being conspecific with *janthinomys* Dyar, 1921b.

1928. *Haemagogus uriartei* Shannon and Del Ponte, 1928:68-69. TYPE: *Holotype* male (128-3) with genitalia slide (2353) and pupal slide (V3), Vipos, Tucaman, Argentina, larva collected in a treehole, 22 Mar 1927, R. Shannon and E. Del Ponte [USNM; see Stone and Knight, 1955:289]. Synonymized with *spegazzinii* by Martinez, Carcavallo and Prosen (1960:72).

1931. *Haemagogus lindneri* Martini, 1931a:118. TYPE: *Holotype* female, (?San Jose de) Chiquitos, Santa Cruz, Bolivia, Oct 1926 [SMNS]. Synonymized with *uriartei* by Lane (1939:121).

Haemagogus (Stegoconops) spegazzinii of Martinez, Carcavallo and Prosen (1961:72); Stone (1963:132); Forattini (1965:34-35); Martinez and Carcavallo (1965:40); Morales-Ayala (1971: 142).

Haemagogus (Haemagogus) uriartei of Edwards (1932:179); Lane (1939:120-121); Levi-Castillo (1951b:11,26-28).

Haemagogus (Stegoconops) uriartei of Dyar (1928:135); Martini (1931a:117, in part; 1931b:211, in part); Lane (1953:800-802); Stone, Knight and Starcke (1959:217); Galindo and Trapido (1967:108).
Haemagogus uriartei of Antunes and Whitman (1937:827); Cerqueira (1943:12-13); Martinez (1950:61); Kumm and Cerqueira (1951:174); Levi-Castillo (1951a:15); Bevier, Torrez-Munoz and Doria-Medina (1953:474); Manso Soto, Martinez and Prosen (1953:33).
Haemagogus (Stegoconops) lindneri of Martini (1931b:212).
Haemagogus lindneri of Mattingly (1955:28).

FEMALE. Wing: 2.63 mm. Proboscis: 2.20 mm. Forefemur: 1.74 mm. Abdomen: 2.38 mm. Dark scales of proboscis, palpus, wing and legs predominantly purple to violet. **Head:** Eyes narrowly separated above antennae (1 ommatidial diameter). Decumbent scales of vertex and occiput light green, bluish green or gold. Proboscis relatively long, about 1.25 of forefemur; palpus relatively short, about 0.12 of proboscis; antenna about 0.70 of proboscis. **Thorax:** Scales of mesonotum and scutellum light bronze to copper with red reflections, bluish green to gold over supraalar bristles and on scutellar lobes, silver in antealar area. *Apn* lobes moderately enlarged, scales almost entirely silver, often a few copper scales posteriodorsally; *ppn* scales gold to copper; lower *stp* without well developed bristle. **Legs:** Midcoxa usually with patch of blue to violet scales near middle; legs moderately long, length of forefemur about 1.45 of distance from top of thorax to apex of midcoxa. **Wing:** R_{2+3} about 1.20-1.50 of R_2. **Abdomen:** Dark scales of tergites light bronze to bluish green with more purple reflections laterally; sternites purple to blue.

MALE (fig. 10). Wing: 2.45 mm. Proboscis: 2.40 mm. Forefemur: 1.80 mm. Abdomen: 2.40 mm. **Head:** Proboscis about 1.35 of forefemur; palpus short, about 0.14 of proboscis; antenna about 0.68 of proboscis. **Legs:** Larger claw of foreleg and midleg simple; smaller claw with acute subbasal tooth. **Abdomen:** Distal segments and genitalia often with purple scales.

MALE GENITALIA (fig. 10). **Segment VIII:** Tergite about 0.70 of sternite; distal margin broadly emarginate, with enlarged setae laterally and dense cluster of about 15-20 large spiniform setae mesally. **Segment IX:** Tergite emarginate mesally, weakly sclerotized at midline, strongly sclerotized immediately laterad, lobes with 1 or 2 setae. **Sidepiece:** Conical, length about 3.5 times median width; basal tergomesal lobe not enlarged but extending distad as slightly raised area with numerous short setae to near distal third of sidepiece, basally with numerous setae, the more proximal ones enlarged; apical sternomesal scales mostly broadly lanceolate. **Claspette:** Slightly bowed outward before middle in dorsal aspect; uniform in thickness, slightly curved dorsad, usually 2 large setae near middle of inner surface; filament striate, broadly sickle-shaped. **Clasper:** Broadest at base; spiniform about 0.50 of clasper. **Phallosome:** Aedeagus large, broadly obovate, tip with a strongly sclerotized dorsal carina proximad to a small beak; venter broadly open except on basal fourth, with heavily sclerotized ridges lateroventrally, expanded basally to meet on midline and forming 2 small distally projecting spines. **Proctiger:** Cercal setae 6-8; apical knob of paraproct with about 15-20 serrations.

PUPA (fig. 10). Abdomen: about 3.50 mm. Trumpet: 0.50 mm. Paddle: 1.00 mm. **Cephalothorax:** Moderately pigmented, slightly darker dorsally. Hairs 4,5-C moderately developed, subequal, triple, weaker than 7-C which is double. **Trumpet:** Medium brown, lighter distally; reticulate sculpturing moderate. **Abdomen:** Weakly pigmented, genital lobe and anterior segments slightly darker. Float hair (1-I) with about 14-16 primary branches and 2-6 secondary branches. Hair 1-II-VII weakly

to strongly developed, branched or dendritic. Hair 2-VII short, considerably cephalad of 1-VII. Hairs 3-II,III,5-IV,V more or less subequal or with 3-III weaker. Hair 6-VII stronger than 6-III-VI which are subequal. Hair 9-VII slightly cephalad of dorsolateral margin of tergite, double; 9-VIII 8-12b. **Paddle:** Weakly pigmented, apex slightly acuminate. Hair 1-P single.

LARVA (fig. 11). Head: 0.90 mm. Siphon: 1.00 mm. Anal Saddle: 0.41 mm. **Head:** Hairs 5,6-C single. **Thorax:** Integument without spicules. Tubercles of hairs 5,6-P connected, tubercle of hair 7-P free. **Abdomen:** Hair 12-I absent. **Segment VIII:** Comb scales 8-10, with single sharply pointed, minutely fringed spine, in single row. **Siphon:** Index about 3.2-3.4. Pecten teeth 20-24, extending to about basal 0.50 of siphon. Hair 1-S 3-4b, inserted at basal 0.60 of siphon. **Anal Segment:** Spines on caudal margin of saddle very well developed, long, numerous. Hair 4a-X 4b, long. Boss strongly sclerotized.

SYSTEMATICS. *Haemagogus spegazzinii* can be distinguished from other species of the Albomaculatus Section: in the **adults** by the combination of (1) almost entirely silver *apn* lobes, (2) darker abdominal scales light bronze or occasionally bluish green and absence of silver scales dorsally on abdominal tergites, (3) light bronze to copper mesonotal scales, (4) absence of a well developed lower *stp* bristle and (5) simple large claw of male foreleg and midleg; in the **male genitalia** by spiniform setae mesally on the distal margin of tergite VIII and a broadly sickle-shaped claspette filament; and in the **larva** by the combination of (1) single hairs 5,6-C (2) integument without spicules, (3) absence of hair 12-I, (4) hair 12-II weaker than 10-II, (5) relatively long siphon (index about 3.2-3.4) and (6) strongly sclerotized boss.

Haemagogus spegazzinii is related to *anastasionis* and *chryochlorus* and is included with these species in the *anastasionis* complex. It shares with these species the absence of a well developed lower *stp* bristle, the simple large claw of the foreleg and midleg of the male, the absence of elongate scales on the distal margin of tergite VIII of the male and, in the larva, the absence of hair 12-I, single hairs 5,6-C and a well-sclerotized boss. It can be separated from them on the basis of the adult ornamentation as discussed above, the broader claspette filament and the longer siphon.

There appears to be considerable variation in the color of the dark scales of the head, mesonotum and abdomen of *spegazzinii,* the abdomen, most conspicuously, being usually light bronze but occasionally dark bluish green. However this variation apparently has no geographical pattern.

Two female specimens in the USNM collection labeled only "Ecuador/R. Levi-Castillo" are typical *spegazzinii,* and, assuming the specimens are correctly labeled, they significantly extend the range of this species.

It is evident from Brethes' original description that *spegazzinii* is a species distinct from *janthinomys.* Although I was not able to see the holotype of *spegazzinii* I am confident that the material on which the above descriptions are based is conspecific with it. I also find that the synonymy of *uriartei* with *spegazzinii* by Martinez, Carcavallo and Prosen (1960:72) is correct. A review of the confusion of *spegazzinii, capricornii* and *janthinomys* is given below in the discussion of the systematics of the latter.

BIONOMICS. The larvae of this species are commonly found in treeholes and bamboo internodes. Antunes and Whitman (1937) showed *spegazzinii* (as *uriartei*) to be capable of harboring yellow fever virus but they were unable to effect transmission. Bevier, Torres-Munoz and Doria-Medina (1953) found *spegazzinii,* as well

as *janthinomys,* to be present in areas of yellow fever outbreaks near Santa Cruz, Bolivia, where it may possibly play a role in transmission.

DISTRIBUTION (fig. 2). *Haemagogus spegazzinii* extends from eastern and southeastern Brazil to Paraguay, northern Argentina and eastern Bolivia, with 1 record from the upper Amazon in Ecuador. The record in Stone, Knight and Starcke (1959:217) of *spegazzinii* (as *uriartei*) from Venezuela undoubtedly refers to *anastasionis*. Material examined: 47 specimens; 13 males, 18 females, 1 pupa, 15 larvae; 1 individual rearing (incomplete).

ARGENTINA. **Cordoba**: Alta Gracia, 12 Feb 1918, 1 F [USNM]. **Formosa**: El Coati, Nov 1949, 1 F [USNM]. **Jujuy**: Ledesma (Libertador General San Martin), G. Boshell-Manrique and H. Kumm, 3 F, 1 M, 1 L [UCLA, USNM]; same data, 1943, H. Kumm, 1 l [USNM]. Locality unspecified, Dec 1968, W. Patterson, 3 M, 2 F [BM]. **Santiago del Estero**: Frias, 24 Feb 1960, 11 L [USNM]. **Tucuman**: Raco, 13 Feb 1927, R. Shannon, 1 F [USNM].

BOLIVIA. **Santa Cruz**: Cercado, Jan 1939, 1 F [USNM]. Pozo Redondo, Cordillera, 7 Mar 1944, Carr, 2 F [UCLA]. Santa Cruz, 30 Dec 1943, Torrez-Munoz, 1 M [UCLA]. Locality unspecified, 9 Dec 1943, 3 M, 7 F [UCLA]. **Locality unspecified**: Carr, 2 M [USNM].

BRAZIL. **Bahia**: Esplanada, 18 Jan 1936, 1 M [BH]. Sacco do Soares, 1931, H. Kumm, 1 F [BM]. **Ceara**: Fortaleza, Mar-Apr 1938, 3 M, 4 F [USNM, BH]. Fortaleza, J. Aragao, 1 L [BH]; same data, 8 Mar 1947, V. Iracema, 1 lp [USNM]. Locality unspecified, 2 M [BH]. **Para**: ?Belem, Apr 1930, N. Davis, 4 M, 1 F [BM]. **Pernambuco**: Sao Goncalo, May 1933, 1 F [USNM]. **Guanabara**: Rio de Janeiro, 1 M, 1 F [GML]. **Sergipe**: Nossa Senhora das Dores, 22 Nov 1946, F. Pedrinhas, 1 M gen [USNM].

ECUADOR. **Locality unspecified**: R. Levi-Castillo, 2 F [USNM].

LOCALITY UNSPECIFIED. 1 M [USNM].

Additional Records From the Literature

BRAZIL. **Goias**: Sao Pedro on Bananal Island (Kumm and Cerqueira, 1951:174). **Mato Grosso**: Aquidauana (Kumm and Cerqueira, 1951:174).

PARAGUAY. **Boqueron**: Fortin M. Estigarriba and Puerto Casado (Manso Soto, Martinez and Prosen, 1953:39).

4. Haemagogus (H.) baresi Cerqueira

Figs. 2,12,13

1960. *Haemagogus (Stegoconops) baresi* Cerqueira, 1960:1-5, 2 plates. TYPE: *Holotype* male (1607.3) with associated pupal skin (slide 316; 2961) but genitalia (slide 332) missing, Igarape do Taruma, Manaus, Amazonas, Brazil, larva from treehole in dark forest, 6 Dec 1956, C. Elias [FH, 15105].

Haemagogus (Stegoconops) baresi of Stone (1961:44).

FEMALE. Wing: 2.40 mm. Proboscis: 2.05 mm. Forefemur: 1.85 mm. Abdomen: 2.50 mm. Dark scales of proboscis, palpus, wing and legs violet with some purple reflections. **Head**: Eyes narrowly separated above antennae (1 ommatidial diameter). Decumbent scales of vertex and occiput dark blue with some bluish green reflections. Proboscis short, about 1.10 of forefemur; palpus about 0.12 of proboscis. Antenna long, about 0.80 of proboscis. **Thorax**: Scales of mesonotum and scutellum dark blue with some green reflections. *Apn* lobes considerably enlarged, scales dark blue; *ppn* scales dark blue with some purple reflections; lower *stp* without well developed bristle. **Legs**: Coxae with patches of violet to purple scales near middle; legs moderately long, forefemur length about 1.50 of distance from

top of thorax to apex of midcoxa; forefemur and midfemur entirely dark scaled; hindfemur with few silver scales in streak on anterior surface extending to basal 0.75. **Wing:** R_{2+3} about 0.55 of R_2. **Abdomen:** Dark scales purple with some violet reflections; bluish green scales present laterally on tergite VII.

MALE (fig. 12). Wing: 2.75 mm. Proboscis: 2.50 mm. Forefemur: 1.85 mm. Abdomen: about 2.60 mm. **Head:** Proboscis about 1.35 of forefemur; palpus very short, about 0.09 of proboscis; antenna long, about 0.80 of proboscis. **Legs:** Larger claw of foreleg and midleg simple; smaller claw of foreleg and midleg with small subbasal tooth.

MALE GENITALIA (fig. 12). **Segment VIII:** Tergite about 0.85 of sternite; distal margin broadly emarginate, with about 15 lanceolate scales mesally. **Segment IX:** Tergite broadly and deeply emarginate, weakly sclerotized mesally; lobes with 1 or 2 setae. **Sidepiece:** Conical, length about 3.5 times median width; basal tergomesal area not enlarged, with numerous setae, the more proximal ones much elongate, somewhat flattened and attenuate; mesal half distad of basal sternomesal area with setae rather evenly distributed; apical sternomesal scales narrowly lanceolate with acuminate tips. **Claspette:** Stem slightly curved dorsad; filament striate, broadly sickle-shaped, tip slightly recurved. **Clasper:** Broadest at base; spiniform about 0.60 of clasper. **Phallosome:** Aedeagus large, broadly obovate, tip with a small beak; venter broadly open except on basal third, with heavily sclerotized ridges lateroventrally which are expanded basally, ovoid sclerotized lobes present basally at midline. **Proctiger:** Cercal setae 4; apical knob of paraproct with about 10 striations.

PUPA (fig. 12). Abdomen: about 3.55 mm. Trumpet: 0.45 mm. Paddle: 0.75 mm. **Cephalothorax:** Weakly pigmented, slightly darker dorsally. Hairs 4,5-C subequal, single, weaker than 7-C which is single. **Trumpet:** Dark brown, lighter distally, reticulate sculpturing moderate. **Abdomen:** Float hair (1-I) with 10-12 primary branches and 2-6 secondary branches. Hair 1-II-VII rather weakly developed, single or double. Hair 2-VII short, considerably cephalad of 1-VII. Hair 3-II single, considerably longer than hairs 3-III,5-IV,V, which are single. Hair 6-VII rather weakly developed, subequal to 6-VI. Hair 9-VII near caudolateral margin of tergite, single; 9-VIII 2-6b. **Terminal Segments:** Male genital lobe about 1.0 of tergite VIII. **Paddle:** Rather broad, apex acuminate, midrib dark. Hair 1-P single.

LARVA (fig. 13). Head: 0.95 mm. Siphon: 0.90 mm. Anal Saddle: 0.35 mm. **Head:** Hair 6-C double. **Thorax:** Integument without spicules. Tubercles of hairs 5,6-P broadly connected, tubercle of hair 7-P narrowly connected to 6-P. **Abdomen:** Hair 12-I absent. Hair 7-II-IV well developed, double, much larger than hair 5 of corresponding segment. Hairs 1,13-III-V very well developed. **Segment VIII:** Comb scales 8-10, with single, pointed, minutely fringed spine, fringe at apex of spine larger and more conspicuous, in single row. **Siphon:** Index about 2.8. Pecten teeth about 11-13, extending to about basal 0.45 of siphon. Hair 1-S double, inserted at basal 0.55 of siphon. **Anal Segment:** Spines on caudal margin of saddle enlarged, conspicuous dorsolaterally. Hair 1-X double, long. Hair 4a-X double or triple, long. Boss strongly sclerotized.

SYSTEMATICS. *Haemagogus baresi* can be separated from the remaining species of the Albomaculatus Section: in the **adults** by the combination of (1) absence of well developed lower *stp* bristle, (2) short female proboscis (1.10 of forefemur), (3) dark blue scales on head, mesonotum, *apn* and *ppn,* (4) dark scales on coxae, (5) entirely dark scaled forefemur and midfemur, and (7) simple large claw of male foreleg and midleg; in the **male genitalia** by the combination of (1) elongate,

lanceolate scales mesally on distal margin of tergite VIII, (2) broadly sickle-shaped claspette filament and (3) aedeagus broadly rounded on distal fourth with very small, weakly sclerotized beak at apex; and in the **larva** by the combination of (1) double hair 6-C, (2) integument without spicules, (3) absence of hair 12-I, (4) hair 12-II weaker than 10-II and (5) hair 7-II-IV double and much larger than hair 5 of corresponding segment.

Haemagogus baresi shares with *anastasionis, chrysochlorus* and *spegazzinii* the absence of a well developed lower *stp* bristle and the absence of a tooth on the large claw of the foreleg and midleg of the male. In the male genitalia *baresi* closely resembles *andinus. Baresi* may be an annectent from between the *anastasionis* complex and the *andinus* complex.

BIONOMICS. Nothing is known of the bionomics of *baresi.*

DISTRIBUTION (fig. 2). *Haemagogus baresi* is known only from 2 localities on the middle Amazon, Iquitos, Peru and Manaus, Brazil. Material examined: 8 specimens; 2 males, 1 female, 2 pupae, 3 larvae; 3 individual rearings (1 larval, 1 pupal, 1 incomplete).

BRAZIL. **Amazonas:** Igarape do Taruma, Manaus, 6 Dec 1956, C. Elias, 1 pM (holotype), 1 lpF (allotype) [FH].

PERU. **Loreto:** Iquitos, 28 May 1931, R. Shannon, 1 lM, 1 l [USNM].

5. Haemagogus (H.) andinus Osorno-Mesa

Figs. 4,14,15

1944. *Haemagogus andinus* Osorno-Mesa, 1944b:170-175. TYPE: *Holotype* male with genitalia slide, coffee plantation near Fusagasuga, Cundinamarca, Colombia, elev. 1746 m, larva collected in "guamos" rothole (*Inga* sp.), May 1942, E. Osorno-Mesa [USNM].

Haemagogus (Haemagogus) andinus of Levi-Castillo (1951b:11,28-30).

Haemagogus (Stegoconops) andinus of Lane (1953:794-796); Stone, Knight and Starcke (1959: 216.

Haemagogus andinus of Hovanitz (1946:35); Kumm, Osorno-Mesa and Boshell-Manrique (1946: 17); Barreto Reyes (1955:78).

FEMALE. Wing: 3.35 mm. Proboscis: 2.72 mm. Forefemur: 2.45 mm. Abdomen: 3.20 mm. Dark scales of proboscis, palpus, wing and legs mixed purple and violet. **Head:** Eyes narrowly separated above antennae (2 ommatidial diameters). Decumbent scales of vertex and occiput copper. Proboscis relatively short, about 1.10 of forefemur; palpus relatively short, about 0.13 of proboscis; antenna about 0.62 of proboscis. **Thorax:** Scales of mesonotum deep copper, green over supraalar bristles, a few silver scales in antealar area; scales on scutellum copper, green on lobes. *Apn* lobes considerably enlarged, scales green, with silver scales anteriorly; *ppn* scales deep copper; *psp* scales with light green or copper reflection. **Legs:** Forecoxa with small patch of purple or violet scales near middle; legs moderately long, forefemur length about 1.50 of distance from top of thorax to apex of midcoxa; knee spots present on midfemur and hindfemur. **Wing:** R_{2+3} about 0.95 of R_2. **Abdomen:** Dark scales light green to light bronze except for blue scales on tergite VIII.

MALE (fig. 14). Wing: 2.95 mm. Proboscis: 2.85 mm. Forefemur: 2.20 mm. Abdomen: 3.25 mm. **Head:** Proboscis about 1.30 of forefemur. **Legs:** Larger claw of foreleg and midleg with acute submedian tooth, smaller claw of foreleg and midleg with acute subbasal tooth.

MALE GENITALIA (fig. 14). **Segment VIII:** Tergite about 0.70-0.75 of sternite; distal margin broadly emarginate, with enlarged setae laterally and cluster of 25-35 lanceolate scales mesally. **Segment IX:** Tergite deeply emarginate and weakly sclerotized mesally; lobes with 1 or 2 setae. **Sidepiece:** Conical; length 3.5 times median width; basal tergomesal lobe slightly enlarged, with numerous setae, the more proximal ones much elongate and flattened and attenuate; mesal half distad of basal tergomesal area with setae rather evenly distributed, short, longer on distal fourth; apical sternomesal scales oblanceolate, usually with acuminate tip. **Claspette:** Stem broader near base, constricted at apical third and sharply angled dorsad beyond constriction; filament striate, broadly sickle shaped. **Clasper:** Broadest just before middle; spiniform about 0.55 of clasper. **Phallosome:** Aedeagus large, broadly obovate, tip produced distally into a strongly sclerotized dorsal carina proximad to a small beak; venter broadly open except on basal fourth, with heavily sclerotized ridges lateroventrally which are expanded basally into ovoid sclerotized lobes at midline. **Proctiger:** Cercal setae 6-8; apical knob of paraproct with about 10 striations.

PUPA (fig. 14). Abdomen: about 3.45 mm. Trumpet: 0.40 mm. Paddle: 0.85 mm. **Cephalothorax:** Weakly pigmented, slightly darker dorsally. Hairs 4,5-C subequal, 1-4b, weaker than 7-C which is usually single. **Trumpet:** Dark brown, lighter distally, reticulate sculpturing moderate. **Abdomen:** Moderately pigmented, genital lobe and anterior segments darker. Float hair (1-I) with 10-14 primary branches and 4-10 secondary branches. Hair 1-II-VII strongly developed, dendritic. Hair 2-VII short, considerably cephalad of 1-VII. Hairs 3-II,III,5-IV,V subequal or with 5-IV,V slightly weaker than 3-II,III; 5-IV,V less than 0.75 of corresponding tergite. Hair 6-VII moderately well developed, single or double, stronger than 6-VI, which is stronger than 6-III-V. Hair 9-VII near caudolateral margin of tergite, usually triple; 9-VIII usually 5-7b. **Terminal Segments:** Male genital lobe 1.2 of tergite VIII. **Paddle:** Relatively narrow, apex acuminate; with darker pigmentation laterally and along midrib. Hair 1-P single.

LARVA (fig. 15). Head: 0.85 mm. Siphon: 0.85 mm. Anal Saddle: 0.33 mm. **Head:** Hair 5-C usually single, occasionally double. Hair 6-C single. **Thorax:** Integument without spicules. Tubercles of hairs 5-6-P usually connected, tubercle of hair 7-P free. **Abdomen:** Hair 12-I absent. **Segment VIII:** Comb scales about 10(8-14), with single sharply pointed, minutely fringed spine, in single row. **Siphon:** Index about 3.5(3.3-3.8). Pecten teeth 16-20(14-23), extending to about basal 0.50 of siphon. Hair 1-S 4b(3-5b), inserted at basal 0.55 of siphon. **Anal Segment:** Spines on caudal margin of saddle very well developed, extremely elongate and conspicuous dorsolaterally. Hair 4a-X double, considerably shorter than hair 4b-X. Boss strongly sclerotized.

SYSTEMATICS. *Haemagogus andinus* can be distinguished from the remaining members of the Albomaculatus Section: in the **adults** by the combination of (1) light green to light bronze abdominal scales with no silver scales dorsally at bases of abdominal tergites, (2) knee spots of silver scales on midfemur and hindfemur, (3) copper scales on vertex, mesonotum and *ppn* (4) relatively short female proboscis (1.10 of forefemur) and (5) single well developed lower *stp* bristle; in the **male genitalia** by the combination of (1) long, lanceolate scales mesally on distal margin of tergite VIII, (2) apical fourth of aedeagus broadly triangular with strongly sclerotized dorsal carina and (3) claspette stem angled sharply dorsad at apical third; and in the **larva** by the combination of (1) integument without spicules, (2) hair 12-I absent, (3) long siphon (index usually about 3.5), (4) hair 5-C usually

single and (6) hair 4a-X usually double.

Andinus is closely related to *nebulosus*, with which it forms the *andinus* complex. It differs in the female in the color of the dark scales of the head, thorax and abdomen and in the larva by the slightly shorter siphon and fewer branches on hair 4a-X. Its relationship to other members of the Albomaculatus Section is obscure, although it may be related to the *anastasionis* complex through *baresi*, as the male genitalia are much like those of *baresi*.

BIONOMICS. Virtually nothing is known of the bionomics of *andinus*. It is uncommon and appears to be restricted to high elevations along the Eastern Cordillera of the Colombian Andes. The few available larval collections have been from treeholes.

DISTRIBUTION (fig. 4). *Haemagogus andinus* is known only from elevations near 2000 meters on the western slopes of the Eastern Cordillera of the Colombian Andes. Material examined: 75 specimens; 16 males, 11 females, 11 pupae, 37 larvae; 11 individual rearings (9 larval, 2 incomplete).

COLOMBIA. **Cundinamarca**: Fusagasuga, 1746 m, 1 F [BM]; same data, 2 lM gen, 1 lp, 4 M, 5 M gen, 6 F, 14 1 [USNM]; same data, H. Kumm, 1 F, 1 1 [UCLA]. Hacienda Normandia, nr. Fusagasuga, 1740 m, 23 Sept 1966, E. Osorno-Mesa and Morales (COB 107), 6 lpM (107-10,12-16), 3 lpF (107-11,17,18), 1 P, 9 L [UCLA]. **Santander**: Locality unspecified, 2 L [USNM].

Additional Record From the Literature

COLOMBIA. **Santander**: Jesus Maria (Kumm, Osorno-Mesa and Boshell-Manrique, 1946:17).

6. Haemagogus (H.) nebulosus Arnell, n. sp.

Fig. 4,16,17

TYPES: *Holotype* female with associated larval and pupal skins (VZ 151-10), Rancho Grande, Aragua, Venezuela, elev. 1100 m, larva taken from small treehole, 5 July 1969, T. and J. Zavortink [USNM]. *Paratypes:* 2 lpF (VZ 151-11,12), 2 pF (VZ 151-100,101), same data as holotype [UCLA, BM, MDM].

FEMALE. Wing: 3.25 mm. Proboscis: 2.65 mm. Forefemur: 2.40 mm. Abdomen: 3.00 mm. Dark scales of proboscis, palpus, wing and legs violet with purple reflections. **Head**: Eyes narrowly separated above antennae (1 ommatidial diameter). Decumbent scales of vertex and occiput light bluish green. Proboscis short, about 1.10 of forefemur, with small patch of silver scales ventrally at base; palpus about 0.15 of proboscis; antenna about 0.68 of proboscis. **Thorax**: Scales of mesonotum predominantly copper, green mixed with copper laterally and posteriorly, greenish blue over supraalar bristles and silver in antealar area; scales green and copper on scutellum. *Apn* lobes slightly enlarged, scales blue with silver scales anteriorly; *ppn* scales green, a few silver scales posteriorly; *psp* scales with light green reflection. **Legs**: Legs moderately long, length of forefemur about 1.5 of distance from top of thorax to apex of midcoxa; knee spots present on midfemur and hindfemur. **Wing**: R_{2+3} about 0.70-0.95 of R_2. **Abdomen**: Dark scales dark blue with purple reflections; basolateral silver patches usually extending to distal margin of tergites II-VII forming nearly complete lateral silver line.

MALE. Unknown.

PUPA (fig. 16). Abdomen: about 4.00 mm. Trumpet: 0.55 mm. Paddle: 1.05 mm. **Cephalothorax**: Moderately pigmented, darker dorsally. Hair 5-C slightly stronger than 4-C and weaker than 7-C. **Trumpet**: Dark brown, lighter distally, reticulate

sculpturing moderate. **Abdomen**: Moderately pigmented, genital lobe and anterior segments considerably darker. Float hair (1-I) with about 12-16 primary branches and 2-6 secondary branches. Hair 1-II-VII very strongly developed, dendritic. Hair 2-VII short, considerably cephalad of 1-VII. Hair 3-II subequal to or slightly stronger than 3-III, and weaker than 5-IV,V which are subequal and as long as corresponding tergite. Hair 6-VII moderately well developed, single or double, stronger than 6-VI which is stronger than 6-III-V. Hair 9-VII slightly cephalad of caudolateral margin of tergite, 4-6b; 9-VIII usually 5-7b. **Paddle**: Relatively narrow, apex acuminate, brown pigmented, midrib darker. Hair 1-P single.

LARVA (fig. 17). Head: 0.95 mm. Siphon: 1.05 mm. Anal Saddle: 0.38 mm. **Head**: Hair 5-C double (double or triple). Hair 6-C single. **Thorax**: Integument without spicules. Tubercles of hairs 5-7-P free or narrowly connected. **Abdomen**: Hair 12-I absent. **Segment VIII**: Comb scales 9-10(9-12), with single sharply pointed, minutely fringed spine, in single row. **Siphon**: Index about 3.8. Pecten teeth 18-22 (16-28), extending to about basal 0.55 of siphon. Hair 1-S 4-5b(3-6b), inserted at basal 0.60 of siphon. **Anal Segment**: Spines on caudal margin of saddle very well developed, extremely elongate and conspicuous dorsolaterally. Hair 4a-X 4-5b. Boss strongly sclerotized.

SYSTEMATICS. *Haemagogus nebulosus* can be separated from the remainder of the Albomaculatus Section: in the **adults** by the combination of (1) enlarged lower *stp* bristle, (2) dark blue abdominal scales with no silver scales dorsally at bases of abdominal tergites, (3) knee spots of silver scales at apex of midfemur and hindfemur, (4) scales of vertex bluish green and (5) relatively short proboscis (1.10 of forefemur) with small patch of silver scales ventrally at base; and in the **larva** by the combination of (1) integument without spicules, (2) hair 12-I absent, (3) long siphon (index about 3.8), (4) hairs 5-C usually double and (6) hair 4a-X usually 4-or 5-branched.

Nebulosus is closely allied to *andinus* but can be distinguished by the color of the dark scales of the head, thorax and abdomen of the female and the longer siphon and more branched hair 4a-X of the larva. Both species are apparently restricted to high elevations in the northern ranges of the Andes.

BIONOMICS. Nothing is known of the bionomics of *nebulosus*. The only collection of this species was made in a very small treehole. The general habitat was a dense cloud forest which is described in a thorough study by Beebe and Crane (1947).

DISTRIBUTION (fig. 4). *Haemagogus nebulosus* is known only from a single locality in the Cordillera de la Costa near Maracay, Venezuela. Material examined: 13 specimens; 5 females, 5 pupae, 3 larvae; 5 individual rearings (3 larval, 2 pupal).

VENEZUELA. **Aragua**: Rancho Grande, type series, see above.

7. *Haemagogus (H.) janthinomys* Dyar

Figs. 3,18,19,20

1921. *Haemagogus (Haemagogus) janthinomys* Dyar, 1921a:112-113. TYPE: *Lectotype* male (17-1) with associated larval skin and genitalia slide (219), St. Ann's, Port of Spain, St. George, Trinidad, Trinidad and Tobago, larva collected in a treehole, June 1905, F.W. Urich [USNM, 24335; selection of Stone and Knight, 1955:288]. Synonymized with *capricornii* by Antunes (1939:106); synonymized with *spegazzinii* by Cerqueira (1943:10); considered a subspecies of *capricornii* by Martinez, Carcavallo and Prosen (1960:76).

1931. *Haemagogus uriartei* var. *obscurescens* Martini, 1931b:212. TYPE: *Lectotype* female (8863;3/30), Ucayali River, Loreto, Peru, 24 Oct 1903 [BM; selection of Mattingly, 1955:28]. Synonymized with *anastasionis* by Stone (1957:339-340). NEW SYNONYMY.

1946. *Haemagogus spegazzinii falco* Kumm, Osorno-Mesa and Boshell-Manrique, 1946:14-28, pl. 1-5. TYPE: *Syntypes* male, female, larvae, Volcanes Forest in Pitas River Valley nr. Caparrapi, Cundinamarca, Colombia, May and June 1943, H.W. Kumm, E. Osorno-Mesa and J. Boshell-Manrique [USNM; lectotype not selected, Stone and Knight, 1955:288]. Synonymized with *janthinomys* by Levi-Castillo (1956:346); resurrected from synonymy with *janthinomys* by Galindo (1957:121-122); considered a subspecies of *capricornii* by Martinez, Carcavallo and Prosen (1960:76). NEW SYNONYMY.

1961. *Haemagogus (Stegoconops) capricornii petrocchiae* Martinez, Carcavallo and Prosen, 1961:79-82. TYPE: *Holotype* male, Salvador Mazza (Pocitos), Departmento General Jose de San Martin, Salta, Argentina, Jan 1960, A. Martinez and R. Carcavallo [BA]. NEW SYNONYMY.

Haemagogus (Haemagogus) janthinomys of Bonne and Bonne-Wepster (1925:435); Dyar (1928: 140); Edwards (1932:179).

Haemagogus (Stegoconops) capricornii janthinomys of Martinez, Carcavallo and Prosen (1961: 76); Stone (1963:132); Forattini (1965:19); Martinez and Carcavallo (1965:42).

Haemagogus spegazzinii janthinomys of Levi-Castillo (1956:346).

Haemagogus janthinomys of Shannon (1931:8); Kumm and Frobisher (1932:352); Komp (1936: 61); Antunes (1937:75); Antunes and Whitman (1937:827); Boshell-Manrique (1938:415); Kumm and Novis (1938:501); Bugher (1941:303).

Haemagogus uriartei var. *obscurescens* of Lane (1939:121); Mattingly (1955:28).

Haemagogus (Haemagogus) spegazzinii falco of Levi-Castillo (1951b:11,21-22).

Haemagogus (Stegoconops) spegazzinii falco of Lane (1953:794); Stone, Knight and Starcke (1959:217); Fauran (1961:31); Cova Garcia, Sutil and Rausseo (1966a:61-62, fig. 117; 1966b: 114-115, fig. 200).

Haemagogus (Stegoconops) capricornii falco of Martinez, Carcavallo and Prosen (1961:76); Stone (1963:132); Forattini (1965:19); Martinez and Carcavallo (1965:42); Morales-Ayala (1971: 142).

Haemagogus spegazzinii falco of Anderson and Osorno-Mesa (1946:613); Hovanitz (1946:35); Bates (1947:1); Osorno-Mesa (1947:455); Waddell and Kumm (1948:247); Galindo, Carpenter and Trapido (1949:277; 1951a:114-116; 1951b:104-106; 1955:158); Galindo, Trapido and Carpenter (1950:546); Kumm and Cerqueira (1951:172-173); Levi-Castillo (1951a:14; 1954: 84); Carpenter, Galindo and Trapido (1952:162); Elton (1952a:157; 1952b:428); Komp (1952:330; 1956:37); Bevier, Torres-Munoz and Doria-Medina (1953:474); Vargas-Mendez and Elton (1953:857); Mackie, Hunter and Worth (1954:19); Barreto Reyes (1955:78); Galindo and Trapido (1955:545; 1957:147); Trapido and Galindo (1955:669; 1956a:303; 1957:122); Trapido, Galindo and Carpenter (1955:525); Galindo, de Rodaniche and Trapido (1956:1022); Galindo, Trapido, Carpenter and Blanton (1956:544); de Rodaniche (1956:480); Galindo (1957:121-124); de Rodaniche and Galindo (1957:236; 1961:393); de Rodaniche, Galindo and Johnson (1957:682); Foote and Cook (1959:141); Galindo, de Rodaniche and Johnson (1959:557); Groot, Morales and Vidales (1961:399); Galindo and de Rodaniche (1964:846).

Haemagogus (Stegoconops) capricornii petrocchiae of Stone (1963:132); Forattini (1965:19); Martinez and Carcavallo (1965:42).

Haemagogus (Haemagogus) capricornii in part of Lane (1939:118).

Haemagogus (Stegoconops) capricornii of Bonne-Wepster and Bonne (1923:127); Bonne and Bonne-Wepster (1925:431); Stone, Knight and Starcke (1959:216, in part); Morales-Ayala (1971:142).

Haemagogus capricornii of Howard, Dyar and Knab (1917:877, in part); Dyar (1921b:150); Lutz and Nunez-Tovar (1928:25); Antunes (1939:106); Shannon, Whitman and Franca (1938: 111, in part); Shannon (1939:137, in part); Bates (1943:23; 1944a:84; 1944b:160; 1945:17; 1946:47); Bugher, Boshell-Manrique, Roca-Garcia and Osorno-Mesa (1944:31); Boshell-Manrique and Osorno-Mesa (1944:172); Osorno-Mesa (1944a:45); Bates and Roca-Garcia (1945:204); Floch and Abonnenc (1947:11); Bevier, Torres-Munoz and Doria-Medina (1953:474).

Stegoconops capricornii of Howard, Dyar and Knab (1913:figs. 165,438).
Aedes capricornii in part of Dyar and Knab (1906b:163-164).
Haemagogus (Haemagogus) spegazzinii of Cerqueira and Boshell-Manrique (1946:193-198); Anduze (1947:353); Levi-Castillo (1951b:11,19-21, in part).
Haemagogus (Stegoconops) spegazzinii of Martinez (1950:61); Stone, Knight and Starcke (1959: 216); Fauran (1961:31); Aitken, Worth and Tikasingh (1968:257).
Haemagogus (Stegoconops) spegazzinii spegazzinii in part of Lane (1953:792-793).
Haemagogus spegazzinii of Shannon and Del Ponte (1928:67); Martini (1931b:212, in part); Cerqueira (1943:10-12); Waddell (1945:329; 1949:568); Cerqueira and Lane (1945:286); Waddell and Taylor (1945:229); Bates and Roca-Garcia (1946:586); Hovanitz (1946:35); Kumm, Osorno-Mesa and Boshell-Manrique (1946:17-19); Laemmert, Ferreira and Taylor (1946:43); Causey and Kumm (1948:470); Waddell and Kumm (1948:247, in part); Causey and Dos Santos (1949:477); Causey, Kumm and Laemmert (1950:302); Kumm (1950:677); Kumm and Laemmert (1950:750); Laemmert and Kumm (1950:724); Kumm and Cerqueira (1951a:171-172; 1951b:196); Levi-Castillo (1951a:13, in part); Komp (1952:330; 1955b: 137-138; 1955e:277-280); Bevier, Torres-Munoz and Doria-Medina (1953:474); Manso Soto, Martinez and Prosen (1953:33); Mackie, Hunter and Worth (1954:19); Horsfall (1955:536); Trapido (1955:619); de Rodaniche and Galindo (1957:235); Stone (1957:340); Boshell-Manrique and Bevier (1958:27); Kerr, Roca-Garcia and Bugher (1960:26).
Haemagogus spegazzinii spegazzinii of Aitken (1955:575); Downs, Aitken and Anderson (1955: 840); Levi-Castillo (1956:345); Foote and Cook (1959:142).
Haemagogus (Stegoconops) anastasionis in part of Morales-Ayala (1971:142).
Haemagogus anastasionis in part of Stone (1957:340); Forattini (1965:32-34).
Haemagogus (Stegoconops) equinus in part of Dyar (1923:183; 1928:134); Edwards (1932:179).
Haemagogus equinus of Dyar (1925b:138, in part); Shannon (1931:8, in part); Soper (1935:172).
Haemagogus albomaculatus in part of Howard, Dyar and Knab (1917:867).
Haemagogus splendens in part of Howard, Dyar and Knab (1917:867).
Haemagogus regalis in part of Theobald (1910:493-494).
Haemagogus cyaneus in part of Theobald (1903a:308; 1907:550); Lutz (1904:13).

FEMALE (fig. 18). Wing: 3.25 mm. Proboscis: 2.55 mm. Forefemur: 2.25 mm. Abdomen: 3.20 mm. Dark scales of proboscis, palpus, wing and legs predominately purple, with some violet reflections. **Head:** Eyes narrowly separated above antennae (1 ommatidial diameter). Decumbent scales of vertex and occiput violet to bluish green with some purple reflections, dark scales often continuing laterally to postgena. Proboscis short, about 1.10-1.15 of forefemur; palpus about 0.15 of proboscis; antenna about 0.74-0.77 of proboscis. **Thorax:** Scales of mesonotum usually dark green, occasionally copper, usually blue or bluish green in fossa and posteriorly, bright blue over supraalar bristles, silver in antealar area; scales dark green to bright blue on scutellar lobes. *Apn* lobes moderately enlarged, scales blue to bluish green, occasionally with a few silver scales laterally; *ppn* scales bronze to dark green. **Legs:** Forecoxa and midcoxa with small to extensive patch of purple scales near middle; legs moderately long, forefemur length about 1.44-1.50 of distance from top of thorax to apex of midcoxa; hindfemur with silver scales on anterior surface in conspicuous streak to near apex. **Wing:** R_{2+3} about 0.90-1.60 of R_2. **Abdomen:** Dark scales purple with some violet reflections; distal margins of tergites V-VIII with dark bluish green scales, more numerous laterally, a few bluish green scales on distal margins of more proximal segments; silver scales dorsally in basal band on tergites VII and VIII; dark scales of sternites purple with bluish green scales distally.

MALE (fig. 18). Wing: 2.90 mm. Proboscis: 2.65 mm. Forefemur: 2.05 mm. Abdomen: 2.80 mm. **Head:** Proboscis about 1.25-1.40 of forefemur; palpus short,

about 0.15 of proboscis; antenna about 0.62-0.68 of proboscis. **Legs**: Larger claw of foreleg and midleg with acute subbasal tooth, smaller claw of foreleg and midleg with acute basal tooth.

MALE GENITALIA (fig. 19). **Segment VIII**: Tergite about 0.60-0.65 of sternite; distal margin broadly emarginate, with enlarged setae laterally and cluster of 20-30 lanceolate scales mesally. **Segment IX**: Tergite emarginate and weakly sclerotized mesally; lobes with usually 2 setae. **Sidepiece**: Conical, length about 3.5 times median width; basal tergomesal lobe slightly enlarged, with numerous setae, the more proximal ones elongate, flattened and attenuate; mesal half distad of basal tergomesal lobe with setae rather evenly distributed, short, longer on distal third; apical sternomesal scales mostly oblanceolate with acuminate tip, some lanceolate. **Claspette**: Stem bowed inward near middle in dorsal aspect; uniformly curved dorsad; slightly constricted near middle, filament striate, broadly sickle-shaped, expanded somewhat near middle, slightly expanded and rounded posteriorly, slightly recurved at apex. **Clasper**: Slightly narrowed at base, spiniform about 0.55 of clasper. **Phallosome**: Aedeagus large, broadly obovate; tip produced distally into sclerotized beaklike keel below a second beaklike process or with keel expanded distally into single, enlarged beak; numerous spicules present on venter of beak; venter broadly open except on basal fourth, with sclerotized ridges ventrolaterally which are expanded basally and terminate in sclerotized lobes mesally. **Proctiger**: Cercal setae about 6; apical knob of paraproct with about 15-20 serrations and a small hooklike process mesally near apex.

PUPA (fig. 19). Abdomen: about 3.30 mm. Trumpet: 0.45 mm. Paddle: 0.65 mm. **Cephalothorax**: Weakly to moderately pigmented, darker dorsally. Hairs 4,5-C subequal, weak, usually single or double, weaker than 7-C which is single. **Trumpet**: Medium to dark brown, lighter distally; reticulate sculpturing moderate. **Abdomen**: Weakly to moderately pigmented, genital lobe and anterior segments darker. Float hair (1-I) with about 12-14 primary branches and 2-6 secondary branches. Hair 1-II-VII weakly to strongly developed, single, multiple or strongly dendritic. Hair 2-VII short, considerably cephalad of 1-VII. Hairs 3-II,III,5-IV,V variable in development, subequal, with 3-III weaker, or with 3-II,III stronger or weaker than 5-IV,V. Hair 6-VII weak, subequal to or weaker than 6-III-VI which are subequal. Hair 9-VII usually considerably cephalad of caudolateral margin of tergite, single or double; 9-VII usually 4-7b. **Terminal Segments**: Male genital lobe about 1.2 of tergite VIII. **Paddle**: Weakly to moderately pigmented; relatively narrow to broad, apex broadly rounded or acuminate. Hair 1-P single.

LARVA (fig. 20). Head: 0.80 mm. Siphon: 0.78 mm. Anal Saddle: 0.33 mm. **Head**: Hair 6-C single. **Thorax**: Integument with spicules. Tubercles of hairs 5-7-P connected. **Abdomen**: Hair 12-I absent. **Segment VIII**: Comb scales 6-8(4-11), with single pointed, minutely fringed spine, in single row, attached basally to sclerotized plate; 1 or more occasionally detached from sclerotized plate. **Siphon**: Index about 2.8(2.5-3.1). Pecten teeth about 10-14(6-15), extending to about basal 0.50 of siphon. Hair 1-S double or triple, inserted at basal 0.55 of siphon. **Anal Segment**: Spines on caudal margin of saddle well developed, much elongate and conspicuous dorsally. Hair 4a-X 3-5b, short, less than length of saddle, or long, nearly the length of 4b-X. Boss strongly sclerotized.

SYSTEMATICS. *Haemagogus janthinomys* can be separated from the remaining species of the Albomaculatus Section by the following characters: in the **adults** from all except *capricornii* by (1) silver scales extending to apex anteriorly on hindfemur, (2) patches of dark scales on forecoxa and midcoxa, and (3) dark

bluish green scales on distal margins of abdominal tergites V-VIII which are more numerous laterally and contrast with predominantly purple abdominal scales; in the **male genitalia** by (1) conspicuous spicules on venter of aedeagus proximad to beaklike apical process and (2) small hooklike process mesally near apex of paraproct; and in the **larva** from all species except *capricornii* by the combination of (1) spiculose integument, (2) absence of hair 12-I and (3) comb scales attached basally to sclerotized plate.

Haemagogus janthinomys is apparently indistinguishable from *capricornii* except in the male genitalia where it is characterized by the spicules and apical process of the aedeagus and a hooklike process on the paraproct.

The apical process of the aedeagus of *janthinomys* varies in development, the extremes being an elongate, dorsally curving beaklike process and a short, beaklike process distad to a heavily sclerotized beaklike keel (see fig. 19). On the basis of this variation, *janthinomys* (as *spegazzinii*) was divided into 2 subspecies *(s. spegazzinii* and *s. falco)* by Kumm, Osorno-Mesa and Boshell-Manrique (1946:14). Kumm and Cerqueira (1951a:172) recognized the 2 subspecies in Brazil, including a number of intermediate forms and Martinez, Carcavallo and Prosen (1961) interpreted the species as a complex of 3 subspecies of *capricornii, c. falco, c. janthinomys* and *c. petrocchiae,* based on a long, intermediate and short aedeagus tip. Having examined a large number of male genitalia from throughout the range, for the most part, I can recognize no geographical pattern in this particular character, although specimens from Central America tend to have a longer apical process and those from Argentina a shorter one. Specimens from the remainder of South America including the islands of Trinidad and Tobago show a completely random pattern of short, long and intermediate development. In fact, a single collection from near Villavicencio, Colombia contains both extremes. All possible degrees of development are evident in the numerous specimens examined from Trinidad, this being true also of specimens from Peru, Brazil and Venezuela. I can see no justification for subdividing *janthinomys* on the basis of this 1 variable character.

As noted in the preceding paragraph and in the long and varied list of synonyms and taxonomic references, there has been considerable confusion and differences of opinion regarding the taxonomy and nomenclature of this most important species. *Janthinomys* was first placed in synonymy with *capricornii* by Antunes (1939: 106) and subsequently with *spegazzinii* by Cerqueira (1943:10) when he resurrected the latter from synonymy with *equinus.* Most authors followed Cerqueira's synonymy and used the name *spegazzinii* for this species until Martinez, Carcavallo and Prosen (1961:63-86) determined that *spegazzinii* was a different species and the same as *uriartei.* These authors considered *janthinomys* as a subspecies of *capricornii,* which in their opinion included 3 other subspecies, the nominate form, *falco* and *petrocchiae.* I find that *capricornii* is specifically distinct from *janthinomys* and as noted in the preceding paragraph see no justification for recognizing *falco* or *petrocchiae* as subspecies distinct from typical *janthinomys.* Having examined the lectotype of *obscurescens* Martini, 1931, described as a variety of *uriartei,* I find it to be conspecific with *janthinomys.* I am also convinced that *spegazzinii* is a distinct species as shown by Martinez, Carcavallo and Prosen.

BIONOMICS. *Haemagogus janthinomys* is found almost exclusively in primary tropical rain forest throughout most of its range and is decidedly arboreal in habit, seldom descending to ground level to bite and then only when the forest canopy has been disturbed. It breeds primarily in treeholes, though it is often taken in bamboo oviposition traps. The treeholes are probably high and inaccessable for

sampling as the number of larvae found in an area is seldom commensurate with the number of adults present. In the rain forests of Central America, *janthinomys* reaches its maximum density at elevations between 100 and 1000 meters. Numerous studies have shown *janthinomys* to be a very efficient vector of yellow fever virus. Because of its ability to harbor and transmit the virus and its arboreal habits, *janthinomys* is the primary vector in the cycle of sylvan yellow fever which is endemic in several areas in South America.

There is an extensive literature on the biology, ecology and disease relations of *janthinomys*. Informative papers on the ecology of *janthinomys* in Central America include Galindo, Trapido and Carpenter (1950), Galindo, Carpenter and Trapido (1951a, 1955) and Trapido and Galindo (1956). Papers discussing the role of *janthinomys* as a vector of yellow fever include Antunes and Whitman (1937), Bates and Roca Garcia (1945, 1946b), Laemmert, Ferreria and Taylor (1946) and Trapido and Galindo (1956). Ilheus virus has been isolated from *janthinomys* captured in Panama (de Rodaniche and Galindo, 1961).

DISTRIBUTION (fig. 3). *Haemagogus janthinomys* extends from the Atlantic versant of Honduras and Nicaragua through Central America and the entire Atlantic and Caribbean drainages of South America to northern Argentina and southeastern Brazil including the islands of Trinidad and Tobago. Material examined: 1407 specimens; 231 males, 463 females, 303 pupae, 410 larvae; 294 individual rearings (179 larval, 20 pupal, 95 incomplete).

ARGENTINA. **Jujuy**: Ledesma (Libertador General San Martin), 2 lM, 2 lF [USNM]; same data, 21 Mar 1926, N. Davis and R. Shannon, 2 F [USNM]; same data, 1943, H. Kumm, 1 M, 5 F, 8 l [UCLA, USNM]; same data, Mar 1944, G. Boshell-Manrique, 1 lM [USNM]. **Salta**: Acambuco, 4 F [USNM].

BOLIVIA. **Beni**: Rurrenabaque, Oct 1921, W. Mann, 1 F [USNM]. **La Paz**: Mapiri, 800 m, 8 Jan 1905, S. Carlos, 1 F [BM]. **Santa Cruz**: Cercado, Feb 1936, 1 F [USNM]. Lagunillas, Cordillera, 20 Mar 1944, 5 F [UCLA]. Pozo Redondo, Cordillera, 7 Mar 1944, 1 F [UCLA]. **Locality unspecified**: Carr, 1 F [UCLA].

BRAZIL. **Acre**: Xapuri, 20 Aug-1 Sept 1947, H. Kumm, 1 lp, 4 M [USNM]; same data, 26 Aug 1947, 1 lpF [BM]; same data, 10 Oct 1947, 1 lpM gen [UCLA]. **Amapa**: Locality unspecified, 20 Sept 1948, H. Kumm, 2 M [BM]. **Amazonas**: Borba, 23 Mar 1948, H. Kumm, 2 lpM gen [UCLA]. Coari, 10 Aug 1948, H. Kumm, 3 M [UCLA, USNM]. Codajaz, 13-16 Aug 1948, H. Kumm, 2 F [BM]. Manaus, 13 Oct 1947, 1 lpF [BM]. Manicore, 22 Mar 1948, H. Kumm, 1 lpM gen [UCLA]. Tefe, Meta Patrimonio, 11 Jan 1949, 2 F [UCLA]. **Bahia**: Ilheus, 1 M [UCLA]; same data, 12 Jan 1944, 5 lp [USNM]; same data, 20 June 1944, 1 lp, 1 M gen [USNM]; same data, 8 Mar 1945, 1 lp, 1 M gen [USNM]. Ilheus, Faz. Pirataguisse, 19 Jan 1944, 1 lpF [BH]; same data, 27 Feb 1944, H. Kumm, 1 lp [USNM]. Ilheus, Ribeirao da Fortuna, 8 Mar 1944, 1 lpM [BH]; same data, 23-26 Feb 1944, 8 lp, 1 M gen, 3 F [USNM]. Rio Cururipe, H. Kumm, 1 M, 2 F [BM]; same data, 22 Aug 1930, N. Davis and R. Shannon, 1 F [USNM]; same data, 22 Apr 1936, E. Silva, 1 M gen, 1 F, 1 p [USNM]. Salvador, P. Antunes, 1 F [USNM]; Salvador, 4 Apr 1944, 9 lp, 9 M, 1 p [USNM]. **Espirito Santo**: Vale do Canaa, 3 Nov 1947, H. Kumm, 1 lp [USNM]; same data, 29 June 1948, 1 lpM [BM]. **Goias**: Agua Fria, Jan 1938, 1 F [USNM]. Anapolis, 1935-1936, 13 F [USNM]. Cachoeira, May 1935, 1 F [USNM]. Caldas Novas, 25 Aug 1948, H. Kumm, 1 lpF, 1 lp [USNM]; same data, 15 Sept 1948, 1 lpM [BM]. Morrinhos, May 1935, 1 F [USNM]; same data, 16 Sept 1948, H. Kumm, 1 lp [USNM]. **Maranhao**: China, 25 Aug 1948, H. Kumm, 1 F [USNM]. Colinas, 26 Aug-17 Sept 1948,.H. Kumm, 1 lpF, 1 lp [USNM, BM]. **Mato Grosso**: Arado, Matta das Palmeiras, 12 May 1944 (SFA Ent.), 3 lpM (6423,6438,6439), 4 lpF (6436,6444, 6445,6449), 2 M, 3 F [USNM]. Florida, 16 Oct 1947, H. Kumm, 1 lpF [BM]; same data, 3 Nov 1947, 1 lpF, 1 F [USNM]. Frei Ambrosis, 16-23 Sept 1947, H. Kumm, 1 lpM, 1 lp, 2 M [USNM, BM]. Sitio Encantadinho, 14 Aug 1947, 1 lp [USNM]; same data, 24 Oct 1947, 2 lpM gen, 1 M gen [UCLA]. **Minas Gerais**: Cabui, 18 Nov 1946, H. Kumm, 1 lp [USNM]. Campina Verde, Jan 1949, 5 M, 4 F [UCLA]. Lavras, 2 M [USNM]. Leopoldina, 16 Sept 1948, 1 lpF, H. Kumm,

1 lpF [USNM]. **Para:** Abaetetuba, 25 Aug 1947, 1 lp, 1 M gen [USNM]. Belem, 24 June 1970, T. Aitken (BRA 46A), 5 F; same data, 1 July 1970 (BRA 46B), 8 F; same data, 8 July 1970 (BRA 46C), 6 F [UCLA]. Belem, Bosque Rodriques Alves, 1 M [USNM]. Castenhal, 14 Feb 1947, 1 lp [USNM]. Curralinho, Apr 1936, 5 F [USNM]. Curralinho, H. Kumm, 1 F [UCLA]. Juruti, 17 Dec 1947, H. Kumm, 1 lpF, 2 F; same data, 19 Mar 1948, 1 lpF [USNM]; Nova Timboteua, 18 Dec 1947, H. Kumm, 1 lp [USNM]; same data, 23-24 Jan 1948, 2 M [BM]; same data, 4 May 1918, 1 lpM [BM]. Locality unspecified (?Belem), Apr 1930, N. Davis, 1 M, 2 M gen, 5 F [USNM, BM]. **Parana:** I. de Maio, 24 Dec 1946, H. Kumm, 1 lp [USNM]; same data, 27 Dec 1946, 1 lpM [BM]; same data, 27 May 1947, 1 lpM [USNM]. **Rio de Janeiro:** Duque de Caxias, 28 Feb 1946, H. Kumm, 1 lp [USNM]. **Rondonia:** Guajara-Mirim, 15 July-9 Sept 1947, H. Kumm, 1 lpF, 2 lp, 2 M, 7 F [USNM, BM]; same data, 24 Mar 1948, 1 pM gen [UCLA]. **Roriama:** Caracarai, 13 Aug 1948, H. Kumm, 1 F [BM]. Rio Branco, 16-18 Sept 1948, H. Kumm, 1 lpF, 1 lp, 1 F [USNM]. **Sao Paulo:** Fernandopolis, 9 Apr 1947, H. Kumm, 1 lpM [BM]; same data, 11 Apr 1947, 2 lp, 1 F [USNM]. **Locality unspecified:** J. Lane, 2 M gen; Feb 1944, 2 M, 3 F; Apr 1944, 1 M, 1 F; 21 Oct 1947, H. Kumm, 3 lpM gen, 2 M gen; same data, 19-21 Sept, 1 lpM, 2 l [USNM].

COLOMBIA. **Boyaca:** Nunchia, 11 l [USNM]. **Caldas:** Rio La Miel, 1 M [USNM]. **Caqueta:** Florencia, 1 M, 15 M gen [USNM]. **Cundinamarca:** Caparrapi, Volcanes Forest, 1000-1500 m, 1 M, 1 M gen, 2 F, 3 lp, 21 l [USNM]. Guayabetal, 10 May 1946, E. Chapin, 1 F [USNM]. Malta, 280 m, 18 Feb 1943, H. Kumm, 1 l [USNM]. **Magdalena:** El Retiro, 1 M [USNM]. **Meta:** El Danubio, nr. Villavicencio, 490 m, 19 June 1965, E. Osorno-Mesa et al. (COB 40), 8 lpM (40-10,20,21,40,42,50-52), 10 lpF (40-11-13,23,24,30,41,43,54,55), 7 L, E; same data (COB 41), 5 lpM (41-10,13-16), 2 lpF (41-11,12) [UCLA]. La Florista, nr. Restrepo, 380 m, 23 June 1965, E. Osorno-Mesa et al. (COB 49), 4 lpF (49-20-23), 1 P [UCLA]. Restrepo, 8 M [USNM]; same data, P. Antunes, 1 M, 3 F [UCLA, USNM]; same data, 20 July-23 Aug 1935, W. Komp, 6 M, 2 M gen, 2 F, 2 p, 29 l [UCLA, USNM]. Retiro, 19 Aug 1935, 1 M; same data, July 1935, W. Komp, 2 l [USNM]. Salinas de Upin, nr. Villavicencio, 440 m, 18 June 1965, E. Osorno-Mesa et al. (COB 38), 1 p, 1 P, 3 l [UCLA]. Vanguardia, nr. Villavicencio, 350 m, 23 June 1965, E. Osorno-Mesa et al. (COB 47), 3 lpM (47-10,12,16), 5 lpF (47-11,13-15,18), 3 L [UCLA]. Villavicencio, 28 June 1941, W. Komp, 1 M gen [USNM]; same data, Sept 1942, 1 M, 1 l [USNM]; same data, Jan 1943, 1 F [USNM]; same data, 8 June 1944 [USNM]; same data, 28 Sept 1943, M. Bates, 1 M, 1 M gen, [USNM]; same data, 1944, 1 lp [USNM]; same data, 15 Oct 1945, 1 M [USNM]; same data, 5 Nov 1947, L. Rozeboom (CV 376A), 2 F [UCLA]. Locality unspecified, 1 M gen [UCLA]. **Norte de Santander:** Tibu, H. Kumm, 3 M, 3 l, [UCLA, USNM]. **Vaupes:** Teresita, 1 lM [USNM]. **Locality unspecified:** Kerr, 1 F [UCLA]; 19,23 June 1941 (MB 278), 2 M, 1 F [UCLA].

ECUADOR. **Napo-Pastaza:** La Coca (Coca and Napo Rivers), 250 m, 23 Apr-12 May 1965, L. Pena (ECU 8), 3 F [UCLA]. ?Pambay, R. Levi-Castillo, 1 lpM gen, 4 M, 6 M gen, 1 F [USNM]. **Locality unspecified:** R. Levi-Castillo, 1 F [USNM].

FRENCH GUIANA. **Guyane:** Cabassou, 31 Jan 1965, T. Aitken (FG 13), 18 F; same data, 1 Feb 1965 (FG 16), 1 F; same data (FG 17), 1 F; same data, 5 Apr 1968, J. Clastrier (FGC 3348), 1 lpM (3348-10); same data (FGC 3359), 1 l; same data (FGC 3361), 1 l [UCLA]. Galion, 30 Jan 1965, T. Aitken et al. (FG 4), 1 F [UCLA]. Chemin Vidal, nr. Remire, 13 Mar 1967, J. Carmen (FG 124A), 1 F [UCLA]. La Chaumiere, Cayenne, 11 June 1967, J. Clastrier (FGC 3271), 1 F; same data, 4 Jan 1968 (FGC 3333), 1 lpM (3333-10); same data (FGC 3334), 1 lpF (3334-11), 1 pF (3334-10) [UCLA]. Matoury, J. Clastrier (FGC 3833), 1 lpM (3833-44), 1 lpF (3833-45) [UCLA]. Raban (5 km SE Cayenne), 3 Feb 1965, T. Aitken et al. (FG 45), 3 F [UCLA]. Rorota (12 km E Cayenne), 6 Feb 1965, T. Aitken et al. (FG 66), 1 F; same data (FG 67), 1 F [UCLA]. **Locality unspecified:** 4 F [GML]; J. Clastrier (FGC 3492), 5 F [UCLA].

GUYANA. **Demerara:** Hyde Park, 1 Aug 1941, L. Rozeboom (BGR 5), 3 F [UCLA]. **Essequibo:** 23 June 1936, 1 F [GML].

HONDURAS. **Atlantida:** Tela, 17-25 May, 4 Sept 1954 (GML), 2 lpM (01580,01583), 4 lpF 01581,01582,01585,01586) [UCLA].

NICARAGUA. **Chontales:** Villa Somoza, July 1953 (GML), 1 lpM (00989) [UCLA]. **Zelaya:** El Recreo, 5 July 1954, K. Neiland (NI 3), 1 L [UCLA].

PANAMA AND CANAL ZONE. **Canal Zone:** Barro Colorado Island, 7 May 1943, W. Komp,

1 M gen; same data, 1 May 1945, 1 lpF (5-106) [USNM]. Ft. Sherman, 23 Sept 1949, 4 F [UCLA]. **Chiriqui:** Chorcha, 5 Jan 1950, P. Galindo (GML), 2 lpM (00402,00410), 1 lpF (00411) [UCLA]. **Darien:** Tacarcuna, 9 Sept 1958 (GG 1), 1 lpF (1-118); same data (GG 123), 12 lpM (123-102,107-109,111,115-117,119,121-123), 11 lpF (123-101,103-106,110,112-114,118,120) [UCLA]. Tacarcuna River Valley, 600 m, 20 June 1963 (PA 406), 1 F; same data, 8 July 1963 (PA 444), 1 F; same data, 12 July 1963 (PA 457), 2 F [UCLA]. **Panama:** Cerro Azul, 1954 (GML), 4 1 [UCLA]. Cerro La Victoria, 1949, H. Trapido, 15 F [UCLA]. Pacora, June-Aug 1950, 33 F [UCLA].

PERU. **Huanuco:** Cochicoto, 12 Nov 1965, J. Hitchcock, 1 M gen [USNM]. **Loreto:** Iquitos, Mar-Apr 1931, R. Shannon, 12 F, 1 1 [USNM]. Ucayali River, 24 Oct 1903, 1 F (*obscurescens* lectotype) [BM].

SURINAM. **Saramacca:** Matta, 15 Jan 1960, T. Aitken, 2 F [UCLA]. **Locality unspecified:** J. Bonne-Wepster, 1 F [USNM].

TRINIDAD AND TOBAGO. TOBAGO. **St. Paul:** Roxborough, Main Ridge, 31 July 1957, T. Aitken, 2 F [UCLA]. TRINIDAD. **Caroni:** Brasso Venado, 120 m, 21 June 1964, R. Manuel and R. Martinez (TR 513), 2 F [UCLA]. Mayaro, 30 m, 23 July 1966, T. Aitken (TR 1561), 2 pM (1561-10,11), 1 pF (1561-12) [UCLA]. **Nariva:** Big Bush Bush, Nariva Swamp, 29 Aug 1961, T. Aitken (1-29/VIII/61), 2 lpF (2,4), 1 M, 2 F; same data, 7 Sept 1961, 1 F [UCLA]. Bush Bush Forest, Nariva Swamp, 3 Jan 1964, TRVL (TR 13), 1 lpM (13-106), 1 lpF (13-108), 3 lP (13-101,104,105); same data (TR 20), 1 lP (20-102); same data, 17 Feb 1964 (TR 72), 1 lpM (72-136), 1 pM (72-131), 3 pF (72-132-134); same data, 26 Feb 1964 (TR 101), 3 lpF (101-149-151); same data, 4 Mar 1964 (TR 153), 2 lpF (153-197,198); same data, 11 Mar 1964 (TR 172), 2 lpF (172-120,180); same data, 15 Apr 1964 (TR 197), 2 lpM (197-101,114), 3 lpF (297-136,199,200); same data (TR 298), 2 lpM (298-111,141), 1 lpF (298-140); same data (TR 299), 7 lpM (299-104, 105,110,112,113,123,132); same data (TR 300), 3 lpM (300-102,124,159), 2 lpF (300-139,151), 6 L; same data, 27 May 1964 (TR 427), 1 lpM (427-157); same data (TR 429), 2 lpM (429-130, 131), 1 lpF (429-148); same data (TR 431), 4 lpM (431-126-128,129) 1 lpF (431-147); same data (TR 432), 1 lpF (432-149), 1 lP (432-159); same data, 10 June 1964 (TR 485), 1 pM (485-181); same data, 5 Dec 1965, T. Aitken (TR 1427), 1 F; same data, 22 Dec 1960 (5-22/XII/60), 2 p; same data, 2 Mar 1961 (4-2/III/61), 5 lp (1-4,6), 1 p; same data, 27 Apr 1961 (5-27/IV/61), 12 lp (2-13), 1 p; same data, 31 May 1961 (3-31/V/61), 5 lp (1-5); same data (4-31/V/61), 3 lp (1-3); same data, 4 Sept 1961 (3-4/IX/61), 1 pM (1), 1 M, 1 F; same data, 7 Sept 1961 (2-7/IX/61), 1 F; same data, 30 Jan 1963 (5-30/I/63), 1 lpM (1); same data, 19 Feb 1963 (6-19/II/63), 1 lpF (1); same data, 11 Mar 1963 (4-11/III/63), 2 lpM (2,3), 1 lP (1); same data (5-11/III/63), 2 lpM (1,5), 3 lpF (2-4); same data, 12 Mar 1963 (13-12/III/63), 1 lpM (1), 1 lp (2) [UCLA]. Charuma Forest, 150 m, 27 Aug 1964, A. Guerra (TR 644), 2 F; same data, 8 Oct 1964 (TR 761), 4 F [UCLA]. Rio Claro, 45 m, 5 Nov 1964, A. Guerra (TR 815), 2 lpF (815-108,110), 1 L [UCLA]. **St. Andrew:** Caratal Road, 75 m, 3 Dec 1964, F. Powdhar (TR 866), 1 F [UCLA]. Coryal, 75 m, 18 June 1964, A. Guerra (TR 498), 7 F [UCLA]. El Quemado Road, 75 m, 3 July 1964, F. Powdhar (TR 547), 5 F [UCLA]. Guaico-Tamana Road, 75 m, 10 Apr 1965, F. Powdhar (TR 1216), 3 pF (1216-100-102) [UCLA]. Mt. Harris, 150 m, 23-31 July 1924, C. Withycombe, 13 F [BM]; same data, 16 July 1964, F. Powdhar (TR 573), 11 F [UCLA]. Mt. Tamana, 100 m, 19 June 1964, A. Guerra (TR 512), 1 F [UCLA]. Nestor Village, 30 m, 12 June 1964, A. Guerra (TR 476), 2 L; same data (TR 482), 6 L; same data (TR 483), 2 lpM (483-116,117), 1 pM (483-103); same data (TR 484), 1 M, 2 F; same data, 24 Apr 1965, F. Powdhar (TR 1232), 1 F [UCLA]. Sangre Grande, 75 m, 17 Dec 1964, F. Powdhar (TR 894), 1 F [UCLA]. Sangre Grande, Biche Road, 15 Oct 1957, T. Aitken, 1 M [UCLA]. Turure Forest, 60 m, Oct 1966, A. Guerra (TR 1618), 1 F [UCLA]. Vega de Oropouche Road, St. John's Estate, 12 Dec 1960, T. Aitken (12/XII/60), 5 lp (2-6), 1 p [UCLA]. **St. David:** Cumana, 90 m, 19 Nov 1964, A. Guerra (TR 840), 1 F [UCLA]. **St. George:** Agua Santa, 75 m, 29 July 1965, A. Guerra (TR 1295), 2 F [UCLA]. Aripo Valley, L'Orange Road, 150 m, 17 Sept 1964, A. Guerra (TR 711), 1 F [UCLA]. Guanapo Valley, 20 m, 17 Apr 1964, A. Guerra (TR 332), 1 lpF (332-129), 1 pF (332-133) [UCLA]. Heights of Guanapo (8 km N Arima), 250 m, 26 Mar 1964, A. Guerra (TR 259), 1 F [UCLA]. Las Lapas Trace, 600 m, 3 Apr 1964, A. Guerra (TR 281), 1 F [UCLA]. Lopinot, 300 m, 30 Apr 1964, A. Guerra (TR 374), 2 F [UCLA]. Monos Island, Grand Fond Bay Valley,

0 m, 1 Aug 1964, R. Manuel (TR 584), 1 pF (584-103) [UCLA]. Mt. Beck, 300 m, 29 Apr 1965, A. Guerra (TR 1137), 1 F; same data (TR 1143), 1 F [UCLA]. St. Ann's, 26 Aug 1945, 1 F; same data, 1906, F. Urich, 1 lp; same data, 26 Aug 1945, W. Komp, 3 lp, 1 P, 1 l [USNM]. St. Augustine, Oct 1923, C. Withycombe, 1 F [BM]. St. Pats, 12 Nov 1953, 1 F; same data, 15 Dec 1954 (GML), 1 lp (02031) [UCLA]. Talparo, 75 m, 26 June 1964, A. Guerra (TR 531), 6 F [UCLA]. Tunapuna, Caura Road, 240 m, 14 May 1964, A. Guerra (TR 397), 1 F [UCLA]. Verdant Vale, 300 m, 10 Sept 1964, A. Guerra (TR 679), 2 pF (679-114,115), 1 L; same data (TR 686), 7 F; same data, 150 m, 12 Nov 1964 (TR 821), 5 L; same data (TR 823), 1 L [UCLA]. **St. Patrick:** Cedros, 27 Mar 1921, G. Pawan, 1 F [BM]. **Victoria:** Mayo, 25 June 1914, J. Dickson, 1 M [BM]. **County unknown:** (?)Franca, Rio Grande, 23 Sept 1903, 1 F [BM]. **Locality unspecified:** S. Vister, 1 F [BM]; F. Urich, 2 M [USNM]; June 1905, A. Busk, 3 F [USNM].

VENEZUELA. **Aragua:** Maracay, Apr 1935, P. Anduze, 1 F [USNM]. Maracay (20 km N on road to Choroni), 800 m, 6 Aug 1969, J. Valencia (VZ 312), 4 lpF (312-10-13) [UCLA]. Rancho Grande, 1095 m, 9 July 1969, T. Zavortink (VZ 168), 1 lpF (168-10), 1 L [UCLA]. Rancho Grande (8 km S), 800 m, 15 July 1969, T. Zavortink (VZ 203), 1 pM (203-101); same data, 11 Aug 1969, J. Valencia (VZ 325), 4 F; same data, 18 Aug 1969, Pulido and Clarijo (VZ 371), 1 l; same data (VZ 375), 1 pM (375-100); same data, 25 Aug 1969, J. Valencia and Clarijo (VZ 409), 1 lpM (409-10) [UCLA]. Rancho Grande (park entrance), 1 Dec 1967, Hansell (VZ 82), 1 l [UCLA]. Turiamo, 16 Sept 1944, 3 M, 5 F [UCLA]; same data, Sept 1944, W. Komp, 1 p, 8 l [USNM]. **Carabobo:** San Jean, 24 Dec 1937, P. Anduze, 1 M gen [USNM]. **Delta Amacuro:** Manoa Woods, Orinoco River, 10 Jan, 1 F [USNM]. **Monagas:** Guamito, 30 July 1927, M. Nunez-Tovar, 1 F [USNM].

Additional Records From the Literature

ARGENTINA. **Catamarca:** Alrededores La Vina and Cuesta del Totoral (Manso Soto, Martinez and Prosen, 1953:37).

BRAZIL. **Ceara:** Pacoti (Kumm and Cerqueira, 1951:172). **Pernambuco:** Recife (Kumm and Cerqueira, 1951:172).

COSTA RICA. **Alajuela:** San Gerardo (Galindo and Trapido, 1955:546). **Limon:** Wauchope (Galindo and Trapido, 1955:545). **Puntarenas:** Cordillera Brunquena, 40 km NW Golfito (Galindo, Carpenter and Trapido, 1951b:105).

8. Haemagogus (H.) capricornii Lutz

Figs. 3,21,22

1904. *Haemagogus capricornii* Lutz, *in* Bourroul, 1904:13. TYPE: *Neotype* female reared from egg, Horto Florestal, Serra da Cantareira, Sao Paulo, Brazil, Apr 1944, L. Gomes [LU; designation by Cerqueira and Lane, 1945:186]. Synonymized with *equinus* by Dyar (1923:183); revalidated by Antunes (1939:106).

Haemagogus (Haemagogus) capricornii of Lane (1939:118, in part); Levi Castillo (1951b:11, 18-19).

Haemagogus (Stegoconops) capricornii of Dyar (1921a:103); Lane (1953:790-792); Stone, Knight, and Starcke (1959:216, in part); Cova Garcia, Sutil and Rausseo (1966a:61-62, fig. 118; 1966b: 46, fig. 201).

Haemagogus (Stegoconops) capricornii capricornii of Martinez, Carcavallo and Prosen (1961: 77); Stone (1963:132); Forattini (1965:19); Martinez and Carcavallo (1965:42).

Haemagogus capricornii of Blanchard (1905:633); Theobald (1907:551; 1910:493); Howard, Dyar and Knab (1917:877, in part); Shannon and Del Ponte (1928:68); Shannon, Whitman and Franca (1938:111, in part); Shannon (1939:137, in part); Cerqueira (1943:8-9); Cerqueira and Lane (1945:279-288); Cerqueira and Boshell-Manrique (1946:193); Waddell and Kumm (1948:247); Waddell (1949:568); Kumm and Laemmert (1950:750); Laemmert and Kumm (1950:724); Kumm and Cerqueira (1951a:173-174; 1951b:196); Levi-Castillo (1951a:14);

Mackie, Hunter and Worth (1954:19); Horsfall (1955:535); Foote and Cook (1959:141).
Stegoconops capricornii of Lutz (1905:83-84).
Aedes capricornii in part of Dyar and Knab (1906b:163-164).
Haemagogus (Stegoconops) equinus in part of Dyar (1923:183; 1928:134); Edwards (1932:179).
Haemagogus equinus in part of Dyar (1925b:138).

FEMALE. Wing: 3.30 mm. Proboscis: 2.60 mm. Forefemur: 2.30 mm. Abdomen: 3.00 mm. Apparently indistinguishable from *janthinomys.*

MALE (fig. 21). Wing: 3.30 mm. Proboscis: 2.90 mm. Forefemur: 2.20 mm. Abdomen: 3.40 mm. Apparently indistinguishable from *janthinomys.*

MALE GENITALIA (fig. 21). **Segment VIII:** Tergite about 0.55-0.60 of sternite; distal margin straight or slightly broadly emarginate, with enlarged setae laterally and cluster of about 20 lanceolate scales mesally. **Segment IX:** Tergite deeply emarginate and weakly sclerotized mesally; lobes with 1 to 3 setae. **Sidepiece:** Conical; length 3.5 times median width; basal tergomesal lobe slightly enlarged, with numerous setae, the more proximal ones enlarged, flattened and attenuate; mesal half distad of basal tergomesal area with setae rather evenly distributed, short, longer on distal fourth; apical sternomesal scales oblanceolate with acuminate tips. **Claspette:** Stem bowed inward near middle in dorsal aspect, slightly constricted near middle, sharply curved dorsad beyond middle; filament striate, broadly sickle-shaped, slightly expanded and rounded posteriorly, apex slightly recurved. **Clasper:** Broadest at base, spiniform short, about 0.40 of clasper. **Phallosome:** Aedeagus large, oval, apex slightly emarginate in dorsal view laterad of median dorsal sclerotized keel, which is produced forward to form a short, blunt tip; venter broadly open except on ventral fourth; sclerotized ridges present lateroventrally which are expanded basally and terminate in sclerotized lobes mesally. **Proctiger:** Cercal setae 6-8; apical knob of paraproct with about 20 serrations.

PUPA (fig. 21). Abdomen: about 3.30 mm. Trumpet: 0.45 mm. Paddle: 0.70 mm. **Cephalothorax:** Weakly to moderately pigmented, darker dorsally. Hairs 4,5-C subequal, weak, single, weaker than 7-C which is also single. **Trumpet:** Medium to dark brown, lighter distally; reticulate sculpturing moderate. **Abdomen:** Weakly to moderately pigmented, genital lobe and anterior segments often darker. Float hair (1-I) with about 12-16 primary branches and about 2-6 secondary branches. Hair 1-II-VII weakly developed, 1-4b. Hair 2-VII short, considerably cephalad of 1-VII. Hairs 3-II,III,5-IV,V subequal or 3-III slightly weaker. Hair 6-VII weak, fine, subequal to 6-III-VI. Hair 9-VII usually slightly cephalad of caudolateral margin of tergite, single or double; 9-VIII usually 4-8b. **Terminal Segments:** Male genital lobe about 1.3 of tergite VIII. **Paddle:** Weakly to moderately pigmented; relatively broad, apex broadly rounded. Hair 1-P single.

LARVA (fig. 22). Head: 0.95 mm. Siphon: 0.80 mm. Anal Saddle: 0.40 mm. **Head:** Hair 6-C single. **Thorax:** Integument with spicules. Tubercles of hairs 5-7-P connected. **Abdomen:** Hair 12-I absent. **Segment VIII:** Comb scales 8-10(5-13), with single sharply pointed, minutely fringed spine, in single row, attached basally to sclerotized plate. **Siphon:** Index about 2.4-2.7. Pecten teeth about 10-14(9-18), extending to about basal 0.45 of siphon. Hair 1-S double, inserted at basal 0.55 of siphon. **Anal Segment:** Spines on caudal margin well developed, much elongate and conspicuous dorsally. Hair 4a-X double or triple, long, nearly the length of 4b-X. Boss strongly sclerotized.

SYSTEMATICS. Although *capricornii* is apparently indistinguishable from *janthinomys* as **adults** and **larva** I consider it as a distinct species. It can be distinguished

from *janthinomys* and the remainder of the Albomaculatus Section in the male genitalia by the combination of (1) absence of hooklike process on apex of proctiger, (2) aedeagus slightly emarginate just laterad of median dorsal sclerotized keel and (3) relatively short tergite VIII which is about 0.55-0.60 of sternite VIII.

Described by Lutz in 1904, *capricornii* was synonymized with *equinus* by Dyar (1923) because the males of *capricornii* were unknown to him. Antunes (1939) resurrected *capricornii* and Cerqueira and Lane (1945) later reared specimens from the type locality and confirmed its validity. For a review of the confusion of *capricornii, spegazzinii* and *janthinomys* see the section on systematics under the latter.

BIONOMICS. Little is known of the bionomics of *capricornii* as the majority of the papers containing information on the biology and habits of this species actually refer to *janthinomys. Capricornii* is found only in the drier, more temperate region of southeastern Brazil and apparently breeds almost exclusively in treeholes.

Capricornii is an efficient vector of yellow fever virus as demonstrated in laboratory transmission studies (Waddell and Kumm, 1948; Waddell, 1949). Yellow fever has been transmitted by bite from wild caught females of presumably *capricornii* from Affonso Arinhos, Brazil (Shannon, Whitman and Franca, 1938), although there is some question as to whether these authors were dealing with *capricornii* or *janthinomys* in their transmission studies. I am unaware of any instances of outbreaks of sylvan yellow fever in areas of southeastern Brazil where *capricornii* would be the only possible vector species.

DISTRIBUTION (fig. 3). *Haemagogus capricornii* is found only in southeastern Brazil, from southern Bahia to northern Rio Grande do Sul. The record of *capricornii* in Stone, Knight and Starcke (1959:216) from Bolivia undoubtedly refers to *janthinomys.* That of Cova Garcia, Sutil and Rausseo from Venezuela is also unquestionably erroneous; their drawings of male genitalia which identify this species are apparently copied directly from Levi-Castillo (1951b:fig. 3, p. 40). Material examined: 87 specimens; 30 males, 10 females, 24 pupae, 23 larvae; 24 individual rearings (13 larval, 1 pupal, 10 incomplete).

BRAZIL. **Espirito Santo:** Santa Teresa, 13 Oct 1947, H. Kumm, 1 lpM gen [UCLA]. **Minas Gerais:** Cabiri, 12 Nov 1946, H. Kumm, 1 lpM [BM]. Lavras, 3 M [UCLA]. **Parana:** Jandaia do Sul, 23 Dec 1946, 1 M gen [USNM]. **Rio de Janeiro:** Duque de Caxias, Mar-Apr 1950, 7 M, 6 F [UCLA]; same data, 4 Mar 1946, H. Kumm, 4 lp [USNM]. ?Neocacios, 23 July 1946, H. Kumm, 1 lpM [BM]. Paraiba do Sul, Mar 1938, 1 M [USNM]. Sao Sebastiao, 15 Oct 1947, H. Kumm, 3 lpM gen [UCLA]. Santa Clara, 30 Apr 1947, 5 lpM gen, 1 pM gen, 2 M gen [USNM]. **Sao Paulo:** ?Gapira, A. Lane, 2 F [UCLA]. Mirasol, L. e Gui, 1 F [UCLA]. Serra da Cantareira, 24 Apr 1944, L. Gomes, 1 lpM, 1 lpF, 6 lp [UCLA, USNM, BH]. **Locality unspecified:** 3 M gen [UCLA].

Additional Records From the Literature

BRAZIL. **Bahia:** Malhada (Kumm and Cerqueira, 1951:174). **Rio Grande do Sul:** Santo Augusto and Sao Luiz Gonzaga (Kumm and Cerqueira, 1951:174). **Santa Catarina:** Ibirama (Kumm and Cerqueira, 1951:174).

9. Haemagogus (H.) mesodentatus Komp & Kumm

Figs. 3,23,24

1938. *Haemagogus mesodentatus* Komp and Kumm, 1938:253-259. TYPE: *Holotype* male, Parque Bolivar, San Jose, San Jose, Costa Rica, 20 Dec 1937, H.W. Kumm [LU; see Stone and Knight, 1955:288].

1956. *Haemagogus mesodentatus gorgasi* Galindo and Trapido, 1956:228-231. TYPE: *Holotype* female (01591) with associated larval and pupal skins, Tapachula, Chiapas, Mexico,

reared from eggs from female taken biting man, 4 Aug 1953 [USNM]. NEW SYNONYMY.

1956. *Haemagogus mesodentatus alticola* Galindo, Trapido and Boshell-Manrique *in* Galindo and Trapido 1956:228-231. TYPE: *Holotype* female (01920) with associated larval and pupal skins, summit of Sumidero Canyon of the Rio Grijalva, 24 km N of Tuxtla Gutierrez, Chiapas, Mexico, elev. 4000 ft, reared from eggs from female taken biting man, 29 June 1953 [USNM]. NEW SYNONYMY.

Haemagogus (Haemagogus) mesodentatus of Lane (1939:120).

Haemagogus (Stegoconops) mesodentatus of Lane (1953:796-798) Stone, Knight and Starcke (1959:216); Bertram (1971:475).

Haemagogus mesodentatus of Kumm, Komp and Ruiz (1940:395,399); Kumm and Zuniga (1942:404); Vargas and Martinez Palacios (1953:38); Trapido and Galindo (1956a:304-305; 1957:126).

Haemagogus (Stegoconops) mesodentatus mesodentatus of Diaz Najera (1963:191; 1966:61); Forattini (1965:26-29).

Haemagogus mesodentatus mesodentatus of Galindo and Trapido (1956:228,231); Galindo, de Rodaniche and Trapido (1956:1022); Galindo and Trapido (1957:147); de Rodaniche and Galindo (1957:235); Boshell-Manrique and Bevier (1958:27); Foote and Cook (1959:141); Vargas and Diaz Najera (1959:362); Diaz Najera (1960:187).

Haemagogus (Stegoconops) mesodentatus gorgasi of Stone, Knight and Starcke (1959:216); Diaz Najera (1963:191; 1966:61); Stone (1963:132); Forattini (1965:26-29).

Haemagogus mesodentatus gorgasi of Galindo, de Rodaniche and Trapido (1956:1022); de Rodaniche and Galindo (1957:236); Foote and Cook (1959:141); Vargas and Diaz Najera (1959:362); Diaz Najera (1960:187).

Haemagogus (Stegoconops) mesodentatus alticola of Stone, Knight and Starcke (1959:216); Diaz Najera (1963:191); Stone (1963:132); Forattini (1965:26-29).

Haemagogus mesodentatus alticola of Boshell-Manrique and Bevier (1958:33); Vargas and Diaz Najera (1959:362); Diaz Najera (1960:187).

FEMALE. Wing: 3.05 mm. Proboscis: 2.55 mm. Forefemur: 2.10 mm. Abdomen: 3.20 mm. Dark scales of proboscis, palpus, wing and legs dark blue to violet with some purple reflections. **Head:** Eyes narrowly separated (1 ommatidial diameter) or contiguous above antennae. Decumbent scales of occiput light green to light bluish green. Proboscis relatively long, about 1.20-1.35 of forefemur; palpus about 0.16 of proboscis; antenna about 0.66-0.71 of proboscis. **Thorax:** Scales of mesonotum and scutellum variable, from hues of green and blue to copper and gold, usually bluish green over supraalar bristles and on scutellar lobes, silver in antealar area. *Apn* lobes moderately enlarged, scales blue to green, with or without silver scales; *ppn* scales with same range of color as mesonotum, often with silver scales ventrally. **Legs:** Relatively short, length of forefemur about 1.25-1.40 of distance from top of thorax to apex of midcoxa; forecoxa occasionally with small patch of violet to purple scale near middle; knee spots present or absent on midfemur and hindfemur; midtarsus with white or gray scales on outer surface of proximal 2 or 3 segments. **Wing:** R_{2+3} usually about 0.75-0.90 of R_2. **Abdomen:** Dark scales blue to violet with some purple reflections; dorsal silver patches of scales basally on tergites III-VIII, often expanded distally along midline and larger on distal segments; lateral silver patches extending to distal margins of tergites II-VII forming broad lateral silver stripe, or with patches only on basal half of more distal segments.

MALE (fig. 23). Wing: 2.90 mm. Proboscis: 2.90 mm. Forefemur: 2.05 mm. Abdomen: 3.20 mm. **Head:** Proboscis about 1.40-1.55 of forefemur; palpus short, about 0.15 of proboscis; antenna about 0.60 of proboscis. **Legs:** Larger claw of foreleg and midleg with acute submedian tooth, smaller claw of foreleg and midleg with acute subbasal tooth.

MALE GENITALIA (fig. 23). **Segment VIII:** Tergite about 0.70-0.75 of sternite; distal margin broadly emarginate, with enlarged setae laterally and cluster of 20-30 lanceolate scales mesally. **Segment IX:** Tergite emarginate and weakly sclerotized mesally; lobes with 1 or 2 setae. **Sidepiece:** Conical, length 3.5 times median width; basal tergomesal lobe slightly enlarged, with numerous setae, the more proximal ones much elongate, flattened and attenuate; mesal half distad of basal tergomesal area with setae rather evenly distributed, short, longer on distal fourth; apical sternomesal scales lanceolate to oblanceolate with acuminate tips. **Claspette:** Stem bowed inward near middle in dorsal aspect, relatively thin, slightly narrowed and curved dorsad beyond middle; filament striate, broadly sickle-shaped, broader near middle. **Clasper:** Broadest at base; spiniform about 0.50 of clasper. **Phallosome:** Aedeagus large, broadly obovate, tip produced distally into long thin beak, which makes up about 0.30 of aedeagus length, the dorsum of tip with a series of proximally projecting coarse serrations forming a median carina; dorsum with broad, elliptical opening into which base of carina projects; venter broadly open except at basal third, with sclerotized ridges lateroventrally which are expanded basally and nearly joined near midline by sclerotized lobes. **Proctiger:** Cercal setae 6-10; apical knob of paraproct with about 20 serrations.

PUPA (fig. 23). Abdomen: about 3.45 mm. Trumpet: 0.45 mm. Paddle: 0.75 mm. **Cephalothorax:** Weakly to moderately pigmented, darker dorsally. Hairs 4,5-C subequal, single to triple, weaker than 7-C which is single. **Trumpet:** Dark brown, lighter distally; reticulate sculpturing moderate. **Abdomen:** Weakly to moderately pigmented, genital lobe and anterior segments darker. Float hair (1-I) with 8-16 primary branches and 2-6 secondary branches. Hair 1-II-VII weakly to very strongly developed, single to dendritic. Hair 2-VII considerably cephalad of 1-VII. Hairs 3-II,III,5-IV,V somewhat variable in development but more or less subequal. Hair 6-VII weakly to moderately developed, subequal to or stronger than 6-III-VI, usually single. Hair 9-VII slightly cephalad of caudolateral margin of tergite, 1-4b; hair 9-VIII 6-10b. **Terminal Segments:** Male genital lobe about 1.2 of tergite VIII. **Paddle:** Weakly to moderately pigmented; apex broadly rounded. Hair 1-P single.

LARVA (fig. 24). Head: 0.90 mm. Siphon: 0.75 mm. Anal Saddle: 0.32 mm. **Head:** Hairs 5,6-C single (single or double). **Thorax:** Integument with spicules. Tubercles of hairs 5-7-P connected. **Abdomen:** Hair 12-I present. **Segment VIII:** Comb scales 8-11(6-12), with single sharply pointed, minutely fringed spine, in single row. **Siphon:** Index about 2.2-2.5(1.9-2.9). Pecten teeth about 12-16(8-17), extending to about basal 0.50 of siphon. Hair 1-S double (2-4b), inserted at basal 0.55-0.60 of siphon. **Anal Segment:** Spines on caudal margin of saddle well developed. Hair 4a-X 3-5b, short or long. Boss strongly sclerotized.

SYSTEMATICS. *Haemagogus mesodentatus* can be distinguished readily: in the **adults** by white or gray scales on outer surface of proximal 2 or 3 midtarsal segments; in the **male genitalia** by aedeagus tip expanded into long, thin, coarsely serrated carina that projects posteriorly into elliptical opening in dorsum of aedeagus; and in the **larva** by the combination of (1) spiculose integument, (2) hair 12-I present and (3) comb scales not attached basally to sclerotized plate.

This species was divided into 3 subspecies by Trapido and Galindo (1956) on the basis of the presence or absence of light knee spots and the amount of silver scales on the *apn* and *ppn* in the female. *Mesodentatus* is unstable in several characters of the adults and larvae. The color of the scales of the mesonotum varies from copper through gold to green and blue, there is a great deal of variation in the number of silver scales on some of the thoracic pleurites and femora and

considerable differences in the development of spiculation and of some hairs in the larva. The characters proposed by Galindo and Trapido for their subspecies are among the more variable and do not hold in the specimens examined in this study. I consider *mesodentatus* to be a somewhat inconstant but monotypic species.

Mesodentatus may be closely related to *janthinomys,* both having a spiculose larval integument and an extreme development of the apex of the aedeagus. They differ in details of adult ornamentation by which they are easily distinguished. The 2 species occupy much the same ecological situations, the canopy, in the rain forests of Central America. The 2 species are sympatric in the forests on the Atlantic side north of the Isthmus of Panama with *mesodentatus* gradually replacing *janthinomys* in Nicaragua and Honduras and becoming abundant beyond the northern limits of *janthinomys.* Both species are capable of transmitting yellow fever virus.

BIONOMICS. *Haemagogus mesodentatus* breeds primarily in treeholes and bamboo internodes although it is found in limestone rock holes at higher elevations in southern and south-central Mexico. As mentioned above, *mesodentatus* is sympatric with *janthinomys* in the rain forests from Panama, where it is rare, to Honduras, where it outnumbers *janthinomys. Mesodentatus* reaches its maximum density in the forests of the Department of Peten in Guatemala and in southern Mexico. Apparently absent from the Pacific slope of Nicaragua and Honduras, it is common in El Salvador, Guatemala and southern Mexico and extends northward to Sonora in the tropical deciduous forest of the Pacific coast. It has been taken at elevations of over 1200 meters in the highlands of southern Mexico and Costa Rica. Although not as efficient a vector as *janthinomys, mesodentatus* is capable of transmitting yellow fever by bite (Galindo, de Rodaniche and Trapido, 1956) and this virus has been isolated from wild caught females in Guatemala (de Rodaniche and Galindo, 1957).

DISTRIBUTION (fig. 3). *Haemagogus mesodentatus* extends from southern Sonora and southern San Luis Potosi, Mexico through both the Atlantic and Pacific versants of Central America to the Isthmus of Panama. Material examined: 437 specimens; 66 males, 136 females, 104 pupae, 131 larvae; 80 individual rearings (57 larval, 16 pupal, 7 incomplete).

COSTA RICA. **Alajuela:** Esparta (11.8 km E), 19 June 1963, C. Hogue (CR 97), 2 F [UCLA]. **San Jose:** Lourdes (nr. San Jose), 1150 m, 29 Oct 1971, D. Schroeder (CR 494), 3 F [UCLA]. San Jose, H. Kumm, 1 M, 1 F, 12 l [USNM, BM]; same data, 14 Aug 1953 (GML), 1 lpF (01661), 1 lp (01660) [UCLA]; same data, 8 June 1963, C. Hogue (CR 88), 1 lpM (88-108), 1 lpF (88-106), 1 M, 2 l, 2 L [UCLA]; same data (CR 89), 2 lpM (89-102,105), 2 lp (89-101,201), 2 L [UCLA].

EL SALVADOR. **Liberdad:** La Liberdad, 15 June 1953 (GML), 1 lpF (01838), 3 pM (01929, 01933,01446) [UCLA]. **San Salvador:** Los Planes, H. Kumm, 4 M, 2 M gen, 4 F, 8 l [USNM]. **Locality unspecified:** 1 L [USNM].

GUATEMALA. **Escuintla:** El Salto, 5 Aug 1953 (GML), 1 lpF (01732), 5 l [UCLA]. Santa Lucia Cotzumalguapa, 3 July 1964, T. Zavortink and P. Cowsill (GUA 31), 1 F [UCLA]. **Izabal:** Rio Chiquito, nr. Bananera, 28 Dec 1954 (GML), 1 lpF (01960) [UCLA]. **Jutiapa:** Jutiapa, 9 July 1943, H. Hargis, 4 F [UCLA]. **Peten:** Locality unspecified, 9 Dec 1955 (GML), 6 l [UCLA]. **Retalhuleu:** San Felipe, 780 m, 2 July 1964, T. Zavortink and P. Cowsill (GUA 22), 1 lpM (22-10); same data (GUA 27), 1 lpF (27-10), 1 pF (27-100); same data (GUA 28), 1 lpM (28-14), 10 lpF (28-10,13,15-22), 1 lF (28-11), 1 pM (28-100), 1 lP (28-12), 7 M, 5 F, 19 P, 6 L; same data, 8 Sept 1964, P. Cowsill and Almengor (GUA 130), 1 lpM (130-10), 2 pM (130-101,102), 1 pF (130-100) [UCLA]. San Sebastian, 300 m, 2 July 1964, T. Zavortink and P. Cowsill (GUA 29), 3 lpM (29-12,14,16), 2 lpF (29-18,20), 2 pM (29-102,103), 2 lP (29-15,

22), 2 M, 1 F, 3 p, 2 P, 3 l, 2 L [UCLA]. **Suchitepequez:** Patulul, 250 m, 20 July 1964, P. Cowsill (GUA 56), 1 lpF (56-11), 1 P, 9 L [UCLA]. Rio Bravo, 175 m, 3 July 1964, P. Cowsill (GUA 24), 1 pF (24-100) [UCLA]. **Department unknown:** El Penon, 24 Aug 1953 (GML), 2 lpF (01639, 01640) [UCLA]. Rio Blanco, P. Woke, 4 l [USNM].

MEXICO. **Chiapas:** Arriaga, 21 May 1963, 1 F [USNM]. La Esperanza, Salto de Agua, 12 Sept 1958, 1 F [USNM]. Sumidero (24 km N Tuxtla Guteirrez), 1030 m, 26-29 June 1953, P. Galindo, H. Trapido, G. Boshell-Manrique (GML), 5 lpM (01528,01631,01715,01718,01923), 4 lpF (01567, 01568,01572,01922), 1 pM (01711), 5 M, 9 F, 2 L [UCLA, USNM, GML]; same data, 23 July 1963, E. Fisher (MF 8), 6 F [UCLA]; same data, 17 Aug 1964 (MEX 120), 13 F [UCLA]; same data (MEX 121), 3 F [UCLA]; same data (MEX 128), 2 F [UCLA]. Tapachula, 4 Aug 1953, P. Galindo and H. Trapido (GML), 2 lpM (01588,01593), 1 lpF (01589), 1 M [UCLA, USNM]. **Guerrero:** Chilpancingo (30 km S), 670-880 m, 31 Aug 1964, E. Fisher (MEX 166), 3 F; same data, 7 Aug 1966, D. Schroeder (MEX 411), 1 F; same data, 8 Aug 1966 (MEX 413), 2 F; same data (MEX 414), 16 F [UCLA]. Puerto Marquez (El Marques), nr. Acapulco, 30 Aug 1964, E. Fisher (MEX 141), 1 F [UCLA]. **Jalisco:** El Tuito, 500 m, 29 Aug 1972, J. Belkin, (MEX 720), 1 F [UCLA]. **Morelos:** Canyon de Lobos, 8 km E Cuernavaca, 1330 m, 30 Sept 1954 (GML), 3 F [GML]. Cuernavaca, 17 May 1945, N. Krauss, 1 F [USNM]. **Nayarit:** Tepic (ca 30 km NW), 1000 m, 7 June 1971, T. Zavortink and L. Nielsen (MEX 658), 1 lpM (658-26); same data (MEX 662), 1 lpM (662-12) [UCLA]. **Oaxaca:** Matias Romero (42 km N), 26 July 1963, E. Fisher (MF 11), 1 lpM (11-10) [UCLA]. **San Luis Potosi:** Taman (1 km S), 14 Sept 1955 (GML), 2 lpM (02319,02320) [UCLA]. **Sinaloa:** Hwy 15, 40 km NE Hwy 40, 450 m, 6 June 1971, T. Zavortink and L. Nielsen (N-14-71, same as MEX 651), 2 lpF (N-14-71-8,10) [Utah]. Hwy 15, 55 km NE Hwy 40, 970 m, 24 June 1970, K. and D. Schroeder (MEX 501), 1 lpM (501-71), 1 lpF (501-70), 1 M, 1 L [UCLA]. **Sonora:** Alamos (12 km SE), 5 June 1971, T. Zavortink and L. Nielsen (MEX 643), 1 lpM (643-16) [UCLA]. **Veracruz:** Amatlan de los Reyes, 800 m, 28 July 1965, D. Schroeder (MEX 243), 1 lpF (243-12), 1 L [UCLA]. Cordoba, 900 m, 13 July 1964, E. Fisher and D. Verity (MEX 26), 3 F; same data, 14 July 1964 (MEX 32), 1 F; same data, 16 July 1964 (MEX 37), 2 F; same data, 29 June 1964 (MEX 55), 1 F; same data, 30 July 1965, D. Schroeder (MEX 248), 1 F; same data, 7 Aug 1965, L. Ramirez (MEX 279), 1 pF (279-100); same data (MEX 280), 1 pF (280-10), 1 l; same data, 11 July 1965, C. Hogue (MEX 377), 1 F [UCLA]. Cueva del Nacemiento del Agua, Rio Atoyac (10 km NE Cordoba), 700 m, 13 July 1965, C. Hogue (MEX 381), 1 M, 3 F [UCLA]. Fortin, 950 m, 5 Oct 1954 (GML), 1 lpM (01895), 2 lpF (01894, 01897), 1 pM (01899), 1 M [UCLA]. Presidio (ca 25 km SE Cordoba), 335 m, 14 July 1965, C. Hogue (MEX 386), 1 F [UCLA].

PANAMA. **Panama:** Cerro Azul, 1957 (GML), 1 lpM (03241) [UCLA].

Additional Record From the Literature

BRITISH HONDURAS. **Cayo:** Chiquibul Road (Bertram, 1971:748).

10. Haemagogus (H.) albomaculatus Theobald

Figs. 4,25,26

1903. *Haemagogus albomaculatus* Theobald, 1903:308-310. TYPE: *Holotype* female, Cara Cara [Kara Kara] Creek, Demerara River, Demerara, British Guiana [Guyana], G.C. Low (123) [BM].

Haemagogus (Haemagogus) albomaculatus of Bonne and Bonne-Wepster (1925:435); Dyar (1928: 141); Edwards (1932:179); Lane (1939:118); Anduze (1947:353); Levi-Castillo (1951b:11, 17-18).

Haemagogus (Stegoconops) albomaculatus of Lane (1953:800); Stone, Knight and Starcke (1959: 216); Fauran (1961:30); Forattini (1965:30-32); Cova Garcia, Sutil and Rausseo (1966a: 61-62, fig. 116).

Haemagogus albomaculatus of Theobald (1903b:283; 1905:37); Aiken and Rowland (1906:

22); Aiken (1907:77; 1909:24); Howard, Dyar and Knab (1917:867, in part), Dyar (1921a: 113); Floch and Abonnenc (1947:11); Komp (1954a:50; 1954b:148-153); Foote and Cook (1959:141).
Cacomyia albomaculatus of Coquillett (1906:25).
Cacomyia albomaculata of Theobald (1907:554; 1910:494).
Haemagogus splendens in part of Howard, Dyar and Knab (1917:867).
Haemagogus cyaneus in part of Theobald (1903a:308; 1910:493).

FEMALE. Wing: 3.00 mm. Proboscis: 2.70 mm. Forefemur: 2.15 mm. Abdomen: 3.05 mm. Dark scales of proboscis, palpus, wing and legs purple to violet. **Head:** Eyes narrowly separated above antennae (1 ommatidial diameter). Decumbent scales of vertex and occiput primarily blue to greenish blue with some light green or purple reflections. Proboscis relatively long, about 1.25 of forefemur; palpus short, about 0.12 of proboscis; antenna about 0.65 of proboscis. **Thorax:** Scales of mesonotum copper, with blue reflections on lateral and posterior margins, deep blue to purple over supraalar bristles, silver in antealar area; scales on scutellar lobes deep blue to purple. *Apn* lobes moderately enlarged, scales greenish blue, often silver on anterior margin; *ppn* scales copper with some blue reflections. **Legs:** Forecoxa with small to large patch of purple scales near middle; legs moderately long, length of forefemur about 1.50 of distance from top of thorax to apex of midcoxa; forefemur and midfemur with silver scales restricted to base of ventral surface. **Wing:** R_{2+3} about 0.70-0.80 of R_2. **Abdomen:** Dark scales of tergites I-VII purple with some violet reflections, tergite VIII greenish blue; silver scales in small basal median patch on tergites VI,VII; dark scales of sternites purple.

MALE (fig. 25). Wing: 2.90 mm. Proboscis: 2.90 mm. Forefemur: 2.05 mm. Abdomen: 3.30 mm. **Head:** Proboscis about 1.40 of forefemur; palpus short, about 0.12 of proboscis; antenna about 0.60 of proboscis. **Legs:** Larger claw of foreleg with acute submedian tooth, smaller claw of foreleg and claws of midleg simple. **Abdomen:** Basal median silver scale patches on tergites VI,VII absent; lateral silver scale patches somewhat reduced.

MALE GENITALIA (fig. 25). **Segment VIII:** Tergite about 0.80 of sternite, distal margin rounded but slightly emarginate mesally, with enlarged setae laterally and about 30 long, lanceolate scales mesally. **Segment IX.** Tergite deeply declivous and weakly sclerotized mesally; lobes relatively conspicuous, with 3 or 4 setae. **Sidepiece:** Conical, length about 2.5-3.0 times median width; basal tergomesal lobe not enlarged, basally with numerous setae, the more proximal ones much elongate, flattened, attenuate; mesal half distad of basal tergomesal lobe with setae rather evenly distributed, short, longer on distal fourth; apical sternomesal scales lanceolate. **Claspette:** Stem bowed inward near middle in dorsal aspect, slightly narrowed and sharply curved dorsad near middle, expanded slightly at apex; filament striate, more or less narrowly triangular, expanded posteriorly and forming a long, narrow point anteriorly. **Clasper:** Broadest near base, spiniform about 0.40 of clasper. **Phallosome:** Aedeagus large, obovate, tip greatly produced forward, with deep cleft mesally forming an acute sclerotized projection on each side of cleft, a sclerotized carina dorsad at base of cleft; venter broadly open except on basal third, with heavy sclerotized ridges lateroventrally which are expanded basally and terminate in sclerotized lobes mesally. **Proctiger:** Cercal setae about 6; apical knob of paraproct with about 20 serrations.

PUPA (fig. 25). Abdomen: about 3.65 mm. Trumpet: 0.50 mm. Paddle: 0.80 mm. **Cephalothorax:** Weakly pigmented, slightly darker dorsally. Hairs 4,5-C subequal, single to triple, weaker than 7-C which is single. **Trumpet:** Dark brown,

lighter distally, reticulate sculpturing moderate. **Abdomen**: Moderately pigmented, genital lobe and anterior segments darker. Float hair (1-I) with about 10 primary branches and 2-5 secondary branches. Hair 1-II-VII moderately to strongly developed, dendritic, strongest on segments V,VI. Hair 2-VII moderate, considerably cephalad of hair 1-VII. Hairs 3-II,III,5-IV,V single, strongly developed, subequal. Hair 6-VII moderately well developed, double or triple. Hair 9-VII near caudolateral margin of tergite, 5-6b; 9-VIII 8-11b. **Terminal Segments**: Male genital lobe about 1.2 of tergite VIII. **Paddle**: Relatively narrow, apex acuminate, with darker pigmentation along midrib. Hair 1-P double.

LARVA (fig. 26). Head: 0.90 mm. Siphon: 0.95 mm. Anal Saddle: 0.35 mm. **Head**: Hair 5-C single or double; hair 6-C double (single or double). **Thorax**: Integument without spicules. Tubercles of hairs 5-7-P broadly joined. **Abdomen**: Hair 3-II-V well developed, single, as long as corresponding segment. Hair 12-I present. Hair 12-II well developed, subequal to hair 3-II and considerably stronger than hair 10-II. **Segment VIII**: Comb scales 8(7-10), with single sharply pointed, very minutely fringed spine, spine long, usually double length of basal, attached part of comb scale; in curved row. **Siphon**: Index about 3.0(2.8-3.1). Pecten teeth about 14-16(12-17), extending to about basal 0.50-0.55 of siphon. Hair 1-S double, inserted at basal 0.60 of siphon. **Anal Segment**: Spines on caudal margin of saddle well developed, long. Hair 4a-X triple (double or triple), long. Boss strongly sclerotized.

SYSTEMATICS. *Haemagogus albomaculatus* can be distinguished from the remaining members of the Albomaculatus Section: in the **adults** by (1) well developed lower *stp* bristle, (2) relatively long female proboscis (1.25 of forefemur), (3) dark scales of female abdomen purple except for greenish blue tergite VIII, (4) absence of knee spots on midfemur and hindfemur, (5) scales of mesonotum and *ppn* copper and (6) simple smaller claws of foreleg and midleg and larger claw of midleg of male; in the **male genitalia** by aedeagus tip deeply cleft mesally with sclerotized carina dorsally at base of cleft and acute sclerotized projections on each side of cleft; and in the **larva** by the combination of (1) integument without spicules, (2) hair 12-I present, (3) strongly sclerotized boss and (4) hair 12-II considerably stronger than hair 10-II.

The larva of *albomaculatus* has previously been unknown and the larva described and illustrated here is presumed to be that species. The association is not certain as no larval rearings were available, although 5 of the 7 larvae examined were from a collection which produced only a single male pupal rearing of *albomaculatus* in addition to the larvae.

The relationships of *albomaculatus* are not clear, as it seems not to be particularly closely allied to any of the other members of the Albomaculatus Section. It may be a rather early offshoot of the main evolutionary line considering the unique development of the aedeagus and its rather restricted distribution.

BIONOMICS. Little is known of the bionomics of *albomaculatus*. It breeds primarily in treeholes and appears to be fairly common along the coast of the Guianas. Its abundance in the more heavily forested interior is not known as relatively little collecting has been done in this area.

The status of *albomaculatus* as a disease vector is uncertain. Sneath (1939; 1940) reports yellow fever immunity among the inhabitants of the forested interior of Guiana, undoubtedly as a result of exposure to jungle yellow fever. *Albomaculatus* is probably present in these areas and may be involved in the transmission cycle, although *janthinomys* is present also, and being a proven vector of jungle yellow

fever, would be more highly suspect. There has been, to my knowledge, no research on the ability of *albomaculatus* to transmit yellow fever, though it is probably a capable vector as nearly all species of *Haemagogus* have been shown to be able to harbor and transmit the virus.

DISTRIBUTION (fig. 4). *Haemagogus albomaculatus* extends from the mouth of the Orinoco River to French Guiana. Material examined: 34 specimens; 6 males, 20 females, 1 pupa, 7 larvae, 1 individual rearing (pupal).

FRENCH GUIANA. **Guyane:** Kaw, 7 Mar 1969, J. Clastrier (FGC 3947), 1 lpM, 5 L; same data (FGC 3948), 1 L; same data (FGC 3950), 1 L [UCLA].

GUYANA. **Demerara:** Cara Cara and Demerara River, Low, 1 F (holotype) [BM]. Georgetown, H. Moore, 1 M, 1 F [USNM]. Georgetown, Hiawakilly, Demerara River, Dec 1908, H. Moore, 1 F [USNM]. **Essequibo:** Issaroro, 17 Sept 1921, G. Bodkin and G. Gevers, 3 F [BM]. Mazaruni, 23 June 1936, 6 F [GML]; same data, 25 June 1936, W. Komp, 1 M [USNM]. Pickersgill, Low, 1 F [BM]. Potaro (?Landing), May 1909, L. Cleare, 2 M, 1 F [BM]; same data, 21 Feb 1939, A. Donovan, 1 F [UCLA]. Rupununi, H. Wise, 1 F [USNM]. Tumatumari, Potaro River, Dec 1915, G. Bodkin, 1 F [BM]. Turu Camp, Barima River rt. bank, 11 Aug 1901, Low, 1 F [BM]. Warapoka Mission, 1 F [USNM].

SURINAM. **Suriname:** Paramaribo, J. Bonne-Wepster, 1 F [USNM].

VENEZUELA. **Delta Amacuro:** Jotakui Island, Orinoco Delta, 20 Dec 1952, I. Ortiz, 1 M [USNM]. **State unknown:** Guanaco River, 2 Jan 1929, F. Urich, 1 F [BM].

11. Haemagogus (H.) panarchys Dyar

Figs. 4,27,28,29

1921. *Haemagogus (Stegoconops) panarchys* Dyar, 1921a:104-105. TYPE: *Holotype* male (70) with most of abdomen mounted on slide (1466), El Salado, Guayaquil, Guayas, Ecuador, F. Campos Ribadeneira [USNM, 24331].

Haemagogus (Stegoconops) panarchys of Bonne and Bonne-Wepster (1925:430); Dyar (1928: 135); Edwards (1932:179).

Haemagogus (Longipalpifer) panarchys of Levi-Castillo (1951b:12,33-35); Stone, Knight and Starcke (1959:216); Forattini (1965:53).

Haemagogus (Cyanoconops) panarchys of Lane (1939:121; 1953:806-807); Levi-Castillo (1949: 165-171).

Haemagogus panarchys of Dyar (1925a:30); Levi-Castillo (1954:84); Komp (1955:237-239).

FEMALE (fig. 27). Wing: 2.90 mm. Proboscis: 3.05 mm. Forefemur: 2.00 mm. Abdomen: 2.95 mm. Dark scales of proboscis, palpus, wing and legs mostly blue to violet with some purple reflections. **Head:** Eyes widely separated above antennae (4 ommatidial diameters). Decumbent scales of vertex and occiput silvery blue to bluish green. Proboscis long, about 1.50 of forefemur; palpus about 0.16 of proboscis; antenna about 0.72 of proboscis. **Thorax:** Scales of mesonotum primarily bluish green, blue over supraalar bristles, silver in antealar area; scales on scutellum bluish green, blue on lobes. Well developed bristle present in antealar area immediately caudad of scutal angle. *Apn* lobes slightly enlarged, scales silver; *ppn* scales silver; lower *stp* usually with 1 very well developed bristle and 1 to 3 moderately developed bristles. **Legs:** Hindcoxa relatively small, base considerably below upper margin of meron; legs relatively short, length of forefemur about 1.25 of distance from top of thorax to apex of midcoxa; knee spots present on midfemur and hindfemur. **Wing:** R_{2+3} about 0.65-0.75 of R_2. **Abdomen:** Dark scales blue to greenish

blue, often with purple reflections; silver scales in broad basal band on tergites II-VII, often expanded laterally, but not connected to lateral silver patches.

MALE (fig. 27). Wing: 2.40 mm. Proboscis: 2.80 mm. Forefemur: 1.65 mm. Abdomen: 2.80 mm. **Head:** Proboscis relatively long, about 1.50-1.70 of forefemur; palpus long, slender, straight throughout, about 0.73-0.79 of proboscis; 5-segmented; segments 2 and 3 ankylosed and long, making up about 0.50-0.55 of palpus; segment 4 making up about 0.18-0.22 of palpus, segment 5 making up about 0.16-0.18 of palpus; segments 3-5 with several moderately to well developed bristles near apex of each segment; antenna about 0.65 of proboscis. **Legs:** Knee spots absent on midfemur and hindfemur; larger claw of foreleg and midleg with acute submedian tooth; smaller claws with acute basal tooth.

MALE GENITALIA (fig. 28). **Segment VIII:** Tergite about 0.50 of sternite, crescent shaped, distal margin convex with setae and scales, scales dense mesally, elongate, lanceolate with acuminate or truncate tips. **Segment IX:** Tergite shallowly emarginate and weakly sclerotized mesally; lobes prominent, strongly sclerotized, with 1 or 2 moderately developed setae. **Sidepiece:** Conical, length 3.0-3.5 times median width; basal tergomesal lobe slightly enlarged, with numerous setae, the more proximal ones much enlarged, flattened and attenuate; short, flattened, apically curved setae extending distad from basal tergomesal area on extreme mesal margin to near middle of sidepiece, shorter setae laterad of flattened setae, followed by bare space to lateral half of sidepiece; distal half with longer setae rather evenly distributed; a row of heavy, short setae dorsad of apical sternomesal scales extending from middle to near apex, usually in row of 3 followed by row of 4; apical sternomesal scales lanceolate to broadly lanceolate. **Claspette:** Stem bowed inward near middle in dorsal aspect; relatively stout, curving sharply dorsad in basal third, with large, dorsal setiferous tubercle near apical third, and a pilosity ventrally on apical fourth, the hairs long and thick at apex; filament striate, leaflike, arising slightly proximad of stem apex. **Clasper:** Broadest at base, spiniform long, about 0.60-0.65 of clasper. **Phallosome:** Aedeagus large, more or less pandurate, apex sharply incised with a pointed, spiculose protuberance mesally; venter broadly open except on basal third, with heavily sclerotized ridges lateroventrally which are expanded basally but not meeting at midline and terminating in two heavily sclerotized lobes basally. **Proctiger:** Cercal setae about 6; apical knob of paraproct with about 10 serrations.

PUPA (fig. 28). Abdomen: about 3.20 mm. Trumpet: 0.45 mm. Paddle: 0.65 mm. **Cephalothorax:** Very weakly pigmented, slightly darker dorsally. Hair 4-C usually single. Hairs 5,7-C moderately well developed, subequal, single. **Trumpet:** Light brown; reticulate sculpturing moderate. **Abdomen:** Weakly pigmented, slightly darker mesally at base of anterior segments. Float hair (1-I) with about 10 primary branches, secondary branches few, usually about 2-4. Hair 1-II-VII weakly to moderately developed, single or multiple. Hair 2-VII short, within own length of base of 1-VII. Hairs 3-II,III usually subequal, shorter than 5-IV,V which are usually subequal. Hair 6-VII weak, subequal to 6-III-VI. Hair 9-VII near caudolateral margin of tergite, usually double; 9-VIII usually 4-5b. **Terminal Segments:** Male genital lobe about 1.6 of tergite VIII. **Paddle:** Weakly pigmented; apex broadly rounded. Hair 1-P single, rarely double.

LARVA (fig. 29). Head: 0.80 mm. Siphon: 0.80 mm. Anal Saddle: 0.35 mm. **Head:** Hair 6-C single. **Thorax:** Integument without spicules. Tubercles of hairs 5-7-P free. **Abdomen:** Hair 12-I present. **Segment VIII:** Comb scales 10-12(8-20), with single pointed, minutely fringed spine, in irregular single row. **Siphon:** Index about 2.7(2.1-3.2). Pecten teeth about 11-14(8-15), extending to about basal 0.45

of siphon. Hair 1-S 4b, inserted at basal 0.50 of siphon. **Anal Segment:** Spines on caudal margin of saddle reduced, most very small, very few elongate. Hair 4a-X 2-4b, elongate. Boss weakly sclerotized or absent.

SYSTEMATICS. *Haemagogus panarchys* is among the most unusual members of the genus in the adult stage and one of the few species in the subgenus *Haemagogus* that can be distinguished with reasonable certainty in the pupal stage. It can be distinguished: in the **adults** by (1) eyes widely separated above antennae (4 ommatidial diameters), (2) proboscis long (1.50 of forefemur in the female and 1.50-1.70 of forefemur in the male), (3) *apn* and *ppn* scales silver, (4) abdominal tergites II-VII silver scaled dorsally at base and (5) male palpus long, about 0.75 of proboscis; in the **male genitalia** by (1) tergite VIII short, crescent-shaped, (2) claspette stem with dense pilosity distally and (3) aedeagus sharply incised at apex with pointed, spiculose mesal protuberance; in the **pupa** by (1) hairs 5,7-C well developed, subequal and (2) hair 2-VII short and within its own length of base of hair 1-VII; and in the **larva** by the combination of (1) integument without spicules, (2) hair 12-I present, (3) weakly sclerotized boss, (4) hair 1-C without serrations and (5) comb scales usually 10-12 and in an irregular single row.

Panarchys does not appear to be particularly closely related to any other species of *Haemagogus*. It may be a relict species close to the main evolutionary stem which gave rise to the subgenus *Haemagogus* as it appears to share more characters with *Conopostegus* than do any of the other species of the subgenus *Haemagogus*. Among the characters which may indicate this relationship are the long male palpus and male claws, somewhat better developed thoracic chaetotaxy and widely spaced eyes in the adults and some details of the pupal chaetotaxy.

BIONOMICS. Larvae of *panarchys* are found most often in bamboo, both cut or broken and uncut internodes, and treeholes. It has never been implicated in any disease transmission.

DISTRIBUTION (fig. 4). *Haemagogus panarchys* is known from the lowlands of Canar, Guayas and Los Rios provinces, Ecuador. Material examined: 719 specimens; 131 males, 136 females, 120 pupae, 332 larvae; 69 individual rearings (32 larval, 33 pupal, 4 incomplete).

ECUADOR. **Canar:** Cochancay (Hwy 8, km 86), 280 m, 13 Feb 1966, J. Belkin and E. Gerberg (ECU 164), 1 P [UCLA]. **Guayas:** Chongon (Hwy 3, km 18), 9 Feb 1966, J. Belkin and E. Gerberg (ECU 134), 8 L [UCLA]. Cordillera de Chongon, R. Levi-Castillo, 1 M gen [USNM]. El Salado, F. Campos R., 1 F; same data, R. Levi-Castillo, 8 M, 8 F [USNM]. Guayaquil, 14 M, 23 F [UCLA]; same data, 5 Apr 1943, 6 M, 2 l [UCLA, USNM]; same data, Apr 1955 (GML), 2 p [UCLA]; same data, Dec 1955 (GML), 12 L [UCLA]. Guayaquil, F. Campos R., 3 F, 4 M [USNM, BM]; same data, 1944, R. Levi-Castillo, 6 M, 3 M gen, 12 F, 1 p 1 l [USNM]. Guayaquil (Hwy 3, km 10), 12 Feb 1966, J. Belkin and E. Gerberg (ECU 160), 10 L; same data (ECU 161), 4 lpM (161-10,32, 34,37), 7 lpF (161-30,31,33,35,36,36A,39), 5 pM (161-100,103,104,108,112), 6 M, 4 F, 7 p, 45 L [UCLA]. Guayaquil (Hwy 3, km 12), 11 Feb 1966, Hjort and Schroeder (ECU 140), 1 lpM (140-10), 1 M, 1 p, 3 L; same data (ECU 141), 2 lpM (141-10,14), 2 lpF (141-11,13), 8 pM (141-15, 100,101,104-107,110), 3 pF (141-103,108,109), 1 lp (141-18), 1 p, 1 P, 25 L; same data (ECU 147), 3 lpM (147-10-12), 1 lpF (147-13), 1 F, 2 P, 29 L; same data (ECU 148), 1 M, 1 P, 2 L; same data (ECU 149), 2 L; same data (ECU 151), 1 pM (151-100), 1 L; same data (ECU 152), 1 lpM (152-11), 2 lpF (152-10,12), 4 L; same data (ECU 153), 1 pM (153-101) [UCLA]. Guayaquil (Hwy 3, km 14), 9 Feb 1966, J. Belkin and E. Gerberg (ECU 155), 2 lpM (135-10, 12), 1 lpF (135-13), 3 pM (135-100,100,101), 1 lP (135-14), 1 P, 40 L; same data (ECU 136), 4 lpF (136-10,20,21,30), 4 pM (136-102,104-106), 1 pF (136-101), 1 lP (136-11), 4 P, 12 L [UCLA]. Guayaquil Country Club, J. Murdock, 2 F; same data, Apr 1941, H. Hansons, 2 M [UCLA]. Hermanitos Experimental Farm (km 3, Guayaquil-Salinas Rd.), 12 M, 36 F, 2 P, 1 L [UCLA]; same data, R. Levi-Castillo, 9 M, 7 F, 30 P, 32 L [USNM, BM]. Los Ciebos, Guayaquil,

15 Feb 1966, J. Belkin (ECU 171), 24 L [UCLA]. Pascuales (Hwy 2, km 9.5), 5 Feb 1966, Hjort (ECU 105), 1 lpM (105-11), 1 lpF (105-10), 1 pF (105-102), 1 lP (105-12), 6 l; same data (ECU 106), 5 L; same data (ECU 107), 1 pF (107-102), 29 L [UCLA]. **Los Rios:** Valencia (4 km W), 6 Feb 1966, J. Belkin and E. Gerberg (ECU 114), 1 M [UCLA]. **Locality unspecified:** F. Campos R., 4 M, 4 F [USNM]; same data, R. Levi-Castillo, 2 M, 8 M gen, 2 F [UCLA, USNM]; same data, 1938, R. Levi-Castillo, 4 M, 4 F [USNM]; same data, 1946, 3 M gen [USNM]; same data, 1950, 4 l [USNM].

12. Haemagogus (H.) soperi Levi-Castillo

Figs. 5,30,31

1955. *Haemagogus (Longipalpifer) soperi* Levi-Castillo, 1955b:480-484, 2 plates. TYPE: *Holotype* male with associated larval and pupal skins, Juan Montalvo, Los Rios, Ecuador [USNM].

Haemagogus (Longipalpifer) soperi in part of Stone, Knight and Starcke (1959:216); Forattini (1965:53).

Haemagogus spegazzinii falco in part of Levi-Castillo (1952:76-81).

FEMALE. Wing: 2.90 mm. Proboscis: 2.85 mm. Forefemur: 2.05 mm. Abdomen: 2.80 mm. Dark scales of proboscis, palpus, wing and legs purple and violet. **Head:** Eyes narrowly separated above antennae (1 or 2 ommatidial diameters). Decumbent scales of vertex and occiput bluish green to light green. Proboscis relatively long, about 1.30-1.40 of forefemur; palpus about 0.16 of proboscis; antenna about 0.65-0.70 of proboscis. **Thorax:** Scales of mesonotum copper to dark green, often dark bluish green to blue in fossa, light bluish green posteriorly, greenish blue over supraalar bristles, silver in antealar area; scales on scutellum bluish green to greenish blue. *Apn* lobes considerably enlarged, scales blue to violet; *ppn* scales usually green to bluish green, occasionally copper, often a few silver scales ventrally. **Legs:** Moderately long, forefemur length about 1.50-1.60 of distance from top of thorax to apex of midcoxa; conspicuous silvery white knee spots anteriorly on mid and hindfemur. **Wing:** R_{2+3} about 0.70-0.95 of R_2. **Abdomen:** Dark scales of tergites purple to violet; silver scales dorsally on tergites VI and VII forming basal band, silver scales occasionally forming a small patch dorsally on IV and V.

MALE (fig. 30). Wing: 2.55 mm. Proboscis: 2.90 mm. Forefemur: 1.95 mm. Abdomen: 2.75 mm. **Head:** Proboscis about 1.45-1.55 of forefemur; palpus long, slender, straight, about 0.65-0.70 of proboscis, 5-segmented, segments 2 and 3 ankylosed and long, making up about 0.60-0.65 of palpus, segment 4 making up about 0.15-0.18 of palpus, segment 5 making up about 0.12-0.14 of palpus; segments 3-5 with several moderately to well developed bristles near apex of each segment; antenna about 0.62 of proboscis. **Legs:** Larger claw of foreleg and smaller claw of foreleg and midleg with acute subbasal tooth; larger claw of midleg simple.

MALE GENITALIA (fig. 30). **Segment VIII:** Tergite about 0.75 of sternite, distal margin declivous mesally, with enlarged setae laterally and about 20-30 lanceolate scales mesally. **Segment IX:** Tergite deeply emarginate and weakly sclerotized mesally; lobes with 1 or 2 setae. **Sidepiece:** Conical, length about 3 times median width; basal tergomesal lobe slightly enlarged, with numerous setae, the more proximal elongate, flattened and attenuate; mesal half of sidepiece between basal sternomesal area and distal fourth with moderately developed setae laterally

and bare space mesally; distal fourth with well developed setae; apical sternomesal scales lanceolate to oblanceolate with acuminate tips. **Claspette:** Stem bowed inward near middle in dorsal aspect; narrowed at base and slightly expanded to apex, angled dorsad near middle; filament striate, broadly sickle-shaped, broader near basal third, with tip often slightly recurved. **Clasper:** Broadest at base; spiniform, about 0.45 of clasper. **Phallosome:** Aedeagus large, broadly obovate, with a median dorsal carina, tip produced forward, broad, strongly sclerotized, terminating in a strongly recurved beak; venter broadly open except on basal third, with heavily sclerotized ridges lateroventrally which are expanded basally and joined at base. **Proctiger:** Cercal setae about 6; apical knob of paraproct with about 15 serrations.

PUPA (fig. 30). Abdomen: about 2.90 mm. Trumpet: 0.40 mm. Paddle: 0.70 mm. **Cephalothorax:** Weakly pigmented, slightly darker dorsally. Hairs 4,5-C weakly developed, single or double. Hair 7-C moderately developed, single. **Trumpet:** Medium brown, lighter apically; reticulate sculpturing moderate. **Abdomen:** Weakly pigmented, darker mesally at base of anterior segments. Float hair (1-I) with 10-12 primary branches and about 4-8 secondary branches. Hair 1-II-VII weakly developed, usually single. Hair 2-VII short, within own length of base of 1-VII. Hair 3-II,III usually subequal, shorter than 5-IV,V which are usually subequal. Hair 6-VII weak, single or double, subequal to 6-III-VI. Hair 9-VII near caudolateral margin of tergite, single or double; 9-VIII 4-7b. **Terminal Segments:** Male genital lobe about 1.4 of tergite VIII. **Paddle:** Weakly pigmented; apex broadly rounded to slightly acuminate. Hair 1-P single.

LARVA (fig. 31). Head: 0.80 mm. Siphon: 0.88 mm. Anal Saddle: 0.35 mm. **Head:** Hair 1-C conspicuously serrate laterally near apex. Hair 5-C single. Hair 6-C double. **Thorax:** Integument without spicules. Tubercles of hairs 5-7-P weakly sclerotized and not connected. **Abdomen:** Hair 12-I present. **Segment VIII:** Comb scales 8-10(5-12), with single broadly rounded to spatulate, minutely fringed spine, in single row. **Siphon:** Index about 2.8(2.6-3.3). Pecten teeth about 11-14(8-17) extending to about basal 0.55 of siphon. Hair 1-S double (double or triple), inserted at basal 0.60 of siphon. **Anal Segment:** Spines on caudal margin of saddle moderately well developed. Hair 4a-X double or triple, long, about 0.67-0.75 of hair 4b-X. Boss weakly sclerotized or absent.

SYSTEMATICS. *Haemagogus soperi* can be distinguished: in the **adults** from all *Haemagogus* except *acutisentis* by the combination of (1) male palpus long (0.65 of proboscis), (2) knee spots of silver scales at apex of midfemur and hindfemur, (3) proboscis long, 1.30-1.40 of forefemur in female and 1.45-1.55 of forefemur in male, (4) R_{2+3} short, 0.70-0.95 of R_2 and (5) dorsal silver scales at base of only abdominal tergites VI and VII; in the **male genitalia** by the combination of (1) tergite VIII with deep declivity mesally on distal margin, (2) apical process of aedeagus relatively broad and truncated and (3) bare space mesally on sidepiece distad of basal sternomesal area; and in the **larva** by the combination of (1) integument without spicules, (2) hair 12-I present, (3) hair 1-C serrate laterally and (4) comb scales broadly rounded or spatulate but never pointed.

Soperi is closely related to *acutisentis* with which it forms the *soperi* complex. The 2 species can be separated by the distribution of setae on the sidepiece of the male genitalia and the shape of the comb scales in the larva, and with a fair degree of certainty in the pupa by hair 3-II,III of *soperi* being subequal and shorter than hair 5-IV,V which are subequal. The 2 species are sympatric over the greater part of their ranges and often found together in the same locality.

The *soperi* complex is allied to *equinus,* the adults and immatures differing only

in relatively minor details, the male genitalia diverging more. The *soperi* complex may have been isolated from *equinus* by the rise of the Andes, and is now only a remnant of a once more extensive population.

BIONOMICS. *Haemagogus soperi* is most often found in broken or cut bamboo internodes but has also been taken from leaf axils. It apparently attacks man readily. I have examined several collections containing both *soperi* and the closely related *acutisentis,* all taken from bamboo, and with water from several internodes combined. It is probable that the 2 species occur in different internodes separated by physical or temporal factors as 2 such closely related species in the same container would undoubtedly compete with each other.

Levi-Castillo (1952; 1955) reports *soperi* as a vector of sylvan yellow fever on the coast of Ecuador but this report has not been confirmed.

DISTRIBUTION (fig. 5). *Haemagogus soperi* is known from the Pacific coastal lowlands of Ecuador. Material examined: 463 specimens; 69 males, 137 females, 165 pupae, 92 larvae; 79 individual rearings (17 larval, 61 pupal, 1 incomplete).

ECUADOR. **Bolivar**: Echeandia, R. Levi-Castillo, 1 M gen [USNM]. **Canar**: Cochancay (Hwy 8, km 86), 280 m, 13 Feb 1966, J. Belkin and E. Gerberg (ECU 167), 30 F [UCLA]. **Guayas**: Empalme (3 km S), 6 Feb 1966, J. Belkin et al. (ECU 120), 13 F [UCLA]. **Los Rios**: Juan Montalvo, R. Levi-Castillo, 2 M gen, 2 p, 3 l [USNM]; same data, 8 Feb 1966, J. Belkin and E. Gerberg (ECU 121), 1 lpM (121-13), 13 lpF (121-10-12,14-19,40-43), 18 pM (121-61,64,66-69,75,78,80,81,83,85,101,102,109,111,112,114), 18 pF (121-60,62,63,65,71-74,76,77,82,100, 105-108,110,113), 29 M, 29 F, 45 p, 20 P, 2 l, 42 L [UCLA]; same data (ECU 124), 3 M, 1 F [UCLA]. Juan Montalvo, Hacienda Mora, 8 Feb 1966, J. Belkin and E. Gerberg (ECU 125, 125A), 1 lpM (125-17), 2 lpF (125-10,18), 4 pM (125-102,105,108,109), 5 pF (125-103,107, 113;125A-103,105), 1 lP (125-16), 4 M, 9 F, 16 P, 28 L; same data (ECU 126), 5 F [UCLA]. Pichilingue, 6 Feb 1966, J. Belkin et al. (ECU 118), 1 pM (118-100), 1 pF (118-103), 1 M, 1 F, 3 p [UCLA]. Valencia (4 km W), 6 Feb 1966, J. Belkin et al. (ECU 114), 4 pM (114-77, 78,95,101), 8 pF (114-71,75,92,94,97,109,112,114) [UCLA]. **Manabi**: Bolivar (?Calceta), R. Levi-Castillo, 1 M gen [UCLA].

13. Haemagogus (H.) acutisentis Arnell, n. sp.

Figs. 5,32,33

TYPES: *Holotype* male with associated larval and pupal skins and genitalia slide (ECU 112-12), 1 km E of Valencia, Los Rios, Ecuador, elev. ca 100 m, larva from fallen cacao pod, 6 Feb 1966, J.N. Belkin et al. [USNM]. *Allotype* female with associated larval and pupal skins (ECU 112-13), same data as holotype [USNM]. *Paratypes:* 1 pF (ECU 112-103), 5 M, 4 F, 7 P (ECU 112), same data as holotype; 1 pM (ECU 114-105), 2 L (ECU 114), same data as holotype except 4 km W of Valencia, larvae and pupa taken from cut bamboo internode [UCLA, BM].

Haemagogus (Longipalpifer) soperi in part of Levi-Castillo (1955:480-484); Stone, Knight and Starcke (1959:216); Forattini (1965:53).

FEMALE. Wing: 2.90 mm. Proboscis: 2.75 mm. Forefemur: 2.20 mm. Abdomen: 3.00 mm. Apparently indistinguishable from *soperi.*

MALE (fig. 32). Wing: 2.60 mm. Proboscis: 2.85 mm. Forefemur: 1.95 mm. Abdomen: 2.80 mm. Apparently indistinguishable from *soperi.*

MALE GENITALIA (fig. 32). **Segment VIII:** Tergite about 0.70-0.75 of sternite, distal margin declivous mesally, with enlarged setae laterally and about 20-25 lanceolate scales mesally. **Segment IX:** Tergite deeply emarginate and weakly sclerotized mesally; lobes with 1 or 2 setae. **Sidepiece:** Conical, length about 3 times median width; basal tergomesal lobe slightly enlarged, with numerous setae, the

more proximal elongate, flattened and attenuate; mesal half of sidepiece between basal sternomesal area and distal fourth with uniformly distributed, relatively short setae; distal fourth with well developed setae; apical sternomesal scales lanceolate to oblanceolate with acuminate tips. **Claspette:** Stem bowed inward near middle in dorsal aspect, angled dorsad near middle; filament striate, broadly sickle shaped, with tip often recurved. **Clasper:** Broadest at base; spiniform about 0.45 of clasper. **Phallosome:** Aedeagus large, broadly obovate, with a median dorsal carina, tip produced forward, broad, strongly sclerotized, terminating in a strongly recurved beak; venter broadly open except on basal third, with heavily sclerotized ridges lateroventrally which are expanded basally and joined at base. **Proctiger:** Cercal setae about 5 or 6; apical knob of paraproct with about 15 serrations.

PUPA (fig. 32). Abdomen: about 3.25 mm. Trumpet: 0.45 mm. Paddle: 0.80 mm. **Cephalothorax:** Weakly pigmented, slightly darker dorsally. Hairs 4,5-C weakly developed, single or double, weaker than 7-C which is single. **Trumpet:** Medium brown, lighter distally; reticulate sculpturing moderate. **Abdomen:** Weakly pigmented, genital lobe and anterior segments darker. Float hair (1-I) with 8-12 primary branches and usually 2-6 secondary branches. Hair 1-II-VII moderately developed, branched or dendritic. Hair 2-VII short, usually considerably cephalad of 1-VII. Hairs 3-II,III,5-IV,V subequal or with 3-III slightly weaker. Hair 6-VII single or double, subequal to 6-III-VI which are moderately well developed. Hair 9-VII slightly cephalad of caudolateral margin of tergite, single or double; 9-VIII 4-6b. **Terminal Segments:** Male genital lobe about 1.3 of tergite VIII. **Paddle:** Weakly pigmented; relatively narrow, apex acuminate. Hair 1-P single.

LARVA (fig. 33). Head: 0.80 mm. Siphon: 0.85 mm. Anal Saddle: 0.35 mm. **Head:** Hair 1-C conspicuously serrate laterally near apex. Hair 5-C single. Hair 6-C double. **Thorax:** Integument without spicules. Tubercles of hair 5-7-P weakly to moderately sclerotized, not connected. **Abdomen:** Hair 12-1 present. **Segment VIII:** Comb scales 9-13, with single short, sharply pointed, minutely fringed spine, in single row. **Siphon:** Index about 2.9(2.5-3.6). Pecten teeth about 12-20, extending to about basal 0.50 of siphon. Hair 1-S double (double or triple), inserted at basal 0.55 of siphon. **Anal Segment:** Spines on caudal margin of saddle moderately well developed. Hair 4a-X 3-4b, long, about 0.67 length of hair 4b-X. Boss weakly sclerotized or absent.

SYSTEMATICS. *Haemagogus acutisentis* is apparently indistinguishable from *soperi* as **adults.** It can be distinguished from *soperi* and the remainder of the Albomaculatus Section: in the **male genitalia** by the combination of (1) tergite VIII with deep declivity mesally on distal margin, (2) apical process of aedeagus relatively broad and truncated and (3) mesal half of sidepiece distad of basal tergomesal area with setae short and evenly distributed, never with a bare space; and in the **larva** by the combination of (1) integument without spicules, (2) hair 12-I present, (3) hair 1-C serrate laterally and (4) comb scales sharply pointed.

Closely allied to *soperi, acutisentis* can be separated from it by the distribution of setae on the sidepiece of the male genitalia, the sharply pointed comb scales, and in the pupa with a fair degree of certainty by hairs 3-II,III,5-IV,V being subequal or with 3-III slightly weaker. The relationships of *acutisentis* are discussed above under *soperi.*

BIONOMICS. Larvae of *acutisentis* have been taken from cut bamboo, fallen cacao pods and treeholes. Further discussion of the bionomics of this species is presented above under *soperi.*

DISTRIBUTION (fig. 5). *Haemagogus acutisentis* is known from the Guayas

River basin and El Oro province of Ecuador. Material examined: 64 specimens; 12 males, 12 females, 22 pupae, 18 larvae; 11 individual rearings (5 larval, 6 pupal).

ECUADOR. **El Oro:** El Guabo, R. Levi-Castillo, 1 M gen [USNM]. **Guayas:** Guayaquil (Hwy 3, km 12), 11 Feb 1966, Hjort and Schroeder (ECU 141), 1 pF (141-102), 1 F, 1 P, 1 L; same data (ECU 147), 1 L [UCLA]. Guayaquil (Hwy 3, km 14), 11 Feb 1966, Hjort and Schroeder (ECU 135), 1 lpF (135-11) [UCLA]. Guayaquil Country Club, J. Murdock, 1 M [UCLA]. Pascuales (Hwy 2, km 9.5), 5 Feb 1966, Hjort (ECU 105), 1 pM (105-101) [UCLA]. **Los Rios:** Juan Montalvo, 8 Feb 1966, J. Belkin and E. Gerberg (ECU 122), 1 pF (122-100) [UCLA]. Juan Montalvo (Hacienda Mora), 8 Feb 1966, J. Belkin and E. Gerberg (ECU 125), 2 lpF (125-13,15), 12 L [UCLA]. Valencia (1 km E), type series, see above. Valencia (4 km W), type series, see above. **Manabi:** Guale, R. Levi-Castillo, 1 M gen [USNM].

14. Haemagogus (H.) equinus Theobald

Figs. 5,34,35

1903. *Haemagogus equinus* Theobald, 1903b:282-283. TYPE: *Holotype* female, lower end of Old Pound Road, Kingston, St. Andrew, Jamaica, taken feeding on a horse, 24 Aug, M. Grabham [BM].

1906. *Aedes philosophicus* Dyar and Knab, 1906a:195. TYPE: *Lectotype* larval skin (295b), with associated male and genitalia slide (330), Tehuantepec, Oaxaca, Mexico, 1 July 1905, F. Knab [USNM; selection of Dyar, 1921:103; see Stone and Knight, 1955: 288-289]. Synonymized with *equinus* by Howard, Dyar and Knab (1917:874-875).

1906. *Aedes affirmatus* Dyar and Knab, 1906b:164. TYPE: *Lectotype* female, Salina Cruz, Oaxaca, Mexico, 15 July 1905, F. Knab [USNM 10023; selection of Dyar, 1921:103; see Stone and Knight, 1955:287]. Synonymized with *equinus* by Howard, Dyar and Knab (1917:817,875).

Haemagogus (Stegoconops) equinus of Dyar (1921a:102; 1923:183, in part; 1928:134, in part); Bonne and Bonne-Wepster (1925:430); Edwards (1932:179, in part); Martini (1935:57); Anduze (1941b:13; 1947:353).

Haemagogus (Longipalpifer) equinus of Levi-Castillo (1951b:12,31-33); Stone, Knight and Starcke (1959:215-216, in part); Fauran (1961:30); Forattini (1965:48-53); Cova Garcia, Sutil and Rausseo (1966a:61-62, fig. 114; 1966b:114, fig. 202); Porter (1967:38); Belkin, Heinemann and Page (1970:187-190); Bertram (1971:745,756); Diaz Najera (1971:82-90).

Haemagogus (Cyanoconops) equinus of Lane (1939:121, in part; 1953:802-806); Diaz Najera (1963:191; 1966:61).

Haemagogus equinus of Theobald and Grabham (1905:37); Theobald (1905:37); Howard, Dyar and Knab (1917:870-871, in part); Johnson (1919:424); Dyar (1925:138-139, in part); Gowdey (1926:74); Shannon and Del Ponte (1928:68); Kumm and Zuniga (1942:404); Boshell-Manrique and Osorno-Mesa (1944:173); Osorno-Mesa (1944a:39); Hill and Hill (1945: 2; 1948:49); Waddell (1945:329; 1949:568); Hill and Taylor (1945:226; 1947:472); Anderson and Osorno-Mesa (1946:613); Hovanitz (1946:35); Kumm, Osorno-Mesa and Boshell-Manrique (1946:19-20); Thompson (1947:79); Woke (1947:365); Arnett (1949:240; 1950:114); Galindo, Carpenter and Trapido (1949:278; 1951a:116-117; 1955:158); Galindo, Trapido and Carpenter (1950:546); Levi-Castillo (1951a:14; 1954:83); Carpenter, Galindo and Trapido (1952:162); Vargas and Martinez Palacios (1953:38); Komp (1954a:51-53; 1955f:163); Barreto Reyes (1955:79); Galindo and Trapido (1955:548; 1957:147); Horsfall (1955:535); Trapido (1955: 629); Trapido and Galindo (1955:669; 1956a:304; 1956b:634; 1957:122); Trapido, Galindo and Carpenter (1955:528); Galindo, de Rodaniche and Trapido (1956:1022); Galindo, Trapido, Carpenter and Blanton (1956:544); Eads and Strom (1957:86); de Rodaniche and Galindo (1957:235); de Rodaniche, Galindo and Johnson (1957:682); Boshell-Manrique and Bevier (1958:27); Breland (1958:217); Foote and Cook (1959:141); Vargas and Diaz Najera (1959:

362); Diaz Najera (1960:185); Kerr, Roca-Garcia and Bugher (1960:26); Groot, Morales and Vidales (1961:399).
Stegoconops equinus of Howard, Dyar and Knab (1913:fig. 162).
Cacomyia equinus of Coquillett (1906:25).
Cacomyia equina of Theobald (1907:554-556; 1910:494).
Haemagogus affirmatus of Busck (1908:64); Aiken (1909:3,4,24).
Haemagogus albomaculatus in part of Howard, Dyar and Knab (1917:870).
Haemagogus regalis in part of Dyar and Knab (1906b:167); Theobald (1910:493-494).
Haemagogus cyaneus of Aiken and Rowland (1906:121); Aiken (1907:77); Aiken (1909:24).

FEMALE. Wing: 3.20 mm. Proboscis: 2.90 mm. Forefemur: 2.30 mm. Abdomen: 3.55 mm. Dark scales of proboscis, palpus, wing and legs dark blue to violet with some purple reflections. **Head:** Eyes narrowly separated above antennae (2 ommatidial diameters). Decumbent scales of vertex and occiput blue to light green. Proboscis relatively long, about 1.25-1.40 of forefemur; palpus about 0.17 of proboscis; antenna 0.61-0.72 of proboscis. **Thorax:** Scales of mesonotum dark green to dark bluish green, blue over supraalar bristles, silver in antealar area; scales on scutellum dark green to blue. *Apn* lobes moderately enlarged, scales dark blue, often with silver scales laterally and anteriorly; *ppn* scales dark blue to bluish green with silver scales ventrally; lower *stp* with single well developed bristle and 1 to 3 smaller bristles. **Legs:** Moderately long, forefemur length about 1.38-1.48 of distance from top of thorax to apex of midcoxa; knee spots present on midfemur and hindfemur. **Wing:** R_{2+3} about 1.05-1.25 of R_2. **Abdomen:** Dark scales blue to purple; silver scales in basal bands on tergites IV-VII, usually continuous with lateral silver patches on VI and VII.

MALE (fig. 34). Wing: 2.65 mm. Proboscis: 2.90 mm. Forefemur: 2.00 mm. Abdomen: 3.40 mm. **Head:** Proboscis about 1.35-1.50 of forefemur; palpus long, slender, straight throughout, about 0.58-0.70 of proboscis; 5-segmented, segments 2 and 3 ankylosed and long, making up about 0.58-0.65 of palpus, segment 4 making up about 0.15-0.18 of palpus, segment 5 making up about 0.12-0.14 of palpus; segments 3-5 with 1 to several stout bristles arising near apex of each segment; antenna about 0.55-0.63 of proboscis. **Legs:** Larger claw of foreleg and smaller claw of foreleg and midleg with acute subbasal tooth, larger claw of midleg simple.

MALE GENITALIA (fig. 34). **Segment VIII:** Tergite about 0.55 of sternite, distal margin broadly emarginate, with enlarged setae laterally and dense cluster of 30-40 lanceolate to obovate scales mesally. **Segment IX:** Tergite declivous and moderately sclerotized mesally; lobes with 1 to 3 setae. **Sidepiece:** Conical, length 3.5-4.0 times median width; basal tergomesal lobe not enlarged, with numerous setae, the more proximal ones much enlarged and flattened; mesal half distad of basal tergomesal area with setae rather evenly distributed, short, longer on distal fourth; apical sternomesal scales lanceolate to oblanceolate. **Claspette:** Stem narrowest at base, slightly curved dorsad on basal third, distal half with membrane projecting anteriorly and posteriorly and enclosing basal portion of filament; filament with basal supporting ribs, a long, narrow, slightly convoluted flap dorsad of stem, slightly expanded at apex with a recurved tip; a broad, flattened flap ventrad of stem, the margin of which may be rounded, angled, or with variously developed pointed process. **Clasper:** Broadest near middle, spiniform about 0.40-0.45 of clasper. **Phallosome:** Aedeagus large, broadly obovate, tip produced distally into a strongly sclerotized dorsal carina proximad to a small beak; venter open except

on basal fourth, with heavily sclerotized ridges lateroventrally which are expanded basally but not meeting at midline. **Proctiger:** Cercal setae 2-7; apical knob of paraproct with about 15 serrations.

PUPA (fig. 34). Abdomen: about 3.30 mm. Trumpet: 0.45 mm. Paddle: 0.70 mm. **Cephalothorax:** Usually rather weakly pigmented, darker dorsally. Hairs 4,5-C moderately developed, usually subequal, single to triple, and often subequal to 7-C, which is usually single. **Trumpet:** Medium brown, reticulate sculpturing moderate. **Abdomen:** Weakly to moderately pigmented, genital lobes and anterior segments darker. Float hair (1-I) with about 8-12 primary branches and 2-6 secondary branches. 1-II-VII weakly to moderately developed, single, branched or dendritic. Hair 2-VII variable in position, usually considerably cephalad of, but occasionally close to 1-VII. Hairs 3-II,III,5-IV,V subequal or with 3-III weaker. Hair 6-VII usually weak, subequal to 6-III-VI, but occasionally considerably stronger than 6-III-VI. Hair 9-VII near or somewhat cephalad of caudolateral margin of tergite, single to triple; 6-VIII 3-6b. **Terminal Segments:** Male genital lobe about 1.3 of tergite VIII. **Paddle:** Weakly pigmented, usually relatively narrow with acuminate apex, occasionally rather broad with broadly rounded apex. Hair 1-P single.

LARVA (fig. 35). Head: 0.75 mm. Siphon: 0.65 mm. Anal Saddle: 0.30 mm. **Head:** Hairs 5,6-C single (single or double). **Thorax:** Integument without spicules. Tubercles of hairs 5-7-P connected in hairy forms, free in non-hairy forms. **Abdomen:** Hair 12-I present. **Segment VIII:** Comb scales 7-10(5-13), with single sharply pointed, minutely fringed spine, in single row. **Siphon:** Index 2.5-3.0(2.1-3.3). Pecten teeth 11-16(8-22), extending to about basal 0.45 of siphon. Hair 1-S double (1-4b), inserted at basal 0.50 of siphon. **Anal Segment:** Spines on caudal margin of saddle well developed. Hair 4a-X 3-5b, long. Boss weakly sclerotized or absent.

SYSTEMATICS. *Haemagogus equinus* can be distinguished from all remaining members of the Albomaculatus Section: in the **adults** by the combination of (1) long male palpus (about 0.65 of proboscis), (2) conspicuous knee spots on apex of midfemur and hindfemur, (3) R_{2+3} about 1.05-1.25 of R_2, (4) silver scales dorsally on abdominal tergites IV-VII and (5) *apn* and posterior *ppn* usually with silver scales; in the **male genitalia** by claspette stem with distal membrane which projects dorsally and ventrally and encloses basal portion of filament, and filament with conspicuous basal supporting ribs; and in the **larva** by the combination of (1) integument without spicules, (2) hair 12-I present, (3) weakly sclerotized boss, (4) hair 1-C without serrations and (5) comb scales usually 7-10 in single, regular row.

There is variation in *equinus* in the shape of the ventral portion of the claspette filament of the male genitalia and in the number of silver scales on the *apn* and *ppn* of the adults. Hairy forms of the larvae and pupae are common in this species throughout its range. Correlated with the increase in length and branching of the hairs in the hairy forms is an increase in sclerotization of the tubercles of some of the thoracic and abdominal hairs and the boss of the ventral brush. Hairy, nonhairy and intermediate forms are occasionally found together in the same collection.

Equinus, and the closely allied *soperi* and *acutisentis* constitute one of the dominant elements of the *Haemagogus* fauna in terms of range, plasticity of habitat and number of individuals. This dominance may indicate *equinus* to be one of the more modern *Haemagogus* species, however the complex distribution pattern and complex geological history of the area now occupied by this species may indicate considerable age.

A relatively recent land connection between Central America and the Greater

Antilles, at least the island of Jamaica, is suggested by the distribution pattern of *equinus*. A land connection in this area during middle Tertiary, called Caribbean Land, has been proposed by paleogeologists (Maldonado-Koerdell, 1964:15-18). A similar distribution pattern is shown by several other culicine species (Belkin, Heinemann and Page, 1970:9; Belkin and Hogue, 1959:430). A long-lasting disjunction between mainland and insular populations of *equinus* would likely result in a morphological diversity between these populations which does not exist at present. The center of dispersal of *equinus* may be Central America, as this species appears to be much more abundant in this area than elsewhere in its range. Dispersal northward into Mexico, east to Jamaica and southeast into northern South America, was accomplished as land connections were made to these areas. An alternate explanation that *equinus* originated on the South American continent and spread northward into Central America during middle Tertiary may be indicated by the apparent relationship between *equinus* and the *soperi* complex of coastal Ecuador. Such a dispersal would depend on the existence of a land connection between South and Central America at a time prior to a land connection between Central America and Jamaica.

BIONOMICS. *Haemagogus equinus,* beside being one of the most abundant and widespread species of *Haemagogus,* is probably the most adaptable in terms of habitat utilization. In Central America it is common in the Atlantic rain forest, is one of the most numerous species in the tropical deciduous forest of the Pacific versant of Nicaragua and is found in considerable numbers in the deciduous forest north along the Pacific to Sinaloa in Mexico. It is found in the thorn forest of the Atlantic coast of northern Mexico and in coastal mangrove in many areas of Central America although it is not common where the typical mangrove breeding species of *Haemagogus* of the Splendens Section, *boshelli, chalcospilans, regalis* and *aeritinctus* are present. It apparently reaches its maximum density in the deciduous forest of Central America. *Equinus* commonly utilizes treeholes and cut and broken bamboo as breeding sites and it is often found in peridomestic situations. It has been taken at elevations of up to 1400 meters but is not common above 750 meters. In the rain forest, *equinus* is decidedly arboreal, being taken biting above ground level or in the forest canopy about 60 percent of the time. Most eggs hatch when first flooded, and since the length of larval developmental time is relatively short, populations of *equinus* reach a peak shortly after the beginning of the rainy season, in contrast to other species of *Haemagogus* whose populations build slowly after the onset of seasonal rains. The more important papers on the biology of *equinus* are those of Galindo, Carpenter and Trapido (1951a), Trapido and Galindo (1956), Galindo and Trapido (1957) and Hovanitz (1946).

Equinus is a proven laboratory vector of yellow fever (Waddell and Taylor, 1945, 1947; Waddell, 1949; Galindo, de Rodaniche and Trapido, 1956) and infected females have been found in nature (de Rodaniche and Galindo, 1957; de Rodaniche, Galindo and Johnson, 1957). Because of its arboreal habits and abundance in areas of yellow fever epizootics in Central America, *equinus* is a primary suspect as a yellow fever vector, especially where *janthinomys* is less abundant or absent, as in Honduras and Guatemala (Trapido and Galindo, 1955; Boshell-Manrique and Bevier, 1958).

DISTRIBUTION (fig. 5). *Haemagogus equinus* extends from extreme southern Texas and southern Sinaloa through southern Mexico, Central America, the Caribbean and Orinoco drainages of Colombia and Venezuela to Guyana and is also found on the islands of Jamaica and Tobago and probably Trinidad. The records

in Stone, Knight and Starcke (1959:215) of *equinus* from Brazil and Bolivia are based on misidentified *janthinomys* females. Material examined: 3924 specimens; 867 males, 862 females, 1079 pupae, 1116 larvae; 224 individual rearings (133 larval, 58 pupal, 33 incomplete).

BRITISH HONDURAS. **Cayo:** Central Farm, 70 m, 17 Aug 1967, D. Bertram (BH 479), 1 F [UCLA]. Chiquibul Road, mile 9 from Georgeville, 300 m, 26 June 1967, D. Bertram (BH A235), 1 F; same data, 10 July 1967 (BH A270), 1 F; same data, 11 July 1967 (BH A271), 1 F; same data, 7 Aug 1967 (BH A456), 1 F [UCLA]. Chiquibul Road, mile 8 from Georgeville, 1 July 1965, R. Disney, 1 M gen [UCLA]. Mountain Pine Ridge, nr. Augustine, 550 m, 10 Aug 1967, P. Williams (BH 490), 3 F [UCLA].

COLOMBIA. **Antioquia:** Turbo, H. Kumm, 1 M, 4 M gen [USNM]. **Bolivar:** ?La Guinea, 1 M gen [USNM]. **Cundinamarca:** Caparrapi, Volcanes Forest, 1000-1500 m, 1943, H. Kumm, 1 lp, 1 M [USNM]. Fusagasuga, 1746 m, 1943, H. Kumm, 1 l [USNM]. Malta, 280 m, 25 Nov 1941, E. Osorno-Mesa, 1 L; same data, 14 Apr 1942, H. Kumm and E. Osorno-Mesa, 1 M gen, 3 l [USNM]. Utica, H. Kumm, 1 M [USNM]. **Meta:** Villavicencio, 470 m, 5 M, 1 M gen [USNM].

COSTA RICA. **Alajuela:** Esparta (11.8 km E), 500 m, 19 June 1963, C. Hogue (CR 97), 1 F [UCLA]. Higuito, nr. San Mateo, 200 m, P. Schild, 3 F [USNM]. **Cartago:** Turrialba, 610 m, June 1924, P. Buxton, 1 F [BM]. **Guanacaste:** El Coco, 19 July 1962, F. Truxal, 1 M, 7 F [LACM]. Las Canas, H. Kumm, 1 F [UCLA]. Liberia (Finca Coyolar), 1 Aug 1964, C. Hogue, 1 F [UCLA]. (?Hacienda) Miravalles, 20 July 1922, A. Alfaro, 1 F [USNM]. Samara, 5 m, 23 Aug 1964, C. Hogue and Miranda (CR 196), 1 L [UCLA]. **Limon:** La Bomba, nr. Limon, 3 Oct 1971, D. Schroeder (CR 470), 1 lpM (470-10) [UCLA]. **Puntarenas:** Boca del Rio Barranca, 10 m, 20 June 1963, C. Hogue (CR 103), 1 F [USNM]. Esparta (3 km E), 250 m, 13 Aug 1971, D. Schroeder (CR 357), 2 lpF (357-10,11), 2 pM (357-100,101), 5 pF (357-102-106); same data (CR 358), 1 pM (358-101) [UCLA]. Macacona, nr. Esparta, 1 June 1943, T. Aitken, 1 F [UCLA]. **San Jose:** San Isidro del General, 21 Nov 1962, C. Hogue and W. Powder (CR 35), 1 P, 1 l, 1 L [UCLA].

EL SALVADOR. **Liberdad:** La Liberdad, 15 June 1953 (GML), 1 lpM (01417), 1 pM (01423), 1 pF (01429) [UCLA]. Zaragoza, H. Kumm, 3 F [UCLA]. **San Miguel:** San Miguel, 2 M [USNM]; same data, H. Kumm, 2 M [UCLA]. **San Salvador:** Los Planes, H. Kumm, 2 M, 11 F [UCLA, USNM]. Parque Balboa, 980 m, 5 Nov 1971, J. Belkin (SAL 49), 1 pF (49-101) [UCLA]. San Salvador, H. Kumm, 3 M, 2 F [UCLA]. **Sonsonate:** Izalco, F. Knab, 1 F [USNM]. Izalco, Parque Atecozol, 430 m, 6 Nov 1971, J. Belkin (SAL 53), 2 lpF (53-60,61), 1 P, 1 l, 1 L [UCLA]. Nahuilingo, H. Kumm, 1 M [UCLA]. San Antonio del Monte, 4 Aug 1964, A. Quinonez (SAL 8), 1 L; same data (SAL 10), 2 lpF (10-13,17), 2 pM (10-100,102), 2 pF (10-107,108), 1 p, 3 P, 30 L [UCLA]. Sonsonate, F. Knab, 1 M, 4 F [USNM]; same data, 2 Aug 1964, A. Quinonez (SAL 4), 1 lpM (4-15), 2 pM (4-100,106), 1 pF (4-101), 1 p, 2 P, 22 L [UCLA]; same data, 3 Aug 1964 (SAL 6), 1 lF (6-14), 1 pM (6-101), 8 P, 6 l, 22 L [UCLA]; same data (SAL 7), 1 lP (7-10), 3 L [UCLA]. **Locality unspecified:** 1 L [USNM].

GUATEMALA. **Alta Verapaz:** Trece Aguas, Barber and Schwarz, 1 F [USNM]. **Escuintla:** Escuintla, 326 m, Schaus and Barnes, 1 F [USNM]. El Salto, 1 Nov 1954 (GML) 1 l [UCLA]. **Izabal:** Livingston, H. Barber, 1 F [USNM]. Mojaca Village (ca 8 km W Morales), 50 m, 28 June 1964, T. Zavortink, 2 F [UCLA]. **Retalhuleu:** Champerico, 0 m, Nov 1965, 2 M [USNM]. **Suchitepequez:** Patulul, 250 m, 20 July 1964, P. Cowsill (GUA 56), 2 lpF (56-10,12), 4 L [UCLA]. **Department unknown:** San Jose, 12 May 1943, D. Hall, 3 M [USNM]. **Locality unspecified:** R. Morales, 1 F [USNM]; 1954 (GML), 2 pM (02080,02087) [UCLA].

GUYANA. **Berbice:** Courantyne, Benab Village 63, 6 Oct 1962. T. Aitken (6/X/62), 1 pM (1); same data, 8 Oct 1962, (8/X/62), 2 lpM (2,3), 4 lpF (1,4-6), 1 lP (7) [UCLA]. **Demerara:** Georgetown, 7 Nov 1967, Hansell and Rauch (GUY 34), 3 lpM (34-10-12); same data (GUY 35), 2 lpM (35-10,11), 1 pM (35-101), 1 pF (35-100), 18 L; same data, 12 Mar 1968 (GUY 73), 1 pF (73-100), 1 L; same data, 12 Apr 1968, Ramjattan (GUY 74), 1 lpF (74-14), 1 pM (74-101), 1 pF (74-100), 1 lp (74-13), 1 lP (74-10), 3 L [UCLA].

HONDURAS. **Atlantida:** Lancetilla, nr. Tela, 18 Nov 1954 (GML), 1 pF (01979), 1 l [UCLA]. Lancetilla Valley, nr. Tela, 19 Aug 1964, A. Quinonez (HON 49), 3 L; same data (HON 52), 1 lpM

(52-14), 5 lpF (52-10-13,15), 2 pM (52-100,101), 1 lP (52-16), 3 F, 3 P, 4 L; same data (HON 54), 1 pF (54-100); same data (HON 55), 1 lp (55-20) [UCLA]. Las Metalias, nr. Tela, 21 Aug 1964, A. Quinonez (HON 57), 1 l [UCLA]. Rio Mezapa, nr. Rio Lean, 4 Sept 1954 (GML), 2 l [UCLA].

JAMAICA. **St. Andrew and Kingston**: Constant Spring, May 1945, R. Hill, 1 M, 1 F, 3 L [USNM]; same data, 7 Sept 1965, J. Belkin (JA 327) 2 lpF (327-14,16), 2 p, 3 L [UCLA]; same data (JA 328), 1 pM (328-101) [UCLA]; same data, 16 Nov 1966, O. Berlin and Watson (JA 696), 1 F [UCLA]; same data (JA 699), 1 pM (699-105) [UCLA]. Hermitage Gate, 29 Oct 1965, W. Page (JA 391), 1 pM (391-108) [UCLA]. King's House, Kingston, Nov 1924, G. Strathairn, 1 M [BM]. Kingston, May 1945, R. Hill, 1 M gen, 2 F [USNM]. Kingston (Pound Road), 24 Aug, M. Grabham, 1 F (holotype) [BM]. Rockfort, 2-30 m, 21 Aug 1968, Hochman (JA 948), 9 F; same data (JA 951), 3 lpF (951-11,13,15), 1 lP (951-12), 3 L; same data, 22 Aug 1968 (JA 952), 1 M, 6 F; same data, 24 Aug 1968 (JA 957), 4 F; same data (JA 958), 1 lpF (958-10), 5 L; same data, 25 Aug 1968 (JA 959), 1 F [UCLA]. **St. Mary**: Broadgate, 28 Nov 1965, W. Page (JA 407), 1 pF (407-114) [UCLA]. **St. Thomas**: Grant's Pen, 10 Dec 1965, W. Page (JA 410), 2 lP (410-12,13), 5 L; same data (JA 412), 1 lpM (412-10), 1 pM (412-100), 1 pF (412-101), 1 p, 1 l [UCLA].

MEXICO. **Campeche**: Campeche (20 km SW), 2 m, 21 July 1970, D. Schroeder (MEX 586), 1 F [UCLA]. **Colima**: Manzanillo (ca 23 km NW), 22 July 1963, S. Telford (MT 9), 1 F [UCLA]. Manzanillo (ca 26 km SE Hwys 80,200), 200 m, 21 July 1963, S. Telford (MT 6-3), 1 F [UCLA]. **Guerrero**: Acapulco, F. Knab, 5 M, 4 F [USNM]. Acapulco (GML), 1 lpM (02524), 1 lpF (02522) [UCLA]. Puerto Marquez (?El Marques), 30 Aug 1964, E. Fisher and D. Verity (MEX 141), 1 M; same data (MEX 143), 1 M, 3 F [UCLA]. **Jalisco**: Las Penas, 18-21 July 1903, A. Duges, 5 F; same data, June 1906, 3 F [USNM]. **Nayarit**: San Blas, 26 June 1956, W. McDonald (UCLA 198), 1 lpM (198-110), 2 lpF (198-106,107), 6 lp (198-103,113-117), 4 p, 4 l; same data, 27 June 1956 (UCLA 203), 4 pM (203-104,106,108,112), 1 pF (203-103), 1 lp (203-105), 4 p, 14 L; same data, 25-29 June 1956, 5 M, 13 F; same data, 25 July 1963, P. Spangler, 1 F [UCLA]. San Blas (6 km SE), 10 July 1963, E. Fisher (MF 2), 1 lpM (2-19), 6 lpF (2-10,13,15-18), 1 pM (2-12), 1 pF (2-10), 1 L; same data (MF 3), 7 M, 6 F [UCLA]. Tepic (ca 30 km NW), 300 m, 7 June 1971, T. Zavortink and L. Nielsen (MEX 658), 3 lpM (658-10,11,31), 12 lpF (658-12-20,27,30,32), 30 M, 17 F, 46 p, 6 l, 27 L; same data (MEX 659), 7 F, 7 P; same data (MEX 660), 4 M, 3 F, 7 p; same data (MEX 661), 2 lpM (661-10,11), 4 lpF (661-12-14,17), 1 M, 1 p, 1 l; same data (MEX 662), 1 lpM (662-10) [UCLA]. **Oaxaca**: Salina Cruz, F. Knab, 7 F [USNM]. Tehuantepec, 5 M, 1 M gen, 3 F, 2 p, 1 l [USNM]. **San Luis Potosi**: Saketepan, nr. Tamazunchale, 200 m, 20 July 1965, D. Schroeder (MEX 220), 1 F; same data, 21 July 1965 (MEX 222), 1 lpM (222-10); same data (MEX 228), 2 lpF (228-11,12) [UCLA]. **Sinaloa**: Hwy 15, 1 km NW road to La Cruz, 6 June 1971, T. Zavortink and L. Nielsen (MEX 650), 1 F, 1 p [UCLA]; same data (N-13-71), 6 lpF (6-12), 20 M, 2 F [Utah]; same data (N-14-71), 6 M, 9 F [Utah]. Palmillas (11 km NW), 40 M, 7 June 1971, T. Zavortink and L. Nielsen (MEX 655), 5 M, 6 F [UCLA]. **Tabasco**: Comalcalco (7 km N), 40 m, 12 July 1970, D. Schroeder (MEX 553), 1 lpM (553-20), 1 lpF (553-21), 1 pM (553-100) [UCLA]. Frontera, Apr 1928, Townsend, 1 F [USNM]. **Veracruz**: Amatlan de los Reyes (2 km E), 800 m, 28 July 1965, D. Schroeder (MEX 241), 1 lpM (241-10) [UCLA]. Amatlan de los Reyes (3 km S), 800 m, 28 July 1965, D. Schroeder (MEX 243), 1 lpM gen (243-10), 1 lpF (243-11), 2 L [UCLA]. Boca del Rio, 0 m, 28 July 1964, E. Fisher (MEX 84), 3 F [UCLA]. Cerro Guzman (?Guzmantla), 9 July 1970, D. and K. Schroeder (MEX 539), 1 lpM (539-80), 1 l [UCLA]. Cordoba (2.5 km E), 920 m, 12 July 1964, E. Fisher and D. Verity (MEX 32), 1 F; same data, 16 July 1964 (MEX 37), 1 F; same data, 17 July 1964 (MEX 42), 2 lpM (42-10,15), 9 lpF (42-11-14,16-19,21), 4 M, 4 F, 2 L; same data, 18 July 1964 (MEX 53), 1 lpF (53-10), 1 lp (53-14), 2 L; same data (MEX 54), 1 lpF (54-10), 5 L; same data, 22 July 1964 (MEX 71), 1 lpF (71-16); same data (MEX 72), 2 lpM (72-11,12), 1 lpF (72-13); same data (MEX 74), 2 lpM (74-11,13), 2 lpF (74-10,14); same data (MEX 75), 3 L; same data (MEX 76), 2 lpF (76-10,11), 1 L [UCLA]. Cuitlahauc (18 km E), 410 m, 15 July 1964, E. Fisher and D. Verity (MEX 35), 1 F [UCLA]. Santa Lucrecia (Jesus Carranza), F. Knab, 1 F [USNM]. Veracruz, 0 m, July 1928, A. Iglesias, 1 M [USNM]; same data, 12 Aug 1965, D. and K. Schroeder (MEX 295), 1 lpM (295-11), 1 lpF (295-10), 1 M, 4 L [UCLA].

NICARAGUA. **Chinandega**: Corinto, 6 Sept 1944, H. Crowell, 10 F [UCLA]; same data, 15 Sept 1944, 1 M, 3 F [UCLA]; same data, 24 Oct 1944, 3 M, 3 F [USNM]; same data, 24 May 1945, 10 F [UCLA]; same data, 10 June 1945, 7 F [UCLA]; same data, 29 Sept 1945, 7 F [UCLA]. **Leon**: Simonello (nr. Nagarote), 14 June 1964, A. Quinonez (NI 8), 1 F; same data, 16 June 1964 (NI 12), 1 pM (12-104) [UCLA]. **Zelaya**: Bluefields, W. Thornton, 1 F [USNM]. El Aserrio (nr. Bluefields), 14 July 1964, A. Quinonez (NI 47), 1 pM (47-100), 1 L [UCLA]. **Locality unspecified**: P. Woke, 1 M, 4 L [USNM].

PANAMA AND CANAL ZONE. **Bocas del Toro**: Almirante, 29 Apr 1963, A. Quinonez (PA 282), 1 M, 1 F [UCLA]. Almirante, mile 2, 16 Apr 1963, A. Quinonez (PA 254), 1 M; same data, 9 May 1963 (PA 342), 4 F [UCLA]. Nigua Creek, nr. Almirante, 4 May 1963, A. Quinonez (PA 312), 1 M gen [UCLA]. **Canal Zone**: Barro Colorado Island, 7 May 1943, W. Komp, 2 lF (43-80, 106) [UCLA, USNM]; same data, 15 May 1945, 2 lpM (5-129A,134), 2 lpF (5-132,133), 1 lp (5-138), 5 M, 2 F, 1 l [UCLA, USNM]; same data, 22 May 1945, 1 lF (5-206), 4 M, 8 F, 2 p [UCLA, USNM]; same data, 23 May 1945, 1 lpM (5-224), 1 lpF (5-175), 1 F, 2 l [UCLA, USNM]; same data, 26 June 1945, 1 lM (5-426), 2 lF (5-418,430) [UCLA, USNM]; same data, 3 Dec 1965, A. Quinonez (PA 856), 1 lpM (856-10), 2 p [UCLA]; same data, 1 July 1967, W. Wirth, 1 M [USNM]. Camacho, 1 June 1922, J. B. Shropshire, 1 M, 4 F [USNM]. Chiva Chiva, 1945, 1 M [USNM]; same data, 12 Nov 1965, R. Schick and A. Quinonez (PA 777), 3 M, 3 p, 3 l [UCLA]. Contractor's Hill (0.8 km N), 13 Dec 1965, R. Schick (PA 897), 1 pF (897-100) [UCLA]. Corozal, 29 Jan 1943, W. Komp, 1 lM (43-45), 3 M, 1 F; 4 l; same data, 6 May 1943, 1 M, 2 F; same data, July 1949, 1 M [UCLA]. Empire, 3 Apr 1922, J. Shropshire, 5 M [USNM, BM]; same data, 10 June 1922, 1 M [USNM]. Ft. Kobbe, 18 May 1950, S. Carpenter, 2 F [UCLA]. Ft. Sherman, 23 Sept 1949, 1 L [UCLA]; same data, 24 Feb 1950, 1 l [UCLA]; same data, 6 May 1949, S. Carpenter, 2 M, 9 F [UCLA, Utah]. France Field, 7 June 1949, 1 L [UCLA]. Gamboa (6 km NW on Pipeline Rd.), 30 m, 15 July 1971, H. Arnell (PA 1121), 2 M, 2 F [UCLA]. Madden Forest Preserve, Las Cruces Trail, 100 m, 24 June 1972, H. Arnell (PA 1061), 1 L [UCLA]. Madden Forest Preserve, 0.5 km W George Green Park, 100 m, 10 July 1972, H. Arnell (PA 1096), 1 lpM (1096-10) [UCLA]. Miraflores, 9 May 1908, A. Jennings, 2 M, 1 F; same data, 20 May 1922, J. Shropshire, 1 F [USNM]. Red Tank, 14 Nov 1949, S. Carpenter, 1 M [UCLA]. Summit, 26 May 1953, 2 M, 1 F; same data, 17 July 1938, 3 M [UCLA]. Summit, W. Komp, 1 M [UCLA]; same data, 25 May 1945, 2 lpM (5-218,238), 2 lp (5-228,235), 3 M, 1 M gen, 1 F, 1 l [UCLA, USNM]. Tabernilla, A. Busck, 1 F [USNM]. **Chiriqui**: Potrerillos, 12 Nov 1949, P. Galindo, 1 l [UCLA]. **Cocle**: El Valle, 5 June 1945, R. Arnett and W. Komp (ASM 611), 4 M [UCLA]; same data, W. Komp, 1 lM (5-304), 1 lp (5-350), 5 M, 3 F, 1 l [UCLA, USNM]; same data, Nov 1946, N. Krauss, 1 F [USNM]. **Colon**: Portobelo, Mar 1911, A. Busck, 3 M, 2 F [USNM]. Portobelo, Caldera Island, A. Jennings, 1 M [USNM]. **Darien**: Rio Tuira, 3 Mar 1958 (GG 69), 8 M [UCLA]. Rio Tuira at mouth of Rio Paya, 2 Mar 1958 (GG 59), 6 M [UCLA]. **Panama**: Archipielago de las Perlas, Isla San Jose, 26 July 1944, W. Komp, 1 lF (4-54) [UCLA, USNM]. Cerro Campana, 750 m, 6 Dec 1950, 1 L; same data, 28 Aug 1963, A. Quinonez (PA 537), 4 M; same data (PA 538), 1 F; same data, 29 Aug 1963 (PA 539), 5 M; same data (PA 540), 1 F [UCLA]. Cerro La Victoria, 11 May 1949, P. Galindo, 4 l [UCLA]; same data, 1949, H. Trapido, 10 F [UCLA, USNM]; ?same data, GML Lab Colony (PA 21), 523 M, 16 M gen, 424 F, 1 F gen, 746 P, 679 L [UCLA]. El Victoria (?La Victoria), 29 June-7 July 1949, 4 M [UCLA]. La Jolla, nr. Pacora, 6 Mar 1951, 1 F [UCLA]. La Zumbadora (nr. Cerro Azul), 600 m, 15 Feb 1963, A. Quinonez (PA 94), 1 lpM (94-102) [UCLA]. Nuevo Emperador, 23 Nov 1965, A. Quinonez (PA 832), 1 lpM (832-20), 1 lpF (832-11) [UCLA]. Pacora, 29 June 1949, 1 M gen [UCLA]. Panama, Paitilla Pt., 14 July, 2 M; same data, 14 May 1949, W. Komp, 3 M [UCLA]. Tocumen, 1 June 1949, S. Carpenter, 2 F [UCLA].

TRINIDAD AND TOBAGO. TOBAGO: **St. Andrew**: Government Stock Farm, Scarborough, 75 m, 15 Nov 1965, T. Aitken et al. (TOB 9), 2 lpM (9-20,21), 1 pF (9-100), 3 L [UCLA]. Orange Hill, 90 m, 24 Nov 1965, R. Martinez and A. Guerra (TOB 99), 1 pM (99-103); same data, 30 Nov 1965 (TOB 138), 1 lpF (138-21), 1 L; same data (TOB 139), 1 lpF (139-30), 1 L [UCLA]. Scarborough, 85 m, 21 Nov 1965, R. Martinez and A. Guerra (TOB 73), 6 L [UCLA]. **St. George**: Caledonia (5 km E Mason Hall) 300 m, 17 Nov 1965, T. Aitken et al. (TOB 49), 1 F [UCLA]. **St. John**: Little Tobago Island, 1 Aug 1963, T. Aitken, 2 F [UCLA]. **St. Patrick**: Carnbee, 75 m,

19 Nov 1965, R. Martinez and A. Guerra (TOB 61), 1 lpM (61-10), 1 pF (61-100), 4 L; same data (TOB 62), 1 F [UCLA]. Mt. Irvine Bay, 20 Nov 1965, R. Martinez and A. Guerra (TOB 70), 7 M, 3 F, 10 p [UCLA]. **Locality unspecified:** July 1905, A. Busck, 1 M [USNM]. TRINIDAD: **St. George:** Monos Island, Grand Fond Bay Valley, 0-60 m, 3 Aug 1964, R. Manuel (TR 596), 6 F [UCLA].

UNITED STATES. **Texas:** Brownsville, 6 Sept 1955 (GML), 2 lpF (02136,02138), 2 pF (02134,02135), 1 M, 1 p [UCLA, USNM]; same data, 12 June 1955, K. Kajihiro, 1 P [UCLA]; same data, 13 Apr 1957, Reimann, 1 p [UCLA].

VENEZUELA. **Aragua:** Cata, 0 m, 21 Aug 1969, J. Valencia and Clarijo (VZ 388), 1 pF (388-100), 1 M, 8 F, 5 p [UCLA]. Choroni (8.7 km S), 300 m, 16 July 1969, T. Zavortink et al. (VZ 228), 1 lpF (228-10), 1 pM (228-102) [UCLA]. Maracay, 600 m, 3 Sept-26 Oct 1926, M. Nunez-Tovar, 9 F [USNM, BM]. Ocumare de la Costa, 100 m, 5 Aug 1969, J. Valencia (VZ 306), 2 lpM (306-10,11), 3 pM (306-100-102), 1 l; same data (VZ 308), 1 pF (308-103) [UCLA]. Turiamo, 14 Sept 1944, 1 M [UCLA]. **Carabobo:** San Esteban, Aug 1940, P. Anduze, 1 M [USNM]. **Sucre:** Isla Patos, 5 Aug 1962, R. Manuel, 1 F [UCLA].

Additional Records From the Literature

VENEZUELA. **Bolivar:** Piar and Roscio districts (Anduze, 1947:353). **Tachira:** Jauregui district (Anduze, 1947:353). **Trujillo:** Betijogue district (Anduze: 1947:353).

TROPICALIS SECTION

FEMALES. **Head:** Eyes narrowly separated above antennae (1 ommatidial diameter). Proboscis 1.10-1.15 of forefemur. **Thorax:** Lower *stp* bristles weakly developed. **Legs:** Length of forefemur about 1.50 of distance from top of thorax to apex of midcoxa. Knee spots absent. Claws of foreleg and midleg with subbasal tooth. **Wing:** Ratio of R_{2+3} to R_2 varied, R_{2+3} about 0.40-1.10 of R_2. **Postnotum:** Bristles absent.

FEMALE GENITALIA. **Tergite IX:** Setae apparently absent.

MALES. **Head:** Proboscis about 1.20 of forefemur. Palpus long. Antenna 0.60 of proboscis, torus much enlarged, flagellum densely plumose, segments 1-12 with very numerous moderate to long bristles. **Legs:** Claws of foreleg enlarged, unequal; claws of midleg subequal, small.

MALE GENITALIA. **Segment IX:** Lobes usually with 1 or 2 setae. **Sidepiece:** Apical lobe absent. **Claspette:** Filament modified. **Clasper:** Simple, cylindrical, curved inward at apex; seta present near apex of inner surface; spiniform apical, 0.40 of clasper.

LARVAE. **Head:** Hair 5-C single. Hair 6-C single (single or double). **Thorax:** Integument without spicules. Tubercles of hairs 5-6-P joined and hair 7-P free. **Abdomen:** Hair 12-1 present. **Segment VIII:** Comb scales 24-28, with single broadly rounded, minutely fringed spine, in irregular double to triple row. **Anal Segment:** Spines of caudal margin of saddle reduced. Ventral brush (4-X) with 6 pair of hairs arising from weakly sclerotized boss.

DISCUSSION. In the adults, *Haemagogus tropicalis* exhibits many of the distinguishing characters of the Albomaculatus Section, toothed claws in the female, the postnotum without setae, closely approximate eyes, the male palpus long as in 4 species of the Albomaculatus Section, while the larva is more typical of the larvae of the Splendens Section having 6 pair of hairs in the ventral brush and 24 to 28 comb scales in a triangular patch. The female genitalia apparently lack setae on tergite IX, a Splendens Section character, while the male genitalia exhibit characters of both sections. *Tropicalis* is a relict species, having been found only at a

single locality at the mouth of the Amazon. Since it is annectent between the Albomaculatus and Splendens Sections, I have placed it in the monotypic Tropicalis Section.

15. Haemagogus (H.) tropicalis Cerqueira & Antunes

Figs. 5,36,37

1938. *Haemagogus tropicalis* Cerqueira and Antunes, 1938:1-9. TYPE: *Holotype* male, Curralinho, Para, Brazil, Jan-May 1936, H.W. Kumm and A. Rabello [LU].

Haemagogus (Longipalpifer) tropicalis of Levi-Castillo (1951b:12,35-37); Stone, Knight and Starcke (1959:216); Forattini (1965:53).
Haemagogus (Cyanoconops) tropicalis of Lane (1939:121; 1953:807-810).
Haemagogus tropicalis of Kumm and Novis (1938:501); Kumm and Cerqueira (1951a:174).

FEMALE. Wing: 3.25 mm. Proboscis: 2.70 mm. Forefemur: 2.45 mm. Abdomen: 3.15 mm. Dark scales of proboscis, palpus, wing and legs purple to violet. **Head:** Eyes narrowly separated above antennae (1 ommatidial diameter). Decumbent scales of vertex and occiput greenish blue anteriorly becoming light green posteriorly and laterally, with some purple reflections. Proboscis about 1.10-1.15 of forefemur; palpus about 0.13 of proboscis; antenna about 0.65 of proboscis. **Thorax:** Scales of mesonotum usually greenish bronze, becoming blue laterally and posteriorly, occasionally entire mesonotum blue, scales silver in antealar area and usually deep blue to purple over supraalar bristles and on scutellar lobes. *Apn* lobes moderately enlarged, scales blue to greenish blue; *ppn* apparently bare; lower *stp* without well developed bristle. **Legs:** Long, length of forefemur about 1.50 of distance from top of thorax to apex of midcoxa. **Wing:** Ratio of R_{2+3} to R_2 variable, R_{2+3} about 0.40-1.10 of R_2. **Abdomen:** Dark scales of tergites greenish blue to violet, with some purple reflections, often with median basal patches of silver scales on segments III-VII; sternites blue to purple.

MALE (fig. 36). Wing: 1.95 mm. Proboscis: 1.85 mm. Forefemur: 1.60 mm. Abdomen: 2.30 mm. **Head:** Proboscis about 1.20 of forefemur; palpus long, slender, straight throughout, about 0.55 of proboscis, 5-segmented, segments 2 and 3 ankylosed and long, making up about 0.62 of palpus length; segment 4 making up about 0.20 of palpus length; segment 5 making up about 0.12 of palpus length; antenna about 0.60 of proboscis. **Legs:** Claws of foreleg unequal, larger claw with submedian tooth, smaller claw with acute subbasal tooth; claws of midleg subequal, small, with acute subbasal tooth.

MALE GENITALIA (fig. 36). **Segment VIII:** Tergite about 0.80 of sternite, distal margin straight, with enlarged setae laterally and several large spiniform setae mesally. **Segment IX:** Tergite broadly emarginate and weakly sclerotized mesally; lobes usually with 1 or 2 poorly developed setae. **Sidepiece:** Conical, length about 2.5 times median width; basal tergomesal lobe poorly developed but extending distally as slightly raised area to slightly distad of middle of sidepiece, with short setae arising from raised tubercles distally and enlarged setae proximally; apical lobe poorly developed, represented by small cluster of moderately developed setae dorsad of apical sternomesal scales on distal fourth; apical sternomesal scales lanceolate to oblanceolate with acuminate tips. **Claspette:** Stem bowed inward near middle in dorsal aspect, slightly narrowed near middle, sharply angled dorsad near distal third; filament broad, leaflike, attached to stem near middle, ventral

half erect, rugose, divided into 2 irregular lobes, dorsal half triangular, apex forming a slightly recurved beak. **Clasper**: Broadest near base, spiniform about 0.40 of clasper. **Phallosome**: Aedeagus large, broadly obovate, tip produced dorsad into sclerotized, beaklike process; venter broadly open except on basal half; with heavily sclerotized ridges lateroventrally which are weaker basally. **Proctiger**: Cercal setae 6-8; apical knob of paraproct with 15-20 serrations.

PUPA. Unknown.

LARVA (fig. 37). Head: 0.80 mm. Siphon: 0.65 mm. Anal Saddle: 0.30 mm. **Head**: Hair 5-C single. Hair 6-C single (single or double). **Thorax**: Integument without spicules. Tubercles of hairs 5,6-P connected, hair 7-P free. **Abdomen**: Hair 12-I present. **Segment VIII**: Comb scales 24-28, with single broadly rounded, minutely fringed spine, in irregular double to triple row. **Siphon**: Index about 2.5. Pecten teeth 10-17, extending to about basal 0.40-0.45 of siphon. Hair 1-S triple. **Anal Segment**: Spines on caudal margin of saddle much reduced, very short, each with multiple teeth. Hair 4a-X 5b, long. Boss weakly sclerotized.

SYSTEMATICS. *Haemagogus tropicalis* can be distinguished from the remaining members of the genus: in the **adults** by the combination of (1) subbasal tooth on claws of female foreleg and midleg and small and subequal claws of male midleg, (2) *ppn* apparently without scales and (3) long male palpus, 0.62 of proboscis, and (4) lower *stp* without well developed bristle; in the **male genitalia** by claspette filament with ventral half erect, rugose and bilobed; and in the **larva** by the combination of (1) 24 to 28 comb scales in a triangular patch, (2) weakly sclerotized boss and (3) hair 6-C usually single.

The affinities of *tropicalis* are discussed above under the Tropicalis Section.

BIONOMICS. *Haemagogus tropicalis* larvae have been taken from treeholes. The adults are reported by Kumm and Cerqueira (1951:174) not to normally attack man.

DISTRIBUTION (fig. 5). *Haemagogus tropicalis* is known only from one locality on the Isla do Marajo at the mouth of the Amazon River. Material examined: 20 specimens; 9 males, 9 females, 2 larvae.

BRAZIL. **Para**: Curralinho, 2 M, 2 M gen, 3 F, 2 L [USNM, BH, GML]; same data, Dec 1935, 3 F [USNM]; same data, 1936, 2 M [USNM]. Curralinho, Rio Cupijo, 11 Apr 1936, A. Azeredo, 2 M, 2 F [USNM, GML]. Curralinho, Rio Pagao, 16 Apr 1936, A. Azeredo, 1 M, 1 F [USNM].

SPLENDENS SECTION

FEMALES. **Head**: Eyes moderately to broadly separated above antennae (2-5 ommatidial diameters). Proboscis 0.80-1.20 of forefemur. **Thorax**: *Ppn* with or without scales; lower *stp* bristles weakly developed. **Legs**: Midcoxa with single well developed bristle laterally; forefemur about 1.40-1.80 of distance from top of thorax to apex of midcoxa. Knee spots absent. Claws of foreleg and midleg simple. **Wing**: R_{2+3} about 0.32-0.50 of R_2. **Postnotum**: Two small bristles present posteriomesally.

FEMALE GENITALIA. **Tergite IX**: Setae absent.

MALES. **Head**: Proboscis about 0.95-1.40 of forefemur. Palpus short, 0.16-0.21 of proboscis; 4-segmented with segment 4 small to minute. Antenna 0.44-0.59 of proboscis with torus moderately enlarged, flagellum sparsely to moderately plumose, segments 1-12 with 6 to about 22 moderately long bristles. **Legs**: Claws of foreleg and midleg enlarged, unequal; larger claw of foreleg with large acute subbasal or

blunt median tooth, smaller claw simple; larger claw of midleg simple or with large, acute subbasal tooth, smaller claw simple.

MALE GENITALIA. **Segment IX:** Tergite without setae. **Sidepiece:** Apical lobe usually present. **Claspette:** Filament highly modified. **Clasper:** Usually modified; spiniform short, 0.18-0.32 of clasper.

LARVAE. **Head:** Hair 5-C single. Hair 6-C double. **Thorax:** Integument without spicules. Tubercles of hairs 5-6-P joined, hair 7-P free. **Abdomen:** Hair 12-I present. **Segment VIII:** Comb scales 10-50(6-75), with single broadly rounded to spatulate, minutely fringed spine, in irregular double row to large triangular patch. **Anal Segment:** Spines on caudal margin of saddle relatively weakly developed, short, usually with multiple teeth. Ventral brush (4-X) with 6 pair of hairs, all hairs but proximal 1 or 2 arising from strongly sclerotized boss. Hair 4a-X 3-8b, long.

DISCUSSION. The Splendens Section can be distinguished from the remainder of the subgenus *Haemagogus:* in the **adults** by (1) the simple female claws, (2) the postnotum with 2 small setae posteriorly and (3) vein R_{2+3} less than 0.50 of R_2; in the **male genitalia** by (1) tergite IX without setae and (2) either a well developed apical lobe on the sidepiece or the apical lobe represented by a dense cluster of setae; and in the **larvae** by the combination of (1) the comb scales numerous and in a triangular patch, (2) 6 pair of hairs in the ventral brush, (3) a strongly sclerotized boss and (4) hair 6-C single.

The Splendens Section appears to be the most highly derived in the adults while its larvae have retained many primitive characters. The setae on the adult postnotum, the simple female claws, the short male palpi, the reduction of bristles on the male antennae, and the unusual development of many structures of the male genitalia are among the more conspicuous departures from the more primitive aedine type and must be considered to be derived characters. In the larvae, however, the greater development of the ventral brush and the large number of comb scales appear to be primitive.

Five phyletic lines are recognizable within the Splendens Section. The species of the *splendens* complex, *splendens* and *celeste,* differ from each other primarily in the plumosity of the male antenna, with relatively minor differences in the adults and larvae. This complex is probably closest to the ancestral stock which gave rise to the Splendens Section. The 2 species have a simple clasper and relatively simple sidepiece in the male genitalia and a large patch of scales on the adult *ppn,* characters typical of the Albomaculatus and Tropicalis Sections. The *splendens* complex is found on the periphery of the range of the Splendens Section, in northern South America and the adjacent Windward Islands.

The *regalis* complex, the second phyletic line, contains the closely allied species *iridicolor, regalis, aeritinctus* and *lucifer.* The adults of this complex can be separated from each other primarily on scale color. The male genitalia differ only in details of the clasper and claspette, and the larvae are virtually indistinguishable. These species probably arose in Central America at a time when this area was undergoing major geological changes. This is discussed further under *iridicolor. Argyromeris* shows affinities to the *regalis* complex in some characters of the male genitalia and in the larva but is not placed in the complex primarily because of differences in the clasper and claspette. It is probably an early offshoot of the line that gave rise to the *regalis* complex.

The unrelated *chalcospilans* and *boshelli* exhibit some extreme derivations, especially in the male genitalia, but show primitive characters in the stronger ventral brush and large number of comb scales in the larvae.

16. Haemagogus (H.) splendens Williston

Figs. 6,38,39,40

1896. *Haemagogus splendens* Williston, 1896:271-272. TYPE: *Lectotype* female, St. Vincent, elev. 1000 ft, H.H. Smith [BM; selection of Belkin, 1968b:22].

Haemagogus (Haemagogus) splendens of Bonne and Bonne-Wepster (1925:435); Dyar (1928: 139-140); Edwards (1932:179, in part); Lane (1939:120, in part; 1953:779-781, in part); Levi-Castillo (1951b:11,16-17, in part); Stone, Knight and Starcke (1959:218, in part); Forattini (1965:47-48, in part).

Haemagogus splendens of Theobald (1903b:283), Dyar and Knab (1906b:166); Howard, Dyar and Knab (1917:867, in part); MacDonald (1917:262); Dyar (1921a:114); Komp (1954:49-51, in part).

Haemagogus cyaneus in part of Theobald (1901:239-241; 1903a:308; 1905:37; 1907:550; 1910: 493); Giles (1902:485); Blanchard (1905:412); Coquillett (1906:25).

FEMALE (fig. 38). Wing: 2.75 mm. Proboscis: 2.35 mm. Forefemur: 2.00 mm. Abdomen: 2.80 mm. Dark scales of proboscis, palpus, wing and legs violet to purple. **Head**: Eyes widely separated above antennae (4 ommatidial diameters). Decumbent scales of vertex and occiput copper to light green. Proboscis about 1.10-1.20 of forefemur; palpus about 0.15 of proboscis; antenna about 0.55-0.60 of proboscis. **Thorax**: Scales of mesonotum usually copper, occasionally bronze; bluish green over supraalar bristles, silver in antealar area; scales on scutellum bluish green. *Apn* lobes with scales greenish blue to copper, often with silver scales dorsally and mesally; *ppn* with large patch of silver or copper scales posteriorly. **Legs**: Hindcoxa enlarged, its base slightly above upper margin of meron; length of forefemur about 1.50-1.65 of distance from top of thorax to apex of midcoxa. **Wing**: R_{2+3} about 0.35-0.45 of R_2. **Abdomen**: Dark scales purple to violet; usually with silver scales dorsally on tergites II-VII in rather broad basal band, occasionally continuous with lateral silver patches.

MALE (fig. 38). Wing: 2.35 mm. Proboscis: 2.40 mm. Forefemur: 2.00 mm. Abdomen: 2.55 mm. **Head**: Proboscis about 1.20-1.37 of forefemur; antenna sparsely plumose, flagellar segment 4 with about 8-10 moderately developed bristles.

MALE GENITALIA (fig. 39). **Segment VIII**: Tergite about 0.85-0.95 of sternite, distal margin slightly rounded, with enlarged setae and with a few large narrowly lanceolate scales mesally. **Segment IX**: Tergite broadly emarginate and weakly sclerotized mesally. **Sidepiece**: Conical, broad, length about 2.5 times median width; basal tergomesal area not enlarged but extending distad as raised area with numerous short setae to near distal third of sidepiece, basally with numerous setae, the more proximal ones much enlarged, flattened and attenuate; apical lobe undeveloped but represented by cluster of relatively long, curved setae; apical sternomesal scales lanceolate to oblanceolate. **Claspette**: Stem bowed inward slightly at distal third in dorsal aspect, stout, angled sharply dorsad at distal third, with seta and spicules at angle; filament striate, broadly sickle-shaped and terminating in slightly recurved tip dorsally, ventral portion elongate, narrow, curved away from stem, tip bifurcate or trifurcate, pointed. **Clasper**: Simple, cylindrical, thickest at base, curved sharply inward at apical third; spiniform inserted apically, about 0.33 of clasper, with bifid tip. **Phallosome**: Aedeagus large, more or less broadly obovate; tip produced dorsad into rather heavily sclerotized carina terminating in beaklike process; venter broadly open except on basal third, with sclerotized ridges

lateroventrally which are expanded basally. **Proctiger:** Cercal setae 3-5; apical knob of paraproct with about 10-15 lateral serrations.

PUPA (fig. 39). Abdomen: about 3.15 mm. Trumpet: 0.40 mm. Paddle: 0.75 mm. **Cephalothorax:** Lightly to moderately pigmented, darker dorsally. Hairs 4,5-C weakly developed, subequal, single to triple, weaker than 7-C which is single. **Trumpet:** Light brown, slightly lighter distally. **Abdomen:** Lightly to moderately pigmented, genital lobe and anterior segments somewhat darker. Float hair (1-I) with about 8-12 primary branches and 2-6 secondary branches. Hair 1-II-VII weakly to rather strongly developed, single, multiple or dendritic, more or less subequal on all segments. Hair 2-VII short, considerably cephalad of 1-VII. Hairs 3-II,III,5-IV,V somewhat variable in length but more or less subequal. Hair 6-VII usually moderately well developed, somewhat stronger than 6-III-VI which are subequal. Hair 9-VII considerably cephalad of caudolateral margin of tergite, 1-4b; 9-VIII 4-8b. **Terminal Segments:** Male genital lobe about 1.0 of tergite VIII. **Paddle:** Weakly pigmented, midrib slightly darker; apex broadly rounded or slightly acuminate. Hair 1-P single.

LARVA (fig. 40). Head: 0.85 mm. Siphon: 0.77 mm. Anal Saddle: 0.34 mm. **Segment VIII:** Comb scales 10-13(6-20), with single broadly rounded, minutely fringed spine, in irregular double row. **Siphon:** Index about 2.5(2.2-2.7). Pecten teeth 12-16(10-21), extending to about basal 0.40-0.45 of siphon. Hair 1-S 4b. **Anal Segment:** Hair 4a-X 3-4b.

SYSTEMATICS. *Haemagogus splendens* can be separated from the remaining species of the Splendens Section: in the **adults** by (1) large patch of silver or copper scales on *ppn,* (2) broad basal bands of silver scales dorsally on abdominal tergites II-VII, (3) scales of vertex copper to light green and (4) male antenna sparsely plumose; in the **male genitalia,** from all species except *celeste* by (1) simple, cylindrical clasper with apical spiniform, (2) characteristic claspette filament with ventral half narrow, pointed and curved away from stem, and (3) all apical sternomesal scales lanceolate to oblanceolate; and in the **larva** by the combination of (1) few comb scales, usually 10-13, (2) hair 7-III-VI subequal to hair 5 of corresponding segment, (3) hair 4a-X with 3 or 4 branches and (4) pecten extending only to basal 0.40-0.45 of siphon.

Closely allied to the mainland *celeste,* the other member of its complex, *splendens* is indistinguishable in the male genitalia, but can be separated with reasonable certainty in all other stages, in the female by copper to light green scales on the vertex and usually copper scales on the *ppn;* in the male by the very sparsely plumose antenna with only 8 to 10 bristles on each segment; in the pupa by subequal hairs 3-II,III,5-IV,V; and in the larva by usually 10 to 13 comb scales and hair 4a-X with 3 or 4 branches. The conspicuous difference in the structure of the male antenna possibly indicates a difference in mating behavior.

The *splendens* complex is the most generalized component of the Splendens Section sharing several characters with members of the Tropicalis and Albomaculatus Sections such as scales on the *ppn,* possibly the more densely plumose male antenna in *celeste,* a simple clasper and poorly developed apical lobe on the sidepiece in the male genitalia, and fewer comb scales in the larva.

BIONOMICS. *Haemagogus splendens* breeds primarily in treeholes but has taken from other plant containers such as cut bamboo internodes and bromeliads. Females bite man readily. It has not been incriminated in disease transmission.

DISTRIBUTION (fig. 6). *Haemagogus splendens* is known from the Windward Islands: Martinique, St. Vincent, the Grenadines and Grenada. Material examined:

210 specimens; 50 males, 70 females, 48 pupae, 42 larvae; 48 individual rearings (26 larval, 18 pupal, 4 incomplete).

GRENADA. **St. Andrew:** Belair School, 8 July 1929 (GRR 21), 1 F [UCLA]. Lower Mt. St. Catherine, 600 m, 25 Oct 1963, R. Martinez (GR 89), 1 F [UCLA]. **St. George:** Anandale Waterfall, 210 m, 28 Oct 1963, R. Martinez (GR 95), 2 lpF (95-101,110), 1 lP (95-104), 1 F [UCLA]. Richmond Hill, 25 July 1942, E. Cochrane, 4 L [USNM]. Tempe, 180 m, 9 Oct 1963, R. Martinez (GR 14), 3 L [UCLA]. Woborn, 15 m, 10 Oct 1963, R. Martinez (GR 19), 1 lpF (19-111), 2 L [UCLA]. **St. Patrick:** River Antoine Estate, 60 m, 29 Oct 1963, R. Martinez (GR 99), 2 lpF (99-109,113), 2 L [UCLA]. **Locality unspecified:** 10 July 1929 (GRR 31), 10 F; same data (GRR 36), 7 M; same data, 17 July 1929 (GRR 58), 1 M; same data (GRR 58A), 1 F; same data, 22 July 1929 (GRR 66), 1 M; same data, 23 July 1929 (GRR 73,73A), 3 M, 1 F [UCLA]; same data, 10 July 1929, F. Root, 2 M, 2 F [BM].

THE GRENADINES. **Bequia Island,** 16 Aug 1929, W. Hoffman (LAR 33B), 4 F [UCLA]. **Union Island,** 20-29 Aug 1929, W. Hoffman (LAR 33F), 6 F; same data, 20 Aug 1929, W. Hoffman (LAR 49), 2 M [UCLA]. **Mayreau Island,** 20 Aug 1929, W. Hoffman (LAR 38), 2 M [UCLA]. **Carriacou Island,** 21 Aug 1929, W. Hoffman (LAR 36A), 1 F; 21 Aug 1929, W. Hoffman (LAR 67), 3 M, 1 F; 1 Aug 1929 (GRR 102), 3 M, 3 F [UCLA].

MARTINIQUE. Fort de France (18-22 km N), 8-9 Aug 1929, W. Hoffman (LAR 28A), 1 F [UCLA].

ST. VINCENT. **Charlotte:** Byera, 120 m, 25 Nov 1963, A. Guerra (VT 24), 1 lpF (24-102), 1 pF (24-103), 1 lp (24-101) [UCLA]. Chapmans, 120 m, 5 Dec 1963, A. Guerra (VT 53), 1 lpF (53-105), 1 pF (53-103) [UCLA]. Diamond, 60 m, 7 Dec 1963, A. Guerra (VT 58), 1 lpM (58-104), 1 lpF (58-105), 2 pM (58-101,102), 1 pF (58-103) [UCLA]. Mt. William, 120 m, 14 Dec 1963, A. Guerra (VT 88) 1 pM (88-103) [UCLA]. Three Rivers, 300 m, 20 Nov 1963, A. Guerra (VT-8), 1 lpM (8-101) [UCLA]. **St. Andrew:** Lowmans, 180 m, 5 Jan 1944, W. Leslie Webb, 1 M [USNM]; same data, 11 Dec 1963, A. Guerra (VT 77), 2 lpM (77-104,113), 4 lpF (77-105,106,110,112), 1 pM (77-103), 4 pF (77-101,102,108,109), 1 L [UCLA]; same data (VT 78), 1 lpF (78-105), 1 pM (78-103), 3 pF (78-101,102,104) [UCLA]. **St. David:** Chateaubelair (1.5 km NE), 30 m, 19 Nov 1963, A. Guerra (VT 1), 1 lpM (1-101), 1 lP (1-102); same data (VT 5), 1 lP (5-101) [UCLA]. Crater Lake, 850 m, 9 Dec 1963, A. Guerra (VT 63), 2 lpF (63-101,105), 1 pF (63-103) [UCLA]. **St. George:** Kings Hill, 120 m, 12 Dec 1963, A. Guerra (VT 80), 1 lpM (80-104), 1 pM (80-102), 2 pF (80-101,103) 3 F; same data (VT 81), 4 lpF (81-104-106,108), 2 pM (101,102), 8 M [UCLA]. **St. Patrick:** Layou, 120 m, 4 Dec 1963, A. Guerra (VT 50), 1 F (50-101). Wallilabou, 120 m, 27 Nov 1963, A. Guerra (VT 30), 1 lpM (30-101) [UCLA]. **Locality unspecified:** 6 Oct 1899, H. Powell, 2 F [BM]; 300 m, H. Smith, 3 F (holotype) [BM]; Low, 1 F [BM].

17. Haemagogus (H.) celeste Dyar & Nunez Tovar

Figs. 6,41,42

1927. *Haemagogus celeste* Dyar and Nunez Tovar, 1927:152. TYPE: *Lectotype* male (2270, "No. 3"), with pupal skin (2270) [uncertain association] and genitalia slide (2270), Maracay, Aragua, Venezuela, 11 Nov 1926, M. Nunez Tovar [USNM; selection of Stone and Knight, 1955:287]. Synonymized with *splendens* by Edwards (1932:179).

Haemagogus (Haemagogus) celeste of Dyar (1928:141-142); Anduze (1941a:829).

Haemagogus (Haemagogus) splendens in part of Lane (1939:120; 1953:779-781); Anduze (1941b: 13; 1947:354); Levi-Castillo (1951b:11,16-17); Stone, Knight and Starcke (1959:218); Forattini (1965:47-48); Cova Garcia, Sutil and Rausseo (1966a:60-61, fig. 120; 1966b:46,112-114, fig. 199); Aitken, Worth and Tikasingh (1968:257).

Haemagogus splendens in part of Anderson and Osorno-Mesa (1946:613); Hovanitz (1946:35); Kumm, Osorno-Mesa and Boshell-Manrique (1946:20); Osorno-Mesa (1947:453); Waddell

(1949:568,572); Levi-Castillo (1951:14); Komp (1954a:50; 1955e:277); Barreto Reyes (1955: 78).

Haemagogus albomaculatus in part of Howard, Dyar and Knab (1917:870).

Haemagogus regalis in part of Dyar and Knab (1906b:167).

FEMALE. Wing: 3.00 mm. Proboscis: 2.45 mm. Forefemur: 2.20 mm. Abdomen: about 3.05 mm. Dark scales of proboscis, palpus, wing and legs violet to purple. **Head:** Eyes widely separated above antennae (5 ommatidial diameters). Decumbent scales of vertex blue to violet, becoming green on occiput. Proboscis about 1.15-1.20 of forefemur; palpus about 0.14 of proboscis; antenna about 0.52-0.58 of proboscis. **Thorax:** Scales of mesonotum copper to bronze, bluish green to greenish blue over supraalar bristles, silver in antealar area; scales on scutellum usually greenish blue, rarely violet. *Apn* lobes with scales greenish blue to bluish green, often with silver scales dorsally and mesally; *ppn* with large patch of scales posteriorly, usually silver, rarely purple. **Legs:** Hindcoxa enlarged, its base slightly above upper margin of meron; length of forefemur about 1.50-1.60 of distance from top of thorax to apex of midcoxa. **Wing:** R_{2+3} about 0.35-0.45 of R_2. **Abdomen:** Dark scales purple to violet; usually with silver scales dorsally on tergites II-VII in rather broad basal band, occasionally continuous with lateral silver patches.

MALE (fig. 41). Wing: 2.40 mm. Proboscis: 2.50 mm. Forefemur: 1.95 mm. Abdomen: 2.55 mm. **Head:** Proboscis about 1.25-1.35 of forefemur; antenna moderately plumose, flagellar segment 4 with about 18-22 moderately developed bristles.

MALE GENITALIA (fig. 41). Apparently indistinguishable from *splendens*.

PUPA (fig. 41). Abdomen: about 3.75 mm. Trumpet: 0.50 mm. Paddle: 0.75 mm. **Cephalothorax:** Weakly to moderately pigmented, darker dorsally. Hairs 4,5-C weakly to moderately developed, subequal, single to triple, weaker than 7-C which is single. **Trumpet:** Medium brown, reticulate sculpturing moderate. **Abdomen:** Weakly to moderately pigmented, genital lobe and anterior segments usually darker. Float hair (1-I) with about 8-14 primary branches and 2-6 secondary branches. Hair 1-II-VII weakly to moderately developed, single to triple, subequal on all segments. Hair 2-VII usually considerably basad of 1-VII. Hairs 3-II,III,5-IV,V stronger on II, becoming slightly shorter on each succeeding segment. Hair 6-VII subequal to or stronger than 6-III-VI which are subequal. Hair 9-VII slightly to considerably cephalad of caudolateral margin of tergite, 1-4b; 9-VIII usually 5-8b. **Terminal Segments:** Male genital lobe about 1.0 of tergite VIII. **Paddle:** Weakly pigmented, midrib slightly darker; apex broadly rounded or very slightly acuminate. Hair 1-P single.

LARVA (fig. 42). Head: 0.90 mm. Siphon: 0.80 mm. Anal Saddle: 0.37 mm. **Segment VIII:** Comb scales 17-22(12-27), with single broadly rounded minutely fringed spine, in irregular double to triple row. **Siphon:** Index about 2.4(2.2-2.6). Pecten teeth 13-16(10-22), extending to about basal 0.50 of siphon. Hair 1-S triple (2-4). **Anal Segment:** Hair 4a-X 4-5b.

SYSTEMATICS. *Haemagogus celeste* can be separated from the remaining species of the Splendens Section: in the **adults** by (1) large patch of silver or occasionally purple scales on *ppn*, (2) broad basal bands of silver scales on abdominal tergites II-VII, (3) blue to violet scales on vertex and (4) moderately plumose male antenna; in the **male genitalia** as in *splendens;* and in the **larva** by the combination of (1) comb scales usually 17-22 and in double or triple row, (2) hair 7-III-VI subequal to hair 5 of corresponding segment, (3) usually 4 or 5 branched hair 4a-X and (4) pecten extending to about basal 0.50 of siphon.

Though indistinguishable from the closely related *splendens* in the male genitalia, *celeste* can be separated from *splendens* in the female by the blue to violet scales on the vertex and usually silver *ppn* scales; in the male by the moderately plumose antenna, each segment with about 18 to 22 bristles; in the pupa by hairs 3-II,III, 5-IV,V becoming weaker on each succeeding segment; and in the larva by usually 17 to 22 comb scales and the 4-or 5-branched hair 4a-X. The affinities of *celeste* to other species of *Haemagogus* are discussed above under *splendens.*

BIONOMICS. *Haemagogus celeste* usually breeds in treeholes and cut or broken bamboo internodes and in Venezuela it is often found in bromeliads. T.H.G. Aitken reports (personal communication) *celeste* to be found almost exclusively in mangrove treeholes on Trinidad, a somewhat different ecological situation than this species inhabits on the mainland, and unusual in that the other mangrove inhabiting species of the Splendens Section are seldom found outside that habitat. Females apparently attack humans readily. This species (as *splendens*) has been shown to be capable of transmitting yellow fever in the laboratory (Anderson and Osorno-Mesa, 1946) although it is a relatively inefficient vector (Waddell, 1949). It is not known to be a vector under natural conditions.

DISTRIBUTION (fig. 6). *Haemagogus celeste* is known from the lower Magdalena and Zulia Rivers of Colombia, the Orinoco basin, the Caribbean drainage of Venezuela and the islands of Trinidad and Tobago. Material examined: 951 specimens; 163 males, 222 females, 276 pupae, 290 larvae; 257 individual rearings (156 larval, 48 pupal, 53 incomplete).

COLOMBIA. **Boyaca**: Remolinos, 120 m, 2 July 1965, E. Osorno-Mesa et al. (COB 54), 3 lpF (54-10-12), 1 P, 1 1 [UCLA]; same data (COB 55), 5 lpM (55-12-15,17), 3 lpF (55-10,11,16), 2 P, 7 L [UCLA]; same data (COB 56), 1 lpM (56-20), 2 lpF (56-21,22), 1 L [UCLA]. **Magdalena**: El Retiro, 2 M gen [USNM]. **Santander del Norte**: Zulia, Feb 1944, H. Kumm, 3 M, 2 M gen, 2 F, 8 1 [UCLA, USNM].

TRINIDAD AND TOBAGO. TOBAGO: **St. Patrick**: Bon Accord Estate, 0 m, 15-16 Nov 1965, T. Aitken et al. (TOB 19), 1 F [UCLA]. Pigeon Point, 2-3 Aug 1957, T. Aitken; 5 F [UCLA]. TRINIDAD: **Caroni**: Caroni Swamp, 18 Oct 1956, H. Trapido et al., 2 F [UCLA]. **Mayaro**: Guayaguayare, 29 Oct 1964, A. Guerra (TR 790), 2 lpF (790-101,102) [UCLA]; same data (TR 802), 3 F [UCLA]. **Nariva**: Bush Bush Forest, Nariva Swamp, 11 Mar 1964, TRVL (TR 171), 2 lpM (171-113,192), 1 lpF (171-114), 1 lp (171-121) [UCLA]; same data, 27 May 1964 (TR 427), 2 lpM (427-138,149), 3 lpF (427-122,128,134), 1 F [UCLA]; same data (TR 432), 1 lpM (432-146), 2 L [UCLA]; same data, 21 June 1965 (TR 1224), 1 lpM (1224-11), 1 lpF (1224-10) [UCLA]; same data, 7 Sept 1961, T. Aitken (2-7/IX/61), 7 lpF (1,3-8), 1 lp (2) [UCLA]; same data, 26 Sept 1961 (9-26/IX/61), 2 lpM (1,2), 3 lpF (3-5) [UCLA]; same data, 30 Jan 1963 (1-30/I/63), 1 lpF (1) [UCLA]; same data, 14 Feb 1963 (12-14/II/63), 2 lpM (1,2), 1 lpF (4), 1 lP (3), 1 M [UCLA]; same data, 5 Mar 1963 (14-5/III/63), 3 lpM (1-3) [UCLA]; same data, 1 Dec 1960, 2 P [UCLA]; same data, 1959-1963, 3 M, 2 F, 36 lp, 8 p, 6 L [UCLA]. Cocal, beginning of boat line, 1 Sept 1960, T. Aitken (1/IX/60), 1 lpM (2) [UCLA]; same data, 1 Nov 1960 (1/XI/60), 1 lpM (2), 1 L [UCLA]. **St. Andrew**: North Manzanilla, 13 Sept 1957, T. Aitken, 17 M, 28 F [UCLA]. **St. George**: Chaguaramas, U.S. Naval Station, 23 Jan 1964, TRVL (TR 48), 1 lP (48-126), 1 L [UCLA]; same data, 6 Dec 1960, T. Aitken, 1 lp [UCLA]; same data, 2 Jan 1957, 1 M [UCLA]. Huevos Island,Tortue Bay, 75 m, 5 June 1965, R. Manuel (TR 1202), 1 lP (1202-10) [UCLA]; same data, 6 June 1965 (TR 1203), 2 lpM (1203-15,16), 6 lpF (1203-11-14,17,18), 1 pM (1203-100), 4 L [UCLA]; same data (TR 1204), 8 lpM (1204-11,13-15,17,19,20,22), 4 lpF (1204-10,16,18,21), 1 pM (1204-100), 1 pF (1204-101), 4 L [UCLA]; same data (TR 1205), 7 lpF (1205-11-17), 5 pM (1205-100-104), 3 L [UCLA]; same data (TR 1208), 6 lpM (1208-11-14,17,20), 9 lpF (1208-15,16,18,19,21-25), 1 pM (1208-100), 5 L [UCLA]; same data (TR 1209), 5 lpM (1209-12-16), 2 lpF (1209-17,18), 7 L [UCLA]; same data, 7 June 1965 (TR 1210), 2 lpM (1210-14,21), 7 lpF (1210-10-13,15-20), 4 pM (1210-100-102,104), 1 pF (1210-103), 7 L [UCLA]; same data, 5-7 June 1965 (TR 1211), 2 F [UCLA].

Monos Island, 260 m, 17 May 1964, R. Manuel (TR 409), 1 F [UCLA]. Monos Island, Grand Fond Bay Valley, 0 m, 2 Aug 1964, R. Manuel (TR 585), 1 lpF (585-122) [UCLA]; same data (TR 586), 2 lpM (586-124,128), 8 lpF (586-118,119,121,125,126,136,139), 1 pF (586-102), 2 lP (586-106,109) [UCLA]; same data (TR 590), 2 lpF (590-128,131) [UCLA]; same data (TR 591), 3 lpM (591-118,136,137), 5 lpF (591-124,127,131,132,134) [UCLA]; same data (TR 596), 1 F [UCLA]. **Locality unspecified:** F. Urich, 1 M, 1 M gen, 1 F [USNM]; June 1905, A. Busk, 1 F [USNM]; 28 June 1914, J. Dickson, 1 F [BM].

VENEZUELA. **Anzoategui:** Puerto La Cruz, 27 Sept 1944, 1 F [UCLA]. **Aragua:** Cagua, 400 m, 12 Aug 1969, J. Pulido and J. Valencia (VZ 339), 2 lpM (339-101,106), 2 lpF (339-100, 107), 1 lP (339-21), 1 l [UCLA]; same data (VZ 340), 1 lpM (340-40), 2 lpF (340-10,11), 1 M [UCLA]; same data (VZ 341), 1 lpM (341-40), 7 lpF (341-10-15,41), 2 pM (341-101,113), 6 pF (341-90,100-102,105,112,114), 1 lP (341-62), 13 M, 6 F, 3 l [UCLA]; same data (VZ 343), 1 lpF (343-10) [UCLA]. Guayabita, 14 July 1927, M. Nunez-Tovar, 3 M, 11 F [USNM]. Maracay, 600 m, 15 July 1969, J. Pulido and J. Valencia (VZ 204), 3 lpF (204-11,13,14), 2 pM (204-100, 101), 1 lP (204-16), 4 M, 3 F, 1 l [UCLA]; same data (VZ 205), 1 lpF (205-11) [UCLA]; same data (VZ 207), 1 lpF (207-20) [UCLA]; same data, 15 July 1969 (VZ 241), 1 lpF (241-20) 2 l [UCLA]; same data, 20 Aug 1969 (VZ 381), 3 lpM (381-11,12,70), 1 lpF (381-13), 2 pM (381-102,104), 1 pF (381-101), 3 lp (381-20,21) [UCLA]; same data, July 1929, F. Root, 5 M, 1 F [BM]; same data, 24 Aug-15 Nov 1926, M. Nunez-Tovar, 12 F, 1 M gen [USNM]. Ocumare de la Costa, 21 July 1927, M. Nunez-Tovar, 4 M, 5 F [USNM, BM]. Turmero, 560 m, 30 Aug 1966, Vasquez (VZ 28), 1 pM (28-102), 2 M, 2 P, 1 L [UCLA]; same data (VZ 29), 2 pM (29-108,109), 2 pF (28-106,107), 1 M, 1 F, 3 L [UCLA]; same data (VZ 30), 1 lpF (30-23), 5 pF (30-105,107-109,111), 1 p, 1 L [UCLA]; same data, 9 Sept 1966 (VZ 37), 1 pM (37-27), 2 lP (37-25,29), 8 L [UCLA]; same data (VZ 38), 1 pM (38-105), 2 pF (38-102,103), 1 P [UCLA]; same data, 14 Sept 1966 (VZ 41), 2 L [UCLA]; same data, 27 Oct 1966 (VZ 44), 1 lpF (44-13), 1 pM (44-12), 4 pF (44-15,17-19) [UCLA]; same data, 1 Nov 1966 (VZ 50), 1 p, 1 L [UCLA]; same data (VZ 51), 1 P [UCLA]; same data, 2 Nov 1966 (VZ 52), 1 pF (52-101), 1 lP (52-59) [UCLA]. **Carabobo:** Carabobo, Oct 1941, P. Anduze, 1 lp [USNM]. Mariara, 400 m, 19 July 1969, J. Pulido and J. Valencia (VZ 245), 1 lpM (245-10) [UCLA]. **Guarico:** Santa Maria de Ipire, Sept 1936, P. Anduze, 1 L [USNM]. Locality unspecified, July 1944, P. Anduze, 1 M gen [USNM]. **Monagas:** Maturin (42 km SE), 28 June 1958, A. Menke, 2 F [LACM]. Quiriquire, 12 June 1935, W. Komp, 1 F [UCLA]. Rancho Cachipo, Quiriquire, Sept 1936, W. Komp, 2 M gen [USNM]. **Yaracuy:** Boca de Yaracuy, Jan 1938, P. Anduze, 1 M, 1 F [USNM]. San Felipe, May 1937, P. Anduze, 1 M [USNM]. **Zulia:** Machiques, 1 June 1938, P. Anduze, 1 M gen [USNM]. **State unknown:** La Trinidad, 14 July 1927, M. Nunez-Tovar, 5 M, 4 F [USNM]. **Locality unspecified:** July 1948, P. Anduze, 1 M [USNM]; P. Anduze, 2 M gen [USNM].

Additional Records From the Literature

COLOMBIA. **Atlantico:** Barranquilla (Kumm, Osorno-Mesa and Boshell-Manrique, 1946:20). **Arauca:** Arauca (Kumm, Osorno-Mesa and Boshell-Manrique, 1946:20).

VENEZUELA. **Bolivar:** Heres, Roscio and Piar districts (Anduze, 1947:354).

18. Haemagogus (H.) iridicolor Dyar

Figs. 7,43,44

1921. *Haemagogus (Haemagogus) iridicolor* Dyar, 1921a:106-107. TYPE: *Lectotype* male (1468) with genitalia slide, Higuito, nr. San Mateo, Alajuela, Costa Rica, P. Schild [USNM; selection of Komp, 1955:29].

Haemagogus (Haemagogus) iridicolor of Bonne and Bonne-Wepster (1925:433); Dyar (1928: 136); Edwards (1932:179); Lane (1939:119); Stone, Knight and Starcke (1959:217); Forattini (1965:39-41); Galindo and Trapido (1967:107).

Haemagogus (Stegoconops) iridicolor of Lane (1953:789-790).
Haemagogus iridicolor of Kumm, Komp and Ruiz (1940:398); Arnett (1949:240); Galindo, Carpenter and Trapido (1949:278); Horsfall (1955:535-536); Komp (1955a:30); Trapido, Galindo and Carpenter (1955:529); Trapido and Galindo (1956a:304; 1957:126); Galindo and Trapido (1955:548; 1957:147).
Haemagogus splendens in part of Howard, Dyar and Knab (1917:867).

FEMALE. Wing: 2.90 mm. Proboscis: 2.30 mm. Forefemur: 2.20 mm. Abdomen: 2.90 mm. Dark scales of proboscis, palpus, wing and legs purple and violet. **Head:** Eyes widely separated above antennae (4 ommatidial diameters). Decumbent scales of vertex and occiput blue to violet with some purple reflections. Proboscis about 1.00-1.10 of forefemur; palpus about 0.16 of proboscis; antenna about 0.60-0.66 of proboscis. **Thorax:** Scales of mesonotum copper to dark bronze, usually dark green in fossa, greenish blue above supraalar bristles, silver in antealar area; scales on scutellum greenish blue. *Apn* lobes with violet scales; *ppn* bare or with small patch of silver scales posteriorly. **Legs:** Length of forefemur about 1.50-1.70 of distance from top of thorax to apex of midcoxa. **Wing:** R_{2+3} about 0.40-0.50 of R_2. **Abdomen:** Dark scales violet or purple with some violet reflections; silver scales present on tergites VI and VII in small median basal patch or indistinct basal band.

MALE (fig. 43). Wing: 2.70 mm. Proboscis: 2.45 mm. Forefemur: 2.30 mm. Abdomen: 3.65 mm. **Head:** Proboscis about 1.05-1.20 of forefemur; antenna short, about 0.50 of proboscis, sparsely plumose, flagellar segment 4 with 10-14 moderately developed bristles.

MALE GENITALIA (fig. 43). **Segment VIII:** Tergite about 0.85 of sternite, distal margin broadly emarginate, with numerous well developed setae, setae longer laterally. **Segment IX:** Tergite straight and weakly sclerotized mesally. **Sidepiece:** Conical, truncate, length about 2.5 times median width; basal tergomesal lobe enlarged, extending distally as raised area to near middle of sidepiece, with numerous setae, the distal ones short, becoming longer proximally, the more proximal ones enlarged, flattened and attenuate; a multiple row of short setae extending obliquely from distal margin of basal lobe to near distal third of sidepiece; setae absent between this row and apical lobe; apical lobe prominent, bearing about 20 moderately developed setae; apical sternomesal scales lanceolate to oblanceolate with acuminate tips. **Claspette:** Stem bowed inward near middle in dorsal aspect, thick basally, sharply angled dorsad near middle and narrowed on distal half; filament a broad, cuneiform leaf attached at apex of stem, somewhat rounded at dorsal angle. **Clasper:** Flattened, curved, expanded considerably on apical fourth and tapering to rather sharp point; spiniform short, spatulate, inserted subapically on inner surface. **Phallosome:** Aedeagus large, obovate, tip produced dorsally into small serrated carina, venter broadly open except on basal third, with sclerotized ridges lateroventrally. **Proctiger:** Cercal setae 3-5; apical knob of paraproct with about 20 serrations.

PUPA (fig. 43). Abdomen: about 3.25 mm. Trumpet: 0.40 mm. Paddle: 0.70 mm. **Cephalothorax:** Weakly to moderately pigmented, darker dorsally. Hairs 4,5-C rather weakly developed, subequal, single to triple, weaker than 7-C which is usually single. **Trumpet:** Medium to dark brown, lighter distally. **Abdomen:** Weakly to moderately pigmented, genital lobe and anterior segments slightly darker. Float hair (1-I) with about 8-14 primary branches and 2-6 secondary branches. Hair 1-II-VII rather weakly developed, usually single (1-4b) and subequal on all segments. Hair 2-VII short, considerably cephalad of 1-VIII. Hair 3-III slightly weaker

than 3-II,5-IV,V which are more or less subequal. Hair 6-VII weakly to moderately developed, subequal to or considerably stronger than 6-III-VI which are subequal. Hair 9-VII usually considerably cephalad of caudolateral margin of tergite, 2-5b; 9-VIII 5-10b. **Terminal Segments:** Male genital lobe about 1.4 of tergite VIII. **Paddle:** Weakly pigmented, midrib weakly pigmented; relatively broad; apex broadly rounded. Hair 1-P single.

LARVA (fig. 44). Head: 0.75 mm. Siphon: 0.65 mm. Anal Saddle: 0.30 mm. **Segment VIII:** Comb scales 25-28, with single broadly rounded, minutely fringed spine, in irregular triple row. **Siphon:** Index about 2.5(2.3-2.7). Pecten teeth about 12-15(8-16), extending to about basal 0.50-0.60 of siphon. Hair 1-S 4-5b. **Anal Segment:** Hair 4a-X 4-5b(4-7b).

SYSTEMATICS. *Haemagogus iridicolor* can be distinguished from most of the remaining species in the Splendens Section by the following characters: in the **adults,** from all species except *lucifer* by (1) dark coxal integument, (2) proboscis slightly longer (1.00-1.10) than forefemur, (3) scales of mesonotum usually copper to dark green but rarely blue and (4) dark abdominal scales purple or violet; in the **male genitalia** by the claspette filament which is a broad, cuneiform leaf inserted distally on claspette stem; and in the **larva** from all species except *regalis, lucifer* and *argyromeris* by the combination of (1) 25 to 28 comb scales in irregular triple row, (2) usually 4-or 5-branched hair 4a-X, (3) hair 7-III-VI subequal to hair 5 of corresponding segment, (4) relatively long spines on caudal margin of saddle and (5) pecten extending to about basal 0.50-0.60 of siphon.

This species can be determined with certainty only in the male genitalia as the adults resemble *lucifer* closely, except in specimens with silver *ppn* scales. The larva is indistinguishable from *lucifer, regalis* and *argyromeris,* and closely resembles *aeritinctus* except in the relative development of the spines of the caudal margin of the saddle, a character difficult to use and possibly not constant. The pupa apparently has no demarcating characters.

Haemagogus iridicolor, aeritinctus, regalis and *lucifer* form a closely related species complex, the *regalis* complex, marked by similarities in structure in all stages, similar or related ecological requirements and, for the most part, allopatric distribution. The 4 species probably arose from a parental stock in lower Central America, possibly as a result of geographical isolation. Geohistorical evidence as interpreted by Maldonado-Koerdell (1964:15-18) indicates the subsidence during middle Tertiary of parts of Caribbean Land, a Middle American early and middle Tertiary land mass which included much of present Central America and the West Indies, forming a series of small land masses in what is now southeastern Central America. The 4 species of this complex may have evolved at this time, each on a separate land mass. *Iridicolor* is probably autochthonous to the Atlantic rain forests of Nicaragua and Costa Rica as it reaches its greatest density in this area.

BIONOMICS. *Haemagogus iridicolor* breeds primarily in treeholes and cut or broken bamboo internodes, and has been found occasionally in terrestrial and epiphytic bromeliads and fallen fruits. In the rain forests of the Atlantic slope it is found primarily in treeholes but is more often taken in bamboo in the drier Pacific side of Costa Rica. It is found commonly from sea level to elevations of over 1000 meters. One collection was taken at over 2400 meters in a cloud forest in Costa Rica. Both *iridicolor* and *lucifer* occur together on the Atlantic side of western Panama. Although *iridicolor* reaches its maximum density in the rain forest of Costa Rica and Nicaragua, it is more abundant than *lucifer* in the mangrove swamps of Bocas del Toro province while *lucifer* is more common than *iridicolor*

in the forest. *Iridicolor* has never been incriminated in the transmission of yellow fever and nothing is known of its capability as a vector.

DISTRIBUTION (fig. 7). *Haemagogus iridicolor* extends from the Atlantic versant of Nicaragua and possibly Honduras (see *aeritinctus*) through both the Atlantic and Pacific versants of Costa Rica to extreme western Panama. Material examined: 1549 specimens; 242 males, 250 females, 404 pupae, 653 larvae; 378 individual rearings (239 larval, 104 pupal, 35 incomplete).

COSTA RICA. **Alajuela:** Alajuela, 925 m, 3 Nov 1971, D. and K. Schroeder (CR 508), 5 lpM (508-13,15-17,107), 5 lpF (508-10-12,14,18), 2 pM (508-102,106), 1 pF (508-105), 5 L [UCLA]; same data (CR 509), 2 lpM (509-13,14), 3 lpF (509-10-12), 2 pM (509-102,103), 2 pF (509-101, 104), 2 P, 7 L [UCLA]; same data, (CR 514), 1 lpM (514-12), 2 lpF (514-10,11), 1 L [UCLA]; same data, 14 Nov 1971 (CR 528), 2 lpM (528-22,23), 7 lpF (528-11,20,21,24,25,27,28), 9 pF (528-61,82,99,102,103,107,108,111,113), 7 pF (528-83,91,92,95,96,109,112), 1 F, 6 L [UCLA]; same data (CR 531), 2 lpM (531-10,23), 1 lpF (531-11), 3 pM (531-50,106,112), 8 pF (531-51,100, 103-105,109-111), 1 p, 6 P, 5 l, 17 L [UCLA]; same data, 26 May 1921-Apr 1922, A. Alfaro, 28 M, 16 F [USNM]. Alajuela (2 km S), 860 m, 27 July 1971, S. Heinemann (CR 295), 1 lpM (295-21), 1 lpF (295-20), 1 pF (295-100), 1 L [UCLA]. Alajuela (3 km S), 880 m, 13 Nov 1962, C. Hogue and W. Powder (CR 18), 1 lpM (18-109), 1 lpF (18-102), 1 pF (18-108), 1 lP (18-104) [UCLA]. Alajuela (3 km SE), 880 m, 18 July 1971, D. Heinemann (CR 268), 2 L [UCLA]; same data (CR 271), 2 lpM (271-32,34,35), 5 lpF (271-30,31,33,36,37), 1 pM (271-101), 1 lP (271-60), 2 L [UCLA]; same data, 13 Nov 1971, D. and K. Schroeder (CR 527), 1 lpM (527-10), 2 pM (527-101,102), 1 pF (527-100) [UCLA]. Atenas (6 km W), 950 m, 2 Aug 1971, S. Heinemann (CR 320), 4 lpM (320-10,14,15,18) 5 lpF (320-11,13,16,17,19) 1 pM (320-100,101), 1 lP (320-12) [UCLA]; same data (CR 321), 15 M, 1 F [UCLA]; same data (CR 322), 3 lpM (322-10,11,14), 6 lpF (322-12,13,15,17-19), 1 pF (322-100), 1 lp (322-16), 1 L [UCLA]; same data (CR 323), 4 L [UCLA]; same data (CR 324), 1 lpM (324-11), 1 lP (324-10), 2 L [UCLA]. Higuito, P. Schild, 9 M, 1 M gen, 7 F [USNM]. La Fortuna, 25 Oct 1951, W. Komp, 3 M, 3 F [UCLA]. San Mateo (3 km E), 300 m, 1 Nov 1971, D. and K. Schroeder (CR 498), 1 lpF (498-11), 1 lP (498-10) [UCLA]. San Ramon (3 km N), 1000 m, 12 Aug 1971, S. Heinemann (CR 343), 1 lpM (343-11), 3 lpF (343-12-14), 2 pM (343-100,101), 1 lP (343-10), 5 L [UCLA]; same data (CR 344), 1 lpM (344-10,11), 1 pM (344-104), 4 pF (344-100-103), 2 lP (344-33,36), 4 P, 3 L [UCLA]; same data (CR 345), 2 lpM (345-18,20), 9 lpF (345-10-17,19), 1 pM (345-105), 5 pF (345-100-104) [UCLA]. Volcan Poas Summit (3 km S), 2400 m, 14 Nov 1962, C. Hogue and W. Powder (CR 20), 1 lpF (20-101) [UCLA]. **Guanacaste:** Cerro Maravilla, 20 May 1921, A. Alfaro, 1 M [USNM]. **Heredia:** Puerto Viejo, 100 m, 15 Aug 1964, C. Hogue (CR 191), 5 L [UCLA]; same data, 8 Jan 1972, D. Schroeder (CR 585), 1 lpM (585-10) [UCLA]. **Limon:** Barra de Parismina, H. Kumm, 1 F [USNM]. La Bomba, 3 Oct 1971, D. Schroeder (CR 470), 2 lpM (470-11,12), 1 L [UCLA]. Limon, F. Knab, 2 F [USNM]. Limon (6 km SW), 14 Dec 1971, D. Schroeder (CR 550), 1 lpF (550-40) [UCLA]. Portete (5 km NW Limon), 2 m, 5 Oct 1971, D. Schroeder (CR 476), 5 lpM (476-12,14,18,19,60), 9 lpF (476-10,11,13,17,61-65), 5 pM (476-91,102,106,110,112), 5 pF (476-100,103-105,107), 2 lP (476-15,16), 6 P, 65 L [UCLA]; same data (CR 478), 7 lpM (478-11-13,15,17,19,32), 5 lpF (478-10,14,16,30,31), 1 pM (478-101), 1 pF (478-102), 1 lP (478-18), 1 P, 4 L [UCLA]. **Puntarenas:** Dominical, 30 May 1943, T. Aitken, 1 M, 1 F [UCLA]. Esparta (5 km E), 250 m, 13 Aug 1971, S. Heinemann and D. Schroeder (CR 356), 5 lpF (356-10,12-15), 2 pM (356-100, 101), 1 lP (356-11), 1 P, 1 l, 1 L [UCLA]; same data (CR 358), 5 lpF (358-14,15,20,21,23), 2 pM (358-102,105), 4 pF (358-103,106,109,111), 16 L [UCLA]. Golfito (GML), 1 lpM (03189) [UCLA]. Villa Niely, 8 Aug 1963, C. Hogue (CR 167), 7 L [UCLA]. **San Jose:** San Isidro del General, 21 Nov 1962, C. Hogue and W. Powder (CR 35), 2 lP (35-201,203), 1 F, 2 L [UCLA]; same data, 14 July 1963, C. Hogue (CR 149), 1 lpF (149-103), 3 lP (149-102,105,108), 3 M, 3 F, 4 p, 24 L [UCLA]; same data (CR 150), 1 M [UCLA]; same data, 21 June 1964 (CR 177), 2 pM (177-203,205), 1 pF (177-201), 1 lp (177-101) [UCLA]; same data (CR 178), 1 M gen, 1 L [UCLA]; same data, 24 June 1964 (CR 183), 14 L [UCLA]. Santa Ana (1 km N), 850 m, 25 July 1971, S. Heinemann (CR 293), 7 lpM (293-10-16), 4 lpF (293-17-19,21), 2 pM (293-103,104), 1 pF (293-101), 1 lP (293-20), 3 L [UCLA]. **Province unknown:** Suerre (Atlantic side),

22 July 1923, A. Alfaro, 2 F [USNM].

NICARAGUA. **Chontales:** Villa Somoza, June, July 1953 (GML), 2 lpM (01471,01518), 4 lpF (01453,01468,01522,01523), 1 pF (01521), 3 l [UCLA]. **Zelaya:** Bluefields, W. Thornton, 6 F [USNM]; same data, 11 July 1964, A. Quinonez (NI 36), 2 F [UCLA]; same data (NI 38), 1 lpM (38-12), 2 pF (38-100,105), 1 pF (38-104), 1 P, 55 L [UCLA]; same data, 13 July 1964 (NI 42), 1 lF (42-11), 1 pF (42-12), 12 L [UCLA]; same data (NI 43), 4 lpF (43-10-13), 3 pM (43-100-102), 1 l, 11 L [UCLA]; same data (NI 47), 7 L [UCLA]; same data, 20 July 1964 (NI 57), 1 lpM (57-30), 1 L [UCLA]; same data, 23 Nov 1971, D. and K. Schroeder (NIC 82), 2 F [UCLA]; same data, 26 Nov 1971 (NIC 108), 1 lpF (108-20) [UCLA]; same data, 27 Nov 1971 (NIC 112), 2 F [UCLA]; same data (NIC 115), 6 lpM (115-10-12,17,18,20), 6 lpF (115-13-16,19,21), 7 L [UCLA]; same data (NIC 117), 12 lpM (117-10,12-15,30,31,33,34,37,38,42), 7 lpF (117-11,16-19,36,39), 2 L [UCLA]; same data (NIC 118), 3 lpM (118-14,15,17), 6 lpF (118-10-12,16,18,19), 1 pM (118-100), 1 lp (118-13), 9 L [UCLA]; same data (NIC 126), 3 lpM (126-11,12,15), 3 lpF (126-13,14,16), 1 lP (126-10) [UCLA]; same data, 28 Nov 1971 (NIC 128), 6 lpM (128-10-12, 15-17), 3 lpF (128-13,14,18), 11 L [UCLA]; same data (NIC 129), 8 lpM (129-13-19,22), 5 lpF (129-10-12,20,21), 2 pM (129-100,101), 13 L [UCLA]; same data (NIC 131), 5 lpM (131-10-12, 14,15), 3 lpF (131-13,16,17), 2 L [UCLA]; same data (NIC 134), 2 lpM (134-11,12), 1 lpF (134-13), 1 pM (134-100), 1 P, 1 l [UCLA]; same data (NIC 135), 2 lpF (135-10,11), 1 L [UCLA]. El Puente, nr. Bluefields, 12 Sept 1967, A. Adames and Herrara (NIC 75), 1 lpM (75-13), 2 lpF (75-10,16), 3 lp (11,14,15) [UCLA]. Rio Curinhuas (100 km from mouth), 29 Nov 1971, I. Sanderson, 2 F [UCLA].

PANAMA AND CANAL ZONE. **Bocas del Toro:** Almirante, 29 Dec 1928, 1 M gen [USNM]; same data, Feb 1931, W. Komp, 1 M gen [USNM]; same data, 27 Apr 1963, A. Quinonez (PA 264), 1 lpM (264-111), 1 lpF (264-104), 3 pM (264-101,107,108), 1 lP (264-110) [UCLA]; same data, 29 Apr 1963 (PA 282), 1 L [UCLA]; same data, 4 May 1963 (PA 317), 1 pM (317-102), 1 l [UCLA]. Almirante (crematory), 30 m, 30 Apr 1963, A. Quinonez (PA 290), 1 lpF (290-106), 1 l, 8 L [UCLA]. Almirante, Bocas-Chiriqui Rd, 6 May 1963, A. Quinonez (PA 324), 1 lpF (324-101), 1 lP (324-102), 2 L [UCLA]; same data (PA 326), 1 pF (326-101) [UCLA]. Almirante, Nigua Creek, 4 May 1963, A. Quinonez (PA 311), 1 lpM (311-105), 1 lpF (311-103), 4 pM (311-101,102,104,105), 6 L [UCLA]; same data (PA 312), 1 lpF (312-102), 3 pM (312-110,112), 1 pF (312-101), 2 L [UCLA]. Bocas del Toro, 1947, P. Galindo, 6 lp [USNM]; same data, 4 Sept 1957 (GML), 1 lpM (03239), 1 l [UCLA]. Bocas del Toro, Big Creek, 9 Apr 1964, A. Quinonez (PA 653), 1 lpM (653-104), 2 lpF (653-103,105), 2 pM (653-106,108), 7 L [UCLA]. Secretarro, 7 June 1949, 12 M, 9 F [UCLA]. **Chiriqui:** Concepcion, 10 Nov 1949 (GML), 2 l [UCLA]. **Locality unspecified:** S. Carpenter, 1 M [UCLA].

19. Haemagogus (H.) aeritinctus Galindo & Trapido

Figs. 7,45,46

1967. *Haemagogus (Haemagogus) aeritinctus* Galindo and Trapido, 1967:103-111. TYPE: *Holotype* male with associated larval and pupal skins and genitalia slide, vicinity of Stann Creek, British Honduras, larva collected in *Rhizophora mangle* treehole, 5 Oct 1955, P. Galindo and H. Trapido [USNM].

Haemagogus (Haemagogus) aeritinctus of Stone (1970:157).
Haemagogus (Haemagogus) regalis in part of Dyar (1921a:105); Martini (1935:56); Stone, Knight and Starcke (1959:217).
Haemagogus regalis in part of Dyar and Knab (1906a:167).
Haemagogus albomaculatus in part of Howard, Dyar and Knab (1917:870).

FEMALE. Wing: 2.15 mm. Proboscis: 1.70 mm. Forefemur: 1.45 mm. Abdomen: 2.20 mm. Dark scales of proboscis, palpus, wing and legs primarily purple, with some violet reflections. **Head:** Eyes widely separated above antennae (4 omma-

tidial diameters). Decumbent scales of vertex and occiput purple and violet anteriorly and laterally, light yellowish brown posteriorly. Proboscis about 1.10-1.20 of forefemur; palpus about 0.15 of proboscis; antenna about 0.55-0.60 of proboscis. **Thorax**: Scales of mesonotum copper with some purple reflections, bluish green over supraalar bristles, silver in antealar area; scales on scutellum bluish green. *Apn* lobes with scales purple and violet, a few silver scales mesally; *ppn* bare. **Legs**: Integument of apex of coxae, trochanters and base of femora yellow; length of forefemur about 1.50 of distance from top of thorax to apex of midcoxa. **Wing**: R_{2+3} about 0.50 of R_2. **Abdomen**: Dark scales predominantly purple, with some violet and copper reflections; silver scales dorsally in indistinct basal band on tergites VII and VIII.

MALE (fig. 45). Wing: 2.30 mm. Proboscis: 2.05 mm. Forefemur: 1.80 mm. Abdomen: 2.85 mm. **Head**: Proboscis about 1.15 of forefemur; antenna sparsely plumose, flagellar segment 4 with about 6 moderately long bristles.

MALE GENITALIA (fig. 45). **Segment VIII**: Tergite about 0.85 of sternite, distal margin straight or slightly rounded, with numerous strong setae, those mesad stout and short. **Segment IX**: Tergite straight and unsclerotized mesally. **Sidepiece**: Conical, truncate, length about 2.5 times median width; basal tergomesal lobe enlarged, extending distad as raised area past middle of sidepiece, with numerous setae, short distally, becoming longer proximally, the more proximal ones much enlarged, flattened and attenuate; distal third of sidepiece without setae on mesal half; apical lobe prominent, bearing 10-15 moderately developed setae; apical sternomesal scales lanceolate to oblanceolate with acuminate tips. **Claspette**: Stem narrow, bent sharply dorsad at apical third and slightly expanded beyond; filament a flat, expanded leaf inserted distally on stem and terminating in a slightly recurved point. **Clasper**: Flattened, curved, expanded at apical fourth and tapering to a rather sharp point; spiniform short, spatulate, inserted subapically on inner surface. **Phallosome**: Aedeagus moderately large, obovate, tip expanded dorsally into serrated carina terminating in small beak; venter broadly open except on basal third, with sclerotized ridges lateroventrally which are expanded basally. **Proctiger**: Cercal setae 5; apical knob of paraproct with about 15 serrations.

PUPA (fig. 45). Abdomen: about 2.80 mm. Trumpet: 0.45 mm. Paddle: 0.55 mm. **Cephalothorax**: Moderately pigmented, darker dorsally. Hair 4-C weak, usually double, subequal to 5-C which is usually single and weaker than 7-C which is single. **Trumpet**: Light brown, reticulate sculpturing moderate. **Abdomen**: Rather weakly pigmented, genital lobe and anterior segments darker. Float hair (1-I) with about 8-10 primary branches and 2-6 secondary branches. Hair 1-II-VII weak, single to triple, subequal on all segments. Hair 2-VII considerably cephalad of 1-VII. Hair 3-II stronger than 3-III but weaker than 5-IV,V which are subequal. Hair 6-VII weaker than 6-III-VI which are subequal. Hair 9-VII near caudolateral margin of tergite, usually double; 9-VIII 4-7b. **Terminal Segments**: Male genital lobe about 1.4 of tergite VIII. **Paddle**: Weakly pigmented; relatively broad; apex broadly rounded. Hair 1-P single.

LARVA (fig. 46). Head: 0.70 mm. Siphon: 0.53 mm. Anal Saddle: 0.26 mm. **Segment VIII**: Comb scales 20-28, with single broadly rounded, minutely fringed spine, in irregular double row. **Siphon**: Index about 2.5. Pecten teeth 10-13, extending to about basal 0.45 of siphon. Hair 1-S 4b. **Anal Segment**: Spines on caudal margin of saddle reduced, very short, each with multiple teeth. Hair 4a-X 5b.

SYSTEMATICS. *Haemagogus aeritinctus* can be separated from the remaining species of the Splendens Section: in the **adults** by the combination of (1) bare *ppn*,

(2) scales of mesonotum copper, (3) proboscis about 1.10-1.20 of forefemur and (4) yellow integument of apex of coxae and trochanters; in the **male genitalia** by (1) claspette filament shaped like a flat, expanded leaf and inserted distally on stem and (2) flattened and sharply pointed clasper; and in the **larva** by the combination of (1) comb scales 20-28 and in irregular double row, (2) pecten extending to about basal 0.45 of siphon, (3) spines on caudal margin of saddle much reduced, and (4) hair 7-III-VI subequal to hair 5 of corresponding segment. The development of the spines on the caudal margin of the saddle is a difficult character to use and may be variable. If this character state breaks down, the larva of *aeritinctus* would be impossible to distinguish from *iridicolor, regalis, lucifer* and *argyromeris.*

This species is closely related to *iridicolor, regalis* and *lucifer,* with which it forms the *regalis* complex. The evolution of this group is discussed under *iridicolor.*

BIONOMICS. *Haemagogus aeritinctus* breeds in treeholes and is restricted to mangrove associations. It has never been taken inland. Females attack man readily and bite around the head, in contrast to most other species of *Haemagogus* which tend to bite low on the body. This species is not known to be involved in the transmission of yellow fever.

DISTRIBUTION (fig. 7). *Haemagogus aeritinctus* is known only from the Atlantic coast of British Honduras, Guatemala and northern Honduras. The two records from Honduras are based on immature stages and one or both of these may actually be *iridicolor.* Material examined: 46 specimens; 6 males, 6 females, 14 pupae, 20 larvae; 14 individual rearings (9 larval, 3 pupal, 2 incomplete).

BRITISH HONDURAS. **Belize:** Belize, 5 Oct 1955 (GML), 1 lpF (02157), 1 pF (02155) [UCLA]. **Stann Creek:** Stann Creek, 5 Oct 1955 (GML), 4 lpM (02180,02186,02189,02192), 4 lpF (02169,02173-02175), 2 pM (02187,02193), 1 lp (02166), 6 l [UCLA, USNM].

HONDURAS. **Colon:** Puerto Castilla, 9 Aug 1964, A. Quinonez (HON 14), 1 L; same data (HON 15), 2 L [UCLA]. **Cortes:** Puerto Cortes, Rio Mar, 10 Aug 1968, A. Adames (HON 64), 1 lP (64-10) [UCLA].

Additional Record From the Literature

GUATEMALA. **Izabal:** Puerto Barrios (Galindo and Trapido, 1967:111).

20. Haemagogus (H.) regalis Dyar & Knab

Figs. 7,47,48

1906. *Haemagogus regalis* Dyar and Knab, 1906a:167. TYPE: *Holotype* male (330 v) with associated larval (fragment) and pupal skins and genitalia slide (36.I.8b), Sonsonate, Sonsonate, El Salvador, 30 Aug 1905, F. Knab [USNM, 10024].

Haemagogus (Haemagogus) regalis of Dyar (1921a:105, in part; 1928:136); Edwards (1932:179); Martini (1935:56, in part); Lane (1939:120, in part; 1953:787-789); Stone, Knight and Starcke (1959:217, in part); Diaz Najera (1966:61); Galindo and Trapido (1967:109-110).
Haemagogus (Stegoconops) regalis of Bonne and Bonne-Wepster (1925:430).
Haemagogus regalis of Theobald (1910:493-494, in part); Kumm and Zuniga (1942:404); Trapido and Galindo (1956a:305); Vargas and Diaz Najera (1959:361); Diaz Najera (1960:187).
Haemagogus albomaculatus in part of Howard, Dyar and Knab (1917:870).
Stegoconops albomaculatus of Howard, Dyar and Knab (1913:fig. 163).
Aedes cyaneus in part of Dyar and Knab (1906a:191,202).

FEMALE. Wing: 3.25 mm. Proboscis: 2.50 mm. Forefemur: 2.45 mm. Abdomen: 3.50 mm. Dark scales of proboscis, palpus, wing and legs purple and violet.

Head: Eyes widely separated above antennae (4 ommatidial diameters). Decumbent scales of vertex and occiput blue with silver reflections. Proboscis about 1.00-1.10 of forefemur; palpus about 0.17 of proboscis; antenna about 0.70 of proboscis. **Thorax:** Scales of mesonotum copper to greenish blue or blue, bluish green over supraalar bristles, silver in antealar area; scales on scutellum greenish blue. *Apn* lobes with scales blue; *ppn* bare. **Legs:** Length of forefemur 1.50-1.60 of distance from top of thorax to apex of midcoxa. **Wing:** R_{2+3} about 0.40-0.45 of R_2. **Abdomen:** Dark scales usually blue with some purple reflections; usually silver scales present dorsally in basal band or median basal patch on tergites III or IV-VII.

MALE (fig. 47). Wing: 2.20 mm. Proboscis: 2.15 mm. Forefemur: 1.85 mm. Abdomen: 2.90 mm. **Head:** Proboscis about 1.12-1.20 of forefemur; antenna sparsely plumose, flagellar segment 4 usually with 12 moderately developed bristles.

MALE GENITALIA (fig. 47). **Segment VIII:** Tergite about 0.90 of sternite, distal margin broadly slightly emarginate, with long, stiff setae, more numerous and stronger mesally. **Segment IX:** Tergite slightly acclivous and weakly sclerotized mesally. **Sidepiece:** Conical, truncate, length about 2.5 times median width, basal tergomesal area enlarged, extending distad as raised area past middle of sidepiece, with numerous setae, short distally, becoming longer proximally, the more proximal ones considerably enlarged; distal third of sidepiece without setae on mesal half; apical lobe prominent, bearing 10-15 moderately developed setae; apical sternomesal scales lanceolate to oblanceolate, the more dorsal projecting more or less dorsad, those ventral projecting mesad. **Claspette:** Stem bowed inward near apex in dorsal aspect, narrow, bent sharply dorsad at apical third and tapering to rather acute apex; filament a flat, expanded leaf terminating in an acute point, inserted distally on stem and extending ventrally over apical third of stem as an attached, folded membrane. **Clasper:** Flattened, curved, more or less arcuate and terminating in a rounded point; spiniform short, spatulate, inserted subapically on inner surface. **Phallosome:** Aedeagus moderately large, obovate, tip expanded dorsally into a small serrated carina terminating in a beaklike process; venter broadly open on distal half, closed basally, with sclerotized ridges lateroventrally which are expanded basally. **Proctiger:** Cercal setae 4-6; apical knob of paraproct with about 15 serrations.

PUPA (fig. 47). Abdomen: about 2.95 mm. Trumpet: 0.35 mm. Paddle: 0.60 mm. **Cephalothorax:** Weakly to moderately pigmented, darker dorsally. Hairs 4,5-C more or less subequal, single to triple, weaker than 7-C which is single. **Trumpet:** Medium brown, lighter distally. **Abdomen:** Weakly to moderately pigmented, genital lobe darker, anterior segments slightly darker. Float hair (1-I) with about 10-14 primary branches and 2-6 secondary branches. Hair 1-II-VII weakly to strongly developed single, multiple or dendritic, more or less subequal on all segments. Hair 2-VII short, considerably cephalad of 1-VII. Hair 3-III weaker than 3-II which is subequal to or slightly weaker than 5-IV,V which are subequal. Hair 6-VII often moderately developed, stronger than or occasionally subequal to 6-III-VI. Hair 9-VII slightly to considerably cephalad of caudolateral margin of tergite, 3-4b; 9-VIII about 5-10b. **Terminal Segments:** Male genital lobe about 1.3 of tergite VIII. **Paddle:** Usually weakly pigmented, midrib weakly pigmented; relatively broad, apex usually broadly rounded, occasionally somewhat acuminate. Hair 1-P single.

LARVA (fig. 48). Head: 0.85 mm. Siphon: 0.70 mm. Anal Saddle: 0.32 mm. **Segment VIII:** Comb scales 22-26(18-29), with single broadly rounded minutely fringed spine, in irregular double to triple row. **Siphon:** Index about 2.5(2.1-2.7). Pecten teeth about 13-18, extending to about basal 0.45-0.50 of siphon. Hair 1-S 4-5b(3-6b). **Anal Segment:** Hair 4a-X 5b(4-6b).

SYSTEMATICS. *Haemagogus regalis* can be distinguished from most other species in the Splendens Section: in the **adults** by the combination of (1) bare *ppn*, (2) proboscis slightly longer (1.00-1.10) than forefemur, (3) abdomen with dark scales usually blue with silver scales dorsally at base of tergites III-VII and (4) coxae with dark integument; in the **male genitalia** by (1) arcuate clasper, (2) claspette stem uniformly narrow on basal half and (3) claspette filament extending posteriorly over distal third of stem as an attached membrane; and in the **larva** from all species except *iridicolor, lucifer* and *argyromeris,* by the combination of (1) usually 22 to 26 comb scales, (2) usually 5-branched hair 4a-X, (3) pecten extending to about basal 0.50 of siphon, (4) hair 7-III-VI subequal to hair 5 of corresponding segment, and (5) relatively long spines on caudal margin of saddle.

Closely allied to *iridicolor, aeritinctus* and *lucifer, regalis* forms the *regalis* complex with these 3 species. The possible evolution of this complex is discussed under *iridicolor.* The habitat of *regalis* is restricted to coastal areas, primarily mangrove swamps. It reaches its greatest density on the Pacific coast from El Salvador to Mexico but is also found on the Atlantic side of the Isthmus of Tehuantepec. This distribution pattern would tend to support the proposed Atlantic-Pacific connection at the Isthmus of Tehuantepec during middle Tertiary (Maldonaldo-Koerdell, (1964:15). A similar distribution pattern is found in *Deinocerites pseudes* Dyar and Knab, 1909, also a littoral species (Adames, 1971:76).

BIONOMICS. Little is known of the bionomics of *regalis.* It breeds mainly in treeholes but occasionally in other plant containers. It seems to be mostly restricted to mangrove swamps and adjacent coastal areas, although it is found inland at low elevations in swampy areas on the Caribbean coast of Mexico. It apparently is not involved in disease transmission.

DISTRIBUTION (fig. 7). *Haemagogus regalis* is known from the Atlantic coastal states of Tabasco and southern Veracruz, Mexico and the Pacific coast from southern Chiapas, Mexico to Honduras. The records in Stone, Knight and Starcke (1959: 217) of *regalis* from British Honduras and Panama and Colombia undoubtedly refer to *aeritinctus* and *lucifer,* respectively. Material examined: 153 specimens; 47 males, 33 females, 23 pupae, 50 larvae; 23 individual rearings (10 larval, 9 pupal, 4 incomplete).

EL SALVADOR. **La Liberdad**: Estero Ticuisiapa, H. Kumm, 5 M, 7 F, 7 l [UCLA, USNM]. **Sonsonate**: San Antonio, 4 Aug 1964 (SAL 10), 1 lP (10-105), 5 L [UCLA]. Sonsonate, 1 Aug 1964 (SAL 2), 2 L [UCLA]; same data (SAL 4), 1 pM (4-103), 1 lP (4-10), 17 L [UCLA]; same data, F. Knab, 3 M, 1 M gen, 4 F, 1 lp [USNM]. **Usultan**: Isla Espiritu Santo, H. Kumm, 3 M, 1 M gen, 2 l [USNM]. Peninsula de San Juan del Gozo, 30 July 1941, H. Kumm, 2 M gen, 2 F, 1 l [USNM]. **Locality unspecified**: 2 L [USNM].

GUATEMALA. **Escuintla**: Puerto de Iztapa, 17,18 July 1953, P. Galindo and H. Trapido (GML), 4 lpM (01114,01123,01125,01126), 3 lpF (01113,01116,01121), 3 pM (01130,01133, 01621), 3 pF (01129,01131,01132), 1 lp (01127), 10 M [UCLA, GML].

MEXICO. **Chiapas**: Puerto Madero, 3 Aug 1953 (GML), 1 M, 8 F [GML]. **Tabasco**: Tenosique de Pino Suarez, 2 M gen [USNM]. **Veracruz**: Coatzacoalcos, 2 Aug 1953, P. Galindo and H. Trapido (GML), 2 lpM (0998,03218), 1 lpF (01141), 2 pM (01145,01149), 8 M, 4 F [UCLA, GML]. Santa Lucrecia (Jesus Carranza), F. Knab, 1 F [USNM].

21. Haemagogus (H.) lucifer (Howard, Dyar & Knab)

Figs. 7,49,50

1913. *Stegoconops lucifer* Howard, Dyar and Knab, 1913:fig. 164. TYPE: *Lectotype* male

(299) on slide 309, Tabernilla, Canal Zone, Panama, 14 Apr 1909, A.H. Jennings [USNM; selection of Dyar, 1921a:107; see Stone and Knight, 1955:288]. Synonymized with *regalis* by Komp (1954c:193-195); resurrected by Trapido and Galindo (1956a: 305).

Haemagogus (Haemagogus) lucifer of Dyar (1921a:107; 1923:183; 1928:138-139); Bonne and Bonne-Wepster (1925:434); Edwards (1932:179); Lane (1939:119; 1953:781-782); Levi-Castillo (1951b:11,22-23); Stone, Knight and Starcke (1959:217); Forattini (1965:35-39); Cova Garcia (1966a:61-62, fig. 115; 1966b:112, fig. 200); Galindo and Trapido (1967: 109-110).

Haemagogus lucifer of Dyar (1925b:139); Kumm, Komp and Ruiz (1940:398); Boshell-Manrique and Osorno-Mesa (1944:173); Osorno-Mesa (1944a:45); Hovanitz (1946:35); Kumm, Osorno-Mesa and Boshell-Manrique (1946:20); Arnett (1949:240; 1950:107); Galindo, Carpenter and Trapido (1949:278; 1951a:118-119; 1955:158); Galindo, Trapido and Carpenter (1950:546); Carpenter, Galindo and Trapido (1952:162); Barreto Reyes (1955:78); Trapido, Galindo and Carpenter (1955:528); Galindo, de Rodaniche and Trapido (1956:1024); Galindo, Trapido, Carpenter and Blanton (1956:544); Trapido and Galindo (1956a:304; 1957:122); de Rodaniche and Galindo (1957:236); de Rodaniche, Galindo and Johnson (1957:682); Galindo, de Rodaniche and Johnson (1959:557); Kerr, Roca-Garcia and Bugher (1960:26); Groot, Morales and Vidales (1961:399); Galindo and de Rodaniche (1964:846).

Haemagogus regalis in part of Komp (1954c:193-195; 1956:37).

Haemagogus splendens in part of Busck (1908:64); Howard, Dyar and Knab (1917:867).

Haemagogus albomaculatus in part of Howard, Dyar and Knab (1917:870).

FEMALE. Wing: 2.80 mm. Proboscis: 2.35 mm. Forefemur: 2.15 mm. Abdomen: 2.80 mm. Dark scales of proboscis, palpus, wing and legs purple and violet. **Head:** Eyes widely separated above antennae (4 ommatidial diameters). Decumbent scales of vertex and occiput violet with some purple reflections. Proboscis about 1.05-1.15 of forefemur; palpus about 0.15 of proboscis; antenna about 0.60-0.65 of proboscis. **Thorax:** Scales of mesonotum dark green to copper, bluish green over supraalar bristles, silver in antealar area; scales on scutellum bluish green but occasionally purple on scutellar lobes. *Apn* lobes with scales violet to purple; *ppn* bare. **Legs:** Length of forefemur about 1.60-1.75 of distance from top of thorax to apex of midcoxa. **Wing:** R_{2+3} about 0.30-0.40 of R_2. **Abdomen:** Dark scales usually purple, occasionally blue to violet; usually with silver scales dorsally in small basal patch on tergites VI and VII.

MALE (fig. 49). Wing: 2.45 mm. Proboscis: 2.45 mm. Forefemur: 2.05 mm. Abdomen: 2.90 mm. **Head:** Proboscis about 1.15-1.20 of forefemur; antenna about 0.50 of proboscis, sparsely plumose, flagellar segment 4 with 12 moderately developed bristles.

MALE GENITALIA (fig. 49). **Segment VIII:** Tergite about 0.80 of sternite, distal margin broadly emarginate, slightly acclivous at midline, with numerous long stiff setae, generally longer and with slightly hooked tips laterally; a few large, cuneate scales laterally. **Segment IX:** Tergite acclivous and weakly sclerotized on midline. **Sidepiece:** Conical, truncate, length about 2.5 times median width; basal tergomesal area enlarged, extending distad as raised area to near distal third of sidepiece, with numerous setae, short distally, becoming longer proximally, the more proximal ones much enlarged, flattened and attenuate, distal third of sidepiece without setae on mesal half; apical lobe prominent, bearing 10-15 moderately developed setae; apical sternomesal scales lanceolate to oblanceolate with acuminate tips, the more dorsal projecting more or less dorsad, those ventral projecting mesad. **Claspette:** Stem bowed inward near apex in dorsal aspect, stout,

expanded slightly at basal third, then constricted slightly beyond middle, angled sharply dorsad at apical third and tapering to acute apex; filament a flat expanded leaf terminating in an acute point, inserted distally on stem and extending posteriorly over apical third of stem as attached folded membrane. **Clasper:** Flattened, curved, expanded on distal fourth and tapering to rather sharp point; apical spiniform short, spatulate, inserted subapically on inner surface. **Phallosome:** Aedeagus moderately large, obovate, tip expanded dorsally into a small serrated carina terminating in a beaklike process; venter broadly open on distal half, closed basally, with sclerotized ridges lateroventrally. **Proctiger:** Cercal setae 4 or 5; apical knob of paraproct with about 20 serrations.

PUPA (fig. 49). Abdomen: about 3.20 mm. Trumpet: 0.40 mm. Paddle: 0.65 mm. **Cephalothorax:** Usually weakly pigmented, occasionally moderately pigmented, somewhat darker dorsally. Hairs 4,5-C rather weakly developed, subequal, 1-4b, weaker than 7-C which is single. **Trumpet:** Medium brown, reticulate sculpturing moderate. **Abdomen:** Weakly pigmented, genital lobe and anterior segments slightly darker. Float hair (1-I) with about 10-15 primary branches and 2-6 secondary branches. Hair 1-II-VII weakly to strongly developed, single, multiple or dendritic, subequal on all segments. Hair 2-VII short, considerably cephalad of 1-VII. Hair 3-III usually weaker than 3-II,5-IV,V which are usually subequal. Hair 6-VII subequal to or stronger than 6-III-VI which are subequal. Hair 9-VII slightly to considerably cephalad of caudolateral margin of tergite, 2-5b; 9-VIII 4-8b. **Terminal Segments:** Male genital lobe about 1.3 of tergite VIII. **Paddle:** Weakly pigmented, midrib weakly pigmented; relatively broad, apex usually broadly rounded. Hair 1-P single.

LARVA (fig. 50). Head: 0.80 mm. Siphon: 0.75 mm. Anal Saddle: 0.31 mm. **Segment VIII:** Comb scales 25-28(21-33), with single broadly rounded, minutely fringed spine, in irregular double to triple row. **Siphon:** Index about 2.4(2.0-2.6). Pecten teeth about 13-15(9-17), extending to about basal 0.50 of siphon. Hair 1-S 4b(3-5b). **Anal Segment:** Hair 4a-X 4-6b.

SYSTEMATICS. *Haemagogus lucifer* can be distinguished from most of the species of the Splendens Section by the following characters: in the **adults**, from all except *iridicolor,* by (1) dark coxal integument, (2) proboscis about 1.05 to 1.15 of forefemur, (3) dark green to copper scales of mesonotum, and (4) dark scales of abdomen usually purple, occasionally blue to violet; in the **male genitalia** by (1) clasper expanded on distal fourth and tapered to sharp point beyond, (2) stout claspette stem which is expanded at basal third and (3) claspette filament extending posteriorly over distal third of stem as an attached membrane; and in the **larva**, from all except *iridicolor, regalis* and *argyromeris,* by the combination of (1) usually 25 to 28 comb scales, (2) hair 4a-X usually 4 to 6 branched, (3) pecten extending to about basal 0.50 of siphon, (4) hair 7-III-VI subequal to hair 5 of corresponding segment and (5) relatively long spines on caudal margin of saddle.

Haemagogus lucifer, iridicolor, aeritinctus and *regalis* form the *regalis* complex, the evolution of which is discussed under *iridicolor.* The present distribution of *lucifer* indicates that it probably arose on a separate land mass near the present Panamanian Isthmus area and spread into northwestern South America when that land mass became connected to South America. *Lucifer* seems to be widespread, though relatively uncommon, in the drainage of the Magdalena River with penetrations into the upper Orinoco and Amazon systems.

BIONOMICS. *Haemagogus lucifer* reaches its maximum density in primary tropical rain forest in Panama but is found in large numbers in second growth and

occasionally in peridomestic situations in areas of high rainfall on the Atlantic side of Panama. It breeds almost exclusively in treeholes. As most eggs hatch when first flooded, *lucifer* is abundant soon after the onset of seasonal rains and maintains relatively high populations throughout the rainy season. It is arboreal in habit, though not as much as *janthinomys*. Females bite man readily, usually around the lower part of the body. Males have been observed near the host where they await females. Copulation takes place in flight. Where *lucifer* and *iridicolor* occur together on the Atlantic coast of western Panama, *lucifer* is more common in the forest and *iridicolor* predominates in coastal mangrove.

Lucifer has been found to be capable of harboring yellow fever virus in the laboratory (Galindo, de Rodaniche and Trapido, 1956) and has been reported to be naturally infected with this virus (de Rodaniche, Galindo and Johnson, 1957). A thorough discussion of the bionomics and disease potential of *lucifer* may be found in Galindo, Trapido and Carpenter (1950) and Galindo, Carpenter and Trapido (1951; 1955).

DISTRIBUTION (fig. 7). *Haemagogus lucifer* is known from the Atlantic versant of Costa Rica and western Panama, the Atlantic and Pacific versants of central and eastern Panama and the Caribbean drainage of Colombia, with one record from the upper Orinoco basin of Colombia and one record from the upper Amazon basin of Ecuador. Material examined: 1246 specimens; 273 males, 348 females, 247 pupae, 378 larvae; 247 individuals (107 larval, 68 pupal, 72 incomplete).

COLOMBIA. **Antioquia:** Casabe, 3 lM gen [USNM]. Turbo, 1 M gen [USNM]. **Cundinamarca:** Caparrapi, Volcanes Forest, 1000-1500 m, 25 May 1943, H. Kumm, 1 lp, 2 M, 1 M gen, 1 F [UCLA, USNM]. Malta, 280 m, 18 Feb 1943, E. Osorno-Mesa, 1 M, 1 M gen, 1 F [UCLA, USNM]. **Meta:** Villavicencio, 1944, M. Bates, 1 M, 1 M gen, 1 l [USNM]. **Santander:** Barranca (nr. Velez), H. Kumm, 1 M [USNM]. Pescadera, Rio Horta, H. Kumm, 1 M [USNM].

COSTA RICA. **Limon:** Guapiles, H. Kumm, 2 M, 1 F, 1 l [USNM].

ECUADOR. **Napo-Pastaza:** Ila, R. Levi-Castillo, 4 M gen [USNM].

PANAMA AND CANAL ZONE. **Bocas del Toro:** Almirante, 9 May 1963, A. Quinonez (PA 342), 2 F [UCLA]; same data, Feb 1931, W. Komp, 1 F [UCLA]; same data, 20 Aug 1944, 1 l, 1 L [UCLA]. Almirante, mile 2, 26 Apr 1963, A. Quinonez (PA 254), 1 lpF (254-104), 2 p [UCLA]; same data, 27 Apr 1963 (PA 259), 1 lpM (259-113), 3 lpF (259-102,115,117), 5 pM (259-101, 106,107,109,110), 2 pF (259-103,108), 2 lP (259-112,114), 1 P, 10 L [UCLA]. Chiriquisito, 19 Apr 1963, A. Quinonez (PA 234), 1 lpM (234-108), 1 pM (234-105), 6 L [UCLA]; same data (PA 235), 1 lp (235-103) [UCLA]; same data, 20 Apr 1963 (PA 245), 4 lpM (245-101,102,104,106), 5 lpF (245-108-111,113), 1 lp (245-103), 1 lP (245-112), 1 P, 2 L [UCLA]. El Guabo, nr. Chriquisito, 15 Apr 1963, A. Quinonez (PA 205), 1 lpM (205-108), 1 lpF (205-107), 1 lM (205-103) 1 pM (205-101), 5 L [UCLA]; same data (PA 206), 1 L [UCLA]. Nigua Creek, nr. Almirante, 27 Apr 1963, A. Quinonez (PA 257), 1 lpM (257-113) [UCLA]; same data, 28 Apr 1963 (PA 277), 3 lpF (277-105-107), 7 pM (277-102-104,108,111-113), 2 pF (277-109,110) [UCLA]; same data, 2 May 1963 (PA 300), 5 L [UCLA]. **Canal Zone:** Barbacoas Island, 14 Dec 1965, A. Quinonez (PA 904), 1 pM (904-104), 2 pF (904-100,103) [UCLA]. Barro Colorado Island, 7 May 1943, W. Komp, 3 lM (43-68,83,101), 3 lF (43-73,77,99), 2 lp (43-103,108), 8 M, 10 F, 22 l [UCLA, USNM]; same data, 21 May 1943, G. Fairchild, 7 lM (43-141,141,147,147,147,147,191), 3 lpF (43-201), 2 lF (43-157,159), 12 M, 1 M gen, 3 F, 6 l [UCLA, USNM]; same data, 23 May 1943, W. Komp, 2 M, 2 F [UCLA]; same data, 31 May 1943, 2 lF (43-225,233), 1 M, 1 F, 5 l [UCLA, USNM]; same data, 15 May 1945, 1 lpM (5-143), 2 lpF (5-142,143), 1 M [UCLA, USNM]; same data, 22 May, 2 lF (5-220,244) [UCLA, USNM]; same data, 23 May 1945, 2 lF (5-226,237) [UCLA]; same data, 26 May 1945, 1 lM (5-427), 1 F [UCLA, USNM]; same data, 3 Dec 1945, A. Quinonez (PA 856), 1 lp (856-11), 1 F [UCLA]; same data (PA 857), 2 lpM (857-10,15), 4 lpF (857-11,14), 3 pM (857-102,103,106), 8 pF (857,100,100a,101,104,105,108-110), 3 M, 2 F, 6 p, 6 P [UCLA];

same data (PA 860), 1 pM (860-100), 1 l [UCLA]; same data, 4 Dec 1965 (PA 861), 2 lpM (861-17,20), 3 lpF (861-21,23,23a), 1 lP (861-22), 2 M, 2 F, 3 p, 1 L [UCLA]. Camacho, 22 Apr 1922, J. Shropshire, 1 F [USNM]; same data, 1 June 1922, 1 F [USNM]. Chagres Camp, 25 July 1921, thru C. Ludlow, 1 M [USNM]. Chagres River, 2 June 1952, S. Carpenter, 2 F [UCLA]. Chagres River at Pina, 4 Aug 1943, W. Komp, 1 pM (43-275) [UCLA]; same data, 5 Aug 1943, 1 lp (43-273), 1 l [USNM]. Chiva Chiva, nr. Miraflores, May 1945, W. Komp, 1 M [UCLA]; same data, 11 Nov 1965, A. Quinonez (PA 768), 1 lpM (768-10), 2 lpF (768-21,22), 1 pM (768-100), 2 M, 2 P, 3 l [UCLA]; same data (PA 771), 1 lpM (771-24), 1 lpF (771-25), 2 pM (771-21,23), 3 pF (771-22,26,100), 3 M, 2 F, 3 p [UCLA]; same data (777), 1 F [UCLA]. Contractor's Hill (0.8 km N), 13 Dec 1965, A. Quinonez (PA 898), 1 lpM (898-11), 1 pF (898-10), 2 M, 2 p, 1 l, 1 L [UCLA]. Corozal, 20 June 1920, J. Zetek, 1 F [USNM]; same data, 15 Jan 1943, W. Komp, 1 F [UCLA]; same data, 29 Jan 1943, 1 M, 1 F [UCLA]; same data, 30 Jan 1943, 2 l [UCLA]; same data, 2 Feb 1943, 1 l [UCLA]; same data, 18 Feb 1943, 2 M [UCLA]; same data, 31 Aug-7 Sept 1943, 4 l [USNM]; same data, 26 Mar 1945, 1 pM (5-63), 18 lp (5-47,48,50,53,55,57,58,58,59,61, 62,65-67,82,82,84,84), 6 l [UCLA, USNM]; same data, 3-4 May 1945, 5 lpF (5-109,117,119,123, 125), 1 lF (5-121), 1 pM (5-118), 1 lp (5-110), 7 F, 8 M, 1 p, 6 l [UCLA, USNM]; same data, 13 June 1945, 4 l [UCLA, USNM]. Corozal Damsite, 2 Mar 1943, W. Komp, 2 M, 1 F [UCLA]; same data, 6 May 1943, 1 lF (43-83), 3 M, 3 F [UCLA, USNM]; same data, 28 July 1943, 1 lM (43-255), 1 F [UCLA]; same data, 18 Sept 1943, 4 lM (43-317A) [UCLA]; same data, 12 Jan 1944, 1 M [UCLA]. Empire, 8 July 1922, J. Shropshire, 1 M gen [USNM]; same data, 7 Aug 1944 (ASM 91-1), 1 F [UCLA]. Farfan, 24 June 1949, 1 F [UCLA]. Ft. Clayton, 11 Nov 1944, Adams and Van Doren (ASM 165-1), 1 L [UCLA]; same data, 28 Nov 1944, K. Frick (ASM 300-3), 1 L [UCLA]; same data, 19 Dec 1951-12 June 1952, S. Carpenter, 8 F [UCLA]. Ft. Davis, 27 Dec 1951-10 Nov 1953, S. Carpenter, 5 F [UCLA]; same data, 22 Nov 1965, R. Schick and A. Quinonez (PA 814), 1 lpF (814-10), 1 M, 1 p, 1 l [UCLA]. Ft. Gulick, 17 Dec 1951, S. Carpenter, 3 F [UCLA]. Ft. Kobbe, 4 June 1952, S. Carpenter, 2 F [UCLA]. Ft. Randolph, 9-19 July 1938, Richardson, 3 M, 5 F [UCLA]; same data, Aug 1938, W. Komp, 2 M gen [USNM]; same data, 8 Aug 1939, 1 M, 6 F [UCLA]. Ft. Sherman, 3 M, 1 L [UCLA]; same data, 5 May-4 Nov 1949, 11 M, 1 M gen, 10 F [UCLA, Utah]; same data, 2 May 1951 (GML), 1 lM (02121) [UCLA]; same data, 11 July 1956 (GML), 1 lpM (02975), 1 lpF (02963) [UCLA]; same data, 1916, L. Dunn, 1 F [USNM]; same data, 16 July 1920, J. Zetek, 2 F [USNM]. France Field, 2 Aug 1972, H. Arnell and M. Boreham (PA 1157), 4 lpM (1157-10-12,18), 7 lpF (1157-13-17,19,20) [UCLA]. Gatun, 15 Sept 1926, D. Curry, 1 lp [USNM]. Gatun Farm, 17,18 Aug 1953, S. Carpenter, 10 F [UCLA]. Juan Mina (6 km NE Gamboa), 25 m, 18 Jan 1963, A. Quinonez (PA 5), 1 lpM (5-105), 1 lpF (5-103), 2 lP (5-107,108), 1 P, 1 L [UCLA]; same data, 20 July 1972, H. Arnell and R. Hinds (PA 1138), 1 pF (1138-100) [UCLA]. Juan Mina (2 km W), 19 July 1972, H. Arnell and R. Hinds (PA 1130), 1 pM (1130-100), 1 l [UCLA]. Largo Remo Island, 27 July 1926, D. Curry, 2 M, 2 F [UCLA, USNM]. Lion Hill, A. Busck, 1 M, 2 F [USNM]. Madden Forest Preserve, George Green Park (0.5 km W), 100 m, 10 July 1972, H. Arnell (PA 1096), 5 lP (1096-11-15), 1 L [UCLA]. Madden Forest Preserve, Las Cruces Trail, 100 m, 16 Nov 1965, A. Quinonez and Moody (PA 792), 2 lpF (792-10,12) [UCLA]; same data, 10 July 1971, H. Arnell (PA 1098), 1 lpM (1098-14), 2 lpF (1098-11,13), 1 pM (1098-100), 2 lP (1098-10,12), 2 L [UCLA]. Margarita, 14 June 1922, J. Shropshire, 1 M [USNM]; same data, 8 Oct 1964, A. Quinonez (PA 714), 1 lpF (714-12), 1 lP (714-16), 4 L [UCLA]; same data (PA 716), 1 lpM (716-10) [UCLA]. Miraflores (Hwys C-2, C-21), 10 Nov 1965, R. Schick and A. Quinonez (PA 767), 1 lpF (767-10), 2 pF (767-100,101), 1 F, 2 L [UCLA]. Mojinga Swamp, 10 m, 8 July 1949, 1 lp [UCLA]; same data, 21 June 1934, W. Komp, 1 l [USNM]; same data, 8 July 1949, L. Rozeboom (PAR 9.1-9.3), 2 M, 1 F [UCLA]; same data, 13 Oct 1964, A. Quinonez (PA 721), 4 pM (721-11,14,15,100), 2 pF (721-10,101), 2 L [UCLA]; same data (PA 724), 1 lpM (724-10), 1 pM (721-102), 1 pF (721-11); same data (PA 727), 2 pM (727-101,103) [UCLA]; same data, 29 July 1972, H. Arnell (PA 1153), 1 lpF (1153-20), 2 pM (1153-100,101), 2 L [UCLA]. Mt. Hope, 12 July 1922, J. Shropshire, 1 M, 1 M gen, 1 F [USNM]. Summit, 11 Oct 1939, W. Komp, 1 M [UCLA]; same data, 1-3 Nov 1939, 1 M, 2 F [UCLA]; same data, 12 Nov 1943, 2 l [UCLA]; same data, 30 Aug 1944, 1 lp [UCLA]; same

data, 25 May 1945, 2 lF, 1 M [UCLA]; same data, Nov 1946, N. Krauss, 1 F [UCLA]. Tabernilla, A. Busck, 3 M, 2 F [UCLA, USNM]; same data, 24 July 1908, A. Jennings, 7 M, 1 M gen, 20 F, 2 p [USNM]; same data, 30 July 1908, 1 M, 1 M gen, 1 F [USNM]; same data, 22 Dec 1908, 1 M, 1 M gen [USNM]; same data, 14 Apr 1909, 1 M, 1 M gen, 1 F [USNM]. Toro Point (Ft. Sherman), 7 Jan 1922, J. Shropshire, 1 M [USNM]. Atlantic side (locality unspecified), June 1938, W. Komp, 5 M, 4 F [UCLA]. Canal Zone (locality unspecified), A. Jennings, 5 F [USNM]. **Cocle:** El Valle, 600 m, 4 Sept 1938, W. Komp, 5 F [UCLA]; same data, 5 June 1945, 1 lM (5-322), 1 lF (5-330), 1 pM (5-371A), 1 lp (5-387), 2 M, 1 l [UCLA, USNM]; same data, 5 June 1945, R. Arnett and W. Komp (ASM 613), 3 M, 10 F [UCLA]; same data (ASM 615), 2 M, 4 F [UCLA]; same data, 10 July 1949, L. Rozeboom (PAR 13.2, 13.4), 2 M, 1 F [UCLA]; same data, 13 Aug 1963, A. Quinonez (PA 502), 1 lpF (502-101), 1 lF (502-102), 1 lP (502-103), 6 L [UCLA]; same data (PA 507), 4 L [UCLA]; same data, 19 Aug 1963 (PA 522), 2 lpM (522-101,102) [UCLA]. **Colon:** Buena Vista, 28 Sept 1949, 1 M, 1 F [UCLA]; same data, 24 Sept 1964, A. Quinonez (PA 710), 1 lpF (710-12), 1 pM (710-101), 1 L [UCLA]. Cativa, 18 Nov 1949, 1 M, 6 F [UCLA]; same data, 22 Nov 1965, R. Schick and A. Quinonez (PA 807), 1 lpF (807-10), 1 pM (807-100), 2 F, 1 L [UCLA]. Pina, 11 July 1956 (GML), 3 lpF (02961,02970,02972), 1 pM (02962); same data, 30 Nov 1963, A. Quinonez (PA 578), 2 lpM (578-101,102), 2 lpF (578-103,104), 1 lP (578-105), 17 L [UCLA]. Portobelo (Caldera Island), 12-16 Aug 1908, A. Jennings, 1 M, 1 M gen [USNM]. Portobelo, 23 May 1908, A. Jennings, 1 F [UCLA]; same data, 13 Mar 1911, A. Busck, 1 F [UCLA]; same data, 4 Dec 1963, A. Quinonez (PA 581), 1 p, 5 L [UCLA]; same data, 9 Dec 1963 (PA 600), 1 pM (600-101), 3 pF (600-102,104,107), 1 lP (600-106), 33 L [UCLA]; same data (PA 601), 1 lpM (601-103), 2 L [UCLA]. Salud, 11 July 1956 (GML), 1 lpM gen (02967), 2 pM (02951,02952) [UCLA]. **Darien:** El Real, H. Kumm, 1 F [UCLA]. La Palma, 120 m, 26 Nov 1966, O. Berlin (PA 951), 2 lpM (951-10,11), 1 pM (951-114) [UCLA]; same data, 60 m, 7 Dec 1966, O. Berlin and R. Hinds (PA 988), 1 lpF (988-10) [UCLA]; same data (PA 991), 1 lpM (991-10) [UCLA]. Paya, 25 Feb 1958 (GG 1), 4 lpM (1-103,105,106,109), 6 lpF (1-101,107,108,110,112, 116), 1 pM (1-121) 4 pF (1-104,111,113,123), 1 F [UCLA]; same data, 21 Feb 1958 (GG 1), 1 lpF (1-131) [UCLA]. Pucro, 8 July 1958 (GG 109), 2 P [UCLA]. (?Rio) Tuira, 26 Feb 1958 (GG 31), 3 M [UCLA]. Rio Tuira at mouth of Rio Paya, 1 Mar 1958 (GG 49), 4 M [UCLA]; same data, 2 Mar 1958 (GG 59), 2 M [UCLA]; same data, 3 Mar 1958 (GG 69), 2 M [UCLA]; **Panama:** Cerro Azul, May-Dec 1954 (GML), 8 l [UCLA]. Cerro Campana, 760 m, 28 Aug 1963, A. Quinonez (PA 537), 1 M [UCLA]; same data, 29 Aug 1963 (PA 539), 1 F [UCLA]; same data (PA 540), 5 F [UCLA]. Cerro La Victoria, 1949, H. Trapido, 1 M, 22 F [UCLA]. El Capesito (nr. San Carlos), 150 m, 13 Aug 1963, A. Quinonez (PA 503), 1 pF (503-126) [UCLA]. El Llano, Rio Bayano, July 1942, H. Kumm, 1 M gen [UCLA]; same data, 1943, 6 M [UCLA]. La Chorrera, 4 July 1944 (ASM 18), 1 L [UCLA]. Lagarto (nr. Bejuco), 8 June 1945, R. Arnett (ASM 619), 3 M, 3 F [UCLA]; same data, 9 June 1945 (ASM 624), 2 M, 6 F [UCLA]; same data, 12 Aug 1963, A. Quinonez (PA 500), 1 lpF (500-103), 3 lP (500-101, 102,104) [UCLA]. La Joya, (?La Jolla, nr. Pacora) 21 June 1944, P. Adams (ASM 9-1), 2 F [UCLA]. La Zumbadora (nr. Cerro Azul), 600 m, 15 Feb 1963, A. Quinonez (PA 94), 1 P, 1 l, 1 L [UCLA]; same data, 18 Feb 1963 (PA 114), 1 L [UCLA]. Nuevo Emperador, 23 Nov 1964, A. Quinonez (PA 824), 1 M, 1 P [UCLA]; same data (PA 825), 1 lpF (825-10), 2 M, 2 F, 2 p, 2 l [UCLA]. Pacora, 9 June-13 Sept 1949, 2 F [UCLA]; same data, 10 Nov 1953, S. Carpenter, 5 F [UCLA]. Paja (Nuevo Emperador), 15 Apr 1941, G. Fairchild, 1 F [USNM]. Panama, 1 F [USNM]; same data (GML), 2 lpM (02124,02125) [UCLA]; same data, A. Jennings, 1 lp [USNM]; same data, 10 May 1941, Middlecauff, 2 L [UCLA]. Rio Pequini, patio del canpamento, 10 Dec 1965, J. Mena (PA 924), 1 lpF (924-10), 1 L [UCLA]. Taboga Island, A. Busck, 1 F [USNM]. Tocumen, 1 June 1949, S. Carpenter, 1 M [UCLA]. **Province unknown:** Cabima, 24,26 May 1911, A. Busck, 2 F [USNM]. **Locality unknown:** W. Komp, 1 M, 1 F, 4 l [UCLA, USNM].

Additional Record From the Literature

COLOMBIA. **Cordoba:** Monteria (Kumm, Osorno-Mesa and Boshell-Manrique, 1946:20).

22. Haemagogus (H.) argyromeris Dyar & Ludlow

Figs. 6,51,52

1921. *Haemagogus argyromeris* Dyar and Ludlow, 1921:679-680. TYPE: *Lectotype* male with genitalia slide (1456), Corozal, Canal Zone, Panama, larva taken in a "container", 27 Oct 1920 [USNM; selection of Stone and Knight, 1955:287].

1921. *Haemagogus (Haemagogus) gladiator* Dyar, 1921a:108-109. TYPE: *Holotype* male (39) with genitalia slide (1488), Corozal, Canal Zone, Panama, larva from "tree hole near Kraft's house", 30 Nov 1909, A.H. Jennings [USNM, 24340]. Synonymized with *argyromeris* by Dyar (1925:139-140).

Haemagogus (Haemagogus) argyromeris of Dyar (1921a:109, in part; 1923:183, in part; 1928: 137-138); Bonne and Bonne-Wepster (1925:434, in part); Edwards (1932:179); Lane (1953: 786-787); Stone, Knight and Starcke (1959:217); Forattini (1965:43-45).

Haemagogus argyromeris of Dyar (1925b:139-140); Arnett (1949:239; 1950:107); Komp (1949: 72; 1955:179-180); Galindo, Trapido and Carpenter (1950:546); Galindo, Carpenter and Trapido (1951a:118-119; 1955:158); Carpenter, Galindo and Trapido (1952:160); Trapido, Galindo and Carpenter (1955:306); Trapido and Galindo (1956a:306).

Haemagogus (Haemagogus) gladiator of Dyar (1923:183).

Haemagogus regalis in part of Busck (1908:64).

Haemagogus albomaculatus in part of Howard, Dyar and Knab (1917:870).

Stegoconops albomaculatus in part of Howard, Dyar and Knab (1913:fig. 439).

FEMALE. Wing: 3.05 mm. Proboscis: 2.05 mm. Forefemur: 2.55 mm. Abdomen: 3.30 mm. Dark scales of proboscis, palpus, wing and legs dark blue to violet with purple reflections. **Head**: Eyes widely separated above antennae (4 ommatidial diameters). Decumbent scales of vertex and occiput greenish blue to bluish green, more bluish green laterally. Proboscis short, 0.90-0.95 of forefemur; palpus about 0.20 of proboscis; antenna about 0.71 of proboscis. **Thorax**: Scales of mesonotum bronze to greenish blue, blue to violet in fossa, bluish green over supraalar bristles, silver in antealar area; scales on scutellum bluish green. *Apn* lobes with scales greenish blue; *ppn* bare. **Legs**: Length of forefemur about 1.53-1.59 of distance from top of thorax to apex of midcoxa. **Wing**: R_{2+3} about 0.35-0.55 of R_2. **Abdomen**: Dark scales blue to violet; silver scales in basal bands on tergites V or VI-VIII, occasionally IV-VIII, often continuous with basolateral silver patches on VI and VII.

MALE (fig. 51). Wing: 2.30 mm. Proboscis: 1.85 mm. Forefemur: 1.80 mm. Abdomen: 2.90 mm. **Head**: Proboscis about 0.95 of forefemur; antenna moderately plumose, flagellar segment 4 with 16-20 bristles.

MALE GENITALIA (fig. 51). **Segment VIII**: Tergite about 0.75 of sternite; distal margin acclivous toward midline, with well developed setae, more numerous mesally, and scales of two types, a few elongate, lanceolate scales near midline and enlarged cuneate scales along entire margin. **Segment IX**: Tergite unsclerotized on midline. **Sidepiece**: Conical, truncate, length about 3.0 times median width; basal tergomesal area slightly enlarged, extending distad as slightly raised area to distal third of sidepiece, with numerous setae which are short distally, becoming longer proximally, the more proximal ones much enlarged, flattened, attenuate; apical lobe well developed, bearing numerous moderately large setae; apical sternomesal scales lanceolate to oblanceolate with acuminate tips. **Claspette**: Stem bowed inward apically in dorsal aspect, narrow, curved dorsad on basal two-thirds, apical third expanded posteriorly into spatulate knob which is spiculose posteriorly and with a seta on posterior margin; filament a striate, narrow, convoluted leaf forming

a beaklike anterior process, inserted apically on stem. **Clasper:** Curved, flattened, gradually expanded to apex which is more or less bulbous; apical spiniform about 0.25 of clasper, flattened, peglike, inserted subapically on inner surface of clasper. **Phallosome:** Aedeagus moderately large, broadly obovate; apex produced dorsad into serrated carina terminating in beaklike process; venter broadly open except on basal third, with sclerotized ridges lateroventrally which are expanded basally. **Proctiger:** Cercal setae 4; apical knob of paraproct with about 15-20 serrations.

PUPA (fig. 51). Abdomen: about 3.20 mm. Trumpet: 0.35 mm. Paddle: 0.65 mm. **Cephalothorax:** Weakly pigmented, slightly darker dorsally. Hairs 4,5-C subequal, single or double, weaker than 7-C which is single. **Trumpet:** Light brown, reticulate sculpturing rather weak. **Abdomen:** Weakly to moderately pigmented, genital lobe and anterior segments often darker. Float hair (1-I) with about 8-10 primary branches and 2-6 secondary branches. Hair 1-II-VII weakly developed, single or double, more or less subequal on all segments. Hair 2-VII short, within own length of 1-VII. Hair 3-II,III usually subequal or with 3-III slightly weaker, and slightly weaker than 5-IV,V which are usually subequal. Hair 6-VII weak, subequal to 6-III-VI. Hair 9-VII often somewhat cephalad of caudolateral margin of tergite, single or double; 9-VIII 5-7b. **Terminal Segments:** Male genital lobe about 1.2 of tergite VIII. **Paddle:** Weakly pigmented; relatively broad, with broadly rounded apex. Hair 1-P double (single or double).

LARVA (fig. 52). Head: 0.75 mm. Siphon: 0.70 mm. Anal Saddle: 0.33 mm. **Segment VIII:** Comb scales 23-27(16-23), with single broadly rounded, minutely fringed spine, in irregular triple row. **Siphon:** Index about 2.6-2.8(1.5-3.0). Pecten teeth 10-12(8-13), extending to about basal 0.50-0.55 of siphon. Hair 1-S 3-4b. **Anal Segment:** Hair 4a-X 3-4b.

SYSTEMATICS. *Haemagogus argyromeris* can be distinguished from the other species of the Splendens Section: in the **adults** by (1) bare *ppn,* (2) short proboscis, about 0.90 of forefemur, (3) dark coxal integument, (4) dark scales of abdomen blue or violet with dorsal silver scales at bases of tergites V to VII; in the **male genitalia** by (1) clasper flattened, curved and expanded in width to apex and (2) claspette stem expanded into spatulate knob on distal third; in the **pupa** by usually double hair 1-P; and in the **larva,** from all species except *iridicolor, regalis* and *lucifer,* by the combination of (1) usually 23 to 27 comb scales, (2) 3-or 4-branched hair 4a-X, (3) pecten extending to about basal 0.50 or 0.55 of siphon, (4) hair 7-III-VI subequal to hair 5 of corresponding segment and (5) relatively long spines on caudal margin of saddle.

The affinities of *argyromeris* are not clear, although close resemblance of the larva and similarity in the male genitalia to the *regalis* complex probably indicates *argyromeris* to be an early offshoot of this species complex. Its extremely limited distribution in the Panamanian Isthmus and abundance in marginal habitats suggest that *argyromeris* is a relict species, able to survive competition with other species of *Haemagogus* because of its ability to utilize habitats not available to the others.

BIONOMICS. *Haemagogus argyromeris* is a mosquito of second growth and open tropical deciduous forest, rarely found in primary forest. It is more closely associated with man than any other *Haemagogus* species and it utilizes the greatest variety of habitats: treeholes, bamboo, fallen fruits, terrestrial bromeliads, artificial containers and occasionally rockholes and ground pools. Many eggs do not hatch when first flooded, consequently populations are slow in building up after rains. Females apparently attack man readily only in the absence of other preferred hosts and usually bite low on the body. This species is probably not involved in

the transmission of sylvan yellow fever because of its absence in forest situations.

DISTRIBUTION (fig. 6). *Haemagogus argyromeris* extends along the Pacific coast from western to central Panama, crossing to the Atlantic at the Panama Isthmus. Material examined: 1552 specimens; 234 males, 839 females, 158 pupae, 321 larvae; 153 individual rearings (65 larval, 10 pupal, 78 incomplete).

PANAMA AND CANAL ZONE. **Canal Zone**: Ancon, 23 Nov 1907-22 July 1908, A. Jennings, 5 M, 4 F [USNM]. Barro Colorado Island, 31 May 1943, W. Komp, 2 M, 2 F [UCLA]. Bella Vista, 7 July 1926, D. Curry, 1 F [USNM]; same data, 16 Aug 1943, H. Crowell (Komp) 2 lF (43-277, 278), 2 lp (43-276), 1 p [UCLA, USNM]. Camacho, 15-22 June 1922, J. Shropshire, 7 M, 1 F [UCLA]. Chiva Chiva, 10 Nov 1965, A. Quinonez (PA 764), 2 lpM (764-20,21), 1 lpF (764-22); same data, 11 Nov 1965 (PA 768) 1 lpM (768-20); same data (PA 773), 2 F, 2 p; same data (PA 770), 1 P [UCLA]. Cocoli Naval Hospital, 25 June 1945, W. Komp, 1 lM (5-417), 4 lF (5-417, 417,424,425), 1 F [UCLA, USNM]. Corozal, 30 Nov 1907, A. Jennings, 1 lpF (39.3), 1 lM (38.2), 2 lF (38.4,39.8), 1 M [USNM]; same data, 27 Oct 1920, C. Ludlow, 1 F [USNM]; same data, July 1941, W. Komp, 4 l [UCLA]; same data, 14 Aug 1941, 13 M [UCLA]; same data, 22 Sept 1941, 1 M, 1 F [UCLA]; same data, 8 Jan 1943, 1 M, 2 l [UCLA, USNM]; same data, 29 Jan 1943, 9 M, 7 F [UCLA]; same data, 18 Feb 1943, 4 M, 6 F [UCLA]; same data, 6 June 1943, 1 M gen [UCLA]; same data, 30 Aug 1943, 1 lpM gen (43-286), 2 lM (43-284,288), 4 lF (43-290,290,290, 296), 5 lp (43-279,282,282,282,283), 2 F, 7 l [UCLA, USNM]; same data, 6, 7 Sept 1943, 3 lp (43-309), 14 l [UCLA, USNM]; same data, 1943, 3 M [UCLA]; same data, 14 July 1944, 6 p, 5 l [UCLA, USNM]; same data, 21 Feb 1945, 13 lp (5-8-12,14-19, [20,23], [22,27]), 8 p, 19 l, 14 L [UCLA, USNM]; same data, 13,14 Mar 1945, 18 L [UCLA]; same data, 26 Mar 1945, 2 lp (5-68, 69), 2 p, 4 l, 4 L [UCLA, USNM]; same data, 3, 4 May 1945, 3 pM (5-103), 1 lF (5-103), 1 F [UCLA, USNM]; same data, 13 June 1945, 2 lpM (5-368,372), 2 lpF (5-283,283) 2 lM (5-335,376), 1 M, 1 F, 1 p [UCLA, USNM]; same data, 23 June 1945, 1 lF (5-405), 2 l [UCLA, USNM]; same data, 21 Dec 1943, H. Crowell (Komp), 2 M, 1 F [UCLA]. Corozal Damsite, 28 July 1943, W. Komp, 1 M [UCLA]. Empire, 2 July 1921, C. Ludlow, 1 M [USNM]; same data, 8 Aug-6 Oct 1921, 4 M [USNM]; same data, 6 July 1922, J. Shropshire, 4 M, 1 F [USNM]. Ft. Amador, 14 Sept 1949, 1 lF [UCLA]; same data, 4 Dec 1949, 2 M, 4 F [UCLA]; same data, 5 Jan 1950, 53 F [UCLA]; same data, 9 Jan 1950, 1 M [UCLA]; same data, 27 Sept 1949 (GML), 2 lp (03394,03411) [UCLA]; same data, 27 Nov 1949 (GML), 2 lpF (00444,00445), 1 lp (00446) [UCLA]; same data, 2 Dec 1949-12 Jan 1950, S. Carpenter, 1 M, 551 F [UCLA]; same data, 18-29 Dec 1949, J. Duncan, 16 F [Utah]. Ft. Clayton, 13 Jan, 1 F [USNM]; same data, 24 Apr 1944, P. Adams, 1 L [USNM]; same data, 7 Oct 1944, K. Frick (ASM 200), 1 M, 1 L [UCLA]; same data, 5 Nov 1944 (ASM 256), 1 F, 3 L [UCLA]; same data, 28 Nov 1944 (ASM 301), 5 M, 3 F [UCLA]; same data, 17 Dec 1944, (ASM 346), 1 L [UCLA]; same data (ASM 347), 10 M, 5 F [UCLA]; same data, 7 Jan 1945 (ASM 367), 9 M, 3 F [UCLA]; same data, 29 Jan 1945 (ASM 386), 2 M, 1 F [UCLA]. Frijoles, 1 Dec 1965, R. Schick and A. Quinonez (PA 844), 1 p [UCLA]. Gatun, 25 Aug 1926, 5 l; same data, 20 Oct 1926, 5 F; same data, 22 July 1908, A. Jennings, 1 M; same data, Dec 1913, H. Trask, 1 M [USNM]. La Pita, 20 June 1921, C. Ludlow, 1 M [USNM]. Las Cascadas, A. Jennings, 2 M, 2 F [USNM]. Matachin, 5 May 1908, A. Jennings, 1 F [USNM]. Miraflores, 9 May 1908, A. Jennings, 1 M, 1 M gen, 3 F [USNM]; same data, 7 Jan 1922, J. Shropshire, 2 M, 1 F [UCLA]; same data, 10 Nov 1965, R. Schick and A. Quinonez (PA 767), 1 lpF (767-12), 1 pM (767-102) [UCLA]. Miraflores Lake, 8 Nov 1965, R. Schick and A. Quinonez (PA 762), 2 lpF (762-14,16), 1 pM (762-100), 2 M, 3 p, 1 P, 2 l [UCLA]. Mojinga Swamp, 13 Oct 1964, A. Quinonez (PA 723), 1 P [UCLA]. Monte Lirio, 14 Jan 1922, J. Shropshire, 1 F [UCLA]. Mt. Hope, 5 June 1943, W. Komp, 1 M [UCLA]. San Pablo, 14 May 1908, A. Jennings, 1 F [USNM]. Paraiso, 1 M gen, 3 P, 2 L [UCLA, USNM]; same data, J. Zetek, 1 M, [USNM]. Rio Cardenas, 3 Mar 1922, J. Shropshire, 1 F; same data, 12 Nov 1965, A. Quinonez (PA 783), 1 F, 1 P; same data (PA 785), 1 lpM (785-10), 1 M, 1 p, 1 l [UCLA]. Rio Chagres, A. Busck, 1 M [USNM]. Rio Chagres, 30 Dec 1931, 1 F [UCLA]. Summit, 25 May 1935, W. Komp, 1 M gen [USNM]; same data, 26 May 1935, 2 M, 2 F [UCLA]; same data, May 1935, 2 l [USNM]; same data, 3 Nov 1937, 1 l [USNM]; same data, 12 Sept 1939, 1 M, 2 F [UCLA]; same data, 27 Sept 1939, 1 M, [UCLA]; same data, 1 Oct 1939, 2 F, 4 l [UCLA, USNM]; same data, 11 Oct 1939, 1 l [USNM]; same data,

1 Nov 1939, 1 M, 1 F [UCLA]; same data, 3 Nov 1939, 1 M [UCLA]; same data, 17 Aug 1941, 1 lM, 1 lF, 1 F, 1 l [UCLA, USNM]; same data, 12 Jan 1943, 1 F [UCLA]; same data, July 1946, N. Krauss, 1 M, 1 F [USNM]. Tabernilla, A. Busck, 1 M, 2 F [USNM]. Atlantic side (locality unspecified), June 1938, W. Komp [UCLA]; same data, 20 June 1945, 1 lpM (5-404), 2 lF (5-403), 1 M, 1 F [UCLA, USNM]; same data, 1945, Henderson, 1 l [UCLA]. Pacific side (locality unspecified), July 1944 (ASM 24-6), 2 L [UCLA]. Locality unspecified, A. Jennings, 2 F [USNM]. Locality unspecified, Feb 1944, 1 F [USNM]; same data, 1916, Dunne, 1 M gen [USNM]; same data, Jan 1945, S. Carpenter, 3 M, 7 F [UCLA]. **Chiriqui:** David, F. Snyder, 1 F [UCLA]. **Cocle:** El Valle, 600 m, 31 Aug 1938, W. Komp, 1 M, 1 F [UCLA]; same data, 8 Oct 1939, 2 M [UCLA]; same data, 5 June 1945, 4 lpM (5-274,340,349,377), 11 lpF (5-298,312,320,321,341-343,346, 348,353,354), 5 lM (5-361,373,373,373,400), 13 lF (5-291,313,324,333,344,388,394,395,397, 407,407,407,407), 1 lp (5-379), 1 M, 3 F, 6 l [UCLA, USNM]; same data, 5 June 1945, R. Arnett and W. Komp (ASM 613), 1 F [UCLA]; same data (ASM 615), 1 M [UCLA]. **Colon:** Buena Vista, 24 Sept 1964, A. Quinonez (PA 710), 4 lpM (710-13,30,31,38), 2 lpF (710-17,39), 1 pF (710-102), 18 L [UCLA]. Pina, 2 Sept 1930, D. Curry, 2 M, 2 F [UCLA]; same data, 5 Aug 1943, W. Komp, 1 p [USNM]. **Los Santos:** Tonosi, 5 May 1949 (GML), 1 M [UCLA]. **Panama:** (?Cerro) Campanita, 21 Sept 1950, 1 lp [UCLA]. Chame, 8-11 Oct, M. Matthes, 1 lpM, 1 F, 5 l [UCLA, USNM]. Chepo, 15 Oct 1939, W. Komp, 3 M, 2 F [UCLA]. El Libano, 22 m, 9 Aug 1963, A. Quinonez (PA 487), 2 lpM (487-102,103), 1 pM (487-104), 1 lp (487-101), 6 L [UCLA]. El Victoria (?La Victoria), 29 June 1949, S. Carpenter, 1 F [UCLA]. Juan Diaz, 4 Nov 1965, R. Schick and A. Quinonez (PA 747), 1 pF (747-100) [UCLA]. La Chorrera, 21 Oct 1944, Van Doren (ASM 277), 1 M [UCLA]. Nueva Gorgona, 20 m, 13 Dec 1966, O. Berlin (PA 1003), 2 M, 1 F, 3 p, 6 P [UCLA]. Nuevo Emperador, 23 Nov 1965, A. Quinonez (PA 825), 2 F, 4 p [UCLA]. Pacora, 19 Nov 1939, M. Matthes, 1 M, 1 F [UCLA]; same data, 24 Oct 1949 (GML), 2 l [UCLA]. Panama, A. Jennings, 2 M gen, 1 F [USNM]; same data, 1 July 1926, D. Curry, 7 L [USNM]; same data, 5 May 1944 (ASM 5-1), 5 M, 1 L [UCLA]. Panama, Paitilla Pt., 5 Aug 1928, H. Dyar and R. Shannon, 1 M [USNM]; same data, 14 May 1939, W. Komp, 1 M, 1 F [UCLA]; same data, 11 Sept 1939, 5 M, 1 F [UCLA]; same data, 1939, 3 F [UCLA]; same data, 24 Aug 1941, 1 M [UCLA]; same data, 28 May 1958 (GML), 1 lpM (03389), 1 lpM gen (03384), 2 lpF (03213,03382), 1 pM (03386), 1 L [UCLA]. Panama Viejo, 23 Oct 1934, L. Rozeboom (PAR 67), 1 M, 2 F; same data (PAR 68), 1 M, 1 F; same data, 27 July 1935 (PAR 82), 1 M, 2 F; same data, 16 Oct 1944, Adams and Van Doren (ASM 205-1), 1 L [UCLA]. Rio Teta, San Carlos, 22 Aug 1963, A. Quinonez (PA 531), 5 lP (531-118-122); same data, 31 Aug 1963 (PA 546), 6 lpM (546-101,102,104-106, 109), 6 lpF (546-107,110,111-114), 1 pM (546-108), 1 lP (546-103), 7 L [UCLA]. Taboga Island, A. Busck, 1 M gen, 3 F [USNM]; same data, A. Jennings, 1 M [USNM]. Tocumen, 6 Sept 1963, A. Quinonez (PA 549), 4 lpM (549-101,103-105), 4 lpF (549-106-109) [UCLA]. **Locality unspecified:** 1 M, 1 F [USNM]; 1 M [UCLA]; J. B. Shropshire, 2 F [USNM]; L. H. Dunn, 1 lp [USNM]; (ASM 93), 1 F [UCLA]; (ASM 99-1), 1 M [UCLA]; (ASM 182), 1 F [UCLA]; L. Rozeboom (PAR 136), 3 M, 2 F [UCLA]; same data, 23 Nov 1934 (PAR 72), 8 M, 9 F [UCLA].

23. Haemagogus (H.) chalcospilans Dyar

Figs. 6,53,54

1921. *Haemagogus (Haemagogus) chalcospilans* Dyar, 1921a:110-112. TYPE: *Holotype* male (247) and genitalia slide (1481), Caldera Island, Portobelo Bay, Colon, Panama, larva from salt pools in rocks near seacoast, 22 Mar 1908, A.H. Jennings [USNM].

Haemagogus (Haemagogus) chalcospilans of Dyar (1923:183; 1928:139-140); Bonne and Bonne-Wepster (1925:434); Edwards (1932:179); Lane (1939:119; 1953:782-784); Levi-Castillo (1951b:11,25-26), Stone, Knight and Starcke (1959:217); Forattini (1965:45-47); Galindo and Trapido (1967:107).

Haemagogus chalcospilans of Dyar (1925b:140); Kumm, Komp and Ruiz (1940:398); Kumm,

Osorno-Mesa and Boshell-Manrique (1946:19); Woke (1947:365); Arnett (1949:239; 1950: 107), Galindo, Trapido and Carpenter (1950:546); Galindo, Carpenter and Trapido (1951a: 119; 1955:163); Carpenter, Galindo and Trapido (1945:160); Barreto Reyes (1955:78); Komp (1955:181); Trapido and Galindo (1956a:305).

Haemagogus splendens in part of Howard, Dyar and Knab (1917:867).

FEMALE. Wing: 2.70 mm. Proboscis: 1.70 mm. Forefemur: 2.05 mm. Abdomen: 2.80 mm. Dark scales of proboscis, palpus, wing and legs purple with some violet reflections. **Head:** Eyes broadly separated above antennae (4 ommatidial diameters). Decumbent scales of vertex and occiput purple. Proboscis short, about 0.80-0.90 of forefemur; palpus about 0.18 of proboscis; antenna about 0.74-0.77 of proboscis. **Thorax:** Scales of mesonotum copper to bronze, conspicuously purple or occasionally dark blue in fossa and blue to greenish blue near scutal angle, bluish green over supraalar bristles, silver in antealar area; scales on scutellum bluish green. *Apn* lobes with purple scales and a few silver scales mesally; *ppn* bare. **Legs:** Integument of apex of coxae and trochanters yellow; length of forefemur about 1.65-1.80 of distance from top of thorax to apex of midcoxa. **Wing:** R_{2+3} about 0.33-0.40 of R_2. **Abdomen:** Dark scales purple to violet with some copper reflections; silver scales dorsally on tergites V or VI and VII in rather broad basal band, often continuous with lateral silver patches.

MALE (fig. 53). Wing: 2.30 mm. Proboscis: 1.80 mm. Forefemur: 1.95 mm. Abdomen: 2.90 mm. **Head:** Proboscis short, about 0.90-0.95 of forefemur; antenna sparsely plumose, flagellar segment 4 with 8 moderately long bristles. **Legs:** Larger claw of foreleg with short, blunt median tooth; smaller claw of foreleg and claws of midleg simple.

MALE GENITALIA (fig. 53). **Segment VIII:** Tergite short, about 0.60 of sternite, distal margin broadly, shallowly emarginate, straight or acclivous mesally, with dense setae, those laterad much elongate and bent mesad at apex, those mesad shorter, 0.25-0.67 of lateral setae. **Segment IX:** Tergite broadly emarginate and weakly sclerotized mesally. **Sidepiece:** Conical, truncate, length about 2.5 times median width; basal tergomesal lobe slightly enlarged, extending distad as raised area to near distal third of sidepiece, with numerous setae, the distal ones short, becoming longer proximally, the more proximal ones elongate and slightly flattened basally; apical lobe prominent, bearing about 20 moderately developed setae; apical sternomesal scales of several types, a more dorsal, dense cluster of nearly circular and lanceolate scales oriented more or less dorsad, and ventrally narrow sinuous scales proximally and large obovate to lanceolate scales distally oriented mesad; a cluster of moderately developed setae just distad of sternomesal scales. **Claspette:** Stem bowed inward near middle in dorsal aspect, curved dorsad, narrowed slightly on basal third, expanded ventrally on apical 0.20 into large rounded or sharply pointed knob, often with serrations on point, usually with a large seta ventrally at base of knob; filament a convoluted membranous flap, beak shaped anteriorly, attached at apex of stem. **Clasper:** Rounded, broadest at base and somewhat sinuous, a small seta inserted on inner surface proximad of spiniform; spiniform short, cylindrical, inserted apically. **Phallosome:** Aedeagus moderately large, obovate, tip produced dorsad into serrated carina terminating in beaklike process; venter broadly open except on basal half, with sclerotized ridges lateroventrally. **Proctiger:** Cercal setae 4-6; apical knob of paraproct with 10-15 serrations laterally and conspicuous knob mesally.

PUPA (fig. 53). Abdomen: about 2.95 mm. Trumpet: 0.30 mm. Paddle: 0.60 mm. **Cephalothorax:** Weakly to moderately pigmented, darker dorsally. Hair 5-C

moderately developed, 2-4b, stronger than 4-C and subequal to 7-C, which is single or double. **Trumpet**: Light to medium brown, reticulate sculpturing moderate. **Abdomen**: Weakly to moderately pigmented, genital lobes and anterior segments slightly darker. Float hair (1-I) with 12-20 primary branches and 2-6 secondary branches. Hair 1-II-VII weakly to very strongly developed, single, multiple or dendritic, usually becoming weaker on posterior segments. Hair 2-VII short, considerably cephalad of 1-VII. Hairs 3-II,III,5-IV,V, subequal, with 3-III somewhat weaker, or 3-II,III subequal and weaker than 5-IV,V, which are subequal. Hair 6-VII usually weakly developed, subequal to 6-III-VI, single or double. Hair 9-VII moderately to considerably cephalad of caudolateral margin of tergite, 2-6b; 9-VIII 8-12b. **Terminal Segments**: Male genital lobe about 1.5 of tergite VIII. **Paddle**: Weakly pigmented; relatively broad, apex broadly rounded. Hair 1-P 3-4b.

LARVA (fig. 54). Head: 0.50 mm. Siphon: 0.65 mm. Anal Saddle: 0.33 mm. **Abdomen**: Hair 7-III-VI weaker than hair 5 of corresponding segment. **Segment VIII**: Comb scales 45-55(40-75), with single spatulate, minutely fringed spine; in large triangular patch, distal scales considerably larger than proximal scales. **Siphon**: Index about 2.4(1.9-2.6). Pecten teeth 12-17(10-21), extending to about basal 0.45-0.50 of siphon. Hair 1-S 4-5b. **Anal Segment**: Spines on caudal margin of saddle reduced, very short, each with multiple teeth. Hair 4a-X 6-9b.

SYSTEMATICS. *Haemagogus chalcospilans* can be readily distinguished from the other species of the Splendens Section: in the **adults** by (1) bare *ppn,* (2) short proboscis, 0.80 of forefemur in female and 0.90-0.95 of forefemur in male, (3) yellow integument of apex of coxae and trochanters, (4) scales of fossa purple or occasionally dark blue, contrasting with predominantly bronze or copper scales on remainder of mesonotum and (5) larger claw of male foreleg with blunt submedian tooth and smaller claw of foreleg and claws of midleg of male simple; in the **male genitalia** by (1) lateral setae on distal margin of tergite VIII much elongate and bent mesad at apex, (2) clasper rounded and somewhat sinuous, with apical spiniform and (3) circular, lanceolate, and sinuous apical sternomesal scales on the sidepiece; in the **pupa** by 3- or 4-branched hair 1-P; and in the **larva** by (1) large number of comb scales, usually 45-55 but occasionally as many as 75, in large triangular patch, (2) 6-to 9-branched hair 4a-X and (3) single hair 5-M.

Haemagogus chalcolpilans exhibits what appears to be clinal variation in characters of the male genitalia and adult. The apical ventral portion of the claspette filament differs in shape, the northern populations tending to be more broadly rounded than the typical form, and in the presence or absence of a ventral seta (see fig. 53). The mesal setae of the distal margin of tergite VIII are considerably longer in northern Costa Rican populations than in the typical form from Panama, although populations from intermediate localities in southern Costa Rica have much shorter setae than does the typical form. Scales on the fossa tend to be more blue in the northern populations than the distinct purple scales of the southern populations.

This seems to be one of the more highly derived species of the subgenus in the adult, several characters being unique to *chalcospilans,* among them several male genitalic characters and the male claws. However the larva exhibits the primitive characters of a very well developed ventral brush and a large patch of up to 75 comb scales.

BIONOMICS. *Haemagogus chalcospilans* is a littoral species, found primarily in mangrove. It is found in tremendous numbers in mangrove treeholes and occasionally inhabits artificial containers and rarely ground pools. Females are fierce biters,

attacking readily in the shade and usually about the head and upper body. This species apparently is not involved in the transmission of yellow fever.

DISTRIBUTION (fig. 6). *Haemagogus chalcospilans* is known from the Pacific coast of Central America from near the Gulf of Fonseca in Honduras where it was collected with *regalis* by Pedro Galindo (personal communication) to eastern Panama and the Atlantic coast from central Panama to northwestern Colombia. Material examined: 3297 specimens; 478 males, 565 females, 680 pupae, 1574 larvae; 384 individual rearings (201 larval, 122 pupal, 61 incomplete).

COLOMBIA. **Antioquia:** Turbo, 1 M, 1 M gen [USNM].

COSTA RICA. **Puntarenas:** Dominical, 28 May 1943, T. Aitken, 16 M, 15 F; same data, 14 June 1943, 1 M, 2 F; same data, 18 June 1943, 8 M, 12 F [UCLA]. Golfito, H. Kumm, 9 M, 20 F [UCLA]. Pitahaya (1.5 km S), 29 Dec 1971, D. Schroeder (CR 579), 2 lpM (579-11,18), 8 lpF (579-12-17,19,20), 1 pM (579-100), 1 pF (579-101), 1 lP (579-10), 1 P, 2 l, 9 L; same data (CR 580), 1 lpM (580-20), 2 pM (580-83,84), 2 pF (580-101,102), 5 P, 2 l, 5 L; same data (CR 581), 1 lpF (581-10), 2 l; same data (CR 582), 7 lpM (582-20-26), 3 lpF (582-27-29), 3 pF (582-100,102), 7 p, 8 l, 4 L; same data (CR 583), 17 L [UCLA]. Puerto Jimenez, H. Kumm, 1 M [UCLA]. Puntarenas, H. Kumm, 16 M, 28 F; same data, 1938, 3 M gen, 1 F [UCLA]. Puntarenas, 8 June 1954 (GML), 1 lpM (01544), 1 lpF (01554) [UCLA]. Puntarenas (12 km E), 3 m, 14 Aug 1971, D. Schroeder (CR 360), 1 lpF (360-10), 1 pF (360-100); same data (CR 362), 1 lpF (362-10); same data (CR 363), 3 lpM (363-11,12,16), 4 lpF (363-10,13-15), 8 pM (363-101, 103-106,108,110,111), 4 pF (363-100,107,109,112), 1 p, 3 P, 2 L; same data (CR 364), 1 lpM (364-10); same data (CR 366), 1 pM (366-100); same data (0.5 km N) (CR 370), 1 lpM (370-10), 1 lpF (370-11), 1 L [UCLA]. Rincon, 26 June 1963, C. Hogue (CR 127), 2 lpF (127-101,102), 1 pF (127-201); same data, 29 June 1963 (CR 130), 3 lpM (130-101,102,105), 2 lpF (130-104, 107), 1 lP (130-103), 2 M, 2 F, 10 p, 1 P, 56 L; same data (CR 131), 4 lpF (131-102-105), 30 M, 42 F, 59 p, 28 P, 2 l, 160 L; same data (CR 132), 2 p; same data (CR 134), 2 lpM (134-103,105), 3 lpF (134-101,102,104), 3 M, 4 F, 7 P, 2 l, 41 L; same data (CR 137), 1 lP (137-105), 2 P, 47 L; same data (CR 138), 1 F; same data (CR 138), 1 F; same data, 29 July 1963, 2 M [UCLA]. **San Jose:** San Isidro del General, 28 May 1943, T. Aitken, 3 M, 9 F [UCLA].

NICARAGUA. **Rivas:** San Juan del Sur, 20 Sept 1943, P. Woke, 4 F [UCLA].

PANAMA AND CANAL ZONE. **Canal Zone:** Albrook AFB, 2 Nov 1965, R. Schick and A. Quinonez (PA 738), 4 lpM (738-12,13,15,24), 7 lpF (738-11,14,16,17,19,21,23), 7 pM (738-100, 102-104,107-109), 4 pF (738-22,101,105,106), 32 M, 22 F, 46 p, 4 P, 5 l, 150 L; same data (PA 739), 2 lpM (739-11,13), 2 lpF (739-10,14), 1 pM (739-100), 3 pF (739-101-103), 1 lP (739-12), 2 P, 40 L; same data (PA 740), 9 lpM (740-10-17,91), 1 pM (740-100), 1 pF (740-90), 3 M, 6 F, 9 p, 4 l, 8 L; same data (PA 741), 1 lpM (741-11), 3 lpF (741-10,12,13), 2 pM (741-102, 103), 2 pF (741-100,101), 2 M, 5 F, 8 p, 3 P, 5 l, 28 L; same data (PA 742), 4 lpM (742-10,12,13, 15), 5 lpF (742-11,14,16-18), 1 pM (742-101), 2 pF (742-100,102), 3 F, 7 p, 30 L; same data (PA 743), 3 F [UCLA]. Ancon, 15 Aug 1918, thru C. Ludlow, 4 M, 3 F; same data, 10 Feb 1908, A. Jennings, 2 M [USNM]. Bella Vista, 7 July 1926, D. Curry, 3 M, 1 F [USNM]. Diablo, 20 Oct 1943, H. Crowell, 3 M, 4 F [UCLA]. Ft. Kobbe, Kobbe Beach, 12 Aug 1972, H. Arnell (PA 1170), 2 lpM (1170-18,38), 16 lpF (1170-11,13-17,23-25,33-35,37,39-41), 10 pM (1170-100-105,107, 108,110,111), 6 pF (1170-90,106,109,112-114), 1 lp (1170-26), 13 lP (10,12,19-22,27-32,36), 17 M, 3 F, 19 p, 4 P, 30 l, 20 L; same data (PA 1171), 4 lpM (1171-12,14,16,21), 6 lpF (1171-11, 13,15,17-19), 6 pM (1171-101-106), 1 pF (1171-100), 2 lP (1171-10,20), 8 L; same data (PA 1173), 2 lpM (1173-10,11), 16 lpF (1173-13-16,18-29), 10 pM (1173-100-109), 2 lP (1173-12,17), 2 P, 9 l, 9 L; same data (PA 1174), 2 lpM (1174-10,16), 12 lpF (1174-11-15,17-23), 11 pM (1174-30, 32,102-106,108,111-113), 7 pF (1174-31,100,101,107,109,110,114), 28 P, 25 L [UCLA]. Ft. Kobbe, Venado Beach, W. Komp, 1 M, 2 F; same data, 21 Feb 1939, 5 M; same data, 20 Oct 1939, 3 M, 3 F; same data, 8 M, 4 F; same data, 23 Oct 1939, 8 M, 3 F [UCLA]. Ft. Sherman, 26 June 1958, 1 L [UCLA]; same data, 16 July 1920, J. Zetek, 1 F [USNM]; same data, 12-19 Nov 1920, 1 F [USNM]; same data, Aug 1938, W. Komp, 1 M, 1 F [UCLA]; same data, 30 Nov 1939, 1 M, 2 F [UCLA]. Gatun, 15 Sept 1926, D. Curry, 8 lp, 1 l [USNM]. Margarita, 14 June 1922, J. Shropshire, 1 M gen [USNM]; same data, 8 Oct 1964, A. Quinonez (PA 716), 1 pM (716-101)

[UCLA]. Miraflores Lake, 9 Nov 1965, A. Quinonez (PA 762), 4 lpM (762-12,15,18,19), 3 lpF (762-10,11,13), 1 pM (762-101), 1 lp (762-17), 4 M, 6 F, 10 p, 1 P, 2 l, 10 L; same data (PA 763), 1 lpM (763-15), 4 lpF (763-10,11,17,18), 3 pM (763-100,101,104), 5 pF (763-103,105-108), 2 lP (763-14,16), 3 F, 30 L [UCLA]. Pina Guapa Island, W. Komp, 1 M, 5 F [UCLA]. Sweetwater Reservoir (nr. Ft. Sherman), 10 Nov 1964, A. Quinonez (PA 731), 1 lpF (731-10), 1 lp (731-14), 2 lP (731-11,17), 19 L; same data (PA 732), 1 pM (732-11), 1 pF (732-13), 1 P, 5 L; same data, 14 Nov 1964 (PA 734), 2 lpF (734-11,15), 1 lp (734-12), 1 L [UCLA]. Atlantic side (locality unspecified), Brown, 4 M, 4 F; same data, June 1937, W. Komp, 3 M, 5 F; same data, June 1938, 2 M, 3 F [UCLA]. Canal Zone (locality unspecified), A. Jennings, 3 F [USNM]. **Colon:** Colon, A. Jennings, 1 F [USNM]. Portobelo, 4 Dec 1963, A. Quinonez (PA 580), 1 lpM (580-106), 3 lpF (580-102,109,110), 2 pM (580-104,107), 4 pF (580-101,103,108,111), 1 l, 240 L; same data, 9 Dec 1963 (PA 600), 1 pF (600-103); same data, 10 Dec 1963 (PA 603), 1 F [UCLA]. Portobelo (Caldera Island), 21 Jan 1908, A. Jennings, 2 M; same data, 22 Jan 1908, 2 p, 1 l; same data, 22 Mar 1908, 2 F; same data, 8 Apr 1908, 1 F; same data, 14 Feb 1909, 6 M, 10 F [USNM]. Portobelo (Rio Caldera), 6 Dec 1963, A. Quinonez (PA 592), 1 p, 5 L [UCLA]. Puerto Pilon, 27 July 1956 (GML), 1 lpM (02988) [UCLA]. **Darien:** Piriaque, nr. El Real, 13 Jan 1964 (PA 622), 29 L [UCLA]. **Panama:** Archipielago de las Perlas, Isla del Rey, H. Kumm, 8 M, 4 F [UCLA, USNM]; Isla San Jose, 26 July 1944, W. Komp, 8 lM (4-44,46,46,47,47,49,52,55), 6 lF (4-41,42,45,46,49,53), 1 pM (4-41A), 1 lp (4-40), 28 M, 26 F, 9 l [UCLA, USNM]; Isla San Jose, Playa Grande (GML), 5 Aug 1956, 4 lpF (03018,03024,03038,03041) [UCLA]; Isleta Trapiche, 8 July 1936, L. Rozeboom (PAR 102), 32 M, 10 F [UCLA]. Chiman, Oct 1942, W. Komp, 5 M, 2 F [UCLA, USNM]. El Corozal, nr. El Libano, 9 Aug 1963, A. Quinonez (PA 486), 1 lpM (486-104), 3 lpF (486-103,107,108), 1 pM (486-111), 1 pF (486-113), 4 lP (486-102,105,109,110), 1 p, 1 P, 1 l, 11 L [UCLA]. El Libano, 27 Aug 1963, A. Quinonez (PA 535), 1 F; same data, 26 Nov 1963 (PA 565), 1 L; same data (PA 567), 5 lpM (567-104-106,111,122), 5 lpF (567-108, 109,113,114,118), 4 lP (567-102,103,107,123), 66 L [UCLA]. Juan Diaz, 29 Nov 1963, A. Quinonez (PA 569), 1 pF (569-101) [UCLA]. La Chorrera, 5 Sept 1944, Adams (ASM 156), 1 M [UCLA]. Pacora, 8 Nov 1965, R. Schick (PA 761), 1 lpM (761-13) [UCLA]. Panama, 2 M, 3 F [USNM]; same data, A. Jennings, 1 M, 3 F [UCLA]. Panama, Paitilla Pt., 1930, 2 M, 3 F [USNM]; same data, June 1938, 2 F [UCLA]; same data, 14 July 1938, W. Komp, 3 F [UCLA]; same data, 1939, 10 M, 5 F [UCLA]; same data, 11 Apr 1939, 1 M, 3 F [UCLA]; same data, 14 May 1939, 2 M, 2 F [UCLA]; same data, 7 Oct 1939, 2 F, 1 l [UCLA, USNM]; same data, 24 Aug 1941, 1 M, 3 F [UCLA]. Panama, Rio Abajo, 6 July 1944, K. Frick (ASM 55), 1 M [UCLA]. Panama, San Francisco de la Caleta, May 1938, W. Komp, 1 M gen [USNM]. Panama Viejo, G. Wade, 1 M [UCLA]. Panama Viejo, 28 May 1936, 1 M gen [USNM]. Panama Viejo, 1 July 1949, 15 F, 1 L; same data, 21 Oct 1949, 3 F; same data, 27 July 1935, L. Rozeboom (PAR 82), 10 M, 6 F; same data, 16 Nov 1935 (PAR 32), 1 M, 2 F; same data, 6 July 1944, R. Arnett et al. (ASM 58), 1 F; same data, 29 Nov 1963, A. Quinonez (PA 570), 2 lpM (570-102,110), 7 lpF (570-101,103-108), 2 lP (570-109,111), 213 L [UCLA]. **San Blas:** Mandinga, 15 Oct 1956 (GML), 3 lpM (03063,03068,03069), 1 lpF (03071) [UCLA]. **Locality unspecified:** 20 Aug 1935, L. Rozeboom (PAR 84), 9 M, 5 F [UCLA].

24. Haemagogus (H.) boshelli Osorno-Mesa

Figs. 6,55,56

1944. *Haemagogus boshelli* Osorno-Mesa, 1944b:165-170. TYPE: *Holotype* male with genitalia slide, Bahia de Solano, Choco, Colombia, elev. 2-20 m, larva from tree hole or coconut shell on ground, May 1942, E. Osorno-Mesa [USNM].

1955. *Haemagogus (Osornomyia) garciai* Levi-Castillo, 1955a:359-364. TYPE: *Holotype* male genitalia slide (male lost), Isla de Changuaral, Bahia de Ancon de Sardinas, Esmeraldas, Ecuador [USNM]. NEW SYNONYMY.

Haemagogus (Haemagogus) boshelli of Levi-Castillo (1951b:11,30-31); Lane (1953:784-786);

Stone, Knight and Starcke (1959:217); Galindo and Trapido (1967:107).
Haemagogus boshelli of Hovanitz (1946:35); Kumm, Osorno-Mesa and Boshell-Manrique (1946: 17); Barreto Reyes (1955:78); Komp (1955:181); Trapido and Galindo (1956a:305).
Haemagogus (Osornomyia) boshelli in part of Levi-Castillo (1955a:361).
Haemagogus (Haemagogus) garciai in part of Stone, Knight and Starcke (1959:217).

FEMALE. Wing: 2.70 mm. Proboscis: 1.90 mm. Forefemur: 1.95 mm. Abdomen: 2.80 mm. Dark scales of proboscis, palpus, wing and legs purple with some violet and bronze reflections. **Head**: Eyes rather narrowly separated above antennae (1-2 ommatidial diameters). Decumbent scales of vertex and occiput purple to violet anteriorly, light yellowish brown posteriorly. Proboscis short, about 0.95-1.05 of forefemur; palpus about 0.17 of proboscis; antenna about 0.70 of proboscis. **Thorax**: Scales of mesonotum copper to bronze, bluish green to greenish blue above supraalar bristles, silver in antealar area; scales on scutellum bluish green to greenish blue. *Apn* lobes with scales violet to purple, silver scales mesally; *ppn* bare. **Legs**: Length of forefemur about 1.40-1.50 of distance from top of thorax to apex of midcoxa. **Wing**: R_{2+3} about 0.40-0.50 of R_2. **Abdomen**: Dark scales purple with copper reflections; usually with silver scales dorsally on tergites VI,VII and occasionally VIII in basal band or median basal patch.

MALE (fig. 55). Wing: 2.20 mm. Forefemur: 1.75 mm. Proboscis: 1.70 mm. Abdomen: 2.80 mm. **Head**: Proboscis about 0.95-1.05 of forefemur; antenna sparsely plumose, flagellar segment 4 with 6-8 moderately long bristles.

MALE GENITALIA (fig. 55). **Segment VIII**: Tergite about 0.90 of sternite, distal margin rounded, densely covered with enlarged setae. **Segment IX**: Tergite straight, moderately sclerotized except on midline. **Sidepiece**: Conical, truncate, length about 2.5 times median width; basal tergomesal lobe considerably enlarged, densely covered with setae, short and curved distally, becoming stronger and hooked proximally; a large oval area near middle of sidepiece giving rise to numerous thick, short, blunt, peglike setae; an irregular row of fine, curved setae extending from near mesal edge of this oval area obliquely to near distal margin of basal tergomesal lobe; apical lobe prominent, thumb-shaped, with numerous fine setae; apical sternomesal scales lanceolate, ovate or obovate. **Claspette**: Setae ventrally near base; filament inserted apically on stem, large, striate, leaflike, bent at right angle near middle with upright half narrow and pointed and dorsal half broad and rounded. **Clasper**: Flattened, angled sharply inward near middle, an elbowlike flap on outer surface distad of angle; tip expanded slightly on outer edge and angled inward; spiniform inserted proximad of distal expansion, relatively long, flattened and expanded distally. **Phallosome**: Aedeagus moderately large, more or less pear-shaped, the apex produced dorsad forming small serrated carina terminating in a sharp point; venter open except at basal third, a small lobe projecting dorsad from point of closure, sclerotized ridges laterally, expanded basally and meeting at midline. **Proctiger**: Cercal setae 3 or 4; paraproct narrowed apically; apical knob with about 10 serrations.

PUPA (fig. 55). Abdomen: about 2.95 mm. Trumpet: 0.40 mm. Paddle: 0.55 mm. **Cephalothorax**: Usually very weakly pigmented, occasionally moderately pigmented, darker dorsally. Hairs 4,5-C moderately developed, 2-5b, usually subequal and slightly weaker than 7-C which is usually double. Hair 8-C usually double (single or double). **Trumpet**: Medium brown, lighter distally; reticulate sculpturing moderate. **Abdomen**: Very weakly to moderately pigmented, anterior segments slightly darker. Float hair (1-I) with about 10-14 primary branches and 2-6 secondary branches. Hair 1-II-VII weakly developed, 1-6b, more or less subequal on all

segments. Hair 2-VII considerably cephalad of 1-VII. Hairs 3-II,5-IV,V subequal and slightly stronger than 3-III. Hair 6-VII weak, single or double, subequal to 6-III-VI. Hair 9 considerably cephalad of caudolateral margin of tergite, 1-4b; 9-VIII about 8-12b. **Terminal Segments:** Male genital lobe about 1.8 of tergite VIII. **Paddle:** Weakly pigmented, midrib lightly pigmented; broad, inner part considerably larger than outer part; apex broadly emarginate. Hair 1-P usually double.

LARVA (fig. 56). Head: 0.70 mm. Siphon: 0.65 mm. Anal Saddle: 0.30 mm. **Thorax:** Hair 5-M double. **Abdomen:** Hair 7-III-VI weakly developed, smaller than hair 5 of corresponding segment. **Segment VIII:** Comb scales 35-42(29-49), with single broadly rounded to spatulate, minutely fringed spine, in irregular triple row to large triangular patch. **Siphon:** Index about 2.5(2.2-2.6). Pecten teeth 12-15 (9-17), extending to about basal 0.50 of siphon. Hair 1-S 4b(4-7b). **Anal Segment:** Spines on caudal margin of saddle reduced, most very short with multiple teeth. Hair 4a-X 6b(4-7b).

SYSTEMATICS. *Haemagogus boshelli* can be distinguished from the other species of the Splendens Section by the following characters: in the **adults** by (1) bare *ppn*, (2) eyes narrowly separated above antennae (1 or 2 ommatidial diameters), (3) proboscis about equal (0.95-1.05) in length to forefemur and (4) dark scales of abdomen purple; in the **male genitalia** by (1) unique clasper development, flattened, bent at right angle near middle with elbowlike flap distad of angle and with bulbous apex and (2) large oval area of peglike setae near middle of sidepiece; and in the **larva** by (1) double hair 5-M, (2) numerous, usually 35-42 comb scales, (3) usually 6 branched hair 4a-X and (4) hair 7-III-VI weaker than hair 5 of corresponding segment.

This species is among the most highly derived in *Haemagogus* as indicated by the most unusual male genitalia as well as several other characters of the adult. The male genitalia are considerably enlarged, as indicated by the genital lobe of the male pupa, with an extreme development of the clasper and sidepiece. As these structures have no counterpart among the remaining *Haemagogus,* it is difficult to determine its affinities or derivation. The larva has a well developed ventral brush and a large number of comb scales.

BIONOMICS. *Haemagogus boshelli* is found primarily in littoral situations from San Miguel Bay in Panama to Ecuador. Like several other species in the Splendens Section, *boshelli* inhabits mostly mangrove treeholes. It penetrates inland into rain forest situations in areas of heavy rainfall in northern Colombia where there is no competition from other species of *Haemagogus.*

DISTRIBUTION (fig. 6). *Haemagogus boshelli* extends along the Pacific coast of South America from eastern Panama to Ecuador, with one record from the Atlantic drainage of northwestern Colombia. Material examined: 836 specimens; 100 males, 93 females, 108 pupae, 535 larvae; 80 individual rearings (49 larval, 22 pupal, 9 incomplete).

PANAMA. **Darien:** Bahia Pina, Ensenada Molino, 2 Aug 1956 (GML), 3 lpM (03096,03105, 03117), 2 lpF (03106,03118), 2 lp (03092,03101) [UCLA]. Jaque, 17 Dec 1963 (PA 608), 4 pF (608-102,103,105,106), 5 lP (608-101,107-111), 1 p, 85 L [UCLA]; same data, 18 Dec 1963 (PA 610), 4 lpF (610-101,103,104,106), 5 P, 32 L [UCLA]; same data, 6 May 1950, P. Galindo (GML), 1 lpF (00424) [UCLA]; same data, 3-4 July 1945, W. Komp, 38 M, 1 M gen, 36 F, 2 p, 19 l, 4 L [UCLA, USNM]. Rio Jaque, 19 Dec 1963 (PA 612), 3 lpM (612-104,115,116), 3 lpF (612-108,110,111), 1 pM (612-109), 3 pF (612-101,102,106), 245 L [UCLA]. Rio Pina, 2 Aug 1956 (GML), 1 lpM (03088), 1 lpF (03113) [UCLA].

COLOMBIA. **Choco:** Bahia Solano, 8 M, 3 M gen, 7 F, 2 l, 2 L [USNM]; same data, 1943, 3 M [UCLA]; same data, 18 July 1942, E. Osorno-Mesa, 1 M [UCLA]. **Narino:** Isla Gorgona, July

1924, L. Cheesman, 2 M, 2 F [BM]. **Valle del Cauca:** Buenaventura, 1944, E. Osorno-Mesa, 2 M, 2 F, 4 l [UCLA, USNM]. Rip Raposo Virus Field Station, nr. Buenaventura, 30 m, 13 Jan 1965, V. Lee (COL 41), 2 lpM (41-10,11), 3 lpF (41-12-14), 1 pM (41-100), 4 L; same data (COL 42), 1 pM (42-12), 5 L; same data, 23 Feb 1965 (COL 56), 3 lpM (56-10,15,17), 4 lpF (56-10,16,18, 19), 5 M, 3 F, 6 P, 4 l, 19 L; same data, 17 Mar 1965 (COL 87), 1 pM (87-100); same data, 31 Mar 1965 (COL 89), 1 lpM (89-20); same data, 5 May 1965, P. Barreto and V. Rivas (COL 110), 1 lpM (110-13), 1 lpF (110-14), 1 pM (110-106), 4 pF (110-101,102,104,109), 1 lP (110-15), 2 p (110-105,107), 8 L [UCLA]. Rio Raposo, brackish water zone, 0 m, 14 Oct 1965, V. Lee (COL 94), 1 lpM (94-14), 6 lpF (94-10,11,13,16-18), 5 pM (94-100-104), 5 P, 21 L; same data (COL 95), 1 lpM (95-10), 1 pM (95-101), 2 l, 2 L; same data, 17 Dec 1965 (COL 144), 1 lpF (144-14), 6 M, 3 F, 7 p, 8 L; same data (COL 143), 2 lpM (144-11,17), 1 lp (144-19), 1 P, 23 L [UCLA]. Rio Raposo, mangrove zone, 0 m, 4 Apr 1966, P. Orjuela (COL 221), 3 lpM (221-10,17,20), 1 pM (221-102), 7 L [UCLA].

ECUADOR. **Esmeraldas:** Changuaral Island, Bahia de Ancon de Sardinas, R. Levi-Castillo, 1 M gen (*garciai* holotype) [USNM]; same data, 14-18 Aug 1972, M. Arzube R. (ECU 179), 2 F [UCLA].

Additional Record From the Literature

COLOMBIA. **Choco:** Napipi (Osorno-Mesa, 1944:169).

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FIGURES

1. Distribution of *Haemagogus (Haemagogus),* Albomaculatus Section, Tropicalis Section and Splendens Section
2. Distribution of *anastasionis, chrysochlorus, spegazzinii* and *baresi*
3. Distribution of *janthinomys, capricornii* and *mesodentatus*
4. Distribution of *andinus, nebulosus, albomaculatus* and *panarchys*
5. Distribution of *soperi, acutisentis, equinus* and *tropicalis*
6. Distribution of *splendens, celeste, argyromeris, chalcospilans* and *boshelli*
7. Distribution of *iridicolor, aeritinctus, regalis* and *lucifer*
8. *Haemagogus (H.) anastasionis;* male genitalia, male claws, pupa
9. *Haemagogus (H.) anastasionis;* larva
10. *Haemagogus (H.) spegazzinii;* male genitalia, male claws, pupa
11. *Haemagogus (H.) spegazzinii;* larva
12. *Haemagogus (H.) baresi;* male genitalia, male claws, pupa
13. *Haemagogus (H.) baresi;* larva
14. *Haemagogus (H.) andinus;* male genitalia, male claws, pupa
15. *Haemagogus (H.) andinus;* larva
16. *Haemagogus (H.) nebulosus;* pupa
17. *Haemagogus (H.) nebulosus;* larva
18. *Haemagogus (H.) janthinomys;* male and female heads and claws; male foretarsus 5; female thorax, wing, legs and genitalia
19. *Haemagogus (H.) janthinomys;* male genitalia, pupa
20. *Haemagogus (H.) janthinomys;* larva
21. *Haemagogus (H.) capricornii;* male genitalia, male claws, pupa
22. *Haemagogus (H.) capricornii;* larva
23. *Haemagogus (H.) mesodentatus;* male genitalia, male claws, pupa
24. *Haemagogus (H.) mesodentatus;* larva
25. *Haemagogus (H.) albomaculatus;* male genitalia, male claws, pupa
26. *Haemagogus (H.) albomaculatus;* larva
27. *Haemagogus (H.) panarchys;* male and female heads and claws; male foretarsus 5; female thorax, wing, legs and genitalia
28. *Haemagogus (H.) panarchys;* male genitalia, pupa
29. *Haemagogus (H.) panarchys;* larva
30. *Haemagogus (H.) soperi;* male genitalia, male claws, pupa
31. *Haemagogus (H.) soperi;* larva
32. *Haemagogus (H.) acutisentis;* male genitalia, male claws, pupa
33. *Haemagogus (H.) acutisentis;* larva
34. *Haemagogus (H.) equinus;* male genitalia, male claws, pupa
35. *Haemagogus (H.) equinus;* larva
36. *Haemagogus (H.) chrysochlorus;* male genitalia, male claws
    Haemagogus (H.) tropicalis; male genitalia, male claws
37. *Haemagogus (H.) tropicalis;* larva
38. *Haemagogus (H.) splendens;* male and female heads and claws; male foretarsus 5; female thorax, wing, legs and genitalia

39. *Haemagogus (H.) splendens;* male genitalia, pupa
40. *Haemagogus (H.) splendens;* larva
41. *Haemagogus (H.) celeste;* male genitalia, male claws, pupa
42. *Haemagogus (H.) celeste;* larva
43. *Haemagogus (H.) iridicolor;* male genitalia, male claws, pupa
44. *Haemagogus (H.) iridicolor;* larva
45. *Haemagogus (H.) aeritinctus;* male genitalia, male claws, pupa
46. *Haemagogus (H.) aeritinctus;* larva
47. *Haemagogus (H.) regalis;* male genitalia, male claws, pupa
48. *Haemagogus (H.) regalis;* larva
49. *Haemagogus (H.) lucifer;* male genitalia, male claws, pupa
50. *Haemagogus (H.) lucifer;* larva
51. *Haemagogus (H.) argyromeris;* male genitalia, male claws, pupa
52. *Haemagogus (H.) argyromeris;* larva
53. *Haemagogus (H.) chalcospilans;* male genitalia, male claws, pupa
54. *Haemagogus (H.) chalcospilans;* larva
55. *Haemagogus (H.) boshelli;* male genitalia, male claws, pupa
56. *Haemagogus (H.) boshelli;* larva

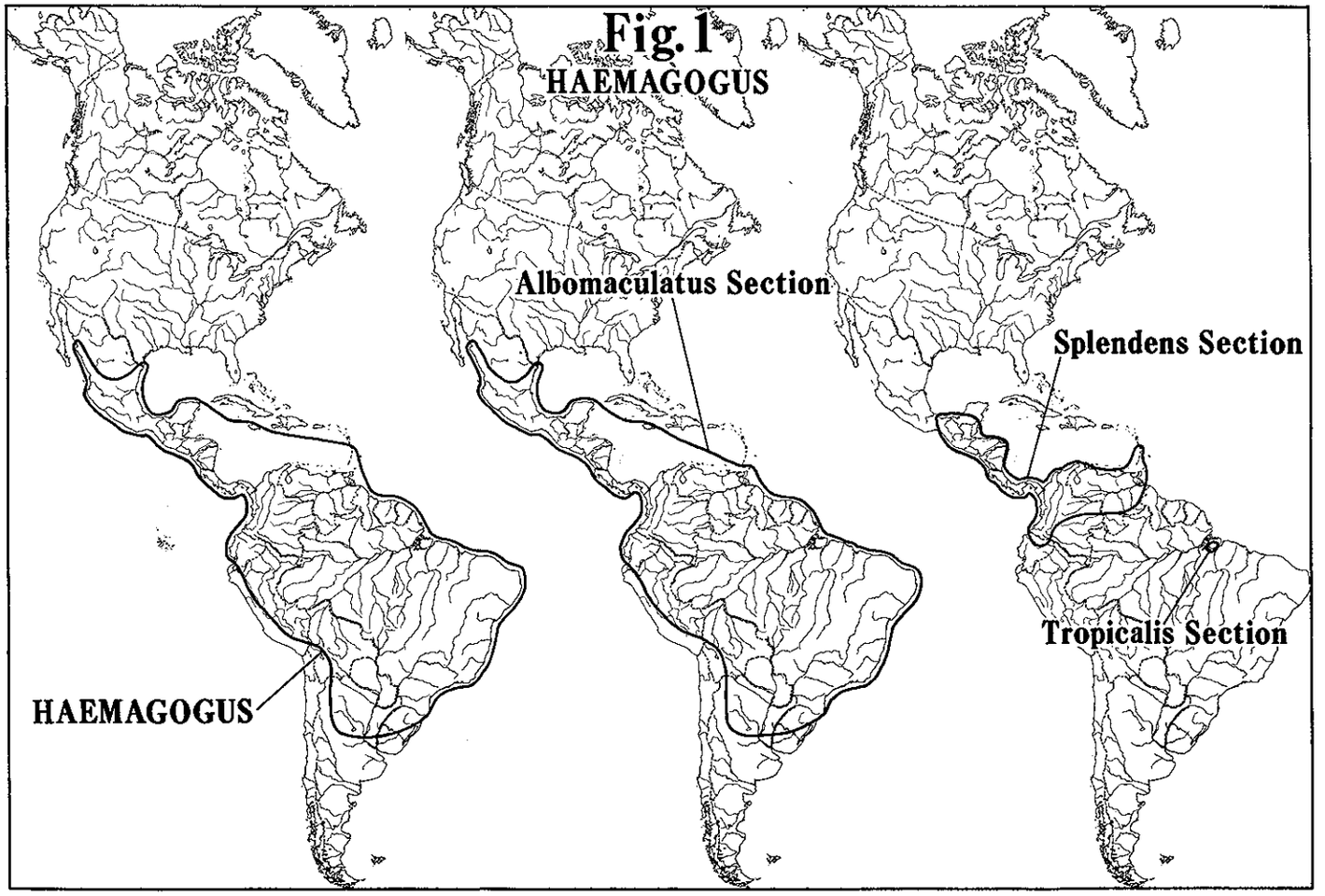

HAEMAGOGUS
Albomaculatus Section
Splendens Section
Tropicalis Section
HAEMAGOGUS

Fig. 1

Fig. 2

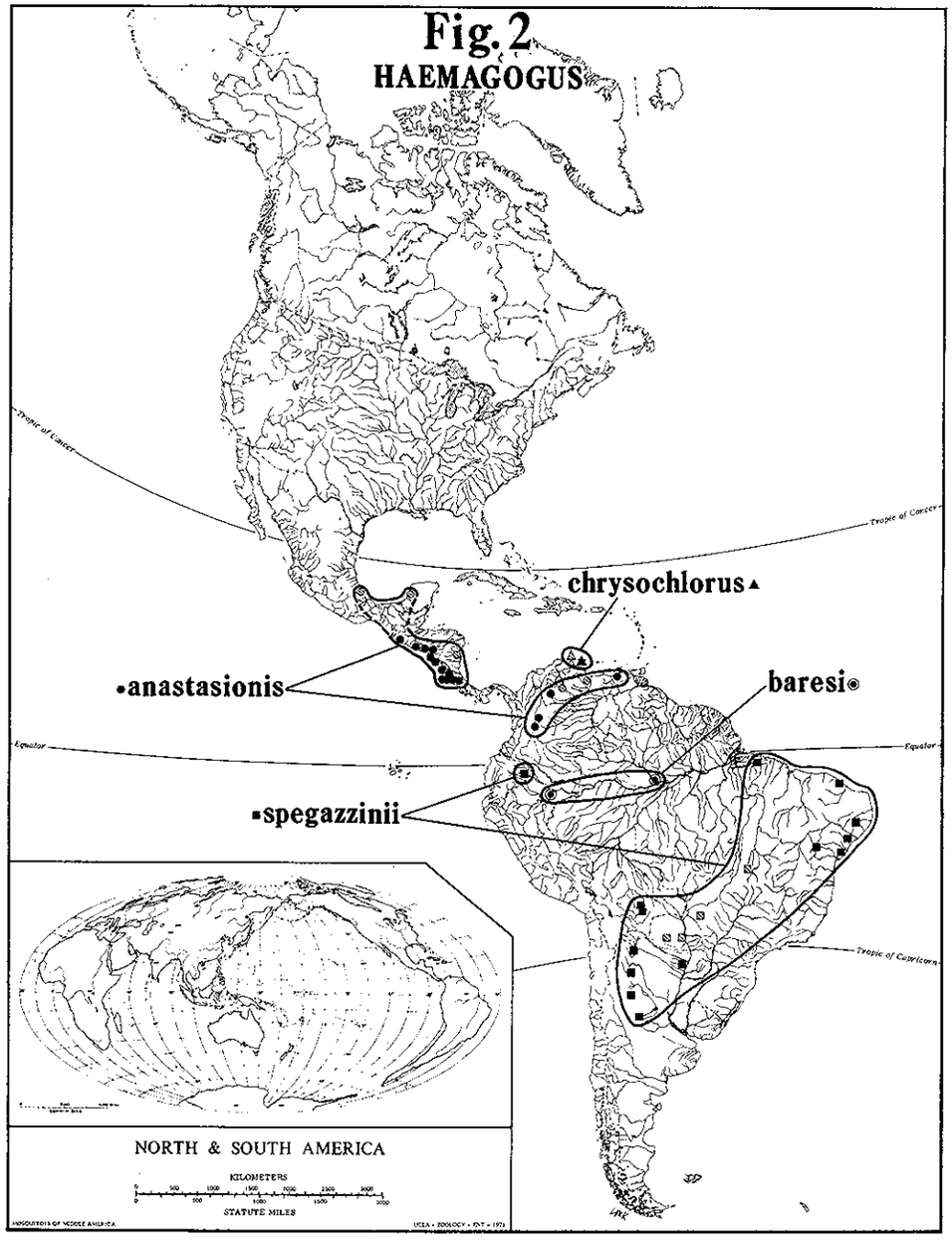

HAEMAGOGUS
Tropic of Cancer
Tropic of Cancer
chrysochlorus
anastasionis
baresi
Equator
Equator
spegazzinii
Tropic of Capricorn
NORTH & SOUTH AMERICA
KILOMETERS
STATUTE MILES

Fig. 3
HAEMAGOGUS

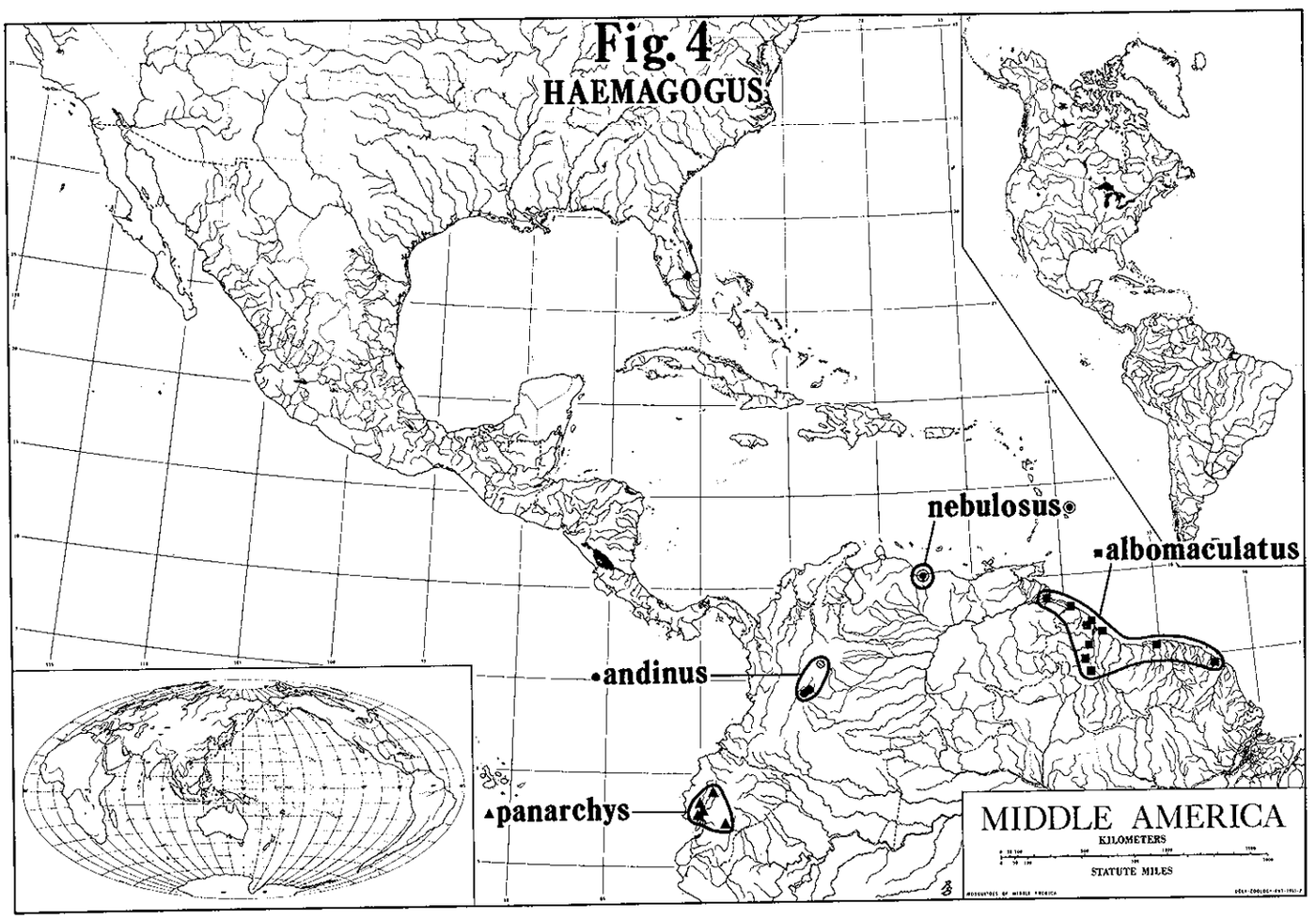
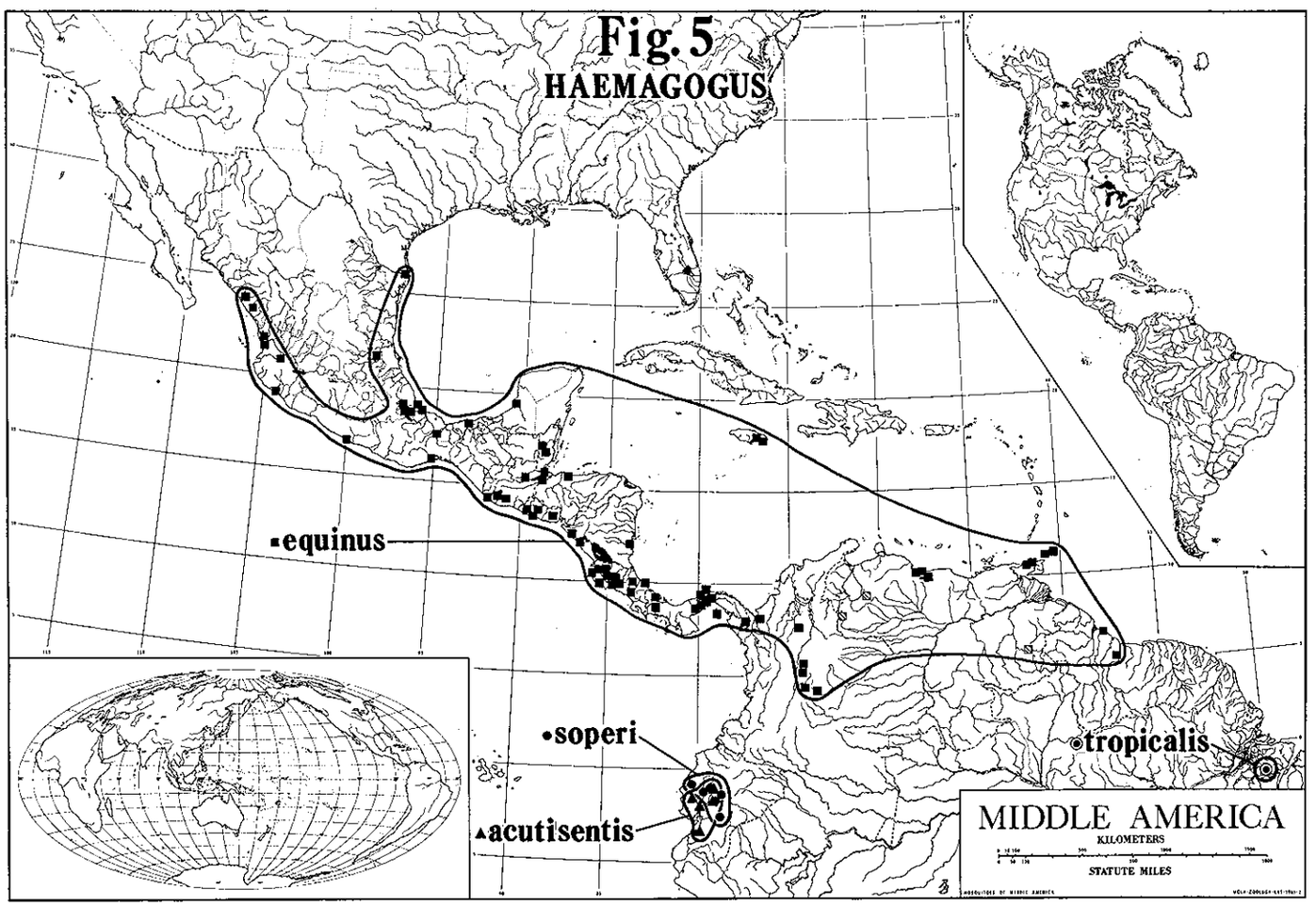


Fig. 4
HAEMAGOGUS
nebulosus
albomaculatus
andinus
panarchys
MIDDLE AMERICA
KILOMETERS
STATUTE MILES

Fig. 5

HAEMAGOGUS



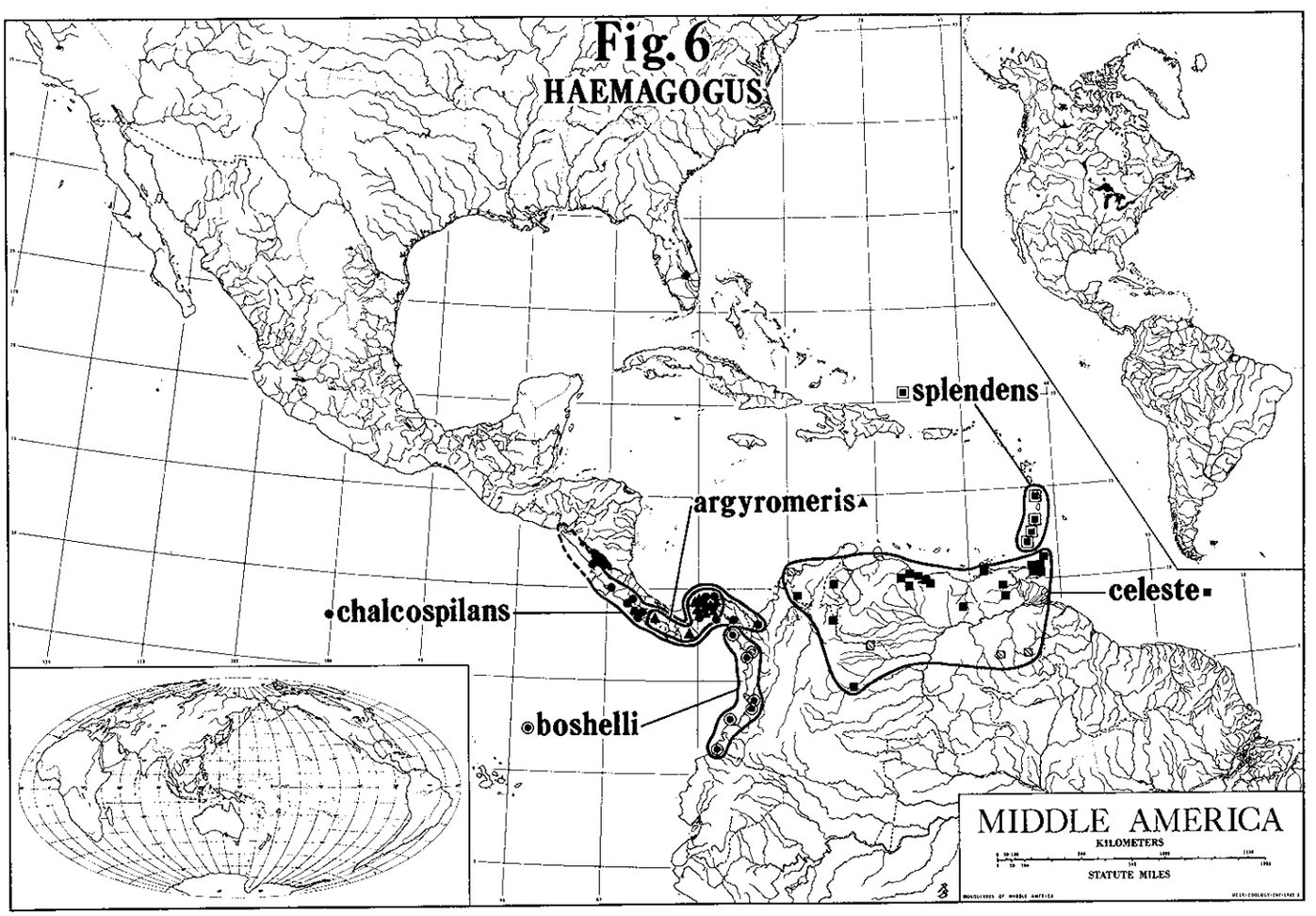


Fig. 6
HAEMAGOGUS
splendens
argyromeris
chalcospilans
celeste
boshelli
MIDDLE AMERICA
KILOMETERS
STATUTE MILES

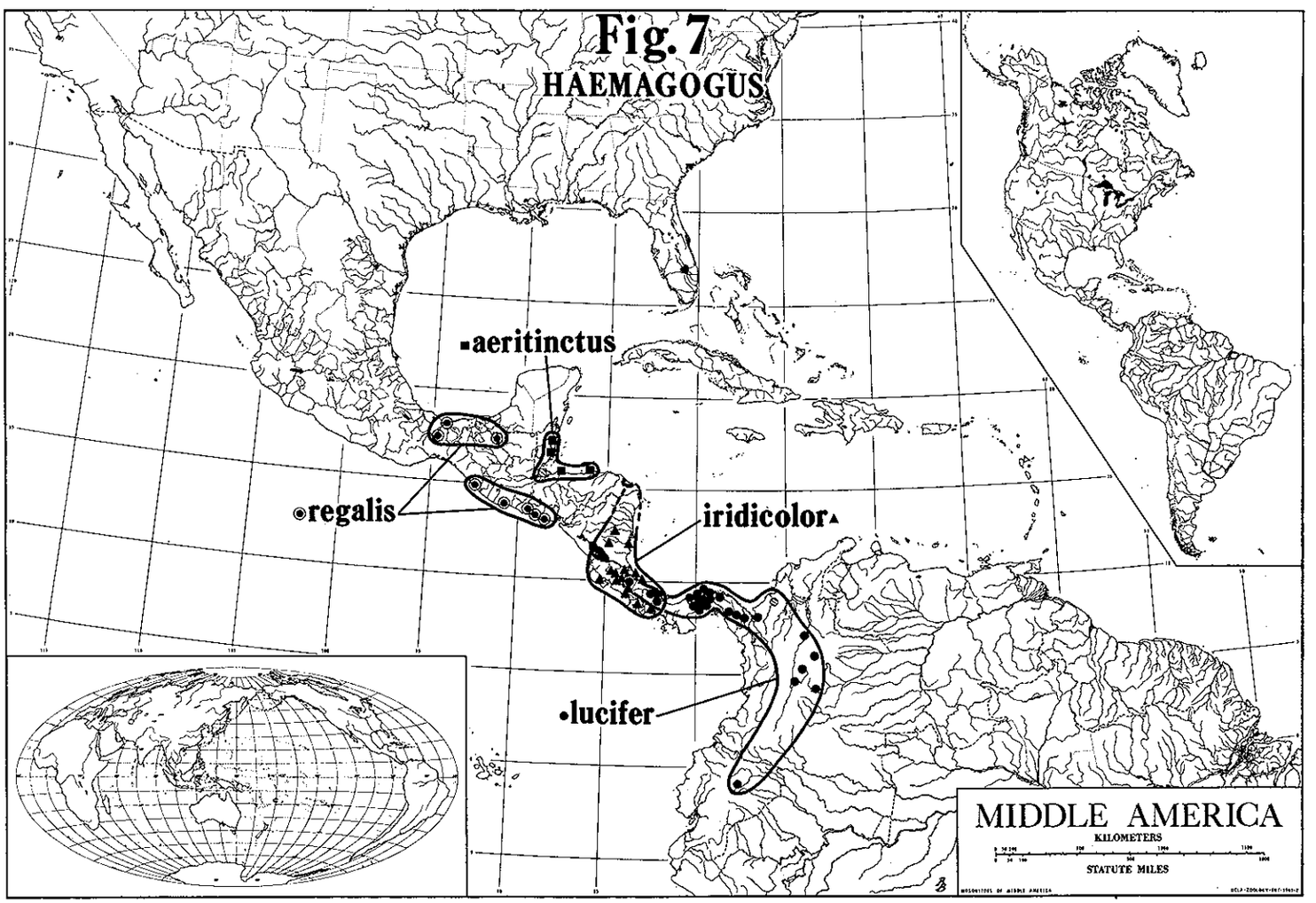


Fig. 7
HAEMAGOGUS
aeritinctus
regalis
iridicolor
lucifer
MIDDLE AMERICA
KILOMETERS
STATUTE MILES

Fig. 8

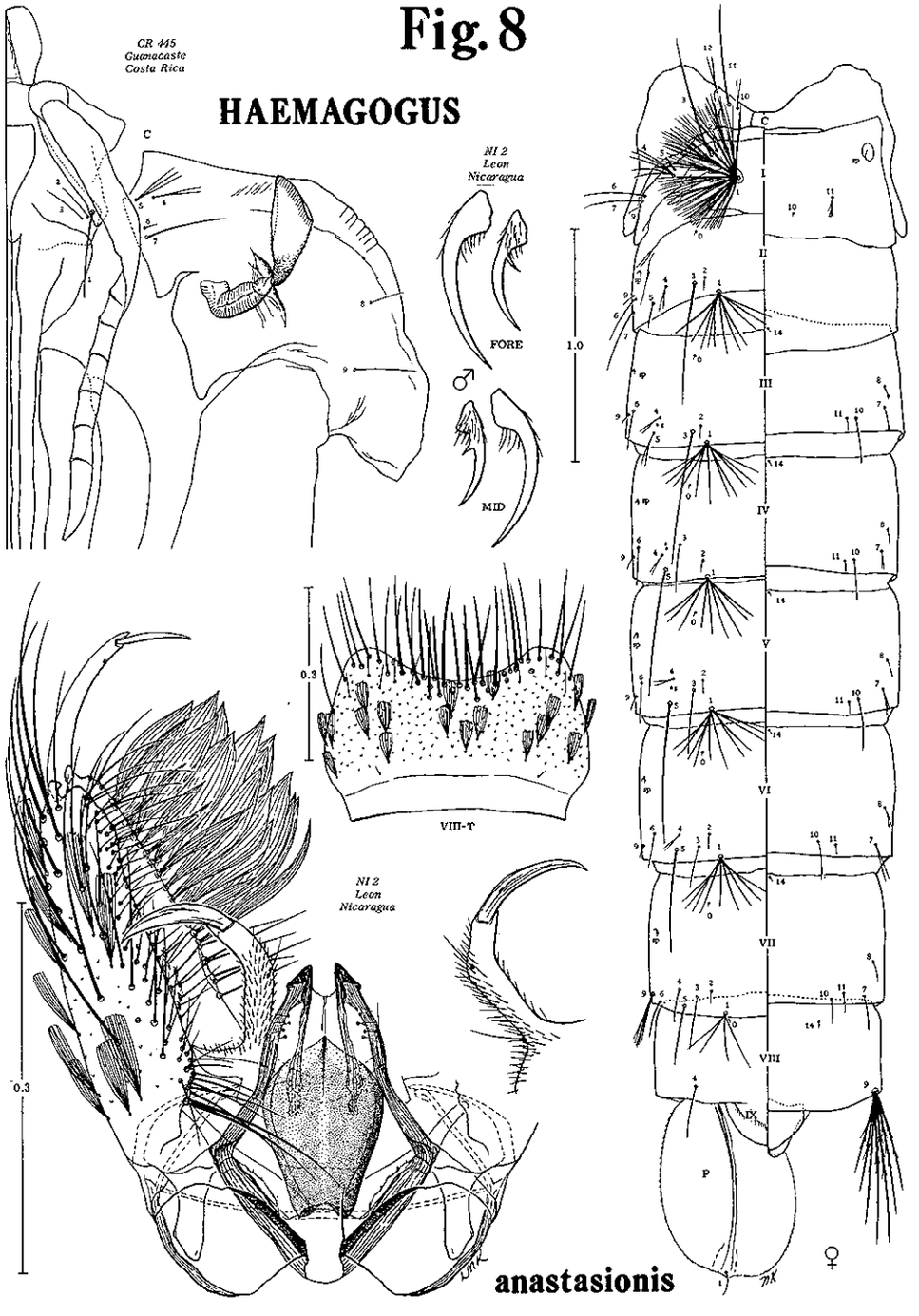
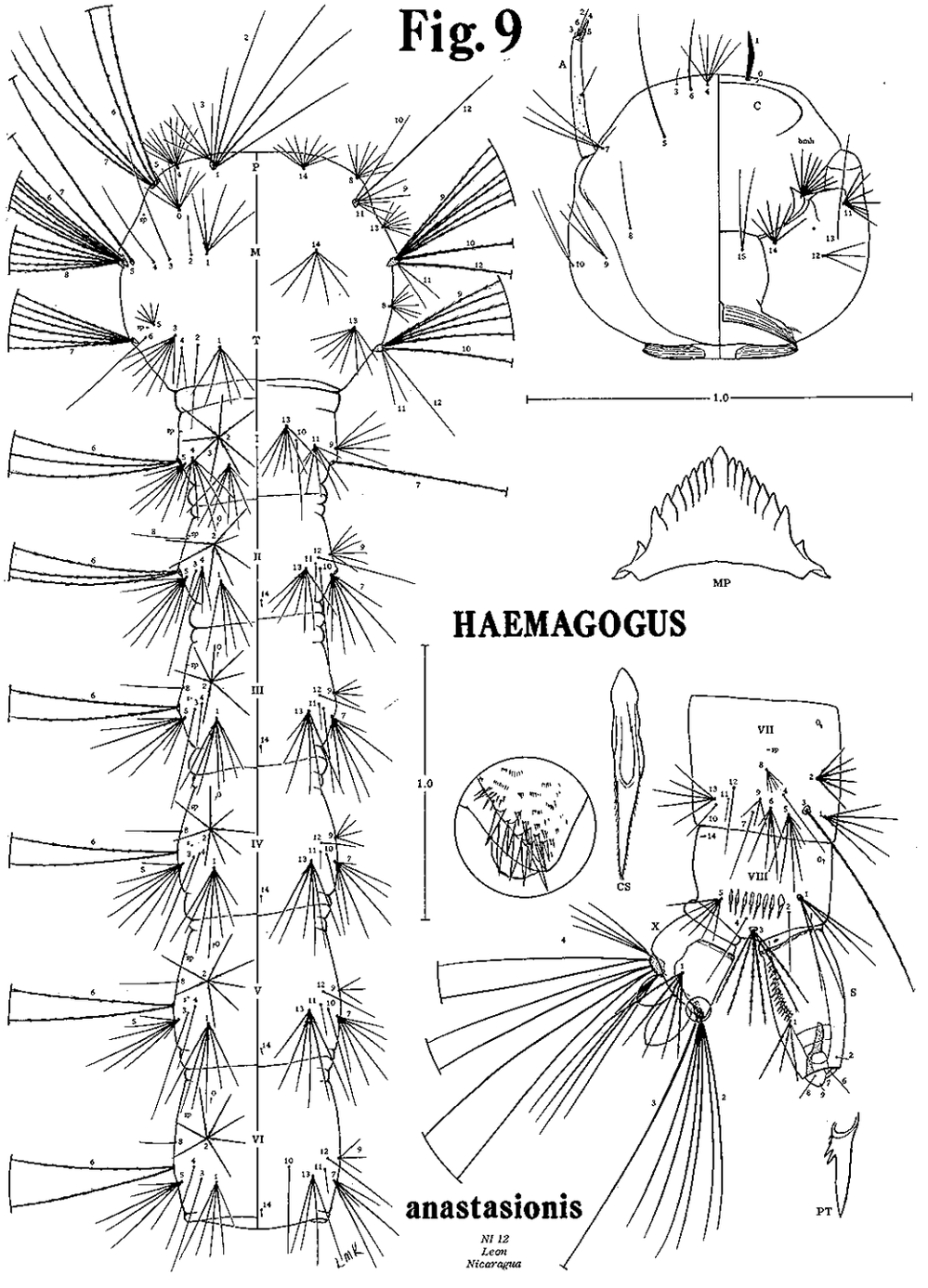

HAEMAGOGUS
CR 445
Guanacaste
Costa Rica
C
NI 2
Leon
Nicaragua
FORE
MID
♂
1.0
0.3
VIII-T
NI 2
Leon
Nicaragua
0.3
I
II
III
IV
V
VI
VII
VIII
IX
P
♀
anastasionis

Fig. 9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T
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bmh
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MP
HAEMAGOGUS
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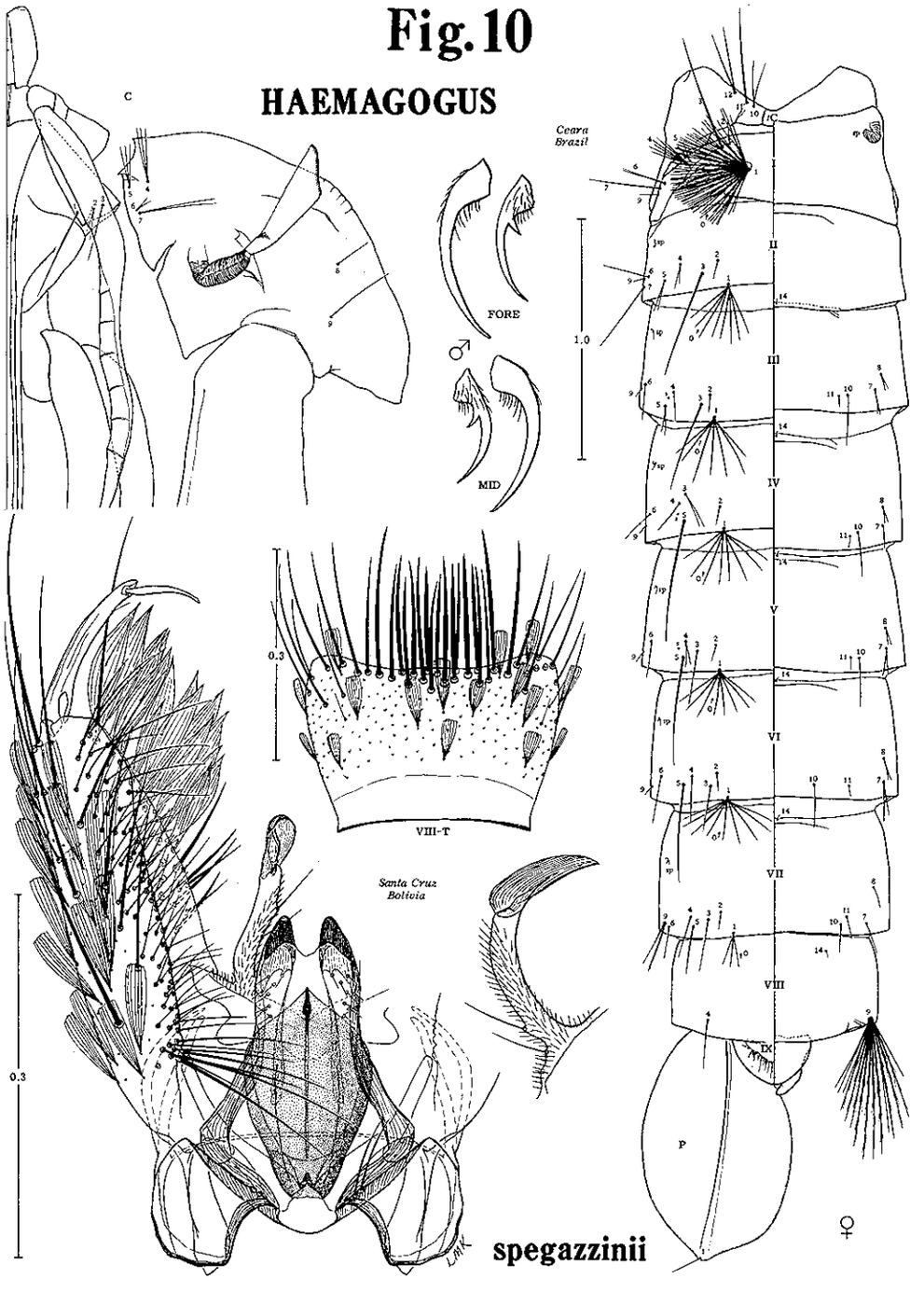
CS
VII
VIII
X
S
PT
anastasionis
NI 12
Leon
Nicaragua

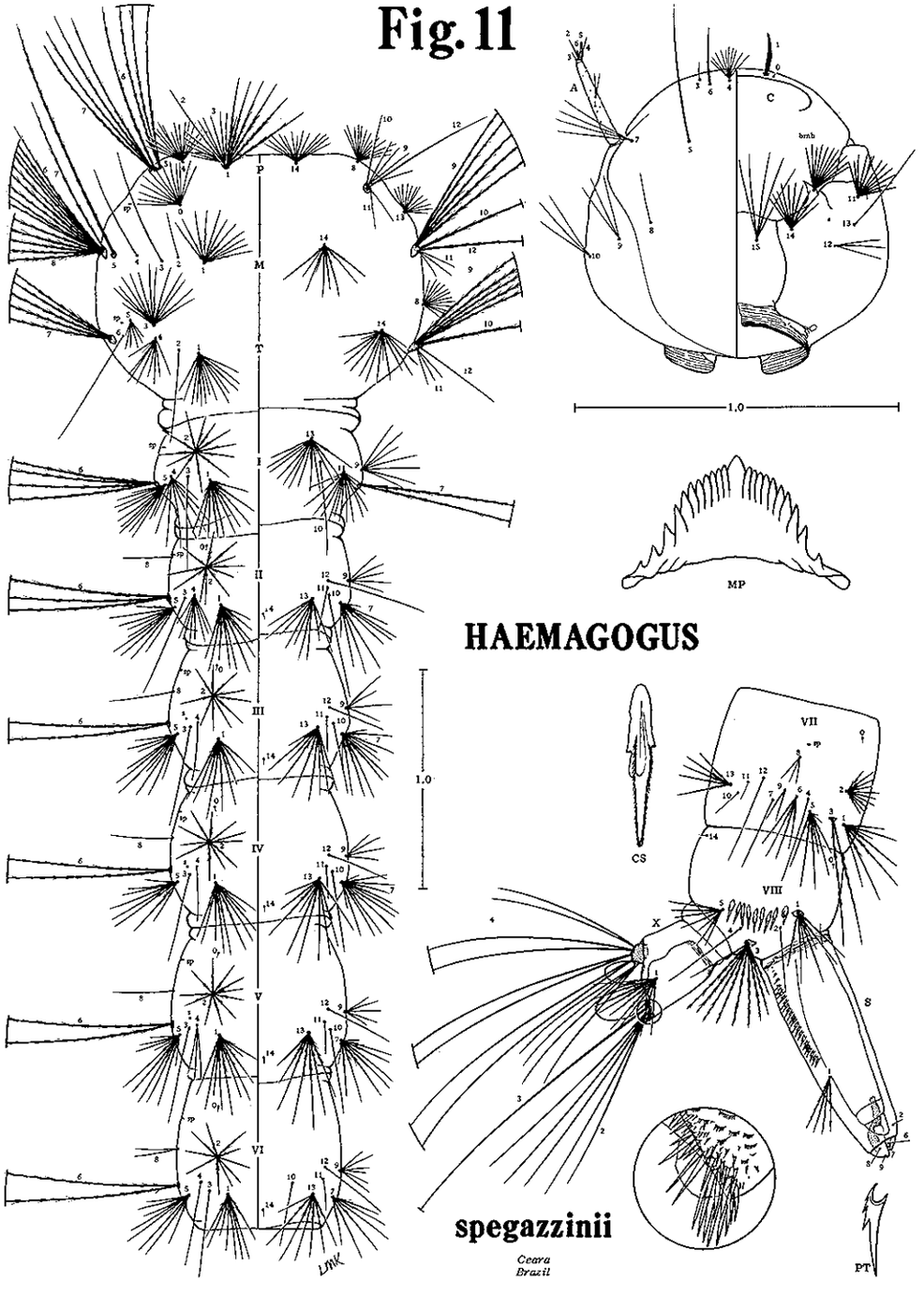
Fig. 10

HAEMAGOGUS



spegazzinii

Fig. 11



HAEMAGOGUS

spegazzinii

Ceara
Brazil

Fig.12

HAEMAGOGUS

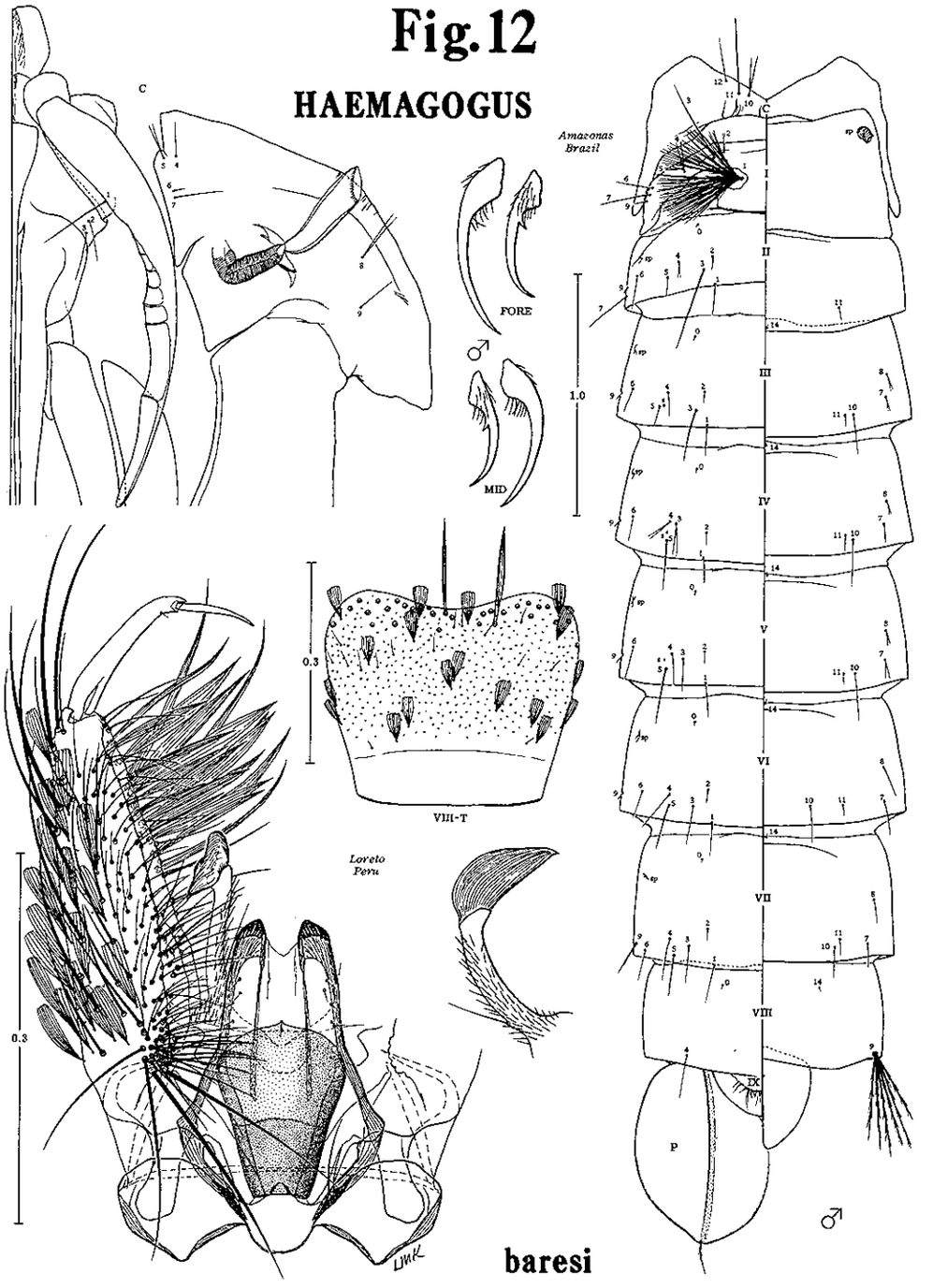


Fig. 13

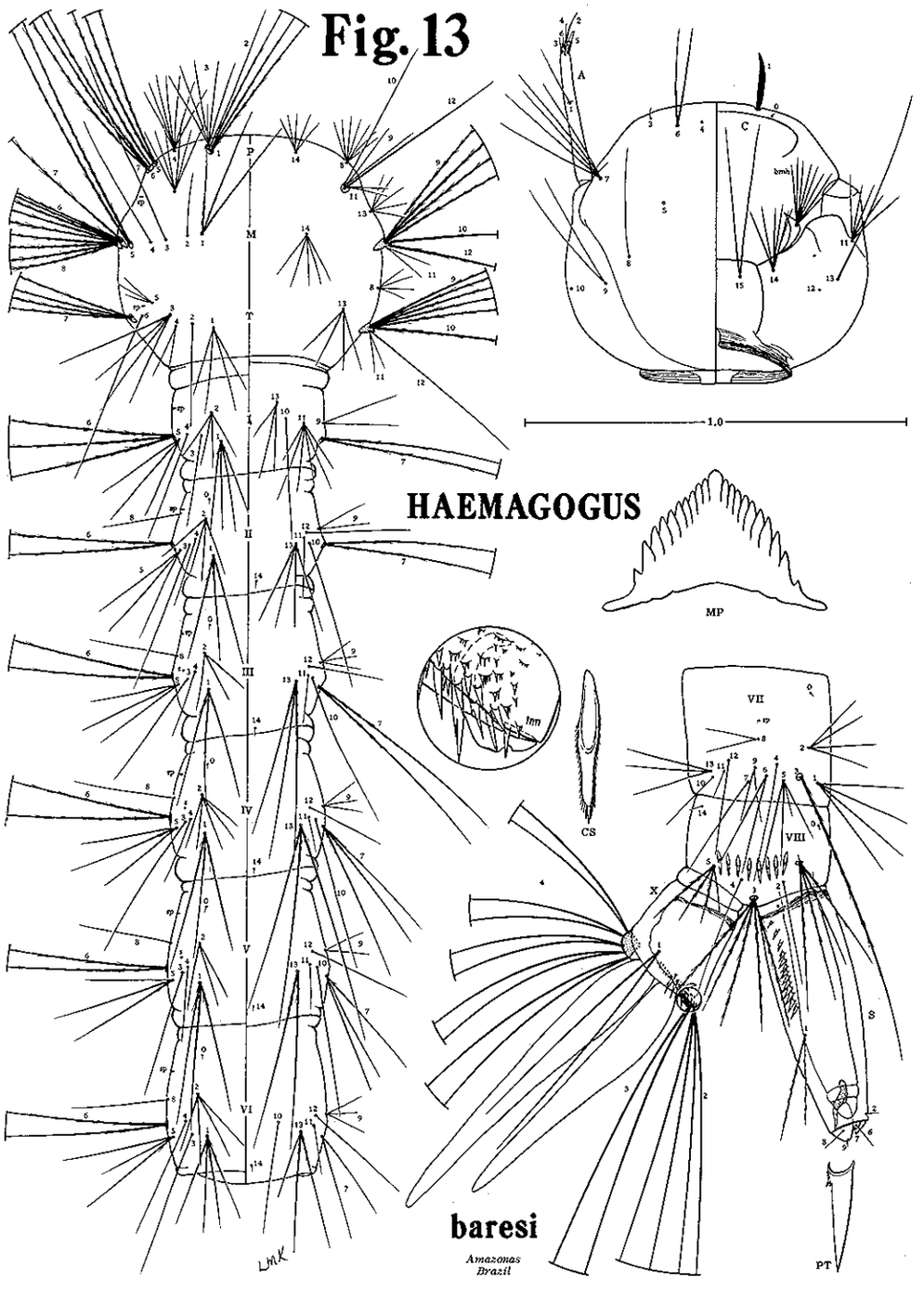


Fig. 14

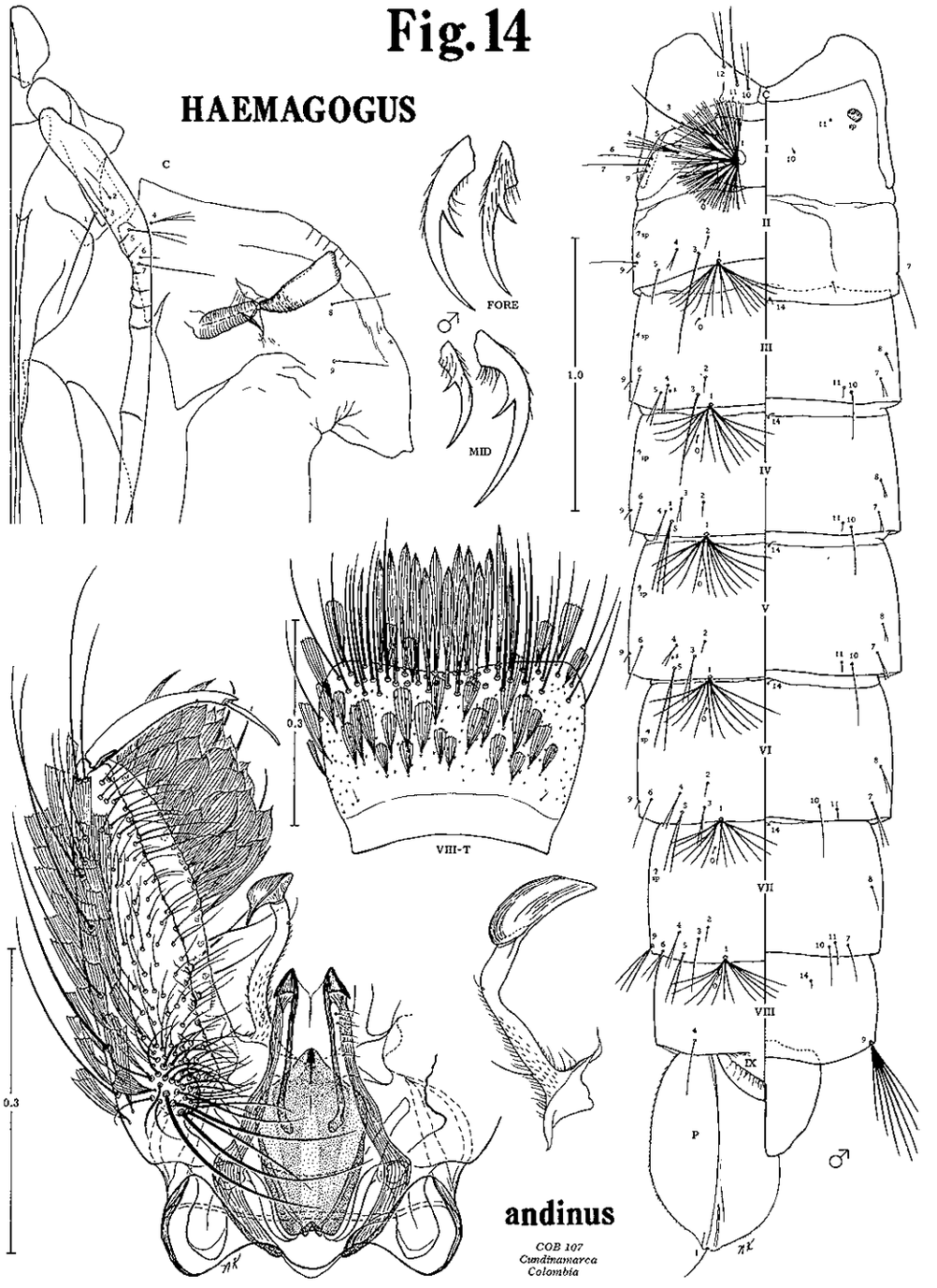
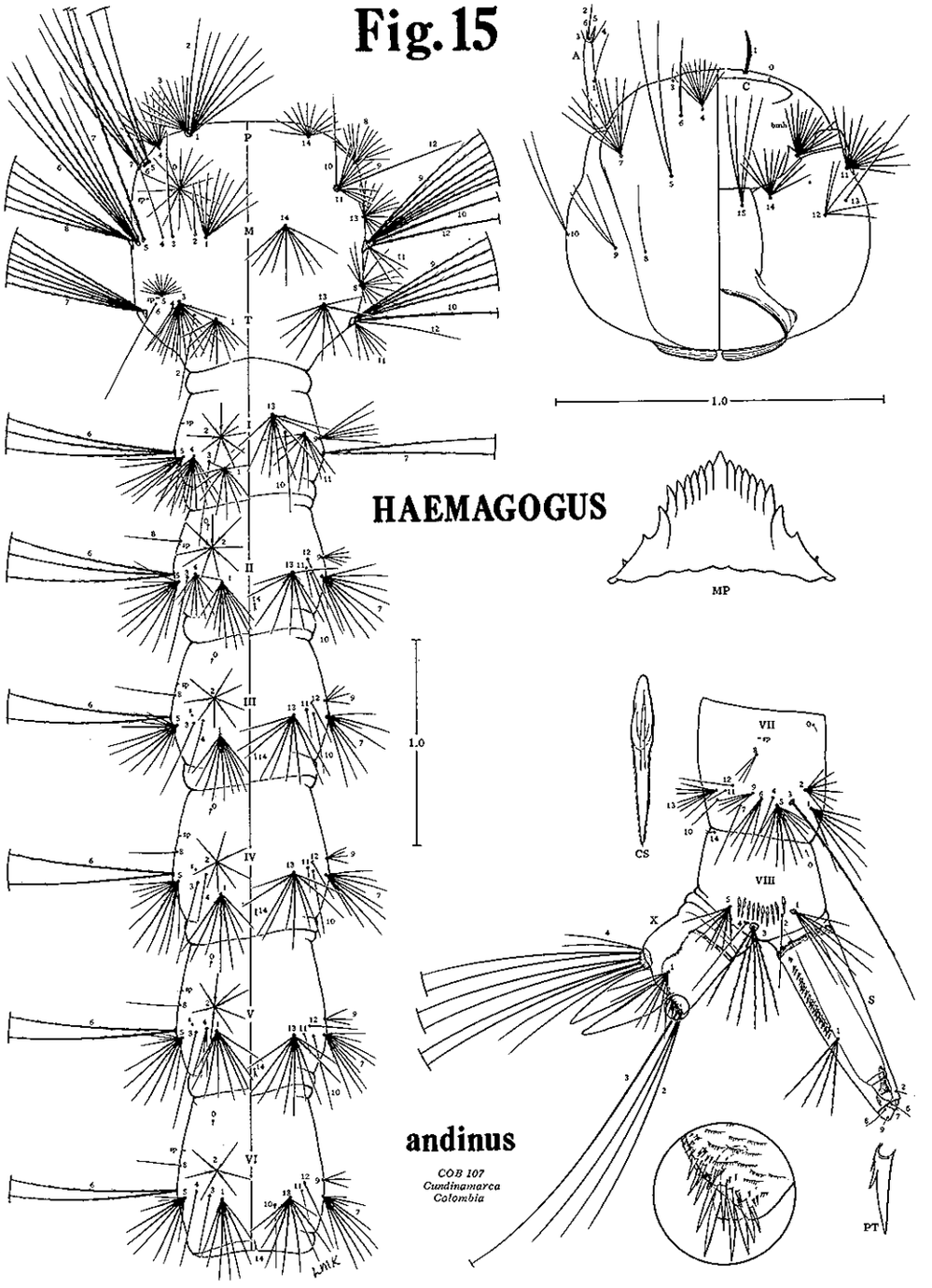

HAEMAGOGUS
C
FORE
♂
MID
1.0
I
II
III
IV
V
VI
VII
VIII
IX
P
♂
0.3
VIII-T
0.3
andinus
COB 107
Cundinamarca
Colombia

Fig. 15


P
M
T
I
II
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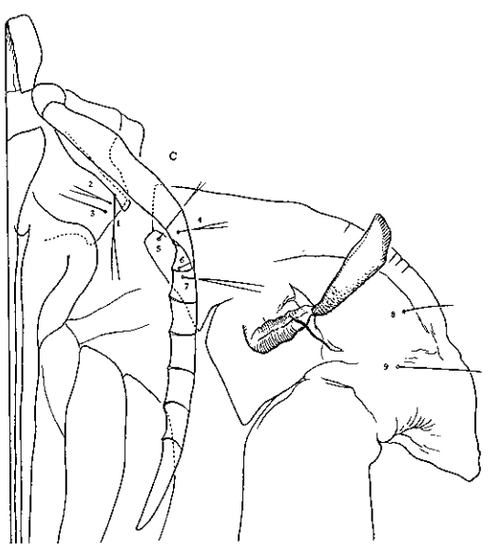
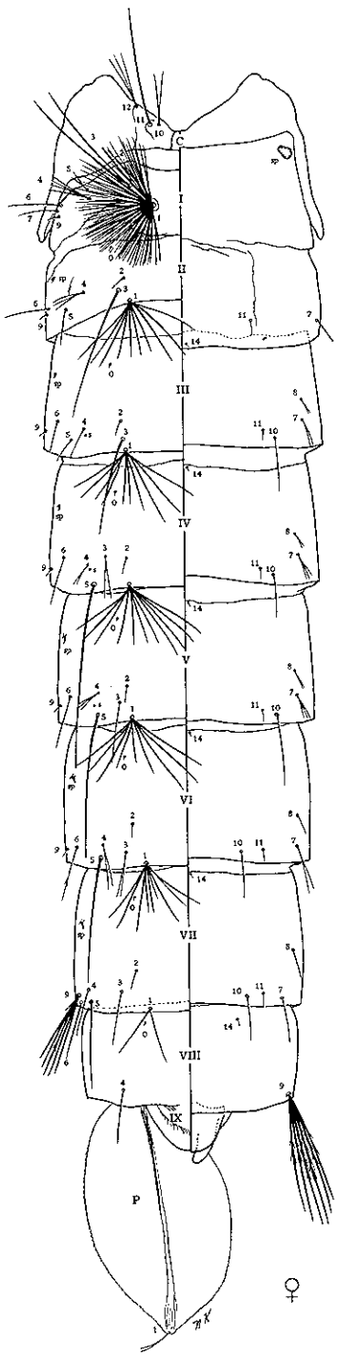
IV
V
VI
1.0
HAEMAGOGUS
MP
CS
VII
VIII
X
S
PT
andinus
COB 107
Cundinamarca
Colombia

Fig. 16

HAEMAGOGUS





1.0

nebulosus

VZ 151
Aragua
Venezuela

Fig. 17

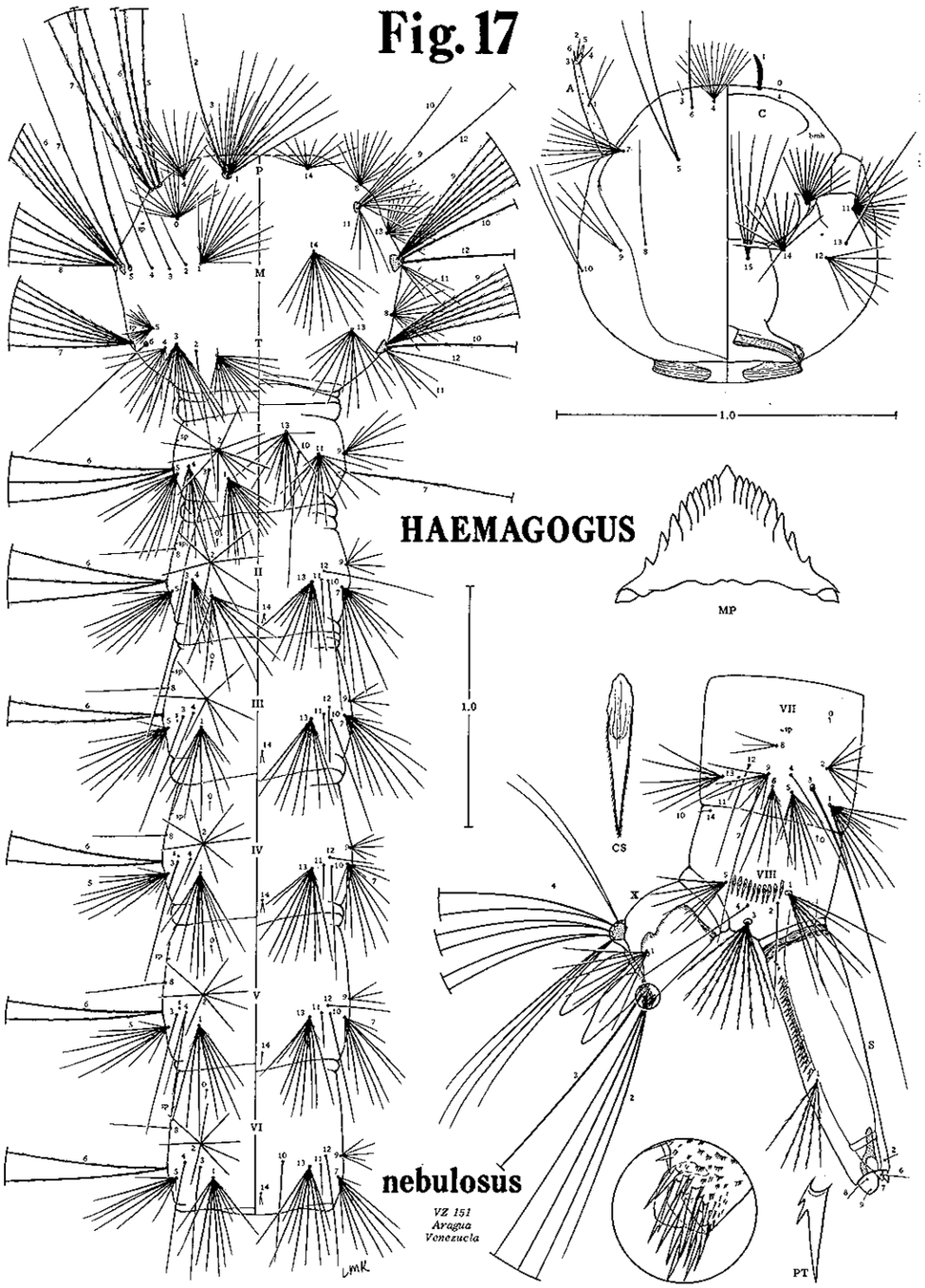

HAEMAGOGUS
nebulosus
VZ 151
Aragua
Venezuela
1.0
MP
CS
PT
LMR

Fig. 18

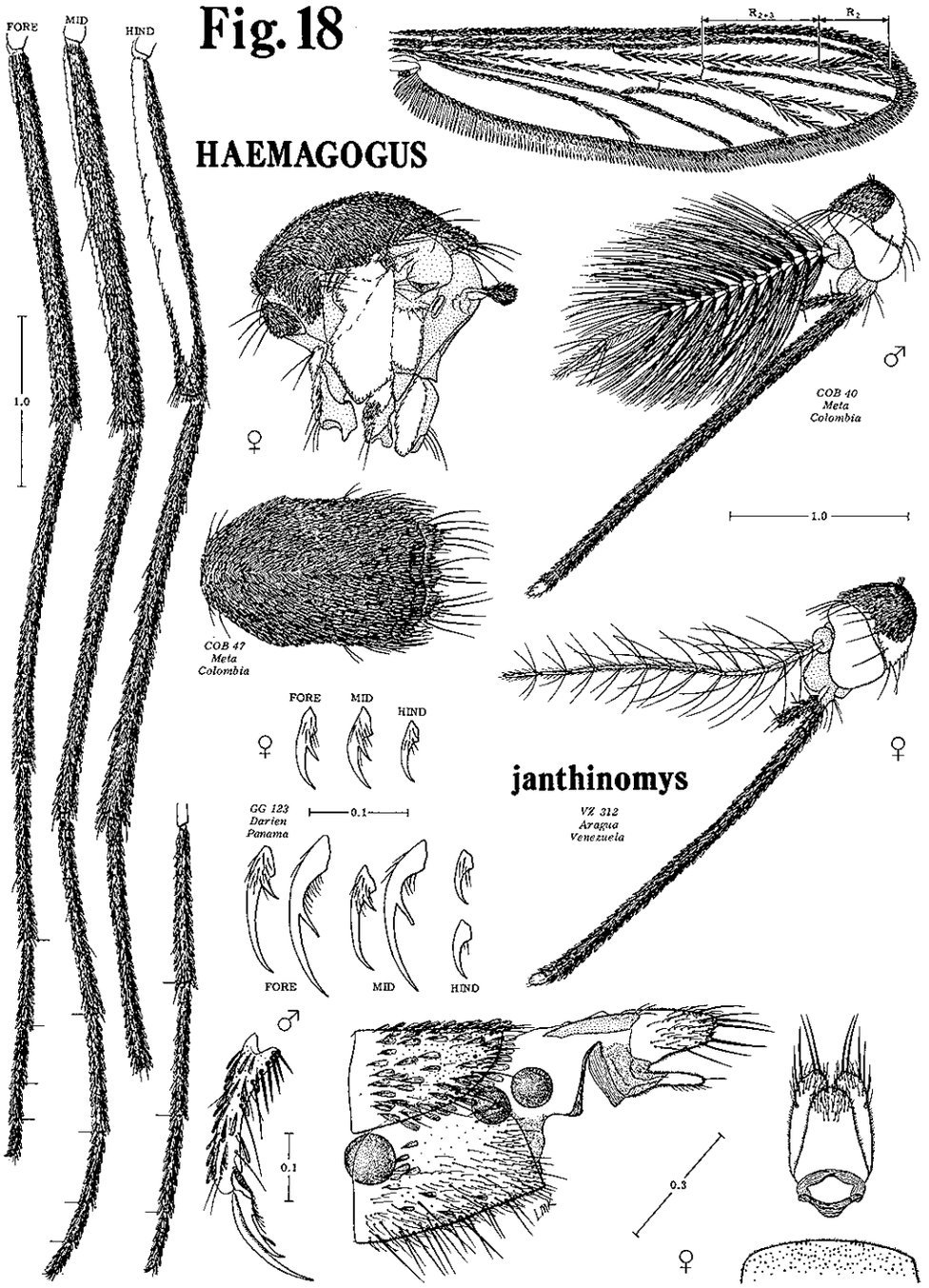
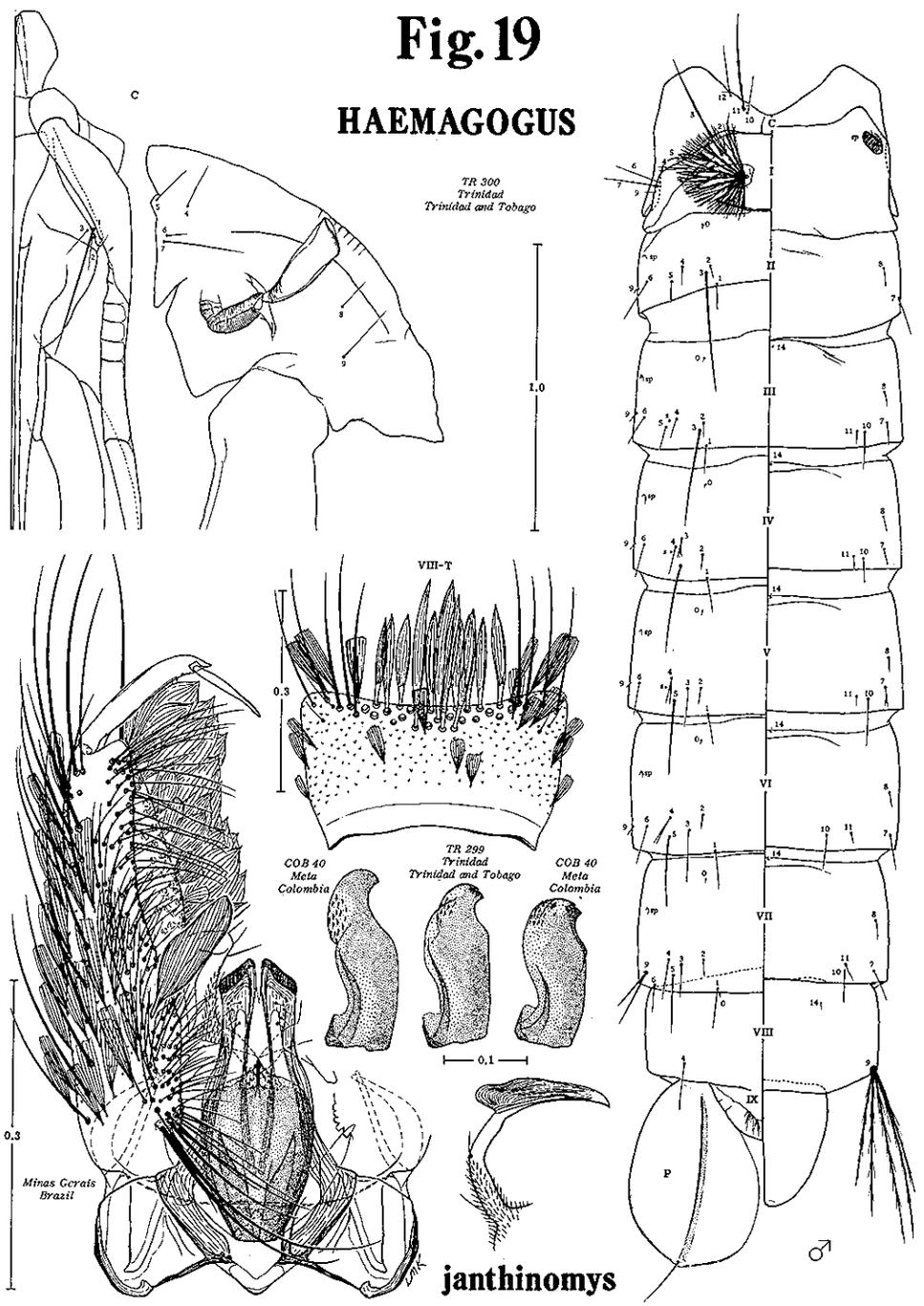

FORE
MID
HIND
1.0
HAEMAGOGUS
♀
♂
COB 40
Meta
Colombia
1.0
COB 47
Meta
Colombia
FORE
MID
HIND
♀
janthinomys
GG 123
Darien
Panama
0.1
VZ 312
Aragua
Venezuela
FORE
MID
HIND
♂
0.1
0.3
♀

Fig. 19

HAEMAGOGUS



janthinomys

Fig. 20

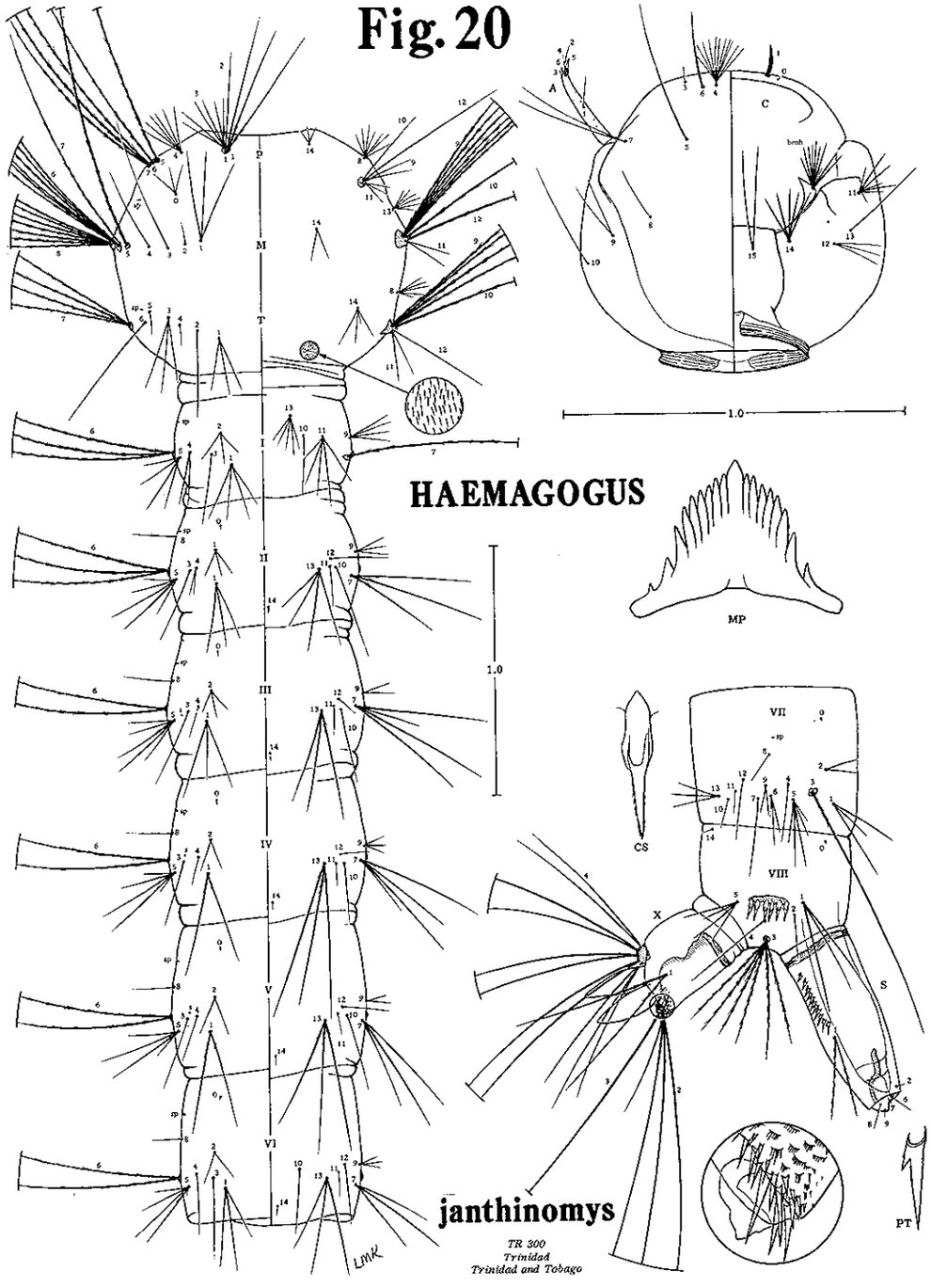
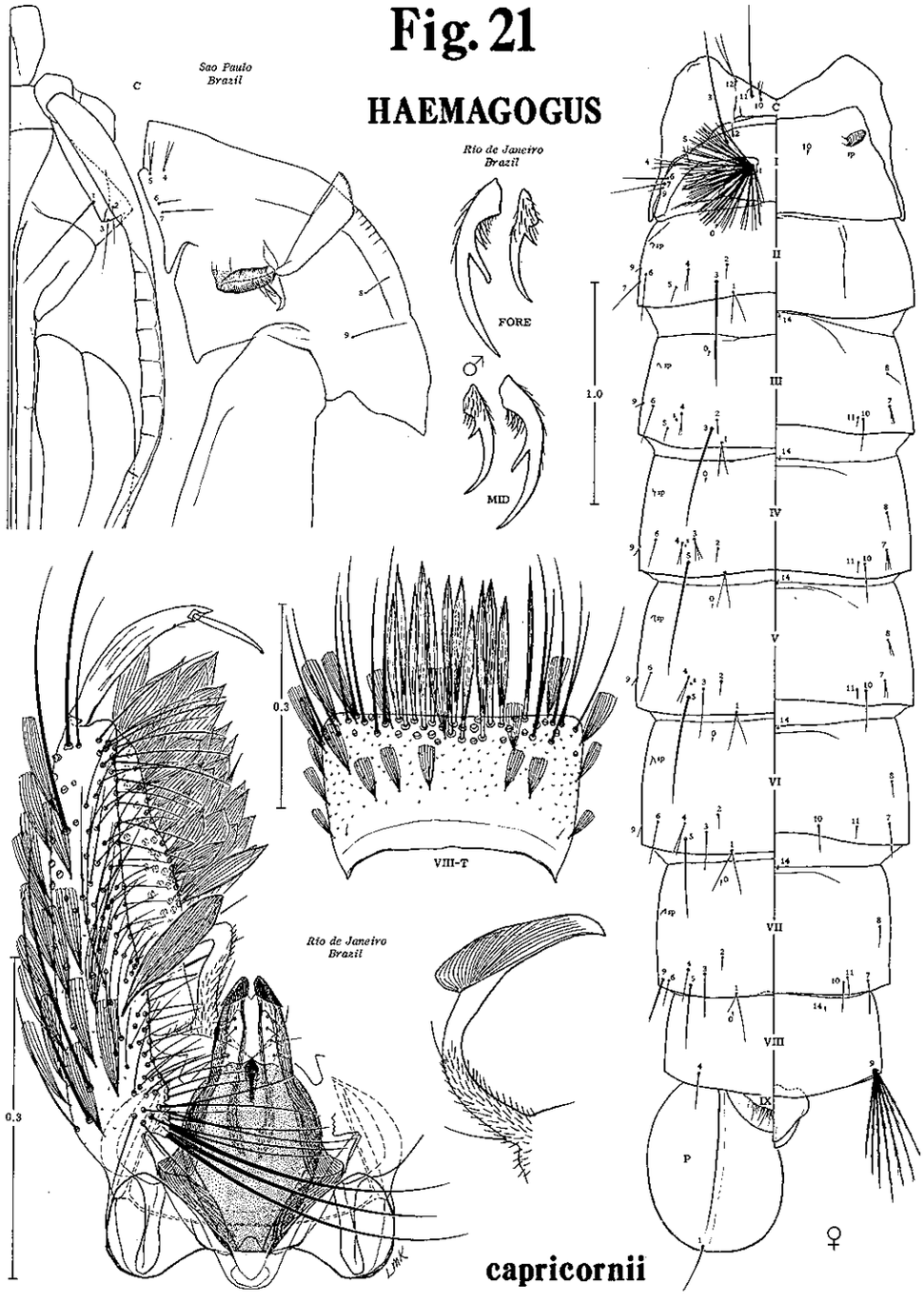

HAEMAGOGUS
janthinomys
TR 300
Trinidad
Trinidad and Tobago
1.0
MP
CS
PT

Fig. 21

HAEMAGOGUS



capricornii

Fig. 22

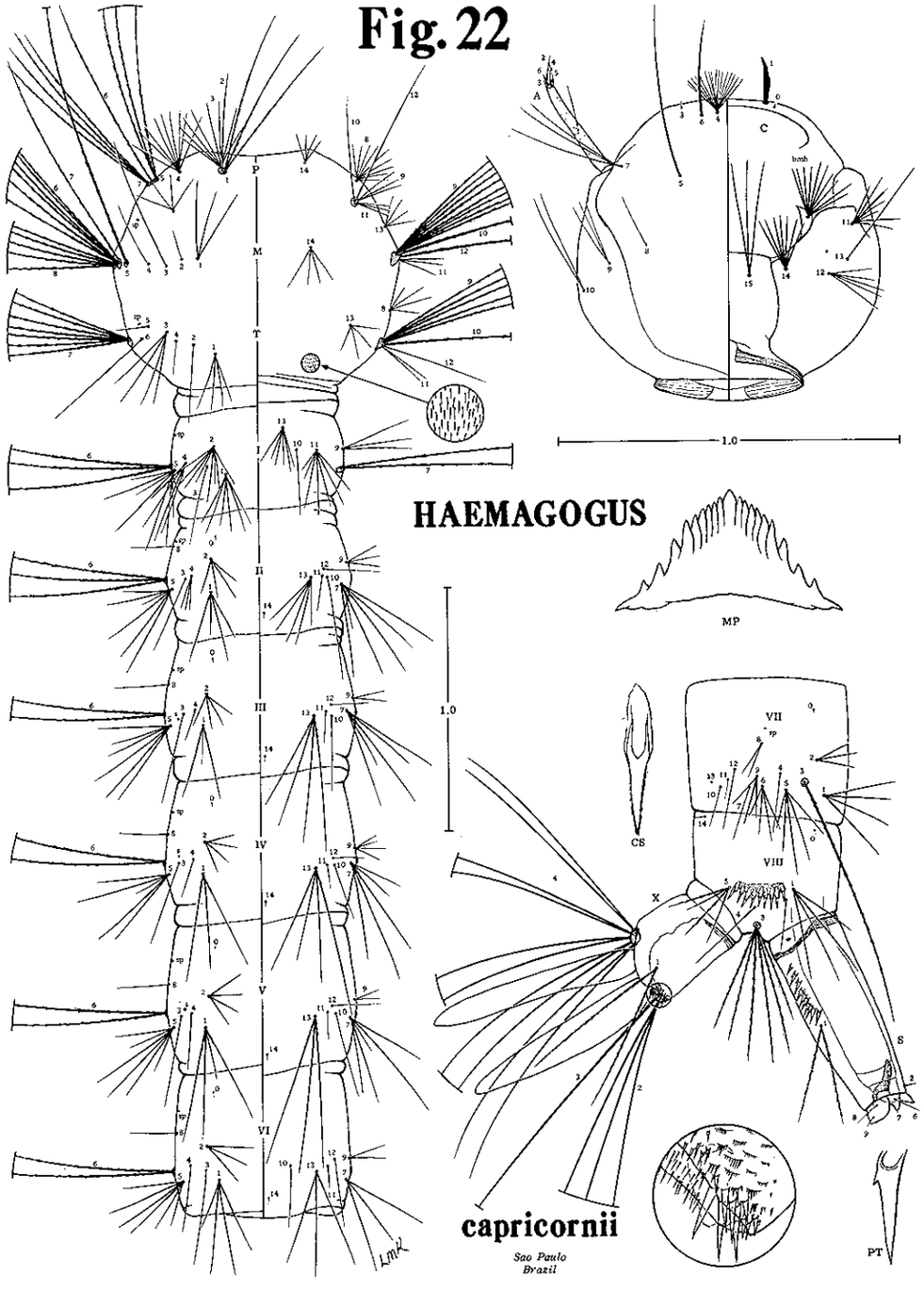
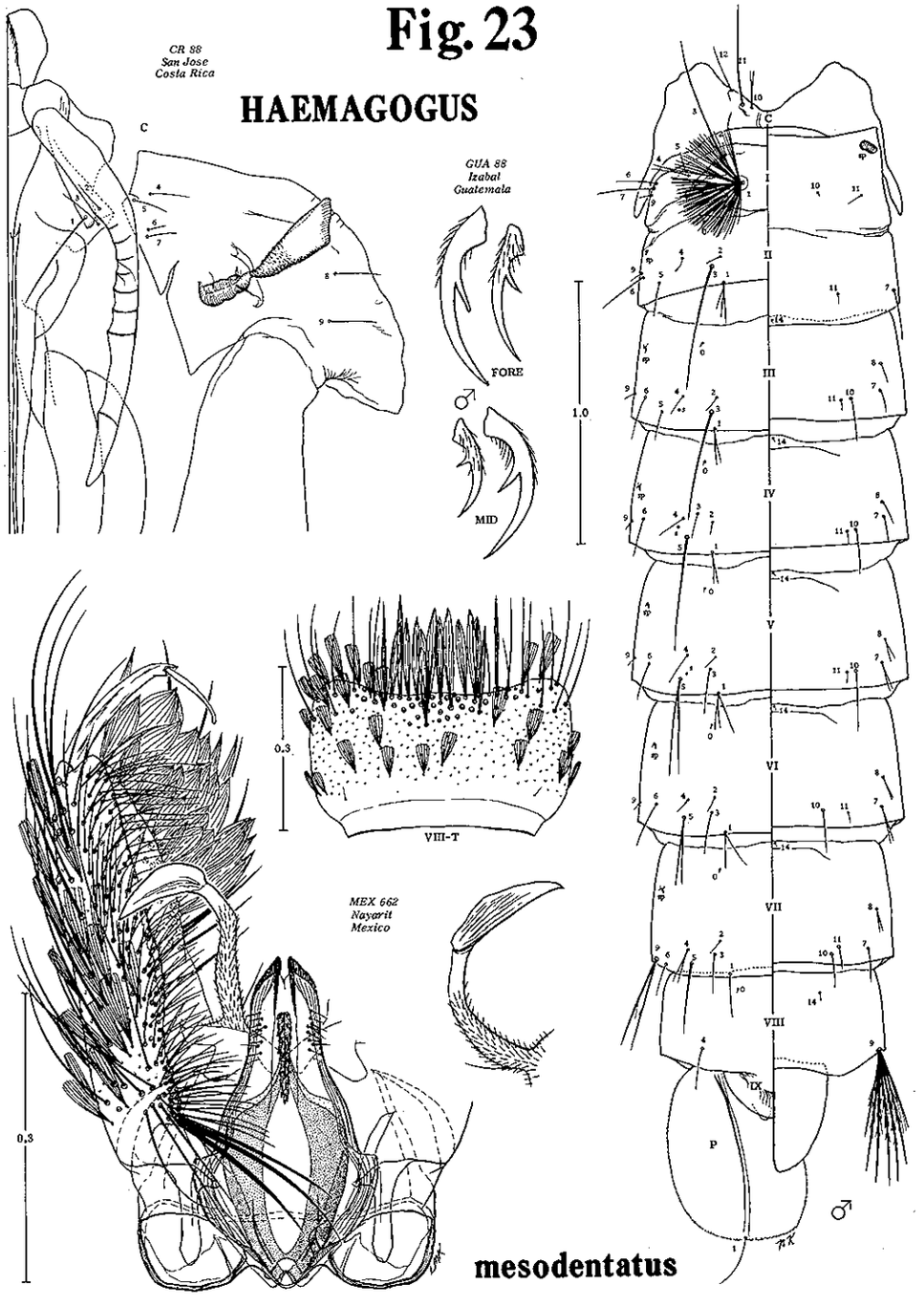


Fig. 23

HAEMAGOGUS



mesodentatus

Fig. 24

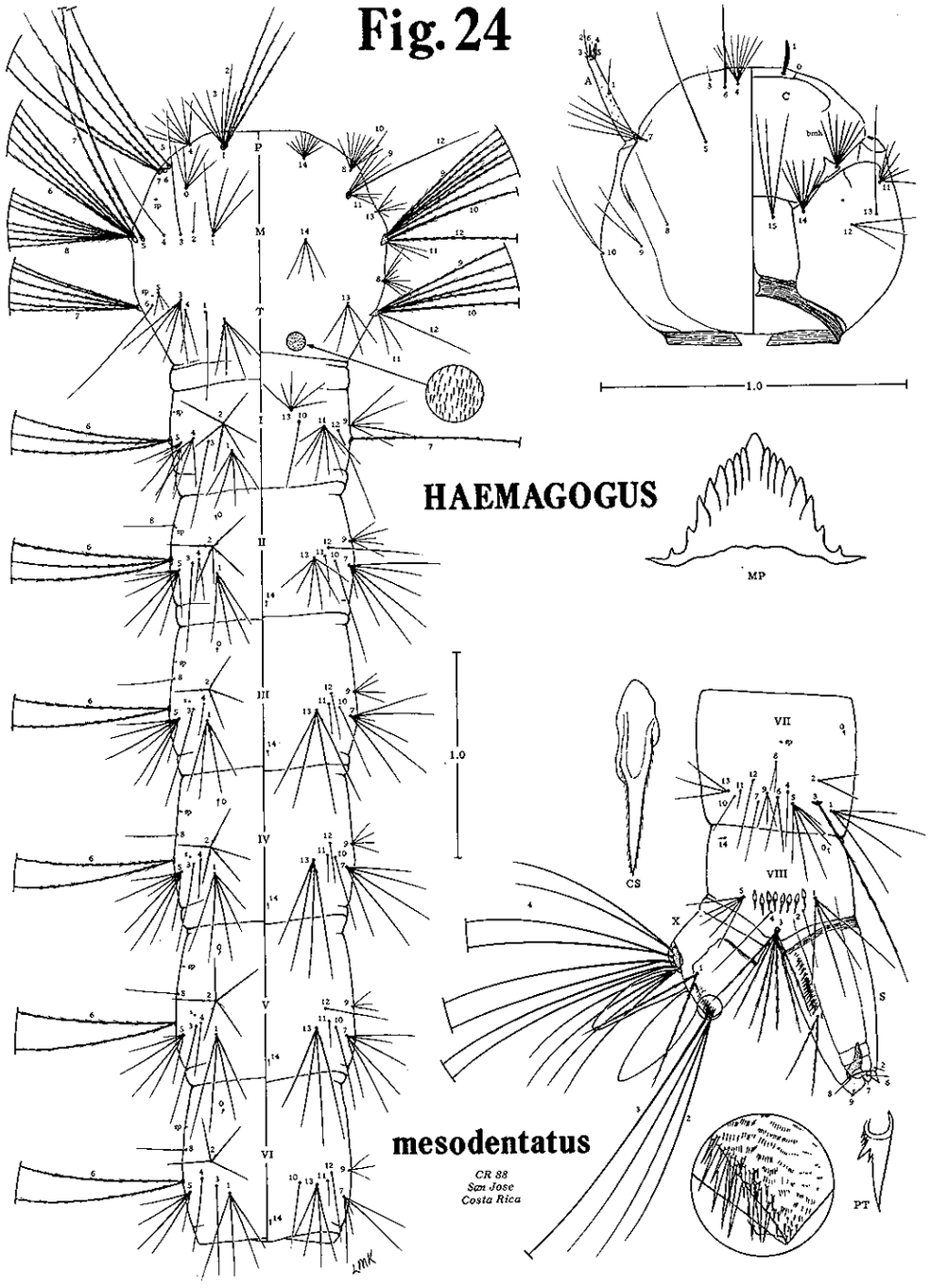
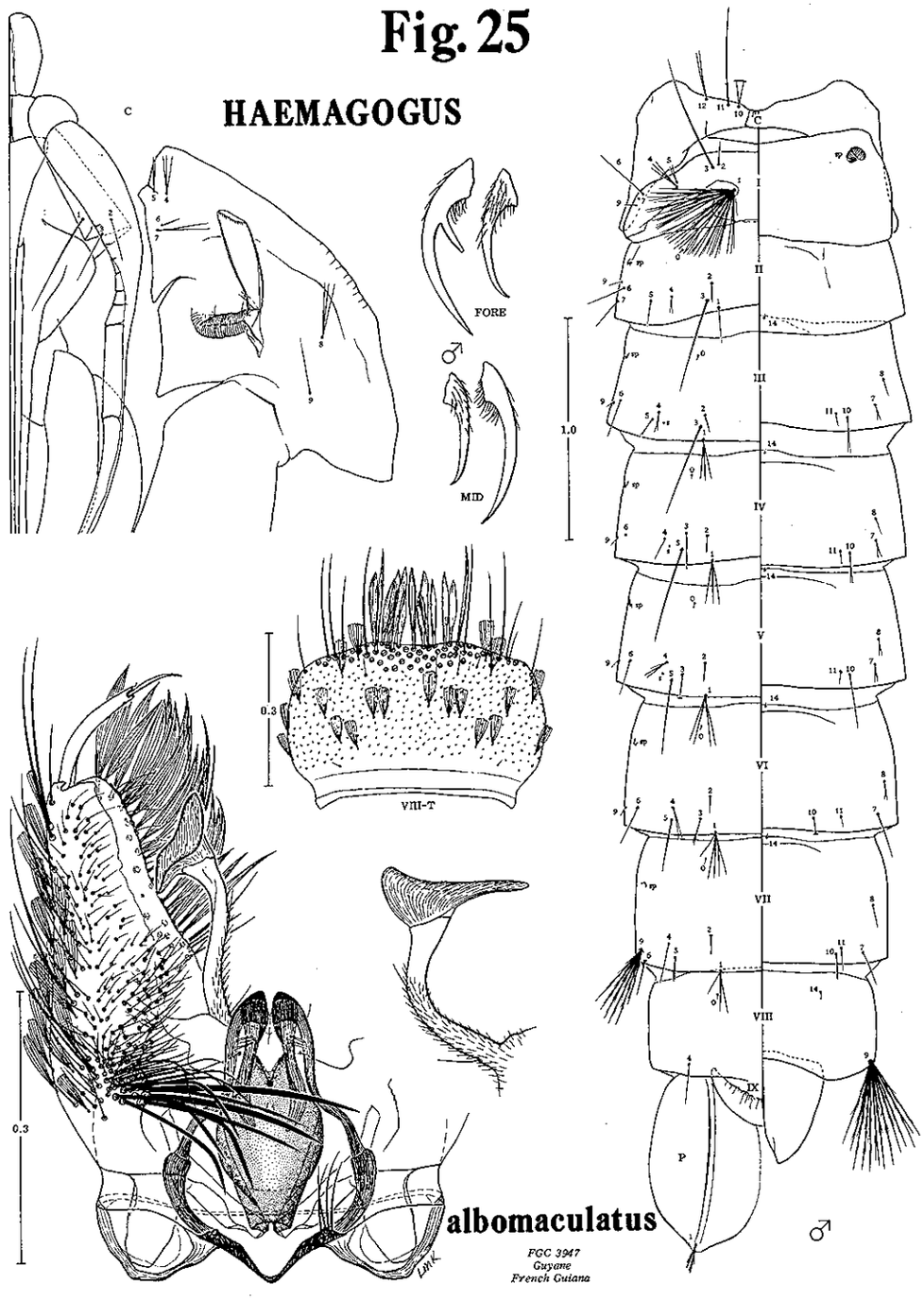

HAEMAGOGUS
mesodentatus
CR 88
San Jose
Costa Rica
1.0
MP
CS
PT

Fig. 25


HAEMAGOGUS
C
FORE
♂
MID
1.0
I
II
III
IV
V
VI
VII
VIII
IX
P
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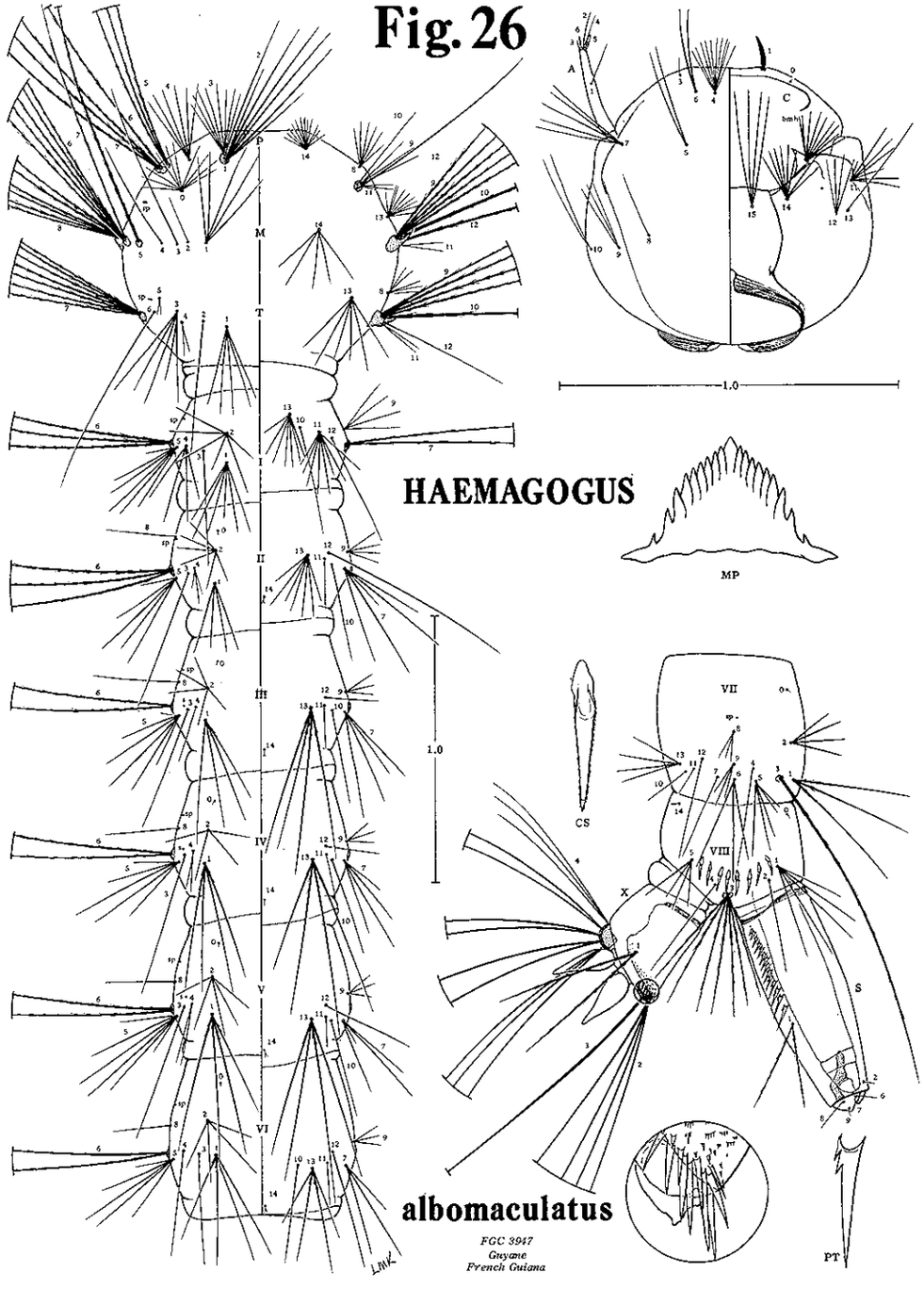
VIII-T
0.3
albomaculatus
♂
FGC 3947
Guyane
French Guiana

Fig. 26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albomaculatus
MP
CS
PT
1.0
FGC 3947
Guyane
French Guiana

Fig. 27

HAEMAGOGUS

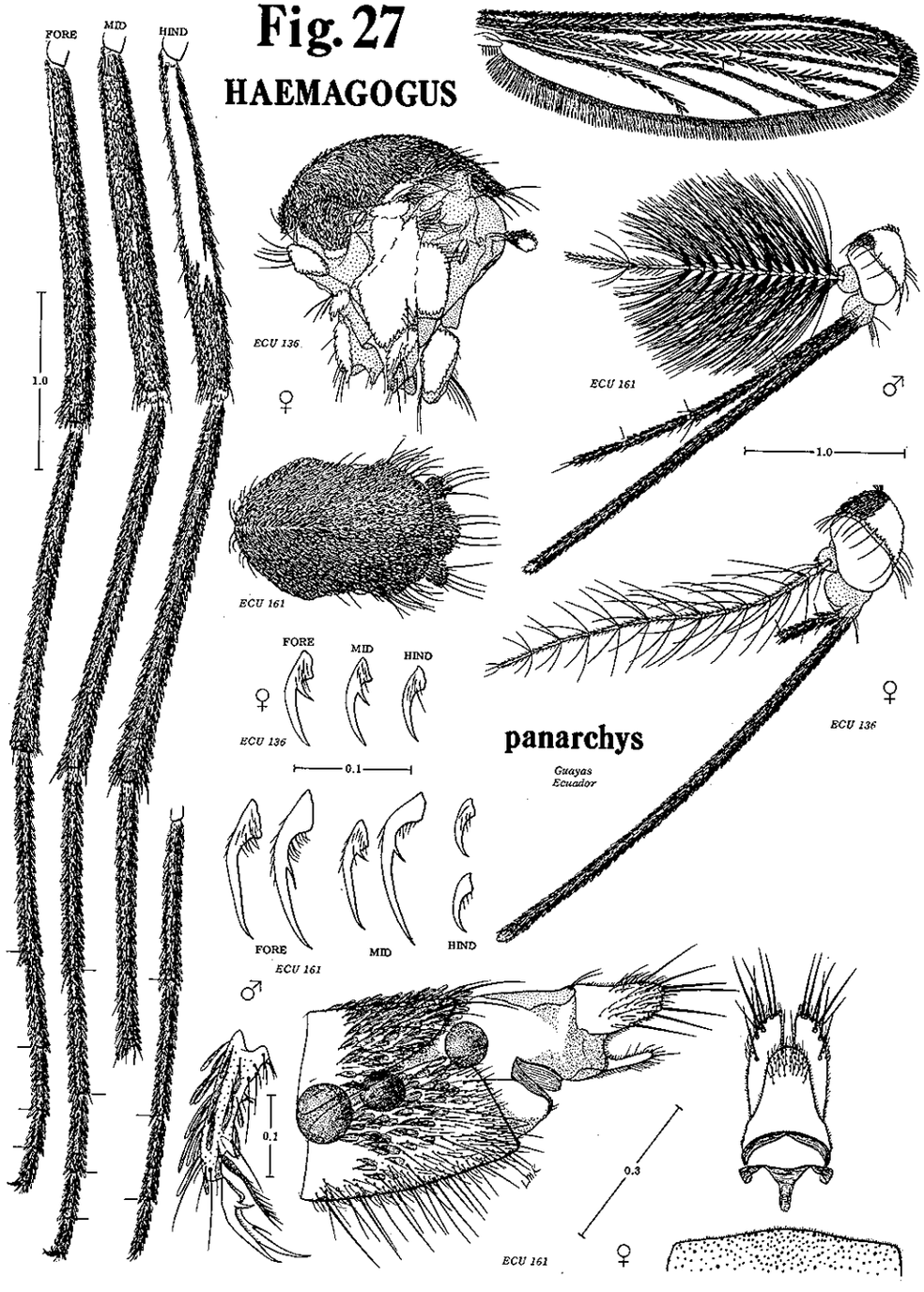
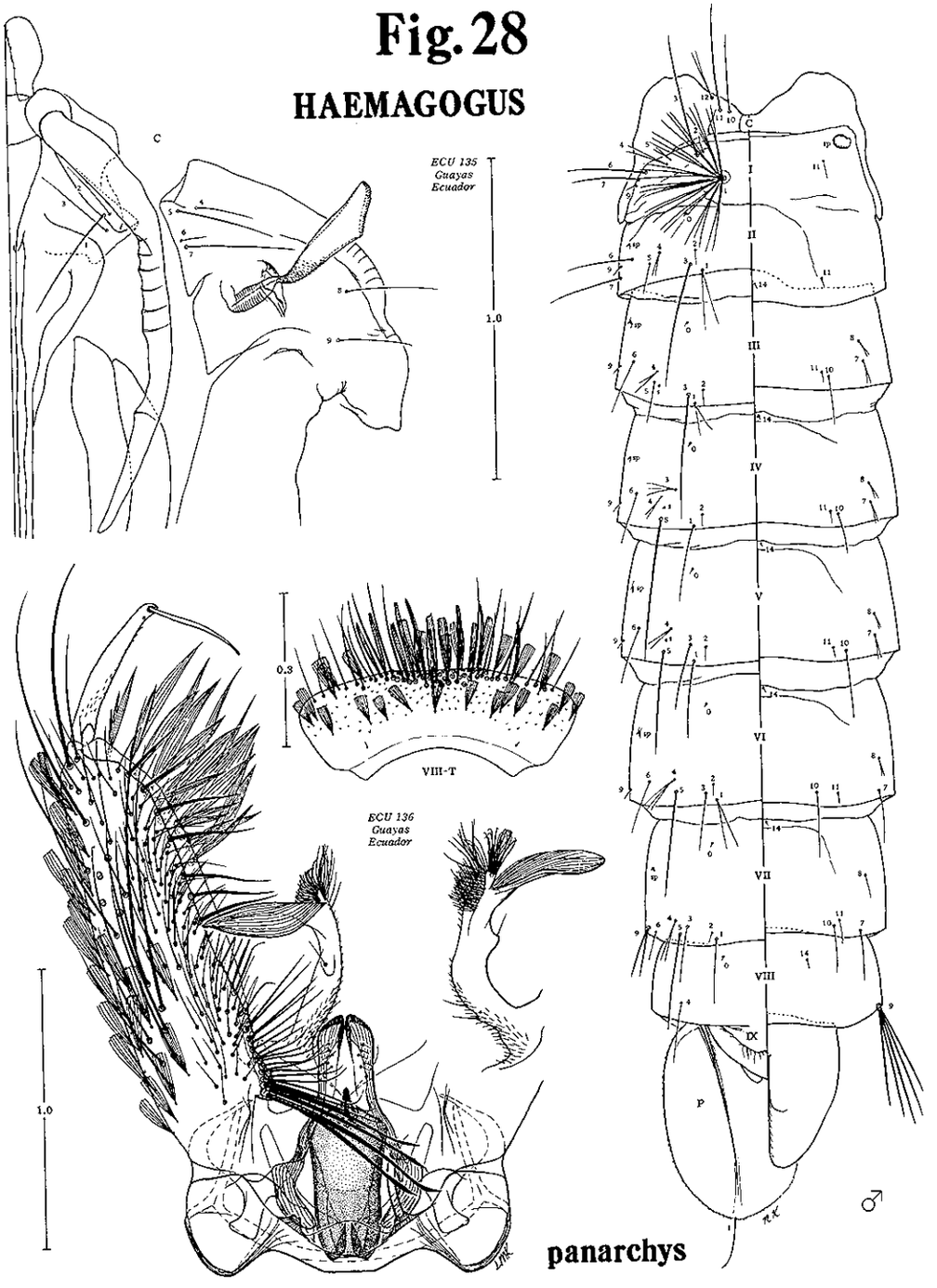


Fig. 28

HAEMAGOGUS



panarchys

Fig. 29

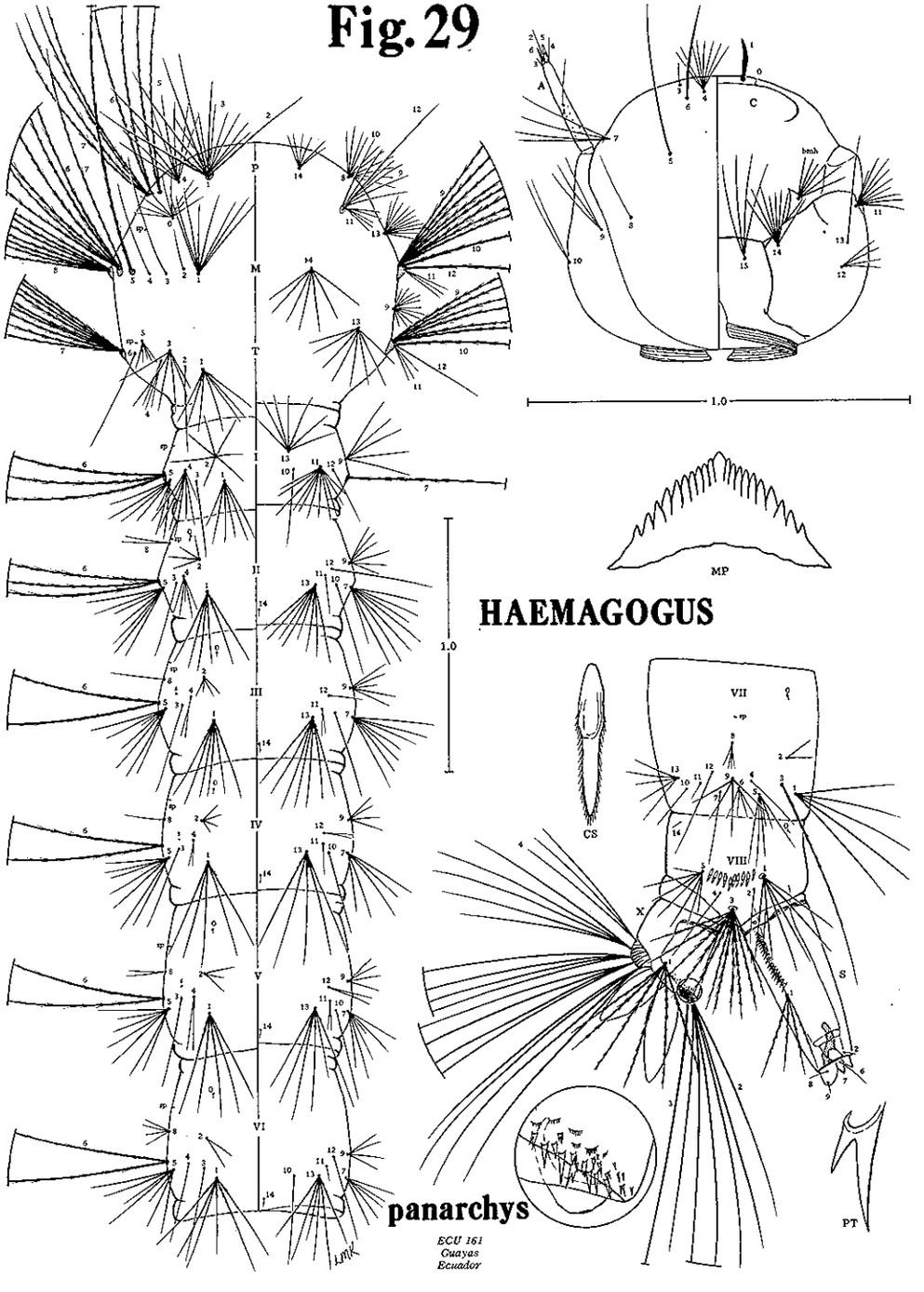
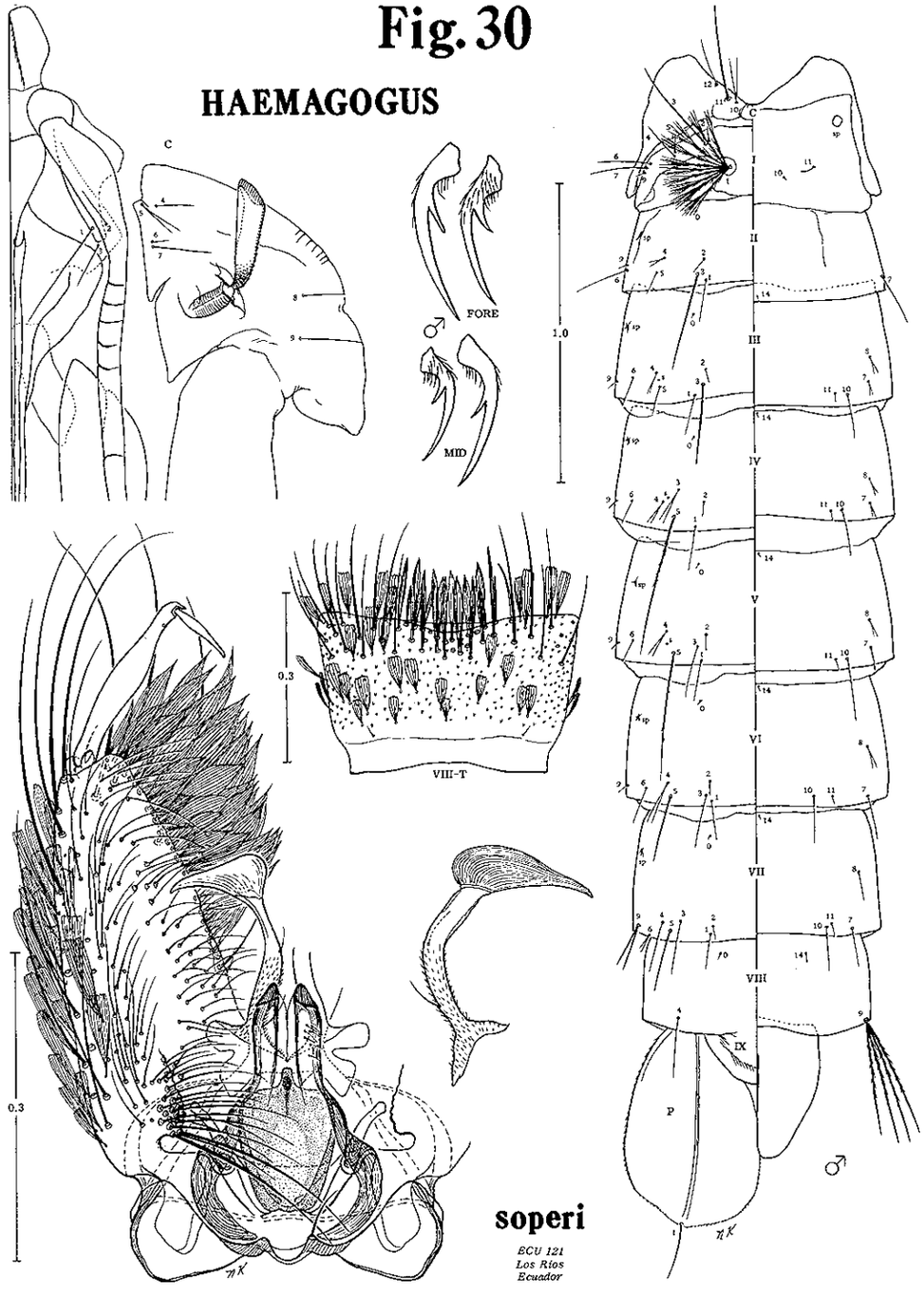


Fig. 30

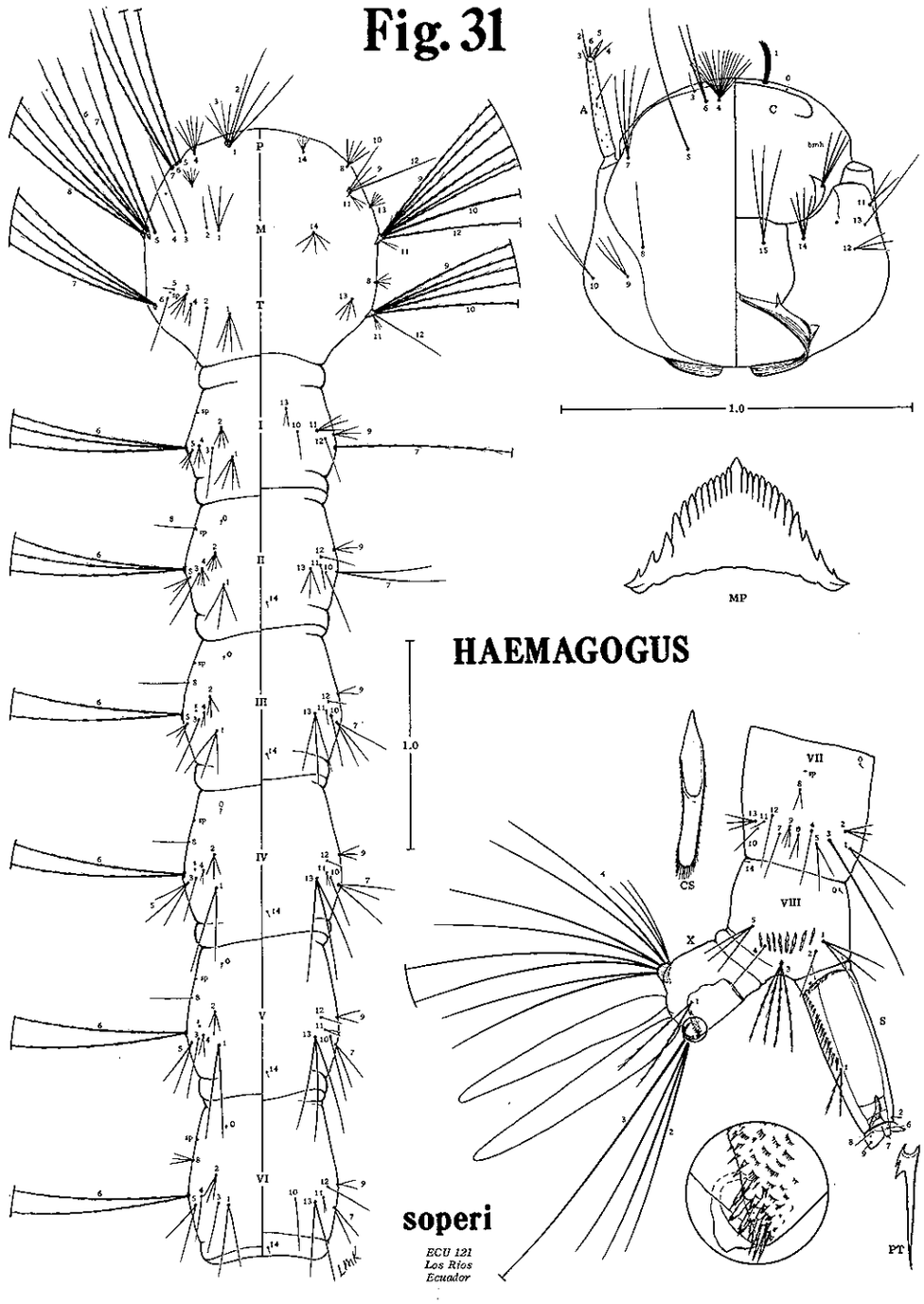
HAEMAGOGUS



soperi

ECU 121
Los Rios
Ecuador

Fig. 31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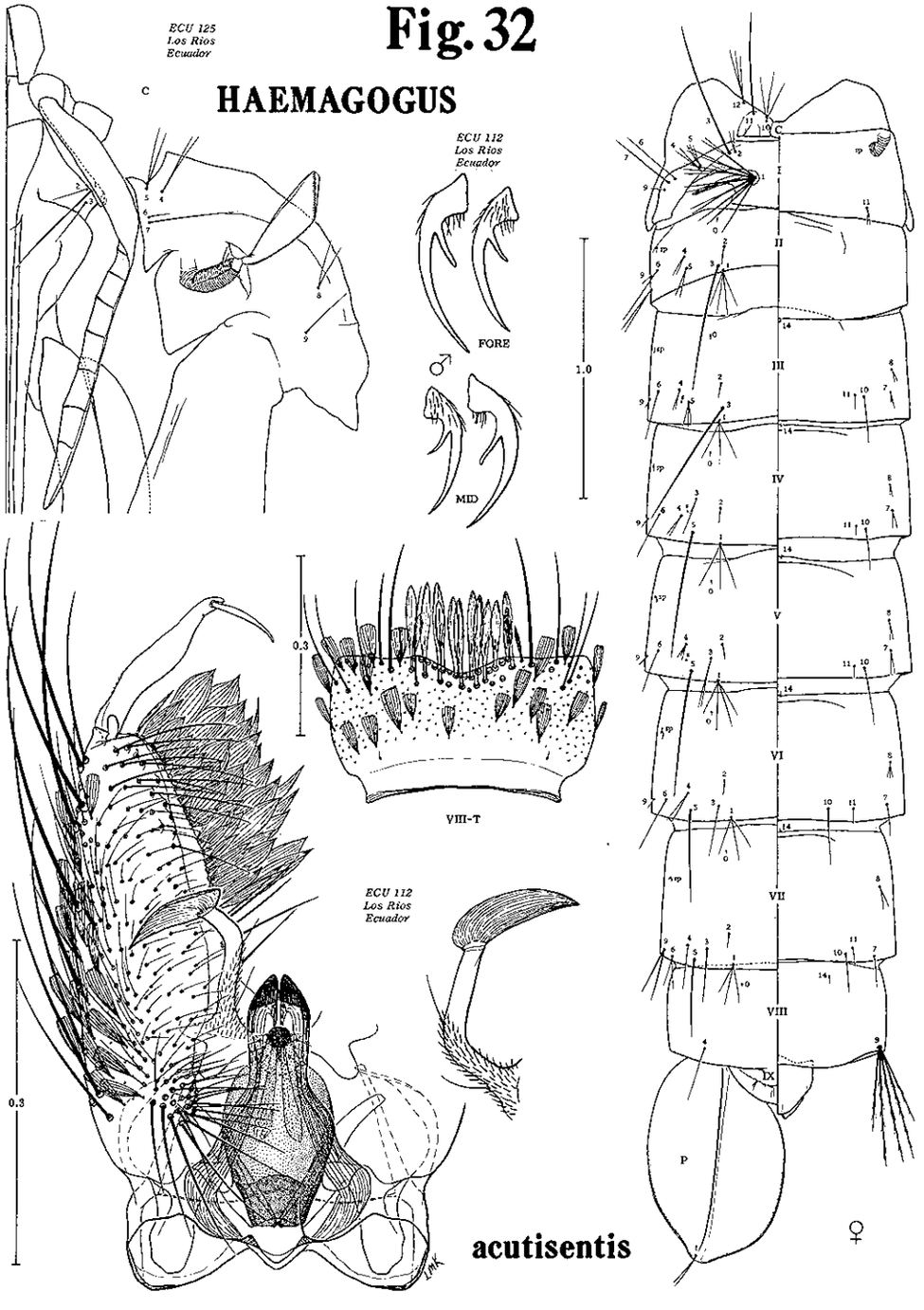
IV
V
VI
VII
VIII
X
S
CS
PT
A
C
bmh
MP
1.0
1.0
HAEMAGOGUS
soperi
ECU 121
Los Rios
Ecuador

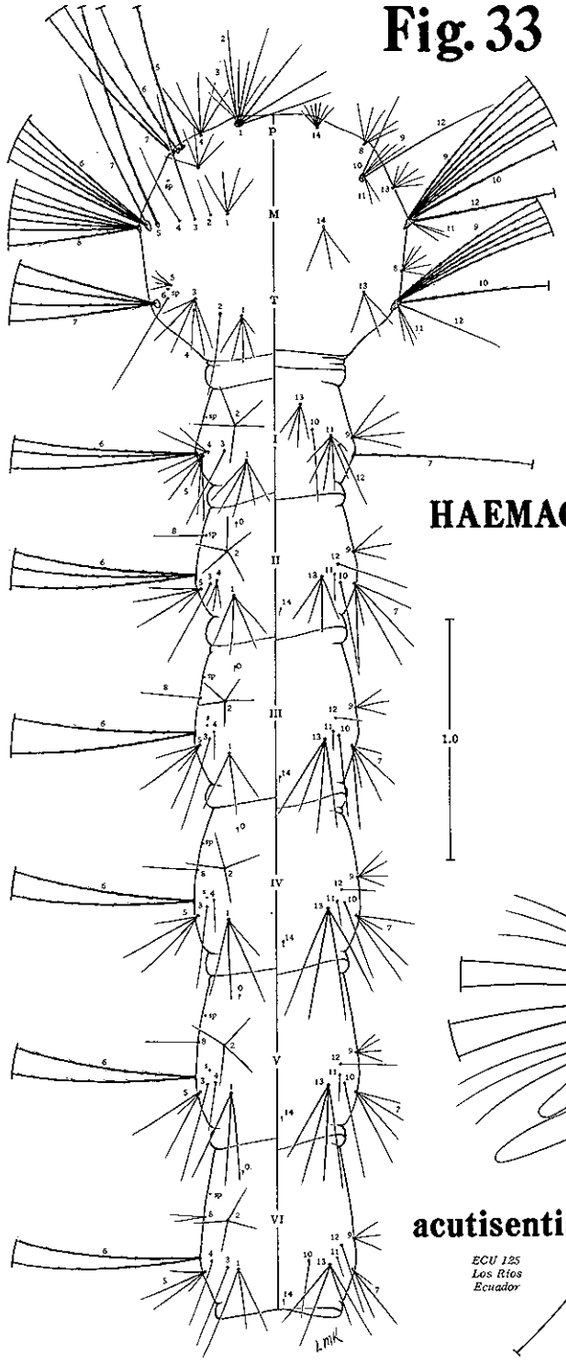
Fig. 32

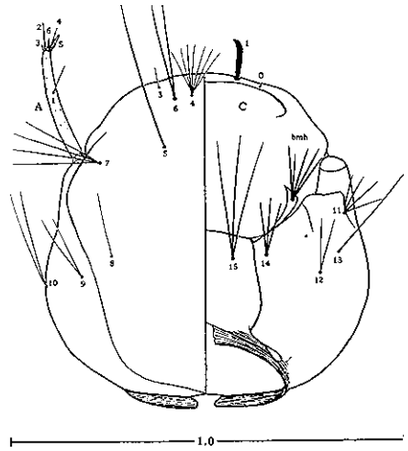
HAEMAGOGUS



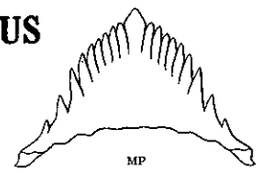
acutisentis

Fig. 33

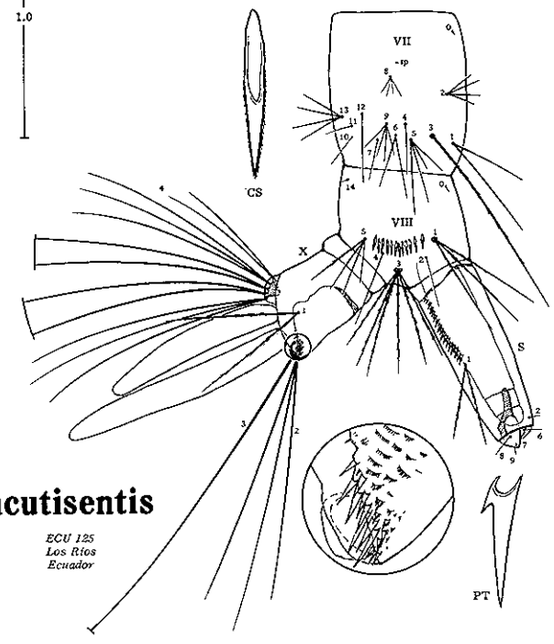




HAEMAGOGUS



1.0

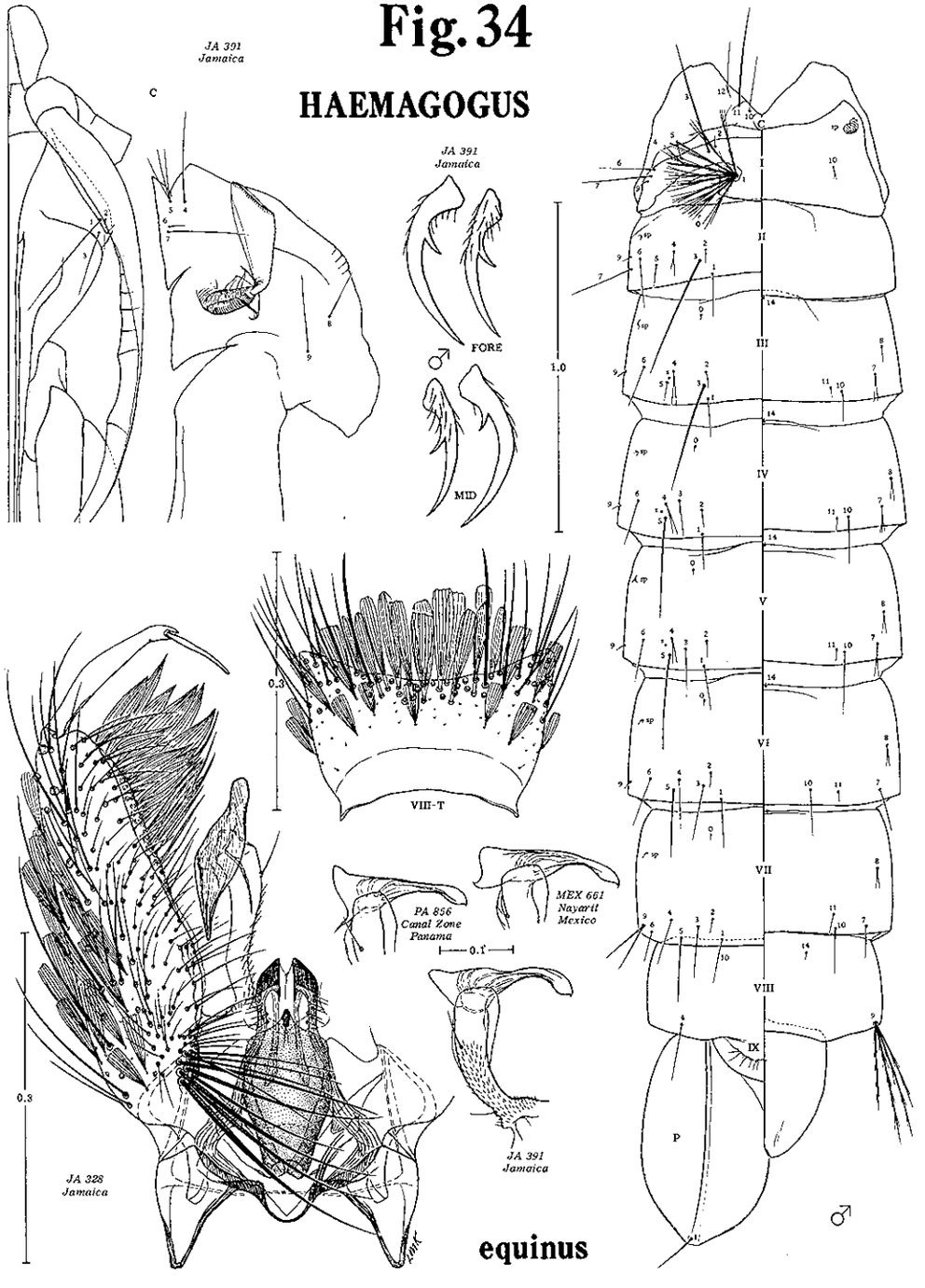


acutisentis

ECU 125
Los Rios
Ecuador

Fig. 34

HAEMAGOGUS



equinus

Fig. 35

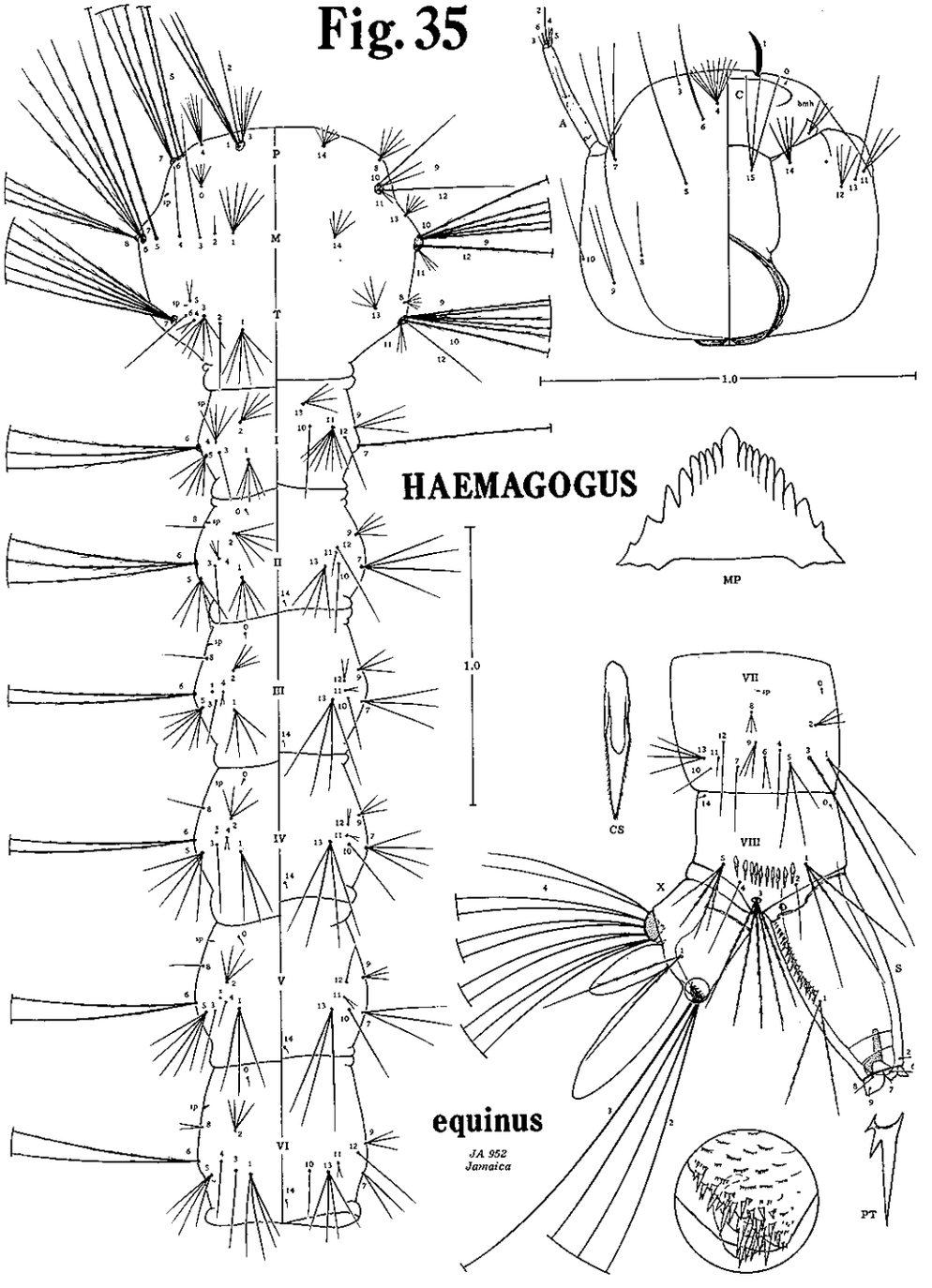

HAEMAGOGUS
equinus
JA 952
Jamaica
MP
CS
PT
1.0
P
M
T
I
II
III
IV
V
VI
VII
VIII
X
S
A
C
bmh

Fig. 36

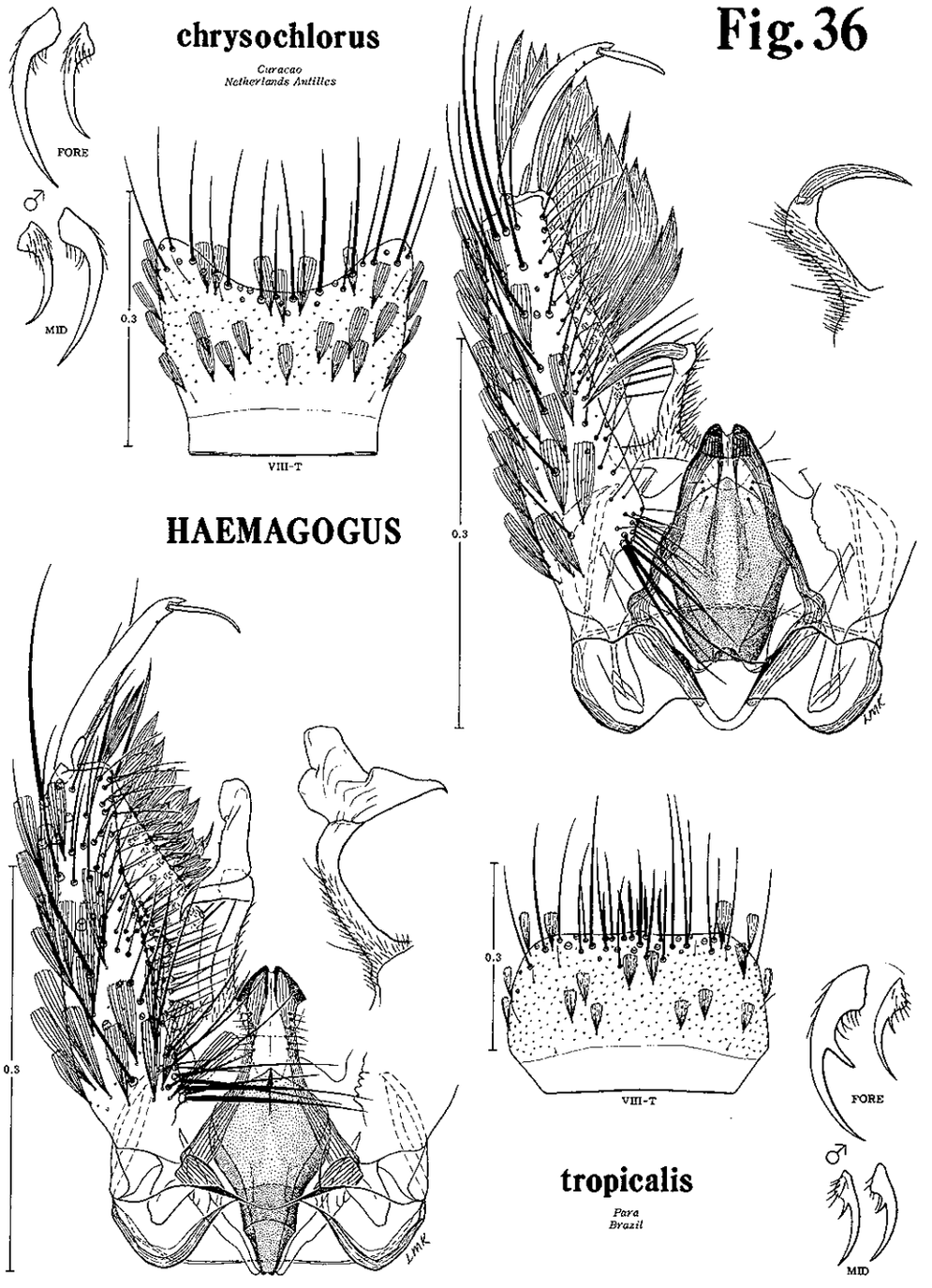

chrysochlorus
Curacao
Netherlands Antilles
FORE
♂
MID
0.3
VIII-T
HAEMAGOGUS
0.3
LMK
0.3
VIII-T
tropicalis
Para
Brazil
FORE
♂
MID

Fig. 37

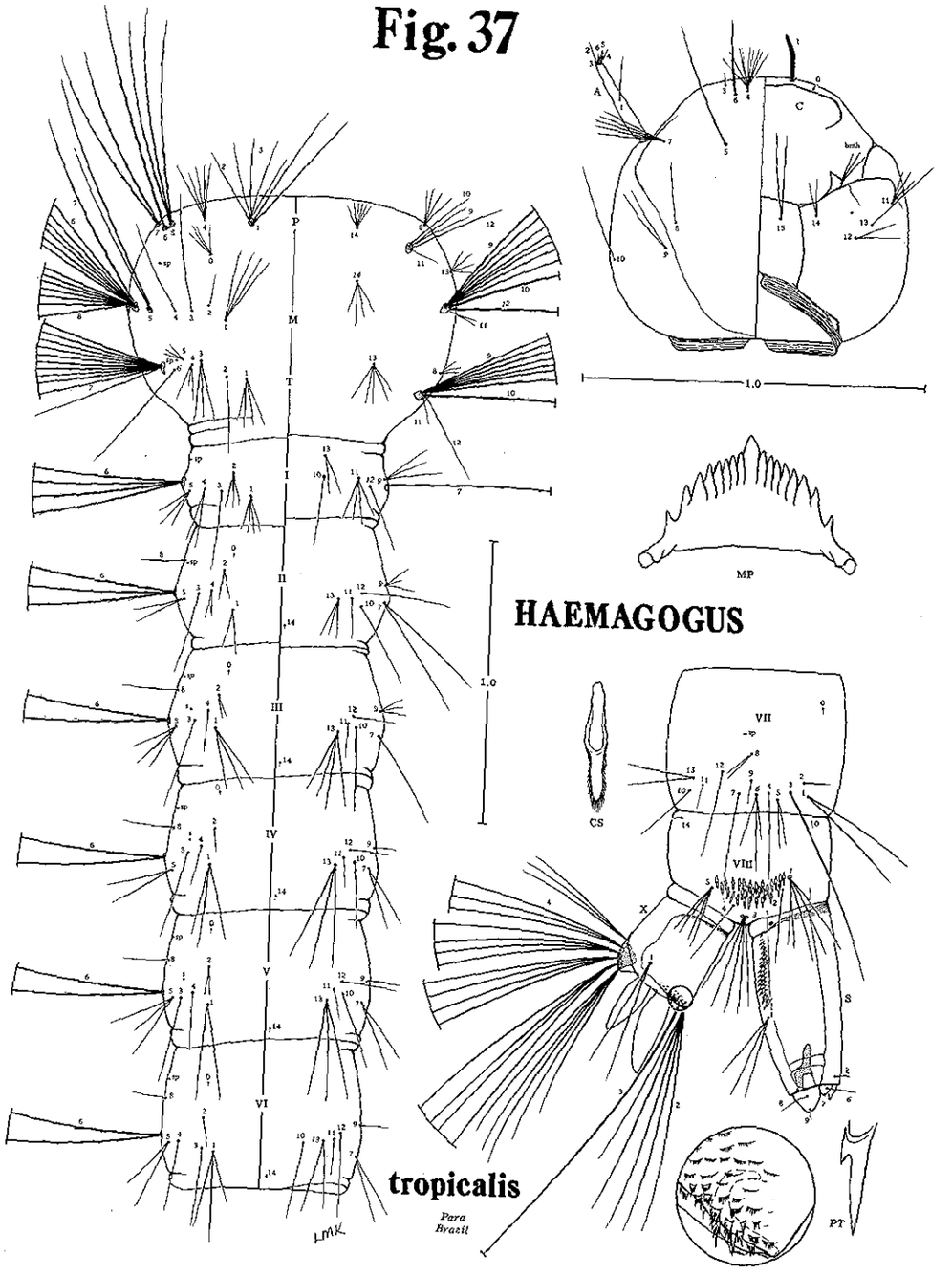
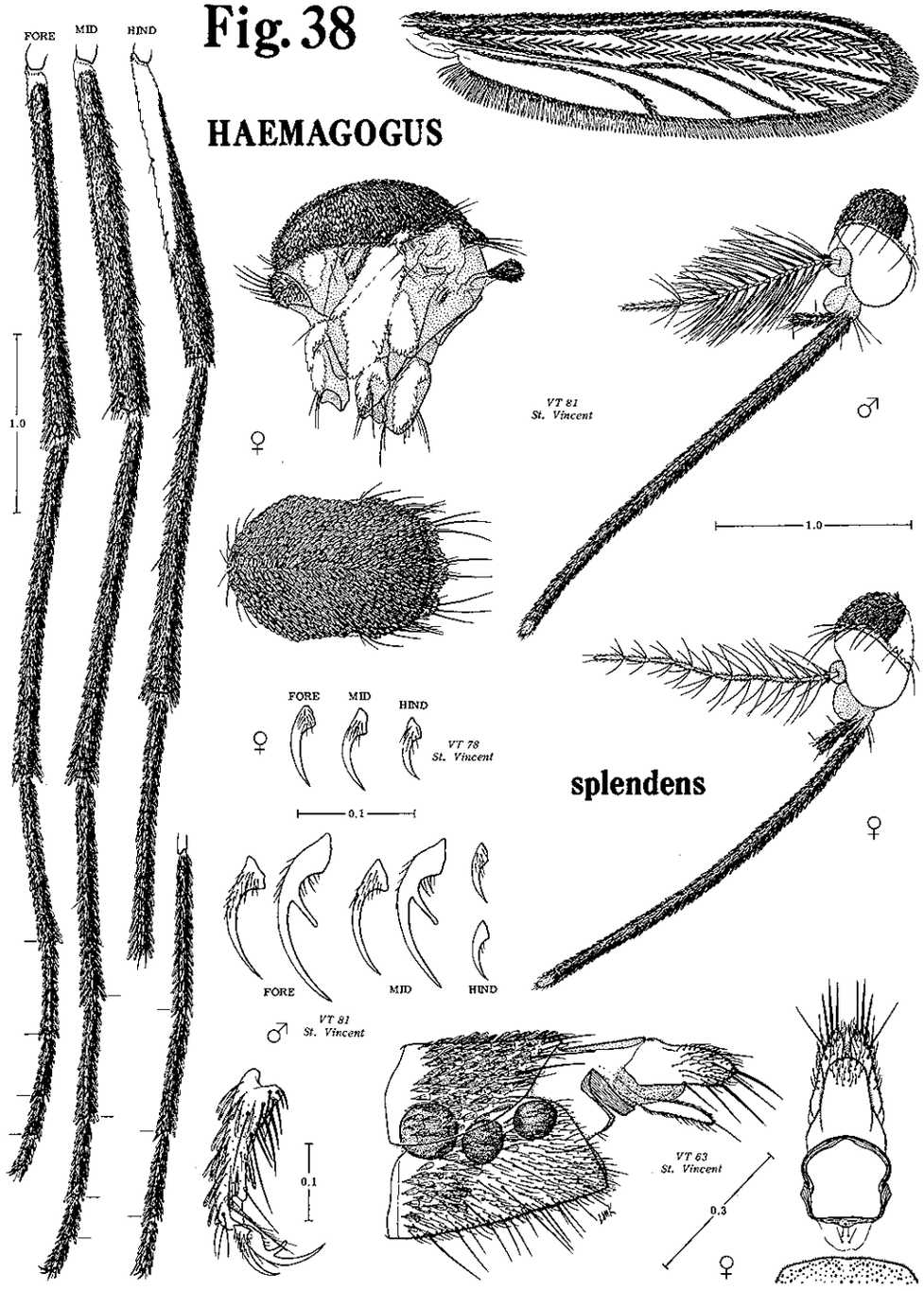


Fig. 38



HAEMAGOGUS

Fig. 39

HAEMAGOGUS

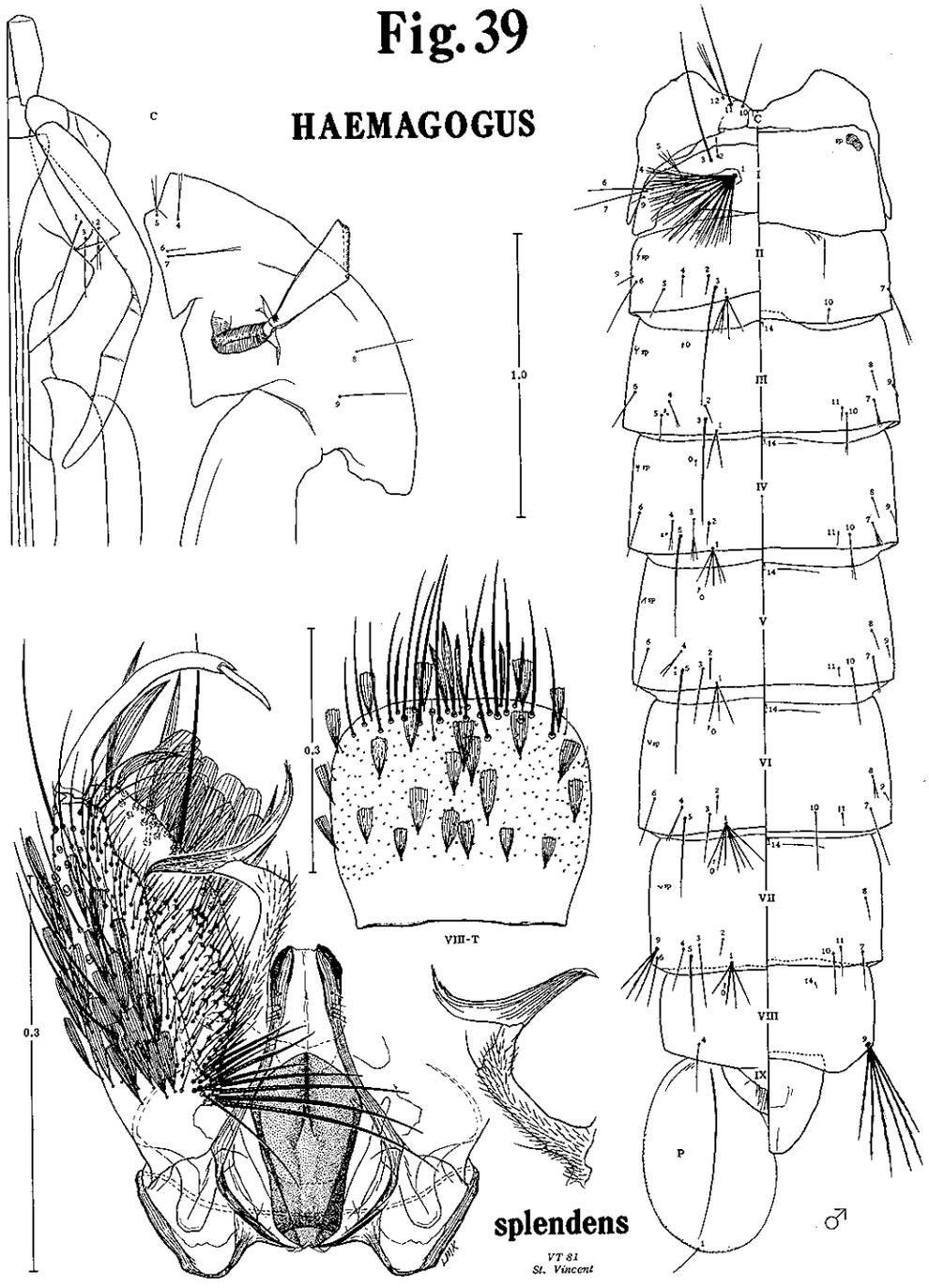


Fig. 40

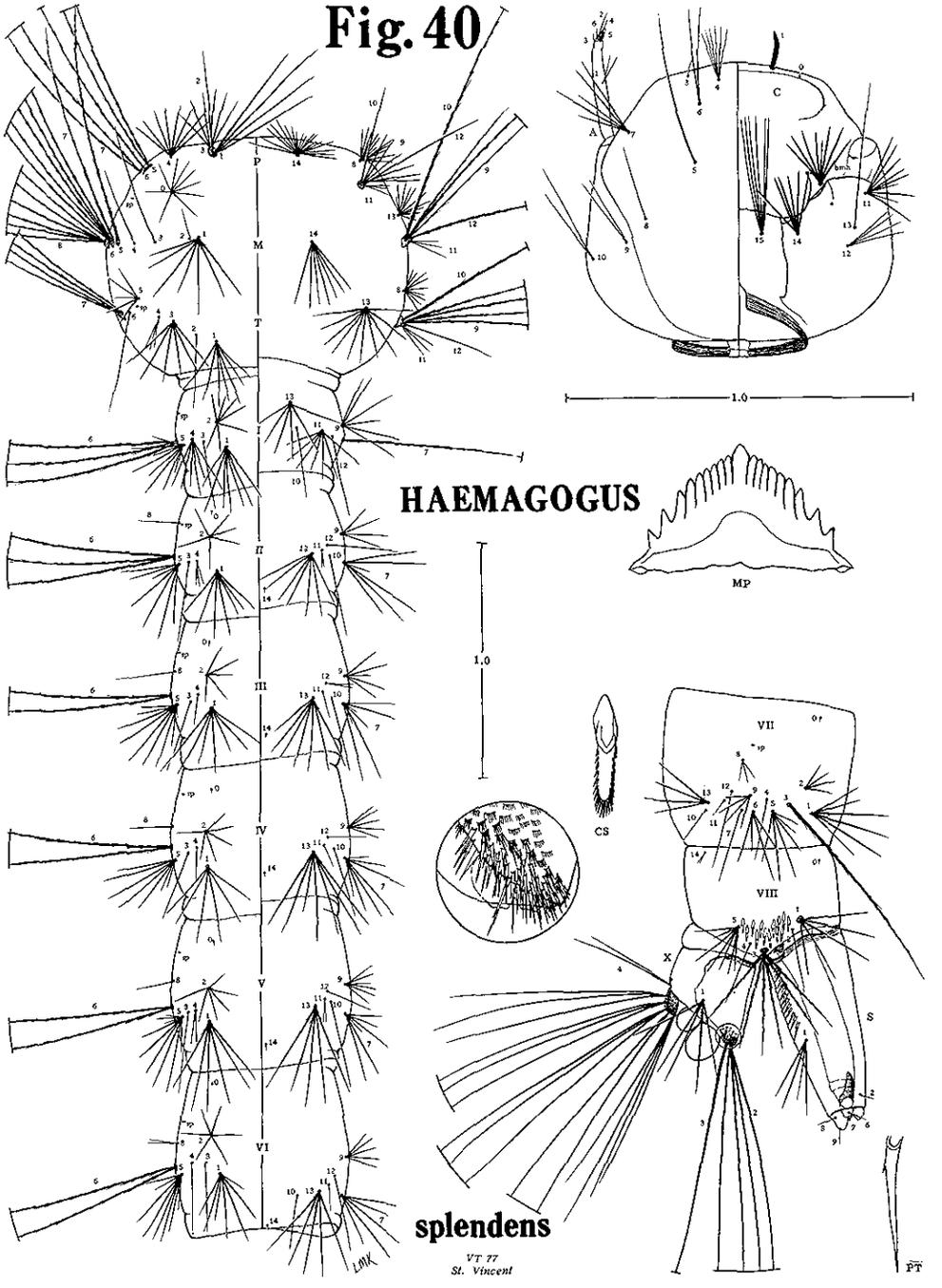
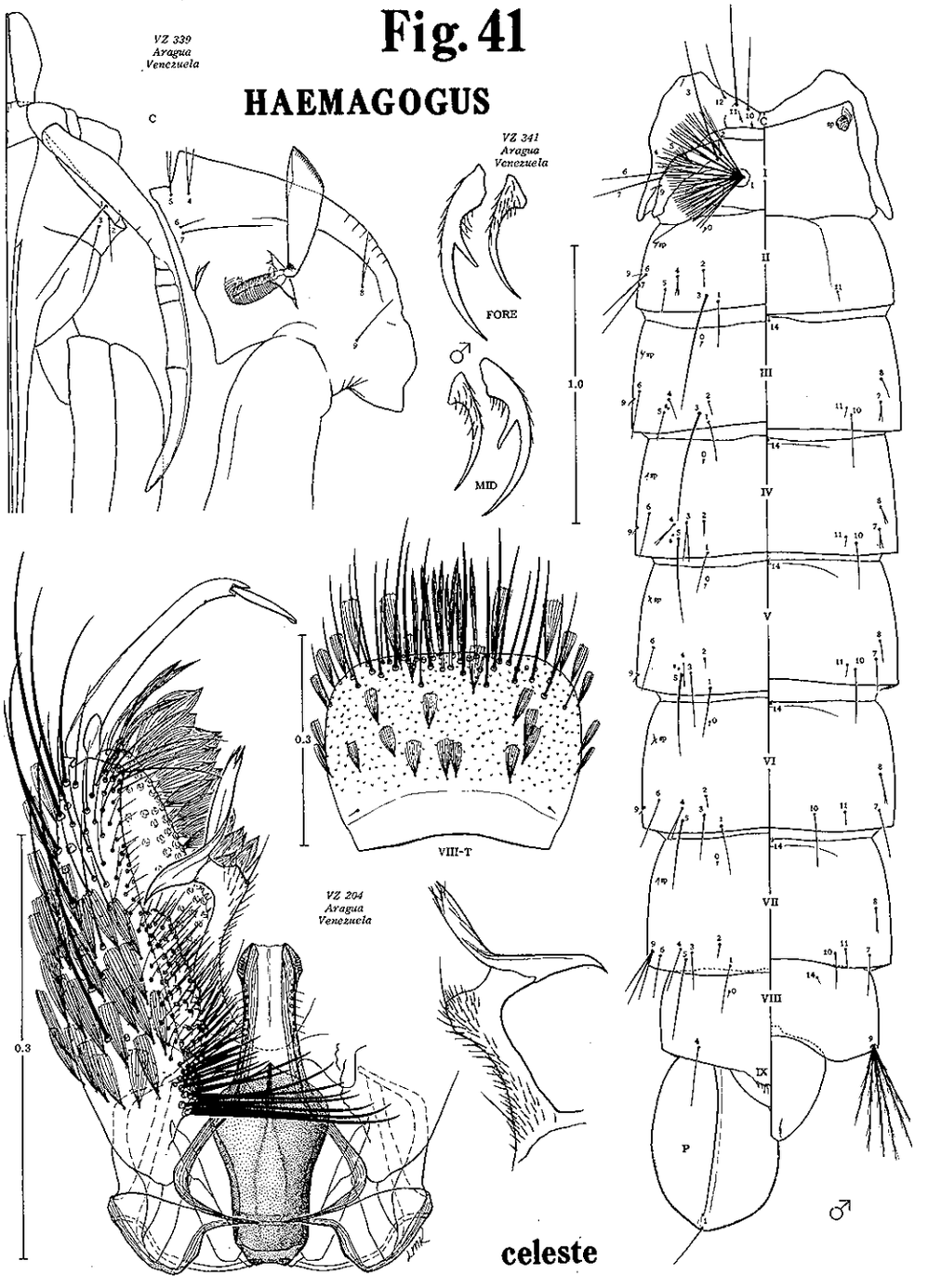


Fig. 41

HAEMAGOGUS



celeste

Fig. 42

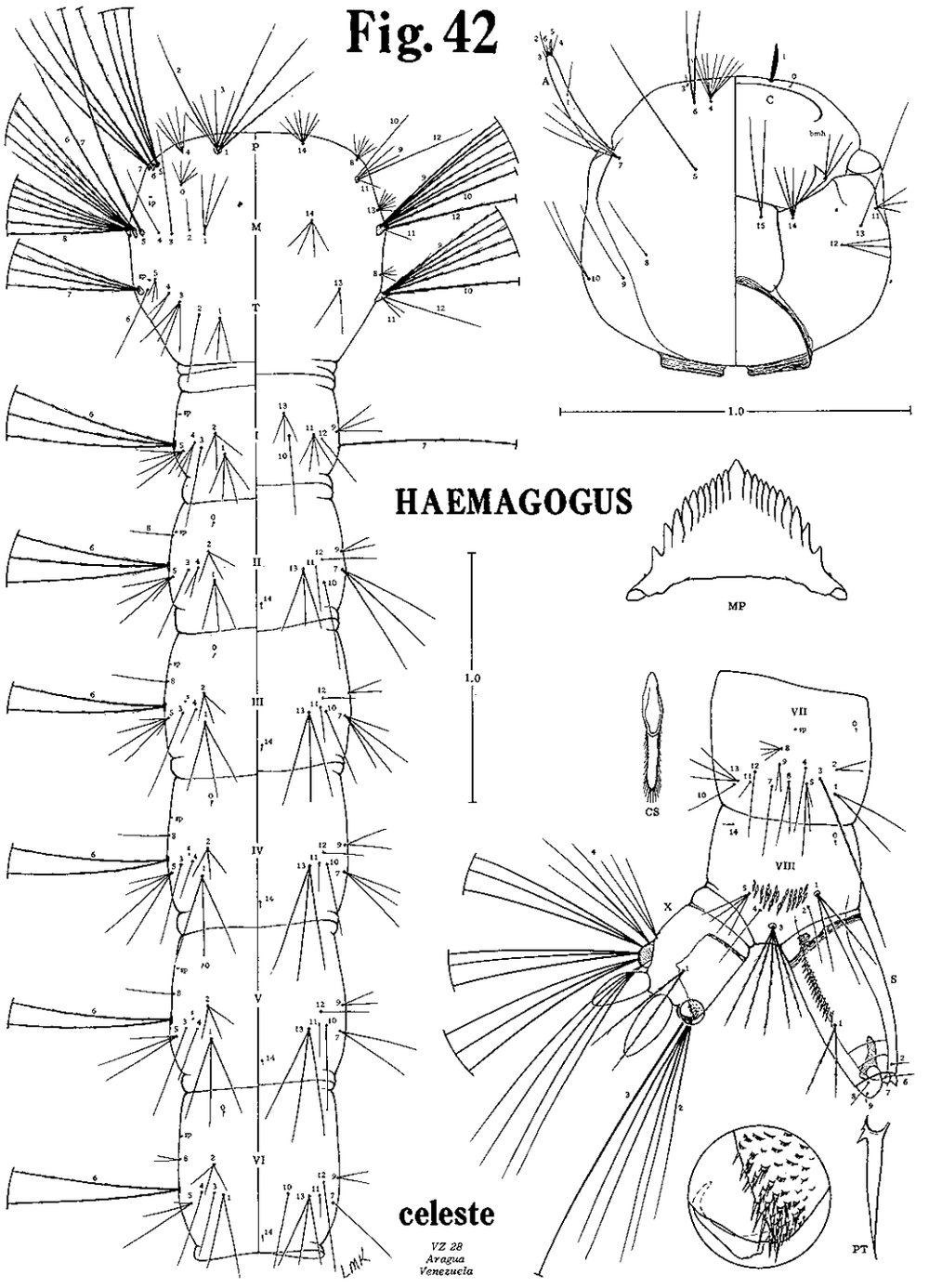

HAEMAGOGUS
celeste
VZ 28
Aragua
Venezuela
1.0
MP
CS
PT
P
M
T
I
II
III
IV
V
VI
VII
VIII
X
S
A
C
bmh

Fig. 43

HAEMAGOGUS

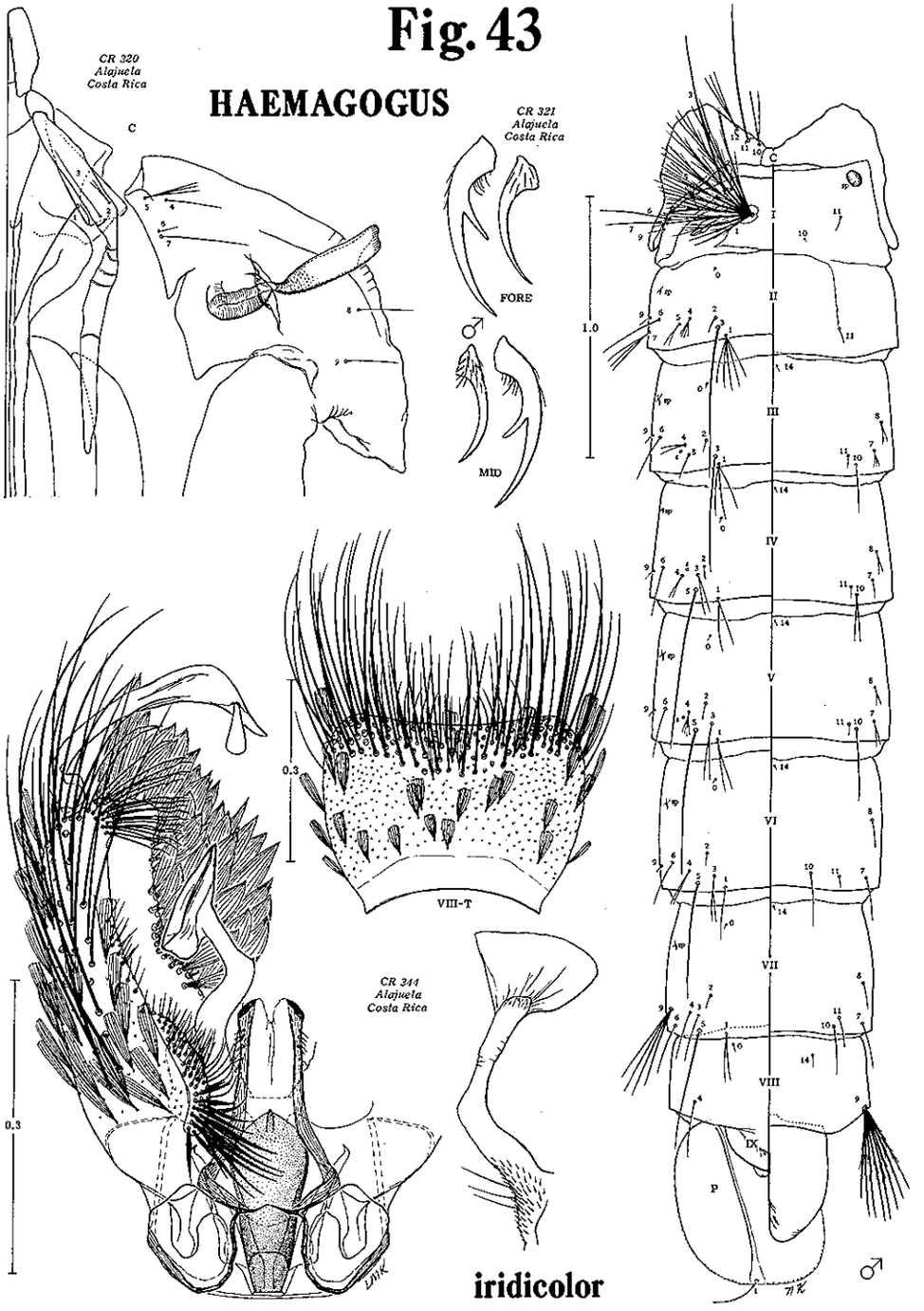


Fig. 44

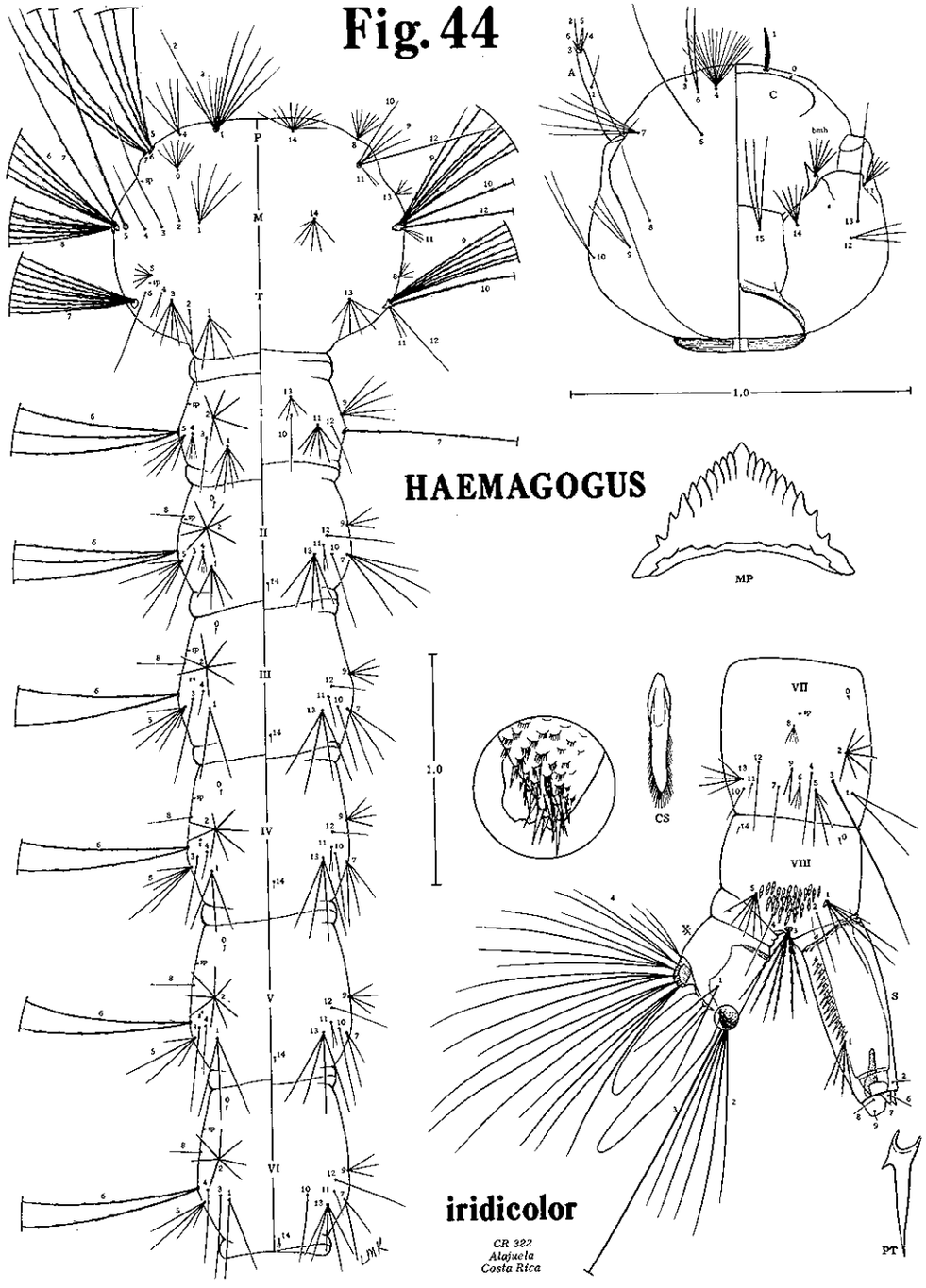

HAEMAGOGUS
iridicolor
CR 322
Alajuela
Costa Rica
1.0
MP
CS
PT

Fig. 45

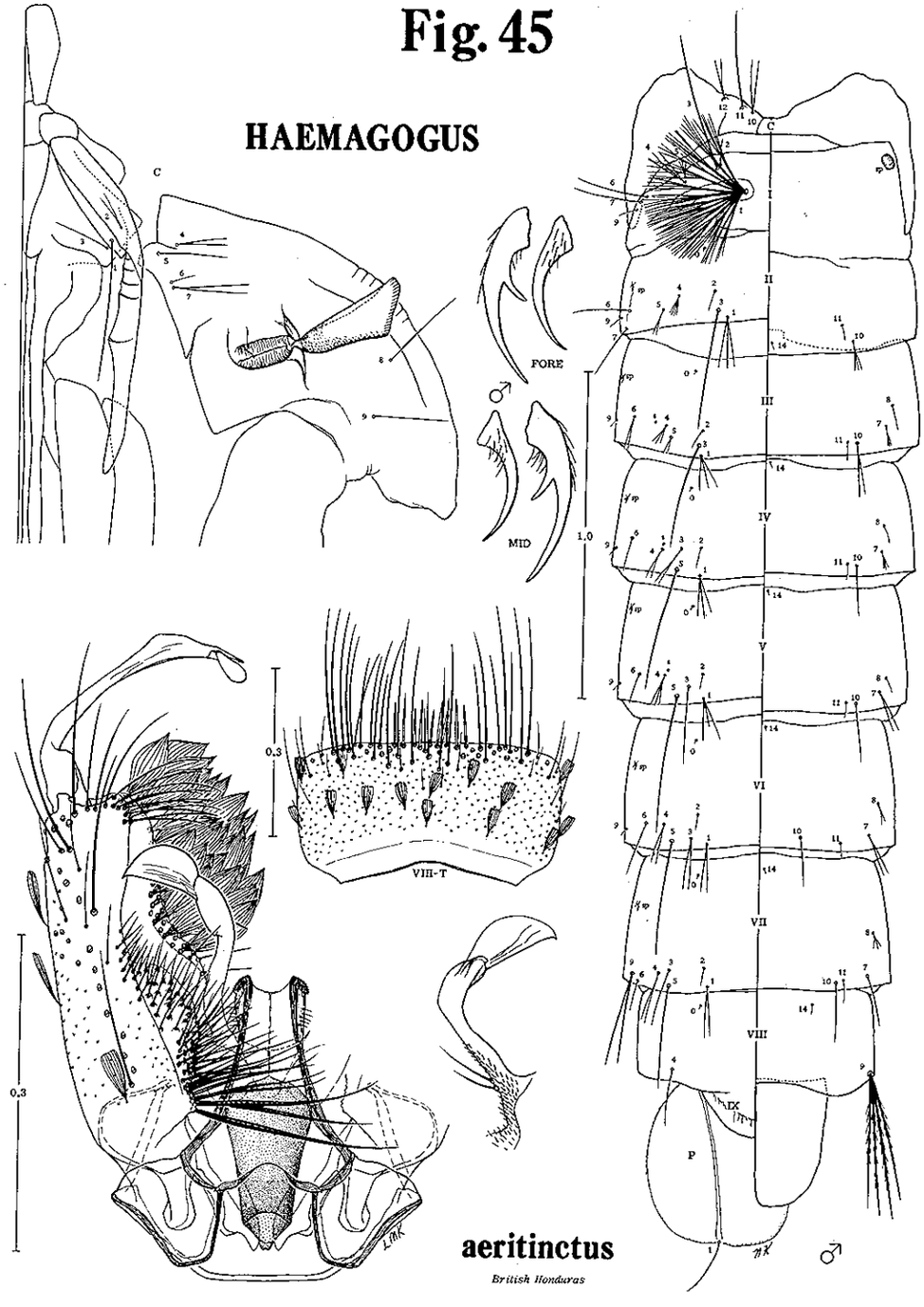

HAEMAGOGUS
C
FORE
♂
MID
1.0
0.3
VIII-T
0.3
I
II
III
IV
V
VI
VII
VIII
IX
P
♂
aeritinctus
British Honduras

Fig. 46

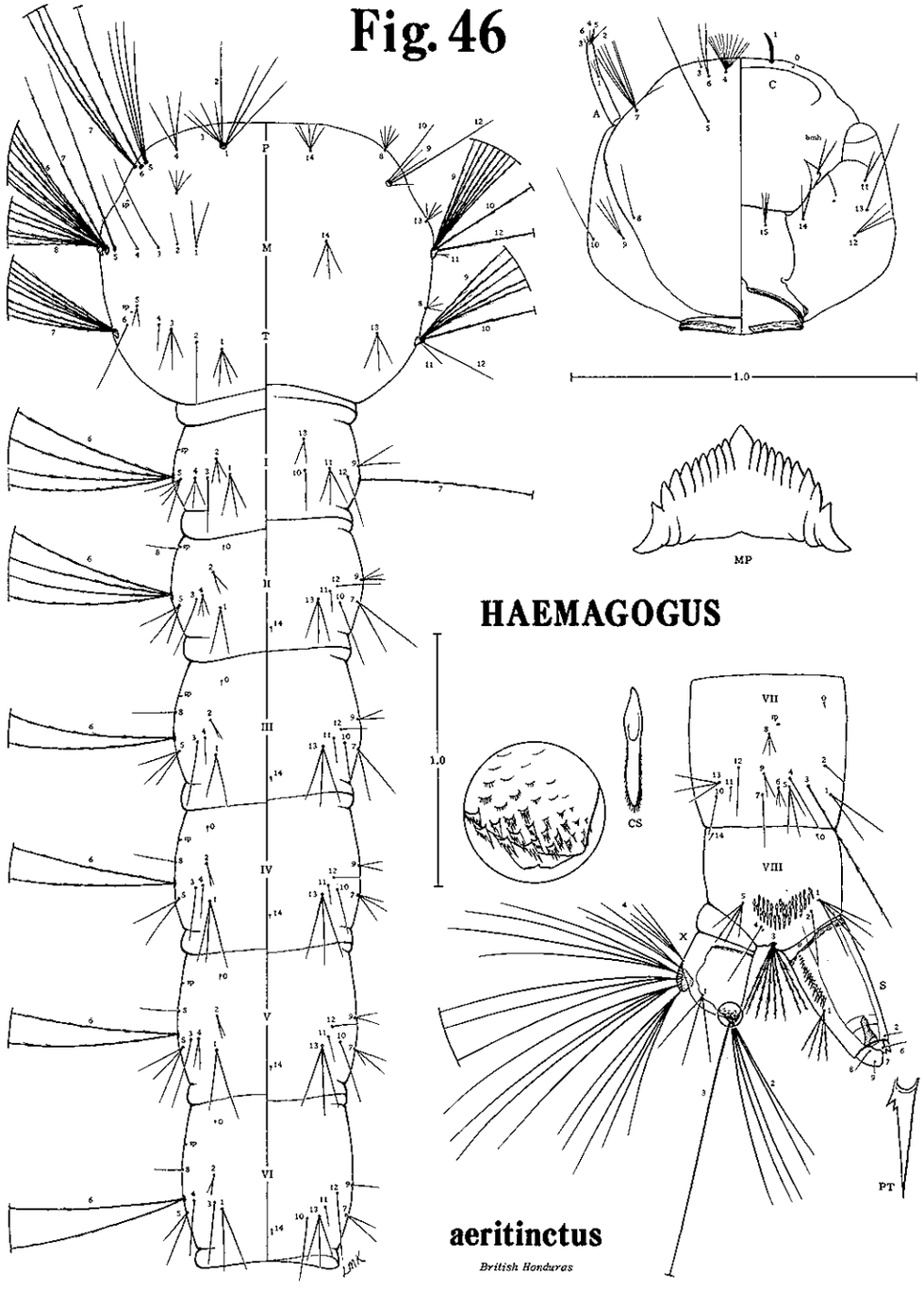
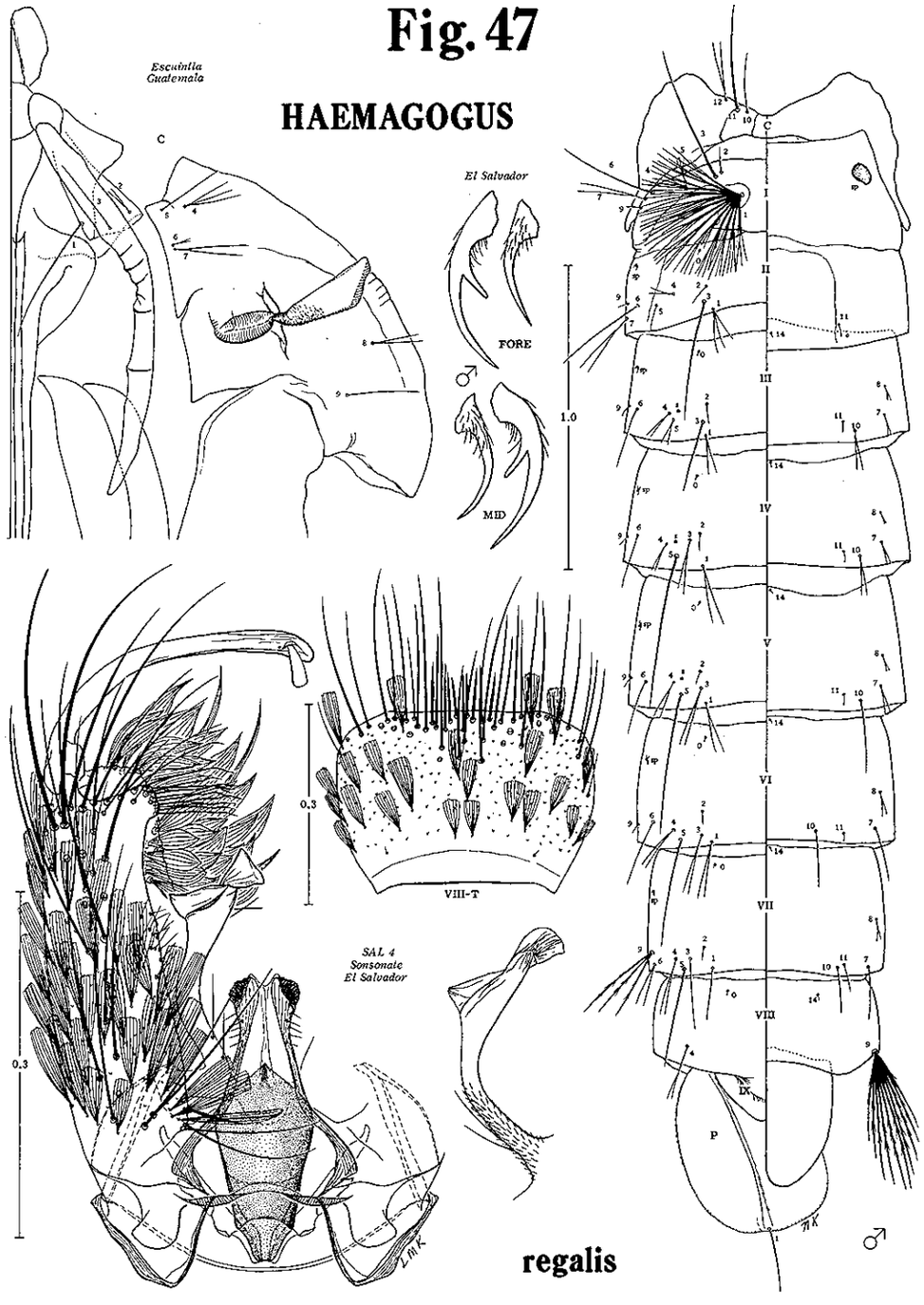

P
M
T
I
II
III
IV
V
VI
A
C
bmh
1.0
MP
HAEMAGOGUS
1.0
CS
VII
VIII
X
S
PT
aeritinctus
British Honduras

Fig. 47

HAEMAGOGUS



regalis

Fig. 48

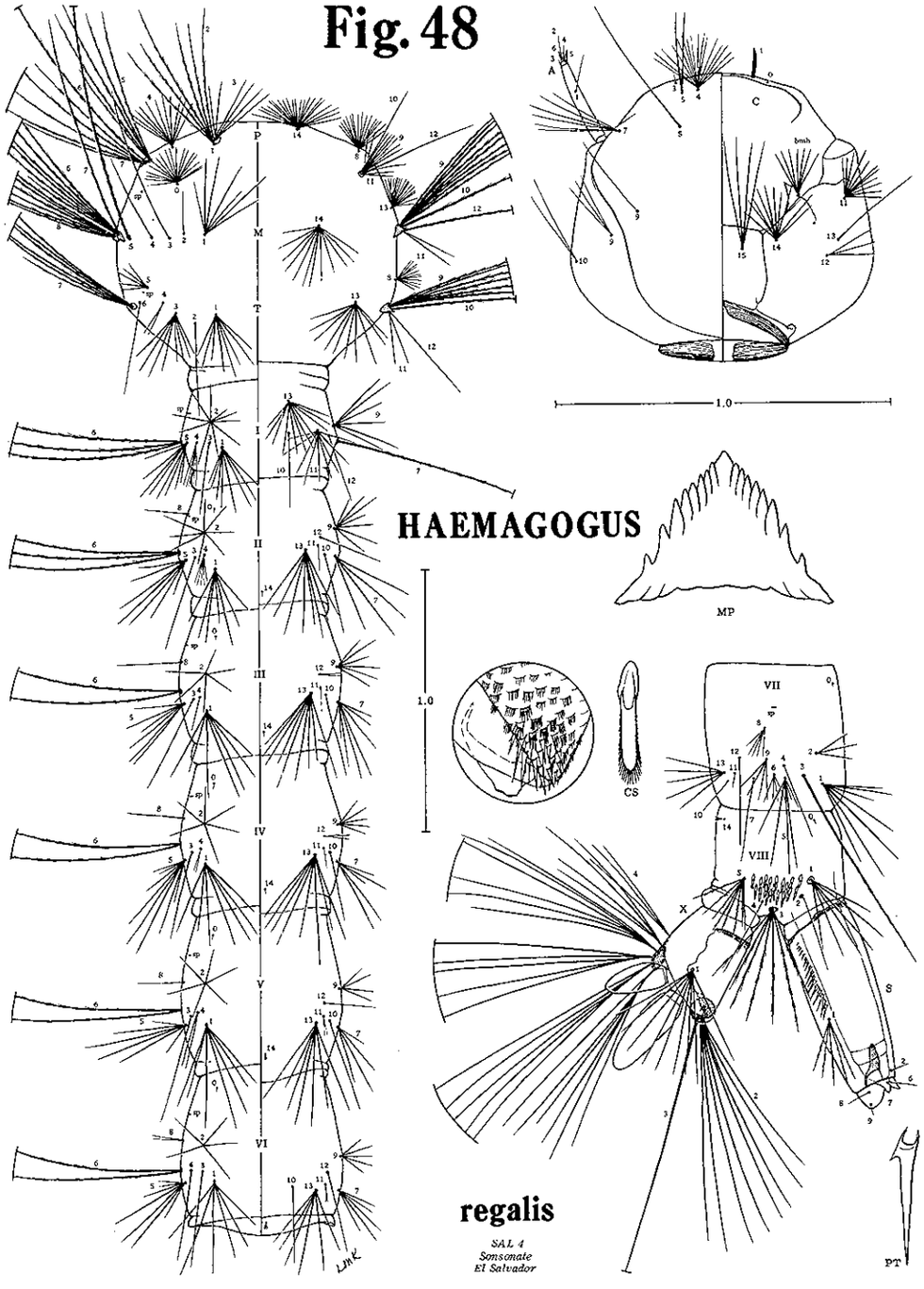


Fig. 49

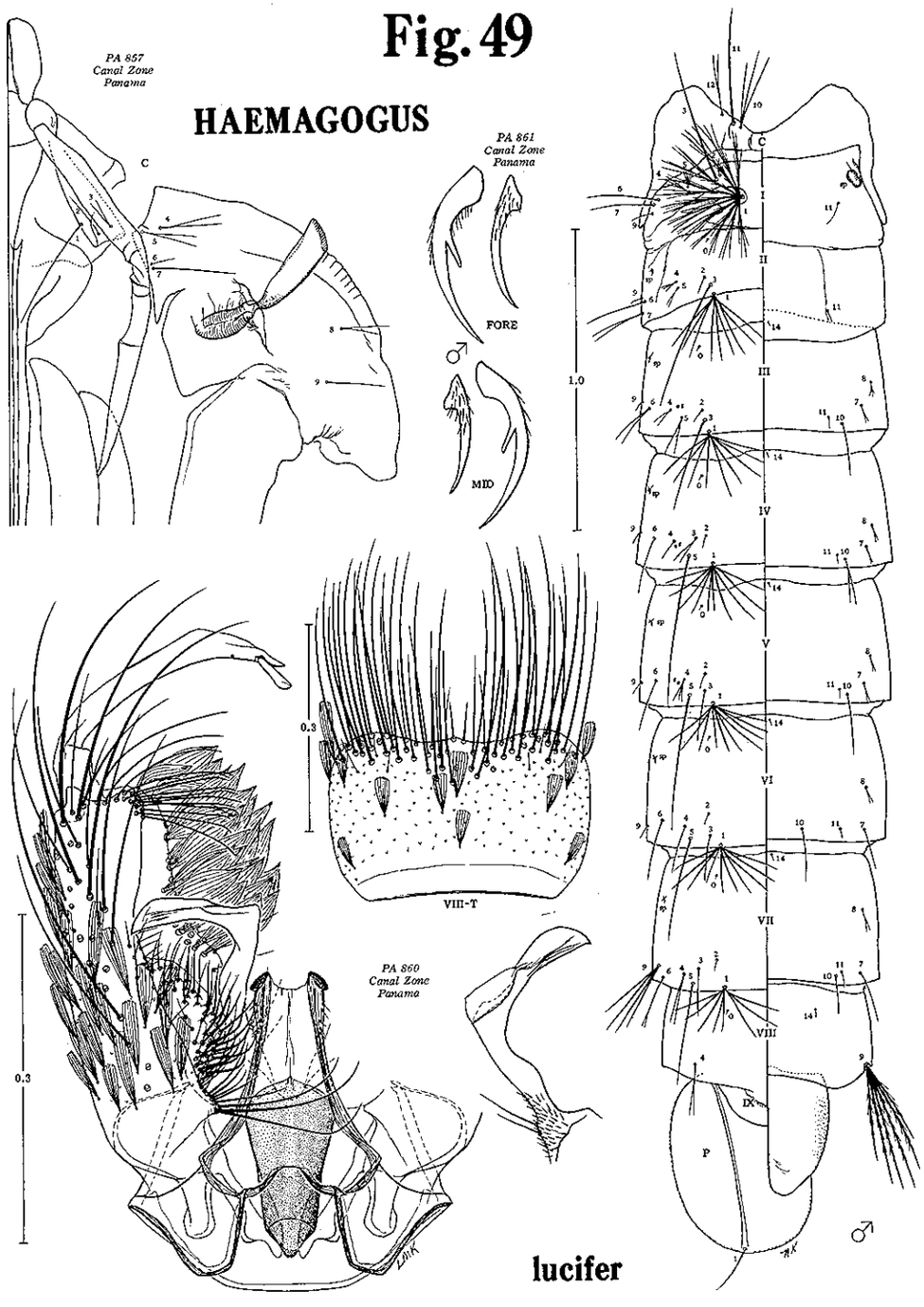
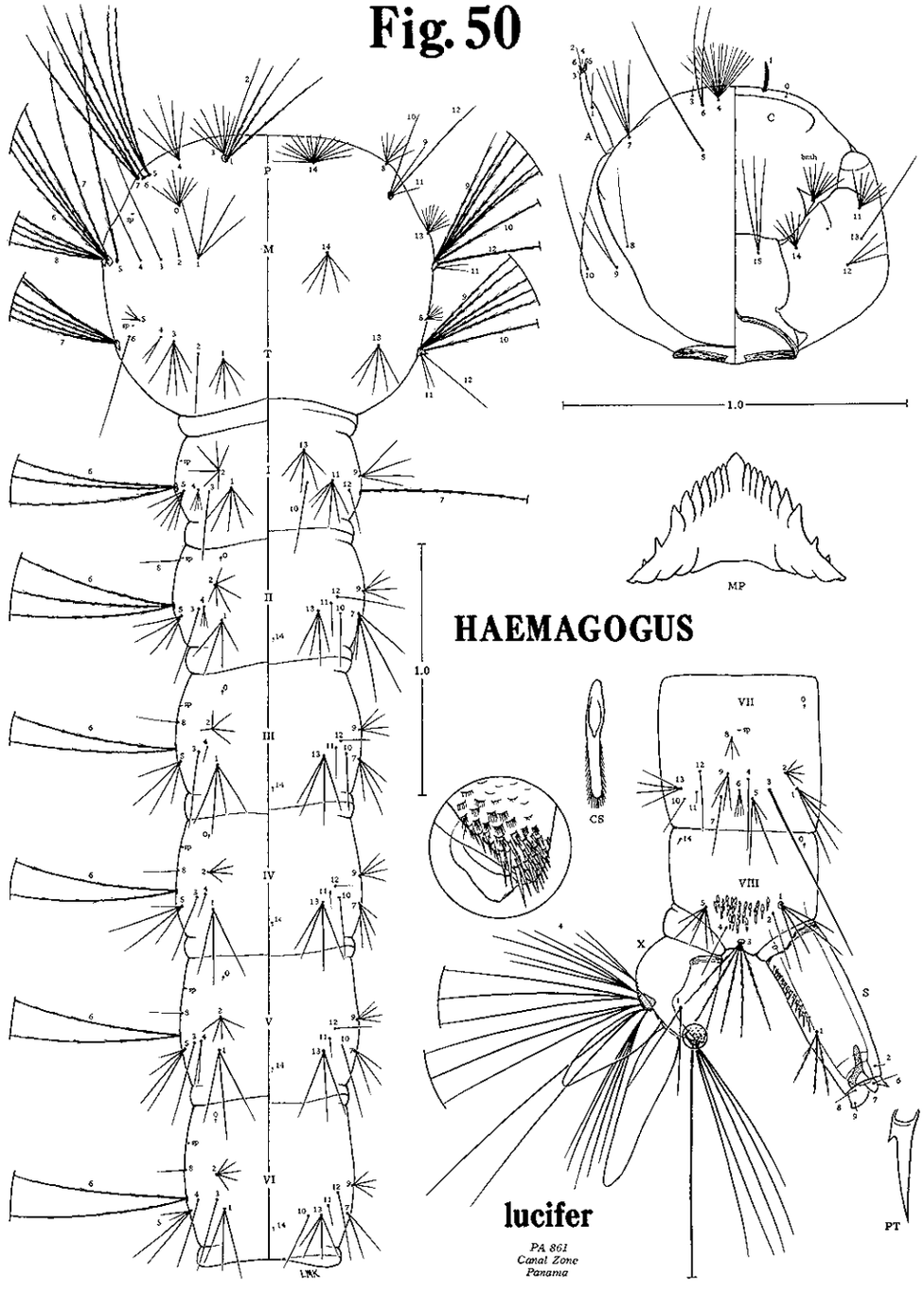

HAEMAGOGUS
PA 857
Canal Zone
Panama
C
PA 861
Canal Zone
Panama
FORE
♂
MID
1.0
I
II
III
IV
V
VI
VII
VIII
IX
P
0.3
VIII-T
PA 860
Canal Zone
Panama
0.3
♂
lucifer

Fig. 50



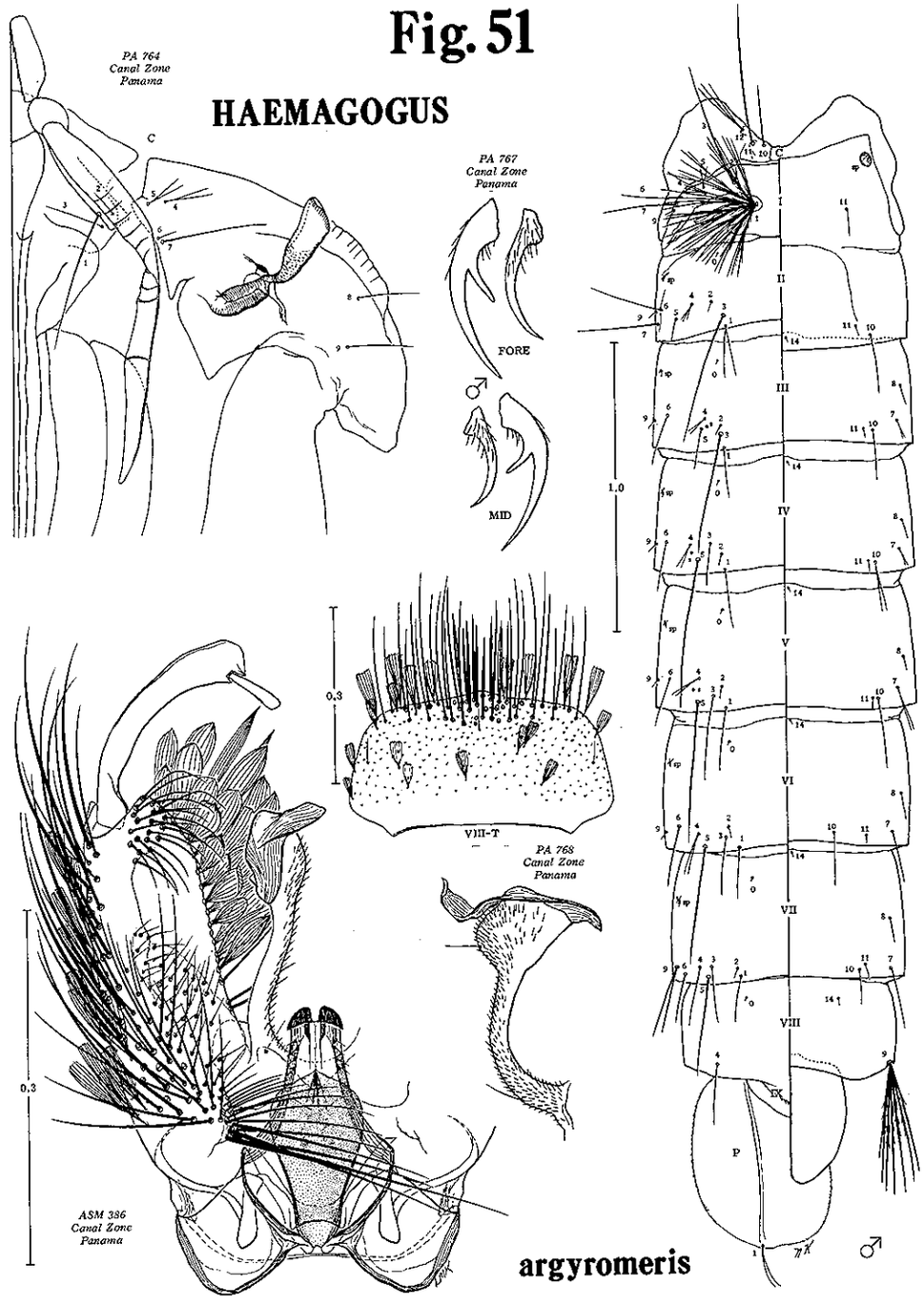
HAEMAGOGUS

lucifer

PA 861
Canal Zone
Panama

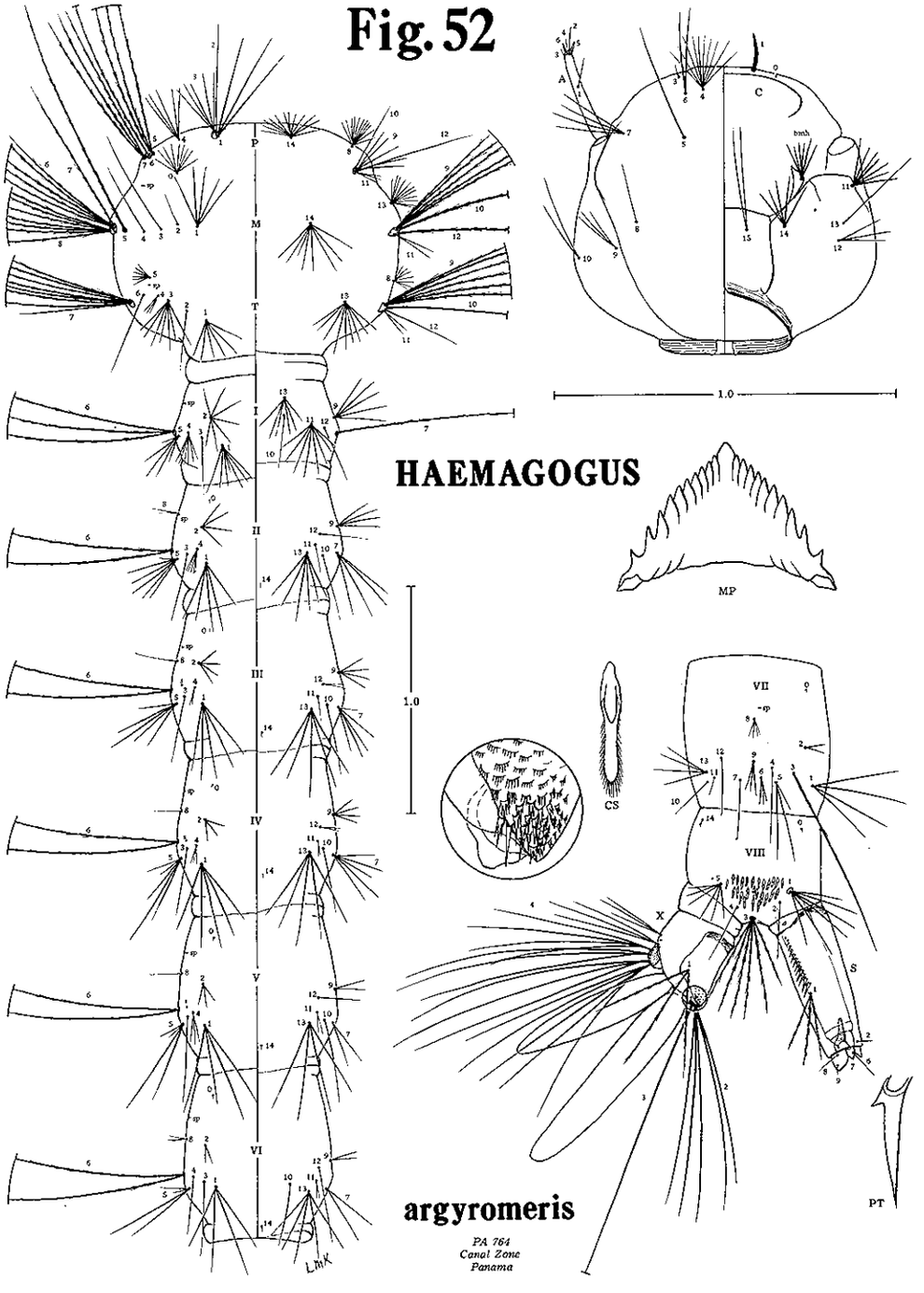
Fig. 51

HAEMAGOGUS



argyromeris

Fig. 52



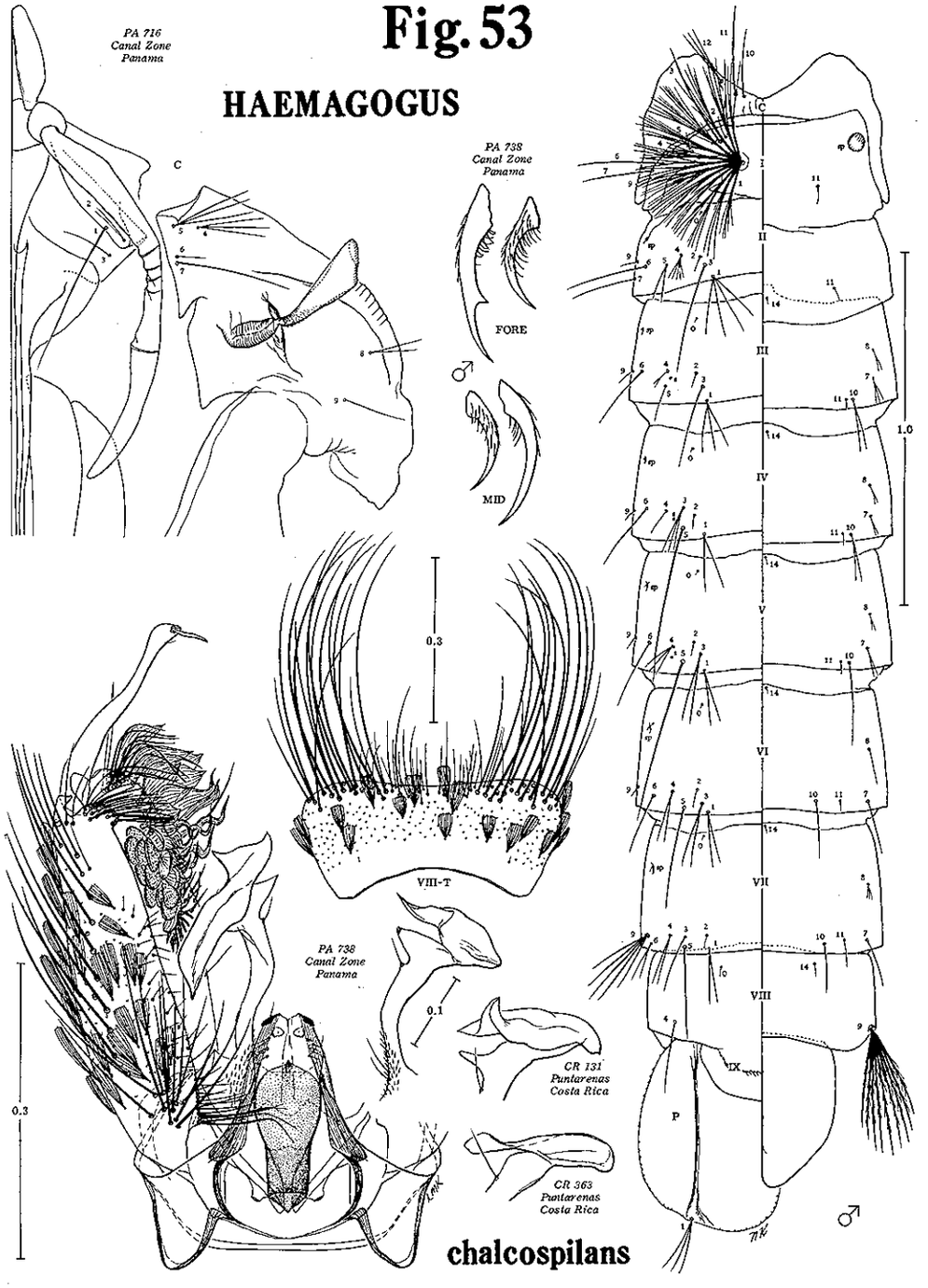
HAEMAGOGUS

argyromeris

PA 764
Canal Zone
Panama

Fig. 53

HAEMAGOGUS



chalcospilans

Fig. 54

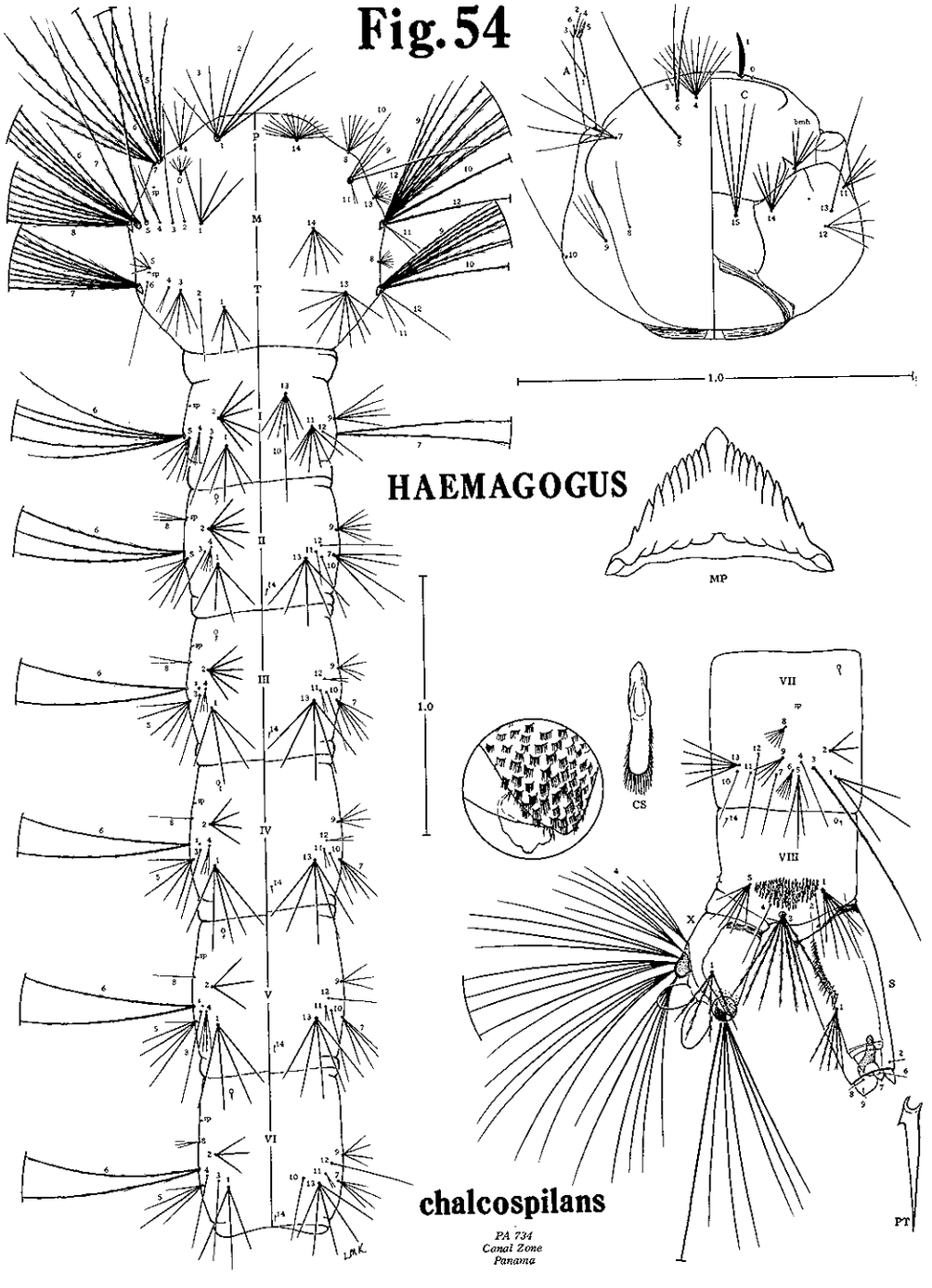

HAEMAGOGUS
chalcospilans
PA 734
Canal Zone
Panama
1.0
MP
CS
PT

Fig. 55

HAEMAGOGUS

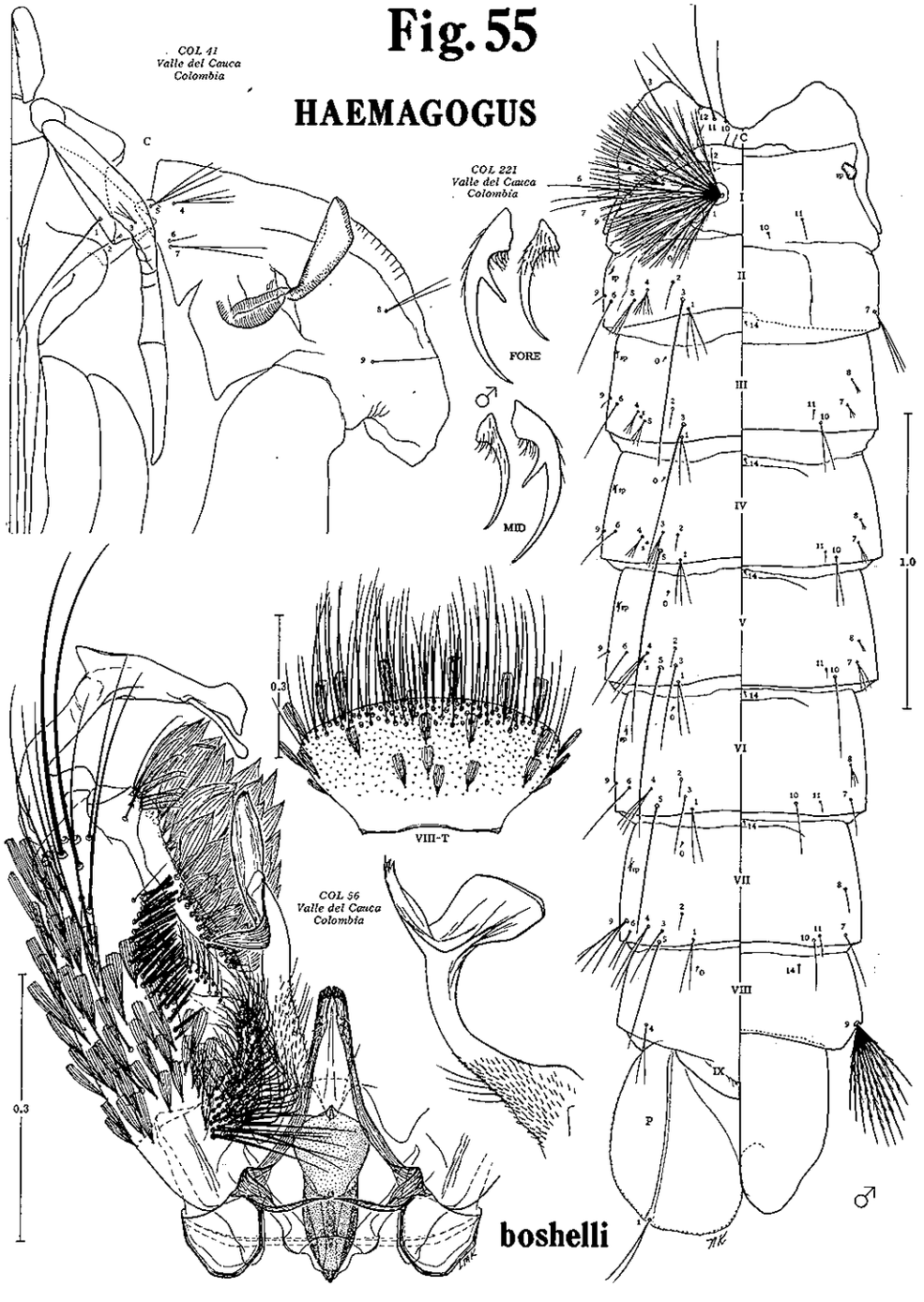
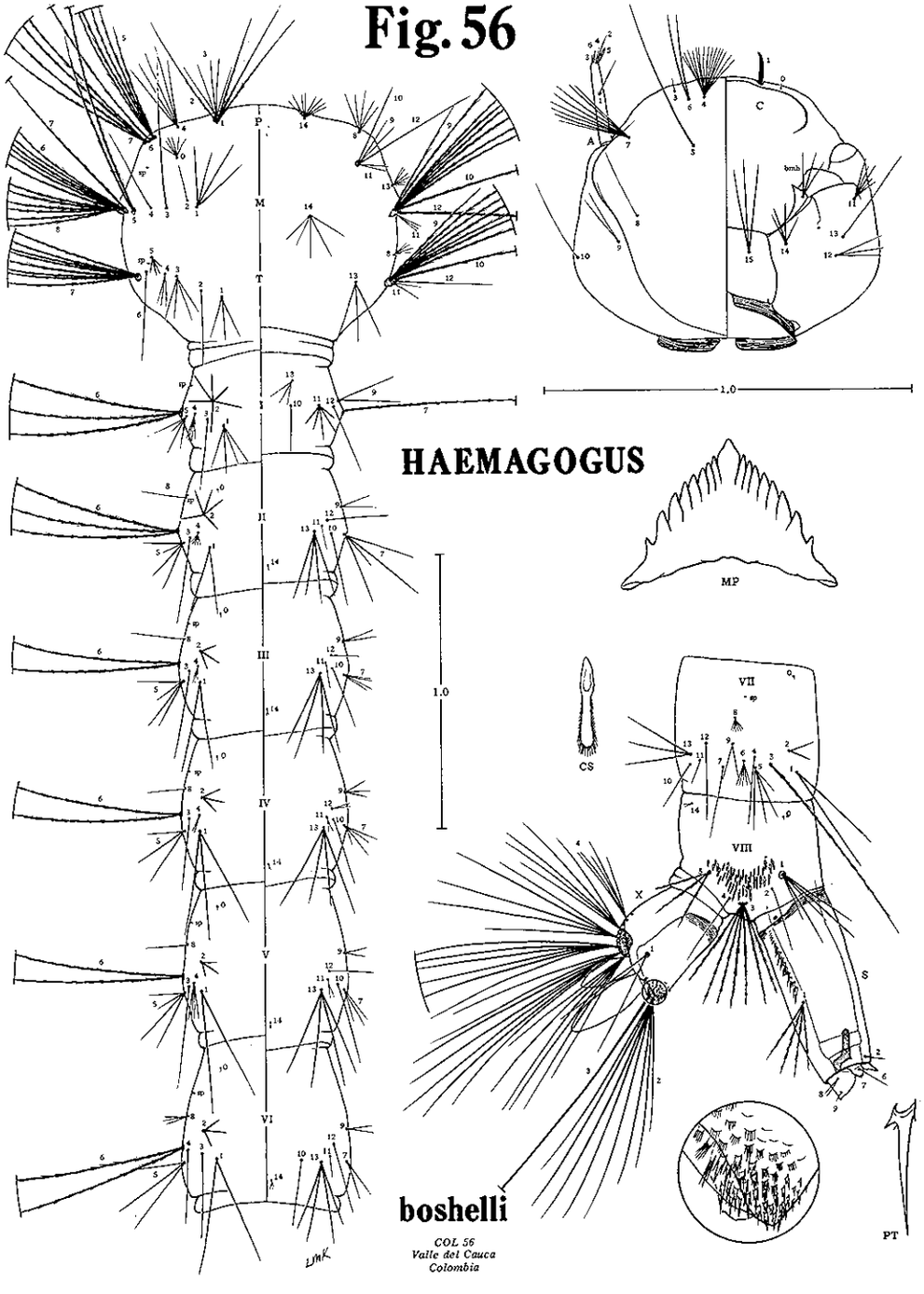


Fig. 56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C
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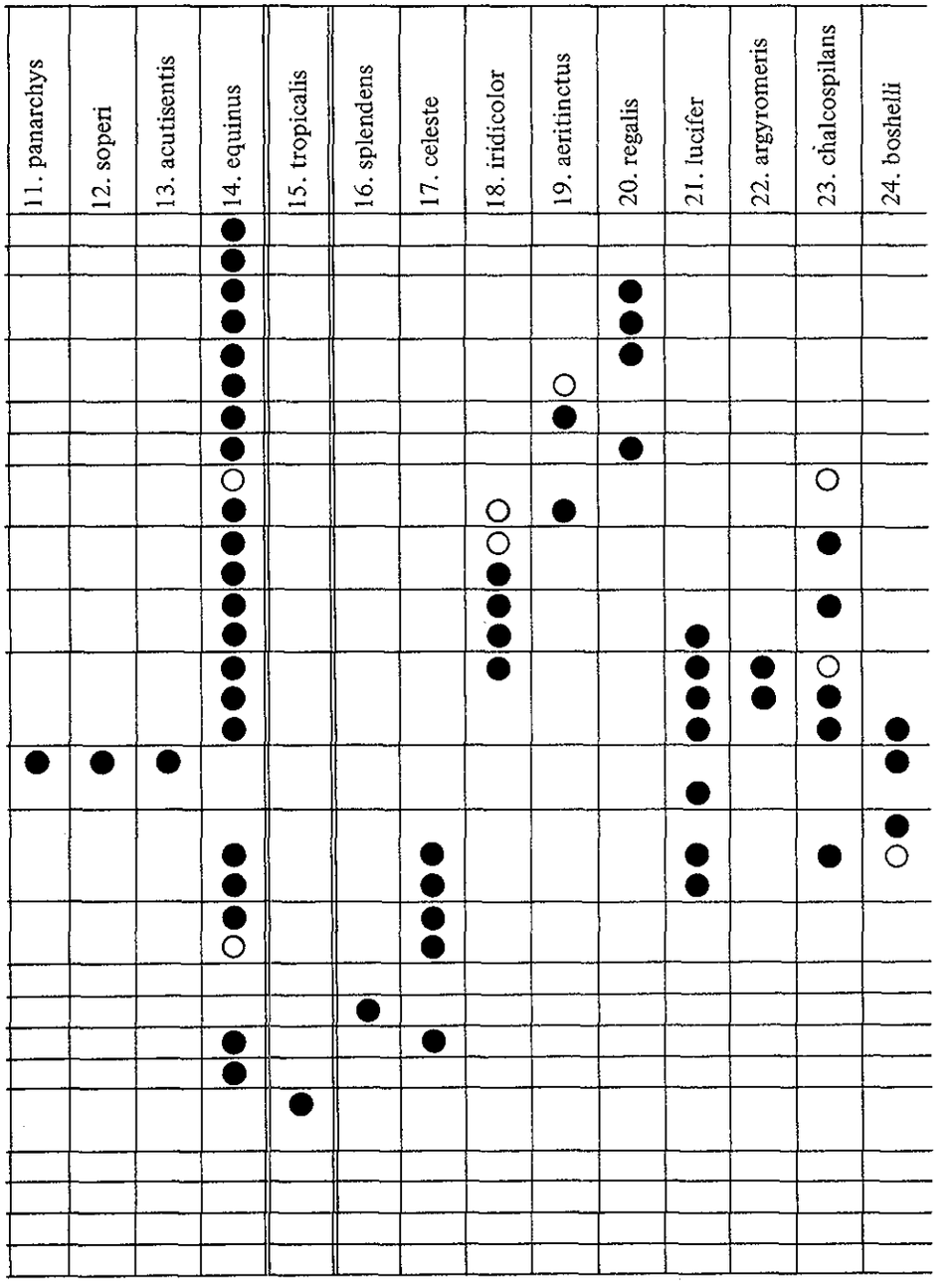
bmh
1.0
HAEMAGOGUS
MP
CS
VII
VIII
X
S
PT
boshelli
COL 56
Valle del Cauca
Colombia

TABLE OF DISTRIBUTIONS

	1. anastasionis	2. chrysochlorus	3. spegazzinii	4. baresi	5. andinus	6. nebulosus	7. janthinomys	8. capricornii	9. mesodentatus	10. albomaculatus
USA										
JAMAICA										
MEXICO Pacific									●	
MEXICO Atlantic	○								●	
GUATEMALA Pacific	●								●	
GUATEMALA Atlantic									●	
BRIT. HONDURAS									○	
EL SALVADOR	●								●	
HONDURAS Pacific	●								●	
HONDURAS Atlantic							●		●	
NICARAGUA Pacific	●								●	
NICARAGUA Atlantic	○						●		●	
COSTA RICA Pacific	●						○		●	
COSTA RICA Atlantic							○		○	
PANAMA West							●		○	
PANAMA Central							●		●	
PANAMA East							●			
ECUADOR Pacific										
ECUADOR Amazon			●				●			
COLOMBIA Pacific										
COLOMBIA Carib.	●				●		●			
COLOMBIA Orinoco-Amazon							●			
VENEZUELA Carib.	●					●	●			
VENEZUELA Orinoco	○						●			●
NETH. ANTILLES		●								
LESS. ANTILLES										
TRINIDAD-TOBAGO							●			
GUIANAS							●			●
BRAZIL Amazon			●	●			●			
BRAZIL Southeast			●				●	●		
PARAGUAY			○				○			
ARGENTINA			●				●			
BOLIVIA			●				●			
PERU				●			●			

TABLE OF DISTRIBUTIONS



CONSPECTUS OF TAXONOMIC CHANGES

NEW TAXA

CHANGES IN TAXONOMIC STATUS

INDEX TO SCIENTIFIC NAMES