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MOSQUITO STUDIES (Diptera, Culicidae)

- XXIV.** A revision of the crabhole mosquitoes of the genus Deinocerites. By Abdiel J. Adames.

CONTRIBUTIONS
of the
AMERICAN ENTOMOLOGICAL INSTITUTE

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MOSQUITO STUDIES (Diptera, Culicidae)

XXIV. A REVISION OF THE CRABHOLE MOSQUITOES

OF THE GENUS *DEINOCERITES*¹

by

Abdiel J. Adames²

CONTENTS

INTRODUCTION	2
MATERIAL AND METHODS	2
TAXONOMIC CHARACTERS	3
SYSTEMATICS	5
BIONOMICS	8
MEDICAL AND PEST IMPORTANCE	10
TAXONOMIC TREATMENT	11
Genus <i>Deinocerites</i>	11
Keys to Groups and Species	16
Spanius Group	25
1. <i>Deinocerites spanius</i>	27
2. <i>Deinocerites atlanticus</i>	28
3. <i>Deinocerites mathesoni</i>	31
4. <i>Deinocerites belkini</i>	34
Dyari Group	35
5. <i>Deinocerites dyari</i>	37
6. <i>Deinocerites barretoii</i>	40
7. <i>Deinocerites nicoyae</i>	41
Cancer Group	43
8. <i>Deinocerites cancer</i>	44
9. <i>Deinocerites melanophylum</i>	49
10. <i>Deinocerites magnus</i>	52

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Epitedeus Group	56
11. <i>Deinocerites epitedeus</i>	59
12. <i>Deinocerites panamensis</i>	61
13. <i>Deinocerites colombianus</i>	64
14. <i>Deinocerites costaricensis</i>	65
15. <i>Deinocerites curiche</i>	68
Pseudes Group	70
16. <i>Deinocerites pseudes</i>	72
17. <i>Deinocerites howardi</i>	77
18. <i>Deinocerites mcdonaldii</i>	79
REFERENCES CITED	83
FIGURES	92
INDEX TO SCIENTIFIC NAMES	153

INTRODUCTION

In the 12 years since the appearance of Belkin and Hogue's review (1959) of the genus *Deinocerites* a great deal of material has accumulated and considerable information has been obtained on the bionomics and behavior of some of the species. Recent studies have shown *Deinocerites pseudes* to be naturally infected with the viruses of St. Louis encephalitis and of Venezuelan equine encephalomyelitis (Tempelis and Galindo, 1970:175). It was therefore considered appropriate to thoroughly revise this biologically interesting and potentially medically important genus. While Belkin and Hogue recognized 11 species (1 not named), in only 3 of these were both the larvae and pupae known and in 1 only was there definite association of all stages. In the present revision, I recognize 18 species and in 16 of these all the stages are known and associated through individual rearings.

I am indebted: to John N. Belkin for guidance in the study and the preparation of the manuscript; to present and past members of the project "Mosquitoes of Middle America", particularly Thomas J. Zavortink, O.G.W. Berlin, Robert X. Schick, also to my fellow students, Michael Nelson and Jose Valencia, for much assistance and stimulating discussions; and to William A. Powder and Sandra J. Heinemann for the preparation of material. For the loan of material I thank: Alan Stone, U.S. National Museum; Charles L. Hogue, Los Angeles County Museum of Natural History; Donald B. Bright, California State College, Fullerton; Bruce Eldridge, Walter Reed Army Institute of Research; Alfonso Diaz Najera, Instituto de Salubridad y Enfermedades Tropicales, Mexico City; Pablo Barreto, Universidad del Valle, Cali, Colombia; and Martin D. Young and Pedro Galindo, Gorgas Memorial Laboratory, Panama, who also provided laboratory facilities in the field. I am also grateful to the Organization of American States for a fellowship that allowed me to pursue the initial part of this study and to the National Science Foundation which supported some of the field work through grant GB 3871. For the preparation of the final illustrations I am indebted to Nobuko Kitamura and for the text copy for lithoprinting to Caryle Abrams.

MATERIAL AND METHODS

MATERIAL. Some 24,366 specimens were examined for this study, 3,005 males,

4,679 females, 13,298 larvae and 3,384 pupae; included were 2,009 individual rearings (1112 larval, 680 pupal, 217 incomplete) of the 16 of the 18 known species. The bulk of this material was collected for the project "Mosquitoes of Middle America" (Belkin, Schick et al, 1965, 1967) and is deposited at the University of California at Los Angeles [UCLA]. Other collections used were those of the U.S. National Museum [USNM] and of the project on tropical land crabs and their associates [LCBA] being conducted by Charles L. Hogue and Donald B. Bright. Smaller loans were also made available from the Instituto de Salubridad y Enfermedades Tropicales, Mexico [ISET], Universidad del Valle, Cali, Colombia, and Gorgas Memorial Laboratory in Panama. I collected additional material and made field observations specifically for this project in Honduras, Nicaragua, Panama and Colombia in August and September 1967.

TAXONOMIC PROCEDURE. The taxonomic methods used here are the classical comparative morphological ones. Species were first recognized on the basis of a series of constant correlated morphological characters in all stages. They were then compared minutely and those showing correlated features in common were assembled into primary phyletic lines called groups. In some instances smaller units, species complexes, were recognized. In the final interpretation of evolution in the group, distributional data were also taken into account.

DESCRIPTIONS. The method of presentation, terminology and abbreviations used in the description of the taxa in general follow Belkin (1962). A few special terms introduced in this revision are self-explanatory and are labelled on the figures.

ILLUSTRATIONS. For every species all the available stages are illustrated. The full chaetotaxy of the immature stages is figured, with a modal value of the hair branching based on 5-10 topotypic specimens (exact number specified in the description of each species). The illustrations of the adults show pertinent details only: male and female heads, male and female genitalia, female forefemur, and claws of foreleg and midleg of female. In addition, the female of *cancer*, the type species of the genus, is illustrated completely.

DISTRIBUTION. Only synoptic distributional data are given here: locality, collector, collection number (when available) and depository. Full data for every specimen examined have been entered in a permanent ledger and will be available on demand to interested parties on microfilm or other desired reproduction method from the Department of Zoology, University of California, Los Angeles.

TAXONOMIC CHARACTERS

The following morphological features of the different stages were found to be particularly useful as diagnostic specific characters as well as taxonomic or group characters. I have indicated whenever possible the primitive or derived states of the various characters. There is no absolute criterion for determining the nature of the character state without paleontological evidence but the derived state is usually indicated by the trend within a taxon and the primitive state by comparison with related taxa, in this case the subgenus *Culex* and the genus *Galindomyia* (see under affinities in the section on systematics).

GENERAL ADULT CHARACTERS. Coloration. — The color of the integument of the pleural sclerites as compared with that of the mesonotal integument is a useful diagnostic specific character but is of no value as a group character.

Antenna. — The elongation of the basal flagellar segments and the consequent elongation of the entire antenna are the most important taxonomic characters in the general external morphology of the adults. The trend within the genus is from an antenna similar in the 2 sexes and with only the first flagellar segment elongate to dissimilar and with additional flagellar segments elongated. The length of the antenna is expressed in terms of its extension beyond the proboscis with reference to specific flagellar segments. This was determined in slide preparations.

Proboscis. — The length of the proboscis, from the basal ventral bristles to the tip of the labella, was determined in slide preparations. As noted above, the proportional length of the antenna and proboscis is the most useful taxonomic character in the adults.

Mesepimeron. — The development of a large patch of scales on the mesepimeron is interpreted as a derived state in *Deinocerites*. It appears to have arisen independently in the Pseudes and Epitedeus Groups.

Forefemur. — The replacement of the simple bristles of the anteroventral and posterodorsal rows by short spiniforms is a derived condition. It appears to have arisen independently in the Pseudes and Epitedeus Groups.

FEMALE SEXUAL CHARACTERS. The female genitalia were studied in part only. The following characters showed taxonomic as well as diagnostic value.

Sternite VIII. — Excellent taxonomic characters are (1) presence (primitive) or absence of scales on the distal sclerotized part and (2) caudal margin without (primitive) or with strongly differentiated bristles.

Postgenital plate. — Primarily of diagnostic specific value. Only the distal part was studied, in lateral as well as ventral aspect.

Cercus. — The general shape as well as the differentiation (derived) of apical and subapical setae are excellent taxonomic as well as diagnostic specific characters.

MALE SEXUAL CHARACTERS. These characters are primarily diagnostic at the specific level but are of some value in classification except for the claws.

Claws. — The length, shape and dentition of the foreclaws and midclaws of nearly every species is uniquely developed.

Tergite IX. — The articulated lobe of tergite IX shows a characteristic development in most species. It is of value as a group character primarily in the Cancer Group where it is markedly flattened (derived).

Sidepiece. — The presence (primitive) or absence of scales on the sidepiece is correlated with a similar development of sternite VIII of the female and is an excellent group character.

Aedeagus. — The intromittent organ is basically similar throughout the genus except for the absence (primitive) of a dorsal basal articular process for the dorsal paramere in the Spanius Group.

Dorsal paramere. — As with the claws and IX tergite lobe, the dorsal paramere is characteristically developed in most species. It is differentiated into 2 parts (primitive) in the northern complex of the Spanius Group but is compact in all other species.

PUPA. The following pupal group characters are usually concordant with the group characters of the adults: (1) on the *cephalothorax*, the increase (derived) in the length of and in the distance between hairs 2 and 3, the reduction (derived) in the length of hair 5, (2) on the *metanotum*, the reduction (derived) in the length of hair 10, and (3) on the *abdomen*, increase in length and reduction in the number of branches in hair 1-II (both derived), the displacement of 5-II mesad (derived), and the reduction (derived) in the length of 1-VII. Other important

group characters are found in cephalothoracic hairs 5,7,8-C and abdominal hairs 1-II and 3-V. There are numerous diagnostic specific hair characters as indicated in the pupal key.

FOURTH INSTAR LARVA. There are numerous characters in the fourth instar larva that show congruent development with adult and pupal characters at the group level and are very useful in classification. Among these are (1) on the *head*, reduction and lateral displacement (both derived) of hair 2-C, and reduction in number of branches and elongation (both derived) of 6-C and to lesser extent 5-C, (2) on the *thorax*, branching (derived) of hair 9-P, (3) on the *abdomen*, increase (derived) in the number of branches in hairs 6-II and 6-VI, and decrease (derived) in the length of 1-VII, (4) on the *siphon*, decrease (derived) in the number of branches of hair 1-S, and (5) on the *anal segment*, independent reduction (derived) in several lines of the number of hairs in the ventral brush from 7 to 6 pairs. There are also numerous specific differences in the branching of other hairs as indicated in the larval key.

SYSTEMATICS

TAXONOMY. The 18 species recognized in this revision fall into 5 well-defined groups on the basis of morphological similarities in 1 or more of the different stages. Two of these groups, Spanius and Cancer, are essentially as defined by Belkin and Hogue (1959); the Dyari Group of these authors is broadened to include 2 other species; and the Pseudes Group is split off from the Epitedeus Group.

Each of the groups is marked by 1 or more unique features or unique combinations of features in 1 or more stages. In all but the Spanius Group these features represent derived states. They are listed below in the diagnosis of each group and are only briefly reviewed here.

In the Spanius Group unique features are present in the adults (extensive scaling of the genitalia and short similar antennae in both sexes) and the larvae (abdominal hair 6-II single); all of these appear to be primitive. In the Dyari Group the best diagnostic features are found in the immature stages (reduced length of pupal hair 10-C and larval hair 1-VII). The Cancer Group is differentiated from the others most clearly by the genitalia in both sexes (flattening of IX tergite lobe in the male and spatulate specialized setae of the cercus in the female). The Epitedeus Group (in the present restricted sense) is the most derived of all and is clearly marked by (1) the absence of a strongly developed lower mesepimeral bristle in the adults and the great elongation of flagellar segments 1-4 of the antenna of the female, (2) the reduced length of hair 5-C and the long double or triple hair 1-II in the pupa, and (3) hair 9-P double or triple in the larva. Finally, the Pseudes Group shares with the Epitedeus Group the development of a patch of mesepimeral scales in the adults (absent in the other groups) but possesses the differentiated mesepimeral bristle; its immature stages however are more similar to those of the Cancer Group from which they are not always easily differentiated.

The Spanius Group appears to be the most ancient segregate of the *Deinocerites* stock because it is characterized largely by primitive and not derived features and because of its widely disjunct distribution. The Dyari Group has also retained many primitive features and in some respects appears to be transitional between the Spanius Group and the others with predominantly derived features, but as indicated above it too possesses unique derived features in the immature stages.

DISTRIBUTION. The genus is largely restricted to Middle America in the sense of Belkin, Schick et al (1965:2), i.e. Central America, the West Indies and adjacent portions of North America and South America. The only known extension from this area is on the Atlantic seaboard of South America down to the state of Maranhao, Brazil, south of the Amazon River.

All the species within a given group are allopatric except for the Pseudes Group where all 3 species have been recorded from a single locality. Only 1 species, *pseudes*, is known with certainty to be present both in the Atlantic and Pacific basins, all others are confined to either one or the other ocean basin.

Each of the groups has a characteristic distribution but 2 or more groups occur in 1 locality. The Cancer Group is confined to the Atlantic basin, centered around the Caribbean Sea but extending into the Bahamas and Florida in the north and into eastern South America south of the Amazon. The Dyari Group is known only from the Pacific shores from Nicaragua to central Colombia. The other 3 groups have been reported from both the Atlantic and Pacific coasts. The Pseudes Group is largely confined to the Pacific coast from the Gulf of California to the Gulf of Guayaquil with only *pseudes* itself invading the Atlantic basin northward from the Isthmus of Tehuantepec, Mexico, into southern Texas. The Epitedeus Group is equally represented on the Atlantic and Pacific sides of Central America and Colombia. Whereas the distributions of all these groups are probably continuous within their range, that of the Spanius Group is widely disjunct, with a pair of geminate Atlantic and Pacific species north of Tehuantepec and a similar pair south of Costa Rica.

All of the 5 groups are known from Panama, 4 on the Pacific side (Spanius, Dyari, Epitedeus and Pseudes) and 3 on the Atlantic (Spanius, Cancer and Epitedeus). Elsewhere at most 2 groups occur sympatrically in the Atlantic basin (Spanius and Pseudes, north of Tehuantepec; Cancer and Epitedeus, Central America; Spanius and Cancer, Colombia and Venezuela) and at most 3 in the Pacific basin (Spanius and Pseudes, north of Tehuantepec; apparently only Pseudes in Guatemala and Salvador and Pseudes and Dyari in Nicaragua; Pseudes, Epitedeus and Dyari in Costa Rica and Colombia; and only Pseudes in Ecuador and northern Peru). In Florida, Bahamas, Greater and Lesser Antilles, Trinidad and Tobago, and northeastern South America only the Cancer Group is represented.

AFFINITIES. The genus *Deinocerites* is undoubtedly a member of the tribe Culicini in the sense of Belkin (1962:117). Only 2 other genera are currently recognized in this tribe, the dominant worldwide *Culex* Linnaeus, 1758 and the monotypic *Galindomyia* Stone & Barreto, 1969 from Colombia.

Deinocerites and *Galindomyia* share the following features not exhibited by *Culex*: (1) flagellar segment 1 elongate in both sexes, (2) dorsal paramere developed in the male, and (3) general development of the subapical lobe of the sidepiece and of the clasper in the male. *Galindomyia leei* Stone & Barreto, 1969 resembles members of the most primitive group (Spanius) of *Deinocerites* in the small size, relatively short antenna and the type of articulation of the dorsal paramere with the aedeagus. Therefore, I consider it likely that *Deinocerites* and *Galindomyia* were derived from a common ancestral stock which separated very early from the stock that gave rise to the dominant genus *Culex*. However, the relationship between *Deinocerites* and *Galindomyia* cannot be determined with any degree of certainty without evidence from the immature stages. Unfortunately the latter are unknown for *leei*; it seems likely that they will be found in crabholes to which the adults appear to be confined as in the case of *Deinocerites*. For the present,

Galindomyia is retained as a genus distinct from *Deinocerites* because of the following features not found in any of the groups of the latter: (1) absence of articulation between tergite and sternite IX, poor development of tergite lobe IX, and unique development of terminal flagellar segment of the antenna and of the foreclaw in the male, and (2) vertex of head with decumbent scales all broad and erect scales restricted to occiput in both sexes. In some respects *Galindomyia* appears to be annectent between *Deinocerites* and *Culex*, notably in the position and development of the subapical lobe of the sidepiece.

Dyar's view (1928:261,337) that *Deinocerites* was derived from *Culex* (*Tinolestes*) *latisquama* (Coquillett, 1906) was apparently based entirely on the mistaken homology of a process from the basolateral sclerotization of the proctiger with the IX tergite lobe of *Deinocerites* and the presence of a short palpus in the male, and the similarity in breeding sites. Actually there is little in the morphology of the adults of *latisquama* to suggest close relationship to *Deinocerites* and its immature stages are completely different and indicate affinity with the *Melanoconion* line of the genus *Culex*.

Of the major lines of *Culex*, the subgenus *Culex* appears to share the greatest number of similarities with *Deinocerites*. Among these are: (1) in the *adults*, decumbent scales of vertex all narrow, erect scales numerous, (2) in the *genitalia*, sidepiece of male and sternite VIII of female with scales, and (3) in the *larva*, abdominal hairs 6-I-VI subequal, with 6-I,II not sharply differentiated, and siphon with only 1 lateral hair out of line.

SPECIATION AND PHYLOGENY. Although the interrelations of the various species are now better understood because of the knowledge of all the stages of 16 of the 18 species, the other data needed to determine the speciation and phylogeny of the genus are still fragmentary and little can be added to the speculations of Belkin and Hogue (1959:420-423) except at the species and group level (see).

Many areas are still not surveyed for *Deinocerites* and it is very probable that some of the existing gaps in distribution will eventually be filled. Accurate determination of distributions may be important to evaluate the places of origin and the relationship to former sea portals in the area for it appears that even dominant species of *Deinocerites* are incapable of crossing relatively small land and sea barriers and that dispersal occurs only through contiguous areas suitable for breeding. This is rather clearly seen in Panama where all the species are restricted either to the Atlantic or to the Pacific basin although there is less than an 80-kilometer gap between the basins and a connection by way of the canal. The few specimens in this area reported from the wrong basin are probably strays as there is no modern record of any species breeding outside of its normal basin.

The present allopatric pattern of species within groups of *Deinocerites* is highly suggestive that speciation in this genus has taken place primarily in conjunction with geographical isolation. Only in the Pseudis Group do the included species occur together and in case of *howardi* (see), as pointed out by Belkin and Hogue (1959:442), it is possible that speciation took place through hybridization or introgression (between *mcdonaldii* and *pseudis* stocks).

If the above pattern of allopatric speciation has occurred in *Deinocerites* in the past, then the present partially overlapping pattern of the distribution of the 5 groups represents subsequent dispersal of the original stocks over more or less contiguous areas of suitable breeding sites. Thus, it may be possible to get some suggestions as to barriers (sea portals) from the distributions of species within a group

and both barriers and connections (or contiguities) from those of groups of *Deinocerites*. It is tempting to date these by correlating them with geological events. Unfortunately the historical geology of the area occupied by the genus is poorly known and subject to different interpretations, sometimes in part based circularly on the distribution of plants or animals. Up to now, no fossil material of *Deinocerites* is known and it is therefore impossible to date directly any of the events in the phylogeny of the genus.

However, the general sequence of events in the evolution of *Deinocerites* may have been as proposed by Belkin and Hogue (1959:423) with slight modifications as follows:

1. The origin of the Spanius Group stock on an island in the center of the Middle American area.

2. Subsequent connection of this island with both North and South America and the invasion of these areas by the Spanius Group.

3. Fragmentation of the central area into islands and the formation of 4 separate lines from the Spanius Group populations, each on a different island and giving rise in the southwest to the Dyari Group, the northeast to the Cancer Group, the northwest to the Pseudes Group and the southeast to the Epitedeus Group.

4. Subsequent connection of the islands containing the different stocks and further species differentiation in the groups by later fragmentation of portions of the various connected areas. This was probably a very complex series of events and extended over a long period of time. The latest fragmentation appears to have taken place in the region of Panama and northwestern South America, but the presence of an undifferentiated population of the dominantly Pacific *pseudes* in the Gulf of Mexico suggests that even more recently there was a gap (mangroves?) through the isthmus of Tehuantepec which allowed this species to cross over into the Atlantic basin.

BIONOMICS

All species of the genus *Deinocerites* normally utilize as breeding sites, as well as adult resting sites, burrows of land crabs of the families Gecarcinidae and Ocypodidae. In Cuba, *cancer* has been reported also from burrows of species of stream inhabiting crabs of the genus *Epilobocera* of the family Pseudothelphusidae (Montchadsky and Garcia, 1966:47). No conclusive evidence has yet been obtained as to the specificity of association of any given mosquito with a particular species of crab and relatively few positive identifications of the burrow makers have been reported. However, it appears that members of the Spanius Group are normally found in small burrows which are usually made by fiddler crabs of the genus *Uca* which contains small species of the family Ocypodidae; only 2 species have been identified, both associated with *mathesoni*: *Uca pugilator* (Bosc, 1802) and *Uca subcylindrica* (Stimpson, 1859). Two species of the Dyari Group (*dyari* and *nicoyae*) have been found associated with the Wide Red Land Crab, *Ucides occidentalis* (Ortmann, 1897), a medium-sized species of the family Ocypodidae. Species of the Cancer, Epitedeus and Pseudes Groups are usually found in large or medium-sized burrows made by members of the family Gecarcinidae, primarily the large *Cardisoma crassum* Smith, 1870 (Mouthless Crab; Pacific) or *Cardisoma guanhumi* Latreille, 1825 (Great Land Crab; Atlantic) and less frequently the med-

ium-sized Atlantic Black Land Crab, *Gecarcinus lateralis* (Fremenville, 1835).

The immature stages of species of *Deinocerites* have occasionally been reported from a variety of abnormal habitats such as postholes (Jennings in Howard, Dyar and Knab, 1915:209), rockholes (Wirth, 1945; Belkin, Heinemann and Page, 1970:49), a beach pool (van der Kuyp, 1948a:748), treeholes (Peyton, Reinert and Peterson, 1964:454; Porter, 1964:222) and various artificial containers such as tin cans, a wooden bucket and an abandoned septic tank (Dyar, 1928:265; Porter, 1964:222). They have also been found in ground pools formed by the flooding of depressions containing crabholes.

It is not unusual to find the immature stages of more than 1 species of *Deinocerites* in the same crabhole but these always belong to different species groups except possibly in the case of *pseudes*, *howardi* and *mcdonaldi* which are partially sympatric members of 1 group. Frequently associated with species of *Deinocerites* are the immature stages of the other normally obligate crabhole mosquitoes. To date the following species have been recorded in such associations: *Culex (C.) janitor* Theobald, 1903; members of *Culex (C.) inflictus* Theobald, 1901 complex; *Culex (Melanoconion) carcinophilus* Dyar & Knab, 1906; *Culex (Mel.)* undescribed spp.; *Culex (Tinolestes) latisquama* (Coquillett, 1906). In exposed shallow crabholes, in flooded crabhole areas and other ground water situations, the following species have been found associated with various species of *Deinocerites*: *Aedes (O.) taeniorhynchus* (Wiedemann, 1821); *Aedes (O.) scapularis* (Rondani, 1848); *Anopheles (A.) eiseni* Coquillett, 1902; *Anopheles (A.) grabhamii* Theobald, 1901; *Anopheles (Nys.) albimanus* Wiedemann, 1821; *Culex (C.) bahamensis* Dyar & Knab, 1906; *Culex (C.) habilitator* Dyar & Knab, 1906; *Culex (C.) nigripalpus* Theobald, 1901; *Culex (Mel.) elevator* Dyar & Knab, 1906 complex; *Culex (Mel.) opisthopus* Komp, 1926; *Psorophora (G.) jamaicensis* Theobald, 1901. In treeholes or various artificial containers, 2 species of *Deinocerites* (*cancer* and *costaricensis*) have been reported to be associated once each with *Aedes (F.) triseriatus* (Say, 1823) complex; *Culex (C.) nigripalpus*; *Culex (Anoed.) conservator* Dyar & Knab, 1906; *Haemagogus chalcospilans* Dyar, 1921; *Orthopodomyia fascipes* (Coquillett, 1905); and *Corethrella (C.)* sp.

Immature stages of *Deinocerites* occur in crabholes near the seashore as well as in those at a considerable distance from the coast. The water in the burrows has been reported to vary from completely fresh to distinctly salty but the only published records of water analyses are for *mathesoni* and *pseudes* and show a range of chloride content from 1,115 to 8,430 ppm and pH from 7.2-7.6 (Fisk, 1941:547; Peyton, Reinert and Peterson, 1964:452).

The natural food of the larvae is unknown but may be, as speculated by Howard, Dyar and Knab (1915:200), "matter in suspension in the water, of which the excrement of the crab not improbably forms an important part". As pointed out by Belkin and Hogue (1959:415) the great development of the subantennal pouch, the peculiar basal and apical lobes of the mandible and the rudimentary mental plate suggest an unusual type of food and a peculiar method of feeding. In the laboratory, larvae have been reared through from eggs on Purina chow (Galindo, 1967) and half and half mixture of ground dog food and porcine liver powder (Gentry, Gerberg and Hopkins, 1970).

The length of the aquatic cycle under natural conditions is not known for any species of *Deinocerites*. Under laboratory conditions it has been determined only for *mathesoni*, *cancer* and *pseudes*. The reported length of the larval cycle varies from only 2 weeks to more than 8 weeks, while the pupal stage is stated to last

from about 3-8 days. In the laboratory, eggs are laid singly in containers above the water level.

All available data indicate that adults of *Deinocerites* are crepuscular or nocturnal in activity and that during daylight hours they rest in the upper portions of crab burrows. If the adults are disturbed or driven out of the holes, they fly out a short distance only and return rapidly to the burrows. Dyar (1928:126) suggested that "the remarkably elongate antennae perhaps serve as special sensory organs to warn them of ... danger ... when the crustacean host enters". As the antennae are elongate in both sexes it is likely that they serve to monitor all the activities of the adults within the confines of the dark crabholes. As shown by Downes (1966) and Provost and Haeger (1967) the antennae of the males are involved in the mating behavior of *cancer*.

It appears that the adults have a relatively short flight range and that their activities are restricted to the immediate vicinity of their breeding sites in the crabholes. However, *mathesoni* (Fisk, 1941:544) and *cancer* (Branch, Logan et al, 1958:161) have been reported in light traps presumably several miles away from crabholes.

Earlier workers generally assumed that the majority of the species of *Deinocerites* do not take blood or at least not from warm blooded vertebrates (Howard, Dyar and Knab, 1915:200; Fisk, 1941:544). It is now known that a number of species are attracted to a variety of hosts in animal-baited traps and some will readily feed on man in the field. Recent studies on the blood meals of wild-caught females of 5 species of *Deinocerites* in Panama (Gorgas Memorial Institute, 1970: 20; Tempelis and Galindo, 1970) have revealed a wider spectrum of hosts for some of these species than has been known for any other group of mosquitoes previously studied, ranging from man and several domestic and wild mammals through birds of several orders, lizards, frogs and toads. Specific differences in host preference were also noted in these studies and also the unusually small blood meals taken by species of *Deinocerites*.

Early reports on the mating behavior of species of *Deinocerites* were based on field observations and indicated that swarming and mating take place above the crabholes (Busck, 1908:61; Howard, Dyar and Knab, 1915:207). Recently, observations have been made in laboratory colonies of *cancer* by Downes (1966) and Provost and Haeger (1967) and *pseudus* by Galindo (1967). In *cancer* 2 types of mating behavior were seen. In the first type, males exhibited "pupal attendance" on the water surface which is described here in the discussion of the bionomics of *cancer*. In the second type, males flew to the walls of the container and copulated with virgin females without pupal attendance. Galindo did not report either swarming or pupal attendance in the laboratory colony of *pseudus* but observed males performing nuptial flights involving hovering over females and contact between midtarsi of the males and the hindlegs of the females prior to copulation end to end. It remains to be seen if all the different types of behavior described occur in a single species in different situations in the field or if different species have developed different mating behavior patterns.

MEDICAL AND PEST IMPORTANCE

Recent data suggesting the potential importance of species of *Deinocerites* as vectors of arboviruses have been reviewed by Tempelis and Galindo (1970:177-

178). As noted in the section on bionomics, some species of the genus readily feed in nature on a variety of cold-blooded and warm-blooded vertebrates as well as man. That such "mosquitoes [are] promising suspects as vectors of viruses which have been isolated from both warm- and cold-blooded animals" (Gorgas Memorial Institute, 1970:20) has been demonstrated by the isolation from wild-caught *pseudos* of the virus of St. Louis encephalitis (SLE) and of Venezuelan equine encephalomyelitis (VEE) and by the transmission of the latter in the laboratory by the same species (Grayson, Sirihongse and Galindo, 1967; Gorgas Memorial Institute, 1970:19; Tempelis and Galindo, 1970:175). However, the importance of species of *Deinocerites* in the epidemiology of either arboviral infection has not been demonstrated as yet. Although some species are known to bite man rather freely, their activity appears to be confined largely to the vicinity of areas with crabholes. Therefore their importance both as pest species and as direct vectors of pathogens to man is probably limited.

In other recent studies in Panama (Gorgas Memorial Institute, 1970:20), *epitedeus* was found to be naturally infected with trypanosomes (60 specimens) and plasmodium-like sporozoites (2 specimens). The vertebrate hosts of these parasites have not been determined.

TAXONOMIC TREATMENT

Genus *DEINOCERITES* Theobald

- 1901. *Deinocerites* Theobald, 1901a:235 (15 July), no included species; 1901b:215 (23 Nov.). TYPE SPECIES: *Deinocerites cancer* Theobald, 1901, Jamaica; by subsequent monotypy.
- 1901. *Brachiosoma* Theobald, 1901a:235, no included species. TYPE SPECIES: *Deinocerites cancer* Theobald, 1901, Jamaica; designation of Coquillett (1910:515). Synonymy with *Deinocerites* by Blanchard (1905:414).
- 1901. *Brachiomyia* Theobald, 1901b:343-344. TYPE SPECIES: *Brachiomyia magna* Theobald, 1901, St. Lucia; by monotypy. Synonymy with *Deinocerites* by Theobald (1903:275).
- 1902. *Deinokerides* Giles, 1902:335,472. TYPE SPECIES: *Deinocerites cancer* Theobald, 1901, Jamaica. Unjustified emendation.
- 1905. *Dinocerites* Blanchard, 1905:413-414. TYPE SPECIES: *Deinocerites cancer* Theobald, 1901, Jamaica. Unjustified emendation.
- 1907. *Dinomimetes* Knab, 1907:120. TYPE SPECIES: *Dinomimetes epitedeus* Knab, 1907, Port Limon, Costa Rica; by monotypy. Synonymy with *Deinocerites* by Dyar (1918:101).
- 1909. *Dinanamesus* Dyar and Knab, 1909:259. TYPE SPECIES: *Dinanamesus spanius* Dyar & Knab, 1909, Corozal, Panama, Canal Zone; by monotypy. Synonymy with *Deinocerites* by Dyar (1918:101).

Deinocerites of Theobald (1903:275-276; 1905b:37); Dyar (1905a:45-49; 1928:261); Felt (1905:459,491); Dyar and Knab (1906:178,188; 1907a:48); Knab (1907b:121-123); Mitchell (1907b:223); Busck (1908:54); Coquillett (1910:531); Surcouf and Gonzalez-Rincones (1911:91); Howard, Dyar and Knab (1915:191); Dyar and Shannon (1924:477,485); Bonne and Bonne-Wepster (1925:168); Shannon (1931:4-5); Gerry (1932:43); King, Bradley and McNeel (1944:61,65,66,75,77; 1946b:5,7); Carpenter, Middlekauff and Chamberlain (1946:25,34,274); Knight and Chamberlain (1948:7); Bates (1949:80,165,171,270,322); Lane (1953:535); Blanton, Keenan and Peyton (1955:41); Horsfall (1955:599-600); Perez Viguera (1956:476); Peyton and Hill (1957:295); Belkin and Hogue (1959:411-451); Gibson and Carrillo (1959:166); Stone, Knight and Starcke (1959:284-285); Scott (1961:244);

Bachmann and Casal (1963:21); Dodge (1962:366; 1963:798,807; 1966:342-343,344-345); Evans (1962:255); Ross (1962:192; 1964:103,104); Forattini (1965:107,108); Diaz Najera (1965:57); Downes (1966:1173-1176); Provost and Haeger (1967:565,570-573); Lee and Barreto (1969:389).

Brachiomyia of Giles (1902:473-474).

FEMALES. Small to medium-sized species; mesonotum usually dark brown, sometimes contrasting with conspicuously lighter portions of pleural integument; without distinct ornamentation on legs or abdomen. **Head:** Eyes contiguous above antennal bases. Decumbent scales on disc of vertex all narrow, a small patch of small broad scales laterally; a slight indication of a frontal tuft of elongate scales or scalelike bristles; orbital line without scales. Erect scales numerous. One pair of strongly developed interorbital (frontal) bristles and a continuous row of orbitals. Clypeus prominent, bare. Proboscis usually distinctly shorter than abdomen. Labium uniform in diameter; weakened beyond middle and often curved caudad; dark scaled and with numerous short bristles; labella small, elongate, with short bristles and usually a few scales. Palpus short, about 0.2 of proboscis; 3-segmented and with an indistinct palpifer; segment 3 elongate, dark scaled; all 3 segments with bristles but only a few well developed in distal part of segments 1 and 2. Antenna always distinctly longer than proboscis, but varied, exceeding proboscis from basal two-thirds of segment 5 to base of segment 11; scape distinct, visible under torus; torus small, with a few short hairs on anterior mesal surface and sometimes with 1 to several small broad scales; flagellar segment 1 without distinct whorl of bristles and always with numerous small broad appressed scales; segments 2-13 without scales except sometimes a few at base of segment 2, flagellar whorls short, composed usually of 8 bristles, dense vestiture of short hairs; flagellar segment 1 conspicuously elongated; segments 2-12 of varied length, either segments 2-12 subequal in length but progressively slightly shortened distad, or segments 2-4 markedly longer than segments 5-12 which are subequal in length but progressively slightly shortened distad; segment 13 longer than 12. **Thorax:** Mesonotum and scutellum with narrow curved decumbent dark scales, some scales broader, particularly on lateral scutellar lobes. Acrostichal bristles absent on disc, sometimes slightly developed on anterior promontory; dorsocentrals, supraalars and marginal scutellars present and strongly developed; posterior fossals usually 1-3. Postnotals present or absent. Paratergite bare. **Apn** with strong bristles and with a group of weaker bristles posteriorly, usually arranged into a more or less transverse row; **ppn** with several bristles in dorsocaudal angle and with narrow curved decumbent scales on upper part followed sometimes by some broad scales caudoventrad, lower part usually with a few hairs, scales absent; **ppl** with several bristles and sometimes with 1 to several small translucent scales; **psp** bare; **stp** with numerous bristles arranged in a continuous curved row along dorsal and caudal margins and with a varied, usually extensive, patch of broad appressed translucent scales, sometimes with scattered hairs in addition; **pra** with several bristles; **mep** with or without a variable patch of broad translucent scales, with or without a few to numerous microsetae in addition, **lmep** with or without 1 very strong bristle, **umep** with a few to numerous bristles; meron and metapleuron simple; metameron either simple or with a few microsetae; usually a few microsetae near base of haltere. **Legs:** Coxae with scales and bristles; anterior surface of forecoxa largely covered by scales and bristles, basolateral area with a few scales; midcoxa with scales anterolaterally and with 2 groups or rows of bristles laterally, the posterior stronger, upper lateroposterior surface with or without scales; hindcoxa with

anterolateral surface with scales, lower lateral with bristles, upper lateroposterior with or without a few scales, posterior surface with bristles. Femora subequal in length and not markedly different in length from proboscis, frequently with variable lighter portions. Forefemur with anteroventral margin with several bristles, a complete row of bristles or a row of short spiniforms; posterodorsal margin with several strong bristles or a complete row of weaker bristles, latter sometimes replaced by spiniforms near base. Midfemur slightly swollen. Tibiae and tarsi dark scaled. Foretibia about equal to forefemur, midfemur and hindfemur slightly longer, subequal. Basal tarsal segments shorter than respective tibiae. Claws simple on all legs; empodium well developed, padlike but short and with setiform spicules; pulvilli small and with setiform spicules. **Wing:** Membrane with microtrichia present. Veins entirely dark scaled. Base of vein R with a few (remigial) bristles; cell R₂ longer than its stem; vein 1A ending well distad of furcation of Cu, base without scales on ventral surface; fringe normal, dark except near base; alula with long narrow marginal scales and broader dorsal scales; upper calypter with a long marginal row of bristles. **Haltere:** Stem light, dorsoapical part with several dark scales; knob dark scaled. **Abdomen:** Tergite I extensively scaled. Tergites completely dark scaled. Sternites II-VII usually lighter than tergites, light scaling variable. **Bucco-pharyngeal Armature:** A single row of blunt teeth on pharyngeal bar; a larger roughly hemispherical, strongly reticulate sclerite over point of articulation of cibarium and pharynx.

FEMALE GENITALIA. *Segment VIII* partly retracted into segment VII. Sternite VIII longer than tergite; with strongly sclerotized caudal band; scales present or absent; deeply emarginate midventrally on caudal margin, side of emargination sometimes produced into distinct angle with strongly differentiated marginal bristles. *Tergite IX* a distinct sclerite with or without setae. *Tergite X* variously developed, sometimes as a broad strong sclerite at base of cercus. *Cercus* long, extending beyond postgenital plate; more or less conical; usually completely retracted, sometimes with apex visible; with numerous setae but without scales on body, apex with more or less strongly and variously differentiated setae. **Postgenital plate** with poorly sclerotized cup-shaped basal part; distal part strongly sclerotized with median caudal emargination or notch and with more or less strongly differentiated lateral setose lobes; in lateral aspect lobe rounded or elongate and with variously differentiated dorsal subapical (1) and apical (1) setae. **Cowl** represented by a broad sclerotized arch articulating with tergite IX laterally, deeply emarginate on anterior margin midventrally where its caudal margin is more or less distinctly joined to base of postgenital plate; *sigma* poorly sclerotized, very narrow and indistinctly joined to cowl; *insula* poorly sclerotized, with several microsetae; atrial plate narrow, strongly sclerotized (cowl, sigma, insula and atrial plate studied in *cancer* only). Spermathecae 3, one larger than the others.

MALES. Essentially similar to females; labium with a more or less distinct joint distad of middle; palpal segment 3 longer. **Antenna:** Distinctly longer but similar to that of female; varied in length, exceeding proboscis from apex of segment 10 to middle of flagellar segment 3; flagellar whorls essentially as in female but slightly longer, flagellar segments 1, 1 and 2, 1-3 or 1-4 with scales, segments 2-6 or 7 with variable number of shaft bristles of approximately same length as those in whorls; flagellar segment 1 distinctly longer, the others of variable length, either segments 2-12 subequal but progressively slightly shortened distad, or segments 2-7 markedly elongated, but progressively shortened distad and segments 7-12 subequal but progressively shortened distad; segment 13 either shorter, equal

to slightly longer, but always broader than 12. *Legs*: Claws of foreleg and midleg enlarged, either similar in shape or anterior member of a pair longer, with or without teeth; claws of hindleg always small and simple as in females; empodium of legs with enlarged claws very strongly developed and with branched processes.

MALE GENITALIA. Rather uniform throughout genus; short and thick. *Segment VIII*: Well developed but normally retracted about half or more of its length into segment VII; without any special features except for broad median emargination of caudal border of tergite and development of numerous strong bristles on and near this border, particularly on lateral tergal area. *Segment IX*: Strongly developed. Tergite represented by a pair of greatly developed lateral lobes articulated and movable on articulation with a lateral dorsal process of sternite; also articulating with a dorsomesal process of sidepiece and the basal piece; median part of tergite largely membranous; lobes variously developed and with numerous setae basomesally. Sternite long and with a median longitudinal apodeme, a caudolateral winglike lobe, and an anterolateral narrow sclerotized bar which extends dorsad on each side and articulates at its dorsal end with tergite. *Sidepiece*: Conical, very thick, scales present or absent, tergal surface with variable number of strong bristles. Subapical lobe (median mesal lobe of Belkin and Hogue, 1959) about median in position, projecting dorsad; with 3 differentiated setae, 2 of which are always spiniform (*a* more mesal, and *b*) and the other (*c*) bristlelike or setiform; usually a thumb at dorsomesal angle; always a patch of short setae on base of lobe on dorsal surface; 3 well differentiated specialized setae on ventromesal surface, the 3 setae usually bristlelike and attenuated apically, except in 1 case (*nicoyae*) in which the 2 distal are spiniform, rather heavy and without apical attenuation; also a variable number of small hairs on ventromesal surface of lobe. A differentiated seta laterad of subapical lobe on tergal surface of sidepiece; a membranous area basad of subapical lobe; usually a distinct apicosternal bristly lobe, dorsad of which the clasper folds at rest against body of sidepiece, this area at least partly membranous; apicosternal lobe with or without differentiated long apical seta. *Clasper*: Short, irregular in shape, with a dorsal inner postmedian angular shelflike process, a ventral inner apical tooth, and a dorsal outer apical process; inserted between the 2 apical projections is a heavy forked spiniform; dorsal surface with a dense vestiture of long hairlike spicules. *Phallosome*: Complex, consisting of a ventral aedeagus and a pair each of ventral and dorsal parameres. Aedeagus more or less conical or cylindrical in tergal aspect with a pair of lateral sclerotized plates variously developed and connected by a basal sternal sclerotized bar and apparently by a sternal membrane not always detectable. Dorsal paramere (according to Belkin, 1968a:9) apparently homologous to the opisthophallus of some Dixinae, articulated ventrally with aedeagus and ventrolaterally with ventral paramere (ventral paramere articulating with aedeagus ventrally and basal piece laterally); dorsal parameres consisting of a pair of lateral toothed plates with an apical dorsal spine and ventrolateral teeth; the 2 sclerotized plates in tergal aspect are either closely approximated or widely separated and are often more or less connected by an incomplete dorsal sclerotized bridge. *Proctiger*: Strongly developed, with basolateral and paraproct sclerotizations and with a slight dorso-lateral process; without basal sternal process. Crown of paraproct with a single row of short, heavy, blunt and curved teeth. Cercal setae numerous (details not studied).

PUPAE. *Cephalothorax*: All hairs present, variously developed; hairs 2,3-C approximated or widely spaced; 5-C usually the longest hair on cephalothorax, ex-

cept in Epitedeus Group in which it is usually subequal to 8-C; hair 6-C always shorter than 7-C; hairs 6,7-C very close together; 8,9-C well caudad of trumpet and moderately close together. **Trumpet:** Not placed on distinct tubercle; inserted about halfway between middorsal line and wing base; short to moderate in length; tracheoid for about 0.3-0.5 of trumpet length; pinna usually short. **Metanotum:** Hair 10-C variously developed, from very short and weaker than 11-C to very strong and longer than 11-C; single to multibranching. **Abdomen:** Hair 1-I with about 4-23 primary branches, fringed, barbed or secondarily dendritic; 1-II either very similar to or markedly different in appearance from 1-I, but always closer to midline, with 1 to many primary branches, simple, barbed or markedly secondarily dendritic; 2-II laterad of 3-II; hair 5-II laterad of 3-II except in Epitedeus Group in which it is mesad, usually single (1-4); hair 7-II ventral in position; 2-III-VII mesad of hair 1; hairs 5-III-VI long, similarly developed, 5-III usually single (1-3, except usually triple in *mathesoni*), 5-IV usually single (1 or 2), hairs 5-V,VI always single; 6-I-VII long, single, as well developed on VII as on other segments; 9-VII short, branched and caudad of hair 6; hair 9-VIII very long and single, arising ventrally at caudolateral angle. **Terminal Segments:** Hair 1-IX not developed. Median caudal lobe well developed, in general with its posterior margin more or less rounded. Cercal lobe of female strongly developed. Male genital lobe projecting well beyond median caudal lobe; IX tergite lobe of adult developed inside the paddle. **Paddle:** Midrib very strongly developed; external buttress slightly developed; margins without spicules. Hair 1-P subapical, long, subequal to or longer than paddle; 2-P absent.

FOURTH INSTAR LARVAE. **Head:** Head capsule about as wide as or wider than long, widest at level of base of antenna owing to development of conspicuous lateral expansion on each side caudad of antenna and the absence of a distinct ocular bulge. A broad deep pouch open cephalad within this subantennal expansion, pouch with a membranous eversible inner wall into which projects a conspicuous fingerlike lobe of mandible with long hairlike spicules, wall withdrawn when lobe of mandible is abducted and expanded out and inflated when lobe of mandible is adducted eliminating pouch; mandible (Howard, Dyar and Knab, 1912, fig. 524) with curved fingerlike lobe densely covered with long hairlike spicules arising from anterolateral basal angle and projecting into lateral subantennal pouch, and with apical mesal angle below teeth developed into a long curved horn; maxilla (Howard, Dyar and Knab, 1912, fig. 479) large, normal, palpus short. Labrum not well differentiated dorsally, rounded on anterior margin; mental plate rudimentary, poorly sclerotized and with variously shaped marginal spicules; labial plate very long and narrow; maxillary suture complete and extended dorsolaterally caudad of posterior tentorial pit; collar not developed. Hair 1-C long, thin to moderately thick, widely spaced, arising on dorsal surface of labrum, not apically; 2-C poorly to well developed, usually distinctly mesad of level, or sometimes slightly mesad, in line or laterad of 1-C; hair 3-C when present usually represented by a spicule; 4-6-C in a group caudad of level of 7-C; hair 4-C minute, multiple; 5,6-C strongly developed; 10-C quite close to 9-C; hair 11-C dorsal, mesad of pouch; 12,13-C close together; 14-C removed from margin; 15-C in anterior half of labial plate; 16,17-C not developed. **Antenna:** From about one-third to about half as long as head capsule, unsegmented, slender, gradually tapered apically; shaft either simple or with few to numerous spicules in basal part. **Thorax:** Without any apparent outstanding features; hairs 1-3-P on poorly sclerotized connected basal tubercles or with poorly developed and unsclerotized common

tubercle; 1,2-P long, single; 3-P shorter than 1,2-P, single to triple; 4-P well developed, branched; 5,6-P long, single; 7-P long, branched; 9-P long, single to triple; 10-P moderate; 12-P long, single; 13-P absent; 14-P single; 1,2-M short, 3,4-M moderate; 5-7-M long, single, 6-M heaviest; 8-M long, multiple, with heavy tubercle; 9-M long, multiple; 10,12-M long, single; 14-M short, dendritic; 1-6-T minute to small; 1,2-T placed far mesad; 1,5-T always minute; 6-T variously developed; 7-T large, multiple, with heavy basal tubercle; 9-T long, multiple; 10-T long, single; 13-T short, multiple. **Abdomen:** Hairs 6-I-VI long; 7-I short to long, 7-II-VI always short; 1-I,II distinctly mesad of others, minute; 1-III moderately to strongly developed; 2-III-V mesad of 1; hairs 5-I-VII small, branched; 9-II-VI minute, single; 10-II-VI moderately to well developed, 10-II usually single (usually triple in *belkini*, 1-4), hair 10-III usually single or double (1-3), hair 10-IV usually single or double (1-3), hairs 10-V,VI usually single (1 or 2); hairs 13-III-V strong; 11,12-II-V laterad of 13. **Segment VIII:** Comb of numerous scales in large triangular patch; individual scale long, parallel-sided, with expanded, fringed, spatulate apex; hair 1-VIII mesad of 2; hairs 2,4-VIII strongly developed, single. **Siphon:** Elongate, without marked distal tapering. Index varied from 3.2-6.5; acus present, attached, with ventral process; valves moderate, normal; trachea well developed. Pecten not extending to middle of siphon; individual pecten tooth usually unequally bifid or trifid. Siphonal hairs always 3 lateral pairs, 1 large (1-S) near middle and 2 small (1ad-S dorsal and 1av-S ventral). **Anal Segment:** Saddle usually represented by poorly defined, unconnected dorsal and ventral sclerotizations; spicules short, in a patch; acus absent. Gills a single pair, short to moderately long, either round and slightly emarginated on apex or more or less cone-shaped and slightly emarginated on ventral margin; without trachea. Hair 1-X small, not on saddle; 2-X moderately long, multiple; 3-X very long, single; 4-X all on grid, 6 or 7 pairs, well developed, multiple.

EGGS. Very brief descriptions have been made for the eggs of 3 species. Fisk (1941:547) describes the egg of *mathesoni* (as *spanius*) as "ovoid ... about 0.4 mm in length and resembling hens' eggs in shape"; Haeger and Phinizee (1959:35) found that of *cancer* to be "bullet-shaped, with the head in the blunt end. The grayish brown chorion and exochorion are very transparent ..."; and Galindo (1967:68) states that the egg of *pseudes* is "elliptical in shape and black in color, being very similar in structure to *Culex ova*".

DISCUSSION. For discussions of the systematics, bionomics and medical and pest importance, see the separate sections above dealing with these subjects.

The brief taxonomic history of *Deinocerites* has been reviewed by Belkin and Hogue (1959:416-417) and will not be repeated here. It is presented in synoptic form in the synonymy and taxonomic references given above for the genus.

KEYS TO GROUPS AND SPECIES

FEMALES

1. Mesepimeron with a patch of translucent scales 2
 Mesepimeron without scales 7
- 2(1). Lower mesepimeral bristle present; antenna with only flagellar segment
 1 markedly longer than others (*Pseudes* Group) 3

Lower mesepimeral bristle absent; antenna with flagellar segments 1-4 markedly longer than others (Epitedeus Group) 5

Pseudes Group

- 3(2). Forefemur with anteroventral and posterodorsal margins with row of bristles only **18. mcdonaldi**
 Forefemur with anteroventral margin with row of short spiniforms and posterodorsal margin with row of short spiniforms at base followed by bristles distad 4
- 4(3). Antenna exceeding proboscis at most from base of flagellar segment 8; tergite IX usually without setae, rarely 1 present **16. pseudes**
 Antenna longer, exceeding proboscis at least from basal two-thirds of flagellar segment 7; tergite IX with 2 or more setae (2-7) on each side **17. howardi**

Epitedeus Group

- 5(2). Forefemur with an anteroventral row of short spiniforms (Atlantic complex). **11. epitedeus; 12. panamensis; 13. colombianus**
 Forefemur with an anteroventral row of bristles (Pacific complex) 6
- 6(5). Cercus (in lateral aspect) with dorsal margin of sclerotized part distinctly longer than ventral; its basal width less than 0.5 of length of sclerotized ventral margin; 5 or 6 apical and subapical distinctly thickened setae with twisted apex **14. costaricensis**
 Cercus (in lateral aspect) with dorsal and ventral margins of sclerotized part subequal in length; its basal width over 0.6 of length of sclerotized ventral margin; 5 or 6 apical or subapical setae slightly to moderately thickened and with apex simple or slightly twisted **15. curiche**
- 7(1). Cercus with 2 long spatulate apical or subapical specialized setae (Cancer Group). 8
 Cercus without long spatulate specialized setae 10

Cancer Group

- 8(7). Specialized setae of cercus not inserted side by side, one apical and shorter, the other subapical; lateral lobe of postgenital plate elongate and with long apical bristle **10. magnus**
 Specialized setae of cercus inserted side by side on apex and subequal; lateral lobe of postgenital lobe short and rounded, its apical bristle short 9
- 9(8). Distal part of postgenital plate (in ventral aspect) with width not more than 1.8 of its length, usually with a distinct median caudal notch as deep as wide and with lateral lobes well differentiated. **8. cancer**
 Distal part of postgenital plate (in ventral aspect) with width always more than 2.0 of its length, usually with only a broad shallow emargination and with lateral lobes appearing as small rounded protuberances **9. melanophylum**

- 10(7). Postnotum without setae; antenna relatively short, exceeding proboscis at most from base of flagellar segment 9; sternite VIII with distal sclerotized band uniformly broad and largely covered with scales (*Spanius* Group) 11
 Postnotum usually with a few setae in lower part; antenna relatively longer, exceeding proboscis from base of flagellar segment 8; sternite VIII with distal sclerotized band narrow, tapering ventrad and with only a few scales (*Dyari* Group) 12

Spanius Group

- 11(10). Antenna relatively short, exceeding proboscis from base of flagellar segment 11; cercus (in lateral aspect) abruptly narrowed in distal half (southern complex) 1. *spanius* (Pacific); 2. *atlanticus*
 Antenna relatively longer, exceeding proboscis from apex of flagellar segment 9; cercus (in lateral aspect) evenly narrowed from base (northern complex) 3. *mathesoni* (Atlantic); 4. *belkini* (Pacific)

Dyari Group

- 12(10). Pleural integument almost uniformly dark brown, not markedly contrasting with dark mesonotal integument; distal part of postgenital plate (in ventral aspect) with margins of median caudal notch parallel 6. *barreto*
 Pleural integument with whitish portions strongly contrasting with dark mesonotal integument; distal part of postgenital plate (in ventral aspect) with margins of median caudal notch diverging distad 13
- 13(12). Tergite IX usually with 1 seta 7. *nicoyae*
 Tergite IX usually with 4 setae 5. *dyari*

MALES

1. Mesepimeron without scales 2
 Mesepimeron with patch of translucent scales 9
- 2(1). Only flagellar segment 1 markedly elongate; antenna exceeding proboscis at most from apex of flagellar segment 9 (*Spanius* Group) 3
 Flagellar segments 1-5 or 1-6 markedly longer than others; antenna exceeding proboscis from at least middle of flagellar segment 5 4

Spanius Group

- 3(2). Antenna relatively short, exceeding proboscis from base of flagellar segment 11 (southern complex) 1. *spanius* (Pacific); 2. *atlanticus*
 Antenna relatively longer, exceeding proboscis from apex of flagellar segment 9 (northern complex). 3. *mathesoni* (Atlantic); 4. *belkini* (Pacific)
- 4(2). Postnotum usually with a few bristles toward lower part; Pacific distribution (*Dyari* Group) 5
 Postnotum without bristles; Atlantic distribution (*Cancer* Group) 7

Dyari Group

- 5(4). Pleuron almost uniformly dark brown, not contrasting markedly with dark brown mesonotum; flagellar segments 1-5 markedly elongated **6. barretoii**
 Pleuron with whitish portions strongly contrasting with dark brown mesonotum; flagellar segments 1-6 markedly elongated 6
- 6(5). Anterior claw of foreleg with a long, very slender tooth; anterior claw of midleg with a shorter, heavier tooth **5. dyari**
 Anterior claws of foreleg and midleg both with a heavy tooth . **7. nicoyae**

Cancer Group

- 7(4). Pleuron usually whitish and distinctly contrasting with dark brown mesonotum; tooth of foreclaw and midclaw nearly basal; antenna exceeding proboscis from base of flagellar segment 5 **10. magnus**
 Pleuron darker, only slightly or not at all contrasting with dark brown mesonotum; tooth of foreclaw and midclaw distinctly subbasal; antenna exceeding proboscis from distal third of flagellar segment 4 8
- 8(7). Anterior claws of foreleg and midleg dissimilar, that of foreleg with a shorter subbasal tooth; flagellar segment 13 slightly longer than 12 **9. melanophyllum**
 Anterior claws of foreleg and midleg similar, with large subbasal tooth; flagellar segment 13 subequal to 12 **8. cancer**
- 9(1). Lower mesepimeron without differentiated bristle (Epitedeus Group) . 10
 Lower mesepimeron with 1 very strong bristle (Pseudes Group) . . . 12

Epitedeus Group

- 10(9). Forefemur with anteroventral row of bristles (Pacific complex) **14. costaricensis**; **15. curiche**
 Forefemur with anteroventral row of short spiniforms (Atlantic complex) 11
- 11(10). Anterior claw of midleg simple **13. colombianus**
 Anterior claw of midleg with a short tooth . **11. epitedeus**; **12. panamensis**

Pseudes Group

- 12(9). Forefemur with anteroventral and posterodorsal rows of bristles only **18. mcdonaldii**
 Forefemur with anteroventral row of short spiniforms and with bristles of posterodorsal row replaced by short spiniforms near base . . . 13
- 13(12). Antenna exceeding proboscis from at least distal third of flagellar segment 3; claws of foreleg very slender and with a distinct very slender subbasal tooth **17. howardi**
 Antenna exceeding proboscis at most from basal third of segment 4; claws of foreleg very heavy and usually with a minute submedian projection **16. pseudes**

MALE GENITALIA

1. Sidepiece with numerous scales; apicosternal lobe of sidepiece short, more or less rounded and without a long heavy, differentiated bristle, a short subapical bristle may be present (Spanius Group) 2
 Sidepiece usually without scales, at most with 1 or 2 scales; apicosternal lobe of sidepiece prominent and with a long heavy, differentiated bristle 5

Spanius Group

- 2(1). Dorsal paramere in form of a small compact, uniformly and heavily sclerotized plate, its apical spine short to moderately long, slightly curved and gradually pointed (southern complex) 3
 Dorsal paramere with 2 sclerotizations, tergal and sternal, connected by a narrow bridge very poorly sclerotized on the margins and membranous centrally, tergal sclerotization bearing the long, slender, strongly hooked apical spine (northern complex) 4
- 3(2). Dorsal paramere with apical spine moderately long and curved, ventral teeth represented by 2 or 3 strong, moderately long spines in caudal area; ninth tergite lobe with outer margin more or less straight except for a bent and angled apex (Pacific) 1. *spanius*
 Dorsal paramere with apical spine short and slightly curved, ventral teeth represented by 3 or 4 small denticles at caudosternal angle; ninth tergite lobe with outer margin curved and directed mesad, apex rounded (Atlantic) 2. *atlanticus*
- 4(2). At least 1 of the dorsal parameres with 2 teeth (2 or 3) on sternal sclerotization; dorsal paramere wider than long (Atlantic) . . . 3. *mathesoni*
 Dorsal parameres always with 3 or 4 teeth on sternal sclerotization; dorsal paramere as wide as long (Pacific) 4. *belkini*
- 5(1). Ninth tergite lobe strongly flattened, not markedly angled laterad at base and dorsal in position (Cancer Group) 6
 Ninth tergite lobe cylindrical, markedly angled laterad at base and more lateral in position 8

Cancer Group

- 6(5). Ninth tergite lobe short, not reaching base of subapical lobe of sidepiece; apical spine of dorsal paramere thick, not strongly differentiated from body of paramere 10. *magnus*
 Ninth tergite lobe long, extending distad of base of subapical lobe of sidepiece; apical spine of dorsal paramere slender, strongly differentiated from body of paramere 7
- 7(6). Dorsal paramere with ventral teeth outstanding, arising from distinct distal process or lobe; its dorsal bridge broad and short; its apical spine rather short and only slightly curved 8. *cancer*
 Dorsal paramere with ventral teeth appressed; its dorsal bridge narrow and long; its apical spine long and strongly curved . . . 9. *melanophylum*

Dyari, Epitedeus and Pseudes Groups

- 8(5). Ninth tergite lobe short, not reaching base of subapical lobe of sidepiece; its distal part more or less conical 9
 Ninth tergite lobe longer, reaching at least base of subapical lobe of sidepiece, distal part variously shaped but not conical 11
- 9(8). Apical spine of dorsal paramere heavy and strongly curved, *in situ* reaching or crossing its mate; ninth tergite lobe with distal part distinctly attenuated or more or less pointed; apex of aedeagus rounded. **5. *dyari***
 Apical spine of dorsal paramere slender and not strongly curved, *in situ* widely separated from its mate; ninth tergite lobe with distal part not strongly attenuated, blunt; apex of aedeagus emarginate or angled . . 10
- 10(9). Dorsal paramere with ventral teeth usually about 18, short to moderately long, and arising from an evenly convex ventrolateral border
 **14. *costaricensis***
 Dorsal paramere usually with about 25 long, moderately heavy ventral teeth arising from a distinct humplike expansion of ventrolateral border **15. *curiche***
- 11(8). Dorsal paramere with a strong dentate process from ventrolateral border, *in situ* extending almost as far caudad as apical spine . . . **16. *pseudes***
 Dorsal paramere with ventral teeth arising from convex ventrolateral border, not from a distinct process 12
- 12(11). Ninth tergite lobe extending well beyond base of subapical lobe, strongly bent near the middle and with this slender distal part more or less paralleling sidepiece **12. *panamensis***
 Ninth tergite lobe not extending beyond base of subapical lobe . . . 13
- 13(12). Ventromesal surface of subapical lobe with the 2 distal setae rather heavy and spiniform and without apical attenuation; dorsal paramere with distal part expanded laterad as a broad hemispherical ledge . **7. *nicoyae***
 Ventromesal surface of subapical lobe with all 3 setae bristlelike and attenuated apically; dorsal paramere with its distal part not expanded as a broad hemispherical ledge 14
- 14(13). Dorsal paramere with apical spine long and slender, but not touching its mate *in situ*; at least the more distal ventral teeth of dorsal paramere as seen *in situ* long and conspicuously oriented in the same direction as the apical spine 15
 Dorsal paramere with apical spine moderately long to long and heavy, usually intercrossing with its mate *in situ*; ventral teeth of dorsal paramere as seen *in situ* short and not oriented in the direction of the apical spine 16
- 15(14). Ninth tergite lobe with distal part broad and directed laterad; body of lobe broad in basal two-thirds, slightly attenuated in distal third . . .
 **13. *colombianus***

Ninth tergite lobe with distal part slender and directed mesad by distinct curvatures of inner and outer margins; body of lobe broad basally, constricted near middle and slender in distal half . . . 11. *epitedeus*

- 16(14). Ninth tergite lobe with apex simple; aedeagus in tergal aspect almost uniform in width except for a subbasal expansion, distally the 2 plates come together forming a rounded expansion; seta *c* of subapical lobe of sidepiece rather heavy and bent apically 6. *barreto*
 Ninth tergite lobe slightly hooked apically; aedeagus in tergal aspect variable in width because of highly sinuous outer margins, with a subapical constriction or sinuosity and narrowed and slightly emarginate apex; seta *c* of subapical lobe of sidepiece moderately heavy, attenuated but not bent apically 18. *mcdonald*; 17. *howard*

PUPAE

(1. *spanius* and 6. *barreto* unknown)

1. Hair 1-II with 1-3 simple or barbed branches (either subequal to or longer than tergite III) 2
 Hair 1-II multibranched *or*, if with less than 4 primary branches, then markedly secondarily dendritic and 10-C markedly multibranched (usually 1-II shorter than tergite III) 8
- 2(1). Hair 10-C strongly developed, distinctly longer than 11-C; hair 5-II always mesad and cephalad of 3-II; hair 5-C single, moderately long, at most equal in length to distance from its alveolus to base of trumpet and to length of trumpet (*Epitedeus* Group) 3
 Hair 10-C poorly developed, always shorter than 11-C (0.3-0.5 of 11-C); hair 5-II always laterad of 3-II; hair 5-C single or double, strongly developed, longer than distance from its alveolus to base of trumpet, at least 1.5 of trumpet length (*Dyari* Group) 7

Epitedeus Group

- 3(2). Hair 10-C usually double; 1-III-VI branched (Atlantic) . 13. *colombianus*
 Hair 10-C usually single; 1-III-VI forked 4
- 4(3). Hair 7-C single (Atlantic) 11. *epitedeus*
 Hair 7-C usually double 5
- 5(4). Hair 3-V usually double (Atlantic) 12. *panamensis*
 Hair 3-V usually single (Pacific) 6
- 6(5). Hair 5-I with 4-6 branches 14. *costaricensis*
 Hair 5-I double or triple 15. *curiche*

Dyari Group

- 7(2). Hair 5-C single; 1-II single 5. *dyari*
 Hair 5-C double; 1-II triple, the middle branch longest 7. *nicoyae*

- 8(1). Hair 1-VII longer than tergite VIII, at least extending to middle of 4-VIII; hair 7-C usually 4 or 5 branched (Spanius Group) 9
 Hair 1-VII shorter than or sometimes equal to tergite VIII, never exceeding the basal third of 4-VIII; hair 7-C usually double or triple 11

Spanius Group

- 9(8). Hair 6-C single; 4-VI usually double or triple; 10-C usually 3 or 4 branched **2. atlanticus**
 Hair 6-C usually double or triple; 4-VI usually 4 or 5 branched; 10-C single or double 10

- 10(9). Hair 8-C single; 10-C usually single; 3-VI single or double (Pacific)
 **4. belkini**
 Hair 8-C double or triple; 10-C double; 3-VI with 3 or 4 branches (Atlantic) **3. mathesoni**

- 11(8). Hair 8-C usually 2-4 branched; 3-V usually double (Cancer Group) 12
 Hair 8-C usually single; 3-V more often single than double (Pseudes Group) 14

Cancer Group

- 12(11). Tergal area between hairs 1-I darkly pigmented **9. melanophylum**
 Tergal area between hairs 1-I amber in color 13

- 13(12). Hair 3-II usually single; 7-C usually double; 10-C most often double
 **8. cancer**
 Hair 3-II usually double or triple; 7-C usually 3 or 4 branched; 10-C usually 3-5 branched **10. magnus**

Pseudes Group

- 14(11). Hair 10-C distinctly longer than 11-C, markedly multibranched, resembling float hair 1-I; hair 5-VII usually reaching to about middle of tergite VIII; hair 4-C most often 4-6 branched **16. pseudes**
 Hair 10-C subequal to 11-C, usually 2-4 branched, not resembling float hair 1-I; hair 5-VII not exceeding apex of tergite VII; hair 4-C most often double or triple 15

- 15(14). Hair 1-V usually double or triple; 8-III usually 4-6 branched
 **18. mcdonaldi**
 Hair 1-V usually 4-6 branched; 8-III usually double or triple . **17. howardi**

FOURTH INSTAR LARVAE

(1. *spanius* and 6. *barretoii* unknown)

1. Hair 6-II single; 1-S usually 4-6 branched (Spanius Group) 2
 Hair 6-II double; 1-S usually double or triple 4

Spanius Group

- 2(1). Hair 6-C single or double; 6-T usually single **2. atlanticus**
 Hair 6-C usually 3 or 4 branched; 6-T always 2-4 branched 3

- 3(2). Siphon short, index less than 4.3; at least 1 of the branches of siphonal hair 1-S reaching alveolus of 1av-S; small ventral saddle absent; 3-IV with 2-4 branches (Atlantic) **3. mathesoni**
 Siphon longer, index more than 5.0; none of the branches of siphonal hair 1-S reaching alveolus of 1av-S; small ventral saddle present; 3-IV with 5-7 branches (Pacific) **4. belkini**

- 4(1). Hair 1-VII poorly developed, shorter than or subequal to 3-VII, not reaching the base of segment VIII; hair 6-VI usually double; 2-C either slightly mesad, in line with or laterad of level of 1-C (Dyari Group). 5
 Hair 1-VII moderately to strongly developed, longer than 3-VII, always exceeding base of segment VIII and sometimes the base of siphon; 6-VI single; 2-C always markedly mesad of 1-C 6

Dyari Group

- 5(4). Ventral brush (4-X) with 7 pairs of hairs; 6-III with 3 or 4 branches; 6-IV usually triple **5. dyari**
 Ventral brush (4-X) with 6 pairs of hairs; 6-III double; 6-IV usually double **7. nicoyae**

- 6(4). Hair 9-P double or triple; 2-C inconspicuous, about 0.25-0.33 of 1-C; hair 5-C usually double or triple (Epiteus Group) 7
 Hair 9-P single; 2-C at least 0.5 of 1-C; hair 5-C usually 4 branched 11

Epiteus Group

- 7(6). Hair 1-VII double; 1-V double; 13-V with 4 or 5 branches (Atlantic) **13. colombianus**
 Hair 1-VII single; 1-V single; 13-V single to triple 8

- 8(7). Ventral brush (4-X) with 6 pairs of hairs 9
 Ventral brush (4-X) with 7 pairs of hairs 10

- 9(8). Hair 8-P double; 3-IV with 3-5 branches; 2-T usually 4 branched (Atlantic) **12. panamensis**
 Hair 8-P single; 3-IV double; 2-T usually double or triple (Pacific) **15. curiche**

- 10(8). Hair 7-II usually single to triple; ventral margin of dorsal saddle reaching alveolus of 1-X (Atlantic). **11. epiteus**
 Hair 7-II with 4-6 branches; ventral margin of dorsal saddle not reaching alveolus of 1-X (Pacific) **14. costaricensis**

Pseudes Group

- 11(6). Head hair 6-C double or triple 12
 Head hair 6-C always single 14

- 12(11). Ventral brush (4-X) with 6 pairs of hairs (some peripheral northern and southern populations) **16. pseudes** (in small part)
 Ventral brush (4-X) with 7 pairs of hairs 13

- 13(12). At least 1 of the branches of hair 1-S usually reaching alveolus of 1av-S; hair 3-VIII usually 5 or 6 branched; 1-VII often double or triple; 6-C usually double, very rarely triple on one side 18. *mcdonaldi*
 Usually none of the branches of hair 1-S reaching alveolus of 1av-S; hair 3-VIII usually 3 or 4 branched; 1-VII usually single; 6-C often triple on at least one side 17. *howardi*
- 14(11). Hair 1-VIII usually 5-7 branched; 1-VII usually long, frequently reaching the base of siphon (central populations) . . . 16. *pseudes* (in large part)

Cancer Group

- Hair 1-VIII usually 3 or 4 branched; 1-VII shorter, never reaching base of siphon 15
- 15(14). Ventral brush (4-X) with 7 pairs of hairs; 2-C usually longer than 1-C; hair 8-P usually double. 10. *magnus*
 Ventral brush (4-X) with 6 pairs of hairs; 2-C usually shorter than 1-C; hair 8-P usually single 16
- 16(15). Sum total of branches of hairs 3,4-P on both sides usually equal to or less than 10 or 4-P usually triple and 3-P usually single 8. *cancer*
 Sum total of branches of hairs 3,4-P on both sides usually more than 10 or 4-P usually 4 branched and 3-P usually double. . . 9. *melanophylum*

SPANIUS GROUP

FEMALES. Small species, wing 2.5-2.7 mm. Mesonotum dark, always strongly contrasting with very distinct whitish portions of pleural integument. *Antenna*: Flagellar segment 1 with scales, shorter than combined length of segments 2 and 3; segments 2-12 subequal in length but progressively slightly shortened distad; relatively short, at most exceeding proboscis from apex of flagellar segment 9. *Thorax*: Postnotum without setae. *Apn* usually whitish; *ppn* usually whitish, scales all narrow; *ppl* whitish; *psp*, *ssp*, *stp* and *pra* usually slightly darker than rest of pleuron; paratergite whitish or very light brown; *mep* whitish and without translucent scales, *lmep* with 1 very strong bristle; meron, metameron and metapleuron whitish. *Legs*: Coxal integument whitish. All of posteroventral surface of forefemur and midfemur and at least basal two-thirds of hindfemur whitish; anteroventral margin of forefemur without spiniforms, but with 4-6 bristles in distal two-thirds, posterodorsal margin with about 6-9 bristles. *Abdomen*: Sternites II-VI and usually part of VII with pale scales.

FEMALE GENITALIA. *Sternite VIII* with distal sclerotized band broad and largely covered by scales; caudal margin not produced into a submedian ventral angle, this area without strongly differentiated marginal bristles. *Tergite IX* usually with at least 1 small seta on each side. *Tergite X* poorly differentiated dorsally and with a very small indistinct lateral sclerotization. *Cercus* with a few moderately strong apical or subapical normal bristles.

MALES. Extremely similar to females. *Antenna*: Exceeding proboscis at most from apex of flagellar segment 9; flagellar segments essentially as in the females, only slightly longer. *Legs*: Claws of foreleg and midleg enlarged, anterior member of a pair always larger and with a heavy subbasal tooth, posterior simple.

MALE GENITALIA. *Segment IX*: Tergite lobe cylindrical; not markedly angled at base; basal one-third broad, distal two-thirds slender; directed inwards distally by a subapical curvature; apex exceeding the subapical lobe. *Sidepiece*: Scales numerous. Apicosternal lobe short, more or less rounded, without differentiated long apical seta (short and subapical when present). *Phallosome*: Dorsal parameres widely separated in tergal aspect, without a differentiated sclerotized dorsal bridge; articulated basoventrally directly with dorsal basal part of aedeagus.

PUPAE. *Cephalothorax*: Hairs 2,3-C closely approximated, 2-C poorly developed, always weaker and shorter than 3-C; hair 5-C usually double (2 or 3), strongly developed, longer than distance from its alveolus to base of trumpet, 1.35-1.50 of trumpet length; 7-C usually with 4 or 5 branches (2-6); hair 8-C usually single or double (1-3). *Metanotum*: Hair 10-C moderately to strongly developed, subequal to or longer than 11-C, branching varied (1-6). *Abdomen*: Hair 1-II not reaching apex of tergite III, multibranched (4-13), usually dendritic; 1-III-VI branched; 5-II always cephalad and sometimes slightly mesad of 3-II; hair 3-V usually double or triple (2-4); hair 1-VII longer than tergite VIII, at least reaching middle of 4-VIII. *Paddle*: Hair 1-P subequal to or slightly longer than paddle.

FOURTH INSTAR LARVAE. *Head*: Hair 2-C about 0.5 of 1-C and always distinctly mesad of 1-C; hair 5-C with 4 or more barbed branches (4-7); hair 6-C variously branched (1-5), barbed, either equal to or slightly longer than 5-C. *Thorax*: Prothoracic hair 9-P single. *Abdomen*: Hair 6-II single; dorsal sensillum of segment V laterad of 4-V; hair 6-VI single; 1-VII moderately developed, longer than 3-VII, exceeding base of segment VIII but not reaching base of siphon; 1-VIII usually with 3 or 4 branches (2-4). *Siphon*: Hair 1-S usually with 4-6 branches (3-7). *Anal Segment*: Ventral brush (4-X) with 6 pairs of hairs. Gill slightly emarginate on apex; short, about one-half to two-thirds of dorsal saddle length. Dorsal saddle narrow, its ventral margin far from hair 1-X.

DISCUSSION. This is undoubtedly the most primitive group of the genus as it shows the least number of derived features and resembles more than any other group the other 2 genera of the tribe, *Culex* and *Galindomyia*. The adults have the shortest antennae in *Deinocerites*. In the male genitalia, the dorsal paramere articulates directly with the aedeagus whereas in other groups this articulation is with a process from the aedeagus. The genitalia of both sexes (sternite VIII in female and sidepiece in male) are densely covered with scales in the Spanius Group. These scales are lacking in the males of the other groups and are reduced to only a few or are completely absent in their females. In the larvae, head hairs 5 and 6 are relatively short, subequal and usually branched while in the other groups 6-C tends to become elongated and single.

The group has a unique distribution pattern and species composition with widely disjunct northern and southern complexes, each with 2 geminate Atlantic and Pacific species. The northern complex has been reported only from the states of Nayarit and Jalisco on the west coast of Mexico (*belkini*) and from southern Texas and possibly down to Veracruz, Mexico (*mathesoni*). The southern complex is known only from Aguadulce (Cocle) to Santa Fe (Darien) on the Pacific coast of Panama (*spanius*) and from a wider area on the Atlantic slope from the Canal Zone, Colombia and Venezuela (*atlanticus*). It is possible that *atlanticus* may consist of 2 or more species.

The 2 complexes are rather strongly differentiated in the structure of the dorsal paramere of the male genitalia, this being composed of 2 separate sclerotizations connected by a poorly sclerotized bridge in the northern complex, while in

the southern complex it is formed as a compact uniformly sclerotized plate. I consider that the former condition is the primitive one. There are also good correlated morphological differences in the genitalia of the females, antennae of both sexes, larvae and pupae as indicated in the keys.

Although the adults of a geminate pair cannot be separated on external morphological features there are good male genitalic characters to distinguish them in both complexes. In the case of the northern complex there are also reliable features distinguishing *belkini* from *mathesoni* in the pupal and larval stages. Since the immature stages of *spanius* are still unknown it cannot be determined if a similar situation prevails in the southern complex.

The species of the group appear to be rare or at least are seldom collected as adults. The latter may be partially due to the superficial resemblance of both males and females to the females of the numerous unornamented species of the of the subgenus *Melanoconion* of *Culex* that at present are impossible to identify to species.

Little is known about the blood feeding habits of members of the group but apparently *atlanticus* may attack man in Panama. The immature stages of the *Spanius* Group have been collected only a few times, most frequently in small burrows made by fiddler crabs of the genus *Uca* and occasionally in large holes of *Gecarcinus lateralis*.

1. *Deinocerites spanius* (Dyar & Knab)

Figs. 3,8

1909. *Dinanamesus spanius* Dyar and Knab, 1909:259. TYPE: Lectotype female, Corozal, Panama, Canal Zone, 11 Dec 1907, crabhole, A.H. Jennings, 69 [USNM, 12052; designation of Stone and Knight, 1957:197].

Deinocerites spanius of Stone and Knight (1957:197).

Deinocerites spanius in part of Dyar (1925:154-155); Carpenter and LaCasse (1955:327-329); Belkin and Hogue (1959:427-428); Stone, Knight and Starcke (1959:285); Ross (1964:104).

Dinanamesus spanius in part of Howard, Dyar and Knab (1915:213-215).

FEMALE (fig. 8). Wing 2.70 mm. Proboscis 1.45 mm. Forefemur 1.27 mm. Abdomen about 2.65 mm. Apparently indistinguishable from *atlanticus*.

FEMALE GENITALIA (fig. 8). *Tergite IX* with or without 1 or 2 setae on each side. *Cercus* (in lateral aspect) very similar to that of *atlanticus* except for somewhat longer broadened basal part. Distal part of *postgenital plate* (in ventral aspect) deeply notched; lateral lobe elongate (in lateral aspect), its apical bristle convergent distally with its mate (in ventral aspect).

MALE (fig. 8). Wing 2.60 mm. Proboscis 1.58 mm. Forefemur 1.30 mm. Abdomen (not including genitalia) about 1.78. Essentially similar to female.

MALE GENITALIA (fig. 8). *Segment IX*: Tergite lobe slender; middle part almost uniform in width, constricted subapically, then strongly expanded and with angled borders apically; outer margin more or less straight except for the very distal part which is bent mesad; ventral surface with a distinct premedian projection or expansion, visible *in toto* only in lateral aspect. *Sidepiece*: Similar to *atlanticus*. *Phallosome*: Dorsal paramere a compact uniformly sclerotized plate; apical spine moderately long, curved and gradually pointed, ventral teeth represented

by 2 or 3 strong, moderately long spines in caudal area. Aedeagus in general similar to *atlanticus*.

PUPA and LARVA. Unknown.

SYSTEMATICS. This species is indistinguishable from *atlanticus* in external features of the adults but the male genitalia readily separate these 2 geminate species. *Deinocerites spanius*, the Pacific representative of the southern complex of the group, is the rarest of the 4 species and is still unknown in the immature stages. It is unfortunate that Stone and Knight (1957:197) in designating the lectotype of *spanius* chose the female syntype from Corozal, thus applying this name to the Pacific population in the Canal Zone and Panama. The much more common Atlantic population in this area is now provisionally assigned to *atlanticus* but this population too is still unknown in the immature stages.

BIONOMICS. The lectotype was said to have been reared from a larva collected in a crabhole. I have no information on the recent collections of this species other than the localities as noted below under distribution. *Deinocerites spanius* appears to be much less common than its sibling of the Atlantic coast, *atlanticus*.

DISTRIBUTION (fig. 3). Pacific coast of Panama from Cocle Province to Darien Province. Material examined: 14 specimens; 5 males, 9 females.

PANAMA AND CANAL ZONE. *Canal Zone*: Corozal, A.H. Jennings. Ft. Clayton, C.S. Ludlow [USNM]. *Cocle*: Aguadulce, GML [UCLA]. *Darien*: Santa Fe, GML [UCLA]. *Panama*: Juan Diaz, GML. Nueva Gorgona, GML [UCLA].

2. *Deinocerites atlanticus* Adames, n.sp.

Figs. 3,9-11

TYPES: *Holotype* male with associated pupal skin and genitalia slide (VZ 170-107), La Boca, Ocumare de la Costa, Aragua, Venezuela, 10 July 1969, T. Zavortink, J. Valencia and J. Pulido [USNM]. *Allotype* female with associated larval and pupal skins (VZ 170-30), same data as holotype [USNM]. *Paratypes*: 9 lpM (VZ 170-11-14,17,19,29,36,44), 6 lpF (170-16,18,37,40,45,46), 3 pM (170-108-110), 4 pF (170-100,102,104,114), 2 lP (170-10,15), 2 lp (170-32,38), 1 l (170-28), 14 M, 3 F, 38 L (170), same data as holotype [BM, UCLA, USNM].

Deinocerites spanius of Dyar (1923a:179; 1928:265,537); Bonne and Bonne-Wepster (1925:176); Edwards (1932:222); Lane (1953:559); Horsfall (1955:599); Forattini (1965:108); Sutill and Pulido (1969:119-125); Barreto and Lee (1969:435).

Deinocerites spanius in part of Dyar (1925:154-155); Belkin and Hogue (1959:427-428); Stone, Knight and Starcke (1959:285); Ross (1964:104).

Dinanamesus spanius in part of Howard, Dyar and Knab (1915:213-215).

Culex (Deinocerites) spanius of Dyar (1918:101).

FEMALE (fig. 9). Wing 2.66 mm. Proboscis 1.73 mm. Forefemur 1.48 mm. Abdomen about 2.71 mm. **Head**: Narrow decumbent scales of vertex creamy; erect scales yellowish or pale brown; lateral patch of broad decumbent scales whitish. **Antenna**: Torus occasionally with 1 scale; proboscis reaching apex of flagellar segment 10 or base of 11. **Thorax**: Middle and lower areas of *ppn* usually with 1 or more small bristles; *ppl* with a few bristles and sometimes a few scales; *mep* with a few scales in upper part, microsetae absent; metameron occasionally with 1 or 2 microsetae. **Legs**: Anterior surface of forecoxa covered with bristles and translucent scales, basolateral area with a few bristles; midcoxa with scales anterolaterally and with 2 rows of bristles laterally, the posterior bristles stronger, pos-

terolateral surface simple; hindcoxa with scales and several bristles laterally, posterior surface with bristles.

FEMALE GENITALIA (fig. 9). *Tergite IX* usually with at least 1 seta on each side, usually 1(0-2) in Venezuelan population and 4(2-5) in Panamanian. *Cercus* (in lateral aspect) broadened in basal half, abruptly narrowed in distal; sternal margin more or less convex, tergal margin distinctly concave in distal half; apex directed dorsad, usually with 4-6 apical and subapical bristles. Distal part of *post-genital plate* (in ventral aspect) usually deeply notched except in some Panamanian specimens; lateral lobe usually elongate (in lateral aspect) except in above mentioned Panamanian specimens in which it is rounded, its apical bristle convergent distally with its mate (in ventral aspect).

MALE (fig. 9). Wing 2.62 mm. Proboscis 1.86 mm. Forefemur 1.56 mm. Abdomen (not including genitalia) about 2.37 mm. Essentially similar to female.

MALE GENITALIA (fig. 10). *Segment IX*: Tergite lobe very slender, slightly widened near middle, then constricted subapically and slightly expanded into a rounded apex; outer margin directed mesad by a well-defined distal curvature; ventral surface with a premedian projection similar to that of *spanius*. *Sidepiece*: Subapical lobe with thumb; seta *c* a moderately heavy bristle attenuated apically. *Phallosome*: Dorsal paramere a small compact uniformly sclerotized plate; apical spine short, broad at base, slightly curved and gradually pointed; ventral teeth represented by 2-4 small denticles at caudoventral angle. Aedeagus (in tergal view) broad at base, then constricted, lateral plates parallel and approaching each other distally.

PUPA (fig. 10). Abdomen 2.60 mm. Trumpet 0.58 mm. Paddle 0.66 mm. Diagnostic characters as in the key; general chaetotaxy based on 6 reared specimens. Hair 10-C about equal in length to 11-C; hair 1-VII extending to about middle of 4-VIII. *Cephalothorax*: Integument light brown. Hair 1(2,2-3), 2(3,3-4), 3(2,2-3), 4(4,3-5), 5(2,2-3), 6(1), 7(4,3-5), 8(2,2-3), 9(2,1-3), 10(4,3-2), 11(2,2-3), 12(3,2-5). *Trumpet*: Short; slightly broadening apically; index about 4.92-6.60. Integument brown distad, blackish on tracheoid; moderately contrasting with cephalothoracic integument. Tracheoid about 0.4 of trumpet length; border of pinna without distinct emargination. *Abdomen*: Integument light brown. Segment I: hair 1 (11,8-13 primary branches), 2(2), 3(2,1-3), 4(5,4-6), 5(3,3-5), 6(1), 7(2,1-4), 9(1). Segment II: hair 0(1), 1(7,6-9), 2(1), 3(2,1-3), 4(4,2-4), 5(1,1-2), 6(1), 7(2,1-3), 9(1). Segment III: hair 0(1), 1(4,2-4), 2(1), 3(2,1-3), 4(2,1-2), 5(1), 6(1), 7(2,1-4), 8(4,3-6), 9(1), 10(2,1-2), 11(1), 14(1). Segment IV: hair 0(1), 1(2,1-3), 2(1), 3(3,2-3), 4(1), 5(1), 6(1), 7(2,1-2), 8(2,2-3), 9(1), 10(2,1-3), 11(1), 14(1). Segment V: hair 0(1), 1(2,1-3), 2(1), 3(2), 4(3,2-4), 5(1), 6(1), 7(4,3-4), 8(2), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(2,1-2), 2(1), 3(2,1-2), 4(2,2-3), 5(1), 6(1), 7(1,1-2), 8(2,2-4), 9(1), 10(2,1-2), 11(1,1-2), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2,1-2), 4(2,1-2), 5(1,1-2), 6(1), 7(1,1-2), 8(2,2-3), 9(4,2-5), 10(1,1-2), 11(1,1-2), 14(1). Segment VIII: hair 0(1), 4(2,1-2), 9(1,1-2), 14(1). *Paddle*: Width about 0.75 of length.

FOURTH INSTAR LARVA (fig. 11). Head 0.95 mm. Siphon 0.83 mm. Diagnostic characters as in the key; general chaetotaxy based on 6 reared specimens. *Head*: Integument yellowish. Mental plate slightly wider than long, triangular, with a median terminal spicule, basal and lateral spicules with denticulate apex, terminal simple. Hair 0(1), 1(1), 2(1), 3(sometimes developed as a minute spicule), 4(4, 3-6), 5(4,4-5), 6(1-2), 7(11,9-11), 8(2,2-3), 9(4,3-5), 10(2,2-3), 11(2,2-6), 12(2), 13(3,2-4), 14(1), 15(2). *Antenna*: Length about 0.38 of head; shaft simple, oc-

casionally with 1 spicule on proximal part; hair 1(3,3-4). **Thorax:** Prothorax: hair 0(4,3-6), 1(1), 2(1), 3(1,1-2), 4(3,2-4), 5(1), 6(1), 7(3,2-3), 8(2,1-4), 9(1), 10(1, 1-2), 11(2,1-3), 12(1), 14(1). Mesothorax: hair 1(1), 2(1,1-2), 3(1), 4(2,2-3), 5(1), 6(1), 7(1), 8(6,6-8), 9(8,7-8), 10(1), 11(2,1-3), 12(1), 13(6,5-8), 14(5-6). Metathorax: hair 1(1), 2(3,2-4), 3(4,4-5), 4(2,1-2), 5(1), 6(1,1-2), 7(8,7-9), 8(4,4-6), 9(8,6-9), 10(1), 11(2,1-2), 12(1), 13(4,3-4). **Abdomen:** Segment I: hair 1(1), 2(1), 3(2,2-3), 4(8,6-8), 5(2,2-4), 6(2), 7(2,1-3), 9(2,1-3), 10(3,2-3), 11(2), 12(2,2-3), 13(1). Segment II: hair 0(1), 1(1), 2(1), 3(2,2-3), 4(4,3-6), 5(2,1-2), 6(1), 7(3,2-4), 8(2,1-2), 9(1), 10(1), 11(2,2-3), 12(2,2-3), 13(?). Segment III: hair 0(1), 1(2,1-2), 2(1), 3(2,2-3), 4(1), 5(1), 6(2), 7(5,4-6), 8(1,1-2), 9(1), 10(2,1-2), 11(1, 1-2), 12(1), 13(1,1-3), 14(1). Segment IV: hair 0(1), 1(1,1-2), 2(1), 3(4,3-4), 4(1), 5(1), 6(2), 7(5,4-6), 8(1), 9(1), 10(1,1-2), 11(2), 12(1,1-2), 13(2,2-3), 14(1). Segment V: hair 0(1), 1(2), 2(1), 3(1), 4(5,4-6), 5(1,1-2), 6(2), 7(4,3-5), 8(1,1-2), 9(1), 10(1), 11(2), 12(1), 13(2), 14(1). Segment VI: hair 0(1), 1(3,2-3), 2(1), 3(1,1-2), 4(4,2-4), 5(1), 6(1), 7(2,2-3), 8(2,1-3), 9(1), 10(1), 11(2), 12(1), 13(?), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(3,2-4), 4(1), 5(2,1-3), 6(7,5-9), 7(2,1-2), 8(6,6-9), 9(1), 10(1), 11(1), 12(1), 13(3,2-3), 14(1). **Segment VIII:** Comb scales very slender in basal three-quarters, apex fringed. Hair 0(1), 1(3,2-4), 2(1), 3(5,4-6), 4(1), 5(4,3-5), 14(1). **Siphon:** Integument yellowish. Index about 3.95-4.35. Pecten teeth usually 5(4-7), usually bifid, sometimes trifid, basal tooth shorter. Hair 1(6,4-6), hair 1ad(2,2-3), hair 1av(3,2-3); hairs 2,6,7,8 and 9 all single. **Anal Segment:** Small ventral saddle present. Gill about 0.5 of dorsal saddle length. Hair 1-X shorter than gill. Hair 1(2,1-3), 2(1), 3(6,4-7), 4a(10,9-13), 4b(9,8-10), 4c(8,8-10), 4d(10,8-11), 4e(11,8-13), 4f(10,7-10).

SYSTEMATICS. I am assigning provisionally to *atlanticus* all the Atlantic populations of the southern complex of the Spanius Group on the basis of similarity in the genitalia of all the males I have seen from the area. This species is indistinguishable from its geminate Pacific representative of the complex, *spanius*, in external features of the adults but is easily differentiated from it in the male genitalia as noted in the key and descriptions. The immature stages of *atlanticus* are known only from the type locality of Ocumare de la Costa and adjacent areas on the northcentral coast of Venezuela; those of *spanius* are completely unknown.

Deinocerites atlanticus, as currently interpreted, has a much wider distribution than any other species of the group, having been found in Panama, Canal Zone, Colombia, the mainland of Venezuela and its outlying island of Orchila. At least the Panamanian (including Canal Zone) population shows some differences in the female genitalia from the topotypic Venezuelan population, having more setae on the lobe of tergite IX, usually 4 (2-5) instead of 1 (0-2), and the postgenital plate less deeply notched and its lateral lobe slender. The status of this population, which was formerly confused with *spanius*, cannot be determined with certainty until its immature stages are found and compared thoroughly with those of topotypic *atlanticus*; but the fact that the single female I have seen from Colombia is intermediate in its genitalic characters between the Venezuelan and the Panamanian populations suggests that the differences noted may be clinal only and that only 1 rather variable species may be involved over the entire range of *atlanticus*.

BIONOMICS. The immature stages of *atlanticus* are definitely known only from the coast of Venezuela where they have been collected principally in small crab-holes along water courses in coconut groves in areas of scrub and thorn forest. The records of *spanius* immatures from Panama in Dyar (1928:265) may pertain

to *atlanticus* but there are no specimens to substantiate them and both larvae and pupae are still unknown from this area.

In Venezuela, adults have been collected together with the immature stages in the situations noted above. In Colombia, they were collected once in a house in Manaure in a thorn woodland. They have been collected on numerous occasions in the Canal Zone in the coastal rainforest but without any record of the type of crabhole. The only report of the biting habits of *atlanticus* is that of Dyar (1925:154, as *spanius*): "the species has lately been found to bite [man] freely". This record may refer to the females collected by D. Baker from October 1924 to May 1925.

This species, as currently interpreted, appears to be quite common in Panama. In Venezuela, its breeding associates are *melanophylum* and a member of the *Culex inflictus* complex.

DISTRIBUTION (fig. 3). Atlantic coast from the Canal Zone in Panama to the state of Aragua and the island of Orchila in Venezuela. Material examined: 648 specimens; 123 males, 160 females, 245 larvae, 120 pupae; 88 individual rearings (50 larval, 29 pupal, 9 incomplete).

COLOMBIA. *Guajira*: Uribia, Manaure, P. Barreto [USNM].

PANAMA AND CANAL ZONE. *Canal Zone*: Arenal River, C.S. Ludlow [USNM]. Cativa, J.B. Shropshire [USNM]. Ft. Davis, D. Baker [UCLA, USNM]. Ft. Randolph, J. Zetek [UCLA]; D. Baker [USNM]; W.P. Murdoch [UCLA]. Ft. Sherman, J. Zetek [UCLA, USNM], D. Baker [USNM]; W.H.W. Komp [UCLA]. France Field, C.S. Ludlow [USNM]. Locality not specified, J.B. Shropshire [USNM]. Margarita, J.B. Shropshire [USNM]. Toro Pt., J.B. Shropshire [USNM].

VENEZUELA. *Aragua*: Cuyagua (VZ 415) [UCLA]. Ocumare del la Costa (VZ 170,175, 346,363-365,385,386) [UCLA, USNM]. Puerto Colombia (VZ 216) [UCLA]. Turiamo, W.H.W. Komp [UCLA, USNM]. *Carabobo*: Moron (VZ 256-258) [UCLA]. *La Orchila, Isla*: F.M. Root (LAR 63) [UCLA, USNM].

3. *Deinocerites mathesoni* Belkin & Hogue

Figs. 3,12-14

1959. *Deinocerites mathesoni* Belkin and Hogue, 1959:426-427. TYPE: Holotype male, Brownsville, Texas, 8-9 Feb 1940, reared, F.W. Fisk [USNM, 64261].

Deinocerites mathesoni of Stone, Knight and Starcke (1959:285); Dodge (1963:803,811; 1966:376); Peyton, Reinert and Peterson (1964:449-458); Ross (1964:104).

Deinocerites spanius of Fisk (1941:543-550); Fisk and LeVan (1941:945); McGregor and Eads (1943:939); Matheson (1944:251-252); Randolph and Neill (1944:81); Knight and Chamberlain (1948:10); Eads, Menzies and Ogden (1951:42,44); Breland (1956:95); Pratt (1956:8); Evans (1962:255).

Deinocerites spanius in part of Carpenter and LaCasse (1955:327-329).

?*Deinocerites spanius* of Vargas (1956:30).

FEMALE (fig. 12). Wing 2.50 mm. Proboscis 1.23 mm. Forefemur 1.22 mm. Abdomen about 2.54 mm. **Antenna**: Torus without scales; tip of proboscis reaching from apex of flagellar segment 9 to base of 10. **Thorax**: *Ppl* sometimes with 1 or more scales; metameron without microsetae. **Legs**: Scaling and bristles as described for *atlanticus*.

FEMALE GENITALIA (fig. 12). **Tergite IX** with 2-5 setae on each side. **Cercus** in lateral aspect broadened at base and evenly narrowed distally, sternal margin

convex, tergal margin almost straight throughout except for a slight concavity in distal half; apex slightly upturned, with 3-5 apical or subapical bristles. Distal part of *postgenital plate* (in ventral aspect) distinctly notched; lateral lobe elongate (in lateral aspect), its apical bristle convergent distally with its mate (in ventral aspect).

MALE (fig. 12). Wing 2.39 mm. Proboscis 1.41 mm. Forefemur 1.27 mm. Abdomen (not including genitalia) about 1.83 mm. Essentially similar to female.

MALE GENITALIA (fig. 13). *Segment IX*: Tergite lobe slender, flattened beyond basal part, constricted subapically and then expanded, sometimes widened near middle; ventral surface with a basal projection. *Sidepiece*: Similar to *atlanticus*. *Phallosome*: Dorsal paramere with 2 sclerotizations, tergal and sternal, connected by a narrow bridge very poorly sclerotized on the margins and membranous centrally; tergal sclerotization bearing the long slender apical spine which is strongly hooked apically; sternal sclerotization usually with 2 or sometimes 3 outstanding teeth. Width of dorsal paramere about 0.6 of the length of tergal sclerotization. Aedeagus in general similar to *atlanticus*.

PUPA (fig. 13). Abdomen 2.56 mm. Trumpet 0.38 mm. Paddle 0.53 mm. Diagnostic characters as in the key; general chaetotaxy based on 6 reared specimens. Hair 10-C about twice the length of 11-C; hair 1-VII extending beyond apex of 4-VIII. *Cephalothorax*: Integument yellowish. Hair 1(2,2-4), 2(3,3-4), 3(3,3-4), 4(6,4-7), 5(2), 6(2,1-3), 7(5,4-6), 8(2,2-3), 9(3,3-4), 10(2), 11(4,3-4), 12(4,3-5). *Trumpet*: Short, almost uniform in width throughout except for slight broadening apically; index about 5.76-6.16. Integument yellowish distad, medium brown on tracheoid, not markedly contrasting with cephalothoracic integument. Tracheoid about 0.4 of the trumpet length; border of pinna with a distinct emargination. *Abdomen*: Integument yellowish. Segment I: hair 1(8-15, primary branches), 2(1,1-2), 3(2), 4(4,3-4), 5(5,4-7), 6(1), 7(4,4-6), 9(1). Segment II: hair 0(1), 1(11,7-11), 2(2,2-3), 3(?), 4(3-4), 5(1), 6(1), 7(3,2-4), 9(1). Segment III: hair 0(1), 1(6,5-6), 2(1), 3(2,2-3), 4(1,1-2), 5(3,1-3), 6(1), 7(2,1-3), 8(6,4-6), 9(1), 10(3-4, 3-6), 11(1), 14(1). Segment IV: hair 0(1), 1(4,3-6), 2(1), 3(4,3-5), 4(1,1-2), 5(1, 1-2), 6(1), 7(2,1-2), 8(3,1-4), 9(1), 10(3,2-5), 11(1,1-2), 14(1). Segment V: hair 0(1), 1(4,2-5), 2(1), 3(3,1-3), 4(5,4-6), 5(1), 6(1,1-2); 7(5,3-6), 8(2,2-3), 9(1), 10(2,1-3), 11(1), 14(1). Segment VI: hair 0(1), 1(4,3-5), 2(1), 3(3,3-4), 4(5,4-5), 5(1), 6(1), 7(2,1-2), 8(2,2-3), 9(1), 10(3,2-3), 11(1), 14(1). Segment VII: hair 0(1), 1(1,1-2), 2(1), 3(2,2-3), 4(3,2-4), 5(3,1-3), 6(1,1-2), 7(2,1-2), 8(3,2-3), 9(5, 4-5), 10(2,1-2), 11(2,1-2), 14(1). Segment VIII: hair 0(1), 4(3), 9(1), 14(1). *Paddle*: Width about 0.67 of length.

FOURTH INSTAR LARVA (fig. 14). Head 0.72 mm. Siphon 0.71 mm. Diagnostic characters as in the key; general chaetotaxy based on 4 reared specimens. Hair 6-III always single as opposed to *atlanticus* and *belkini* in which it is either single or double. *Head*: Integument yellowish. Mental plate distinctly wider than long, triangular, with or without a median terminal spicule; basal spicule shorter; all spicules with denticulate apex. Hair 0(1), 1(1), 2(1), 3(sometimes developed as a spicule), 4(7,6-7), 5(6,5-6), 6(4,3-4), 7(10,8-11), 8(8,2-3), 9(3,2-7), 10(2,2-3), 11(4,3-6), 12(2,1-3), 13(3,3-4), 14(1), 15(2,2-3). *Antenna*: Length about 0.46 of head; shaft with a few spicules on proximal part; hair 1(4,5-7). *Thorax*: Prothorax: hair 0(7,4-7), 1(1), 2(1), 3(2,1-2), 4(4,3-5), 5(1), 6(1), 7(4,3-5), 8(2,2-3), 9(1), 10(1), 11(4), 12(1), 14(1). Mesothorax: hair 1(1), 2(1), 3(1,1-2), 4(3,1-4), 5(1), 6(1), 7(1), 8(9,6-11), 9(8,8-14), 10(1), 11(2), 12(1), 13(?). Metathorax: hair 1(1), 2(2), 3(4,3-4), 4(1,1-2), 5(1), 6(3,2-3), 7(9-14), 8(6), 9(10,7-11), 10(1), 11(2), 12(1), 13(4,3-5). *Abdomen*: Segment I: hair 1(1), 2(1), 3(3,2-3), 4

(5,5-9), 5(1,1-3), 6(2,2-3), 7(3,2-3), 9(2,1-3), 10(2,1-2), 11(2,2-5), 12(3,2-3), 13(2,1-2). Segment II: hair 0(1), 1(1), 2(1), 3(4,3-5), 4(3), 5(1,1-3), 6(1), 7(4,3-4), 8(3,2-5), 9(1), 10(1,1-4), 11(3,1-3), 12(2), 13(?). Segment III: hair 0(1), 1(3), 2(1), 3(3,2-3), 4(2), 5(1), 6(1), 7(6), 8(1,1-2), 9(1), 10(2,1-2), 11(2), 12(2,1-2), 13(1), 14(1). Segment IV: hair 0(1), 1(1), 3(4,2-4), 4(1), 5(1), 6(2,1-2), 7(4,3-7), 8(1), 9(1), 10(1,1-2), 11(2,1-2), 12(2), 13(2), 14(1). Segment V: hair 0(1), 1(1), 2(1), 3(1), 4(5,4-5), 5(1), 6(2,1-2), 7(3,3-6), 8(1), 9(1), 10(1), 11(2,1-2), 12(1,1-2), 13(2), 14(1). Segment VI: hair 0(1), 1(2), 2(1), 3(1), 4(4,3-4), 5(2), 6(1), 7(2), 8(2,2-3), 9(1), 10(1), 11(2), 12(1), 13(?), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2,1-3), 4(1), 5(2), 6(6,6-7), 7(1,1-2), 8(6,5-6), 9(2,1-2), 10(1), 11(1), 12(1), 13(2,2-4), 14(1). **Segment VIII:** Comb scales slender basally, slightly widened around middle, apex fringed. Hair 0(1), 1(4,3-4), 2(1), 3(5,3-7), 4(1), 5(4,3-5), 14(1). **Siphon:** Integument yellowish. Index about 3.6-4.3. Pecten teeth 4 (3-6), usually bifid, sometimes trifid; basal tooth shorter. Hair 1(4,3-7), hair 1ad (4,1-5), hair 1av(4,3-4); hairs 2,6,7,8 and 9 all single. **Anal Segment:** Gill about 0.5 of dorsal saddle length. Hair 1-X about the same length as gill. Hair 1(1), 2(5,5-8), 3(1), 4a(10,9-12), 4b(8,8-9), 4c(8,7-9), 4d(9,8-10), 4e(9,8-10), 4f(7,6-9).

SYSTEMATICS. *Deinocerites mathesoni* is the Atlantic member of the northern complex of the Spanius Group. Its adults are indistinguishable from those of its geminate Pacific species, *belkini*, in external features but the 2 species are easily separated by male genitalic, pupal and larval characters as noted in the keys and descriptions.

This species is definitely known only from southern Texas but it is very likely that it occurs along the Atlantic coast of Mexico and that the records of *spanius* from the states of Tamaulipas and Veracruz (Vargas, 1956:30) pertain to it.

There is no doubt, now that the Spanius Group has been shown to consist of 4 distinct species, that *mathesoni* is indigenous to Texas and that it was not introduced there by aircraft as suggested by Fisk (1941:548) who first recorded this species (as *spanius*) from the United States.

BIONOMICS. The bionomics of *mathesoni* have been investigated by Fisk (1941, as *spanius*) and by Peyton, Reinert and Peterson (1964). Fisk reported the immature stages from holes of the fiddler crab, *Uca pugilator*, and Peyton et al found them very commonly in the holes of *Uca subcylindrica* and less frequently in those of the Black Land Crab, *Gecarcinus lateralis*. *Deinocerites mathesoni* appears to prefer holes ranging from $\frac{3}{4}$ to $1\frac{1}{4}$ inches but occasionally has been found in holes of only $\frac{1}{2}$ inch diameter. Chloride content determinations varied from 8,430 ppm for a single composite sample by Fisk and from 1,115 to 2,603 ppm for several individual samples by Peyton et al. The range of pH values, determined colorimetrically by Fisk and Peyton et al was 7.2-7.6.

Females of *mathesoni* have not been reported to feed on man and Fisk fed them on a small turtle. He reports finding both sexes several miles from any obvious breeding site. Fisk also observed mating of reared individuals in the morning of the eighth day after the first adults emerged.

Deinocerites pseudus is the only species reported to be associated with *mathesoni* to date (Peyton, Reinert and Peterson (1964)).

DISTRIBUTION (fig. 3). Atlantic coast in Texas from Corpus Christi to Brownsville and probably southward into Mexico, at least to Veracruz. Material examined: 78 specimens; 26 males, 28 females, 18 larvae, 6 pupae; 4 individual larval rearings.

TEXAS. *Cameron County:* Brownsville, F.W. Fisk [UCLA, USNM]; T.N. Burns; E.S. Ross [USNM]; J.F. Reinert; M.D. Huettel (TEX 13-16,19,20); D. Eyles (KO 32-7) [UCLA]. Har-

lingen [USNM]. Laguna Vista, S.R. Telford (MT 10) [UCLA]. Locality not specified [USNM]. *Nueces County*: Corpus Christi, F.R. du Chanois [USNM]. *Willacy County*: Tenerias triangulation station, M.D. Huettel (TEX 10,11) [UCLA].

4. *Deinocerites belkini* Adames, n.sp.

Figs. 3,15-17

TYPES: *Holotype* male with associated larval and pupal skins and genitalia slide (MT 4-12), Barra de Navidad, Jalisco, Mexico, 13 July 1963, S.R. Telford, Jr. [USNM]. *Allotype* female with associated larval and pupal skins (MT 4-10), same data as holotype [USNM]. *Paratypes*: 9 lpM (MT 4-13,14,20,25,30,31,33,35,37), 8 lpF (4-11,22-24,26,32,34), 3 pM (4-16,17,27), 2 pF (4-19,28), 1 lP (4-36), 22 L (4), same data as holotype [BM, UCLA, USNM].

FEMALE (fig. 15). Wing 2.57 mm. Proboscis 2.52 mm. Forefemur 1.53 mm. Abdomen about 2.09 mm. Apparently indistinguishable from *mathesoni*.

FEMALE GENITALIA (fig. 15). Tergite IX with 1-6 setae on each side. Cercus and postgenital plate essentially similar to *mathesoni*.

MALE (fig. 15). Wing 2.41 mm. Proboscis 1.27 mm. Forefemur 1.47 mm. Abdomen (not including genitalia) about 2.29 mm. Essentially similar to female.

MALE GENITALIA (fig. 16). *Segment IX*: Tergite lobe slender, slightly widened near middle, flattened beyond basal part, constricted subapically and then expanded; ventral surface with a very strong premedian projection, visible *in toto* only in lateral aspect. *Sidepiece*: Similar to *atlanticus*. *Phallosome*: Dorsal paramere essentially as in *mathesoni* except for usually 3 or 4 teeth on sternal sclerotization and the width which is about 0.5 of the length of tergal sclerotization. Aedeagus in general similar to *atlanticus*.

PUPA (fig. 16). Abdomen 2.57 mm. Trumpet 0.61 mm. Paddle 0.61 mm. Diagnostic characters as in the key; general chaetotaxy based on 10 reared specimens. Hair 10-C about 1.3 length of 11-C; hair 1-VII as in *mathesoni*. *Cephalothorax*: Integument yellowish. Hair 1(2,2-3), 2(3,2-3), 3(2,2-4), 4(4,3-5), 5(2,2-3), 6(2,1-3), 7(4,3-6), 8(1), 9(3,2-4), 10(1,1-2, forked when double), 11(3,3-4), 12(4,3-5). *Trumpet*: Moderately long and slender, almost uniform in width throughout except for broadened apex; index about 8.7-11.0. Integument yellowish distad, medium brown on tracheoid; not markedly contrasting with cephalothoracic integument. Tracheoid about 0.4 of trumpet length; border of pinna without a distinct emargination. *Abdomen*: Integument yellowish. Segment I: hair 1(14,12-16 primary branches), 2(1,1-2), 3(2), 4(3,2-3), 5(5,3-8), 6(1), 7(3,3-5), 9(1). Segment II: hair 0(1), 1(4-9), 2(2), 3(1,1-2), 4(4,3-6), 5(1), 6(1), 7(2,1-3), 9(1). Segment III: hair 0(1), 1(6,4-7), 2(1), 3(2), 4(2,1-4), 5(1,1-3), 6(1), 7(2,1-3), 8(7,6-10), 9(1), 10(2,2-3), 11(1), 14(1). Segment IV: hair 0(1), 1(5,4-6), 2(1), 3(4,4-5), 4(2,1-3), 5(1,1-2), 6(1), 7(3,2-4), 8(3,2-4), 9(1), 10(3,2-4), 11(1), 14(1). Segment V: hair 0(1), 1(4,3-5), 2(1), 3(3,2-3), 4(5,4-6), 5(1), 6(1,1-3), 7(5,4-5), 8(3,2-3), 9(1), 10(2), 11(1), 14(1). Segment VI: hair 0(1), 1(2,1-3), 2(1), 3(2,1-2), 4(5,3-6), 5(1), 6(1), 7(2,1-3), 8(3,2-5), 9(1), 10(2,1-2), 11(1). Segment VII: hair 0(1), 1(2), 2(1), 3(2,1-2), 4(2,2-3), 5(2,1-3), 6(1), 7(2,1-2), 8(3-4,2-4), 9(6,1-8), 10(2,1-2), 11(1,1-2), 14(1). Segment VIII: hair 0(1), 4(2,2-3), 9(1), 14(1). *Paddle*: Width about 0.75 of length.

FOURTH INSTAR LARVA (fig. 17). Head 0.94 mm. Siphon 1.19 mm. Diagnostic characters as in the key; general chaetotaxy based on 7 reared specimens.

Head: Integument yellowish. Mental plate distinctly wider than long, without median terminal spicule; all spicules with denticulate apex, basal and lateral spicules longer than terminal. Hair 0(1), 1(1), 2(1), 3(not detectable), 4(7,5-7), 5(5,5-7), 6(3,2-4), 7(10,9-11), 8(3,2-3), 9(4,3-5), 10(2,2-3), 11(5,3-7), 12(4,2-4), 13(5,4-6), 14(1), 15(3,2-3). **Antenna:** Length about 0.45 of head; shaft with several spicules on proximal part; hair 1(4,3-5). **Thorax:** Prothorax: hair 0(6,6-7), 1(1), 2(1), 3(2,1-2), 4(4,3-5), 5(1), 6(1), 7(4,4-5), 8(3,2-3), 9(1), 10(1), 11(2,1-4), 12(1), 14(1,1-3). Mesothorax: hair 1(1), 2(1), 3(1), 4(3,3-4), 5(1), 6(1), 7(1), 8(8,6-8), 9(8,7-9), 10(1), 11(2,1-3), 12(1), 13(11,10-11), 14(3-5 primary branches). Metathorax: hair 1(1), 2(3,2-4), 3(4,3-6), 4(2,2-3), 5(1), 6(3,2-4), 7(10,8-12), 8(7,5-7), 9(9,6-10), 10(1), 11(2,2-3), 12(1), 13(5,4-5). **Abdomen:** Segment I: hair 1(1), 2(1), 3(3,2-4), 4(8,8-10), 5(3,2-4), 6(2), 7(3,2-3), 9(3,2-3), 10(3,2-4), 11(2,2-3), 12(2,1-3), 13(1,1-2). Segment II: hair 0(1), 1(1), 2(1,1-2), 3(4,3-4), 4(6,5-6), 5(2,2-3), 6(1), 7(4,3-6), 8(3,3-4), 9(1), 10(3,3-4), 11(2,2-3), 12(2,2-3), 13(12,10-13). Segment III: hair 0(1), 1(3,2-3), 2(1), 3(3,2-3), 4(2,1-2), 5(1,1-3), 6(1,1-2), 7(5,4-6), 8(2,1-3), 9(1), 10(2), 11(2), 12(2), 13(1), 14(1). Segment IV: hair 0(1), 1(1,1-2), 2(1), 3(5,5-7), 4(2,1-2), 5(1,1-2), 6(2,2-3), 7(6,4-6), 8(1,1-2), 9(1), 10(2,1-2), 11(2,2-3), 12(2,1-2), 13(2), 14(1). Segment V: hair 0(1), 1(1), 2(1), 3(1), 4(7,4-7), 5(1,1-2), 6(2,1-2), 7(5,5-7), 8(2,1-2), 9(1), 10(1,1-2), 11(2,2-3), 12(1), 13(2), 14(1). Segment VI: hair 0(1), 1(2,1-3), 2(1), 3(1), 4(4,3-5), 5(2,2-3), 6(1), 7(3,2-3), 8(3,3-5), 9(1), 10(1), 11(2), 12(1), 13(16-22), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2,2-3), 4(1), 5(2,1-3), 6(10,10-12), 7(2,1-2), 8(9,6-11), 9(1,1-2), 10(1,1-2), 11(1,1-2), 12(1), 13(3,2-5). **Segment VIII:** Comb scales with basal two-thirds narrow, distal third wide and fringed. Hair 0(1), 1(3,3-4), 2(1), 3(5,5-6), 4(1), 5(4,3-5), 14(1). **Siphon:** Integument yellowish. Index about 5.2-6.4. Pecten teeth 4(4-5), all teeth about the same size, usually bifid, sometimes trifid. Hair 1(4,3-6), hair 1ad(2,2-3), hair 1av(2,1-3); hairs 2,6,7,8 and 9 all single. **Anal Segment:** Gills about two-thirds of dorsal saddle length. Hair 1-X about same length as gill. Hair 1(2,1-3), 2(4,3-5), 3(1), 4a(10,7-12), 4b(8,7-10), 4c(7,6-8), 4d(7,6-10), 4e(8,7-9), 4f(8,5-10).

SYSTEMATICS. *Deinocerites belkini* is the Pacific member of the northern complex of the Spanius Group. It is easily differentiated from its Atlantic twin, *mathesoni*, in the male genitalia, pupae and larvae but cannot be separated from it on external features of the adults.

This species is known to date only from the 3 localities in the states of Nayarit and Jalisco, Mexico, but it is very likely that it occurs southward of this area toward the isthmus of Tehuantepec.

BIONOMICS. Immature stages of *belkini* have been found only once, in small crabholes which may have been made by fiddler crabs. Adults have been collected twice in large crabholes in association with the adults of *mcdonaldii*.

DISTRIBUTION (fig. 3). Pacific coast of Mexico in the states of Nayarit and Jalisco. Material examined: 94 specimens; 16 males, 11 females, 42 larvae, 25 pupae; 25 individual rearings (19 larval, 5 pupal, 1 incomplete).

MEXICO. *Nayarit:* Matanchen, San Blas (MF 6) [UCLA]. *Jalisco:* Barra de Navidad (MT 4) [BM, UCLA, USNM]. Puerto Vallarta (MEX 466) [UCLA].

DYARI GROUP

FEMALES. Small species, wing 2.6-3.0 mm. Mesonotum dark, pleuron with

strongly contrasting whitish portions or almost uniformly dark brown not contrasting with mesonotal integument (*barretoii*). **Antenna:** Flagellar segment 1 with scales, about equal to combined length of segments 2, 3 and two-thirds of 4; segments 2-12 subequal in length but progressively slightly shortened distad; moderately long, exceeding proboscis from base of flagellar segment 8. **Thorax:** Postnotum usually with a few setae in lower part. **Apn** light, slightly darkened anteriorly or entirely dark brown; **ppn** either light or brown, scales all narrow; **ppl** light, slightly darkened or brownish; **psp**, **ssp**, **stp** and **pra** either markedly darkened or concolorous with most of pleuron; paratergite dark; **mep** light or brown and without translucent scales, **lmep** with 1 very strong bristle; meron light or brown; metameron and metapleuron either light or pale brownish. **Legs:** Coxal integument either light, slightly darkened or brownish. Entire posteroventral surface of all femora whitish; anteroventral margin of forefemur without spiniforms but with 4-9 bristles, posterodorsal margin with weaker bristles. **Abdomen:** Sternites III-VII dark scaled, II sometimes pale scaled.

FEMALE GENITALIA. **Sternite VIII** with sclerotized distal band narrow and with only a few scales, gradually shortened ventrad; caudal margin not produced into a submedian ventral angle, this area without strongly differentiated marginal bristles. **Tergite IX** with at least 2 small setae on each side. **Tergite X** poorly differentiated dorsally and with a very small indistinct lateral sclerotization. **Cercus** with a few moderately strong apical or subapical normal bristles.

MALES. Essentially similar to females. **Antenna:** Exceeding proboscis from at least middle of flagellar segment 5; flagellar segments 1, 2 and base of 3 with scales; segments 1-5 or 1-6 markedly elongated but progressively shorter distad; segment 1 always shorter than combined length of segments 2 and 3; segments 7-12 subequal but progressively slightly shortened distad; segment 13 slightly wider than 12. **Legs:** Claws of foreleg and midleg enlarged; anterior member of a pair always larger and with a subbasal tooth, posterior simple.

MALE GENITALIA. **Segment IX:** Tergite lobe cylindrical; angled laterad at base; distal part varied in shape and length, apex at most reaching base of subapical lobe. **Sidepiece:** Without scales. Apicosternal lobe prominent; long, slender and with a long apical seta. **Phallosome:** Dorsal parameres widely separated in tergal aspect, with a slight indication of a very short, narrow, incomplete sclerotized dorsal bridge; articulated ventrally with a subbasal dorsal sclerotized projection of aedeagus.

PUPAE. **Cephalothorax:** Hairs 2,3-C closely approximated, 2-C poorly developed, shorter than 3-C; hair 5-C single or double, strongly developed, longer than distance from its alveolus to base of trumpet, at least 1.5 of trumpet length; 7-C usually double (1-3); hair 8-C single. **Metanotum:** Hair 10-C poorly developed, always shorter than 11-C (0.3-0.5), usually single (1 or 2). **Abdomen:** Hair 1-II usually not reaching apex of tergite III, single or triple, barbed; 1-III-VI branched; 5-II always laterad of 3-II; hair 3-V usually double (1-4); hair 1-VII shorter than tergite VIII, at most reaching base of 4-VIII. **Paddle:** Hair 1-P as long as or longer than paddle.

FOURTH INSTAR LARVAE. **Head:** Hair 2-C short, inconspicuous, about 0.20-0.25 of 1-C, either slightly mesad, in line with or laterad of 1-C; hair 5-C usually with 3 or 4 barbed branches (2-5); hair 6-C single and barbed, about 1.25-1.33 of 5-C. **Thorax:** Prothoracic hair 9-P single. **Abdomen:** Hair 6-II double; dorsal sensillum of segment V laterad of 4-V; hair 6-VI usually double (1 or 2); hair 1-VII short, shorter than 3-VII and not reaching base of segment VIII; hair 1-

VIII usually with 4-6 branches (4-7). *Siphon*: Hair 1-S usually double or triple. *Anal Segment*: Ventral brush (4-X) with 6 or 7 pairs of hairs. Gill slightly emarginate on apex or towards ventral margin; short, about 0.60-0.70 of dorsal saddle length. Dorsal saddle narrow; its ventral margin far from hair 1-X.

DISCUSSION. The Dyari Group shows fewer derived features than any other group except Spanius and in some respects may be regarded as transitional between the latter and the other groups of the genus. The adults are small species, only slightly larger than those of the Spanius Group, but they have distinctly longer antennae than the latter and show sexual dimorphism in the flagellum as do all the groups other than Spanius. In general external features, the adults show more resemblance with the Cancer Group than with the 2 other derived groups (Epitedeus and Pseudes). They are usually readily distinguished from the Cancer Group by the presence of postnotal bristles. The male genitalia do not show any distinctive characters on a group level but sternite VIII of the female is uniquely developed. The immature stages provide the most reliable diagnostic features for the group in the reduced length of pupal hair 10-C and larval hair 1-VII.

The Dyari Group as now understood is diagnosed in the adults essentially as it was by Belkin and Hogue (1959:428) except that a few scales may be present in the female genitalia and the ninth tergite lobe of the male is not always short as in *dyari*. It consists of 3 allopatric species with complementary known distributions extending from Nicaragua and Costa Rica (*nicoyae*) through Panama and northern Colombia (*dyari*) to central Colombia (*barreto*). The group as a whole has the most restricted range in the genus and is confined to the Pacific basin.

On the basis of the development of the dorsal paramere (expanded external surface) and subapical lobe of the sidepiece (ventromesal spiniforms), *nicoyae* is sharply differentiated from the other 2 species and it appears likely that it was separated early from the stock which gave rise to the *dyari-barreto* complex. It would appear also that the short tergite IX lobe of *dyari* is a derived state since *barreto* has this lobe similar to that of *nicoyae*.

The species of the group appear to be uncommon as they have seldom been collected even as adults. Because of the elongate antennae they are not as likely to be confused with unornamented species of the subgenus *Melanoconion* of *Culex* as species of the Spanius Group. Recent studies have shown that *dyari* females have a definite preference for reptilian blood but nothing is known of the blood feeding habits of the other 2 species. The immature stages of the Dyari Group are apparently very difficult to locate and only a few collections of *nicoyae* and *dyari* have been made to date. Both of these species were found in the medium-sized burrows of *Ucides occidentalis*. The immature stages of *barreto* are unknown.

5. *Deinocerites dyari* Belkin & Hogue

Figs. 4,18-20

1959. *Deinocerites dyari* Belkin and Hogue, 1959:428-429. TYPE: Holotype male, Corozal, Panama, Canal Zone, 20 Apr 1919, J. Zetek, 1183 [USNM, 64262].

Deinocerites dyari of Stone, Knight and Starcke (1959:284); Gorgas Memorial Institute (1970:20); Tempelis and Galindo (1970).

FEMALE (fig. 18). Wing 2.67 mm. Proboscis 1.22 mm. Forefemur 1.53 mm.

Abdomen about 2.55 mm. Mesonotum dark brown, pleuron with strongly contrasting whitish portions. **Head:** Narrow decumbent scales of vertex creamy; erect scales brown to very dark brown; lateral patch of broad decumbent scales whitish. **Antenna:** Torus occasionally with 1 scale. **Thorax:** *Apn* light or slightly darkened anteriorly; *ppn* light and often with a few scales in middle; *ppl* light or slightly darkened, with several bristles and frequently a few scales; *psp*, *ssp*, *stp* and *pra* usually markedly darker than rest of pleuron; *mep* light, with a few scales in upper part, microsetae absent; metameron simple; meron, metameron and metapleuron light. **Legs:** Coxal integument usually light; anterior surface of forecoxa covered with bristles and translucent scales, basolateral area with a few bristles; midcoxa with scales anterolaterally, with 2 groups of bristles laterally, the anterior bristles irregular, the posterior in a row and stronger, posterolateral surface simple; hindcoxa with scales and several bristles laterally, posterior surface with bristles.

FEMALE GENITALIA (fig. 18). **Tergite IX** usually with 4 setae on each side (2-5). **Cercus** (in lateral aspect) broadened basally, gradually narrowing distally, sternal margin convex, tergal margin more or less straight throughout except for a slight subapical concavity; apex slightly upturned, usually with 4-6 moderately strong apical or subapical bristles. Distal part of **postgenital plate** (in ventral aspect) deeply notched, margins of notch diverging distad; lateral lobe elongate (in lateral aspect), its apical bristle slightly converging with its mate (in ventral aspect), its small dorsal bristle not converging.

MALE (fig. 18). Wing 2.61 mm. Proboscis 1.88 mm. Forefemur 1.78 mm. Abdomen (not including genitalia) about 1.88 mm. Flagellar segments 1-6 markedly elongated. Anterior claw of foreleg with a long, very slender tooth, anterior claw of midleg with a shorter and heavier tooth.

MALE GENITALIA (fig. 19). **Segment IX:** Tergite lobe with distal part short, more or less pointed and conical, not reaching more than halfway to subapical lobe. **Sidepiece:** Subapical lobe with a distinct thumb; seta *c* rather heavy and spiniform but with an apical attenuation; the 3 setae of ventromesal surface bristlelike and attenuated apically. **Phallosome:** Dorsal paramere with apical spine long and strongly curved, ventral teeth large and arising from convex caudolateral border. Aedeagus (in tergal aspect) almost uniform in width except for a subbasal expansion; distally the 2 plates come together forming a globular expansion.

PUPA (fig. 19). Abdomen 3.52 mm. Trumpet 0.51 mm. Paddle 0.71 mm. Diagnostic characters as in the key; general chaetotaxy based on 8 reared specimens. Hair 5-IV usually reaching spiracular sensillum of segment V. **Cephalothorax:** Integument light brown. Hair 1(2), 2(2,2-4), 3(2,1-2), 4(3,1-4), 5(1), 6(1), 7(2,1-2), 8(1), 9(2,1-2), 10(1,1-2), 11(2,1-3), 12(2,1-3). **Trumpet:** Short, index 3.6-5.0. Integument brown distad, darker on tracheoid, contrasting with cephalothoracic integument. Tracheoid about 0.36 of trumpet length. **Abdomen:** Integument light brown. Segment I: hair 1(8,4-13 primary branches), 2(1), 3(2,1-2), 4(4,2-4), 5(2,1-3), 6(1), 7(2,2-4), 9(1), 10(1), 11(1). Segment II: hair 0(1), 1(1), 2(1,1-2), 3(1), 4(2,1-4), 5(1), 6(1), 7(1,1-2), 9(1). Segment III: hair 0(1), 1(4,2-5), 2(1), 3(2,1-2), 4(1,1-2), 5(1,1-2), 6(1), 7(2,1-3), 8(3,2-6), 9(1), 10(2,1-2), 11(1), 14(1). Segment IV: hair 0(1), 1(2,1-5), 2(1), 3(3,2-3), 4(1), 5(1), 6(1), 7(2,1-2), 8(2,1-2), 9(1), 10(2,1-2), 11(1), 14(1). Segment V: hair 0(1), 1(2,1-3), 2(1), 3(2,1-4), 4(3,2-4), 5(1), 6(1), 7(2,2-4), 8(2,1-2), 9(1), 10(2,1-2), 11(1), 14(1). Segment VI: hair 0(1), 1(2,2-3), 2(1), 3(1,1-3), 4(3,2-3), 5(1), 6(1), 7(1,1-2), 8(1,1-2), 9(1), 10(2,1-2), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2,1-2), 4(2,1-2), 5(1), 6(1), 7(2), 8(2,2-3), 9(3,3-5), 10(2,1-2), 11(1), 14(1). Segment VIII: hair 0(1), 4(2,

1-2), 9(1), 14(1). **Paddle:** Width about 0.73 of length; apex usually slightly produced; hair 1-P longer than paddle.

FOURTH INSTAR LARVA (fig. 20). Head 1.11 mm. Siphon 1.07 mm. Diagnostic characters as in the key; general chaetotaxy based on 7 reared specimens. **Head:** Integument light brown. Mental plate more or less rectangular, marginal spicules sharply pointed. Hair 0(1), 2(1), 3(not detectable), 4(3,2-4), 5(3,3-5), 6(1), 7(9,7-11), 8(3,2-4), 9(5,5-6), 10(2,1-4), 11(3,2-4), 12(2,1-3), 13(4,4-6), 14(1), 15(3,2-3). **Antenna:** Length about 0.38 of head; shaft with several spicules on proximal part. Hair 1(5,4-7). **Thorax:** Prothorax: hair 0(5,5-7), 1(1), 2(1), 3(1,1-2), 4(3,2-4), 5(1), 6(1), 7(3), 8(2,2-3), 9(1), 10(1), 11(3,2-4), 12(1), 14(1). Mesothorax: hair 1(1), 2(2), 3(1), 4(3,2-4), 5(1), 6(1), 7(1), 8(6,5-7), 9(5,4-7), 10(1), 11(3,2-3), 12(1), 13(8,6-8), 14(6,4-7). Metathorax: hair 1(1), 2(3,3-4), 3(4,3-5), 4(2,2-4), 5(1), 6(2,1-3), 7(9,7-10), 8(7,7-10), 9(8,6-9), 10(1), 11(3,2-3), 12(1), 13(4,4-6). **Abdomen:** Segment I: hair 1(1), 2(1), 3(3,3-4), 4(6,5-7), 5(3,2-4), 6(2,2-4), 7(2), 9(3,3-4), 10(4,3-5), 11(3,2-4), 12(3,2-4), 13(1,1-2). Segment II: hair 0(1), 1(1), 2(1), 3(3,2-3), 4(3,2-4), 5(4,3-5), 6(2), 7(3,2-3), 8(2,1-4), 9(1), 10(1,1-2), 11(2,2-4), 12(3,3-5), 13(7,7-9). Segment III: hair 0(1), 1(2,2-3), 2(1), 3(2,1-3), 4(1,1-2), 5(4,3-6), 6(3,3-4), 7(4,3-5), 8(2,1-3), 9(1), 10(2), 11(2,1-2), 12(2,1-2), 13(1,1-2), 14(1). Segment IV: hair 0(1), 1(2), 2(1), 3(4,2-4), 4(1), 5(3,2-4), 6(3), 7(5,5-6), 8(1), 9(1), 10(2,1-2), 11(2,1-2), 12(2,1-2), 13(2), 14(1). Segment V: hair 0(1), 1(2,1-2), 2(1), 3(1), 4(4,4-5), 5(2,1-3), 6(2,2-3), 7(5,3-6), 8(1), 9(1), 10(1), 11(2,1-2), 12(1), 13(2), 14(1). Segment VI: hair 0(1), 1(3,3-4), 2(1), 3(1), 4(4,3-4), 5(2,2-4), 6(2,1-3), 7(3,2-3), 8(2), 9(1), 10(1,1-2), 11(2), 12(1), 13(13,9-14), 14(1). Segment VII: hair 0(1), 1(2), 2(1), 3(3,3-4), 4(1), 5(2,2-3), 6(7,6-8), 7(2,1-2), 8(5,4-7), 9(2,1-2), 10(2,1-2), 11(1,1-2), 12(1), 13(2,2-3), 14(1). **Segment VIII:** Comb scales with body very slender, apex slightly wider and fringed. Hair 0(1), 1(4,4-5), 2(1), 3(4,3-6), 4(1), 5(3,3-4), 14(1). **Siphon:** Integument medium brown. Index about 4.6-5.8. Pecten teeth 4(3-5), usually bifid, sometimes trifid, both blades very slender, size variable. Hair 1(2,2-3), hair 1ad(2), hair 1av(2,1-2); hairs 2,6,7,8,9 all single. **Anal Segment:** Gill about 0.7 of dorsal saddle length. Hair 1-X shorter than gill. Hair 1(3), 2(8,6-9), 3(1), 4a(12,11-14), 4b(10,10-11), 4c(11,9-12), 4d(11,10-14), 4e(13,11-14), 4f(12,11-14).

SYSTEMATICS. This species appears to be the most derived one of the group judging by the reduction of the IX tergite lobe of the male genitalia. In other respects the male genitalia are very similar to those of *barretoii* and I therefore consider that these 2 species are closely related. As noted above in the description and in the keys, the adults of *dyari* are readily distinguished from *barretoii* by the lighter pleural integument which strongly contrasts with the dark mesonotum.

BIONOMICS. The immature stages of *dyari* are known only from Curiche, Colombia, where they were found in large crabholes in a mangrove area. On 1 occasion adults were found in this locality in a hole in which a Wide Red Land Crab, *Ucides occidentalis*, was also collected (COA 26).

Studies on the blood feeding habits of species of *Deinocerites* in Panama indicate that *dyari* has a definite preference for reptiles (Gorgas Memorial Institute, 1970:20; Tempelis and Galindo, 1970).

This species has been found associated with *pseudodes*.

DISTRIBUTION (fig. 4). Pacific coast from the Canal Zone, Las Perlas islands southward to Curiche, Colombia. Material examined: 116 specimens; 35 males, 30 females, 32 larvae, 19 pupae; 19 individual rearings (9 larval, 5 pupal, 5 incomplete).

COLOMBIA. *El Choco*: Curiche (COA 22,24-29) [BM, UCLA, USNM].

PANAMA AND CANAL ZONE. *Canal Zone*: Corozal, J. Zetek [UCLA, USNM]. La Boca, A. Busck [USNM]. *Darien*: Boca Lava, B.F. Eldridge [USNM]. *Isla San Jose* (Archipiélago de las Perlas), J.P.E. Morrison [USNM]. *Panama*: Punta Paitilla, Panama City, GML [UCLA].

6. *Deinocerites barreto* Adames, n.sp.

Figs. 4,21

TYPES: *Holotype* male with genitalia slide (COL 47f), mouth of Raposo River, Valle, Colombia, 31 Mar 1955, V.H. Lee [USNM]. *Allotype* female with genitalia slide (COL 47a), same data as holotype [USNM]. *Paratypes*: 2 M (COL 47h,g), 3 F (47c-e), same data as holotype [UCLA, USNM].

Deinocerites dyari of Barreto and Lee (1969:435,436).

FEMALE (fig. 21). Wing 3.06 mm. Proboscis 1.88 mm. Forefemur 1.78 mm. Abdomen about 2.60 mm. Mesonotum dark brown; pleuron almost uniformly dark brown, not markedly contrasting with mesonotum. *Antenna*: Torus without scales. *Thorax*: *Apn* dark brown; *ppl* dark brown, with a few scales in middle; *ppl* dark brown, with several bristles and at least 1 scale; *psp*, *ssp*, *stp* and *pra* dark brown and concolorous with most of pleuron; *mep* dark brown, with a few scales in upper part; microsetae absent; metameron simple; meron brown; metameron and metapleuron lighter than adjacent portions of pleuron. *Legs*: Coxal integument slightly brownish; scaling and bristles as described for *dyari*.

FEMALE GENITALIA (fig. 21). *Tergite IX* with 1-4 setae on each side. *Cercus* (in lateral aspect) broadened basally and evenly narrowing distally; sternal and tergal margins convex; apex not upturned, with 4 or 5 moderately strong apical or subapical bristles which may be twisted apically. Distal part of *postgenital plate* (in ventral aspect) deeply notched, margins of notch parallel; lateral lobe elongate (in lateral aspect), its apical and dorsal bristles converging with their mates (in ventral aspect).

MALE (fig. 21). Wing 2.72 mm. Proboscis 1.78 mm. Forefemur 1.73 mm. Abdomen (not including genitalia) about 2.14 mm. Flagellar segments 1-5 markedly elongated. Anterior claws of foreleg and midleg similar to those of *dyari*.

MALE GENITALIA (fig. 21). *Segment IX*: Tergite lobe with distal part long, cylindrical, slender and reaching base of subapical lobe but not extending beyond. *Sidepiece*: Subapical lobe with a distinct thumb; seta *c* rather heavy, spiniform and bent apically; the 3 setae of ventromesal surface bristlelike and attenuated apically. *Phallosome*: Dorsal paramere only known in tergal aspect, apical spine long and strongly curved. Aedeagus apparently similar to that of *dyari*.

PUPA and LARVA. Unknown.

SYSTEMATICS. *Deinocerites barreto* appears to be closely related to *dyari* on the basis of general similarity in the male genitalia. However, it has an elongate IX tergite lobe, a primitive character state in my opinion. Therefore I consider that *barreto* is probably the earlier derivative of this phyletic line. The adults of *barreto*, as noted above and in the keys, are readily separated from the other 2 species of the group by the dark pleural integument. The male of *barreto* also differs from the others in having only flagellar segments 1-5 elongated instead of segments 1-6.

BIONOMICS. Adults of *barreto* have been collected from crabholes in a mangrove area at the mouth of the Raposo River in Colombia. On 1 occasion a female was caught in a treehole in the same area.

DISTRIBUTION (fig. 4). Pacific coast of Colombia near Buenaventura. Material examined: 13 specimens; 5 males, 8 females.

COLOMBIA. *Valle:* Rio Raposo (COL 47), type series [BM, UCLA, USNM]; (VL 26,69) [VALLE].

7. *Deinocerites nicoyae* Adames & Hogue

Figs. 4,22-24

1970. *Deinocerites nicoyae* Adames and Hogue, 1970:9. TYPE: Holotype male (CR 254-21) with associated larval and pupal skins and genitalia slide, Estero El Mero, Boca del Rio Barranca, Puntarenas Province, Costa Rica, 11 Feb 1969, C.L. Hogue and D.B. Bright [USNM].

FEMALE (fig. 22). Wing 2.79 mm. Proboscis 1.69 mm. Forefemur 1.61 mm. Abdomen about 2.83 mm. Apparently indistinguishable from *dyari*.

FEMALE GENITALIA (fig. 22). *Tergite IX* usually with 1 seta on each side (0-3). *Cercus* (in lateral aspect) broadened basally, gradually narrowing distally, sternal margin convex, tergal margin more or less concave; apex upturned, usually with 4-6 moderately strong apical or subapical bristles. Distal part of *postgenital plate* (in ventral aspect) deeply notched, margins of notch diverging distad; lateral lobe elongate (in lateral aspect), its apical bristle converging with that of its mate (in ventral aspect), its small dorsal bristle not converging.

MALE (fig. 22). Wing 2.91 mm. Proboscis 1.90 mm. Forefemur 1.90 mm. Abdomen (not including genitalia) about 1.67 mm. Flagellar segments 1-6 markedly elongated. Anterior claws of foreleg and midleg both with a heavy tooth.

MALE GENITALIA (fig. 23). *Segment IX:* Tergite lobe with distal part reaching base of subapical lobe, directed mesad distally by a distinct deep mesal curvature or constriction, expanded distally. *Sidepiece:* Subapical lobe with distinct thumb; seta *c* rather heavy and spiniform, with an apical attenuation; the most anterior seta of ventromesal surface bristlelike and attenuated apically, the 2 posterior setae spiniform, rather heavy and without apical attenuation. *Phallosome:* Dorsal paramere with caudoventral margin expanded laterad as a broad hemispherical ledge; apical spine short, heavy and strongly curved dorsad, visible *in toto* only in lateral aspect; ventral teeth large, heavy and progressively shorter toward apex. Aedeagus (in tergal aspect) broad in middle, then constricted; apex truncate and poorly sclerotized but well defined by a subapical necklike constriction.

PUPA (fig. 23). Abdomen 3.56 mm. Trumpet 0.51 mm. Paddle 0.71 mm. Diagnostic characters as in the key; general chaetotaxy based on 6 reared specimens. Hair 5-IV not reaching spiracular sensillum of segment V. *Cephalothorax:* Integument light brown. Hair 1(2), 2(2,1-3), 3(2,1-3), 4(3,2-4), 5(2), 6(1,1-2), 7(2, 2-3), 8(1), 9(2), 10(1,1-2), 11(2), 12(2,2-3). *Trumpet:* Short, index about 4.5-4.6. Integument brown distad, darker on tracheoid; markedly contrasting with cephalothoracic integument. Tracheoid about 0.45 of trumpet length. *Abdomen:* Integument light brown. Segment I: hair 1(13-14,8-15 primary branches), 2(1,1-2), 3(2,1-2), 4(3,2-5), 5(3,2-4), 6(1), 7(2,2-3), 9(1). Segment II: hair 0(1), 1(3), 2(2,1-2), 3(1), 4(3,2-4), 5(1), 6(1), 7(2,1-2), 9(1). Segment III: hair 0(1), 1(4,3-5),

2(1), 3(2,1-2), 4(1,1-2), 5(1,1-2), 6(1), 7(2,1-3), 8(4,4-6), 9(1), 10(2), 11(1,1-2), 14(1). Segment IV: hair 0(1), 1(2,2-4), 2(1), 3(3,2-3), 4(1,1-2), 5(1), 6(1), 7(2,1-3), 8(2,1-3), 9(1), 10(2), 11(1), 14(1). Segment V: hair 0(1), 1(2,2-3), 2(1), 3(2,1-2), 4(3,2-4), 5(1), 6(1), 7(4,2-4), 8(2,1-3), 9(1), 10(2,1-2), 11(1), 14(1). Segment VI: hair 0(1), 1(2,2-4), 2(1), 3(2,2-3), 4(3,2-4), 5(1), 6(1), 7(2,1-2), 8(2,1-2), 9(1), 10(2,1-2), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2,1-2), 4(2), 5(1,1-2), 6(1,1-2), 7(1,1-2), 8(2,1-2), 9(3,2-4), 10(2,1-2), 11(1), 14(1). Segment VIII: hair 0(1), 4(2), 9(1), 14(1). **Paddle:** Width about 0.70 of length; apex more or less rounded; hair 1-P usually as long as paddle.

FOURTH INSTAR LARVA (fig. 24). Head 1.05 mm. Siphon 1.14 mm. Diagnostic characters as in the key; general chaetotaxy based on 8 reared specimens. **Head:** Integument yellowish to very light brown. Mental plate triangular, wider than long, basolateral spicules sometimes denticulate, all others sharply pointed. Hair 0(1), 1(1), 2(1), 3(not detectable), 4(3,3-5), 5(4,2-5), 6(1,1-2), 7(9,7-11), 8(3,2-5), 9(3,3-5), 10(2,2-4), 11(4,2-4), 12(2,2-3), 13(4,2-4), 14(1,1-2), 15(2,2-3). **Antenna:** Length about 0.33 of head; shaft with a few minute spicules on proximal part. Hair 1(4,4-7). **Thorax:** Prothorax: hair 0(5,5-8), 1(1), 2(1), 3(2), 4(3,2-3), 5(1), 6(1), 7(4,2-4), 8(2), 9(1), 10(1), 11(4,2-5), 12(1), 14(1). Mesothorax: 1(1), 2(2,1-3), 3(1), 4(3,2-4), 5(1), 6(1), 7(1), 8(7,6-8), 9(6,5-7), 10(1), 11(4,2-4), 12(1), 13(11,8-11), 14(9,8-10). Metathorax: hair 1(1), 2(2,2-4), 3(5,3-5), 4(4,2-5), 5(1), 6(2,1-3), 7(7,7-9), 8(7), 9(7,5-8), 10(1), 11(2,2-3), 12(1,1-2), 13(4,3-5). **Abdomen:** Segment I: hair 1(1), 2(1), 3(2,2-3), 4(6,4-7), 5(3,2-4), 6(2,2-3), 7(2,2-3), 9(4,3-4), 10(4,3-4), 11(3,2-4), 12(3,2-3), 13(1). Segment II: hair 0(1), 1(1), 2(1), 3(2,2-3), 4(4,3-4), 5(4,3-5), 6(2), 7(3,2-4), 8(3,2-4), 9(1), 10(1), 11(2,2-3), 12(3,3-4), 13(6,5-8). Segment III: hair 0(1), 1(3,2-3), 2(1), 3(2,2-3), 4(2,1-2), 5(3,2-4), 6(2), 7(4,4-5), 8(2), 9(1), 10(2), 11(2), 12(2,2-3), 13(1), 14(1). Segment IV: hair 0(1), 1(1,1-2), 2(1), 3(4,3-5), 4(1,1-2), 5(2,1-2), 6(2,2-3), 7(5,4-5), 8(1), 9(1), 10(2), 11(2), 12(2,1-2), 13(2), 14(1). Segment V: hair 0(1), 1(1,1-2), 2(1), 3(1), 4(4,4-5), 5(2,1-2), 6(2), 7(4,4-5), 8(1), 9(1), 10(1), 11(2), 12(1), 13(2), 14(1). Segment VI: hair 0(1), 1(3,2-4), 2(1), 3(1), 4(4,3-4), 5(2,1-2), 6(2,1-2), 7(3,2-3), 8(2), 9(1), 10(1), 11(2), 12(1), 13(8,8-9), 14(1). Segment VII: hair 0(1), 1(2,1-2), 2(1), 3(2,2-3), 4(1), 5(2), 6(6,4-6), 7(1), 8(5,3-5), 9(1,1-3), 10(1), 11(1), 12(1), 13(2), 14(1). **Segment VIII:** Comb scales similar to those of *dyari*. Hair 0(1), 1(6,5-7), 2(1), 3(6,5-7), 4(1), 5(3,3-4), 14(1,1-2). **Siphon:** Integument medium brown. Index about 4.7-5.3. Pecten teeth 5(4-6), usually bifid, sometimes trifid, both blades very slender; distal teeth generally slightly longer. Hair 1(3,2-3), hair 1ad(2), hair 1av(2,1-3); hairs 2,6,7,8,9 all single. **Anal Segment:** Gill about 0.6 of dorsal saddle length. Hair 1-X shorter than gill. Hair 1(3,2-5), 2(7,5-7), 3(1), 4a(12,10-13), 4b(9,8-11), 4c(10,9-11), 4d(11,10-12), 4e(14,10-14), 4f(11,9-11).

SYSTEMATICS. *Deinocerites nicoyae* clearly belongs to a different phylad than the other 2 species of the group. This is particularly evident in the male genitalia (shape of paramere; spiniform setae of ventromesal surface of subapical lobe; IX tergite lobe) but is also suggested in the larva (reduction of ventral brush and branching of hairs 6-III,IV). It seems likely therefore that *nicoyae* represents the earliest offshoot of the group.

I have tentatively assigned to *nicoyae* a single female collected in a light trap at Puerto Somoza, Nicaragua. It is possible that this specimen could represent a distinct species but this cannot be determined without males and immature stages.

BIONOMICS. *Deinocerites nicoyae* has been collected in mangrove areas most

frequently in the burrows of the Wide Red Land Crab, *Ucides occidentalis*. The immature stages were found on 1 occasion only, when the water level in these burrows was considerably depressed. Occasionally associated with *nicoyae* was *pseudus*, which more frequently utilizes the burrows of *Cardisoma crassum*.

DISTRIBUTION (fig. 4). Pacific coast from Puerto Somoza, Nicaragua, to the mouth of the Gulf of Nicoya in Costa Rica. Material examined: 422 specimens; 151 males, 93 females, 167 larvae, 11 pupae; 11 individual rearings (6 larval, 3 pupal, 2 incomplete).

COSTA RICA. *Puntarenas*: Boca del Rio Barranca, Estero El Mero (CR 238,420,254; LCBA-188) [BM, LACM, UCLA, USNM]. La Angostura (CR 3,27) [UCLA].

NICARAGUA: *Leon*: Puerto Somoza (NI 20) [UCLA].

CANCER GROUP

FEMALES. Medium-sized species, wing 2.78-3.01 mm. Mesonotum dark; pleural integument whitish to dark, distinctly, slightly or not contrasting with mesonotal integument. **Antenna:** Flagellar segment 1 with scales, about equal to combined length of segments 2-4; segments 2-12 subequal in length but progressively slightly shortened distad; moderately long, exceeding proboscis from at least basal half of flagellar segment 9. **Thorax:** Postnotum without setae. **Apn** whitish to dark brown; **ppn** usually whitish to dark brown, scales all narrow; **ppl** whitish to dark brown; **psp**, **ssp**, **stp** and **pra** slightly (usually) or markedly darker than rest of pleuron; paratergite either light brown or dark brown; **mep** whitish to dark brown and without translucent scales, **lmep** with 1 very strong bristle; meron, metameron and metapleuron whitish to light brown. **Legs:** Coxal integument whitish to brownish. Basal two-thirds of posteroventral surface of all femora pale; anteroventral margin of forefemur without spiniforms but with 6-8 strong bristles on distal two-thirds, posterodorsal margin with a row of weak bristles. **Abdomen:** Sternites II-IV paler than tergites.

FEMALE GENITALIA. **Sternite VIII** with sclerotized distal band broad and without scales; caudal margin produced into a distinct submedian ventral angle, with several very strong marginal bristles. **Tergite IX** without setae. **Tergite X** represented dorsally by a poorly sclerotized cuplike area and laterally by a broad strong sclerite at base of cercus. **Cercus** with 2 long apical or subapical spatulate setae.

MALES. Essentially similar to females. **Antenna:** Exceeding proboscis from at least base of flagellar segment 5; flagellar segments 1-4 with scales; segments 1-6 markedly elongated but progressively shorter distad; segment 1 always shorter than combined length of segments 2 and 3; segments 7-12 subequal but progressively slightly shortened distad; segment 13 either shorter, equal or slightly longer, but always slightly broader, than 12. **Legs:** Claws of foreleg and midleg enlarged; anterior member of a pair larger and with a variable subbasal to almost basal tooth, posterior with or without subbasal tooth.

MALE GENITALIA. **Segment IX:** Tergite lobe not markedly angled laterad at base; distal part strongly flattened, widened; apex sometimes exceeding the subapical lobe. **Sidepiece:** Without scales. Apicosternal lobe prominent, with a long apical seta. **Phallosome:** Dorsal parameres connected by a variable, but well differentiated dorsal sclerotized bridge; articulated ventrally with a dorsal sclerotized projection from basal third of aedeagus.

PUPAE. **Cephalothorax:** Hairs 2,3-C closely approximated, 2-C weaker and shorter than 3-C; hair 5-C double, strongly developed, longer than distance from its

alveolus to base of trumpet, about 1.3-1.5 of trumpet length; 7-C usually double or triple (2-5); hair 8-C usually with 2-5 branches (1-6). **Metanotum:** Hair 10-C moderately to strongly developed, always longer than 11-C, branching varied (1-7). **Abdomen:** Hair 1-II not reaching apex of tergite III, multibranched (6-30), sometimes dendritic and barbed; 1-III-VI branched; 5-II always laterad of 3-II; hair 3-V usually double (1-4); hair 1-VII shorter or sometimes equal to tergite VIII, never exceeding basal third of 4-VIII. **Paddle:** Hair 1-P longer than paddle.

FOURTH INSTAR LARVAE. **Head:** Hair 2-C varied in length from 0.5 to longer than 1-C, always markedly mesad of 1-C; hair 5-C usually with 4 barbed branches (2-5); hair 6-C single and barbed, about 1.33-1.50 of 5-C. **Thorax:** Prothoracic hair 9-P single. **Abdomen:** Hair 6-II double; dorsal sensillum of segment V laterad of 4-V; hair 6-VI single; 1-VII moderately developed, longer than 3-VII, exceeding base of segment VIII but not reaching base of siphon; 1-VIII usually with 3 or 4 branches (2-5). **Siphon:** Hair 1-S usually double (1-5). **Anal Segment:** Ventral brush (4-X) with 6 or 7 pairs of hairs. Gill slightly emarginate on apex; short, about 0.45-0.60 of dorsal saddle length. Dorsal saddle narrow, its ventral margin far from hair 1-X.

DISCUSSION. The Cancer Group is well marked by unique features in both male (IX tergite lobe) and female (cercal setae) genitalia. The immature stages of this group are very similar to those of the Pseudos Group from which, however, they can usually be separated by the characters given in the keys.

On the basis of morphological features of the adults (length of antenna) and larvae (ventral brush), the clearly marked *magnus* appears to be the representative of the primitive stock of the group. The other 2 species of the group, *cancer* and *melanophylum*, are obviously closely related and show derived states in these characters.

The group is apparently restricted to the Atlantic basin and its distribution is centered around the Caribbean Sea with extensions northward into the Bahamas and Florida and southward to the state of Maranhao in Brazil. The 3 species have complementary allopatric distributions with a possible gap in eastern Venezuela: *cancer* in Central America down to at least Almirante, Panama, in the western Antilles through Hispaniola, and in the Bahamas and southern Florida; *melanophylum* from central Panama through Colombia to central Venezuela; and *magnus* in the eastern Antilles from Mona and Puerto Rico through the Lesser Antilles, Trinidad and Tobago, the Guianas and in Brazil south of the Amazon. Over much of the group's distribution (West Indies, Bahamas, Florida, eastern South America) either *cancer* or *magnus* is the only representative of the genus.

The species of the group are usually common in areas where no other species of the genus are present. Considerable information has been accumulated on the bionomics of *cancer* in recent years but little is known about the other species. All 3 species may occasionally bite man but in Panama *cancer* appears to have a preference for avian blood and *melanophylum* for reptilian blood. The immature stages of all 3 species are usually found in large crabholes, probably largely those made by *Cardisoma guanhumii*.

8. *Deinocerites cancer* Theobald

Figs. 1,5,25-28

1901. *Deinocerites cancer* Theobald, 1901b:215-216,356. TYPE: Lectotype female, Spanish

Town Road, Kingston, Jamaica, 8 Feb 1900, M. Grabham [BM; designation of Belkin and Hogue, 1959:432].

1909. *Deinocerites tetraspathus* Dyar and Knab, 1909:260. TYPE: Lectotype female with genitalia slide (472), Bluefields, Nicaragua [USNM, 12109; designation of Stone and Knight, 1957:197]. Synonymy with *cancer* by Dyar (1928:262).

Deinocerites cancer of Pazos (1904:135); Dyar (1905b:24; 1905c:27; 1905d:53; 1905e:109; 1922:8); Felt (1905:491,492); Coquillett (1906:26; 1910:531); Mitchell (1906:19,20; 1907a:13; 1907b:264); Knab (1907a:121); Dyar and Knab (1918:183); Johnson (1919:422); Gowdey (1926:73); Gerry (1932:43,44,71); King, Bradley and McNeel (1944:4,61,68,79,81); Middlekauff and Carpenter (1944:89); Roth and Young (1944:84); Pratt, Wirth and Denning (1945:426); Wirth (1945:200); Carpenter and Chamberlain (1946:88); Carpenter, Middlekauff and Chamberlain (1946:275-277); Pritchard (1947:13); Thompson (1947:78); Hill and Hill (1945:2; 1948:51-52); Thurman, Haeger and Mulrennan (1949:171); de la Torre, Alayo and Calderon (1956:80); Pratt (1956:8); Branch, Logan, Beck and Mulrennan (1958:161,162); Belkin and Hogue (1959:432-434); Branch and Seabrook (1959:216); Evans (1962:255); Dodge (1963:798,811; 1966:375); Ross (1964:104); Porter (1964:222); Forattini (1965:108); Downes (1966:1169-1177); Montchadsky and Garcia Avila (1966:47); Provost and Haeger (1967:565-574); Gentry, Gerberg and Hopkins (1970:68-70); Gorgas Memorial Institute (1970:20); Tempelis and Galindo (1970).

Deinocerites cancer in part of Theobald (1903:276-281; 1905a:35-36; 1905b:37; 1910:553); Dyar and Knab (1906:188); Surcouf and Gonzalez-Rincones (1911:91); Howard, Dyar and Knab (1915:201-205); Bonne and Bonne-Wepster (1925:173-174); Dyar (1928:262-263); Edwards (1932:222); Matheson (1944:250-251); Lane (1953:554-556); van der Kuyp (1953b:144,146); Carpenter and LaCasse (1955:325-327); Horsfall (1955:599-600); Perez Viguera (1956:476-483); Forattini (1958:175); Stone, Knight and Starcke (1959:284).

?*Deinocerites cancer* of Martini (1935:57); Vargas (1956:30).

?*Deinocerites cancer* in part of Knab (1907:95-97).

Dinocerites cancer in part of Blanchard (1905:414).

Deinokerides cancer in part of Giles (1902:472-473).

Culex (Deinocerites) cancer of Dyar (1918:102).

Deinocerites tetraspathus of Howard, Dyar and Knab (1915:209-210); Bonne and Bonne-Wepster (1925:175).

Deinocerites melanophylum in part of Dyar (1925:155).

Brachiomyia magna in part of Giles (1902:474).

FEMALE (figs. 1,25,26). Wing 2.88 mm. Proboscis 2.09 mm. Forefemur 1.73 mm. Abdomen about 3.11 mm. Mesonotum dark brown, pleural integument slightly contrasting with mesonotal integument or concolorous. **Head:** Narrow decumbent scales of vertex creamy to brownish; erect scales brown to dark brown; lateral patch of broad decumbent scales whitish. **Antenna:** Torus occasionally with 1 scale; variable in length, exceeding proboscis from at least basal half of flagellar segment 9 to apex of segment 8. **Thorax:** *Apn* pale brown to dark brown; *ppn* pale brown to dark brown, usually with several scales in middle and lower part; *ppl* pale brown to brown, with several bristles and scales; *psp*, *ssp*, *stp* and *pra* brown to dark brown; paratergite brown to dark; *mep* brown to dark brown, upper part with several bristles, microsetae absent; metameron simple; meron, metameron and metapleuron very pale brown to medium brown. **Legs:** Coxal integument very pale brown to medium brown; anterior surface of forecoxa covered with bristles and translucent scales, basolateral area with a few bristles; midcoxa with scales anterolaterally, with 2 rows of bristles laterally, the anterior bristles more irregular in order, the posterior ones stronger, posterolateral surface simple; hindcoxa with scales and several bristles laterally, posterior surface with bristles. **Haltere:** Stem with dorsoapical part with several bristles.

FEMALE GENITALIA (fig. 26). *Sternite VIII* with differentiated marginal bristles largely restricted to sternal margin, at most continued dorsad on one-third of caudolateral border. *Cercus* (in lateral aspect) with sternal margin more or less convex but slightly sinuous subapically, tergal margin more or less straight but slightly downturned apically; apex downturned; the 2 specialized setae inserted side by side on apex and subequal in length; tergal and sternal surfaces each with a moderately strong normal bristle, the sternal shorter and closer to apex. Distal part of *postgenital plate* (in ventral aspect) with width not more than 1.8 of length, usually with notch as deep as wide; lateral lobe short and more or less rounded (in lateral aspect), its apical bristle subequal to total length of lobe and displaced mesad and proximad of apex, convergent with its mate (in ventral aspect), its small dorsal and subapical bristles appearing almost apical.

MALE (fig. 25,26). Wing 3.34 mm. Proboscis 2.60 mm. Forefemur 2.40 mm. Abdomen (not including genitalia) about 3.0 mm. Flagellar segment 4 with very few scales, segment 13 subequal to 12. Proboscis extending to distal third of flagellar segment 4. Anterior claws of foreleg and midleg similar, with a large sub-basal tooth.

MALE GENITALIA (fig. 27). *Segment IX*: Tergite lobe extending beyond subapical lobe, with the external and internal margins rather evenly curved, distal part very broad. *Sidepiece*: Subapical lobe without a distinct thumb; seta *c* rather heavy, spiniform and with apex bent and attenuated. *Phallosome*: Dorsal parameres closely approximated tergally and with a broad dorsal, almost complete bridge; apical spine slender, moderately curved; ventral teeth slender, long and arising from a distinct process from the convex caudolateral border, two or more teeth often with a common base, several additional smaller denticles removed from border. Aedeagus (in tergal aspect) with outer margins sinuous, expanded before middle, constricted near middle and expanded subapically, apex more or less rounded.

PUPA (fig. 27). Abdomen 3.64 mm. Trumpet 0.53 mm. Paddle 0.76 mm. Diagnostic characters as in the key; general chaetotaxy based on 10 reared specimens. Also differing from *melanophylum* in hair 10-C usually being double or triple (1-7) instead of usually with 4-6 branches (2-8). *Cephalothorax*: Integument yellowish. Hair 1(2,2-3), 2(4,3-5), 3(2), 4(3,2-4), 5(2), 6(1), 7(2), 8(2,2-4), 9(2,1-3), 10(2), 11(2,1-3), 12(3,2-5). *Trumpet*: Short, slightly widening apically; index about 4.1-5.1. Integument brown distad, slightly darker on tracheoid; contrasting with cephalothoracic integument. Tracheoid about 0.36 of trumpet length. *Abdomen*: Integument light to medium brown. Segment I: hair 1(16,12-19), 2(1,1-2), 3(2,1-2), 4(4,3-5), 5(5,3-7), 6(2,1-2), 7(3,2-4), 9(1,1-3). Segment II: hair 0(1), 1(7,5-8), 2(1,1-2), 3(1), 4(3,3-5), 5(1,1-2), 6(1), 7(2,1-2), 9(1). Segment III: hair 0(1), 1(4,3-6), 2(1), 3(2,2-3), 4(2,1-2), 5(1,1-2), 6(1), 7(2,2-3), 8(3,2-5), 9(1), 10(2,1-3), 11(1), 14(1). Segment IV: hair 0(1), 1(3,2-6), 2(1), 3(6,4-7), 4(1,1-2), 5(1), 6(1), 7(2,1-3), 8(2,1-3), 9(1), 10(2,2-3), 11(1), 14(1). Segment V: hair 0(1), 1(3,1-3), 2(1), 3(2,1-2), 4(3,3-5), 5(1), 6(1), 7(3,1-4), 8(3,2-4), 9(1), 10(1,1-2), 11(1), 14(1). Segment VI: hair 0(1), 1(3,2-4), 2(1), 3(2,1-3), 4(2,2-3), 5(1), 6(1), 7(1,1-2), 8(2,2-3), 9(1), 10(2,1-3), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2), 4(2,1-4), 5(2,1-3), 6(1), 7(1), 8(2,2-3), 9(3,2-5), 10(2,1-3), 11(1), 14(1). Segment VIII: hair 0(1), 4(2), 9(1), 14(1). *Paddle*: Width about 0.71-0.81 of length, apex more or less rounded.

FOURTH INSTAR LARVA (fig. 28). Head 1.16 mm. Siphon 1.25 mm. Diagnostic characters as in the key; general chaetotaxy based on 10 reared specimens.

Head: Integument yellowish to light brown. Mental plate wider than long, triangular, lateral spicules denticulate, terminal ones sharply pointed, median terminal conspicuously produced. Hair 0(1), 1(1), 2(1), 3(sometimes developed as a minute spicule), 4(4,2-6), 5(4,3-5), 6(1), 7(8,6-8), 8(3,3-4), 9(5,3-6), 10(2,2-3), 11(5,2-5), 12(2,2-4), 13(5,3-6), 14(1), 15(2,1-3). **Antenna:** Length about 0.41 of head; shaft with a few spicules on proximal part. Hair 1(5,4-6). **Thorax:** Prothorax: hair 0(8,4-10), 1(1), 2(1), 3(1,1-2), 4(3,2-3), 5(1), 6(1), 7(3,2-3), 8(1), 9(1), 10(1), 11(3,2-5), 12(1), 14(1). Mesothorax: hair 1(1), 2(2,2-3), 3(1), 4(3,2-3), 5(1), 6(1), 7(1), 8(6,5-7), 9(7,5-9), 10(1), 11(3,2-4), 12(1), 13(8,8-12), 14(8,6-10). Metathorax: hair 1(1), 2(3,1-4), 3(4,3-6), 4(4,3-6), 5(1), 6(2,1-2), 7(8,6-9), 8(6,6-8), 9(7,5-9), 10(1), 11(2,2-3), 12(1), 13(4,3-5). **Abdomen:** Segment I: hair 1(1), 2(1), 3(3,2-3), 4(6,4-8), 5(4,2-4), 6(2), 7(2), 9(2,1-3), 10(2,1-3), 11(2,2-4), 12(2,2-3), 13(2,1-2). Segment II: hair 0(1), 1(1), 2(1), 3(3,2-3), 4(5,4-7), 5(3,2-3), 6(2,2-3), 7(5,4-6), 8(3,2-4), 9(1,1-2), 10(1), 11(3,2-3), 12(3,2-3), 13(8,6-11). Segment III: hair 0(1), 1(3,2-4), 2(1), 3(1,1-2), 4(2,1-4), 5(2,2-3), 6(2), 7(6,4-6), 8(2,1-3), 9(1), 10(1), 11(2,2-3), 12(1), 13(1,1-2), 14(1). Segment IV: hair 0(1), 1(1), 2(1), 3(3,3-4), 4(1,1-2), 5(2,1-3), 6(2), 7(4,4-7), 8(1), 9(1,1-2), 10(1), 11(2,2-3), 12(2), 13(2), 14(1). Segment V: hair 0(1), 1(1), 2(1), 3(1), 4(5,4-7), 5(2,1-3), 6(2), 7(6,4-6), 8(1), 9(1,1-2), 10(1), 11(1,1-2), 12(2,1-2), 13(2), 14(1). Segment VI: hair 0(1), 1(3,2-3), 2(1), 3(1), 4(3,2-4), 5(2,2-4), 6(1), 7(3,2-4), 8(2,2-4), 9(1), 10(1), 11(2), 12(1,1-2), 13(12,8-14), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2,2-4), 4(1), 5(3,2-3), 6(8,6-8), 7(1,1-2), 8(5,4-7), 9(1,1-3), 10(1), 11(1), 12(1), 13(2,1-3), 14(1). **Segment VIII:** Comb scales slender at base, wider apically, fringe restricted to apex. Hair 0(1), 1(4,3-4), 2(1), 3(4,3-5), 4(1), 5(3,2-3), 14(1,1-2). **Siphon:** Integument light brown. Index about 4.4-5.7. Pecten teeth 5(5-7), usually bifid, sometimes trifid, longest blade wider; basal tooth shorter, others progressively longer apically. Hair 1(2,2-3), hair 1ad(2), hair 1av(1,1-2), hairs 2,6,7,8 and 9 all single. **Anal Segment:** Gill about 0.60 of dorsal saddle length. Hair 1-X longer than gill. Hair 1(1), 2(6,5-7), 3(1), 4a(11,11-13), 4b(10,9-11), 4c(9,8-10), 4d(9,8-11), 4e(11,10-13), 4f(11,6-13).

SYSTEMATICS. *Deinocerites cancer* appears to be the dominant and most widespread derivative of the group. It is very similar to *melanophylum*, particularly in the female and larva. However it can usually be separated from *melanophylum* in all stages by the key characters, except as noted under *melanophylum* for some Venezuelan larvae.

I have found no significant differences between the Antillean and Central American populations of *cancer* and I am convinced that only 1 species is involved. Such a pattern of distribution is known for a number of other mosquitoes (Belkin, Heinemann and Page, 1970:9, Middle American element) and suggests that the present large water gaps between these areas are relatively recent (Belkin and Hogue, 1959:430).

BIONOMICS. *Cardisoma guanhumii* appears to be the only species of crab definitely identified as the maker of the burrows utilized by the immature stages of *cancer* (Pratt, Wirth and Denning, 1945:246; Haeger and Phinizee, 1959:34). In Cuba, the immatures of *cancer* have been reported from burrows of *Cardisoma* and unidentified species of stream inhabiting crabs of the genus *Epilobocera* (family Pseudothelphusidae) by Montchadsky and Garcia (1966:47). Belkin, Heinemann and Page (1970:49) state that in Jamaica *cancer* has been collected only in crab-holes of medium to large size and never in smaller ones like those made by fiddler crabs. The immature stages of *cancer* have been reported several times from out-

side their normal breeding sites: from rockholes by Wirth (1945:200) and by Belkin, Heinemann and Page (1970:49); from a treehole by Porter (1964:222); from a tin can (T.E. Duffey record in Carpenter, Middlekauff and Chamberlain, 1946:277); from a wooden bucket, an abandoned septic tank and a tin can (Porter, 1964:222, records of F.H. Stutz and J.H. Heidt); and from flooded areas with crabholes by several workers.

The normal associates of the immature stages of *cancer* are other normally obligate breeders in crabholes that occur sympatrically: *Culex (C.) janitor* and *Culex (Mel.) carcinophilus* in the West Indies; *D. epitedeus*, *Culex (Tin.) latisquama* and 1 or more species of the *Culex (C.) inflictus* complex in Central America and Panama. Other species occasionally found associated with *cancer* in unusual breeding sites, including shallow or flooded crabholes, are: *Aedes (O.) taeniorhynchus*, *Anopheles (A.) grabhamii*, *Anopheles (Nys.) albimanus*, *Culex (C.) nigripalpus*, *Culex (C.) bahamensis*, *Culex (Mel.) elevator* complex, *Culex (Mel.) opisthopus* and *Psorophora (G.) jamaicensis* in various ground pools (Belkin, Heinemann and Page, 1970:49; Pratt, Wirth and Denning, 1945:246; Wirth, 1945:200); *Aedes (F.) triseriatus* complex and *Culex (C.) nigripalpus* in treeholes or containers (Carpenter, Middlekauff and Chamberlain, 1946:277; Porter: 1964:222).

The bionomics of *cancer* have been studied by Haeger and Phinizee (1959) in an autogenous colony from the Florida Keys and by Gentry, Gerberg and Hopkins (1970) in Baltimore in a colony established from material collected on Grand Cayman Island. According to the latter authors larval development requires 3 to 4 weeks at 27° C while Haeger and Phinizee (1955:35) state that it took about 2 to 3 weeks.

Howard, Dyar and Knab (1915:205) attribute to M. Grabham the statement that *cancer* feeds only at night and is "a voracious bloodsucker". Hill and Hill (1948:52) dealing with the same topotypic Jamaican population of *cancer* report that: "while they probably feed on crabs, we have caught them full of blood in animal-baited traps and occasionally they will bite man." Forattini (1965:108) does not specify the source of his statement that *cancer* attacks animals such as horses and man. Gentry, Gerberg and Hopkins (1970:79) report feeding females on chickens and indicate that although a bared forearm was offered on numerous occasions, bites were experienced only 4 times; no full engorgement was noted either on chicken or human hosts. Haeger and Phinizee (1959:37) found that in their colony females would not feed on man or animals until a batch of autogenous eggs was laid. After that a few would bite man and would also feed to a limited extent on both land crab and salt water blue crab haemolymph to produce a second batch of eggs. Studies on the blood feeding habits of *cancer* in Almirante, Panama, have shown that this population has a definite preference for avian blood (Gorgas Memorial Institute, 1970:20; Tempelis and Galindo, 1970).

The unusual mating behavior of *cancer* has been studied in detail by Downes (1966) and by Provost and Haeger (1967). The males exhibit a so-called "pupal attendance behavior" during which they walk on the surface of the water with the antennae directed down to the surface. When a female pupa is encountered its trumpets are touched by the tips of the antennae and it is seized and held by the claws of the male. Copulation takes place before the female is completely free of the pupal skin. More than 1 male may attempt to copulate with 1 female and some females may emerge unattended but are soon contacted by 1 or more males.

DISTRIBUTION (fig. 5). From Florida and the Bahamas through Cuba and His-

paniola to the Atlantic coast of Central America from the Yucatan Peninsula in Mexico to the Bocas del Toro Province in Panama. Material examined: 5773 specimens; 668 males, 1294 females, 2868 larvae, 943 pupae; 635 individual rearings (250 larval, 333 pupal, 52 incomplete).

BAHAMA ISLANDS. *Abaco*: Marsh Harbor, G.M. Stokes [USNM].

BRITISH HONDURAS. Belize, D.S. Bertram [LOND, UCLA]; [USNM]. Trapp's Key, W.H. Sligh [USNM].

CAYMAN ISLANDS. Grand Cayman (CAY 10A,11A,12,13,19,127) [UCLA].

COSTA RICA. *Limon*: Cahuita (LCBA 233,234,237,238,240-243) [LACM, UCLA].

CUBA. *Guantanamo*: U.S. Naval base, K.L. Knight (461,462) [UCLA, USNM]. *La Habana*: Habana, J.R. Taylor [USNM]. *Marianao*, H.P. Carr [UCLA, USNM]. *Pinar del Rio*: Mariel, J.R. Taylor [USNM].

DOMINICAN REPUBLIC. *Azua*: Azua, P.A. Ricart [USNM]. *Montecristi*: Montecristi, P.A. Ricart [UCLA, USNM]. *San Pedro de Macoris*: San Pedro de Macoris, P.A. Ricart [USNM]. *Santo Domingo*: Santo Domingo, A. Busck (1136,580113-11); F.E. Campbell (10.1,10.2,10.4) [UCLA, USNM].

FLORIDA. *Beach County*: Boca Raton, Wanamaker [USNM]; [UCLA, USNM]. *Broward County*: Ft. Lauderdale, W.W. Wirth and D.G. Denning [UCLA, USNM]. Hollywood [USNM]. *County not specified*: (1173,1282,1302,1719-8,1946,1990) [USNM]. *Dade County*: Coral Gables [USNM]. Miami, G.F. Mozzette [UCLA, USNM]; [USNM]; W.W. Wirth [USNM]. Miami Beach W.W. Wirth [USNM]. *Martin County*: Jupiter Island, Wanamaker [USNM]. *Monroe County*: Key West Banks [USNM]. *St. Lucie County*: Ft. Pierce [USNM]; N.G. Piatte [USNM].

GUATEMALA. *Izabel*: Puerto Matias (GUA 5) [UCLA].

HAITI. *Department not specified*: W.H.W. Komp, leg (No. T.5) [USNM]; S.S. Cook [USNM]. *Ouest*: Gode (HAT 12) [UCLA]. Gressier (HAT 3,4) [UCLA]. Riviere Froide (HAT 1) [UCLA]. *Sud*: Les Cayes (HAT 14) [UCLA].

HONDURAS. Puerto Castilla, R.X. Maxwell (100) [UCLA, USNM]; (HON 8,9) [UCLA]. Puerto Cortes (HON 62,66,69,71-75,77,79,81-84,86,87,89,91) [UCLA]. Tela, W.H.W. Komp [USNM].

JAMAICA. Near the coast all around the island. For specific localities see Belkin, Heinemann and Page (1970:50).

MEXICO. *Cozumel, Isla de*: Espiritu Santo Bay [USNM].

NICARAGUA. *Zelaya*: Bluefields (NI 34,51) [UCLA].

PANAMA. *Bocas del Toro*: Almirante (PA 1033, GML 03690) [UCLA].

SAN ANDRES, ISLA DE (Colombia). (ISA 209,211,214) [UCLA].

9. *Deinocerites melanophylum* Dyar & Knab

Figs. 5,29-31

1907. *Deinocerites cancer melanophylum* Dyar and Knab, 1907b:200. TYPE: Lectotype male, Colon, Panama, A. Busck, 213 [USNM, 10865; designation of Stone and Knight, 1957:197].

1925. *Deinocerites monospathus* Dyar, 1925:155. TYPE: Holotype female, Fort Sherman, Panama, Canal Zone, 24 April 1925, D. Baker; unique (mounted on same slide with normal female of *melanophylum*) [USNM, 12128]. Synonymy with *melanophylum* by Belkin and Hogue (1959:434).

Deinocerites melanophylum of Busck (1908:60-61); Howard, Dyar and Knab (1915:207-209); Dyar (1923:179); Stone and Knight (1957:197); Belkin and Hogue (1959:434-435); Stone, Knight and Starcke (1959:285); Downes (1966:1173); Gorgas Memorial Institute (1970:20); Tempelis and Galindo (1970).

Deinocerites melanophylum in part of Dyar (1925:155).

?*Deinocerites melanophylum* of van der Kuyp (1953a:38).

?*Deinocerites melanophylum* in part of Bonne and Bonne-Wepster (1925:175); van der Kuyp (1948b:895-897; 1953b:144,146; 1954:39,46,56,57,64,67,71,72,73,76,82,84,86,88,90,95,96, 112).

Culex (Deinocerites) melanophylum of Dyar (1918:102).

Deinocerites monospathus of Dyar (1928:263); Horsfall (1955:599); Stone and Knight (1957: 197).

Deinocerites cancer of Anduze (1941:17); Anduze, Pifano and Vogelsang (1947:16); Arnett (1950:107); Carpenter and Peyton (1952:677,681); Komp (1956:349-351).

Deinocerites cancer in part of Lane (1953:554-556); Carpenter and LaCasse (1955:327); Horsfall (1955:599-600); Forattini (1958:175); Stone, Knight and Starcke (1959:284).

?*Deinocerites pseudus* of Anduze (1941:17); Anduze, Pifano and Vogelsang (1947:16).

FEMALE (fig. 29). Wing 3.01 mm. Proboscis 1.98 mm. Forefemur 1.73 mm. Abdomen about 2.70 mm. Essentially similar to *cancer* except for the antenna exceeding the proboscis from base of antennal flagellar segment 8.

FEMALE GENITALIA (fig. 29). Essentially as in *cancer* except for the following. Distal part of *postgenital plate* (in ventral aspect) with width always more than 2.0 of length, notch often poorly differentiated, anterior border with a distinct median cephalic sclerotized projection; lateral lobe poorly differentiated, usually appearing only as a small rounded protuberance.

MALE (fig. 29). Wing 3.0 mm. Proboscis 2.39 mm. Forefemur 1.63 mm. Abdomen (not including genitalia) about 2.35 mm. Flagellar segment 4 with several scales, segment 13 slightly longer than 12. Proboscis extending to distal one-third of flagellar segment 4. Anterior claw of foreleg with a small subbasal tooth, that of midleg with a longer and heavier tooth.

MALE GENITALIA (fig. 30). *Segment IX*: Tergite lobe essentially as in *cancer* except not quite as broad apically and with more sinuous margins. *Sidepiece*: Essentially as in *cancer* except that seta *c* usually less attenuated apically. *Phallosome*: Dorsal parameres widely separated in tergal aspect and with a long narrow incomplete dorsal bridge; apical spine long, slender and strongly curved; ventral teeth short and heavy to minute and in several rows, directed parallel to convex margin so that they appear appressed to body of paramere. Aedeagus in tergal aspect expanded before middle, constricted near middle then expanded subapically; apex blunt.

PUPA (fig. 30). Abdomen 3.34 mm. Trumpet 0.45 mm. Paddle 0.68 mm. Diagnostic characters as in the key; general chaetotaxy based on 10 reared specimens. *Cephalothorax*: Integument yellowish to medium brown. Hair 1(2,2-5), 2(4,3-5), 3(2,2-3), 4(4,3-5), 5(2), 6(1), 7(2,1-2), 8(3,1-6), 9(2,1-3), 10(6,4-7), 11(3,2-5), 12(2,2-4). *Trumpet*: Short, slightly widening apically; index about 3.4-4.3. Integument brown distad, slightly darker on tracheoid; contrasting with cephalothoracic integument. Tracheoid about 0.38 of trumpet length. *Abdomen*: Integument light to medium brown. Segment I: hair 1(16,12-23, primary branches), 2(1), 3(2,1-3), 4(3,3-5), 5(3,3-7), 6(1), 7(3,2-4), 9(1). Segment II: hair 0(1), 1(11-17), 2(2,1-3), 3(1), 4(4,1-6), 5(1,1-4), 6(1), 7(2,1-3), 9(1). Segment III: hair 0(1), 1(6,3-7), 2(1), 3(4,1-7), 4(1,1-2), 5(1), 6(1), 7(2,1-4), 8(2,1-5), 9(1), 10(2,1-2), 11(1), 14(1). Segment IV: hair 0(1), 1(3,2-5), 2(1), 3(6,3-7), 4(1), 5(1), 6(1), 7(2,1-3), 8(1,1-2), 9(1), 10(2,1-3), 11(1), 14(1). Segment V: hair 0(1), 1(2,1-4), 2(1), 3(2,2-3), 4(3,2-6), 5(1), 6(1), 7(4,2-5), 8(2,1-2), 9(1), 10(1,1-2), 11(1), 14(1). Segment VI: hair 0(1), 1(2,1-3), 2(1), 3(2,1-3), 4(4,3-5), 5(1), 6(1), 7(1,1-2), 8(2,1-3), 9(1), 10(2,1-2), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2,1-2),

4(2,1-2), 5(1,1-3), 6(1,1-3), 7(1), 8(2,1-3), 9(4,3-6), 10(2,1-2), 11(1), 14(1). Segment VIII: hair 0(1), 4(2,1-3), 9(1), 14(1). **Paddle:** Width about 0.70 of length; apex more or less rounded.

FOURTH INSTAR LARVA (fig. 31). Head 1.16 mm. Siphon 1.31 mm. Diagnostic characters as in the key; general chaetotaxy based on 7 reared specimens. **Head:** Integument yellowish to light brown. Mental plate wider than long; shape of spicules variable, apex either simple or denticulate. Hair 0(1), 1(1), 2(1), 3 (sometimes developed as a spicule), 4(7,6-8), 5(5,4-6), 6(1), 7(10,8-12), 8(4,3-4), 9(4,4-5), 10(3,2-5), 11(5,3-6), 12(3,2-3), 13(4,3-6), 14(1), 15(3,2-4). **Antenna:** Length about 0.43 of head; shaft with several spicules on proximal part; hair 1 (6,4-9). **Thorax:** Prothorax: hair 0(9,7-12), 1(1), 2(1), 3(2,2-3), 4(4,3-5), 5(1), 6(1), 7(4,2-5), 8(1,1-2), 9(1), 10(1), 11(3,3-4), 12(1), 14(1). Mesothorax: hair 1(1), 2(3,2-4), 3(1), 4(2,2-3), 5(1), 6(1), 7(1), 8(7,4-8), 9(6,5-8), 10(1), 11(3,2-3), 12(1), 13(?), 14(10,8-12). Metathorax: hair 1(1), 2(4,3-6), 3(6,4-7), 4(5,3-5), 5(1), 6(1), 7(9,8-10), 8(7-10), 9(6-10), 10(1), 11(4), 12(1), 13(6,5-7). **Abdomen:** Segment I: hair 1(1), 2(1), 3(3,2-4), 4(9,7-11), 5(3,2-4), 6(2), 7(2,1-3), 9(4,3-4), 10(2,2-3), 11(3,2-6), 12(3,2-4), 13(1). Segment II: hair 0(1), 1(1), 2(1), 3(3,2-4), 4(7,6-9), 5(4,2-5), 6(2,2-3), 7(4,4-7), 8(3,2-4), 9(1), 10(1), 11(2,2-3), 12(3,2-3), 13(7,7-12). Segment III: hair 0(1), 1(3,1-3), 2(1,1-2), 3(1,1-2), 4(2,1-3), 5(3,2-4), 6(2), 7(6,6-8), 8(2,2-3), 9(1), 10(1,1-2), 11(2,1-3), 12(3,2-3), 13(1), 14(1). Segment IV: hair 0(1), 1(2,1-2), 2(1), 3(4,3-5), 4(2,1-3), 5(3,2-4), 6(2), 7(6,6-8), 8(1), 9(1), 10(1), 11(2,2-3), 12(2,1-2), 13(2), 14(1). Segment V: hair 0(1), 1(2,1-2), 2(1), 3(1), 4(7,5-9), 5(3,3-5), 6(2), 7(8,7-9), 8(1,1-2), 9(1), 10(1), 11(2), 12(1,1-2), 13(2,2-3), 14(1). Segment VI: hair 0(1), 1(4,3-5), 2(1), 3(1), 4(3,2-4), 5(5,4-5), 6(1), 7(4,3-5), 8(3,2-3), 9(1), 10(1,1-2), 11(2,2-3), 12(1), 13(13-17), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(5,4-5), 4(1), 5(2,2-3), 6(10,9-12), 7(1,1-2), 8(5,4-6), 9(4,2-4), 10(1), 11(1), 12(1), 13(2,2-4), 14(1). **Segment VIII:** Comb scales slender, slightly wider near middle, fringe conspicuous at apex, less developed in distal half. Hair 0(1), 1(4,3-5), 2(1), 3(4,4-5), 4(1), 5(3,3-4), 14(1). **Siphon:** Integument light brown. Index about 5.3-6.5. Pecten teeth 6(5-8), usually bifid, occasionally trifid, blades slender, size variable throughout. Hair 1(3,2-4), hair 1ad(2,2-3), hair 1av(2,2-3); hairs 2,6,7,8 and 9 all single. **Anal Segment:** Gill about 0.45 of dorsal saddle length. Hair 1-X longer than gill. Hair 1(2,1-2), 2(9,6-11), 3(1), 4a(11,11-14), 4b(10,10-12), 4c(10,10-12), 4d(12,11-12), 4e(10,11-13), 4f(11,10-11).

SYSTEMATICS. *Deinocerites melanophylum* is very similar to *cancer* in all stages but it can usually be separated from it by the key characters. In some larvae from Venezuela (VZ 216-218,257) the diagnostic features of *melanophylum* break down.

The interpretation that *melanophylum* is distinct from *cancer* is supported by the difference in blood hosts found in recent investigations in Panama (see bionomics). The preference for reptilian hosts by *melanophylum* suggests also that this species is the earlier derivative of the complex.

It is not known at present if *melanophylum* comes in contact with *cancer* in Panama and with *magnus* in Venezuela, as no collections of *Deinocerites* have been made in these relatively wide gaps (particularly in Venezuela).

BIONOMICS. Komp's (1957:350) record of the immature stages of *melanophylum* (as *cancer*) from the burrows of a large land crab, probably *Cardisoma guanhumii*, on the right bank of the lower Chagres River in the Canal Zone is the only more or less definite association of this mosquito with a specific crab. Elsewhere *melanophylum* has usually been found in large crabholes except in Venezuela where

it has been collected also in small crabholes.

In Panama, *melanophylum* has been found associated with *panamensis* and with a member of the *Culex (C.) inflicus* complex; in Colombia, with *colombianus*; and in Venezuela, with *atlanticus* and a member of the *Culex (C.) inflicus* complex.

Busck (1908:61) reported this species not to bite man in the Canal Zone but Carpenter and Peyton (1952:677) report occasional specimens (as *cancer*) taken in horse-baited traps in this area. Recent studies at the Gorgas Memorial Laboratory indicate that *melanophylum* has a marked preference for reptilian blood in Panama (Gorgas Memorial Institute, 1970:20; Tempelis and Galindo, 1970).

According to Busck (1908:61), *melanophylum* (as *cancer*) adults come out at dusk "and swarm above the hole for copulation". However, it seems very likely that this species exhibits the same pupal attendance and mating behavior as its very close relative, *cancer*, as suggested by the observations of Komp (1957:350) who noted several pairs of newly emerged adults copulating in the container in which he had placed several pupae (and larvae) the night before.

DISTRIBUTION (fig. 5). Atlantic coast from Canal Zone to state of Aragua in Venezuela. Two records of *melanophylum* in Belkin and Hogue (1959:434) are probably erroneous. The specimen from Bocas del Toro is probably from Panama and not Colombia and in that case should be *cancer*; however this cannot be determined because of its poor condition. The record from Maracay, which was interpreted as indicating the presence of this species in Lago Valencia, has not been confirmed in extensive recent search and is probably based on mislabelled material. Material examined: 1045 specimens; 170 males, 195 females, 522 larvae, 158 pupae; 139 individual rearings (110 larval, 19 pupal, 10 incomplete).

COLOMBIA. *Antioquia*: Atrato River delta (COA 30) [UCLA]. Turbo (COA 34-41) [UCLA].

PANAMA AND CANAL ZONE. *Canal Zone*: Cristobal [UCLA]. Ft. Randolph, J. Zetek; D. Baker [USNM]. Ft. Sherman, various collectors [UCLA, USNM]. France Field, J. Zetek [USNM]; W.P. Murdoch [UCLA]. Locality not specified, A.H. Jennings (248,352) [USNM]; W.H.W. Komp [UCLA]. Margarita, J.B. Shropshire [USNM]. Mt. Hope, S.J. Carpenter [UCLA]. Toro Pt., J.B. Shropshire [USNM]. *Colon*: Calderas Island, Portobelo Bay, A.H. Jennings [USNM]. Colon, A. Busck [USNM]; (PA 1012,1014-1016,1029,1032) [UCLA]. *San Blas*: Cuadi River, B.F. Eldridge [USNM].

VENEZUELA. *Aragua*: Cuyagua (VZ 414,415) [UCLA]. Maracay (locality questionable), M. Nunez-Tovar [USNM]. Ocumare de la Costa, M. Nunez-Tovar [USNM]; (VZ 134,170,173,174, 346,351,363,364,386) [UCLA]. Puerto Colombia (VZ 214,216-218) [UCLA]. Turiamo, W.H.W. Komp (32-19,22); E.B. Winston [UCLA]. *Carabobo*: Moron (VZ 256,257) [UCLA]. Puerto Cabello (VZ 260) [UCLA].

10. *Deinocerites magnus* (Theobald)

Figs. 5,32-34

1901. *Brachiomyia magna* Theobald, 1901:344-345. TYPE: Holotype male (described as female), St. Lucia, Low, per Daniels [BM]; specimen presumably lost, see Belkin, 1968:22].
1909. *Deinocerites troglodytus* Dyar and Knab, 1909:260. TYPE: Lectotype female, Trinidad, W.I., June, A. Busck [USNM, 12128; designation of Stone and Knight, 1957:197]. Synonymy with *magnus* by Belkin and Hogue (1959:431).

Deinocerites magnus of Belkin and Hogue (1959:431); Stone, Knight and Starcke (1959:285); Fauran (1961:44,45); Downes (1966:1173); Fleming and Walsh (1966:425,426); Porter (1967:

39,40); Aitken, Spence, Jonkers and Downs (1969:210).

Deinocerites magna of Theobald (1905:37).

Brachiomyia magna in part of Giles (1902:474).

Deinocerites cancer of Aiken and Rowland (1906:37); Aiken (1907:76; 1909:25); Root (1922:405); Senevet (1936:133,134; 1938:189); Cerqueira (1938:289-291); Pritchard and Pratt (1944:233); Weatherbee (1944:645); Floch and Abonnenc (1947:12); van der Kuyp (1948a:748, 749; 1953:144,146); Pratt and Seabrook (1952:27); Fox (1953:179); Fox and Maldonado-Capriles (1953:165); Maldonado-Capriles, Pippin and Kuns (1958:68).

Deinocerites cancer in part of Theobald (1903:276-281; 1905a:35-36; 1910:553); Surcouf and Gonzalez-Rincones (1911:91); Howard, Dyar and Knab (1915:201-205); Bonne and Bonne-Wepster (1925:173-174); Dyar (1928:262-263); Edwards (1932:222); Matheson (1944:250-251); Lane (1953:554-556); van der Kuyp (1953b:144,146; 1954:39,46,56,57,64,65,67,71, 72,73,76,82,84,86,88,90,95,96,112); Carpenter and LaCasse (1955:325-327); Horsfall (1955:599-600); Perez Viguera (1956:476); Forattini (1958:175); Stone, Knight and Starcke (1959:284); Porter (1967:39,40).

Deinokerides cancer in part of Giles (1902:472-473).

Dinocerites cancer in part of Blanchard (1905:414).

Deinocerites troglodytus of Howard, Dyar and Knab (1915:206,207); Urich (1917:525-530); Bonne-Wepster and Bonne (1923:124); Bonne and Bonne-Wepster (1925:171-173); Floch and Abonnenc (1945:38,39,40); Stone and Knight (1957:197).

Culex (Deinocerites) troglodytus of Dyar (1918:101).

FEMALE (fig. 32). Wing 2.78 mm. Proboscis 2.04 mm. Forefemur 1.68 mm. Abdomen about 2.55 mm. Mesonotum dark; pleural integument usually whitish, distinctly contrasting with mesonotal integument. **Head**: Narrow decumbent scales of vertex creamy; erect scales yellowish to brownish; broad decumbent scales in lateral patch whitish. **Antenna**: Torus occasionally with 1 scale; exceeding proboscis from apex of flagellar segment 8. **Thorax**: *Apn* whitish (pale); *ppn* whitish, with a few scales in middle; *ppl* whitish, with bristles and sometimes a few scales; *psp*, *ssp*, *stp* and *pra* usually slightly darker than rest of pleuron; paratergite light brown; *mep* whitish, upper part with several bristles, microsetae absent; metameron simple; meron, metameron and metapleuron whitish. **Legs**: Coxal integument whitish; scaling and bristles as in *cancer*.

FEMALE GENITALIA (fig. 32). **Sternite VIII** with strong marginal bristles continued about halfway dorsad on caudolateral border. **Cercus** with sternal margin convex, tergal margin more or less concave; apex slightly upturned; the 2 specialized cercal bristles not inserted side by side, 1 distinctly apical and shorter; tergal and sternal surfaces each with a moderately strong normal bristle, tergal more apical. Distal part of **postgenital plate** (in ventral aspect) deeply notched; lateral lobe elongate (in lateral aspect), its apical bristle markedly longer than total length of lobe, parallel not convergent with its mate (in ventral aspect), not markedly displaced from apex of lobe.

MALE (fig. 32). Wing 2.78 mm. Proboscis 2.19 mm. Forefemur 2.18 mm. Abdomen (not including genitalia) about 2.60 mm. Flagellar segment 13 slightly shorter than 12. Proboscis extending to base of flagellar segment 5. Both claws of foreleg with a heavy almost basal tooth; anterior claw of midleg with a nearly basal tooth.

MALE GENITALIA (fig. 33). **Segment IX**: Tergite lobe barely reaching base of subapical lobe, very broad and with sinuous external and internal margins. **Side-piece**: Subapical lobe with a distinct thumb; seta *c* spiniform, apex not markedly attenuated. **Phallosome**: Dorsal parameres closely approximated in tergal aspect, with a broad, short dorsal bridge; apical spine heavy, long and only slightly curv-

ed; ventral teeth few in number, short, heavy, and arising in a single row along the truncate lateral border. Aedeagus in tergal view slender, expanded in basal third then narrowing apically; apex rounded.

PUPA (fig. 33). Abdomen 3.46 mm. Trumpet 0.48 mm. Paddle 0.73 mm. Diagnostic characters as in the key; general chaetotaxy based on 10 reared specimens. **Cephalothorax**: Integument yellowish to medium brown. Hair 1(2,2-3), 2(3,2-4), 3(2,1-3), 4(4,2-6), 5(2,2-4), 6(1), 7(3,2-5), 8(3,2-5), 9(3,2-3), 10(4-5,3-5), 11(3,3-4), 12(3,2-5). **Trumpet**: Short, slightly widening apically, index about 4.4-5.2. Integument brown distad, slightly darker on tracheoid. Tracheoid about 0.33 of trumpet length. **Abdomen**: Integument medium brown. Segment I: hair 1(20,11-30 primary branches), 2(1), 3(2), 4(3,2-4), 5(5,4-6), 6(1), 7(4,2-4), 9(1). Segment II: hair 0(1), 1(10,6-12), 2(2,2-3), 3(1), 4(5,4-6), 5(1,1-2), 6(1), 7(2,2-3), 9(1). Segment III: hair 0(1), 1(4,2-6), 2(1), 3(3,1-3), 4(2,2-3), 5(2,1-2), 6(1), 7(4,2-5), 8(3,2-6), 9(1), 10(2,2-3), 11(1), 14(1). Segment IV: hair 0(1), 1(2,2-4), 2(1), 3(4,3-6), 4(1), 5(1), 6(1), 7(2,2-3), 8(2,1-2), 9(1), 10(3,2-4), 11(1), 14(1). Segment V: hair 0(1), 1(2,2-3), 2(1), 3(2,2-4), 4(5,2-5), 5(1), 6(1), 7(4,3-5), 8(2,2-4), 9(1), 10(2,1-3), 11(1), 14(1). Segment VI: hair 0(1), 1(2,2-3), 2(1), 3(2,2-3), 4(4,2-5), 5(1), 6(1,1-2), 7(2,1-3), 8(2,1-3), 9(1), 10(2,2-3), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2,1-2), 4(2), 5(2,1-3), 6(1,1-2), 7(1), 8(2,1-2), 9(3,2-4), 10(2,1-2), 11(1), 14(1). Segment VIII: hair 0(1), 4(2,1-2), 9(1), 14(1,1-2). **Paddle**: Width about 0.61 of length; apex slightly produced.

FOURTH INSTAR LARVA (fig. 34). Head 1.14 mm. Siphon 1.11 mm. Diagnostic characters as in the key; general chaetotaxy based on 7 reared specimens. Hairs 2-C often closer to each other on midline than they are to 1-C as opposed to *cancer* and *melanophylum* in which hairs 2-C are closer to 1-C than they are to each other. **Head**: Integument yellowish to light brown. Mental plate distinctly wider than long, triangular, at least all distal spicules sharply pointed; median terminal spicule slightly produced or about level with others. Hair 0(1), 1(1), 2(1), 3(sometimes developed as a minute spicule), 4(5,3-6), 5(4,3-4), 6(1), 7(8,8-10), 8(3,3-4), 9(5,4-5), 10(3,2-3), 11(5,3-5), 12(2,2-3), 13(5,5-6), 14(1), 15(3,1-3). **Antenna**: Length about 0.41 of head; shaft with several spicules on proximal part. Hair 1(5,4-6). **Thorax**: Prothorax: hair 0(7,6-9), 1(1), 2(1), 3(2), 4(5,4-5), 5(1), 6(1), 7(3,2-4), 8(2,1-3), 9(1), 10(1), 11(4,3-5), 12(1), 14(1). Mesothorax: hair 1(1), 2(4,2-4), 3(1), 4(3,2-4), 5(1), 6(1), 7(1), 8(6,5-9), 9(7,6-9), 10(1), 11(2,1-3), 12(1), 13(8,8-12), 14(12,10-13). Metathorax: hair 1(1,1-2), 2(4,2-4), 3(5,5-6), 4(3,3-5), 5(1), 6(1), 7(8,8-13), 8(7,4-9), 9(8,7-15), 10(1), 11(3,2-3), 12(2,1-3), 13(5,4-6). **Abdomen**: Segment I: hair 1(1), 2(1), 3(2,2-3), 4(8,7-12), 5(5,5-7), 6(2,2-4), 7(2), 9(3,2-5), 10(3,2-4), 11(3,2-4), 12(2,2-3), 13(2,1-2). Segment II: hair 0(1), 1(1), 2(1), 3(3,2-5), 4(5,3-6), 5(3,2-4), 6(2,2-3), 7(3,2-5), 8(2,2-4), 9(1), 10(1,1-2), 11(2,2-3), 12(3,2-4), 13(8,6-10). Segment III: hair 0(1), 1(2,2-3), 2(1), 3(1,1-2), 4(2,2-3), 5(2,2-3), 6(2,2-3), 7(4,3-6), 8(2,2-4), 9(1,1-2), 10(2,2-3), 11(2,2-3), 12(2,2-3), 13(1), 14(1). Segment IV: hair 0(1), 1(2,1-2), 2(1), 3(3,2-4), 4(1,1-2), 5(3,2-4), 6(2,2-3), 7(6,3-6), 8(1,1-2), 9(1), 10(2,2-3), 11(2,1-2), 12(2,2-3), 13(2), 14(1). Segment V: hair 0(1), 1(2,1-2), 2(1), 3(6,3-7), 4(1), 5(2,2-3), 6(2), 7(5,5-7), 8(1,1-2), 9(1), 10(1), 11(1,1-2), 12(2), 13(2,2-3), 14(1). Segment VI: hair 0(1), 1(4,2-5), 2(1), 3(1), 4(3,3-5), 5(3,2-4), 6(1,1-2), 7(3,2-4), 8(3,2-4), 9(1), 10(1), 11(2,2-3), 12(1), 13(12,9-13), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(3,2-4), 4(1), 5(3,2-4), 6(8,7-11), 7(1,1-2), 8(4,4-8), 9(3,2-3), 10(1), 11(1,1-2), 12(1), 13(2,1-2), 14(1). **Segment VIII**: Comb scales slender, wider apically; fringe conspicuous at apex; less developed in distal half. Hair 0(1), 1(4,3-4),

2(1), 3(4,3-5), 4(1), 5(3,2-3), 14(2,1-2). *Siphon*: Integument light brown. Index about 3.8-5.1. Pecten teeth 6(5-7), usually bifid, sometimes trifid, both blades slender, basal shorter, rest variable in size. Hair 1(3), hair 1ad(2,2-3), hair 1av(2,2-3); hairs 2,6,7,8 and 9 all single. *Anal Segment*: Gill about 0.5 of dorsal saddle length. Hair 1-X longer than gill. Hair 1(1,1-2), 2(8,6-9), 3(1), 4a(12,11-13), 4b(11,9-12), 4c(9,8-11), 4d(9,7-10), 4e(9,8-10), 4f(9,7-12), 4g(12,11-12).

SYSTEMATICS. *Deinocerites magnus* is clearly differentiated from the *cancer-melanophylum* complex and is probably an earlier offshoot from the original stock of the Cancer Group as shown by the absence of the conspicuous derived features in the adults (increased antennal length) and the larva (reduced ventral brush) found in *cancer* and *melanophylum*.

In spite of the extensive fragmentation of *magnus* into insular populations over much of its range no significant differentiation has occurred. All the populations I have examined conform to the diagnostic features given above and no significant variation has been noted.

I have not seen the material reported as *cancer* from the state of Maranhao by Cerqueira (1938:289-291) but judging by his figures it can be unquestionable referred to *magnus*.

BIONOMICS. There is no published record of a specific identification of a crab with which *magnus* may be associated but its immature stages have usually been found in large crabholes and only occasionally in smaller ones. In addition to these normal breeding sites, *magnus* has been reported from a beach pool in Sint Maarten (van der Kuyp, 1948a:748, as *cancer*) and has been taken recently in ground pools (flooded crabhole areas) in Trinidad and Grenada.

As in the case of other members of the group, the reports on the blood feeding habits of the females are conflicting. Theobald (1903:279, as *cancer*) quotes a report from Dr. Low that the latter could not induce this species to bite on Barbados and never saw any traces of blood in the stomachs of specimens from St. Vincent. In Trinidad, Urich (1913:527, as *troglydytus*) found the species to be a timid biter in the field and to rarely enter houses to feed. In recent years females have been caught in Trinidad no. 10 traps baited with mice in Trinidad (once) and baited with chicks in Antigua, Dominica, St. Lucia and Trinidad. Females were also collected biting man in the evening in St. Vincent. In Surinam, Bonne and Bonne-Wepster (1925:175, as *troglydytus*) captured females indoors and reported their bite as painful and giving "a peculiar sensation different from one of the ordinary house mosquitoes in Surinam". Floch and Abonnenc (1947: 11, as *cancer*) report a female biting man in French Guiana.

Busck (reported in Howard, Dyar and Knab, 1915:207) observed this species to swarm at dawn and evening and "frequently noted copulation at such times." This appears to be the only information available on the mating habits of *magnus*.

Over much of its range *magnus* appears to be the only normal obligate crab-hole breeder, its various known associates being largely encountered in marginal environments. It has been found with *Aedes (O.) taeniorhynchus* in Anguilla and Antigua; with *Culex (C.) habilitator* in Montserrat and Nevis; with *Culex (C.) inflictus* Theobald, 1901 in Dominica and Trinidad; with species of *Culex (C.)* and *Culex (Mel.)* in Dominica; and with a member of the *Aedes (O.) scapularis* complex in Trinidad.

DISTRIBUTION (fig. 5). From Mona Island and Puerto Rico eastward and southward throughout the Lesser Antilles, Trinidad and Tobago, the Guianas and the state of Maranhao in Brazil. Material examined: 2138 specimens; 250 males, 1027

females, 627 larvae, 234 pupae; 151 individual rearings (97 larval, 33 pupal, 21 incomplete).

BARBADOS. Bridgetown (BAR 3,5,8) [UCLA]. Gracine Hall swamp (BAR 25) [UCLA]. Locality not specified, A. Busck [USNM].

BRITISH VIRGIN ISLANDS. *Tortola*: Road Harbor, F.M. Root (LAR 5) [USNM]. *Virgin Gorda*: Locality not specified, F.M. Root (LAR 8,8A) [USNM].

DOMINICA. Cabrit swamp, W.W. Wirth [USNM]; (DOM 76,94,99,100,155,156,165) [UCLA]. Layou, W.W. Wirth; D.F. Bray [USNM]; (DOM 76) [UCLA]. Macoucheri, W.W. Wirth [USNM]. Portsmouth, D.F. Bray [USNM]; F.M. Root (LAR 19a) [USNM].

FRENCH GUIANA. Stoupan (FG 58B) [UCLA].

GRENADA. Pt. Saline (GR 5,6,8) [UCLA].

GRENADINES. *Canouan*, F.M. Root (LAR 33e). *Carriacou*, F.M. Root (LAR 36b-2). *Little Martinique*, F.M. Root (LAR 35). *Little St. Vincent*, F.M. Root (LAR 35b). *Mustique*, F.M. Root (LAR 33d). *Saline*, F.M. Root (LAR 37,37A) [USNM].

GUADELOUPE. *Desirade*: Baie Mahault (FWI 218). Leproserie (FWI 220) [UCLA]. *Island not specified*: A. Busck [USNM]. *Grande Terre*: Port-Louis (FWI 199,200) [UCLA]. *Marie Galante*: Grand Bourg (FWI 232). Grande Anse (FWI 224) [UCLA].

GUYANA. New Amsterdam (GUY 18) [UCLA].

LEEWARD ISLANDS. *Anguilla*: Little Harbour (ANG 12,13) [UCLA]. *Antigua*: Ballast Bay (ANT 99,100) [UCLA]. Bethesda (ANT 20,22) [UCLA]. Bolands (ANT 4) [UCLA]. English Harbour, J.F.G. Clark; R.H. Darsie [USNM]. Fitches Creek (ANT 87,88) [UCLA]. St. Johnston (ANT 56) [UCLA]. *Barbuda*: Codrington (BAB 2,4) [UCLA]. *Montserrat*: Fox's Bay (MNT 44,45,57,83,87,90) [UCLA]. Iles Bay Estate (MNT 16) [UCLA]. Old Road Estate (MNT 53) [UCLA]. *Nevis*: Charlestown, F.M. Root (LAR 13,14a) [USNM]; between Ft. Charles and Pinney's Estate (NEV 3,32,34,49,60) [UCLA]. *St. Kitts*: Frigate Bay Estate (KIT 36,40,41) [UCLA].

MARTINIQUE. Locality not specified, A. Busck; F.M. Root (LAR 28A) [UCLA, USNM].

NETHERLANDS WEST INDIES. *Sint Maarten*: Philipsburg, E. van der Kuyp [USNM].

PUERTO RICO. *Mona*: W.F. Pippin [USNM]. *Puerto Rico*: Catano, H.D. Pratt [USNM]; T.H.G. Aitken [UCLA]. Central Aguire, G.S. Tulloch [USNM]. Dorado, G.S. Tulloch [USNM]. Ft. Buchanan, H.D. Pratt [USNM]. Isla Verde [UCLA]. Mayaguez, G.S. Tulloch [USNM]. Playa de Humacao (PR 23-26) [UCLA]. Roosevelt Roads NS, H.C. Hurt [UCLA, USNM]. San Juan, H.D. Pratt [USNM].

ST. LUCIA. Choc swamp (LU 48,49,51,54,153,155) [UCLA]. Cul de Sac Estate (LU 129) [UCLA]. Marigot Harbour, R.H. Darsie [USNM]. Port Voilet swamp (LU 107,117) [UCLA]. Reduit swamp (LU 76) [UCLA]. Roseau Sugar Estate (LU 24,25,27) [UCLA]. Vieux Fort (LU 95) [UCLA].

ST. VINCENT. Kingstown, F.M. Root (LAR 29B) [USNM]. Young's Island (VT 73) [UCLA].

TRINIDAD AND TOBAGO. *Tobago*: Bon Accord Estate (TOB 12,20) [UCLA]. Crown Pt. (Brown's), R.H. Darsie [USNM]. *Trinidad*: Chaguana (TR 769) [UCLA]. Chaguaramas (U.S. Naval Base), J. Leacock; K.L. Knight [USNM]. Guayaguayare (TR 794,800) [UCLA]. Locality not specified, A. Busck; F. Urich [USNM]. Matelot (TR 185) [UCLA]. Monos Island (TR 592) [UCLA]. Nariva Swamp, T.H.G. Aitken [UCLA]. Port of Spain, F.M. Root (LAR 54) [USNM]. San Souci (TR 156) [UCLA].

VIRGIN ISLANDS. *St. Croix*: Locality not specified, M.A. Beatty [UCLA, USNM]. *St. John*: Caneel Bay, T.H.G. Aitken [UCLA]. *St. Thomas*: Charlotte Amalie (VI 21-23,25,26,29) [UCLA]. Locality not specified, C. Cregue [USNM].

EPITEDEUS GROUP

FEMALES. Medium-sized species, wing 2.83-3.98 mm. Mesonotum dark brown, pleuron usually tan and not strongly contrasting with mesonotal integument. *Antenna*: Flagellar segment 1 with numerous scales, about equal to combined length of segment 2 and about one-half of 3; segment 2 with a few scales; segments

1-4 greatly elongated; segments 5-12 subequal in length but progressively slightly shortened distad; extremely long, exceeding proboscis from at least distal third of flagellar segment 5. **Thorax:** Postnotum with or without bristles on lower part. **Apn** usually tan; **ppn** usually tan or slightly paler, scales broad on caudoventral area; **ppl** tan; **psp**, **ssp**, **stp** and **pra** tan or brownish; paratergite tan or brownish; **mep** usually tan and with a patch of or almost completely covered with translucent scales, **lme** without bristle; meron, metameron and metapleuron usually dark tan. **Legs:** Coxal integument usually tan. Forefemur completely dark, basal two-thirds of posteroventral surface of midfemur often pale, basal half of anteroventral and posteroventral surfaces of hindfemur slightly paler; anteroventral margin of forefemur with a row of spiniforms or bristles, posterodorsal margin with a row of weak bristles. **Abdomen:** Sternites II-VII lighter than tergites.

FEMALE GENITALIA. **Sternite VIII** with sclerotized distal band broad and with several scales; caudal margin not produced into a submedian ventral angle, this area without strongly differentiated marginal bristles. **Tergite IX** with 1 to several setae on each side. **Tergite X** poorly differentiated dorsally, laterally with a very small indistinct sclerotization. **Cercus** with a few moderately strong apical or subapical normal bristles or with 5 or 6 apical and subapical specialized setae with twisted apex.

MALES. Essentially similar to females. **Antenna:** Exceeding proboscis from apical third of flagellar segment 4; flagellar segments 1-4 with scales; segments 1-6 markedly elongated but progressively shorter distad; segment 1 about equal to combined length of segment 2 and one-third of 3; segments 7-13 subequal but progressively slightly shortened distad; segment 13 slightly expanded subapically. **Legs:** Claws of foreleg markedly enlarged, anterior slightly larger and with a variable submedian tooth, posterior simple or with a very small denticle; claws of midleg not markedly enlarged and very similar in shape, anterior slightly larger and either simple or with a small submedian tooth or denticle, posterior simple.

MALE GENITALIA. **Segment IX:** Tergite lobe cylindrical; angled at base; distal part variously shaped; apex sometimes reaching base of subapical lobe. **Sidepiece:** Without scales. Apicosternal lobe prominent, with a long apical seta. **Phallosome:** Dorsal parameres widely separated but always with an indication of an incomplete dorsal bridge; articulated ventrally with a dorsal sclerotized projection from basal third of aedeagus.

PUPAE. **Cephalothorax:** Hairs 2,3-C not closely approximated, 2-C as strongly developed and as long as or longer than 3-C; hair 5-C single, moderately long, at most equal in length to distance from its alveolus to base of trumpet and to length of trumpet; 7-C usually single or double (1-4); hair 8-C usually triple (2-5). **Metanotum:** Hair 10-C strongly developed, always longer than 11-C, single or double. **Abdomen:** Hair 1-II long, exceeding apex of tergite III, usually double or triple (1-3), simple; 1-III-VI usually forked (except in *colombianus*); 5-II always mesad and cephalad of 3-II; hair 3-V usually single or double (1-3); hair 1-VII shorter than tergite VIII, at most reaching alveolus of hair 4-VIII. **Paddle:** Hair 1-P longer than paddle.

FOURTH INSTAR LARVAE. **Head:** Hair 2-C short, inconspicuous, about 0.25-0.33 of 1-C, always mesad of 1-C; hair 5-C usually double, rarely triple (1-3), with a few very inconspicuous barbs; 6-C single and usually simple, barbs at most few and inconspicuous, length about 1.5 of 5-C. **Thorax:** Prothoracic hair 9-P double or triple. **Abdomen:** Hair 6-II double; dorsal sensillum of segment V mesad of 4-V; hair 6-VI single; 1-VII very long, always longer than 3-VII and exceeding

base of siphon; 1-VIII usually with 3 or 4 branches (2-4). *Siphon*: Hair 1-S usually double (1 or 2). *Anal Segment*: Ventral brush (4-X) with 6 or 7 pairs of hairs. Gill slightly emarginate on ventral margin; long, from 0.5-1.0 of dorsal saddle length. Dorsal saddle at least moderately broad, its ventral margin sometimes reaching alveolus of hair 1-X.

DISCUSSION. This group shows more unique derived characters than any other. The adults share with the Pseudes Group the presence of mesepimeral scales but are unique in the loss of the lower mesepimeral bristle. In the pupae, the hairs are more strongly developed than in the other groups and abdominal hair 1-II is rather long and double or triple instead of being multibranching as in the Spanius, Cancer and Pseudes Groups. The larvae are distinct from all the other groups in a double or triple hair 9-P (always single in the others) and a double hair 5-C (at least triple in the others).

The Epitedeus Group consists of a pair of clearly marked geminate complexes, 1 restricted to the Atlantic basin and the other to the Pacific basin. The species within each complex show complementary allopatric distributions and are very similar to each other but are readily distinguished by male genitalic characters as well as those in the larvae and pupae. In both complexes the northernmost species appears to be the dominant one and also has retained 7 pairs of hairs in the ventral brush of the larva: *epitedeus* (Atlantic), *costaricensis* (Pacific). The degree of morphological differentiation and the distribution of the species suggest that the original stock of the group first split into an Atlantic and Pacific component and that later both of these were subdivided.

The Atlantic complex of 3 species (*epitedeus*, *panamensis*, *colombianus*) is characterized in the adults by the presence of spiniforms instead of simple bristles in the anteroventral margin of the forefemur. The IX tergite lobe of the male genitalia of this complex is varied in shape but not conical and it always reaches the base of the subapical lobe of the sidepiece. *Deinocerites epitedeus* occupies the northern part of the distribution of the complex from the Gulf of Honduras to at least as far south as Almirante, Bocas del Toro, Panama; *panamensis* is known from the central part of Panama in the region of the Canal Zone; and *colombianus* has been found in the region of San Blas, Panama, and Turbo, Colombia.

The Pacific complex consists of 2 known species only (*costaricensis* and *curiche*). It is characterized in the adults by the presence of simple bristles in the anteroventral row of the forefemur and by a short conical IX tergite lobe not reaching the subapical lobe of the sidepiece in the male genitalia. *Deinocerites costaricensis* is known to date only from Costa Rica but it is possible that it will be found to the north as well as to the south; *curiche* is currently known only from the area of the same name in northern Colombia. There are no records of the Pacific complex from Panama but it is very likely that it is represented there by either or both of the species and possibly a third one as well which might occupy the intermediate area as in the case of the Atlantic complex.

All but 2 species of the complex appear to be rare. *Deinocerites epitedeus* is apparently the dominant species of *Deinocerites* on the Atlantic coast of Central America from the Gulf of Honduras to the province of Bocas del Toro, Panama; and *panamensis* is common on the Atlantic coast of the Canal Zone. The only reliable information on the blood feeding habits is for *epitedeus* in Almirante, Panama, where it has been shown to utilize a wide range of vertebrate hosts from amphibians to mammals. The immature stages of the group have been collected only in large crabholes. The species of crab (*Cardisoma crassum*) has been iden-

tified only in the case of *costaricensis*.

11. *Deinocerites epitedeus* (Knab)

Figs. 6,35-37

1907. *Dinomimetes epitedeus* Knab, 1907:120-121. TYPE: Lectotype male (344a), with genitalia on slide (286), Port Limon, Costa Rica, F. Knab [USNM, 10291; designation of Stone and Knight, 1957:197].

Deinocerites epitedeus of Bonne and Bonne-Wepster (1925:174); Kumm and Ruiz (1940:392, 402); Stone and Knight (1957:197); Ross (1962:192); Gorgas Memorial Institute (1970:20); Tempelis and Galindo (1970).

Deinocerites epitedeus in part of Dyar (1925:154,156; 1928:264,537); Horsfall (1955:599); Forattini (1958:176); Belkin and Hogue (1959:438-441); Stone, Knight and Starcke (1959:284).

Dinomimetes epitedeus of Surcouf and Gonzalez-Rincones (1911:92).

Dinomimetes epitedeus in part of Howard, Dyar and Knab (1915:197-199).

Deinocerites cancer in part of Knab (1906:95-97).

Culex (Deinocerites) epitedeus of Dyar (1918:101).

FEMALE (fig. 35). Wing 3.93 mm. Proboscis 2.75 mm. Forefemur 2.77 mm. Abdomen about 3.52 mm. **Head**: Narrow decumbent scales of vertex creamy, erect scales brownish. **Antenna**: Torus sometimes with a few scales; exceeding proboscis from middle to apex of flagellar segment 5. **Thorax**: Postnotum usually with 2 or more bristles near lower end; *ppn* with several bristles on middle and lower areas; *ppl* with numerous bristles and sometimes with a few scales; *mep* with a patch of translucent scales usually in upper half, *umep* bristles numerous, body of sclerite with scattered microsetae; metameron sometimes with a few small bristles. **Legs**: Anterior surface of forecoxa largely covered by bristles and scales, basolateral area with some bristles; midcoxa with outer surface covered with translucent scales, except for a lower posterior area, and 2 groups of bristles, those in anterior group more numerous and scattered, those in posterior group in a row and stronger; hindcoxa with anterolateral surface with scales, lower lateral with bristles, upper lateroposterior with a few scales, posterior surface with numerous bristles; forefemur with a row of spiniforms in anteroventral margin.

FEMALE GENITALIA (fig. 35). **Sternite VIII** sometimes with several scales. **Tergite IX** with 3-6 setae on each side. **Cercus** in lateral aspect with sternal margin convex; tergal margin slightly sinuous at base and slightly concave distally; apex slightly upturned, usually with 4 moderately strong apical or subapical normal bristles. Distal part of **postgenital plate** (in ventral aspect) with deep notch; lateral lobe (in lateral aspect) moderately elongate, its apical bristle only slightly convergent with its mate (in ventral aspect).

MALE (fig. 35). Wing 3.93 mm. Proboscis 3.01 mm. Forefemur 2.65 mm. Abdomen (not including genitalia) about 3.21 mm. Anterior claw of foreleg with a moderately large submedian tooth; that of midleg with a small tooth.

MALE GENITALIA (fig. 36). **Segment IX**: Tergite lobe with distal part slender, reaching base of subapical lobe but not extending beyond it; directed mesad by distinct curvatures of inner and outer margins; body of lobe broad basally, constricted near middle and slender in distal half. **Sidepiece**: Subapical lobe with rather small thumb; seta *c* spiniform and attenuated apically. **Phallosome**: Dorsal

parameres with broad but short incomplete bridge; apical spine long and slender; ventral teeth usually long, frequently several joined at base. Aedeagus in tergal aspect with external margins sinuous, narrower apically after a constriction distad of middle, apex rounded.

PUPA (fig. 36). Abdomen 4.36 mm. Trumpet 0.91 mm. Paddle 0.86 mm. Diagnostic characters as in the key; general chaetotaxy based on 8 reared specimens. Hair 1-C forked at about 0.4 from base. Hair 9-C usually forked. **Cephalothorax**: Integument yellowish to medium brown. Hair 1(2), 2(2,1-2), 3(2), 4(1), 5(1), 6(3,2-4), 7(1), 8(3), 9(2-3,2-4), 10(1), 11(2,2-3), 12(3,2-4). **Trumpet**: Moderately long, width almost uniform throughout except for slight widening apically; index about 5.3-7.6. Integument brown distad, darker on tracheoid; markedly contrasting with cephalothoracic integument. Tracheoid about 0.4 of trumpet length. **Abdomen**: Integument yellowish to medium brown. Segment I: hair 1(13,9-19), 2(1), 3(2,2-3), 4(5,3-6), 5(3,3-5), 6(1), 7(1,1-2), 9(1,1-2). Segment II: hair 0(1), 1(2,2-3), 2(2), 3(1), 4(6,4-6), 5(1), 6(1), 7(1), 9(1). Segment III: hair 0(1), 1(5,2-6), 2(1), 3(2,2-3), 4(2,2-3), 5(1), 6(1), 7(3,2-5), 8(5,3-5), 9(1), 10(1), 11(1), 14(1). Segment IV: hair 0(1), 1(4,3-6), 2(1), 3(5,3-6), 4(2,1-2), 5(1), 6(1), 7(3,2-4), 8(3,2-4), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(4,2-5), 2(1), 3(1), 4(5,3-5), 5(1), 6(1), 7(5,2-7), 8(2,1-3), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(3,2-6), 2(1), 3(1,1-2), 4(3,2-3), 5(1), 6(1), 7(1), 8(2), 9(1), 10(1), 11(1,1-2), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2), 4(2), 5(3,3-6), 6(1), 7(1), 8(4,2-4), 9(5,4-6), 10(1,1-2), 11(1,1-2), 14(1). Segment VIII: hair 0(1), 4(2,1-2), 9(1), 14(1). **Paddle**: Width about 0.76 of length.

FOURTH INSTAR LARVA (fig. 37). Head 1.21 mm. Siphon 1.52 mm. Diagnostic characters as in the key; general chaetotaxy based on 8 reared specimens. **Head**: Integument light brown. Mental plate almost as long as wide, triangular; marginal spicules usually sharply pointed, sometimes denticulate. Hair 0(1), 1(1), 2(1), 3(not detectable), 4(3,3-5), 5(2,2-3), 6(1), 7(5,4-11), 8(3,1-4), 9(5,4-6), 10(3,2-3), 11(4,3-4), 12(1,1-2), 13(5,4-5), 14(1), 15(4,3-4). **Antenna**: Length about 0.63 of head; shaft with numerous spicules on proximal part. Hair 1(3,3-4). **Thorax**: Prothorax: hair 0(10,8-12), 1(1), 2(1), 3(1), 4(3), 5(1), 6(1), 7(3,2-3), 8(1,1-2), 9(3,2-3), 10(1), 11(4,4-10), 12(1), 14(1). Mesothorax: hair 1(1), 2(3,2-4), 3(1), 4(1), 5(1), 6(1), 7(1), 8(6,5-7), 9(7,5-8), 10(1), 11(2,2-4), 12(1), 13(11-16), 14(6,6-10). Metathorax: hair 1(1), 2(4,3-5), 3(6,4-8), 4(4,3-5), 5(1), 6(1), 7(7,6-9), 8(10-19), 9(7,6-8), 10(1), 11(3,2-3), 12(1), 13(6,5-6). **Abdomen**: Segment I: hair 1(1), 2(1), 3(1,1-2), 4(8,8-10), 5(3,3-5), 6(2,2-3), 7(2), 9(3,2-3), 10(1), 11(3,2-4), 12(3,2-3), 13(1). Segment II: hair 0(1), 1(1), 2(1), 3(2,1-3), 4(8,7-9), 5(4,3-5), 6(2), 7(2,1-4), 8(4,3-4), 9(1), 10(1), 11(3,2-3), 12(2,2-5), 13(9,8-11). Segment III: hair 0(1), 1(1,1-2), 2(1), 3(1), 4(2), 5(3,2-5), 6(2), 7(6,5-9), 8(2,1-3), 9(1), 10(1), 11(2,2-3), 12(2,2-4), 13(1), 14(1). Segment IV: hair 0(1), 1(1), 2(1), 3(3,2-4), 4(2), 5(3,2-4), 6(2), 7(8,5-10), 8(2,1-2), 9(1), 10(1), 11(2), 12(3,2-3), 13(2,1-2), 14(1). Segment V: hair 0(1), 1(1), 2(1), 3(1), 4(7,6-9), 5(4,3-5), 6(2), 7(10,6-10), 8(2), 9(1), 10(1), 11(1), 12(3,2-4), 13(2), 14(1). Segment VI: hair 0(1), 1(5,2-6), 2(1), 3(1), 4(1,1-2), 5(4,2-7), 6(1), 7(4,3-5), 8(3,2-4), 9(1), 10(1), 11(3,2-4), 12(1), 13(19-28), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(4,4-6), 4(1), 5(4,2-6), 6(12,10-15), 7(1), 8(9,8-12), 9(2,2-4), 10(1), 11(2,2-3), 12(1), 13(2), 14(1). **Segment VIII**: Comb scales slender at base, fringe restricted mainly to the apex. Hair 0(1), 1(3,2-4), 2(1), 3(4,3-5), 4(1), 5(2,2-3), 14(1). **Siphon**: Integument light brown. Index about 4.1-5.2. Pecten teeth 5(4-6), bifid, both blades narrow apically, longer blade wider; distal teeth slightly increasing in size. Hair

1(2,1-2), hair 1ad(4,2-6), hair 1av(4,2-6); hairs 2,6,7,9 all single; 8(2,2-4). *Anal Segment*: Gill subequal to dorsal saddle length. Ventral margin of dorsal saddle reaching alveolus of hair 1-X. Hair 1-X shorter than gill. Hair 1(1,1-5), 2(6,6-8), 3(1), 4a(11,10-12), 4b(11,9-11), 4c(10,9-12), 4d(10,9-12), 4e(12,10-13), 4f(13,10-14), 4g(10,7-14).

SYSTEMATICS. This is the dominant species of the Atlantic complex of the group and occupies the largest part of its known range from the Gulf of Honduras to the province of Bocas del Toro in Panama. It is most readily differentiated from the other species of the complex by the shape and length of the IX tergite lobe in the male genitalia and by the presence of 7 pairs of hairs instead of 6 in the ventral brush of the larva. The female cannot be distinguished from those of *panamensis* and *colombianus* but the pupa is usually readily separated from all the other species of the group by the key characters.

BIONOMICS. All the records of the immature stages of *epitedeus* are from large crabholes but without any indication of the species of crab involved. The original collection of *epitedeus* was made by F. Knab (1906:95, as *cancer*) in crabholes on the side of a hill near Port Limon, Costa Rica, at a considerable elevation above sea level. These crabholes contained fresh water supplied by a small brook. Recently, *epitedeus* has been collected in the same general area near Port Limon, in a cacao grove about 2 mi from the sea (CR 73), and at another locality about ¼-½ mi from the sea (CR 76). Although no determination of the chloride content was made, it is very likely that the water in these crabholes was fresh.

Deinocerites epitedeus has been found associated with the following species: *cancer* in Guatemala and Nicaragua; 1 or more species of the *Culex* (*C.*) *inflictus* complex in Guatemala, Nicaragua and Costa Rica; *Culex* (*Tin.*) *latisquama* in Nicaragua; and with a species of *Culex* (*Mel.*) in Costa Rica.

Only 2 reports have appeared on the blood feeding habits of *epitedeus*. Kumm, Komp and Ruiz (1946:392) caught 11 females on horse bait in Puerto Viejo, Costa Rica. In Panama, *epitedeus* has been found to have a very wide range of hosts ranging from amphibians to mammals (Gorgas Memorial Institute, 1970:20; Tempelis and Galindo, 1970).

DISTRIBUTION (fig. 6). Atlantic coast from the Gulf of Honduras to Bocas del Toro Province in Panama. Material examined: 984 specimens; 132 males, 119 females, 531 larvae, 202 pupae; 49 individual rearings (30 larval, 15 pupal, 4 incomplete).

COSTA RICA. *Limon*: Cahuita (LCBA 232,234,235,238-240,243). Cieneguita, near P. Limon [USNM]. Puerto Limon, F. Knab, type series; (K 344A) [USNM]. Puerto Viejo (181) [USNM]. Westfalia, near P. Limon (CR 73,76) [UCLA].

GUATEMALA. *Izabel*: Puerto Matias (GUA 5,5A,6) [UCLA].

NICARAGUA. *Zelaya*: Bluefields (NI 34,51,67-70,72,73) [UCLA].

PANAMA. *Bocas del Toro*: Almirante (PA 271,274,1031) [UCLA].

12. *Deinocerites panamensis* Adames, n.sp.

Figs. 6,38-40

TYPES: *Holotype* male with associated larval and pupal skins (PA 598-101), Portobelo, Colon, Panama, 9 Dec 1963, A. Quinonez [USNM]. *Allotype* female with associated larval and pupal skins and genitalia slide (PA 598-104), same data as holotype [USNM]. *Paratypes*: 4 lpM (PA 598-102,109,110), 2 lpF (598-105,108), 4 pF (598-106,112-114), 1 lP (598-111), 1 l (598-103), same data as holotype [BM, UCLA, USNM].

Deinocerites epitedeus of Dyar (1923:180); Arnett (1948:193).

Deinocerites epitedeus in part of Dyar (1925:154,156; 1928:264,537); Lane (1953:556,557,558, 559); Horsfall (1955:599); Forattini (1958:176); Belkin and Hogue (1959:438-441); Stone, Knight and Starcke (1959:284).

Dinomimetes epitedeus of Busck (1908:75).

Dinomimetes epitedeus in part of Howard, Dyar and Knab (1915:197-199).

FEMALE (fig. 38). Wing 3.41 mm. Proboscis 2.50 mm. Forefemur 1.98 mm. Abdomen about 2.9 mm. Apparently indistinguishable from *epitedeus*.

FEMALE GENITALIA (fig. 38). Essentially similar to *epitedeus* except for the following. Tergite IX with 2-4 setae on each side. Distal part of postgenital plate (in ventral aspect) with a deeper notch; lateral lobe basically similar and its apical bristle parallel with or diverging from its mate.

MALE (fig. 38). Wing 3.21 mm. Proboscis 2.65 mm. Forefemur 2.60 mm. Abdomen (not including genitalia) about 2.5 mm. Apparently indistinguishable from *epitedeus*.

MALE GENITALIA (fig. 39). Differing from *epitedeus* apparently only in IX tergite lobe with distal part very long and very slender, angled laterad at base, then bent mesad to parallel sidepiece and extending beyond base of subapical lobe.

PUPA (fig. 39). Abdomen 3.58 mm. Trumpet 0.73 mm. Paddle 0.76 mm. Diagnostic characters as in the key; general chaetotaxy based on 5 reared specimens. Hair 1-C branched; 9-C usually forked. **Cephalothorax**: Integument yellowish. Hair 1(2,2-3), 2(2), 3(2), 4(1), 5(1,1-2), 6(3,2-3), 7(2), 8(3), 9(3,2-3), 10(1,1-2), 11(2), 12(2). **Trumpet**: As in *epitedeus*; index about 6.2-8.1, tracheoid about 0.50 of trumpet length. **Abdomen**: Integument yellowish. Segment I: hair 1(13,13-18), 2(1,1-2), 3(2,2-3), 4(4,3-5), 5(5,3-5), 6(1), 7(2), 9(1,1-2). Segment II: hair 0(1), 1(3,1-3), 2(2), 3(1), 4(6,3-7), 5(1), 6(1), 7(1), 9(1). Segment III: hair 0(1), 1(5,3-6), 2(1), 3(2), 4(2,1-3), 5(1), 6(1), 7(3,3-4), 8(5,4-6), 9(1), 10(1), 11(1), 14(1). Segment IV: hair 0(1), 1(5,4-5), 2(1), 3(4,3-5), 4(1,1-2), 5(1), 6(1), 7(2,2-3), 8(2,2-3), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(5,4-5), 2(1), 3(2,1-3), 4(5,4-6), 5(1), 6(1), 7(5,4-6), 8(2,2-3), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(4,3-4), 2(1), 3(2,1-2), 4(2,2-4), 5(1), 6(1), 7(1), 8(3,2-3), 9(1), 10(1,1-2), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2,2-3), 4(2,1-2), 5(2,2-3), 6(1,1-2), 7(1), 8(3,2-4), 9(5,4-6), 10(2,1-2), 11(2,1-3), 14(1). Segment VIII: hair 0(1), 4(2), 9(1), 14(1). **Paddle**: Width about 0.86 of length.

FOURTH INSTAR LARVA (fig. 40). Head 1.18 mm. Siphon 1.52 mm. All measurements from skins. Diagnostic characters as in the key; general chaetotaxy based on 5 reared specimens. **Head**: Integument yellowish to light brown. Mental plate similar to that of *epitedeus*. Hair 0(1), 1(1), 2(1), 3(not detectable), 4(4,3-5), 5(2,1-2), 6(1), 7(5,4-7), 8(4,4-6), 9(6,3-6), 10(3,1-3), 11(4,4-5), 12(2), 13(6,5-7), 14(1), 15(2,2-3). **Antenna**: Length about 0.50 of head; shaft with numerous spicules on proximal part. **Thorax**: Prothorax: hair 0(12,10-12), 1(1), 2(1), 3(1), 4(4,4-5), 5(1), 6(1), 7(3,2-4), 8(2), 9(2,1-2), 10(1,1-2), 11(4,3-5), 12(1), 14(1). Mesothorax: hair 1(1), 2(3,2-4), 3(1), 4(2,1-2), 5(1), 6(1), 7(1), 8(7,6-8), 9(9,7-9), 10(1), 11(3,2-3), 12(1), 13(?), 14(?). Metathorax: hair 1(1), 2(4), 3(6,6-8), 4(4,3-5), 5(1), 6(1), 7(8,8-11), 8(?), 9(10,8-10), 10(1), 11(2,2-3), 12(1), 13(6,5-6). **Abdomen**: Segment I: hair 1(1), 2(1), 3(2,2-3), 4(9,8-11), 5(4,3-6), 6(3,2-3), 7(2,1-2), 9(3,2-4), 10(2,1-2), 11(2,2-3), 12(4,2-4), 13(1,1-2). Segment II: hair 0(1), 1(1), 2(1), 3(2,2-3), 4(9,8-10), 5(4,3-5), 6(2,2-3), 7(4,3-4), 8(4,3-4), 9(1), 10(1), 11(3,2-3), 13(3,2-4), 13(8-11). Segment III: hair 0(1), 1(2,2-3), 2(1), 3(1), 4(2,2-3), 5(3,2-3), 6(2), 7(5-7), 8(2), 9(1), 10(1), 11(2), 12(3,2-3), 13(1),

14(1). Segment IV: hair 0(1), 1(1,1-2), 2(1), 3(3,3-5), 4(2), 5(3,2-4), 6(2), 7(8-9), 8(2,1-2), 9(1), 10(1), 11(2,2-3), 12(3,2-3), 13(2,1-2), 14(1). Segment V: hair 0(1), 1(1,1-2), 2(1), 3(1), 4(8,6-9), 5(4,3-4), 6(2), 7(9,9-11), 8(2), 9(1), 10(1), 11(2,2-3), 12(1,1-2), 13(2,1-3), 14(1). Segment VI: hair 0(1), 1(4,4-5), 2(1), 3(1), 4(3,2-3), 5(4), 6(1), 7(4,3-6), 8(3,3-4), 9(1), 10(1), 11(3,2-3), 12(1), 13(?), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(4,4-5), 4(1), 5(3,3-4), 6(12,11-13), 7(1), 8(8,5-9), 9(2,2-3), 10(1), 11(2), 12(1), 13(2,1-2), 14(1). **Segment VIII:** Comb scales similar to those of *epitedeus*. Hair 0(1), 1(3,3-4), 2(1), 3(4,4-5), 4(1), 5(4,2-4), 14(1). **Siphon:** Integument light brown. Index about 4.8-6.0. Pecten teeth 5(4-6), shape and size similar to those of *epitedeus*. Hair 1(2), hair 1ad(4,1-4), hair 1av(4,1-5); hairs 2,6,7,9 all single; 8(2,1-2). **Anal Segment:** Gill length probably about the same as in *epitedeus*. Ventral margin of dorsal saddle reaching alveolus of hair 1-X. Hair 1-X shorter than gill. Hair 1(1,1-2), 2(7,6-9), 3(1), 4a(14,11-15), 4b(12,11-16), 4c(14,10-15), 4d(13,11-16), 4e(14,12-17), 4f(14,10-15).

SYSTEMATICS. *Deinocerites panamensis* occupies a restricted central part of the range of the Atlantic complex of the group in Central Panama and Canal Zone where it seems to be as common as *epitedeus* is to the north. It is readily differentiated from the other members of the complex by the shape and length of IX tergite lobe of the male genitalia. Its larva has only 6 pairs of hairs in the ventral brush as does *colombianus* as well as *curiche* but it can be distinguished from both by the key and diagnostic characters given above. The female is indistinguishable from the other 2 members of the Atlantic complex (*epitedeus* and *colombianus*) but the pupa is usually readily separated by the key characters from all the species of the group.

At the present time, there are wide gaps between the known distributions of *epitedeus*, *panamensis* and *colombianus* on the inaccessible Atlantic coast of western and eastern Panama respectively and it is not known if these species actually come in contact.

BIONOMICS. This species has been collected only in large crabholes. There is no definite information about the blood feeding habits of *panamensis*, the only reference to them being that of Busck (1908:75, as *epitedeus* from Colon, Panama) who stated, "Though possessing a well-developed proboscis, this species probably does not bite man; but this should be definitely ascertained by observations."

Deinocerites panamensis has been found associated with the following species: *melanophylum*, species of the *Culex (C.) inflicus* complex, *Culex (Tin.) latisquama* and *Anopheles (A.) eiseni*.

DISTRIBUTION (fig. 6). Atlantic coast of central Panama and Canal Zone. Material examined: 195 specimens; 51 males, 96 females, 23 larvae, 25 pupae; 23 individual rearings (20 larval, 2 pupal, 1 incomplete).

PANAMA AND CANAL ZONE. *Canal Zone:* Ancon (?), J. Zetek [USNM]. Arenal River, C.S. Ludlow [USNM]. Caldera, A.H. Jennings (160) [USNM]. Cativa, J.B. Shropshire [UCLA]. Ft. Davis, D. Baker [USNM]. Ft. Gulick, S.J. Carpenter [UCLA]. Ft. Lorenzo, J.B. Shropshire [USNM]. Ft. Randolph, H.G. Dyar and R.C. Shannon [USNM]. Ft. Sherman, S.J. Carpenter [UCLA]; W.H.W. Komp (KO 32-22); J. Zetek; L.H. Dunn [USNM]. France Field, J. Zetek [USNM]. Locality not specified, A.H. Jennings (129,150,158,177,180) [USNM]. Majagual, J. B. Shropshire [UCLA, USNM]. *Colon:* Colon, A. Busck (213) [USNM]. El Corredor (PA 1013, 1016) [UCLA]. Lagarto [UCLA, USNM]. Maria Chiquita (PA 1006,1008) [UCLA]. Portobelo (PA 585,598) [UCLA]. Salud (PA 573) [UCLA].

13. *Deinocerites colombianus* Adames, n.sp.

Figs. 6,41-43

TYPES: *Holotype* male with associated larval and pupal skins and genitalia slide (COA 40-27), La Punta, Turbo, Antioquia, Colombia, 30 Aug 1967, A.J. Adames and A. Quinonez [USNM]. *Allotype* female with associated larval and pupal skins and genitalia slide (COA 40-22), same data as holotype [USNM]. *Paratypes:* 2 lpM (COA 39-10,13), 1 lpF (39-11), 2 lpF (40-20,28), 1 F (38), 2 L (35), 8 L (39), 1 L (40), same data as holotype [BM, UCLA, USNM].

FEMALE (fig. 41). Wing 3.67 mm. Proboscis 2.09 mm. Forefemur 2.14 mm. Abdomen about 3.41 mm. Essentially similar to *epitedeus* from which it is apparently indistinguishable.

FEMALE GENITALIA (fig. 41). Sternite VIII sometimes with a few scales. Tergite IX with 4-6 setae on each side. Cercus essentially similar to *epitedeus*. Distal part of postgenital plate basically similar to *epitedeus* except for slight differences in contour of lateral lobe (in ventral aspect), apical bristle parallel with its mate.

MALE (fig. 41). Wing 3.13 mm. Proboscis 2.70 mm. Forefemur 2.50 mm. Abdomen (not including genitalia) about 2.24 mm. Anterior claw of foreleg as in *epitedeus*, that of midleg simple.

MALE GENITALIA (fig. 42). Differing from *epitedeus* apparently only in IX tergite lobe with distal part broad and directed laterad; body of lobe broad in basal two-thirds, slightly attenuated in distal third; reaching base of subapical lobe but not extending beyond it.

PUPA (fig. 42). Abdomen 4.05 mm. Trumpet 0.71 mm. Paddle 0.76 mm. Diagnostic characters as in the key; general chaetotaxy based on 5 reared specimens. Hairs 1-C and 9-C branched. **Cephalothorax:** Integument yellowish to medium brown. Hair 1(2), 2(2), 3(2), 4(1), 5(1,1-2), 6(2,1-3), 7(2,1-4), 8(3), 9(3,2-3), 10(2,1-2), 11(2,2-3), 12(2). **Trumpet:** As in *epitedeus*; index about 5.2-6.1. Tracheoid about 0.45 of trumpet length. **Abdomen:** Integument yellowish to medium brown. Segment I: hair 1(16,14-18), 2(1,1-2), 3(2), 4(4,3-5), 5(3,3-4), 6(1,1-2), 7(2), 9(1). Segment II: hair 0(1), 1(2,2-3), 2(2), 3(1), 4(4,2-4), 5(1), 6(1,1-2), 7(1), 9(1). Segment III: hair 0(1), 1(3,3-4), 2(1), 3(2), 4(1,1-2), 5(1), 6(1), 7(3,2-4), 8(4,4-6), 9(1), 10(1), 11(1), 14(1). Segment IV: hair 0(1), 1(4,3-4), 2(1), 3(4,3-6), 4(1), 5(1), 6(1), 7(2,1-2), 8(2,2-3), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(3,2-4), 2(1), 3(1,1-2), 4(5,3-6), 5(1), 6(1), 7(4,2-5), 8(2,2-3), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(2,2-4), 2(1), 3(1,1-2), 4(2,2-3), 5(1), 6(1), 7(1,1-2), 8(2,1-2), 9(1), 10(1,1-2), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2,1-2), 4(2,1-2), 5(2,2-3), 6(1), 7(1), 8(2,2-3), 9(5,5-7), 10(2,1-2), 11(1,1-2), 14(1). Segment VIII: hair 0(1), 4(2), 9(1), 14(1). **Paddle:** Width about 0.8 of length.

FOURTH INSTAR LARVA (fig. 43). Head 1.27 mm. Siphon 1.52 mm. Diagnostic characters as in the key; general chaetotaxy based on 6 reared specimens. **Head:** Integument light brown. Mental plate similar to that of *epitedeus* except for the subapical spicules which are usually denticulate. Hair 0(1), 1(1), 2(1), 3(not detectable), 4(4,3-5), 5(2,2-3), 6(1), 7(7,5-8), 8(4,4-5), 9(5,4-6), 10(3,2-4), 11(5,4-6), 12(2,1-3), 13(7,5-8), 14(1), 15(3,2-4). **Antenna:** Length about 0.45 of head; shaft with numerous spicules on proximal part. Hair 1(4,3-6). **Thorax:** Prothorax: hair 0(12,9-12), 1(1), 2(1), 3(1,1-2), 4(4,3-5), 5(1,1-2), 6(1), 7(4,3-4), 8(2,2-3), 9(2,2-3), 10(1), 11(3,3-4), 12(1), 14(1). Mesothorax: hair 1(1), 2(2,2-3), 3(1), 4(2), 5(1), 6(1), 7(1), 8(8), 9(7-9), 10(1), 11(2,2-3), 12(1), 13(?), 14(8-

12). Metathorax: hair 1(1), 2(2,2-3), 3(5,4-7), 4(4,3-4), 5(1), 6(1), 7(9,8-9), 8(?), 9(9,8-9), 10(1), 11(4), 12(1), 13(5,4-6). **Abdomen:** Segment I: hair 1(1), 2(1), 3(3,2-3), 4(9,8-9), 5(3,3-4), 6(3,2-3), 7(2), 9(2,1-3), 10(1), 11(2), 12(3,3-4), 13(1). Segment II: hair 0(1), 1(1), 2(1), 3(2), 4(7,7-12), 5(4,3-5), 6(2,2-3), 7(2,2-4), 8(4,2-4), 9(1), 10(1), 11(2,2-3), 12(2), 13(?). Segment III: hair 0(1), 1(1,1-2), 2(1), 3(1), 4(2,2-3), 5(2,2-3), 6(2,2-3), 7(9,5-9), 8(1,1-2), 9(1), 10(1,1-2), 11(2), 12(2), 13(2), 14(1). Segment IV: hair 0(1), 1(2), 2(1), 3(2,2-3), 4(2,2-3), 5(3,2-3), 6(2), 7(8-10), 8(1), 9(1), 10(1), 11(2,1-2), 12(1), 13(4,3-5), 14(1). Segment V: hair 0(1), 2(2), 3(1), 4(7,6-9), 5(3,3-4), 6(2), 7(10,7-10), 8(1), 9(1), 10(1), 11(2,1-2), 12(2,2-3), 13(4,4-5), 14(1). Segment VI: hair 0(1), 1(5,3-5), 2(1), 3(1), 4(3,2-4), 5(5,3-5), 6(1), 7(3,3-4), 8(2,2-3), 9(1), 10(1), 11(2), 12(1), 13(?), 14(1). Segment VII: hair 0(1), 1(2), 3(4,3-4), 4(1), 5(3-4), 6(13,12-14), 7(1), 8(7-9), 9(3), 10(1), 11(2,2-3), 12(1), 13(2,2-3), 14(1). **Segment VIII:** Comb scales similar to those of *epitedeus*. Hair 0(1), 1(4,3-4), 2(1), 3(4,4-5), 4(1), 5(5,5-6), 14(1). **Siphon:** Integument light brown. Index about 5.1-5.6. Pecten teeth 3(2-5); shape and size as in *epitedeus*. Hair 1(2), hair 1ad(4,3-4), hair 1av(4,3-4); hairs 2,6,7,9 all single; 8(2,1-3). **Anal Segment:** Gill about 0.53 of dorsal saddle length. Ventral margin of dorsal saddle reaching alveolus of hair 1-X. Hair 1-X longer than gill. Hair 1(1), 2(8,7-12), 3(1), 4a(13,12-17), 4b(12,11-14), 4c(12,10-13), 4d(12,10-14), 4e(13,12-14), 4f(9,9-10).

SYSTEMATICS. *Deinocerites colombianus* is the most clearly marked of the 3 members of the Atlantic complex of the group. Its female however cannot be differentiated from the other 2 species. In addition to the diagnostic features in the keys, the larva of *colombianus* is distinguished from *epitedeus* by the reduction of the ventral brush to 6 pairs of hairs (from 7 pairs in the latter). This species occupies the southern part of the range of the complex from the San Blas area of Panama into the Turbo area of Colombia.

BIONOMICS. The immature stages of *colombianus* have been collected in large crabholes in association with *melanophyllum* and *Culex (Tin.) latisquama*. Nothing is known of the blood feeding habits of this species.

DISTRIBUTION (fig. 6). Atlantic coast of eastern Panama and western Colombia. Material examined: 99 specimens; 47 males, 23 females, 20 larvae, 9 pupae; 9 larval individual rearings.

COLOMBIA. *Antioquia:* Atrato delta (COA 31) [UCLA]. Turbo (COA 35,39,40), type series [BM, UCLA, USNM].

PANAMA. *San Blas:* Cuadi River, B.F. Eldridge [UCLA, USNM].

14. *Deinocerites costaricensis* Adames & Hogue

Figs. 6,44-46

1970. *Deinocerites costaricensis* Adames and Hogue, 1970:12. TYPE: Holotype female (CR 28-213) with associated larval and pupal skins, 1 km north Boca del Rio Barranca, Hacienda Bonilla, Puntarenas Province, Costa Rica, 17 Nov 1962, C.L. Hogue and W.A. Powder [USNM].

Deinocerites species A of Belkin and Hogue (1959:438); Ross (1962:192); Hogue and Wirth (1968:6).

FEMALE (fig. 44). Wing 3.98 mm. Proboscis 2.37 mm. Forefemur 2.24 mm.

Abdomen about 3.77 mm. **Head:** Narrow decumbent scales creamy; erect scales usually yellowish. **Antenna:** Torus sometimes with a few scales; exceeding proboscis at least from middle of flagellar segment 5. **Thorax:** Postnotum without hairs. Middle and lower parts of *ppn* with numerous bristles; *ppl* bristles very numerous, scales few; *mep* with translucent scales usually covering most of the sclerite, body of sclerite also with very numerous microsetae, *umep* bristles numerous; metameron with several small hairs. **Legs:** Scaling similar to *epitedeus* except for more numerous scales in lateroposterior surface of hindcoxa; forefemur with anteroventral margin with a row of bristles.

FEMALE GENITALIA (fig. 44). **Sternite VIII** usually without scales, at most 1 present. **Tergite IX** with 1-3 setae on each side. **Cercus** (in lateral aspect) with dorsal margin of sclerotized part distinctly longer than ventral, its basal width less than 0.5 of length of sclerotized ventral margin; ventral margin convex, dorsal margin more or less straight but slightly directed ventrad distally; apex directed caudad, with 5 or 6 apical or subapical specialized setae with twisted apex. Distal part of **postgenital plate** (in ventral aspect) with deep round notch, apicolateral margins more or less conical; lateral lobe (in lateral aspect) elongate, its apical bristle parallel with its mate (in ventral aspect).

MALE (fig. 44). Wing 3.13 mm. Proboscis 2.71 mm. Forefemur 2.37 mm. Abdomen (not including genitalia) about 2.79 mm. Anterior claw of foreleg with a very long slender tooth, posterior claw with a very small denticle; anterior claw of midleg with a small denticle.

MALE GENITALIA (fig. 45). **Segment IX:** Tergite lobe broad at base and cone shaped distally; apical part not strongly attenuated and not reaching base of subapical lobe. **Sidepiece:** Subapical lobe with rather small thumb; seta *c* spiniform, with an apical attenuation. **Phallosome:** Dorsal parameres widely separated but with a slight indication of an incomplete dorsal bridge; apical spine long and slender; ventral teeth about 18, short to moderately long, slender, arising from an evenly convex ventrolateral border. Aedeagus (in tergal aspect) more or less uniform in width but with a premedian constriction and an apical expansion.

PUPA (fig. 45). Abdomen 4.07 mm. Trumpet 0.76 mm. Paddle 0.48 mm. General chaetotaxy based on 10 reared specimens. Except for diagnostic characters in the key apparently indistinguishable from *curiche*. Hair 1-C forked, main stem about 0.4 of total length, 9-C usually slightly forked. **Cephalothorax:** Integument yellowish. Hair 1(2,1-2), 2(2), 3(2,1-2), 4(1), 5(1,1-2), 6(2,2-5), 7(1), 8(3,3-4), 9(2,1-4), 10(1), 11(2,1-3), 12(2,1-3). **Trumpet:** As in *epitedeus*; index about 5.3-7.6. Tracheoid about 0.5 of trumpet length. **Abdomen:** Integument yellowish to medium brown. Segment I: hair 1(15,7-20), 2(1,1-2), 3(2), 4(3,2-4), 5(5,4-6), 6(1), 7(2,1-3), 9(1), 10(occasionally present, 1), 11(occasionally present, 2,1-3). Segment II: hair 0(1), 1(2,2-3), 2(2), 3(1), 4(4,4-6), 5(1), 6(1), 7(1), 9(1). Segment III: hair 0(1), 1(5,4-7), 2(1), 3(2,2-4), 4(2,1-3), 5(1), 6(1), 7(3,2-5), 8(5,4-6), 9(1), 10(1), 11(1,1-3), 14(1). Segment IV: hair 0(1), 1(5,3-6), 2(1), 3(3,2-6), 4(2,1-2), 5(1), 6(1), 7(3,2-4), 8(2,2-3), 9(1), 10(1), 11(1,1-2), 14(1). Segment V: hair 0(1), 1(4,2-5), 2(1), 3(1), 4(4,2-6), 5(1), 6(1), 7(4,2-5), 8(3,1-3), 9(1), 10(1), 11(1,1-2), 14(1). Segment VI: hair 0(1), 1(4,2-5), 2(1), 3(1), 4(2,1-2), 5(1), 6(1), 7(1), 8(2,1-4), 9(1), 10(1), 11(2,1-2), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2,1-2), 4(1,1-2), 5(3,1-5), 6(1), 7(1), 8(2,2-3), 9(4,3-6), 10(1), 11(2,1-2), 14(1). Segment VIII: hair 0(1), 4(2,1-2), 9(1), 14(1). **Paddle:** Width about 0.8 of length.

FOURTH INSTAR LARVA (fig. 46). Head 1.22 mm. Siphon 1.43 mm. Diag-

nostic characters as in the key; general chaetotaxy based on 9 reared specimens. **Head:** Integument yellowish to light brown. Mental plate almost as wide as long, triangular, with apical and subapical spicules denticulate, lateral ones usually sharply pointed, sometimes denticulate. Hair 0(1), 1(1), 2(1), 3(not detectable), 4(3, 2-5), 5(2), 6(1), 7(6,4-8), 8(5,3-6), 9(5,3-5), 10(3,2-4), 11(3,2-4), 12(2,1-2), 13(6,5-8), 14(1), 15(4,3-5). **Antenna:** Length about 0.33 of head; shaft with numerous minute spicules on proximal part. Hair 1(4,3-5). **Thorax:** Prothorax: hair 0(9,9-13), 1(1), 2(1), 3(1), 4(3,2-4), 5(1), 6(1), 7(3,2-4), 8(1,1-2), 9(3,2-3), 10(1), 11(4,4-6), 12(1), 14(1). Mesothorax: hair 1(1), 2(3,2-5), 3(1), 4(1,1-2), 5(1), 6(1), 7(1), 8(8,6-8), 9(8,7-10), 10(1), 11(3,2-4), 12(1), 13(16,12-19), 14(?). Metathorax: hair 1(1), 2(3,2-4), 3(5,4-7), 4(4,3-6), 5(2,1-2), 6(1), 7(9,7-9), 8(12, 12-24), 9(10,8-10), 10(1), 11(3,3-5), 12(1), 13(6,5-7). **Abdomen:** Segment I: hair 1(1), 2(1), 3(2,1-2), 4(9,7-12), 5(5,4-6), 6(2,2-3), 7(2,1-2), 9(2,2-3), 10(2,1-2), 11(2,1-4), 12(2), 13(1). Segment II: hair 0(1), 1(1), 2(1), 3(2), 4(9,5-10), 5(5, 4-5), 6(2,2-3), 7(5,4-6), 8(4,2-5), 9(1), 10(1), 11(3,2-4), 12(2,2-3), 13(14,12-16). Segment III: hair 0(1), 1(1,1-2), 2(1), 3(1), 4(2), 5(3,2-4), 6(2), 7(7,5-12), 8(2, 1-2), 9(1), 10(1), 11(2,1-3), 12(2,2-3), 13(1), 14(1). Segment IV: hair 0(1), 1(2,1-2), 2(1,1-2), 3(2,1-3), 4(2), 5(4,2-5), 6(2), 7(10,7-10), 8(2,1-2), 9(1), 10(1), 11(2,2-5), 12(2,1-3), 13(1,1-2), 14(1). Segment V: hair 0(1), 1(1), 2(1), 3(1), 4(6,5-8), 5(5,2-5), 6(2), 7(6,5-9), 8(2,2-3), 9(1), 10(1), 11(3,2-3), 12(1), 13(2,1-2), 14(1). Segment VI: hair 0(1), 1(5,3-7), 2(1), 3(1), 4(2,1-2), 5(5,3-5), 6(1), 7(4,2-5), 8(3,2-4), 9(1), 10(1), 11(3,3-4), 12(1), 13(16-25), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(5,4-7), 4(1), 5(2,2-4), 6(11,9-13), 7(1), 8(7,7-11), 9(3,2-5), 10(1), 11(2,1-4), 12(1), 13(1,1-2), 14(1). **Segment VIII:** Comb scales slender at base, apex fringed, slightly fringed on lateroapical margin. Hair 0(1), 1(3,3-4), 2(1), 3(4,4-5), 4(1), 5(2), 14(1). **Siphon:** Integument light brown. Index about 3.8-5.6. Pecten teeth 6(4-6), similar to those of *epitedeus*. Hair 1(2,1-2), hair 1ad(3,2-5), hair 1av(3,3-4); hairs 2,6,7 and 9 all single; 8(2,1-2). **Anal Segment:** Gill subequal to dorsal saddle length. Ventral margin of dorsal saddle not reaching alveolus of hair 1-X. Hair 1-X shorter than gill. Hair 1(2,1-3), 2(9,6-10), 3(1), 4a(12,12-15), 4b(13,11-14), 4c(12,9-15), 4d(13,12-15), 4e(13,12-15), 4f(14,12-16), 4g(12,11-14).

SYSTEMATICS. *Deinocerites costaricensis* is the better known of the 2 species comprising the Pacific complex of the group and occupies the northern part of its range in Costa Rica. It is possible that it occurs also in northern Panama. The females of the 2 species are usually readily differentiated by the key characters. Of particular interest are the specialized setae of the cercus which are better developed in the female of *costaricensis*. These specialized setae, I believe, have arisen independently and are not indicative of any relationship with the Cancer Group which has a single pair of spatulate cercal setae. Therefore, I reject the suggestion of Belkin and Hogue (1959:438) that *costaricensis* (as species A) is a species of hybrid origin between the Cancer Group and the *mcdonaldii* stock.

The 2 species of the complex cannot be differentiated on external features of the adults but are usually readily separated in the other stages and the male genitalia by the key characters. The larva of *costaricensis* retains the primitive condition of 7 pairs of hairs in the ventral brush while that of *curiche* has the brush reduced to 6 pairs of hairs.

At present there is a wide gap between the distribution of *costaricensis* and that of *curiche* from the Osa Peninsula in Costa Rica to northern Colombia. It is probable that 1 or more species of the complex will be found in this area, 1

or both of the known species and possibly a third one which would occupy the central area of the distribution of the Pacific complex as in the case of the Atlantic complex of the group.

BIONOMICS. All records of *costaricensis* are from the burrows of the Mouthless Crab, *Cardisoma crassum*, where it is usually associated with the more common *pseudus*. It has also been found associated with a species of the *Culex* (*C.*) *inflictus* complex and a species of *Culex* (*Mel.*). There is also a record of a single larva from a mangrove treehole (CR 130) in association with *Culex* (*Anoed.*) *conservator*, *Haemagogus chalcospilans*, *Orthopodomyia fascipes* and *Corethrella* (*C.*) *sp.*

DISTRIBUTION (fig. 6). Pacific coast of Costa Rica. Material examined: 689 specimens; 31 males, 41 females, 528 larvae, 89 pupae; 38 individual rearings (23 larval, 5 pupal, 10 incomplete).

COSTA RICA. *Puntarenas*: Boca del Rio Barranca (LCBA 111,155,156,158,159,174) [UCLA]. Boca del Rio Baru (CR 34,43) [UCLA]. Hacienda Bonilla (CR 28,106,107) [BM, LACM, UCLA, USNM]. Rincon, Peninsula de Osa (CR 122-124,130,135,136,142) [UCLA]. Tarcoles (835) [USNM].

15. *Deinocerites curiche* Adames, n.sp.

Figs. 6,47-49

TYPES: *Holotype* male with associated larval and pupal skins (COA 50-14), El Naranjo, Curiche, El Choco, Colombia, 31 Aug 1967, A.J. Adames and A. Quinonez [USNM]. *Allotype* female with associated larval and pupal skins (COA 50-11), same data as holotype [USNM]. *Paratypes*: 2 lpM (COA 50-12,19), 1 pF (50-100), 2 IP (50-10,18), 9 L (50), same data as holotype [BM, UCLA, USNM].

FEMALE (fig. 47). Wing 2.83 mm. Proboscis 2.75 mm. Forefemur 2.39 mm. Abdomen about 2.5 mm. Apparently indistinguishable from *costaricensis*.

FEMALE GENITALIA (fig. 47). *Sternite VIII* sometimes with several scales. *Tergite IX* with 1-3 setae on each side. *Cercus* (in lateral aspect) with the dorsal and ventral margins of sclerotized part subequal; its basal width over 0.6 of length of sclerotized ventral margin; ventral and dorsal margins convex; apex directed caudad; 5 or 6 weak to moderately strong apical or subapical bristles, with or without twisted apex. Distal part of *postgenital plate* basically as in *costaricensis* except for a shallower notch (in ventral aspect).

MALE (fig. 47). Wing 3.16 mm. Proboscis 2.42 mm. Forefemur 2.24 mm. Abdomen (not including genitalia) about 2.50 mm. Apparently indistinguishable from *costaricensis* except for posterior claw of foreleg which appears to be single.

MALE GENITALIA (fig. 48). *Segment IX*: Tergite lobe similar to that of *costaricensis* except for a more sinuous inner margin and blunter apex. *Sidepiece*: As in *costaricensis*. *Phallosome*: Dorsal paramere with about 25 ventral teeth, usually long, moderately heavy and arising from a distinct humplike expansion of ventrolateral border. Aedeagus similar to that of *costaricensis*.

PUPA (fig. 48). Abdomen 4.61 mm. Trumpet 0.84 mm. Paddle 0.78 mm. General chaetotaxy based on 5 reared specimens. Except for diagnostic key characters indistinguishable from *costaricensis*. Hair 1-C usually forked, main stem about 0.4 of total length, 9-C sometimes slightly forked. *Cephalothorax*: Integument medium brown. Hair 1(2), 2(2), 3(2), 4(1), 5(1), 6(2,2-4), 7(2,1-2), 8(3), 9(3,1-3),

10(1), 11(2), 12(1). **Trumper:** As in *epitedeus*; index about 5.4-7.1. Tracheoid about 0.3-0.4 of trumpet length. **Abdomen:** Integument yellowish to medium brown. Segment I: hair 1(13,10-15), 2(1,1-2), 3(2), 4(3,1-4), 5(2,2-3), 6(1), 7(2,1-2), 9(1), 10(occasionally present, 1), 11(occasionally present, 1). Segment II: hair 0(1), 1(2,1-2), 2(2,1-2), 3(1), 4(3,1-4), 5(1), 6(1,1-2), 7(1), 9(1). Segment III: hair 0(1), 1(4,4-6), 2(1,1-2), 3(2,1-3), 4(2), 5(1), 6(1), 7(2,2-4), 8(5,4-7), 9(1), 10(1), 11(1), 14(1). Segment IV: hair 0(1), 1(5,5-6), 2(1), 3(3,1-4), 4(1), 5(1), 6(1), 7(3,2-3), 8(3,1-3), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(6,4-8), 2(1), 3(1,1-2), 4(6,2-6), 5(1), 6(1), 7(3,3-7), 8(3,2-4), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(5,4-7), 2(1), 3(1), 4(2), 5(1), 6(1), 7(1,1-2), 8(2,2-3), 9(1), 10(1), 11(2), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(1,1-2), 4(2,1-2), 5(3,2-5), 6(1), 7(1), 8(2,1-2), 9(4,4-5), 10(2), 11(2), 14(1). Segment VIII: hair 0(1), 4(2,1-2), 9(1), 14(1). **Paddle:** Width about 0.8 of length.

FOURTH INSTAR LARVA (fig. 49). Head 1.27 mm. Siphon 1.31 mm. Diagnostic characters as in the key; general chaetotaxy based on 5 reared specimens.

Head: Integument yellowish to light brown. Mental plate similar to that of *costaricensis*, except for lateral spicules which are usually all denticulate. Hair 0(1), 1(1), 2(1), 3(not detectable), 4(3,2-5), 5(2), 6(1), 7(6,5-7), 8(4,4-6), 9(5,4-7), 10(3,1-3), 11(3,2-5), 12(1), 13(6,5-7), 14(1), 15(3,3-4). **Antenna:** Length about 0.44 of head; shaft with numerous spicules on proximal part. Hair 1(4). **Thorax:** Prothorax: hair 0(8,8-10), 1(1), 2(1), 3(1), 4(3,2-4), 5(1), 6(1), 7(3,2-3), 8(1), 9(2), 10(1), 11(3), 12(1), 14(1,1-2). Mesothorax: hair 1(1), 2(3,2-4), 3(1), 4(1,1-2), 5(1), 6(1,1-2), 7(1), 8(8-9), 9(6-9), 10(1), 11(3), 12(1), 13(?), 14(?). Metathorax: hair 1(1), 2(2,2-3), 3(5,5-7), 4(3,2-4), 5(1,1-2), 6(1), 7(8,8-9), 8(?), 9(7-9), 10(1), 11(2-3), 12(1), 13(7). **Abdomen:** Segment I: hair 1(1), 2(1), 3(2,1-2), 4(7-9), 5(4,3-4), 6(2), 7(2,1-2), 9(2,2-3), 10(1), 11(2,2-3), 12(2,2-3), 13(1). Segment II: hair 0(1), 1(1), 2(1), 3(1,1-2), 4(6,6-7), 5(3,3-5), 6(2), 7(4,1-4), 8(4,4-5), 9(1), 10(1), 11(2,2-3), 12(2,2-3), 13(?). Segment III: hair 0(1), 1(1,1-2), 2(1), 3(1), 4(2,2-3), 5(3), 6(2), 7(5,3-6), 8(2,2-3), 9(1), 10(1), 11(2,2-3), 12(2), 13(1), 14(1). Segment IV: hair 0(1), 1(1), 2(1), 3(2), 4(2), 5(3,2-3), 6(2), 7(7,7-8), 8(2), 9(1), 10(1), 11(2), 12(2), 13(1,1-2), 14(1). Segment V: hair 0(1), 1(1), 2(1), 3(1), 4(7,6-8), 5(3,3-4), 6(2), 7(6,6-7), 8(2), 9(1), 10(1), 11(3,2-3), 12(1,1-2), 13(2), 14(1). Segment VI: hair 0(1), 1(5,5-6), 2(1), 3(1), 4(2), 5(3,3-4), 6(1), 7(5,4-5), 8(3,2-4), 9(1), 10(1), 11(3,2-5), 12(1), 13(?), 14(1). Segment VII: hair 0(1), 1(2), 2(1), 3(5,4-6), 4(1), 5(3,3-4), 6(10,9-10), 7(1), 8(6,6-7), 9(2,2-3), 10(1), 11(3,2-3), 12(1), 13(2), 14(1). **Segment VIII:** Comb scales slender at base and fringed only apically. Hair 0(1), 1(3,2-4), 2(1), 3(4,3-4), 4(1), 5(3), 14(1). **Siphon:** Integument light brown. Index about 4.4-4.9. Pecten teeth 5(4-7), similar to those of *epitedeus*. Hair 1(2), hair 1ad(3,2-3), hair 1av(4,2-4); hairs 2, 6, 7, 9 all single; 8(2). **Siphon:** Gill about 0.76 of dorsal saddle length. Ventral margin of dorsal saddle not reaching alveolus of hair 1-X. Hair 1-X shorter than gill. Hair 1(1), 2(6,6-8), 3(1), 4a(12,11-14), 4b(11,11-14), 4c(12,11-12), 4d(12,11-14), 4e(13,12-15), 4f(11,10-14).

SYSTEMATICS. This species is the southern member of the Pacific complex of the group. As indicated under its close relative *costaricensis*, it can usually be readily separated from that species in all stages except on external features of the adults. Its distribution is probably more extensive than reported here.

BIONOMICS. All the collections of *curiche* are from large crabholes. This species has been found associated with *pseudos* and *Culex (C.) inflicus*. Nothing is known of its blood feeding habits.

DISTRIBUTION (fig. 6). Pacific coast of northern Colombia. Material examined: 71 specimens; 7 males, 9 females, 34 larvae, 21 pupae; 19 individual rearings (9 larval, 5 pupal, 5 incomplete).

COLOMBIA. *El Choco*: Curiche (COA 10,15,17,43,48,50) [BM, UCLA, USNM].

PSEUDES GROUP

FEMALES. Medium-sized species, wing 3.0-3.4 mm. Mesonotum dark brown; pleural integument usually tan or brownish and not strongly contrasting with mesonotal integument. *Antenna*: Flagellar segment 1 with scales, length varied, about equal to combined length of segments 2-4 or 2-5; segments 2-12 subequal in length but progressively slightly shortened distad; length varied, exceeding proboscis from base of flagellar segment 9 to distal half of 7. *Thorax*: Postnotum without bristles or with bristles in middle (usually in *mcdonaldi*). *Apn* usually tan to brownish; *ppn* usually light tan to brownish, scales broad on caudoventral area; *ppl* usually light tan to brownish; *psp*, *ssp*, *stp* and *pra* usually brownish; paratergite usually brownish; *mep* usually lighter than *stp*, and with a patch of translucent scales, *lmep* with 1 very strong bristle; meron, metameron and metapleuron usually lighter than *stp*. *Legs*: Coxal integument usually lighter than *stp*. Only posteroventral two-thirds of hindfemur pale, other femora dark; anteroventral margin of forefemur with or without spiniforms; when latter present then a row of short spiniforms near base of posterodorsal margin also present, when absent then a row of bristles present on both anteroventral and posterodorsal margins. *Abdomen*: Sternites II,III or (usually) II-VI paler than tergites.

FEMALE GENITALIA. *Sternite VIII* with sclerotized distal band broad and without or with only a few scales; caudal margin not produced into a submedian ventral angle, this area without strongly differentiated marginal bristles. *Tergite IX* usually with a few setae on each side. *Tergite X* poorly differentiated dorsally and with a very small lateral sclerotization. *Cercus* with a few moderately strong apical or subapical normal bristles.

MALES. Essentially similar to females. *Antenna*: Length varied, exceeding proboscis from base of flagellar segment 5 to middle of segment 3; flagellar segments 1 and 2 to 1-4 with scales; segments 1-7 markedly elongated but progressively shortened distad; segment 1 subequal to combined length of segments 2 and one-half of 3; segments 8-13 subequal but progressively slightly shortened distad; segment 13 sometimes slightly broader than 12. *Legs*: Claws of foreleg strongly enlarged, similar in shape, either slender or heavy, usually both with a very minute submedian projection or a very minute slender subbasal tooth; claws of midleg slightly enlarged, similar in shape and simple.

MALE GENITALIA. *Segment IX*: Tergite lobe cylindrical; angled laterad at base; apex always at least reaching base of subapical lobe. *Sidepiece*: Without scales. Apicosternal lobe prominent, with a long apical seta. *Phallosome*: Dorsal parameres with an incomplete dorsal bridge; articulated ventrally with a dorsal sclerotized projection from basal third of aedeagus.

PUPAE. *Cephalothorax*: Hairs 2,3-C closely approximated, 2-C weaker and shorter than 3-C; hair 5-C double, strongly developed, longer than distance from its alveolus to base of trumpet, about 1.3-1.5 of trumpet length; 7-C usually double or triple (1-3); hair 8-C usually single (1 or 2). *Metanotum*: Hair 10-C moderately to strongly developed, equal to or longer than 11-C, variously branched, usually

double or triple (in *howardi* and *mcdonaldi*) to markedly multibranching (*pseudes*). **Abdomen:** Hair 1-II not reaching apex of tergite III, usually multibranching (3-10 primary branches), if single or double then markedly secondarily dendritic; 1-III-VI branched; 5-II always laterad of 3-II; hair 3-V often single (1 or 2); hair 1-VII shorter than tergite VIII, at most reaching base of 4-VIII. **Paddle:** Hair 1-P subequal to longer than paddle.

FOURTH INSTAR LARVAE. **Head:** Hair 2-C at least subequal to 0.5 of 1-C, always markedly mesad of 1-C; hair 5-C usually with 4 barbed branches (3-5); hair 6-C single to triple, barbed, length varied, about 1.2 to 1.4 of 5-C. **Thorax:** Prothoracic hair 9-P single. **Abdomen:** Hair 6-II double; dorsal sensillum of segment V laterad of 4-V; hair 6-VI single; 1-VII moderately to strongly developed, always longer than 3-VII and exceeding base of segment VIII, sometimes reaching base of siphon; 1-VIII usually with 5 branches (2-7). **Siphon:** Hair 1-S usually triple (2-4). **Anal Segment:** Ventral brush (4-X) with 6 or 7 pairs of hairs. Gill short to moderately long, either round and slightly emarginate on apex or more or less cone-shaped and slightly emarginate on ventral margin. Length varied, about 0.45 to 0.9 of dorsal saddle length. Dorsal saddle narrow to moderately broad, its ventral margin sometimes near base of hair 1-X.

DISCUSSION. The *Pseudes* Group is proposed here for *pseudes*, *howardi* and *mcdonaldi* which were included by Belkin and Hogue (1959) in their *Epitedeus* Group. The new group contains the most complex and intriguing elements in the genus. The *Pseudes* Group shares with the restricted *Epitedeus* Group the development of a patch of mesepimeral scales in the adults but is distinguished from the latter by the presence of a strongly differentiated lower *mep* bristle. Its immature stages resemble those of the *Cancer* Group and their separation from that group is sometimes rather tenuous.

The group is known only from the Pacific basin except for the Atlantic intrusion of *pseudes* into the Gulf of Mexico. It is the only group whose species are not allopatric in distribution. All 3 have been found in 1 locality in the Bahia de Banderas area near the mouth of the Gulf of California.

Of the 3 included species, *mcdonaldi* appears to be the most primitive as it lacks the spiniforms of the forefemur in the adults (present in the other 2 species) and has 7 pairs of hairs in the ventral brush of the larva. This species appears to be restricted to the region of the Gulf of California in Mexico on the mainland as well as the tip of Baja California. *Deinocerites pseudes* is the modern dominant species of the entire genus with a distribution extending from the Gulf of California and the Gulf of Mexico to the Gulf of Guayaquil. It is thus the only species in the genus definitely known to be present in both the Atlantic and Pacific basins and it is the only one to show considerable variation especially on the periphery of its range. The third species, *howardi*, shows a remarkable mixture of morphological characters of different stages of *mcdonaldi* and *pseudes* and may have been produced through hybridization or introgression between these species as suggested by Belkin and Hogue (1959:436). The range of *howardi* is now known to extend from Bahia de Banderas, Mexico, to Nicaragua.

Two of the species, *mcdonaldi* and *howardi*, appear to be rare or uncommon, but *pseudes* is the most common species of the genus. Nothing is known of the bionomics of *mcdonaldi* or *howardi* but considerable information has been gathered on *pseudes* which has been colonized in Panama. The latter species will bite man and has been shown to have a wide variety of blood hosts including mammals, birds, lizards and amphibians. The immature stages of all 3 species have been

found primarily in large crabholes (*Cardisoma* and *Gecarcinus*); *pseudes* has also been recorded from the smaller holes made by *Ucides* and even *Uca*.

16. *Deinocerites pseudes* Dyar & Knab

Figs. 7,50-52

1909. *Deinocerites pseudes* Dyar and Knab, 1909:260. TYPE: Lectotype female, Ancon, Panama, Canal Zone, A.H. Jennings, 378 [USNM, 12053; designation of Stone and Knight, 1957:197].

Deinocerites pseudes of Howard, Dyar and Knab (1915:210-213); Dunn (1917:167-168); Dyar (1923a:180; 1925:155; 1928:263-264,537); Bonne and Bonne-Wepster (1925:176); Edwards (1932:222); Martini (1935:57); Kumm and Zuniga (1942:406); Arnett (1950:107); Carpenter and Peyton (1952:677-681); Lane (1953:556,557); Horsfall (1955:599); Vargas (1956:30); Stone and Knight (1957:197); Forattini (1958:176); Stone, Knight and Starcke (1959:285); Diaz Najera (1963:190,191); Peyton, Reinert and Peterson (1964:449-458); Galindo (1967:187-190); Grayson, Shrihongse and Galindo (1967:204); Stone (1967:218); Hogue and Wirth (1968:6); Gorgas Memorial Institute (1970:20); Tempelis and Galindo (1970); Reinert (1970).

Culex (Deinocerites) pseudes of Dyar (1918:101).

Deinocerites cancer in part of Knab (1906:95-97).

Deinocerites epitedeus of Rueger and Druce (1950:60,62); Breland (1956:95); Evans (1962:255); Vargas (1956:30; 1960:342).

Deinocerites epitedeus in part of Lane (1953:559, U.S.A. record); Forattini (1958:176).

FEMALE (fig. 50). Wing 2.24-3.4 mm. Proboscis 1.93-2.29 mm. Forefemur 1.53-1.98 mm. Abdomen about 2.55-3.52 mm. Highly variable in size. **Head**: Narrow decumbent scales creamy; erect scales yellowish to brownish; broad decumbent scales of lateral patch whitish. **Antenna**: Torus without scales; flagellar segment 1 equal to combined length of segments 2-4 or 2 to basal third of 5; exceeding proboscis from base of flagellar segment 9 to base of segment 8. **Thorax**: Postnotum without bristles; *ppn* with several bristles in lower part; *ppl* with numerous bristles and occasionally a few scales; *mep* with translucent scales usually covering most of the sclerite, also with numerous microsetae; *umep* bristles numerous; metameron simple. **Legs**: Anterior surface of forecoxa largely covered by bristles and scales, basolateral area with several bristles; midcoxa with scales anterolaterally, laterally with 2 rows of bristles, the anterior row more or less irregular, posterior bristles stronger, posterolateral surface simple; hindcoxa with scales and bristles, upper lateroposterior surface with scales, posterior surface with bristles; forefemur with spiniforms in anteroventral and at base of posterodorsal rows.

FEMALE GENITALIA (fig. 50). **Sternite VIII** usually without scales, rarely with 1. **Tergite IX** occasionally with 1 seta on each side. **Cercus** (in lateral aspect) with ventral margin convex, dorsal margin slightly sinuous in basal part and slightly concave distally; apex slightly upturned, usually with 3 or 4 moderately strong apical or subapical bristles. Distal part of **postgenital plate** (in ventral aspect) with a very deep notch with parallel margins ending in a more or less round base; lateral lobe (in lateral aspect) elongate, its apical bristle parallel with its mate (in ventral aspect).

MALE (fig. 50). Wing 2.6-3.9 mm. Proboscis 2.2-3.0 mm. Forefemur 1.7-2.7 mm. Abdomen (not including genitalia) about 2.3-3.7 mm. Highly variable in size. Flagellar segments 1-3 with scales. Proboscis reaching basal third of flagellar seg-

ment 4 to base of segment 5. Claws of foreleg heavy, usually with a very minute submedian projection.

MALE GENITALIA (fig. 51). *Segment IX*: Tergite lobe extremely variable, usually not extending beyond subapical lobe, with or without a distinct curvature and expansion. *Sidepiece*: Subapical lobe with a large thumb; seta *c* spiniform and usually rather heavy. *Phallosome*: Dorsal parameres with a very slight indication of a narrow incomplete dorsal bridge; apical spine short and broad; ventral teeth short and heavy and on a prominent lobe which in tergal aspect projects about as far caudad as the apical spine. Aedeagus, as seen in tergal aspect, with very sinuous outer margins, markedly constricted beyond middle and narrowing apically; apex slightly swollen.

PUPA (fig. 51). Abdomen 4.0 mm. Trumpet 0.45 mm. Paddle 0.76 mm. Diagnostic characters as in the key; general chaetotaxy based on 10 reared specimens. Hair 5-III usually exceeding the spiracular sensillum and sometimes the alveolus of hair 4 of the second segment following. Hairs 5-IV,V usually reaching and/or exceeding alveolus of hair 4 of the second segment following. *Cephalothorax*: Integument yellowish. Hair 1(2), 2(4,2-5), 3(2,1-2), 4(4,4-6), 5(2), 6(1), 7(2), 8(1, 1-2), 9(2,1-2), 10(multibranched), 11(4,2-4), 12(3,3-5). *Trumpet*: Short, progressively widening apically; index about 2.75-3.28. Integument strongly pigmented, contrasting with cephalothoracic integument, slightly darker on tracheoid, brown distad. Tracheoid about 0.3 and pinna about 0.26 of trumpet length. *Abdomen*: Integument yellowish. Segment I: hair 1 (multibranched), 2(1), 3(2,2-4), 4(4,3-5), 5(6,3-7), 6(1), 7(4,2-6), 9(1), 10(occasionally present, 1), 11(occasionally present, 2). Segment II: hair 0(1), 1(usually multibranched, if single or double then markedly secondarily dendritic), 2(1,1-2), 3(1), 4(4-5,3-5), 5(1), 6(1), 7(2,1-3), 9(1). Segment III: hair 0(1), 1(5,3-6), 2(1), 3(2,1-4), 4(2,1-3), 5(1), 6(1), 7(2, 2-3), 8(4-5,2-6), 9(1), 10(2,2-3), 11(1), 14(1). Segment IV: hair 0(1), 1(3,3-4), 2(1), 3(4,3-5), 4(1), 5(1), 6(1,1-2), 7(2,1-3), 8(2,1-4), 9(1), 10(2,1-2), 11(1), 14(1). Segment V: hair 0(1), 1(2,2-3), 2(1), 3(1,1-2), 4(4-5), 5(1), 6(1), 7(4,3-7), 8(2,2-4), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(2,2-4), 2(1), 3(1, 1-2), 4(2,2-3), 5(1), 6(1), 7(1), 8(1,1-3), 9(1), 10(1,1-2), 11(2,1-3), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2,1-2), 4(1), 5(2,1-3), 6(1,1-2), 7(1), 8(2,2-4), 9(4,3-5), 10(2,1-2), 11(1,1-2), 14(1). Segment VIII: hair 0(1), 4(1,1-2), 9(1), 14(1). *Paddle*: Width about 0.77 of length; hair 1-P longer than paddle.

FOURTH INSTAR LARVA (fig. 52). Head 1.27 mm. Siphon 1.44 mm. Diagnostic characters as in the key; general chaetotaxy based on 10 reared specimens. Length of hairs often variable throughout. *Head*: Integument light brown. Mental plate wider than long, triangular; marginal spicules usually sharply pointed. Hair 0(1), 1(1), 2(1), 3(sometimes developed as a minute spicule), 4(6,5-8), 5(4,3-4), 6(usually single, except in the northernmost populations [Brownsville, Texas] and 1 of the southernmost [Playas, Ecuador] in which they are single to triple, see systematics), 7(10,9-12), 8(4,3-5), 9(5,4-8), 10(2,2-3), 11(4,4-5), 12(2,1-2), 13(6, 5-6), 14(1), 15(2,1-3). *Antenna*: Length about 0.46 of head; shaft with numerous spicules on proximal part. Hair 1(6,5-7). *Thorax*: Prothorax: hair 0(15,10-16), 1(1), 2(1), 3(2,2-3), 4(5,4-5), 5(1), 6(1), 7(4,4-5), 8(1,1-2), 9(1), 10(1,1-2), 11(4, 3-5), 12(1), 14(1). Mesothorax: hair 1(1), 2(2,2-3), 3(1), 4(3,2-3), 5(1), 6(1), 7(1), 8(7,5-7), 9(8,6-8), 10(1), 11(4,3-5), 12(1), 13(7-19), 14(11-14). Metathorax: hair 1(2,1-2), 2(3,2-4), 3(6,4-7), 4(4,2-6), 5(1), 6(1,1-2), 7(9,8-10), 8(14-20), 9(8,7-10), 10(1), 11(3,2-4), 12(1), 13(5,4-7). *Abdomen*: Segment I: hair 1(1), 2(1), 3(3,2-3), 4(9,8-13), 5(5,3-6), 6(2,2-3), 7(2,2-3), 9(3,2-3), 10(2,2-3), 11(3,2-

4), 12(2,2-3), 13(2,1-2). Segment II: hair 0(1), 1(1), 2(1), 3(2,2-3), 4(7,5-7), 5(4,4-5), 6(2), 7(4,3-5), 8(4,1-4), 9(1,1-2), 10(1), 11(2,1-3), 12(2,1-3), 13(?). Segment III: hair 0(1), 1(2,2-4), 2(1), 3(1), 4(2,1-3), 5(3,2-4), 6(2,1-2), 7(8,6-10), 8(2,1-3), 9(1), 10(1,1-2), 11(2,1-2), 12(2,2-3), 13(1), 14(1). Segment IV: hair 0(1), 1(2), 2(1), 3(3,3-4), 4(1,1-2), 5(3,2-5), 6(2,2-3), 7(8,6-9), 8(1), 9(1), 10(1), 11(2,1-3), 12(2,2-3), 13(4,2-4), 14(1). Segment V: hair 0(1), 1(2,1-2), 2(1), 3(1), 4(6,5-8), 5(4,2-5), 6(2), 7(7,7-10), 8(1), 9(1), 10(1), 11(2,2-3), 12(1,1-2), 13(4,2-4), 14(1). Segment VI: hair 0(1), 1(4,3-7), 2(1), 3(1), 4(4,3-5), 5(4,3-6), 6(1,1-2), 7(3,2-4), 8(3,2-4), 9(1), 10(1), 11(2,2-4), 12(1), 13(?), 14(1). Segment VII: hair 0(1), 1(1-2), 2(1), 3(4,1-5), 4(1), 5(5,2-5), 6(16,15-20), 7(2,1-2), 8(10, 9-13), 9(3,2-4), 10(1,1-2), 11(2), 12(1), 13(2,2-3), 14(1). **Segment VIII:** Comb scales with fringe conspicuous at apex, less developed in distal half. Hair 0(1), 1(6,5-7), 2(1), 3(5,4-7), 4(1), 5(4,3-5), 14(2,2-3). **Siphon:** Integument light brown. Index about 5.2-5.6. Pecten teeth 4(3-6), usually bifid, sometimes trifid, longest blade markedly wider; size variable, basal tooth usually shortest. Hair 1(4,3-4), hair 1ad(3,2-4), hair 1av(3,2-4); hairs 2,6,7,8,9 all single. **Anal Segment:** Gill length about 0.56-0.9 of dorsal saddle length; gill either round and slightly emarginate on apex (usually in the northern and southernmost populations) or more or less conical and slightly emarginate on ventral margin (usually in central populations, see systematics). Dorsal saddle moderately broad and with its ventral margin near base of hair 1-X only when gill is conical. Length of hair 1-X variable as compared to gill length. Hair 1(1-2), 2(9,8-12), 3(1), 4a(15,14-17), 4b(12,12-16), 4c(11,10-14), 4d(12,11-13), 4e(13,13-15), 4f(13,13-16).

SYSTEMATICS. *Deinocerites pseudus* is the most widespread and the dominant species of the genus, with a range extending from the Gulf of Mexico (from south Texas) to the isthmus of Tehuantepec in the Atlantic basin and from the Gulf of California to the southern shores of the Gulf of Guayaquil in northern Peru in the Pacific basin. There are a few specimens apparently collected in the Atlantic basin of Panama but these may be strays or erroneously labelled as no recent specimens are known from this area.

The most characteristic and constant features of *pseudus* are the development of the dorsal paramere and the claws of the male, and of hair 10-C of the pupa. In most other characters, including size, *pseudus* shows a great deal of variation that is not found to any extent in any other species of the genus. The variability reaches its peak in the peripheral populations in the north and in the south.

In the adults, there is very striking variation in size, even in the same collection. I found no correlation between size and any other variation noted in the adults or the immature stages and consider that it is probably dependent on the nutrition of the larva. Another striking variation in the adults is in the relative length of the basal flagellar segments in both sexes. This variation affects greatly the proportional length of the antenna and proboscis as noted in the description.

The immature stages show a great deal of variability also and tend to be conspicuously differentiated at the periphery of the range in the north and in the south. It appears that in these peripheral populations there is a tendency for the same phenotypes to predominate possibly because of the marginal or severe environmental conditions encountered by the species in these areas.

At the northern periphery of the range only the populations in the Atlantic basin from Tampico northward show striking departures from the central populations. In the northernmost population in Texas, the larvae have hair 6-C usually double (1-3) and only slightly longer than 5-C, whereas in the central popula-

tions it is apparently always single and markedly longer than 5-C. Abdominal hair 1-VII tends to be poorly developed and shorter than in the central populations in which it is usually extremely long, often reaching the base of the siphon. The siphon in these northern populations is uniformly short, whereas in central populations it is variable. The anal gill is more or less round and with a slight apical emargination in the north while this condition is only rarely found in the central populations which normally have the gill more or less conical and with a slight ventral emargination. Specimens from Tampico show gills tending toward the type in Texas while those from Veracruz are more like the central populations, suggesting a clinal variation in the expression of this character. Both populations have a moderately long siphon. The length of the pupal hairs tends to be slightly reduced in these northern populations.

Of the peripheral southern populations, I have studied 1 each on the north and the south shores of the Gulf of Guayaquil. In the population from Playas, Ecuador (north), the larvae are similar to those from Texas with hair 6-C usually double and 1-VII, gill and siphon similarly developed. In the population from Tumbes, Peru, the larvae are essentially the same as in Playas except that hair 6-C is usually single and occasionally double but of the same relative length as in the Texas and Ecuador populations. The pupae in both populations have the hairs only slightly reduced in length.

BIONOMICS. Considerable additional information on the bionomics of this dominant and widespread species has been published since the summaries in Howard, Dyar and Knab (1915:212) and Belkin and Hogue (1959:449).

Knab (1906:95) reared adults of *pseudes* (as *cancer*) from immature stages collected in the burrows of *Cardisoma crassum* at Rio Aranjuez near Puntarenas, Costa Rica (336,339). Peyton, Reinert and Peterson (1964:451) recorded *pseudes* immatures from the holes of *Uca subcylindrica*, *Cardisoma guanhumii* and *Gecarcinus lateralis* in several localities in Texas. Other specific records of immature stages are from the burrows of *Cardisoma crassum* in Colombia (COA 23) and Costa Rica (CR 28) and of adults only from burrows of *Ucides occidentalis* in Colombia (COA 26). Other general records indicate that *pseudes* usually, but not always, breeds in large crabholes. Peyton, Reinert and Peterson (1964:453-454) report that *pseudes* in Texas appears to prefer crabholes of a diameter of 2 inches or more. These authors also recorded 2 unusual collections of immatures, 1 in a grassy pool containing a crabhole in Texas, the other from a treehole in Mexico (collection of R.B. Eads). They found the same range of pH (7.2-7.6) and chloride content (1,115-2,603 ppm) in the holes containing *pseudes* as in those utilized by *mathesoni*.

Through its extensive range, *pseudes* has been found to breed in association with a variety of mosquitoes: *mathesoni* in Texas (Peyton, Reinert and Peterson, 1964); *howardi* in Nicaragua (NI 3,5,14,15,26,27); *costaricensis* in Costa Rica (CR 28, 106,107,118); *curiche* and *dyari* in Colombia (COA 10,17,25,27,28,48,50); 1 or more members of the *Culex (C.) inflicus* complex in Costa Rica, Panama and Colombia; *Culex (Tin.) latisquama* in Panama; *Culex (Mel.) sp.* in Costa Rica and Panama; *Aedes (O.) taeniorhynchus* in Nicaragua and *Anopheles (A.) eiseni* in Colombia.

Galindo (1967) colonized *pseudes* in Panama and found that the eggs were laid singly above the water surface in a hollow cylinder of plaster of Paris simulating a crabhole. Hatching took place without flooding 48-60 hours after oviposition, larvae breaking out of the eggshell and either dropping or sliding down the sides

of the container to the water below. At a constant temperature of 76° F, the larval cycle from hatching to pupation lasted 3 or 4 weeks and the pupal stage 3 or 4 days. In Texas, Peyton, Reinert and Peterson (1964:454) found that larvae collected in the field required 2-2½ months to complete their development and the pupae 7 or 8 days. Furthermore, they noted that fourth instar larvae collected during the latter part of November and in December did not pupate for at least 2 months whereas those collected in March pupate within 30 days or less. No first instar larvae were found during the winter months.

Considerable information has accumulated regarding the blood feeding habits of *pseudes* since Dyar's (1925:155) statement that "the adults are not known to bite". The species has been taken in horse-baited traps in Costa Rica (Kumm, Komp and Ruiz, 1940:392) and inside houses in El Salvador (Kumm and Zuniga, 1942:406). Peyton, Reinert and Peterson (1964:455) reported that in Texas *pseudes* will readily bite man from dusk to midnight. They also noted that a number of specimens reported as *Deinocerites* sp. from horse-baited traps in Panama (Blanton, Keenan and Peyton, 1955) were actually *pseudes*. Galindo (1967) found Panamanian *pseudes* to feed readily on man in the field as well as the laboratory and provided his colony with a source of blood from golden hamsters, guinea pigs and domestic chicks. More recent investigations on the blood feeding habits of *Deinocerites* in Panama (Gorgas Memorial Institute, 1970:20; Tempelis and Galindo, 1970) have shown that *pseudes* has a wide range of hosts including mammals, birds, lizards and amphibians.

The mating behavior of *pseudes* in the laboratory is described in some detail by Galindo (1967) who did not find either swarming or pupal attendance in this species.

DISTRIBUTION (fig. 7). Pacific coast from Bahia de Banderas, Jalisco, Mexico, to Gulf of Guayaquil in northern Peru; also Atlantic coast from Texas to state of Campeche, Mexico. Material examined: 9285 specimens; 951 males, 1239 females, 6054 larvae, 1041 pupae; 567 individual rearings (375 larval, 141 pupal, 51 incomplete).

COLOMBIA. *El Choco*: Curiche (COA 1,3,6-12,21,23,25-27,42-48,50) [UCLA]. *Narino*: Tumaco (PBR 989,65,67,68; 991,41; 994,8,9) [VALLE].

COSTA RICA. *Guanacaste*: El Coco (CR 201-212) [UCLA]. Samara (CR 195,198) [UCLA]. *Puntarenas*: Aranjuez, Rio, F. Knab (336) [USNM]. Boca de Barranca (CR 98,99,101-107,118, 233,235,237-244,248,251-254; LCBA 2-4,12,104-106,111,112,115-118,122-124,126,135,137-143, 145,146,148,150,154,161,167,168,174,188,190,230); F.S. Truxal [LACM, UCLA]. Bonilla, Hacienda, H.W. Kumm (75) [USNM]; (CR 28,29) [UCLA]. Jicoral, H.W. Kumm et al (982) [USNM]. La Angostura (CR 111,115) [UCLA]. Puntarenas, H.W. Kumm et al (440) [USNM]. Rincon, Osa Peninsula (CR 142) [UCLA]. San Lucas, Isla, H.W. Kumm et al (1117) [USNM].

ECUADOR. *Guayas*: Playas, 7 km E, near Data (ECU 157) [UCLA]; (LCBA 513,514) [LACM; UCLA].

EL SALVADOR. Espiritu Santo, H.W. Kumm (570) [USNM]. Estero Ticuiclapa [? Ticuistate], W.H.W. Komp (791, KO 32-29) [USNM].

GUATEMALA. *Escuintla*: San Jose [USNM].

HONDURAS. *Choluteca*: Trujillo, Rio Negro [USNM].

MEXICO. *Campeche*: Cuidad del Carmen, 36 km W (MF 14,15) [UCLA]. *Guerrero*: Puerto Marquez, near Acapulco (MEX 142,144,145) [UCLA]. Zihuatanejo, A. Duges [USNM]. *Jalisco*: Barra de Navidad (MT 1,4) [UCLA]. Puerto Vallarta [as Las Penas], A. Duges [UCLA, USNM]. *Tabasco*: Paraiso, near Puerto Ceiba [ISET]. *Tamaulipas*: Laguna de Chareil, Tampico (MEX 207A) [UCLA]. La Pesca (TEX 29,30,32) [UCLA]. Tampico (MEX 6-10) [UCLA]; A. Martinez [ISET]; J. Goldberger [USNM]. *Veracruz*: Boca del Rio, near Veracruz (MEX 80,85-88) [UCLA]. Coatzacoalcos (MEX 113) [UCLA]. Nautla, A. Duges [USNM]. Tuxpan (TEX 22-27) [UCLA]. Veracruz, on steamer [USNM].

NICARAGUA. *Chinandega*: Corinto, P.A. Woke (779,793,794,806). K.R. Maxwell (14) [USNM]. Punta San Jose [as Monypenny Pt.], Bahía el Rosario, W.H.W. Komp [USNM]. *Leon*: Puerto Somoza (NI 1,4,5,14,15,20,26,27) [UCLA]. *Rivas*: San Juan del Sur, P.A. Woke (KO 32-9) [USNM].

PANAMA AND CANAL ZONE. *Canal Zone*: Albrook Field, W.H.W. Komp [UCLA, USNM]; (PA 737,743,934) [UCLA]. Ancon, A.H. Jennings (69,352,371,378,411,440,464); L. Roth [USNM]. Cocoli, W.H.W. Komp [USNM]. Corozal, J. Zetek [UCLA, USNM]; L.H. Dunn; W.H.W. Komp [USNM]. Ft. Sherman, L.H. Dunn, 1 M [USNM]. Gatunella River, J. Zetek [USNM]. Howard Air Force Base (PA 468) [UCLA]. Monte Lirio, 2 F [UCLA, USNM]. Rodman Naval Station (PA 880,885-892,894,906-910) [UCLA]. *Darien*: El Real (PA 618,620,621) [UCLA]. Jaque (PA 608,611,615) [UCLA]. *Locality not specified*: (55-1, 64-1) [UCLA]. *Panama*: El Libano, Corozal (PA 484,565,566) [UCLA]. Juan Diaz (PA 569,1018-1023) [UCLA]. La Chorrera (ASM 11-1). Nueva Gorgona (PA 998,1001) [UCLA]. Panama (49-57-1) [UCLA]. L.H. Dunn [USNM]. *Perlas, Archipiélago de las*: Contadora, Isla, GML (PA 1045-1047) [UCLA]. San Jose, Isla, J.P.E. Morrison [USNM]. *Tobago, Isla*: A. Busck [USNM].

PERU. *Tumbes*: Tumbes, Playa Hermosa (PER 15) [UCLA]; (LCBA 505-510) [LACM].

TEXAS. *Cameron County*: Boca Chica Beach, E.L. Peyton [USNM]. Laguna Vista (MT 10) [UCLA]. Stell-Lind Banco, E.L. Peyton, J.F. Reinert and N.E. Peterson [USNM]; (TEX 1-7, 12) [UCLA].

17. *Deinocerites howardi* Belkin & Hogue

Figs. 7,53-55

1959. *Deinocerites howardi* Belkin and Hogue, 1959:441-442. TYPE: Holotype male, Las Penas (Puerto Vallarta), Jalisco, Mexico, 10 May 1903, A. Duges [USNM, 64264].

Deinocerites howardi of Stone, Knight and Starcke (1959:284); Ross (1962:192).

FEMALE (fig. 53). Wing 3.16 mm. Proboscis 2.16 mm. Forefemur 1.88 mm. Abdomen about 3.11 mm. Essentially similar to *pseudes* except for antenna which exceeds proboscis from at least distal third of segment 7.

FEMALE GENITALIA (fig. 53). *Sternite VIII* usually with a few scales. *Ter-gite IX* with more than 2 setae on each side (3-7). *Cercus* (in lateral aspect) basically similar to that of *pseudes*. Distal part of *postgenital plate* basically as in *pseudes* except margins of notch converging to a round base; apical bristle of lateral lobe slightly converging basally, then parallel with its mate (in ventral aspect).

MALE (fig. 53). Wing 3.01 mm. Proboscis 2.29 mm. Forefemur 2.29 mm. Abdomen (not including genitalia) about 2.75 mm. Flagellar segments 1-3 with scales. Proboscis at most reaching distal third of segment 3. Claws as in *mcdonaldii*.

MALE GENITALIA (fig. 54). Apparently indistinguishable from *mcdonaldii*.

PUPA (fig. 54). Abdomen 3.69 mm. Trumpet 0.56 mm. Paddle 0.66 mm. Diagnostic characters as in the key; general chaetotaxy based on 10 reared specimens. Hairs 5-III-V moderately long, usually not reaching the spiracular sensillum of the second segment following. *Cephalothorax*: Integument yellowish. Hair 1(2,2-3), 2(4,3-6), 3(2,2-3), 4(2,2-3), 5(2,1-2), 6(1), 7(2,2-3), 8(1,1-2), 9(2,1-2), 10(3,2-4), 11(3,2-3), 12(3,2-4). *Trumpet*: As in *mcdonaldii*; index about 4.0-6.0. Tracheoid about 0.3 and pinna 0.12 of trumpet length. *Abdomen*: Integument yellowish to medium brown. Segment I: hair 1(18,13-22 primary branches), 2(1,1-3), 3(1-2), 4(2,2-5), 5(5,3-5), 6(1,1-2), 7(4,3-5), 9(1,1-2), 10(occasionally present, 1), 11(occasionally present, 2,1-3). Segment II: hair 0(1), 1(5,3-9 primary branches), 2(1,

1-2), 3(1), 4(4,2-5), 5(1), 6(1), 7(2,2-3), 9(1). Segment III: hair 0(1), 1(6,3-10), 2(1), 3(2,1-3), 4(2,1-3), 5(1,1-2), 6(1), 7(3,1-3), 8(3,2-5), 9(1), 10(2,1-2), 11(1), 14(1). Segment IV: hair 0(1), 1(6,4-7), 2(1), 3(4,2-5), 4(1,1-2), 5(1,1-2), 6(1), 7(2,1-3), 8(2,2-3), 9(1), 10(2), 11(1,1-2), 14(1). Segment V: hair 0(1), 1(5,2-6), 2(1), 3(1,1-2), 4(4,2-5), 5(1), 6(1), 7(3,1-5), 8(2,1-3), 9(1), 10(2,1-2), 11(2,1-3), 14(1). Segment VI: hair 0(1), 1(3,1-4), 2(1), 3(2,1-2), 4(3,2-3), 5(1), 6(1), 7(1), 8(2,1-3), 9(1), 10(1,1-2), 11(1,1-3), 14(1). Segment VII: hair 0(1), 1(1,1-2), 2(1), 3(2,1-3), 4(1,1-2), 5(2,2-4), 6(1), 7(1), 8(2,1-3), 9(4,1-5), 10(1,1-2), 11(1,1-2), 14(1). Segment VIII: hair 0(1), 4(2,1-2), 9(1), 14(1). **Paddle**: Width about 0.82 of length; hair 1-P subequal to paddle.

FOURTH INSTAR LARVA (fig. 55). Head 1.11 mm. Siphon 1.52 mm. Diagnostic characters as in the key; general chaetotaxy based on 7 reared specimens. **Head**: Yellowish to light brown. Mental plate as broad as long, triangular; terminal spicules long and filamentous, lateral shorter and denticulate. Hair 0(1), 1(1), 2(1), 3(sometimes developed as a minute spicule), 4(6,4-6), 5(4,4-5), 6(2-3), 7(9,8-11), 8(3,2-5), 9(6,4-7), 10(2,1-2), 11(4,3-7), 12(2,2-3), 13(8,6-8), 14(1), 15(2,2-3). **Antenna**: Length about 0.46 of head; shaft with numerous spicules on proximal part. Hair 1(5,4-6). **Thorax**: Prothorax: hair 0(8,8-11), 1(1), 2(1), 3(1), 4(4,2-4), 5(1), 6(1), 7(3,2-4), 8(1,1-2), 9(1,1-2), 10(1), 11(3,3-4), 12(1), 14(1). Mesothorax: hair 1(1), 2(3,2-3), 3(1), 4(2,1-3), 5(1), 6(1), 7(1), 8(7,6-9), 9(7,6-9), 10(1), 11(3,2-4), 12(1), 13(12,9-12), 14(11,5-13). Metathorax: hair 1(1,1-2), 2(3,2-3), 3(5,5-6), 4(4,4-6), 5(1,1-2), 6(1), 7(8,7-8), 8(11-14), 9(9,7-9), 10(1), 11(3,1-4), 12(1), 13(4,4-5). **Abdomen**: Segment I: hair 1(1), 2(1), 3(2,2-3), 4(7,7-10), 5(3,1-5), 6(2,2-3), 7(2,1-2), 9(2,2-3), 10(1,1-2), 11(2,1-3), 12(1,1-2), 13(1,1-2). Segment II: hair 0(1), 1(1), 2(1), 3(2,2-3), 4(6,4-8), 5(5,3-5), 6(2), 7(3,2-4), 8(4,3-6), 9(1), 10(1), 11(3,3-4), 12(1), 13(11-13). Segment III: hair 0(1), 1(2,1-2), 2(1), 3(1), 4(1), 5(3,3-5), 6(2), 7(5,3-6), 8(2,1-2), 9(1), 10(1), 11(2), 12(2), 13(1), 14(1). Segment IV: hair 0(1), 1(2,1-2), 2(1,1-2), 3(3,1-3), 4(1), 5(3,2-4), 6(2), 7(6,3-7), 8(1), 9(1), 10(1), 11(2,1-3), 12(1), 13(2), 14(1). Segment V: hair 0(1), 1(2,1-2), 2(1), 3(1), 4(4,4-5), 5(4,3-5), 6(2), 7(6,6-7), 8(1), 9(1), 10(1), 11(1), 12(2,2-4), 13(3,2-4), 14(1). Segment VI: hair 0(1), 1(3,2-3), 2(1), 3(1), 4(3,3-4), 5(4,3-4), 6(1), 7(3,2-3), 8(4,3-6), 9(1), 10(1), 11(2,2-3), 12(1), 13(15,14-18), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2,2-3), 4(1), 5(4,4-5), 6(10,8-12), 7(1), 8(5,4-7), 9(2), 10(1), 11(2), 12(1), 13(1,1-2), 14(1). **Segment VIII**: Comb scales similar to those of *mcdonaldi*. Hair 0(1), 1(5,4-7), 2(1), 3(3,2-5), 4(1), 5(3,3-4), 14(2,1-4). **Siphon**: Integument light brown. Index about 4.3-5.6. Pecten teeth 5(2-6), in general similar to those of *pseudodes*. Hair 1(3,3-4), hair 1ad(3,2-4), hair 1av(3,2-3); hairs 2,6,7,9 all single; 8(2,1-2). **Anal Segment**: Hair 1-X and gill length probably similar to *mcdonaldi*. Hair 1(2,1-3), 2(7,6-10), 3(1), 4a(11,8-12), 4b(8,7-11), 4c(9-10,7-12), 4d(8,6-10), 4e(9,7-9), 4f(9,8-11), 4g(11,10-14).

SYSTEMATICS. The nature or origin of *howardi* is the most intriguing and possibly the most significant problem in the genus. Belkin and Hogue (1959:442) suggested that *howardi* was formed through hybridization or introgression between the ancient *mcdonaldi* stock and the modern dominant *pseudodes* because of the peculiar combination in *howardi* adults of general external features (spiniforms of forefemur and lack of postnotal bristle) indistinguishable from those of *pseudodes* and of genitalia and claws of the male indistinguishable from those of *mcdonaldi* and because of the sympatric occurrence of the 3 species. I have studied the immature stages of *howardi* (unknown to Belkin and Hogue) and have found them

to be so similar to *mcdonaldi* that separation of the 2 is sometimes not feasible on the basis of the combination of characters in the keys. Belkin and Hogue (loc. cit.) also noted that the antennae of both sexes were longer than in *pseudes* or *mcdonaldi*, implying this to be a manifestation of hybrid vigor. I find that in the female of *howardi* there are usually more numerous setae on IX tergite lobe of the genitalia than in the other 2 species.

I tend to agree with Belkin and Hogue as to the probable origin of *howardi* through hybridization for the reasons given below. First, the presence of some larval characters of *pseudes* in some larvae of *mcdonaldi* (see) suggests that introgression may occur occasionally between these 2 species. Second, such hybridization could occur in an isolated area marginal to both species (Bahia de Banderas) where a hybrid might have a selective advantage. Should such a hybrid become stabilized it would probably be reproductively isolated from both *mcdonaldi* and *pseudes*, thus explaining the unique situation in *Deinocerites* of the sympatric occurrence of 3 members of the same group.

Alternative derivation of *howardi* either from *mcdonaldi* or *pseudes* or independently of the others from a stock common to all 3 species would involve the development of identical combinations of characters in different lines or acquisition and subsequent loss of several characters in 1 line and would appear to be a more tenuous and less probable explanation.

The problem of the origin of *howardi* might possibly be resolved in the future through experimental hybridization and cytogenetic analysis.

BIONOMICS. The immature stages of *howardi* have been collected in large crab-holes. In Mexico these were associated with *Aedes (O.) taeniorhynchus* and in Nicaragua with *taeniorhynchus* and *pseudes*. Nothing is known of the blood feeding habits of *howardi*.

DISTRIBUTION (fig. 7). Pacific coast from Bahia de Banderas, Mexico, to Nicaragua. Material examined: 196 specimens; 50 males, 25 females, 81 larvae, 40 pupae; 39 individual rearings (25 larval, 13 pupal, 1 incomplete).

EL SALVADOR. Estero Ticuiclapa [? Ticuistate], W.H.W. Komp (791, KO 32-29) [USNM].

MEXICO. *Colima*: Manzanillo, M. Rueda [ISET]. *Guerrero*: Puerto Marquez, near Acapulco (MEX 144) [UCLA]. *Jalisco*: Barra de Navidad (MT 1) [UCLA]. Puerto Vallarta [as Las Penas], A. Duges [UCLA, USNM].

NICARAGUA. *Chinandega*: Corinto, P.A. Woke (806) [USNM]. Punta San Jose [as Monypenny Pt.], Bahia el Rosario [USNM]. *Leon*: Puerto Somoza (NI 3,5,14,15,26,27) [UCLA].

18. *Deinocerites mcdonaldi* Belkin & Hogue

Figs. 7,56-58

1959. *Deinocerites mcdonaldi* Belkin and Hogue, 1959:437-438. TYPE: Holotype male (UCLA 199-116) with associated larval and pupal skins, San Blas, Nayarit, Mexico, 26 June 1956, W.A. McDonald [USNM, 64263].

Deinocerites mcdonaldi of Stone, Knight and Starcke (1959:285).

FEMALE (fig. 56). Wing 3.01 mm. Proboscis 2.09 mm. Forefemur 1.73 mm. Abdomen about 2.5 mm. **Head**: Narrow decumbent scales of vertex creamy; erect scales yellowish to pale brown; broad decumbent scales of lateral patch whitish. **Antenna**: Torus usually with 1 scale; flagellar segment 1 slightly longer than seg-

ments 2-4 combined; exceeding proboscis from base of flagellar segment 9. *Thorax*: Postnotum usually with 1 bristle near middle; *ppl* with several bristles; *mep* with a patch of translucent scales usually in upper two-thirds, body of sclerite with a few microsetae; only a few *umep* bristles; metameron simple. *Legs*: Scaling similar to *pseudis* except for upper lateroposterior scales on hindcoxa which are absent; forefemur with bristles only in anteroventral and posterodorsal rows.

FEMALE GENITALIA (fig. 56). *Sternite VIII* with a few scales. *Tergite IX* with 1-3 setae on each side. *Cercus* in lateral aspect basically similar to that of *pseudis*. Distal part of *postgenital plate* basically as in *pseudis* except for shallower notch and bristles of lobes converging (in ventral aspect).

MALE (fig. 56). Wing 3.11 mm. Proboscis 2.24 mm. Forefemur 2.24 mm. Abdomen (not including genitalia) about 2.75 mm. Flagellar segments 1 and 2 with scales. Proboscis reaching base of flagellar segment 4. Claws of foreleg slender, with a very minute slender subbasal tooth.

MALE GENITALIA (fig. 57). *Segment IX*: Tergite lobe with distal part moderately long, slender, reaching base of subapical lobe but not extending beyond; slightly hooked apically. *Sidepiece*: Subapical lobe with a distinct thumb; seta *c* spiniform and attenuated apically. *Phallosome*: Dorsal paramere with short, broad incomplete dorsal bridge; apical spine moderately long, heavy and markedly curved; ventral teeth short, arising from the evenly convex ventrolateral border. Aedeagus with highly sinuous margins and with a subapical necklike constriction; apex narrow and slightly emarginate.

PUPA (fig. 57). Abdomen 3.03 mm. Trumpet 0.61 mm. Paddle 0.66 mm. Diagnostic characters as in the key; general chaetotaxy based on 8 reared specimens. Hairs 5-III-V moderately long, usually reaching and sometimes slightly exceeding sensillum of the second segment following, 5-III usually slightly longer than 5-IV,V. *Cephalothorax*: Integument yellowish. Hair 1(2,1-3), 2(3,2-5), 3(2), 4(2,1-3), 5(2,1-2), 6(1), 7(2,1-2), 8(1), 9(2,1-3), 10(2,2-4), 11(2,1-4), 12(2,2-4). *Trumpet*: Short, slightly widening apically; index about 4.5-5.6. Integument brown distad, darker on tracheoid; contrasting with cephalothoracic integument. Tracheoid about 0.33 and pinna about 0.12 of trumpet length. *Abdomen*: Integument yellowish to medium brown. Segment I: hair 1(18,16-22, primary branches), 2(2,1-3), 3(2,1-2), 4(5,4-6), 5(6,4-6), 6(1), 7(2,2-4), 9(1), 10(occasionally present, 1), 11(occasionally present, 1,1-3). Segment II: hair 0(1), 1(6,3-8), 2(1), 3(1), 4(4,4-6), 5(1), 6(1), 7(2,1-3), 9(1). Segment III: hair 0(1), 1(4,4-6), 2(1), 3(2,2-5), 4(2), 5(1), 6(1), 7(3,3-4), 8(6,4-6), 9(1), 10(2), 11(1), 14(1). Segment IV: hair 0(1), 1(4,2-5), 2(1), 3(4,3-5), 4(1,1-2), 5(1), 6(1), 7(2,2-3), 8(2,2-3), 9(1), 10(2), 11(1), 14(1). Segment V: hair 0(1), 1(2,2-4), 2(1), 3(1,1-2), 4(5,4-6), 5(1), 6(1), 7(4,3-6), 8(2,2-3), 9(1), 10(1,1-2), 11(1,1-2), 14(1). Segment VI: hair 0(1), 1(2,1-3), 2(1), 3(1,1-2), 4(3,2-4), 5(1), 6(1,1-2), 7(1), 8(2,2-3), 9(1), 10(1), 11(2,1-2), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2,1-2), 4(1,1-2), 5(2,1-3), 6(1), 7(1,1-2), 8(3,1-4), 9(3,1-4), 10(1,1-2), 11(1,1-2), 14(1). Segment VIII: hair 0(1), 4(2,1-2), 9(1), 14(1,1-2). *Paddle*: Width about 0.82 of length; hair 1-P as long as or slightly longer than paddle.

FOURTH INSTAR LARVA (fig. 58). Head 1.11 mm. Siphon 1.16 mm. Diagnostic characters as in the key; general chaetotaxy based on 7 reared specimens. *Head*: Integument yellowish to light brown. Mental plate triangular; length variable, either as broad as or broader than long, spicules long and usually filamentous, sometimes lateral ones denticulate. Hair 0(1), 1(1), 2(1), 3(sometimes developed as a minute spicule), 4(6,6-9), 5(4,4-5), 6(2), 7(10,8-11), 8(2,2-3), 9(5,

4-6), 10(2,1-2), 11(4,3-6), 12(2), 13(7,6-7), 14(1), 15(3,2-4). **Antenna:** Length about 0.46 of head; shaft with a few spicules on proximal part. Hair 1(6,4-8). **Thorax:** Prothorax: hair 0(9,8-10), 1(1), 2(1), 3(2,1-2), 4(4,3-5), 5(1), 6(1), 7(4, 2-4), 8(1,1-3), 9(1), 10(1), 11(4,3-5), 12(1), 14(1). Mesothorax: hair 1(1), 2(3, 2-3), 3(1), 4(2,2-3), 5(1), 6(1), 7(1), 8(8,8-9), 9(8,6-12), 10(1), 11(3,2-4), 12(1), 13(11,10-13), 14(11,9-12). Metathorax: hair 1(1,1-2), 2(2,2-3), 3(5,4-7), 4(4,3-6), 5(1), 6(1), 7(9,7-10), 8(9-14), 9(9,8-10), 10(1), 11(3,2-4), 12(1), 13(5,5-9). **Abdomen:** Segment I: hair 1(1), 2(1), 3(2,2-3), 4(10,7-10), 5(3,3-4), 6(2,1-3), 7(2), 9(3,2-3), 10(1,1-2), 11(2,2-3), 12(2,1-3), 13(2). Segment II: hair 0(1), 1(1), 2(1), 3(2,1-3), 4(7,6-8), 5(4,4-6), 6(2), 7(4,3-6), 8(4,3-4), 9(1), 10(1), 11(4,2-4), 12(1), 13(12,12-15). Segment III: hair 0(1), 1(2,1-2), 2(1), 3(1), 4(1), 5(4,3-5), 6(2), 7(5,5-6), 8(2), 9(1), 10(1), 11(2), 12(2), 13(1,1-2), 14(1). Segment IV: hair 0(1), 1(2), 2(1), 3(2,1-3), 4(1), 5(4,3-5), 6(2), 7(6,6-8), 8(1), 9(1), 10(1), 11(2), 12(2), 13(2,2-3), 14(1). Segment V: hair 0(1), 1(1,1-2), 2(1), 3(1), 4(6,4-6), 5(4,3-6), 6(2), 7(7,6-8), 8(1,1-2), 9(1), 10(1), 11(2,2-3), 12(1), 13(3,2-4), 14(1). Segment VI: hair 0(1), 1(3,3-4), 2(1), 3(1), 4(3,3-4), 5(5,3-6), 6(1), 7(3,2-3), 8(3,2-4), 9(1), 10(1), 11(2,2-3), 12(1), 13(18,15-19), 14(1). Segment VII: hair 0(1), 1(2,1-3), 2(1), 3(3,2-3), 4(1), 5(4,3-5), 6(12,9-12), 7(1), 8(6,5-8), 9(3,2-5), 10(1), 11(2), 12(1), 13(2,1-3), 14(1). **Segment VIII:** Comb scales with slender body, fringe conspicuous at apex, less developed in distal half. Hair 0(1), 1(5, 2-5), 2(1), 3(5,4-6), 4(1), 5(3,3-4), 14(2,2-3). **Siphon:** Integument light brown. Index about 3.2-4.6. Pecten teeth 5(4-6), in general similar to those of *pseudus*. Hair 1(3,2-4), hair 1ad(3,3-4), hair 1av(3,2-4); hairs 2,6,7 and 9 all single; 8(2, 1-2). **Anal Segment:** Gill about 0.45 of dorsal saddle length. Hair 1-X usually subequal to gill length. Hair 1(2,1-2), 2(9,8-10), 3(1), 4a(12,11-14), 4b(11,11-12), 4c(10,10-11), 4d(10,10-11), 4e(12,9-12), 4f(12,11-14), 4g(12,8-15).

SYSTEMATICS. *Deinocerites mcdonaldi* is sharply differentiated from the other members of the group in the adults by the presence of only simple bristles on the forefemur instead of spiniforms. The genitalia and claws of its male are indistinguishable from *howardi* and it also shares with the latter species a ventral brush of 7 pairs of hairs. I interpret *mcdonaldi* as the earliest derivative of the *Pseudus* Group stock.

It has been suggested that *howardi* (see) arose through hybridization or introgression between *mcdonaldi* and the modern dominant *pseudus*. That introgression between the latter 2 species may occur is also suggested in a sample of larvae of *mcdonaldi* (MEX 476) which contains some specimens with hair 6-C single and strongly developed and 1-VII long as in *pseudus* while all the other characters are typical of *mcdonaldi*.

The surmise of Belkin and Hogue (1959:438) that the population from Baja California is not differentiated from that of the mainland of Mexico is confirmed here on the basis of larvae, pupae and adults.

BIONOMICS. Immature stages of *mcdonaldi* have been collected most frequently in large crabholes. In several collections in San Jose del Cabo, Baja California, Mexico, the species of crab inhabiting the burrows was identified as *Cardisoma crassum*, the pH was found to be 7.6-8.0 and the chloride content ranged from 2,350-8,400 ppm. In Puerto Vallarta, Jalisco, Mexico, *mcdonaldi* was found associated with *belkini*, *Aedes (O.) taeniorhynchus* and a member of the *Culex (C.) inflictus* complex. Nothing is known of the blood feeding habits of *mcdonaldi*.

DISTRIBUTION (fig. 7). Mouth of the Gulf of California on mainland and lower part of Baja California. Material examined: 2506 specimens; 287 males, 272 fe-

males, 1506 larvae, 441 pupae; 183 individual rearings (76 larval, 62 pupal, 45 incomplete).

MEXICO. *Baja California Sur*: Isla Espiritu Santo, Bahia San Gabriel [LACM]. San Jose del Cabo, W.G. Downs [USNM]; (MEX 389-393) [UCLA]. *Jalisco*: Puerto Vallarta [as Las Penas], A. Duges [UCLA, USNM]; (MEX 460-484) [UCLA, USNM]; (LCBA 532) [LACM]. *Nayarit*: San Blas, Matanchen (UCLA 199,204) [UCLA, USNM]; (MF 4,6) [UCLA]. *Sinaloa*: Mazatlan (3176,3179,3325) [ISET].

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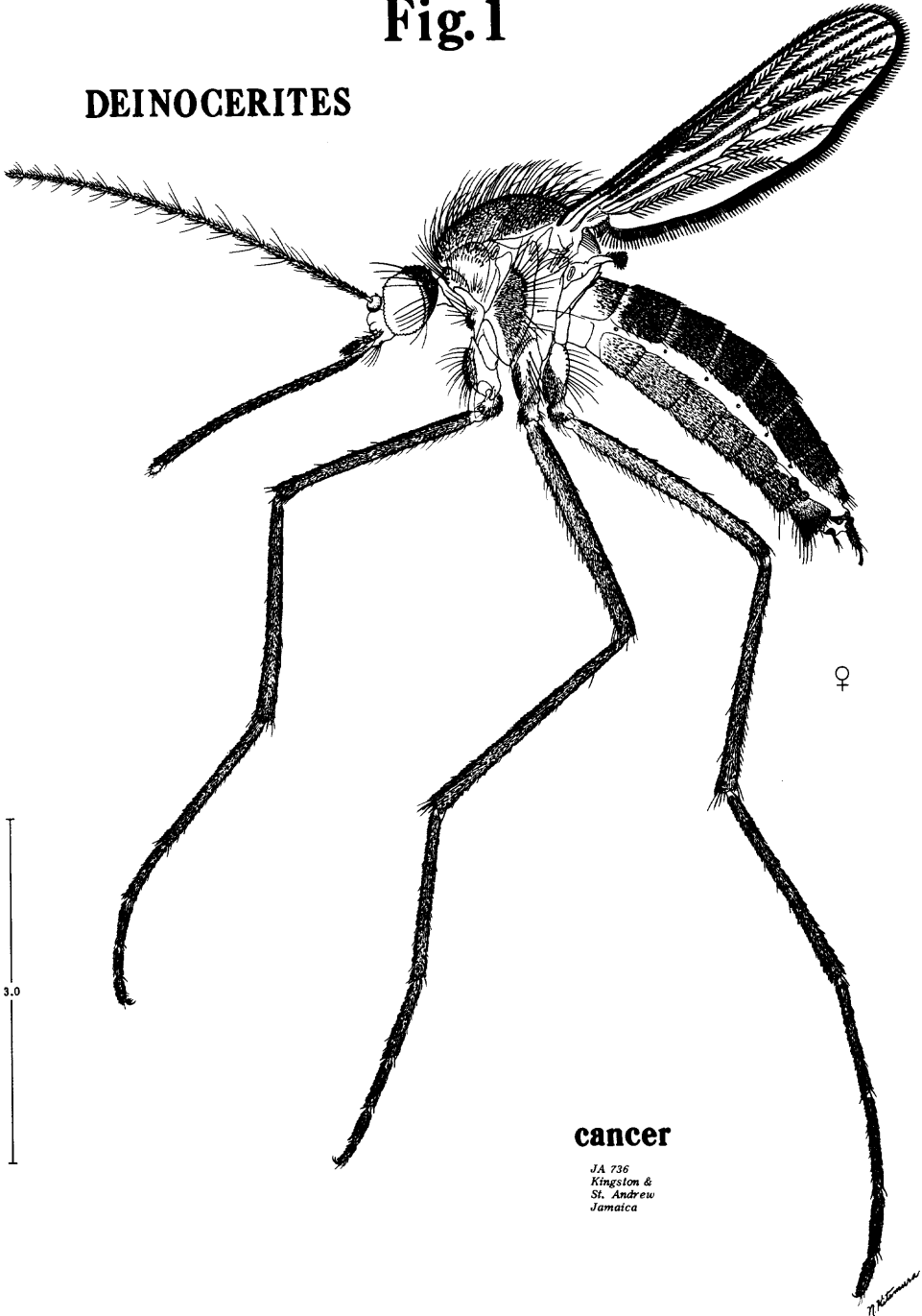
FIGURES

1. *Deinocerites cancer*; female
2. Distribution of the genus *Deinocerites*
3. Distribution of the Spanius Group
4. Distribution of the Dyari Group
5. Distribution of the Cancer Group
6. Distribution of the Epitedeus Group
7. Distribution of the Pseudes Group
8. *Deinocerites spanius*; male and female heads and genitalia, female forefemur, and male foreclaws and midclaws
9. *Deinocerites atlanticus*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
10. *Deinocerites atlanticus*; male genitalia and pupa
11. *Deinocerites atlanticus*; larva
12. *Deinocerites mathesoni*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
13. *Deinocerites mathesoni*; male genitalia and pupa
14. *Deinocerites mathesoni*; larva
15. *Deinocerites belkini*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
16. *Deinocerites belkini*; male genitalia and pupa
17. *Deinocerites belkini*; larva
18. *Deinocerites dyari*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
19. *Deinocerites dyari*; male genitalia and pupa
20. *Deinocerites dyari*; larva
21. *Deinocerites barretoii*; male and female heads and genitalia, female forefemur, and male foreclaws and midclaws
22. *Deinocerites nicoyae*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
23. *Deinocerites nicoyae*; male genitalia and pupa
24. *Deinocerites nicoyae*; larva
25. *Deinocerites cancer*; male head, female head and thorax and wing
26. *Deinocerites cancer*; male claws, female legs and genitalia
27. *Deinocerites cancer*; male genitalia and pupa
28. *Deinocerites cancer*; larva
29. *Deinocerites melanophylum*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
30. *Deinocerites melanophylum*; male genitalia and pupa
31. *Deinocerites melanophylum*; larva
32. *Deinocerites magnus*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
33. *Deinocerites magnus*; male genitalia and pupa
34. *Deinocerites magnus*; larva
35. *Deinocerites epitedeus*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
36. *Deinocerites epitedeus*; male genitalia and pupa
37. *Deinocerites epitedeus*; larva

38. *Deinocerites panamensis*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
39. *Deinocerites panamensis*; male genitalia and pupa
40. *Deinocerites panamensis*; larva
41. *Deinocerites colombianus*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
42. *Deinocerites colombianus*; male genitalia and pupa
43. *Deinocerites colombianus*; larva
44. *Deinocerites costaricensis*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
45. *Deinocerites costaricensis*; male genitalia and pupa
46. *Deinocerites costaricensis*; larva
47. *Deinocerites curiche*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
48. *Deinocerites curiche*; male genitalia and pupa
49. *Deinocerites curiche*; larva
50. *Deinocerites pseudes*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
51. *Deinocerites pseudes*; male genitalia and pupa
52. *Deinocerites pseudes*; larva
53. *Deinocerites howardi*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
54. *Deinocerites howardi*; male genitalia and pupa
55. *Deinocerites howardi*; larva
56. *Deinocerites mcdonaldi*; male and female heads, female forefemur and genitalia, and male foreclaws and midclaws
57. *Deinocerites mcdonaldi*; male genitalia and pupa
58. *Deinocerites mcdonaldi*; larva

Fig. 1

DEINOCERITES



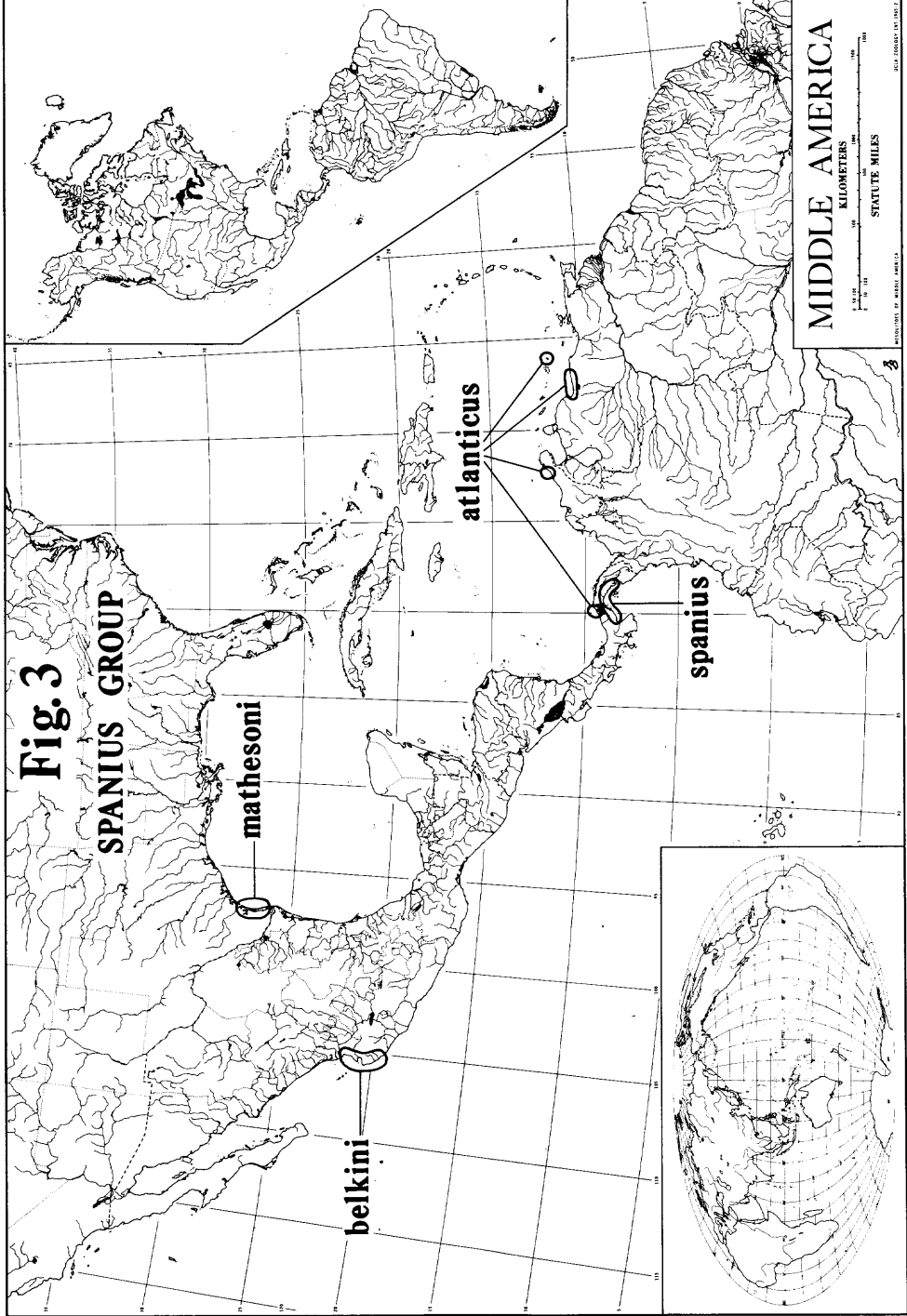
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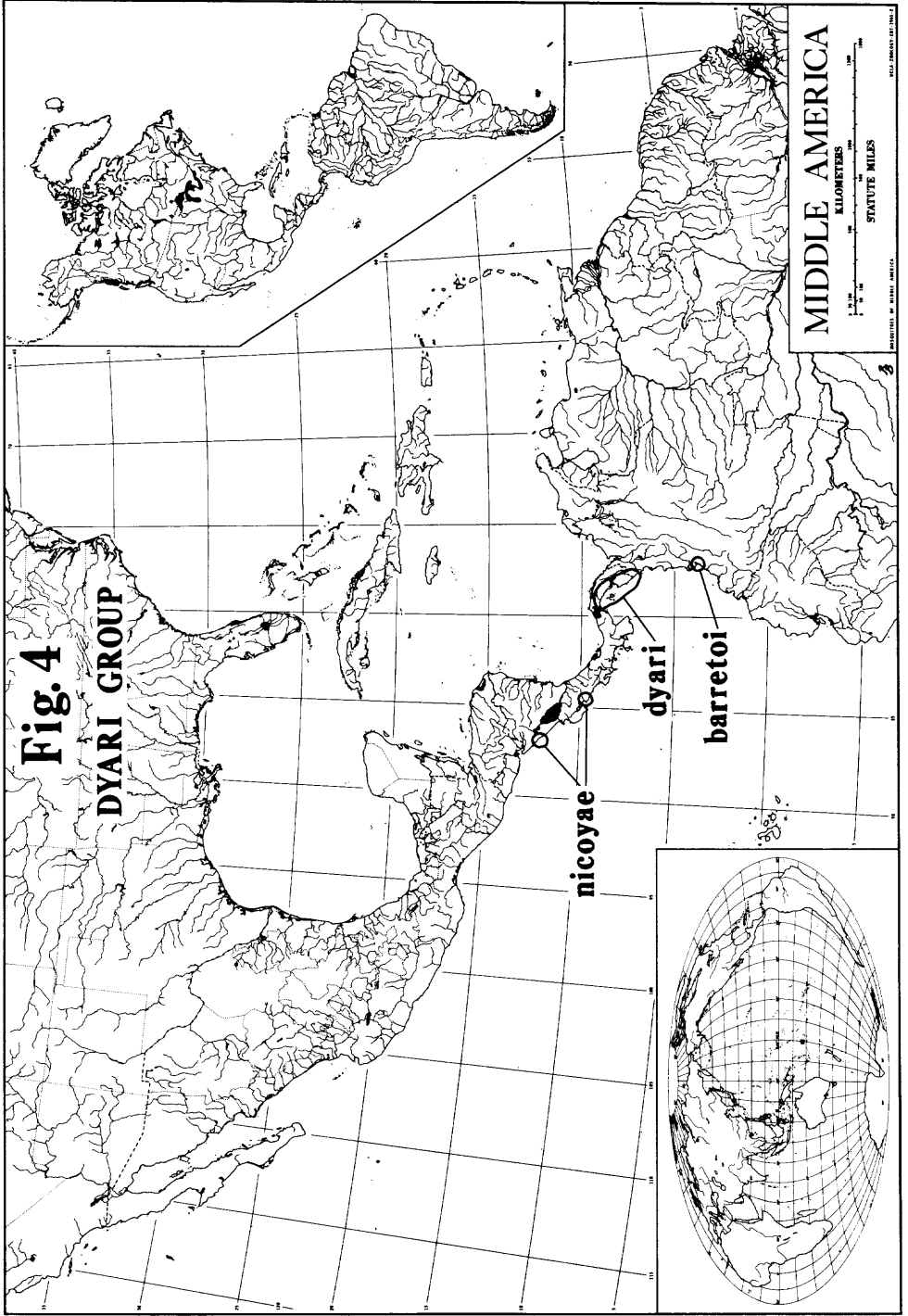
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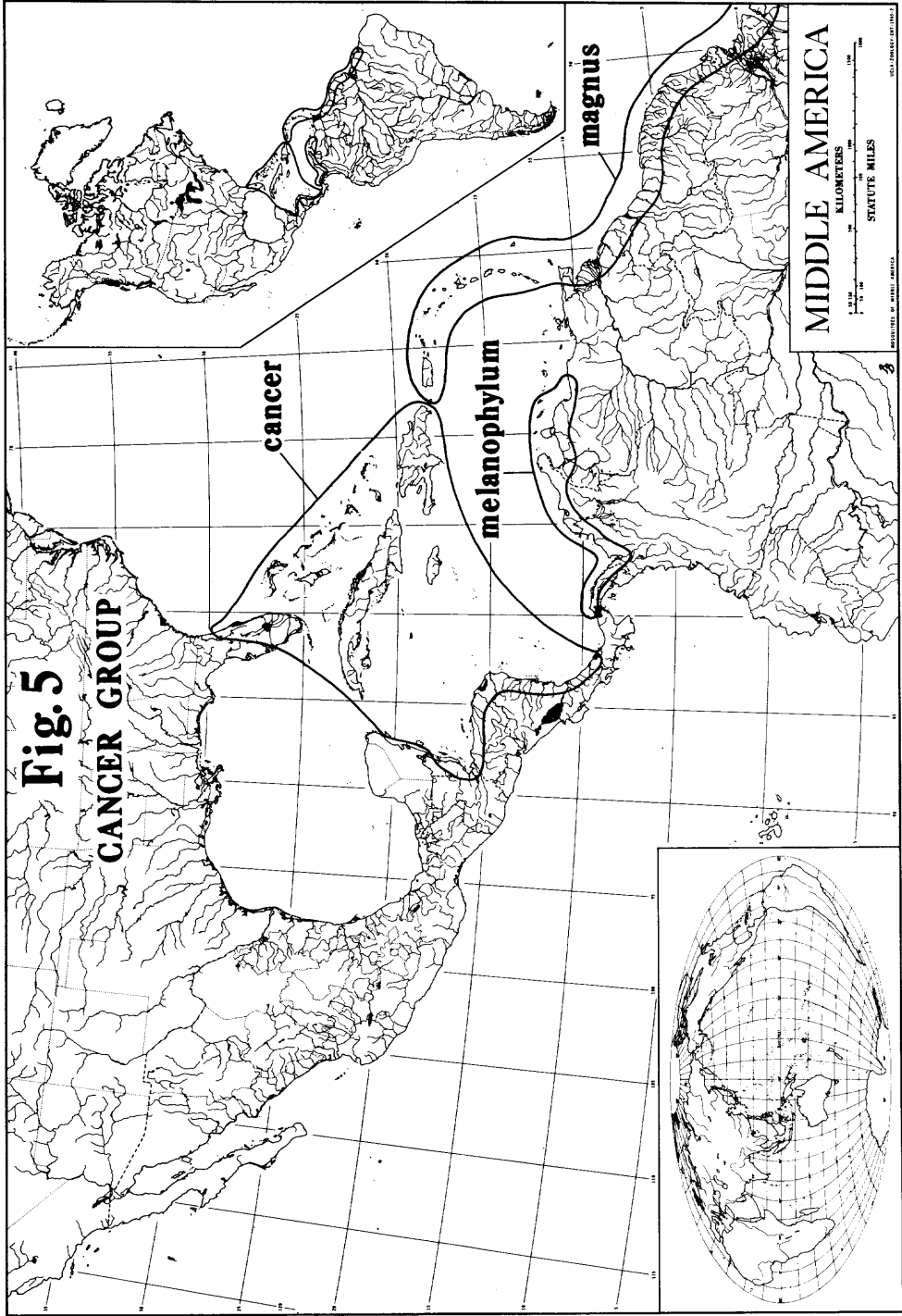
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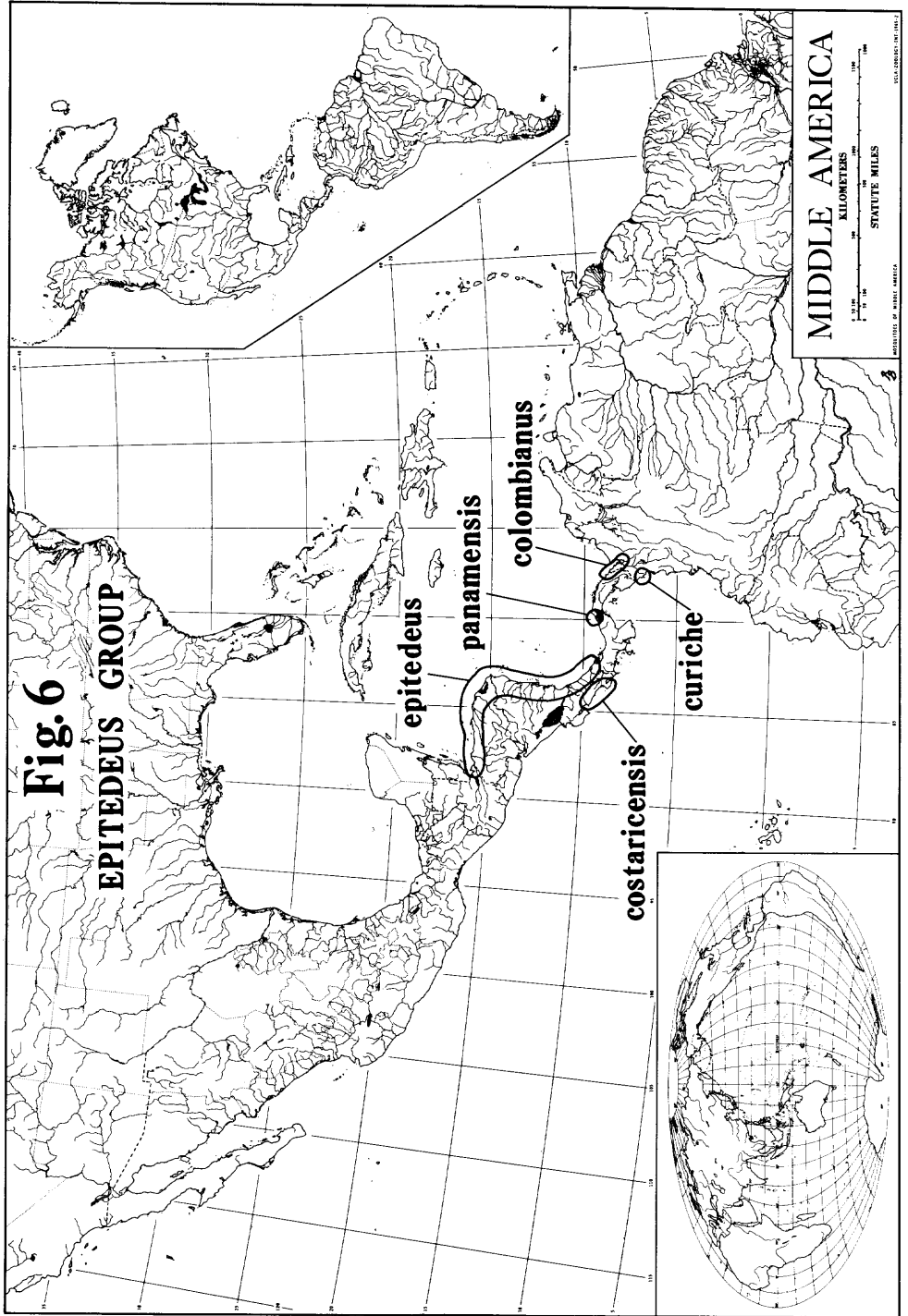
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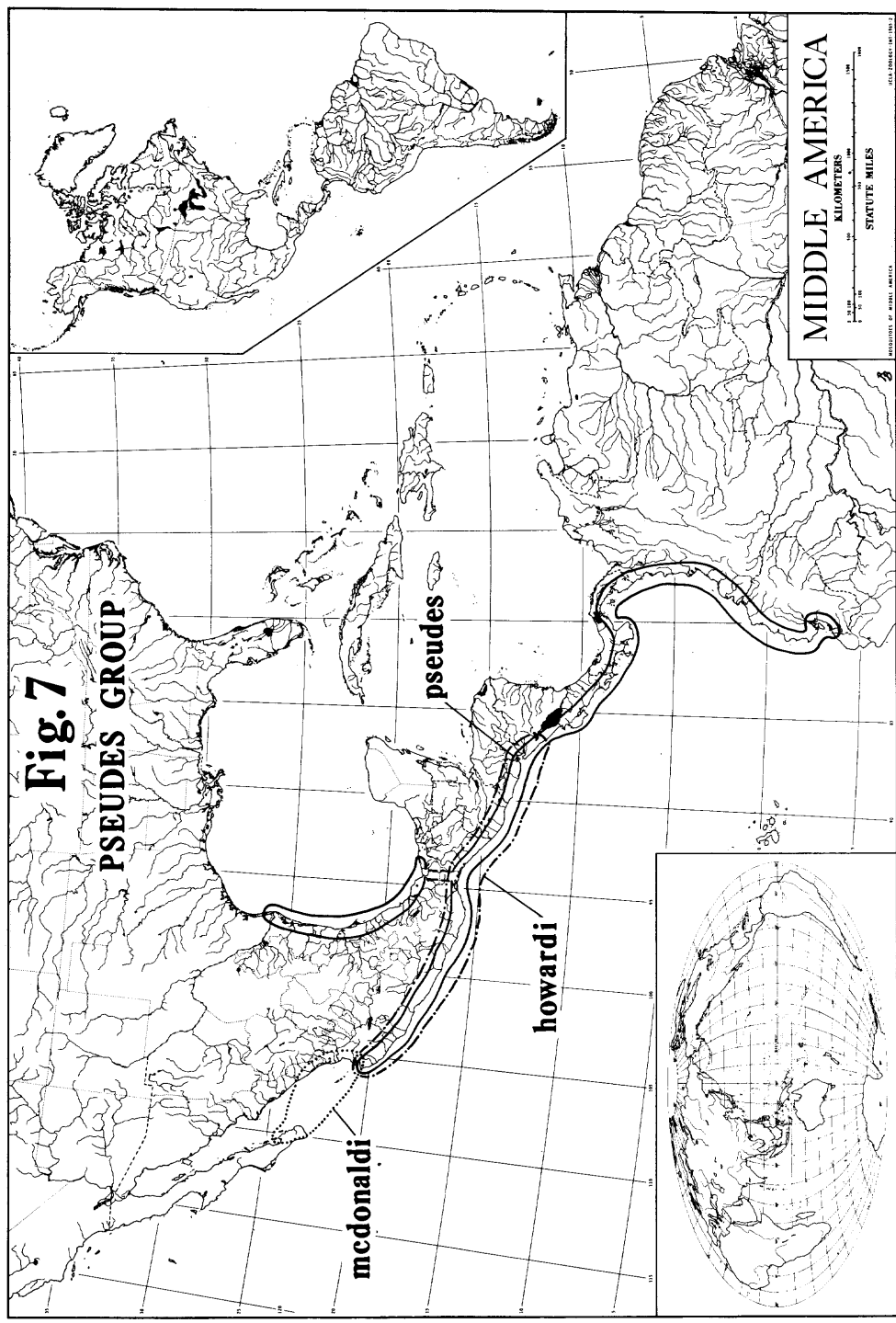
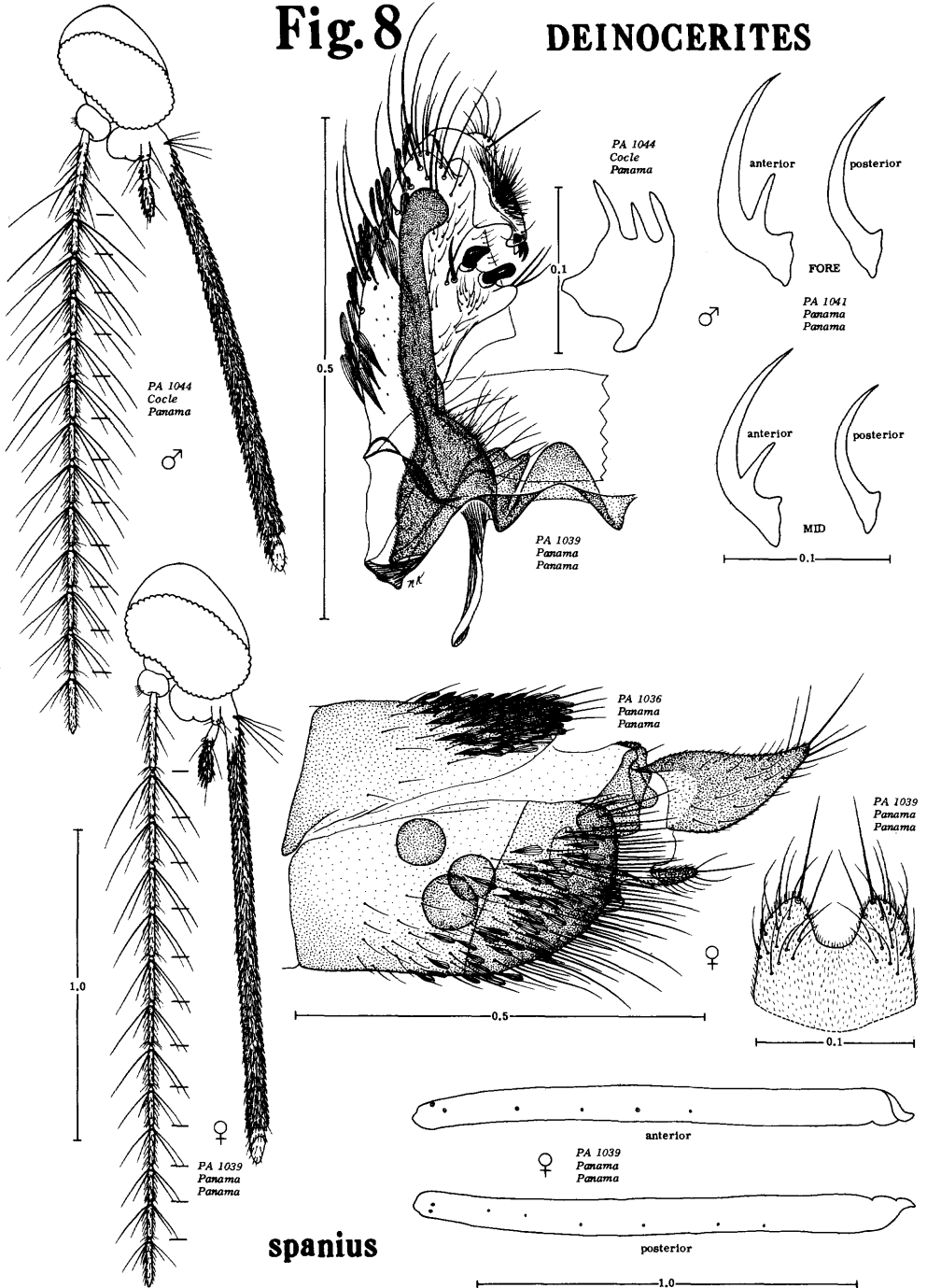
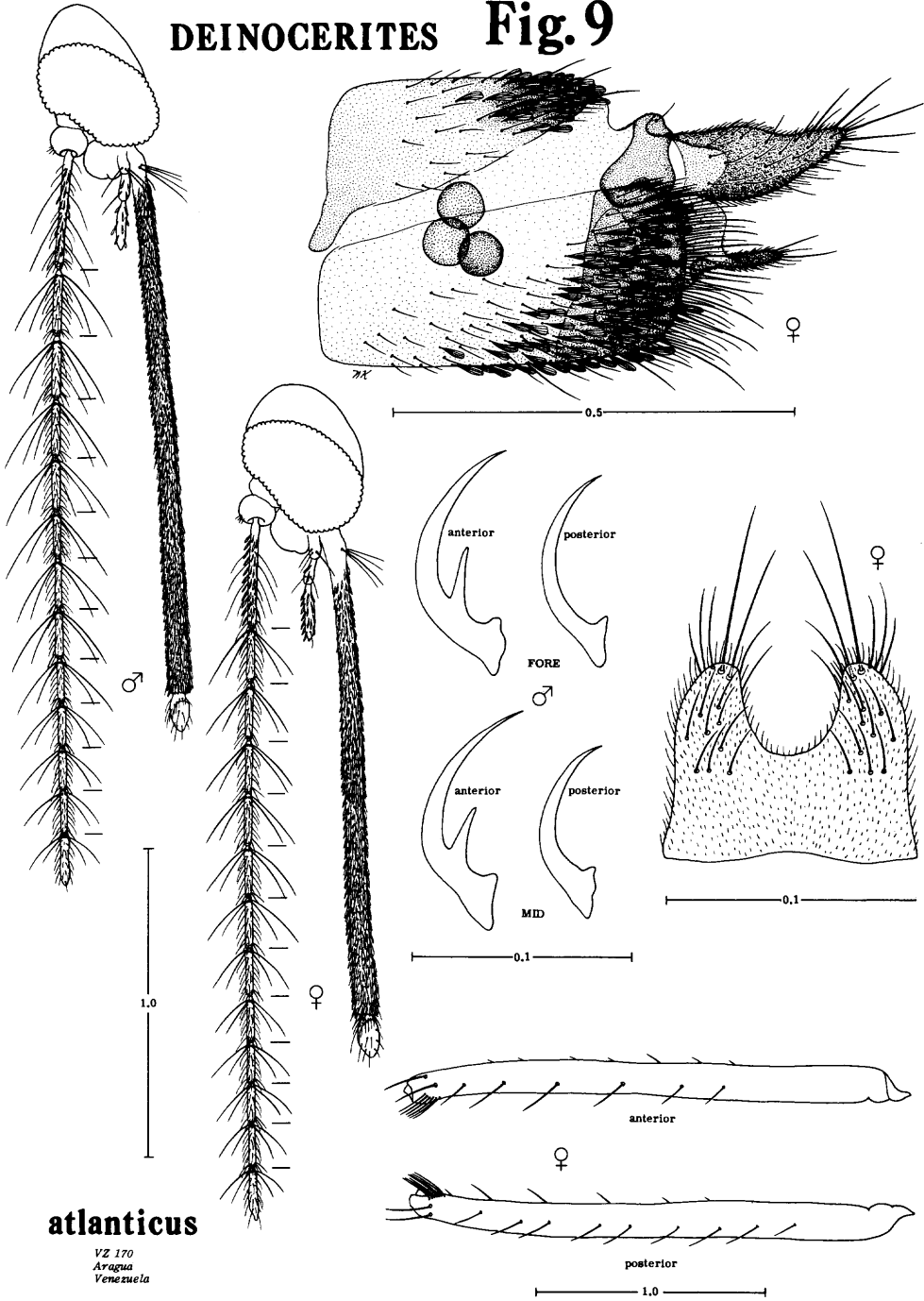


Fig. 8

DEINOCERITES



DEINOCERITES Fig. 9

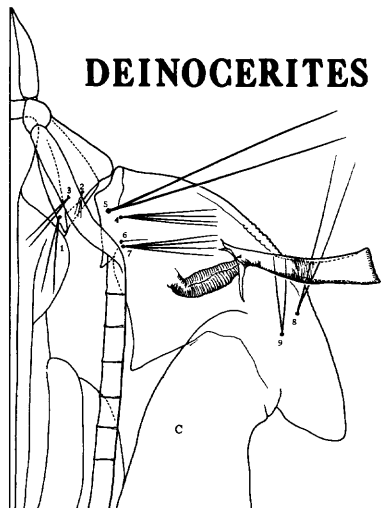


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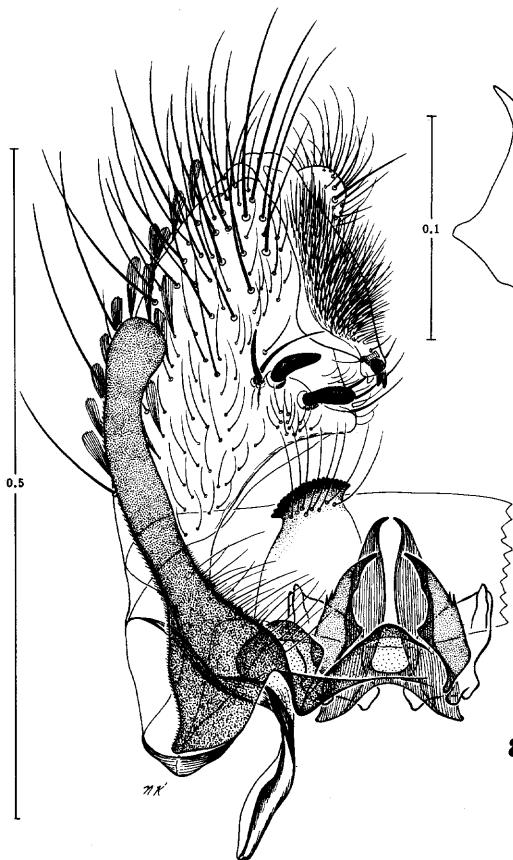
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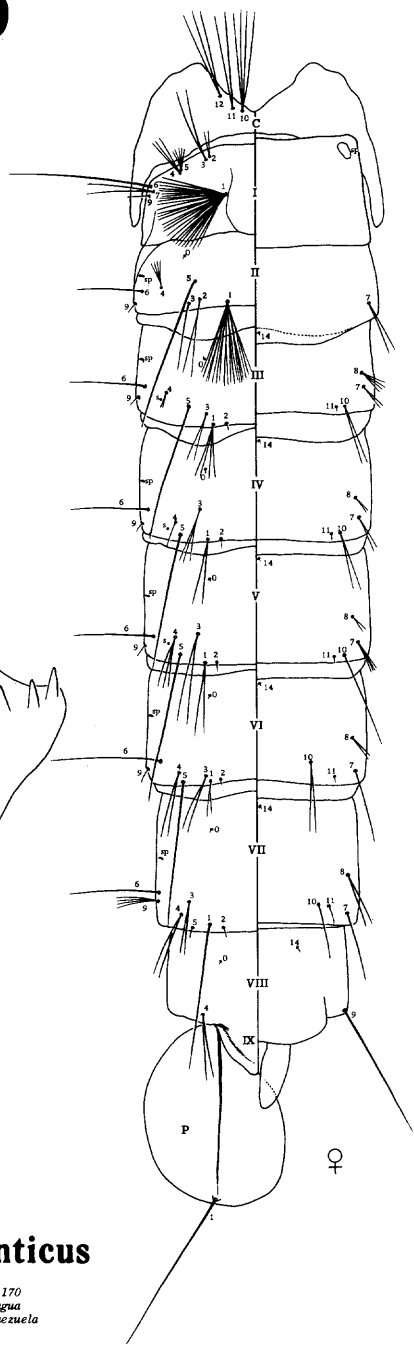
Fig.10



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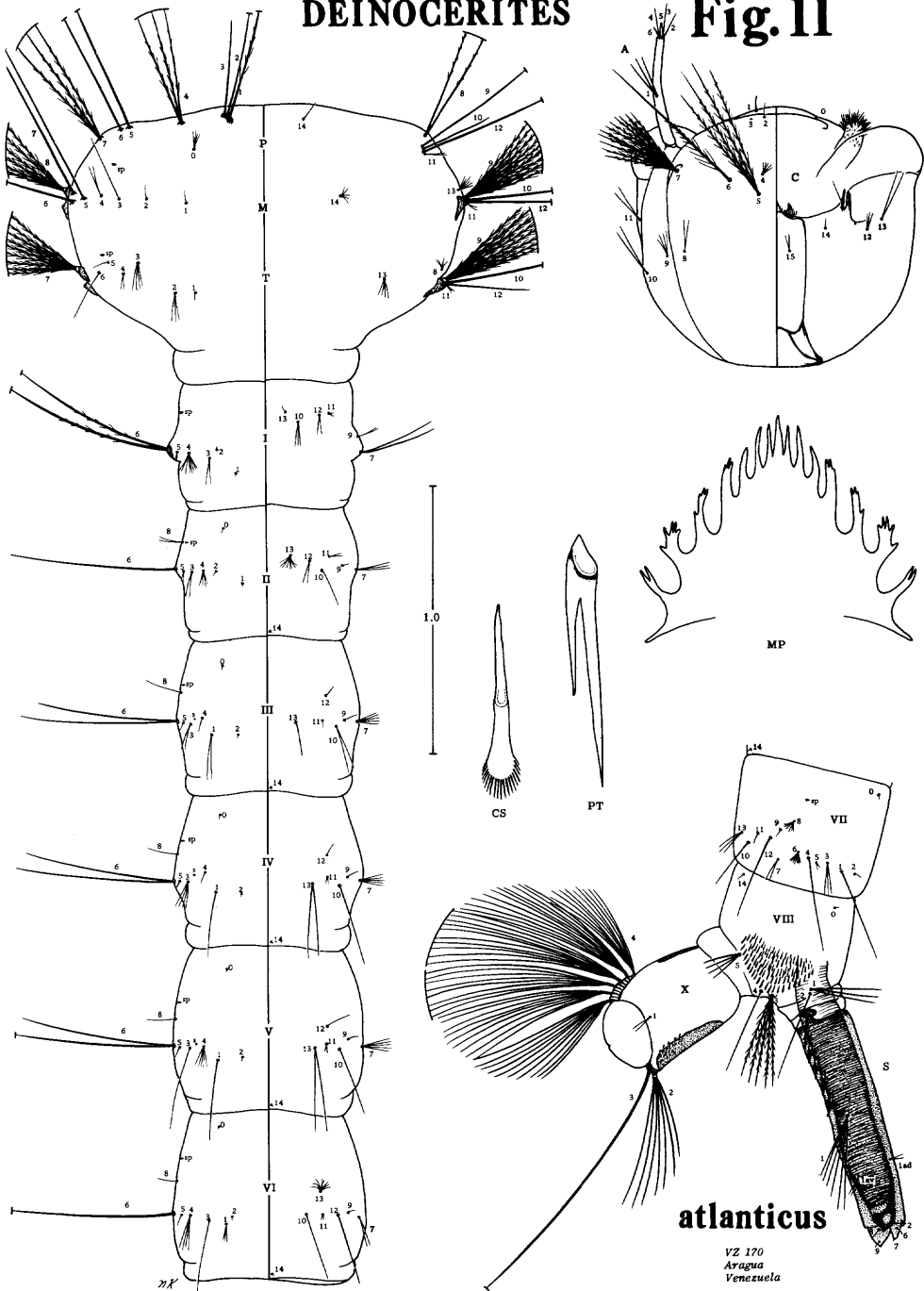


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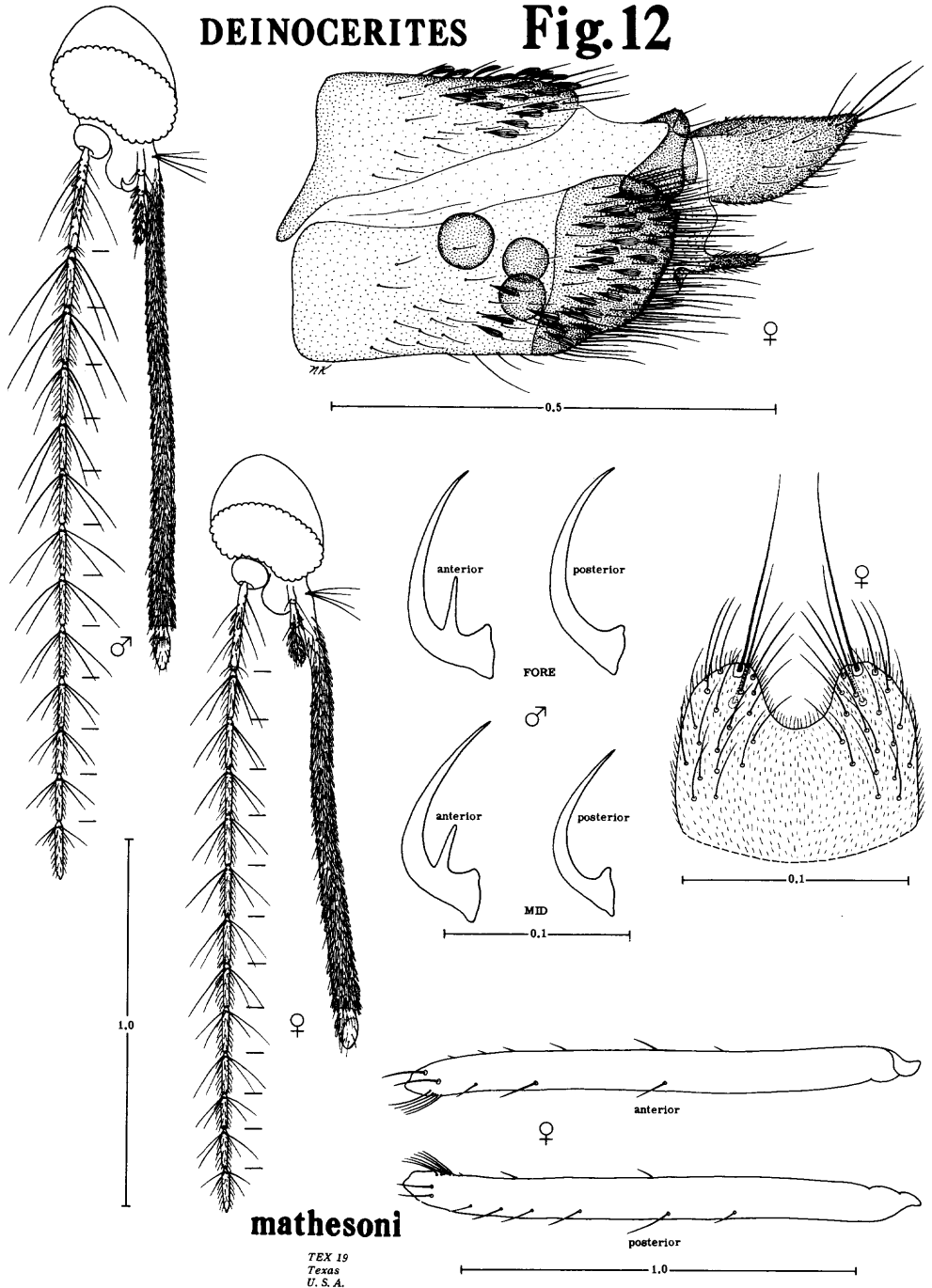
Fig. 11



atlanticus

VZ 170
Aragua
Venezuela

DEINOCERITES Fig.12

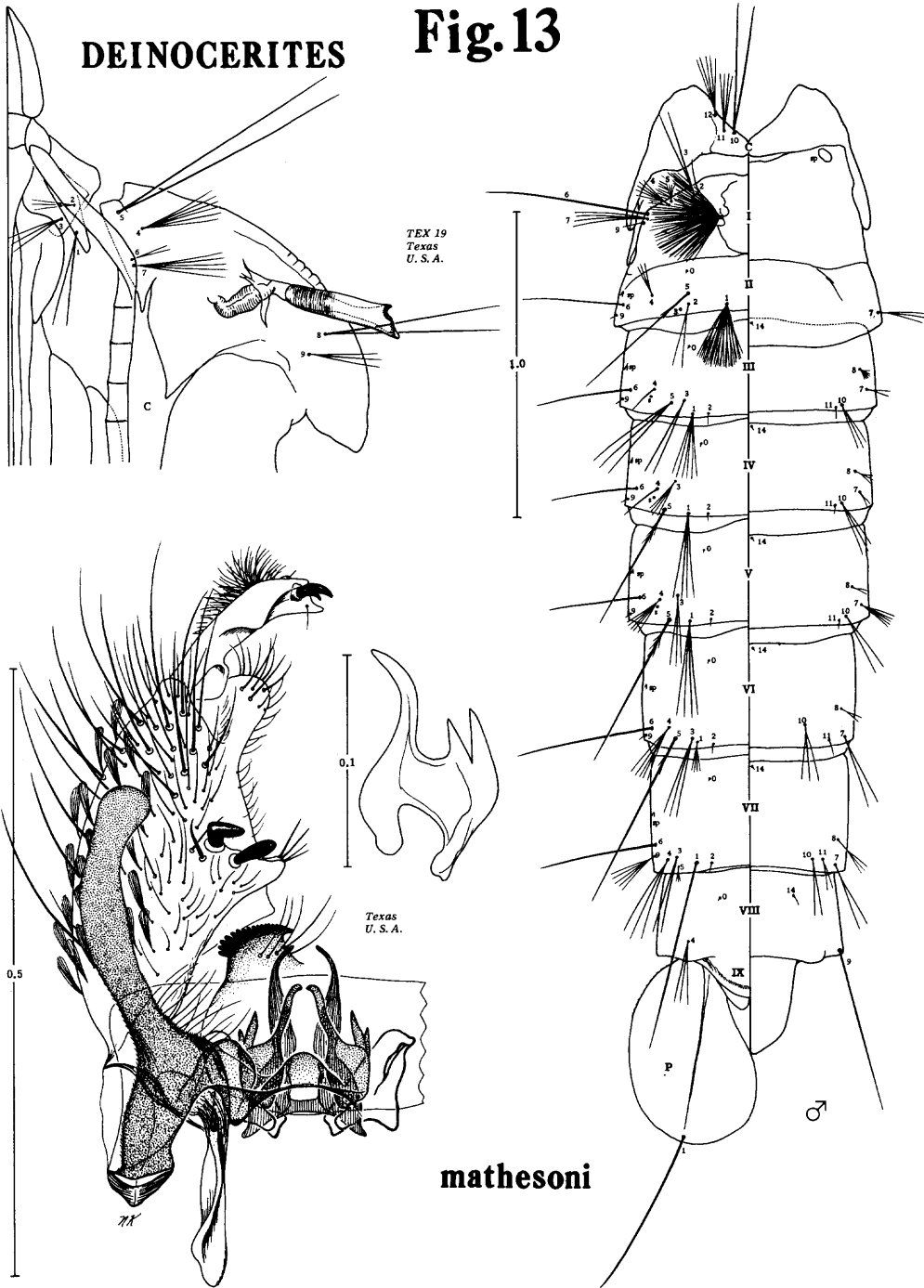


mathesoni

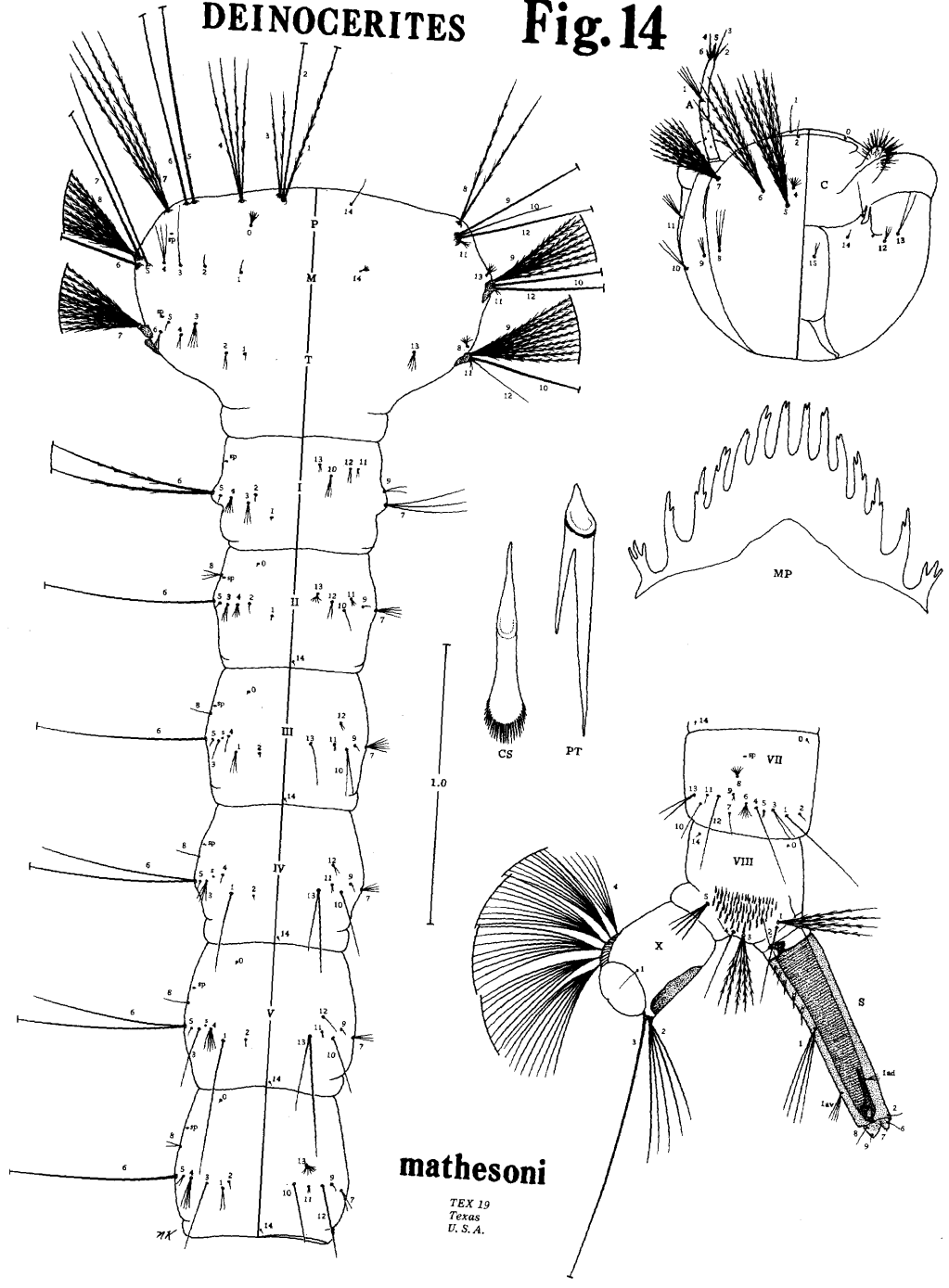
TEX 19
Texas
U. S. A.

DEINOCERITES

Fig. 13

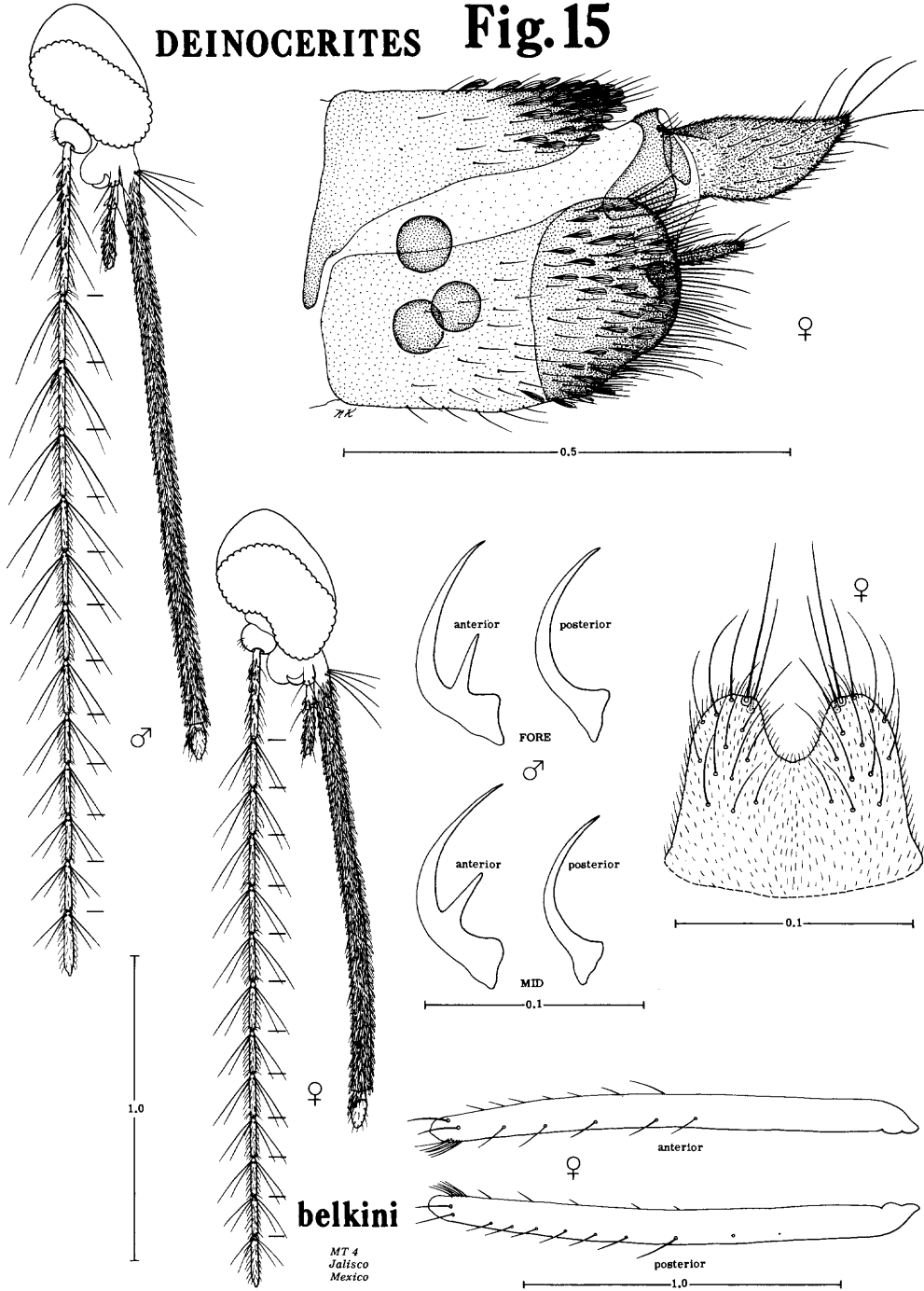


DEINOCERITES Fig. 14



mathesoni
 TEX 19
 Texas
 U. S. A.

DEINOCERITES Fig. 15

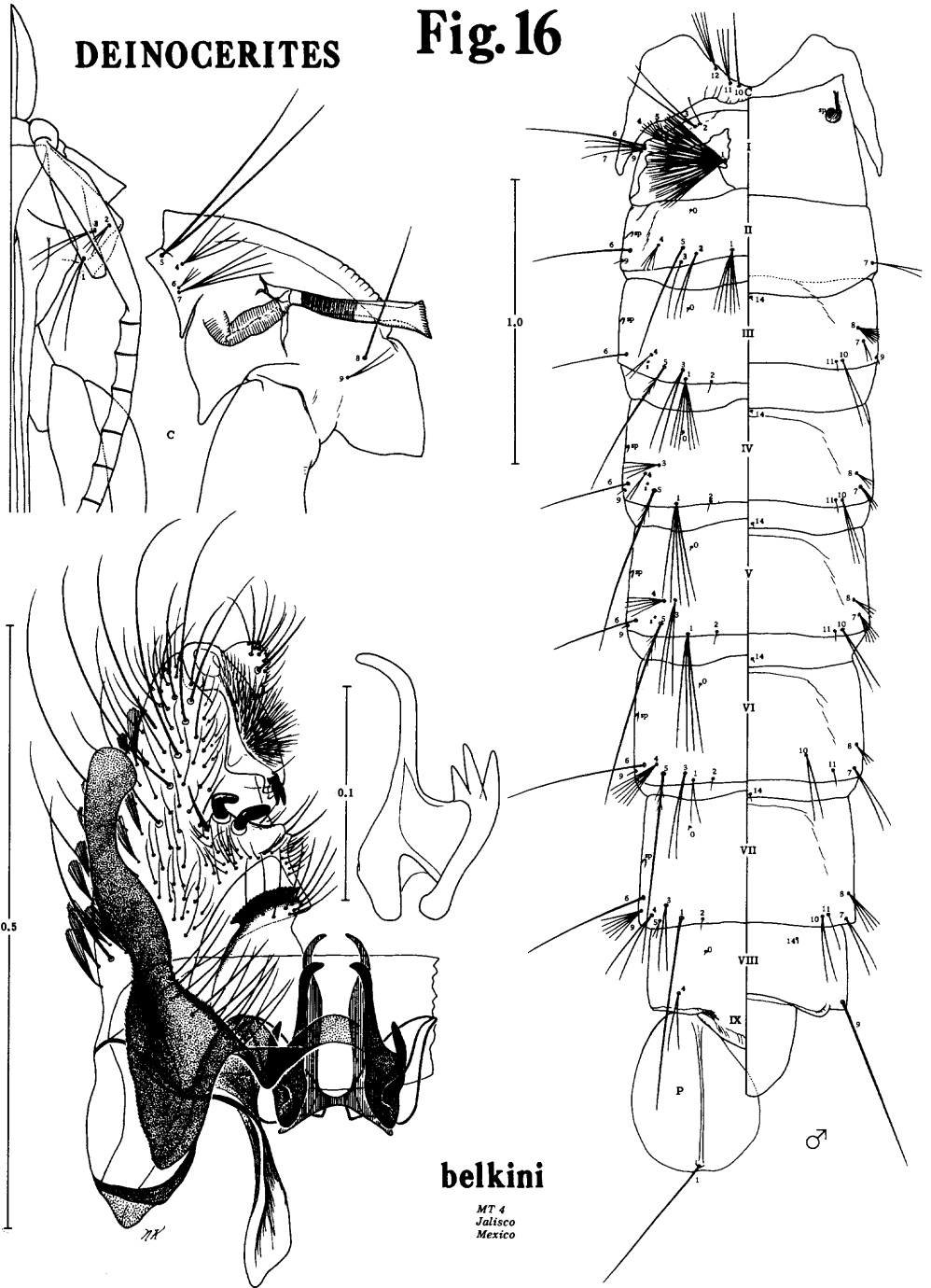


belkini

MT 4
Jalisco
Mexico

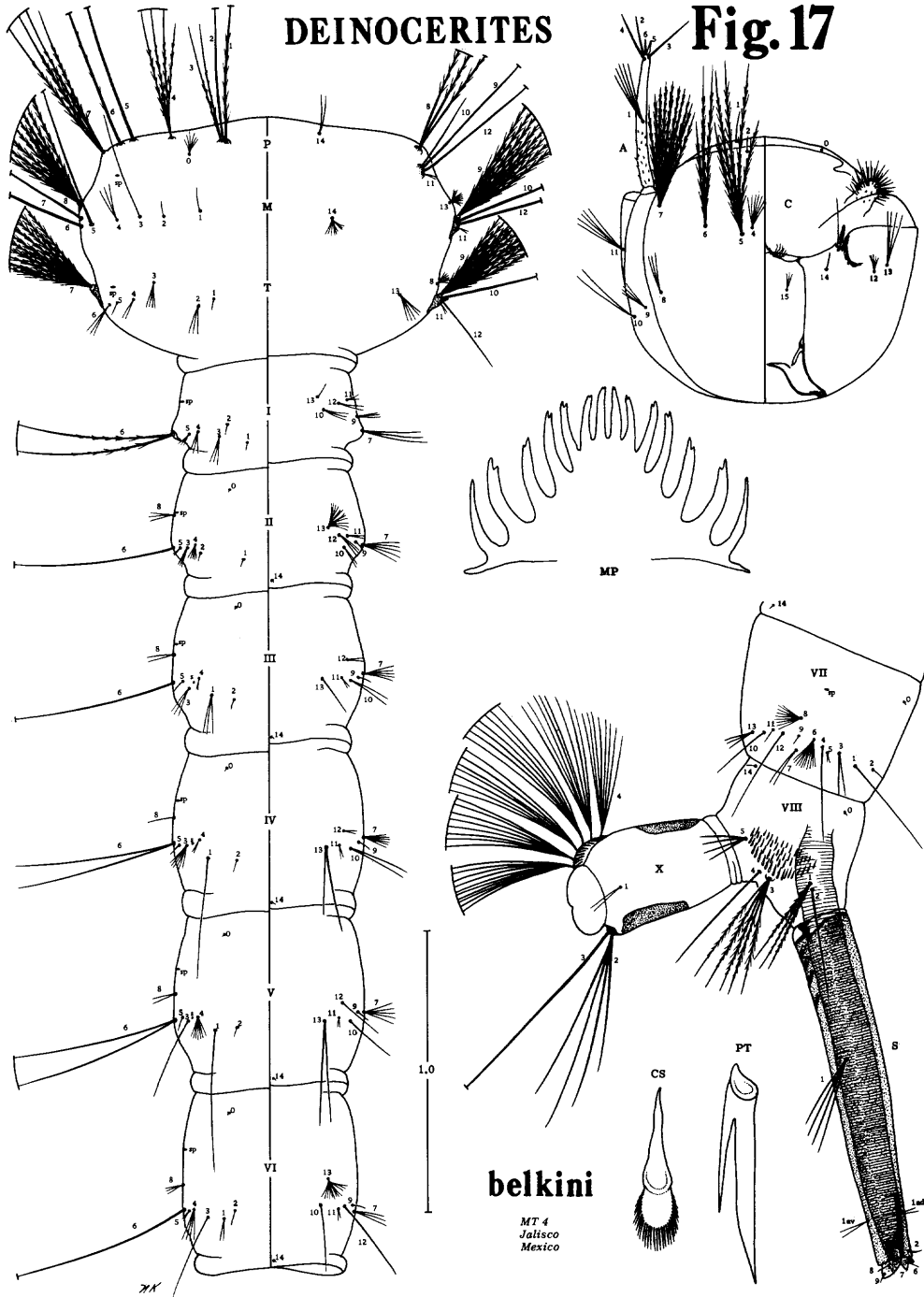
DEINOCERITES

Fig. 16



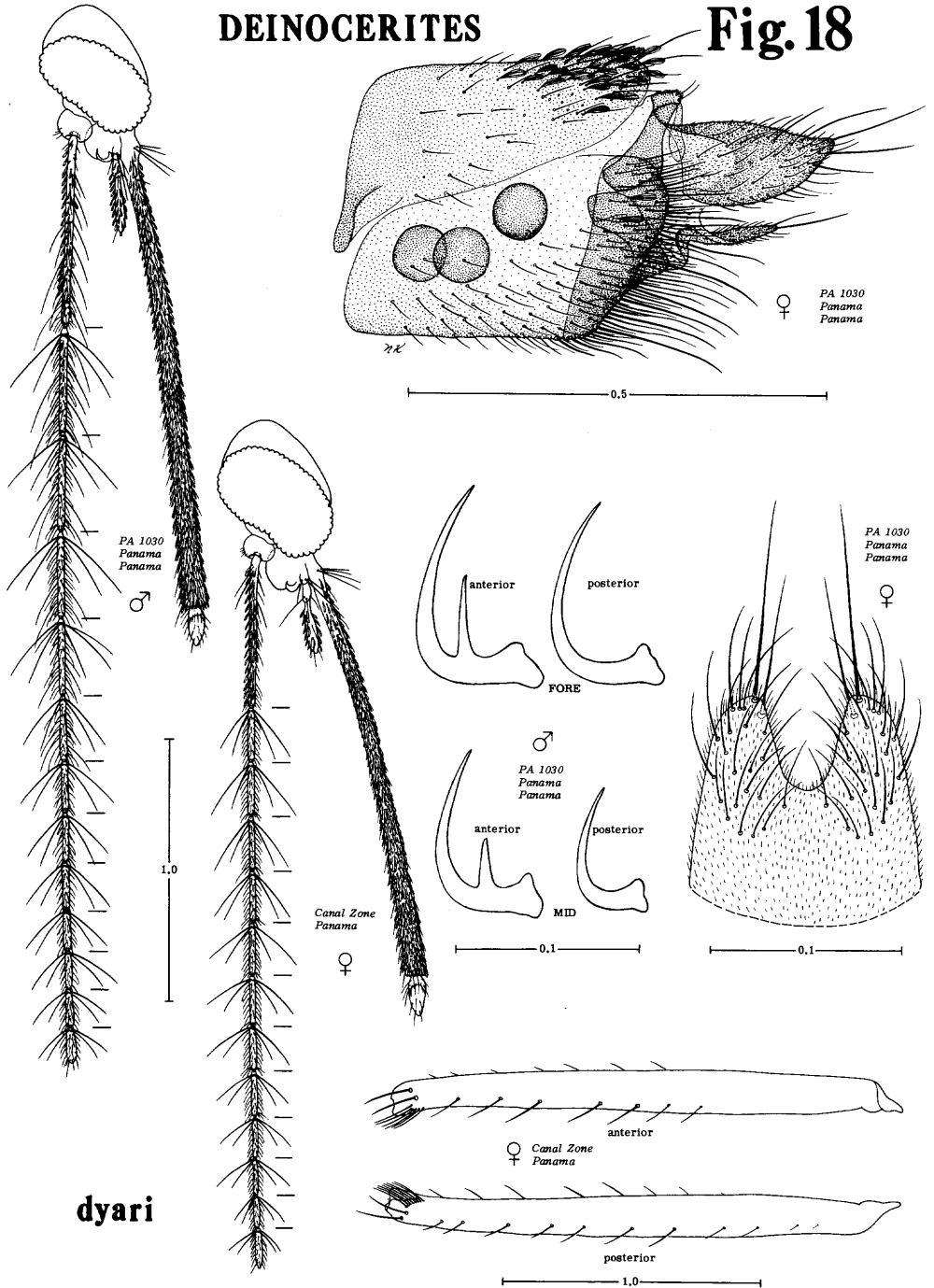
DEINOCERITES

Fig. 17



DEINOCERITES

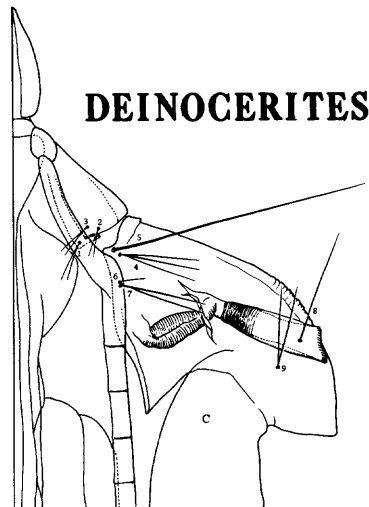
Fig. 18



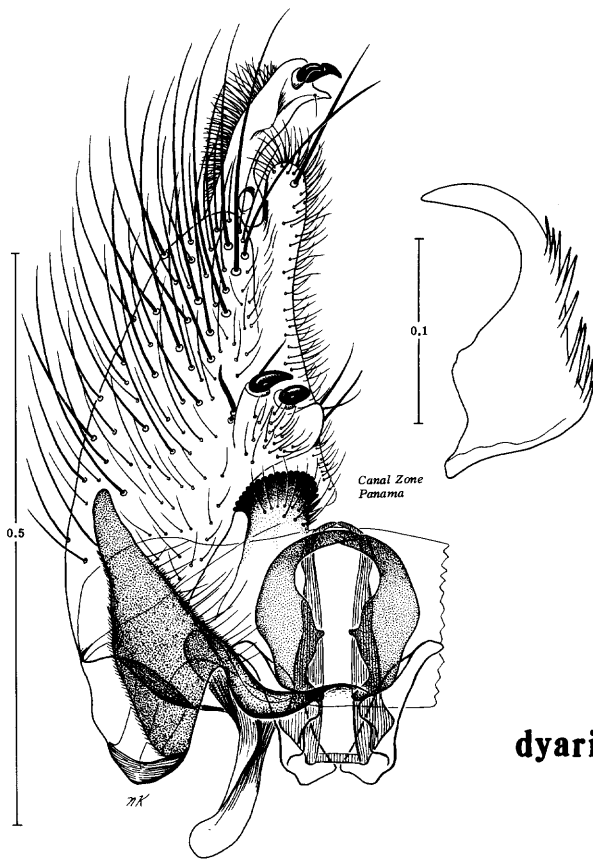
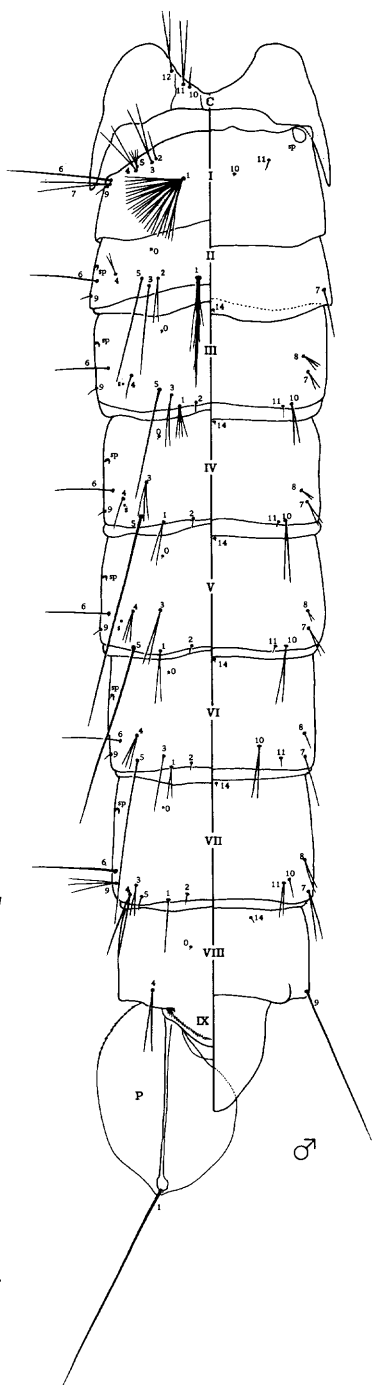
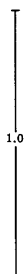
dyari

Fig. 19

DEINOCERITES



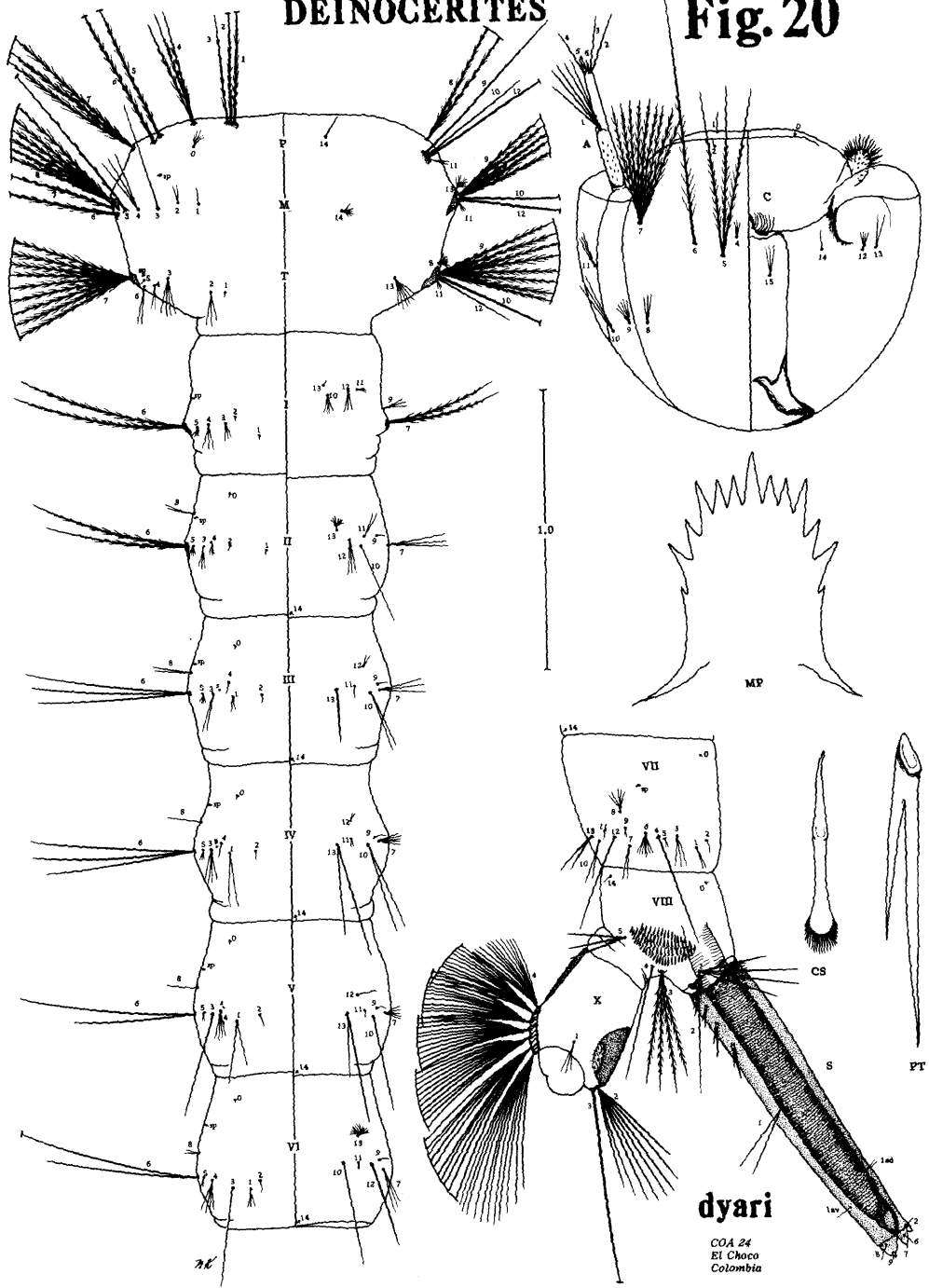
COA 24
El Choco
Colombia



dyari

DEINOCERITES

Fig. 20

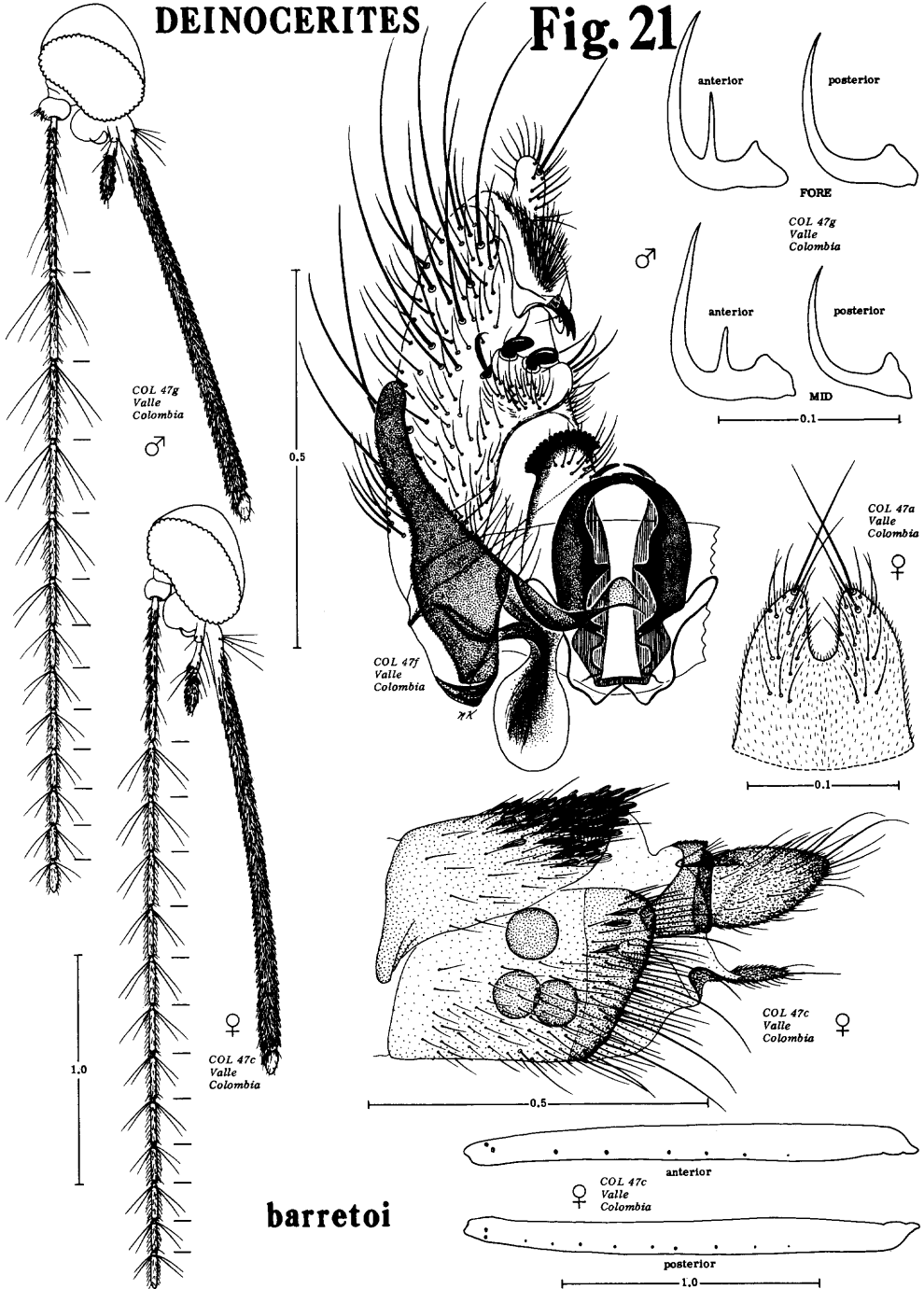


dyari

COA 24
El Chaco
Colombia

DEINOCERITES

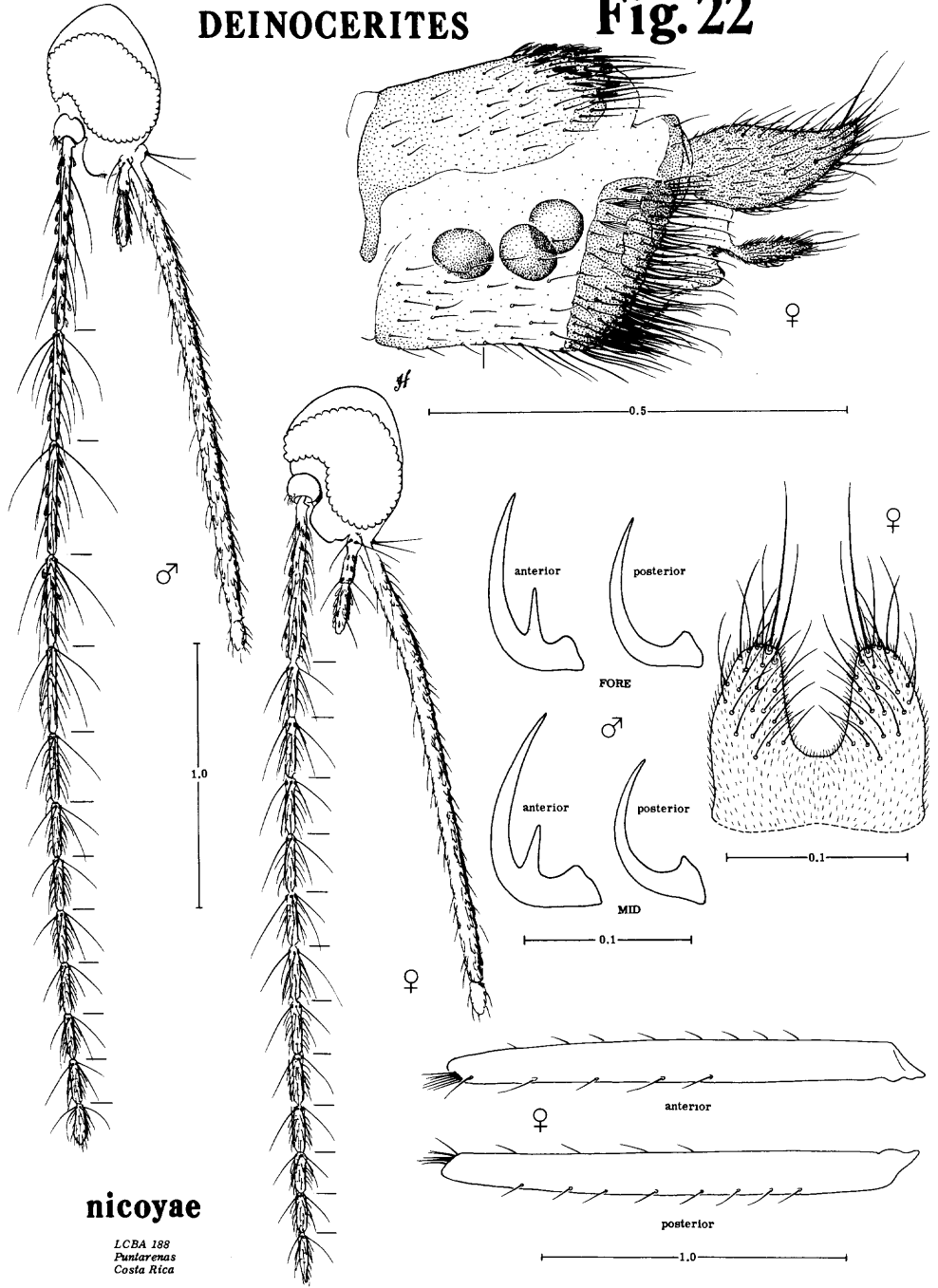
Fig. 21



barretoii

DEINOCERITES

Fig. 22

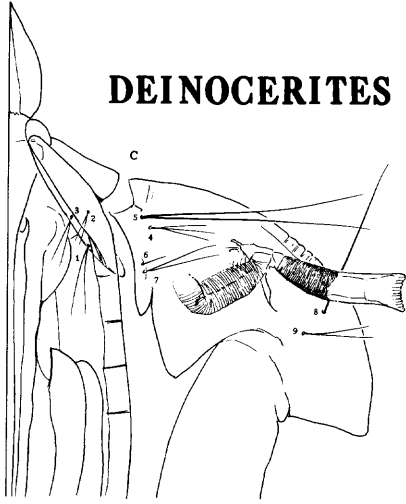


nicoyae

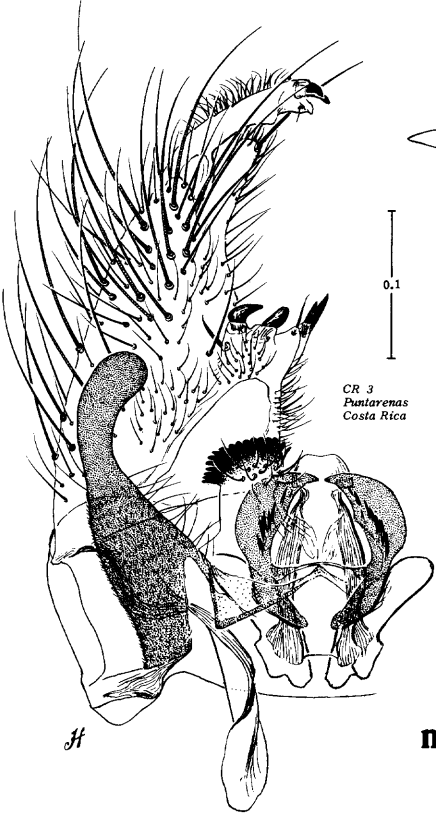
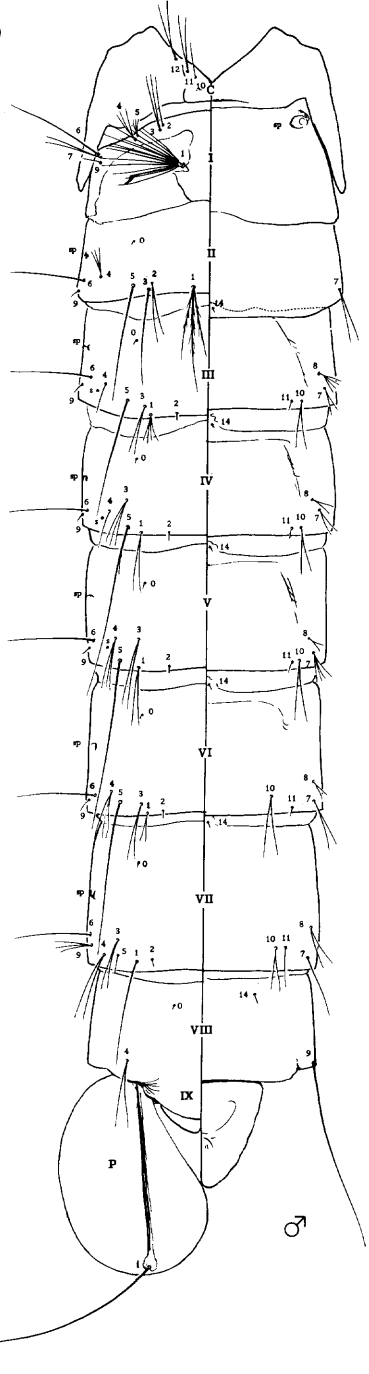
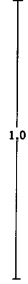
LCBA 188
Puntarenas
Costa Rica

Fig. 23

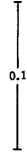
DEINOCERITES



CR 254
Pantarenas
Costa Rica



CR 3
Pantarenas
Costa Rica



nicoyae

DEINOCERITES

Fig. 24

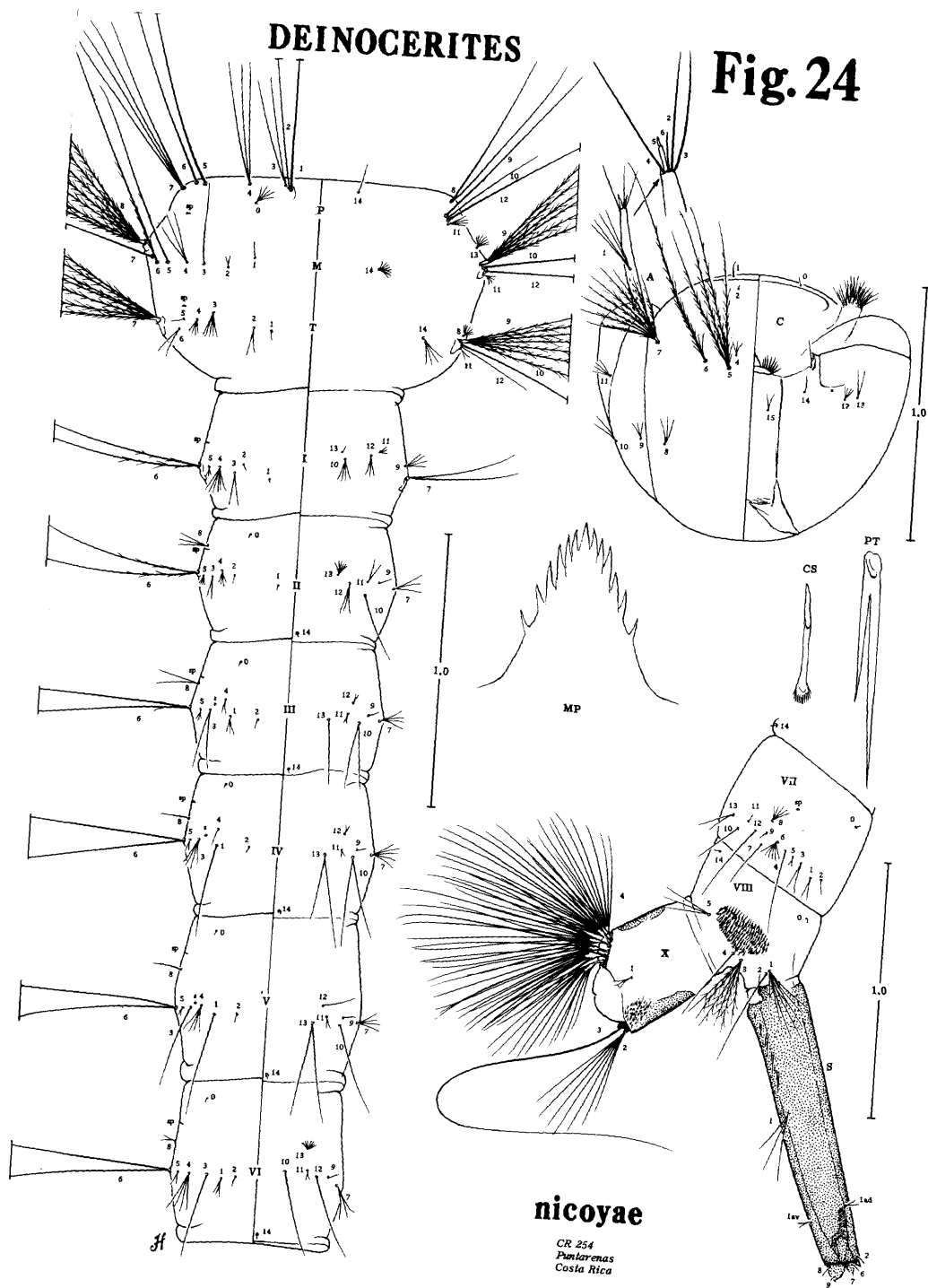
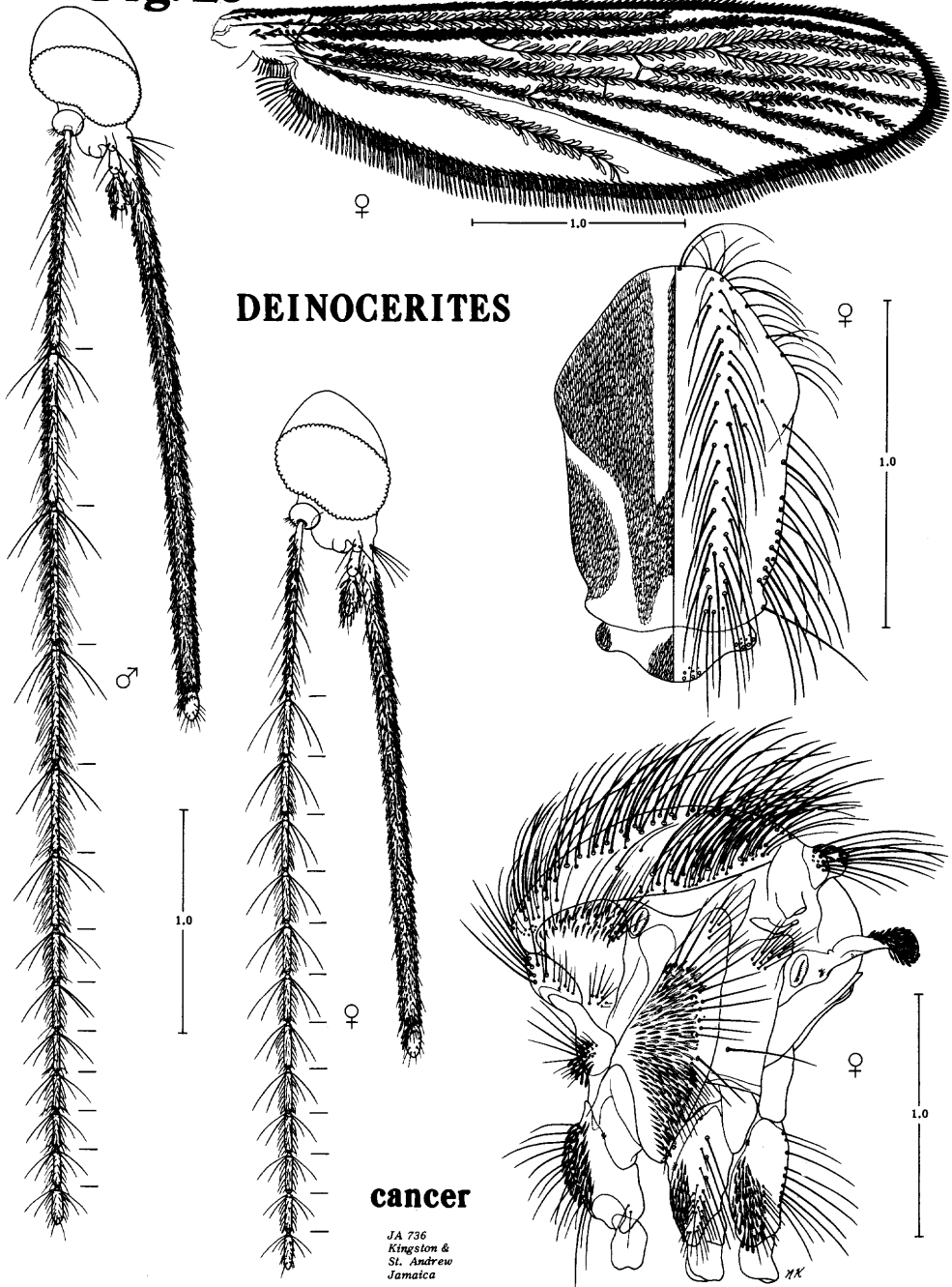


Fig. 25



DEINOCERITES Fig. 26

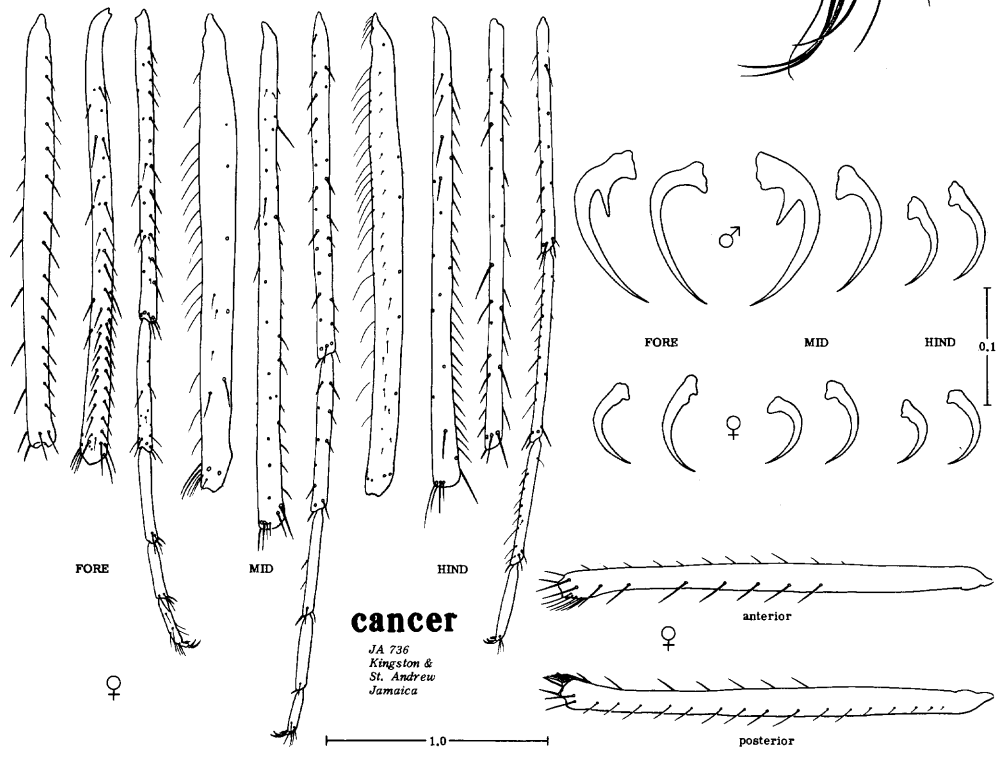
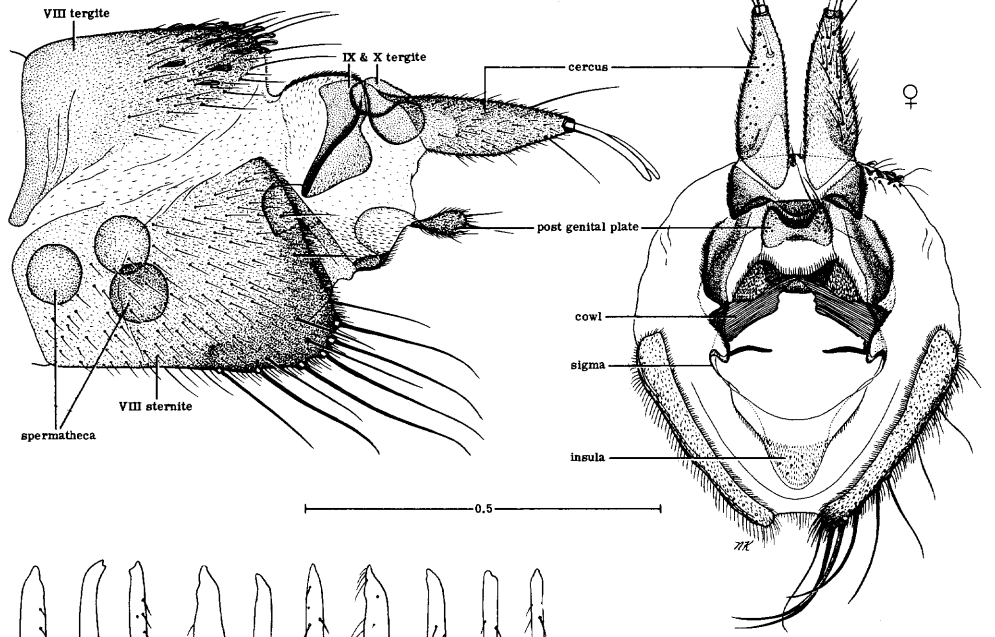
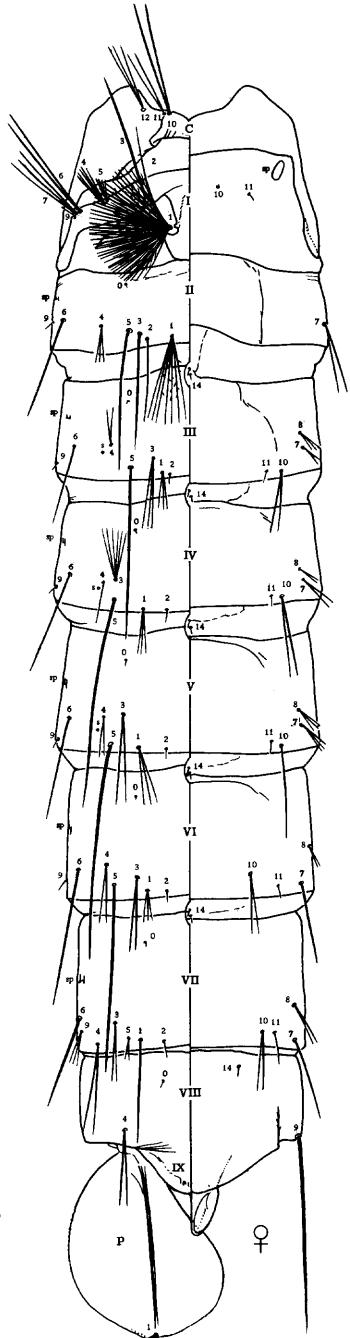
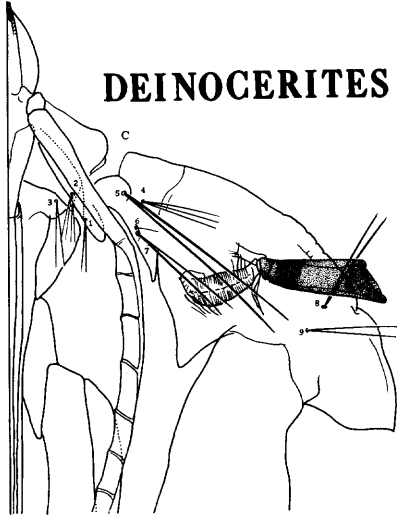


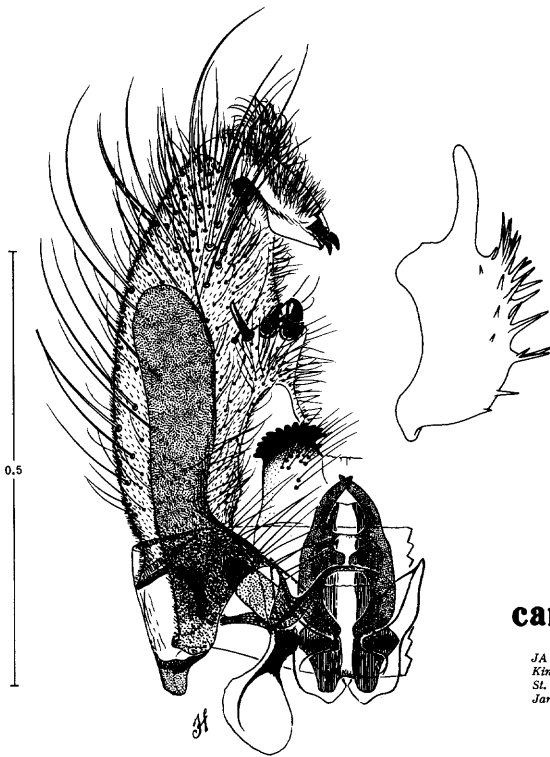
Fig. 27

DEINOCERITES

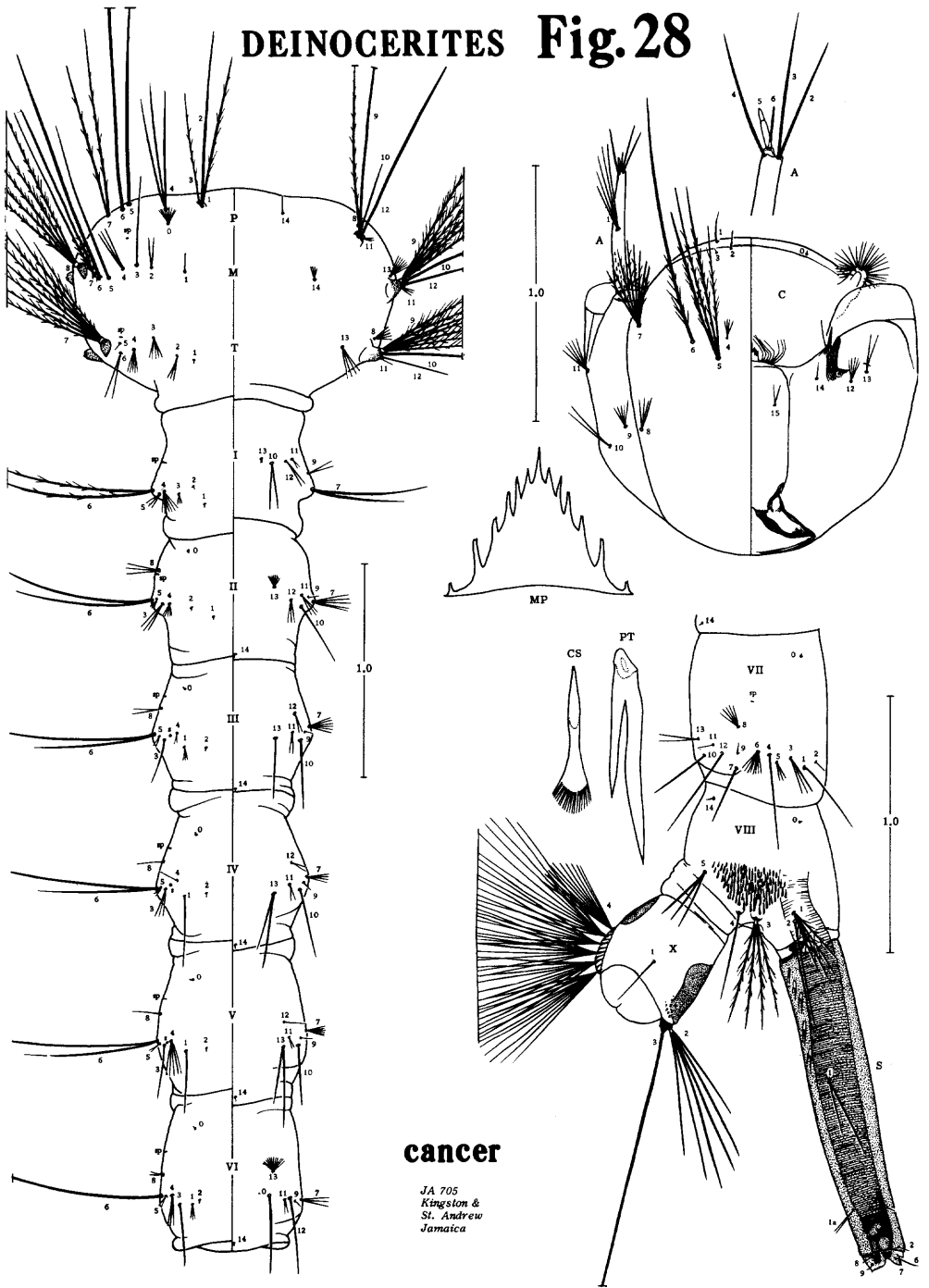


cancer

JA 705
Kingston &
St. Andrew
Jamaica



DEINOCERITES Fig. 28

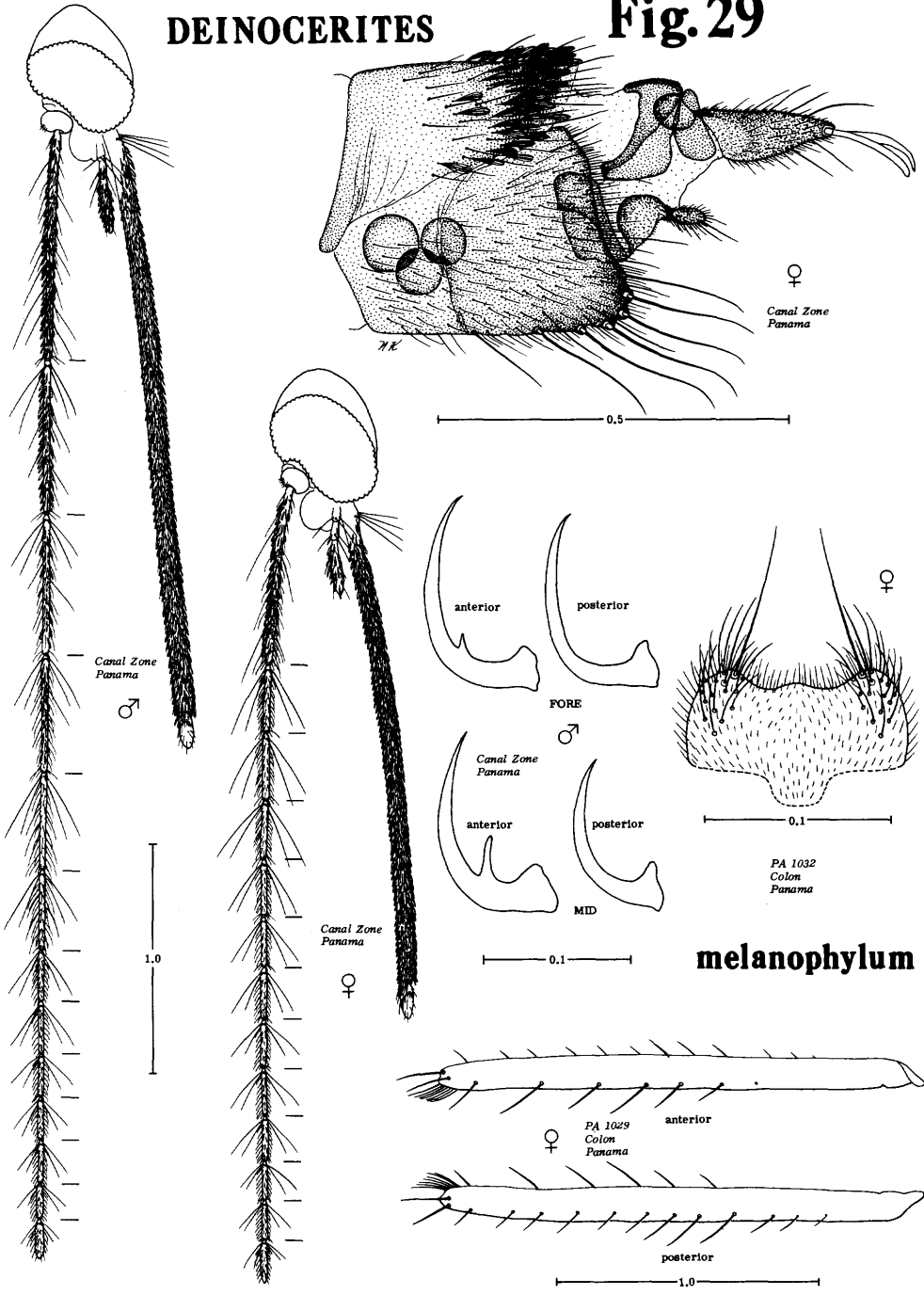


cancer

JA 705
Kingston &
St. Andrew
Jamaica

DEINOCERITES

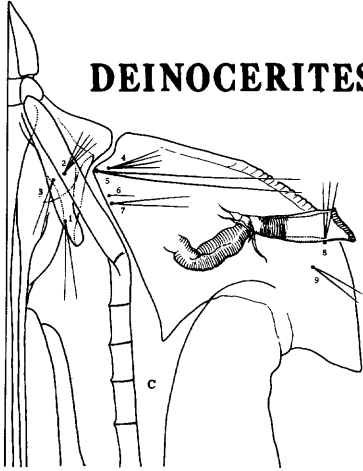
Fig. 29



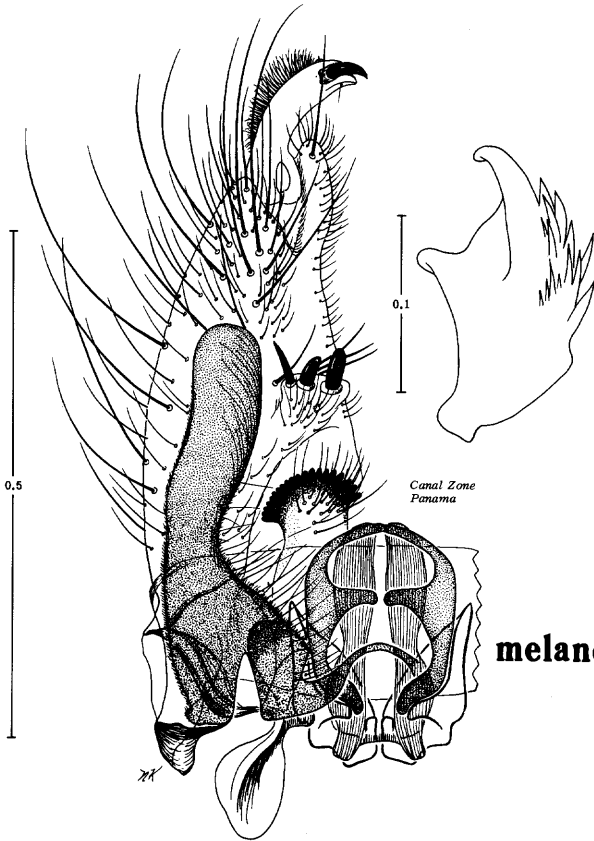
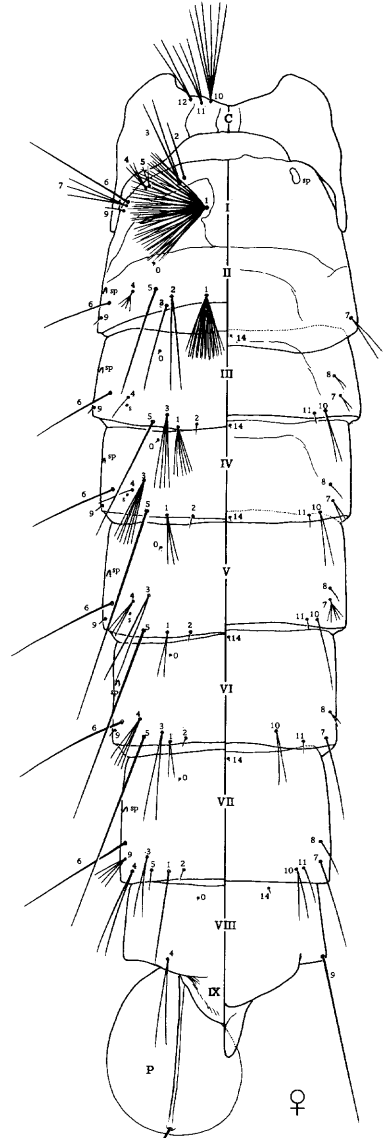
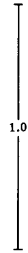
melanophylum

Fig. 30

DEINOCERITES



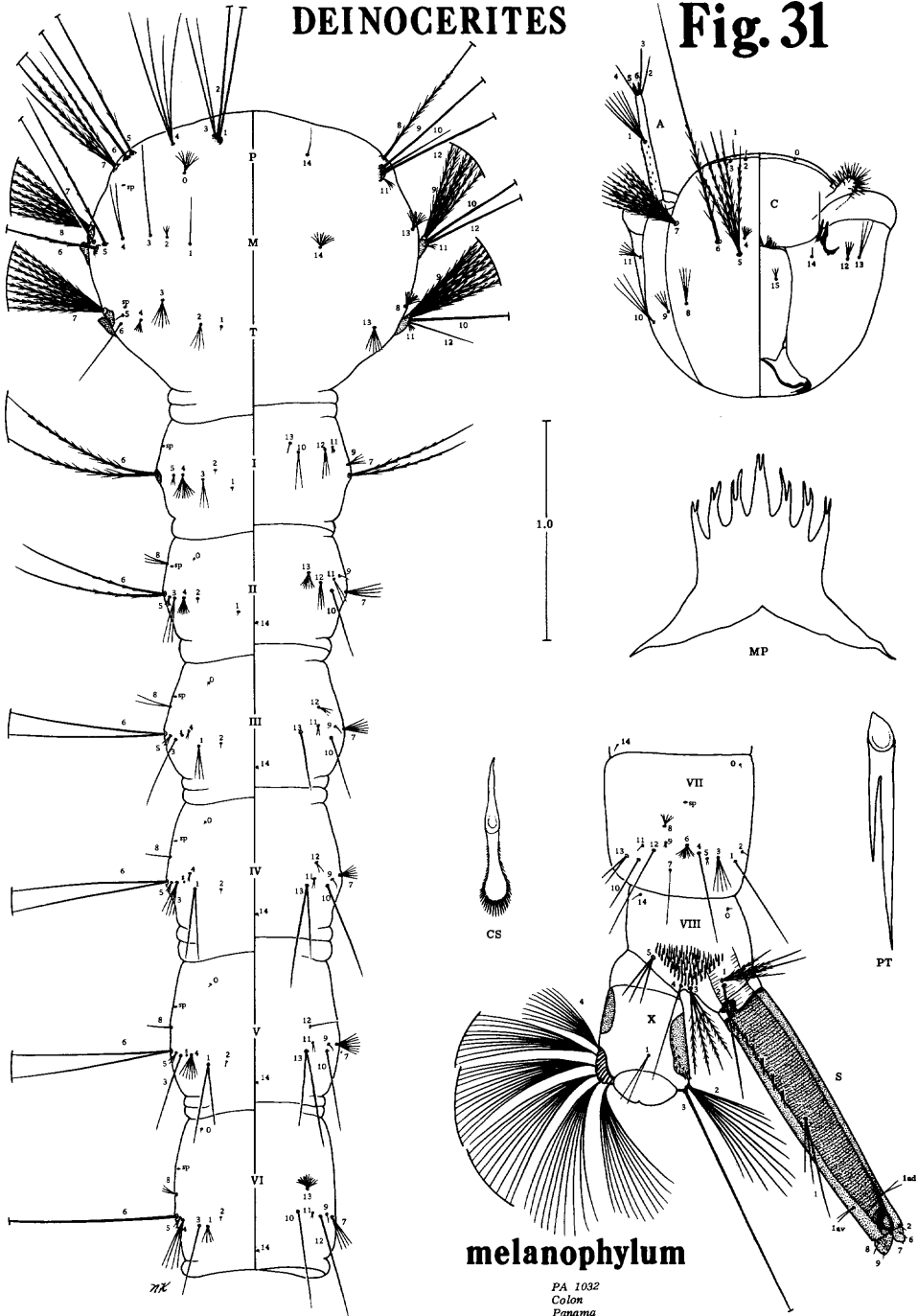
PA 1012
Colon
Panama



melanophylum

DEINOCERITES

Fig. 31



PA 1032
Colon
Panama

DEINOCERITES

Fig. 32

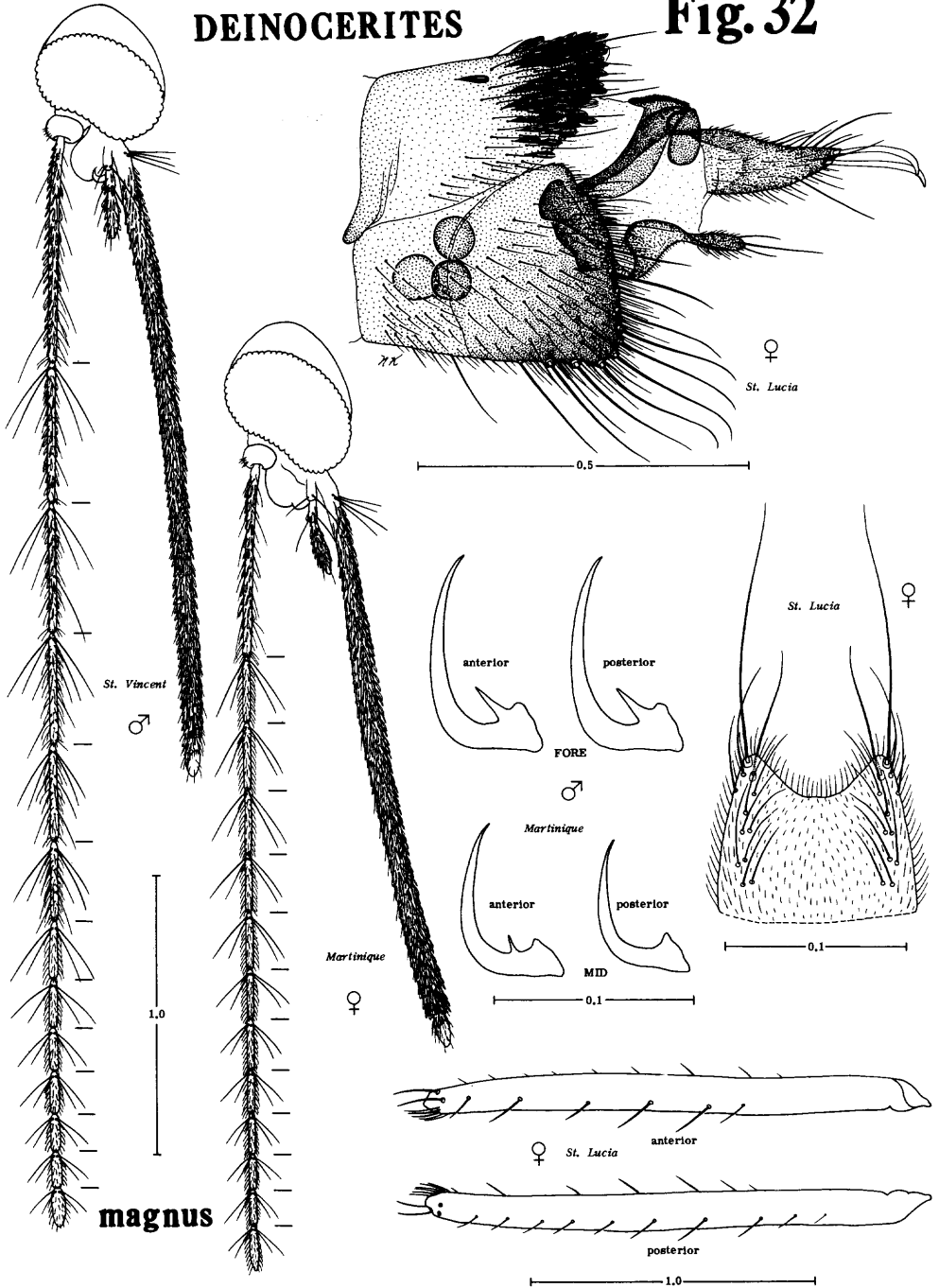
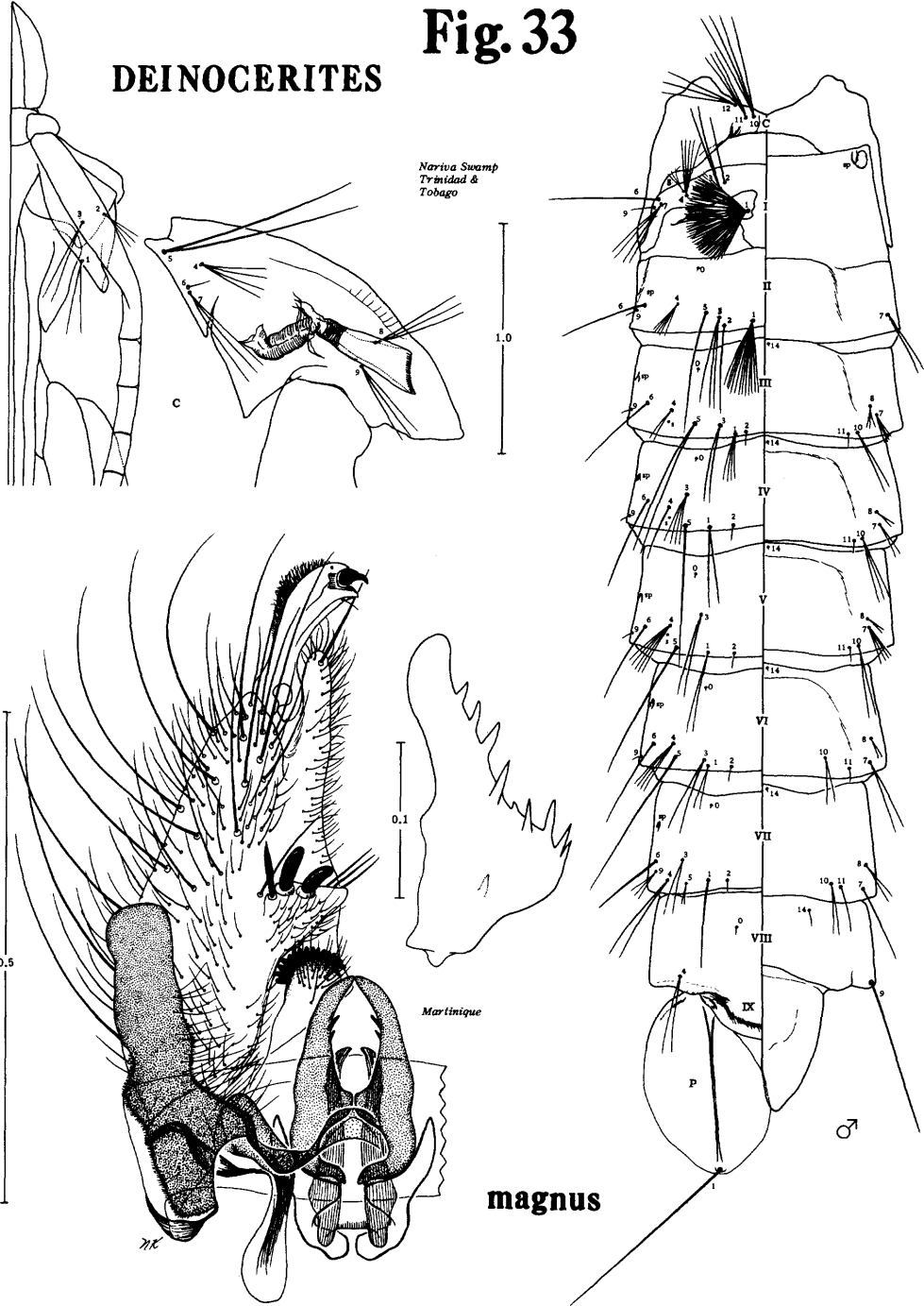


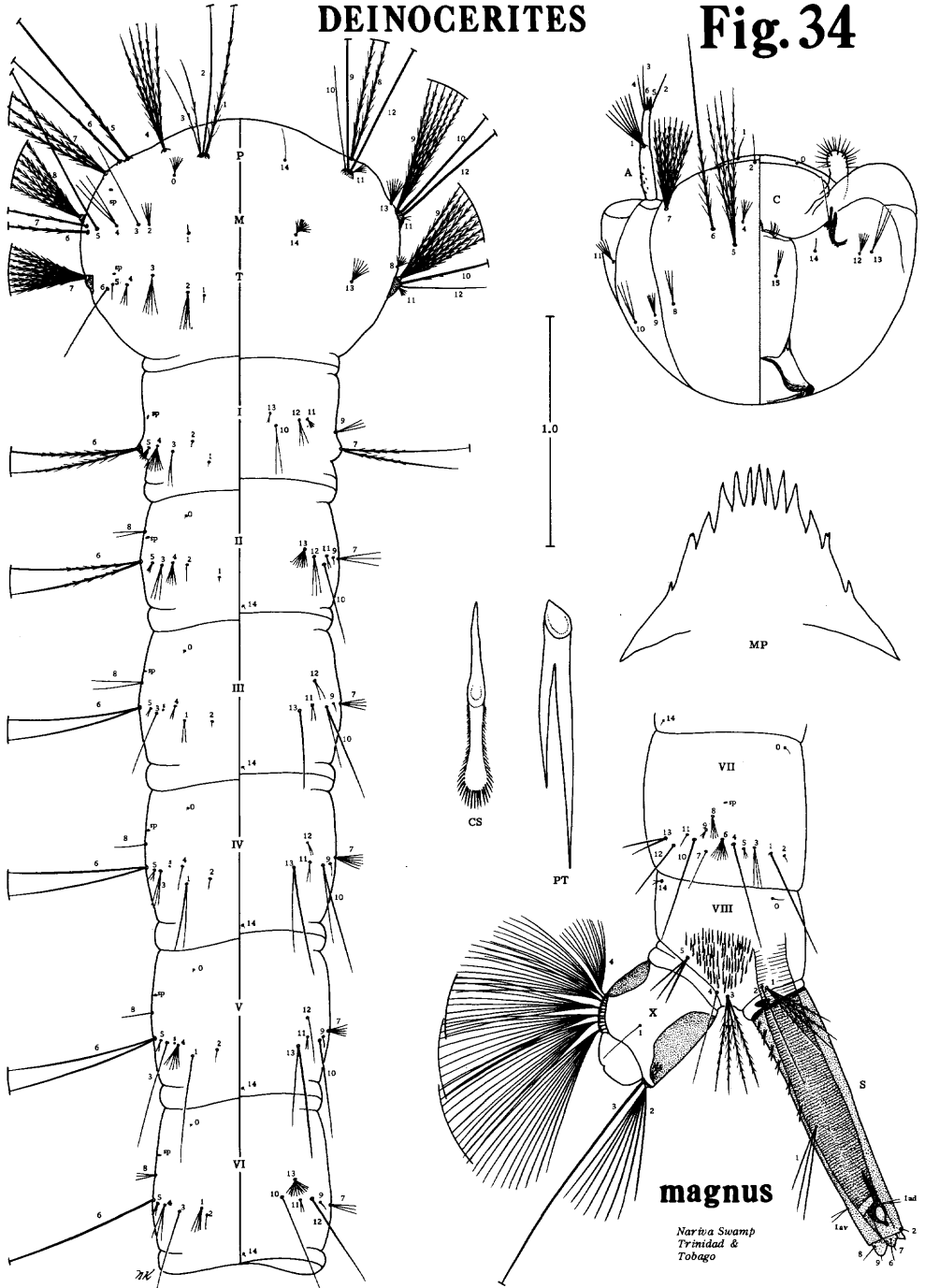
Fig. 33

DEINOCERITES

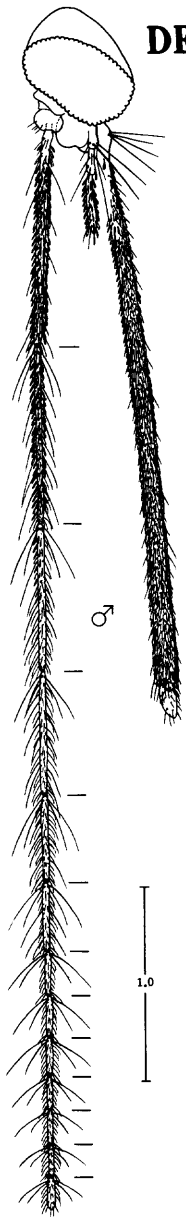


DEINOCERITES

Fig. 34

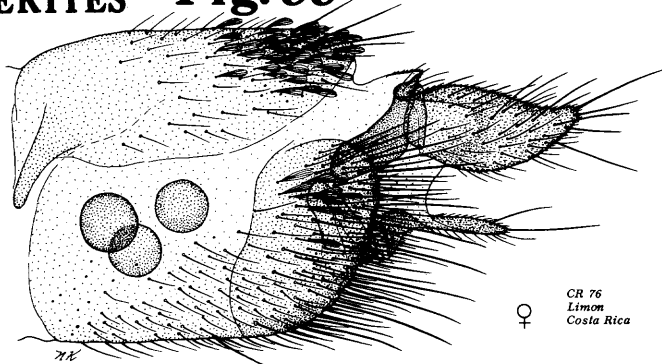
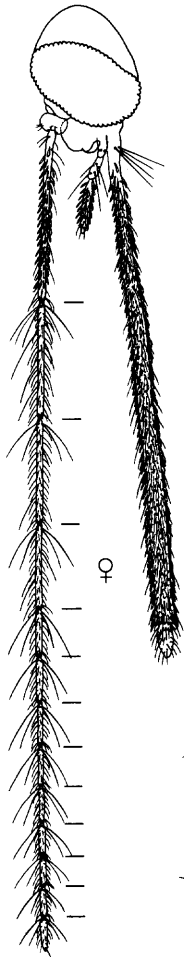


DEINOCERITES Fig. 35

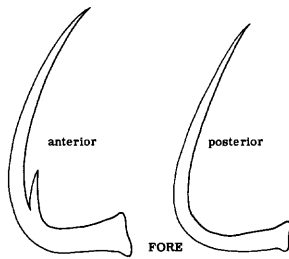


epitedeus

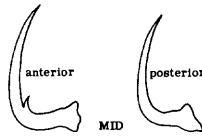
LCBA 234
Limon
Costa Rica



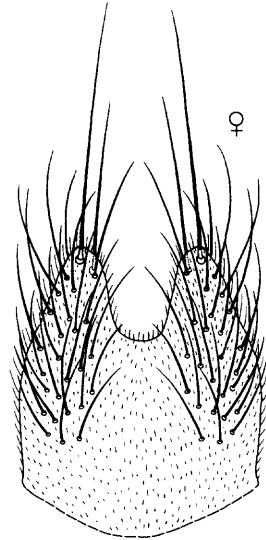
CR 76
Limon
Costa Rica



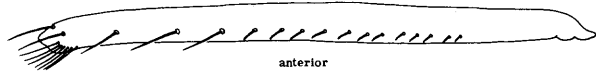
♂



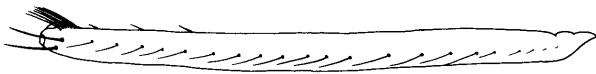
0.1



♀



♀

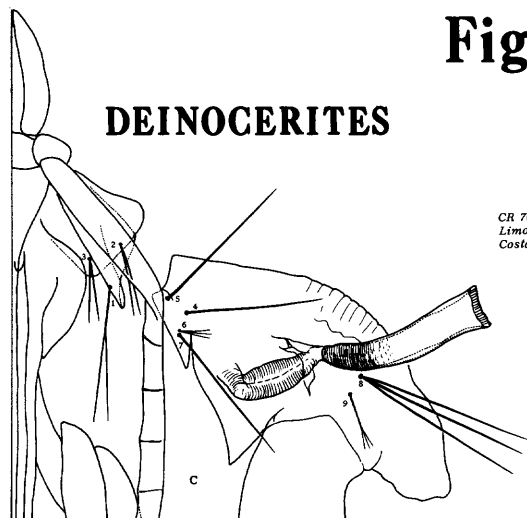


posterior

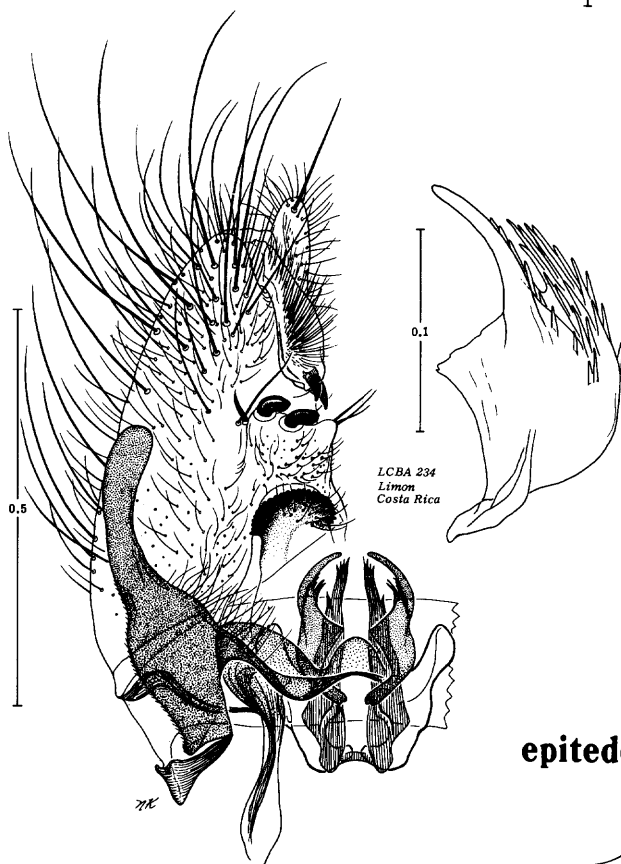
1.0

Fig. 36

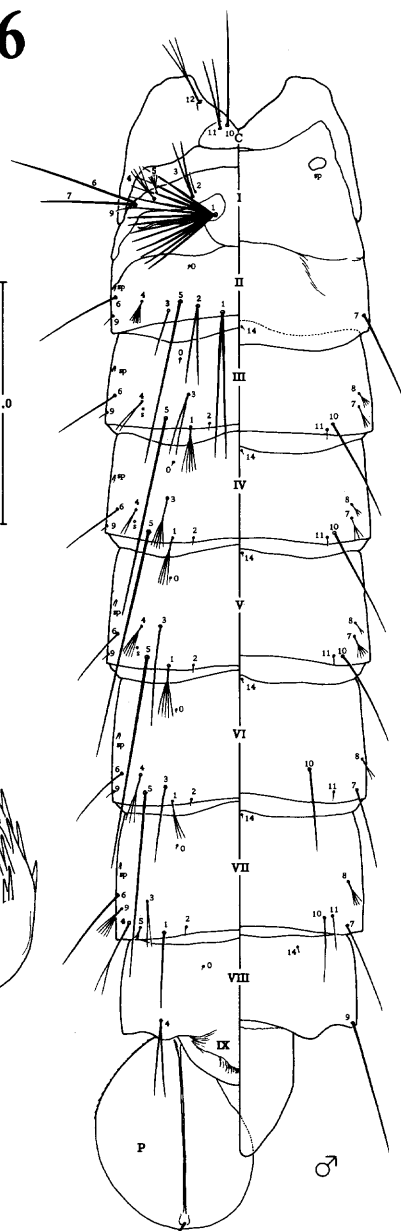
DEINOCERITES



CR 76
Limon
Costa Rica



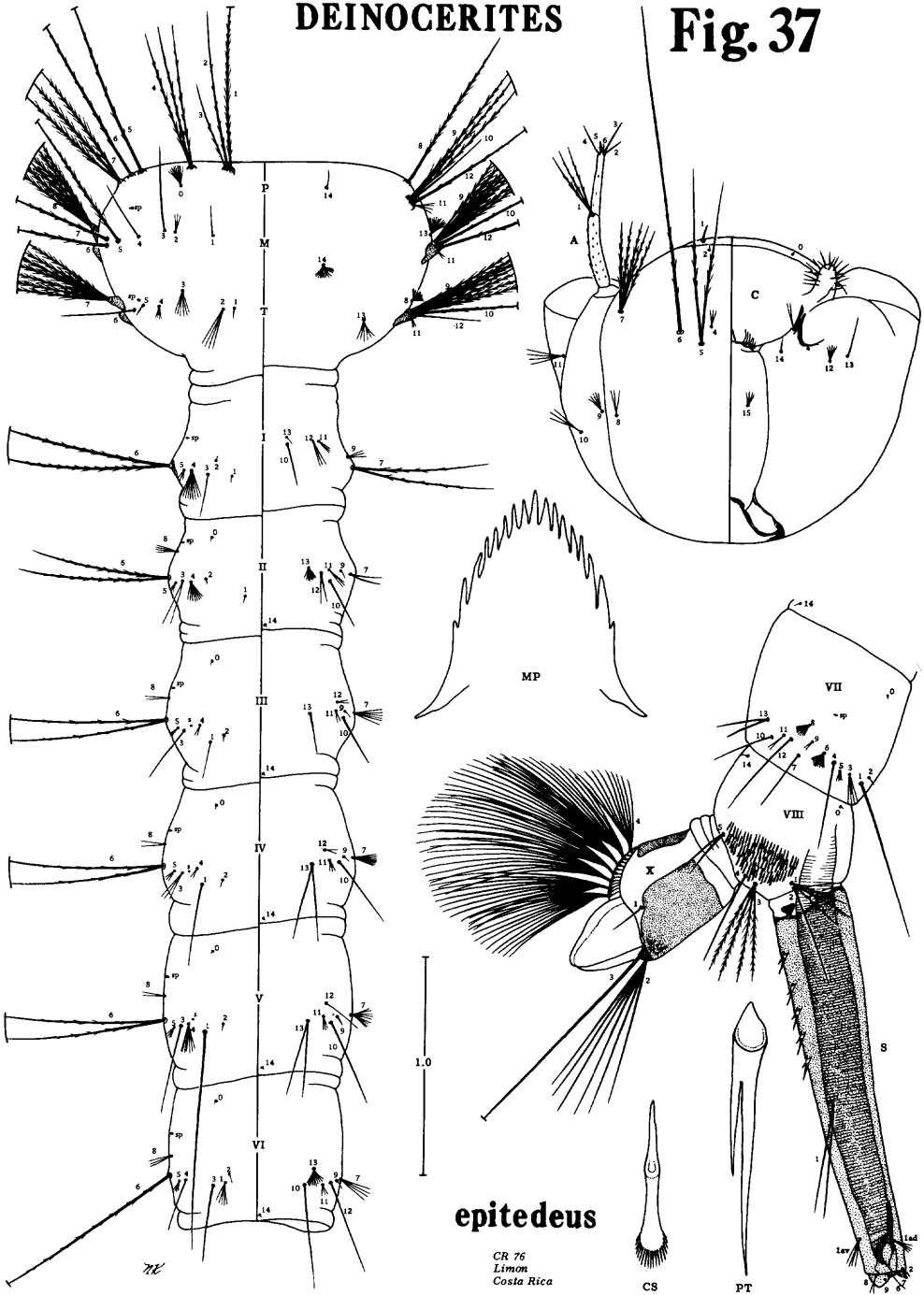
LCBA 234
Limon
Costa Rica



epitedeus

DEINOCERITES

Fig. 37



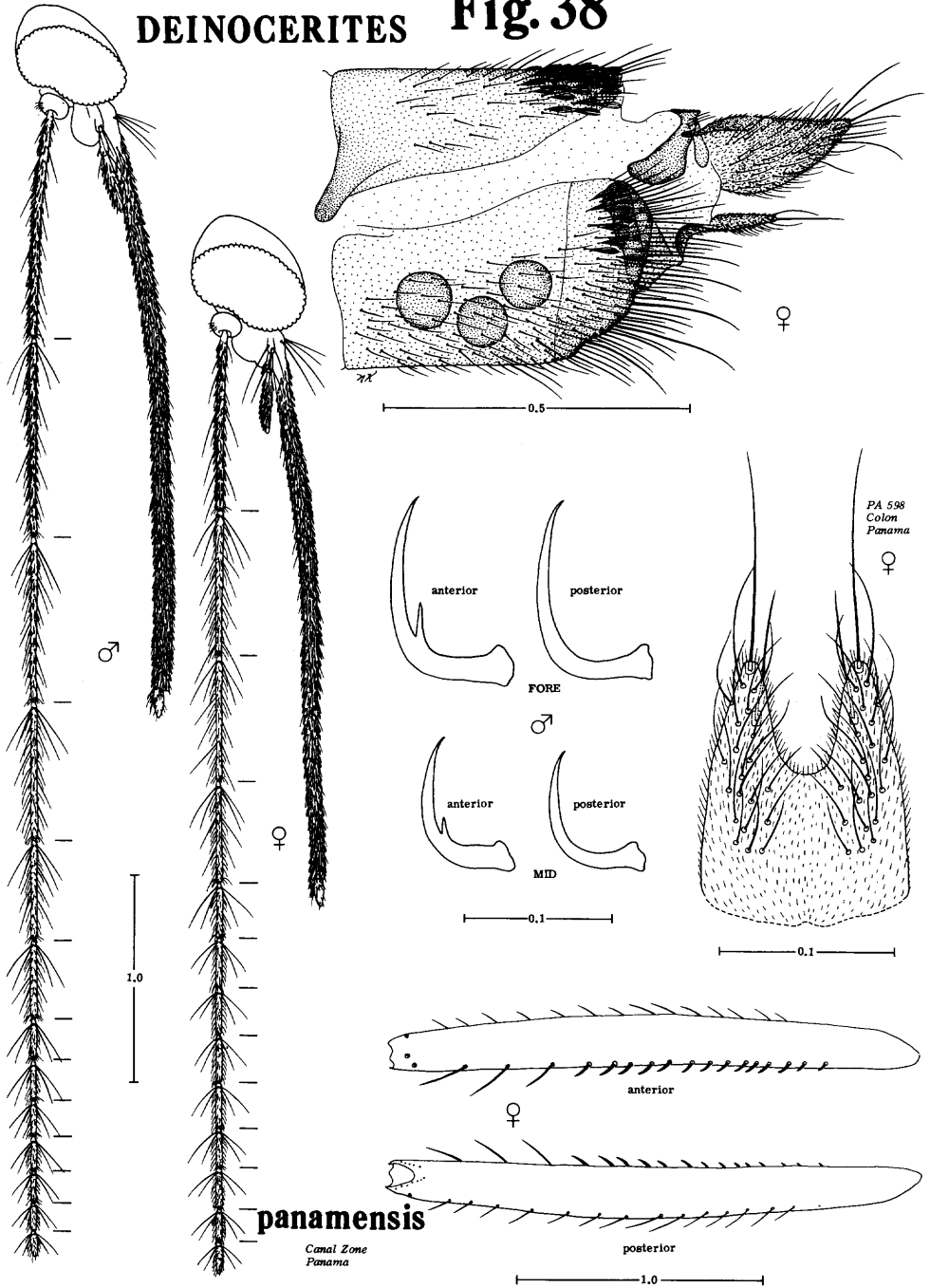
epitedeus

CR 76
Limon
Costa Rica

CS

PT

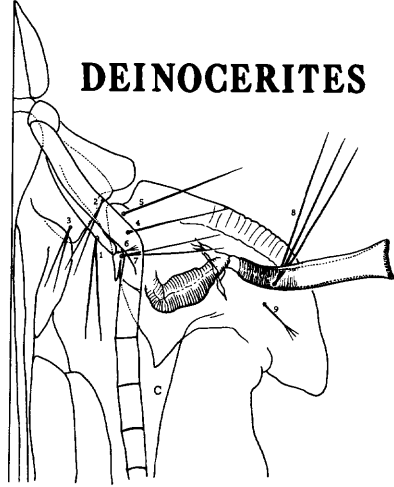
DEINOCERITES **Fig. 38**



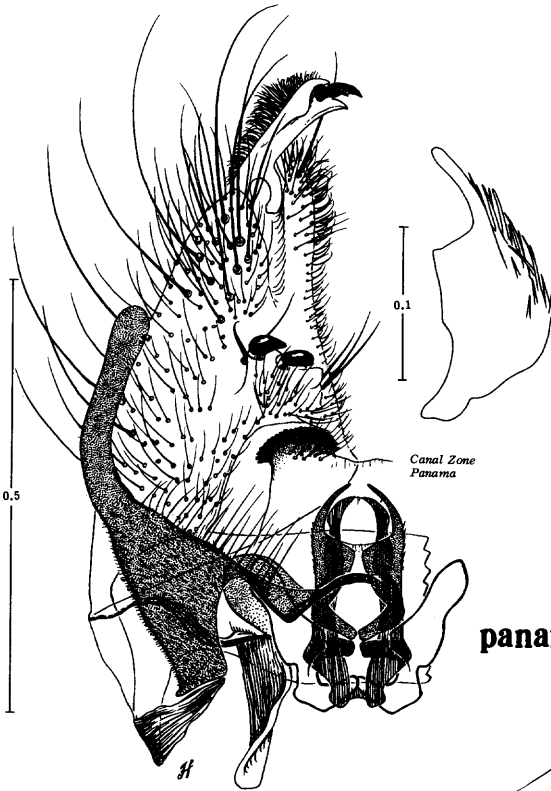
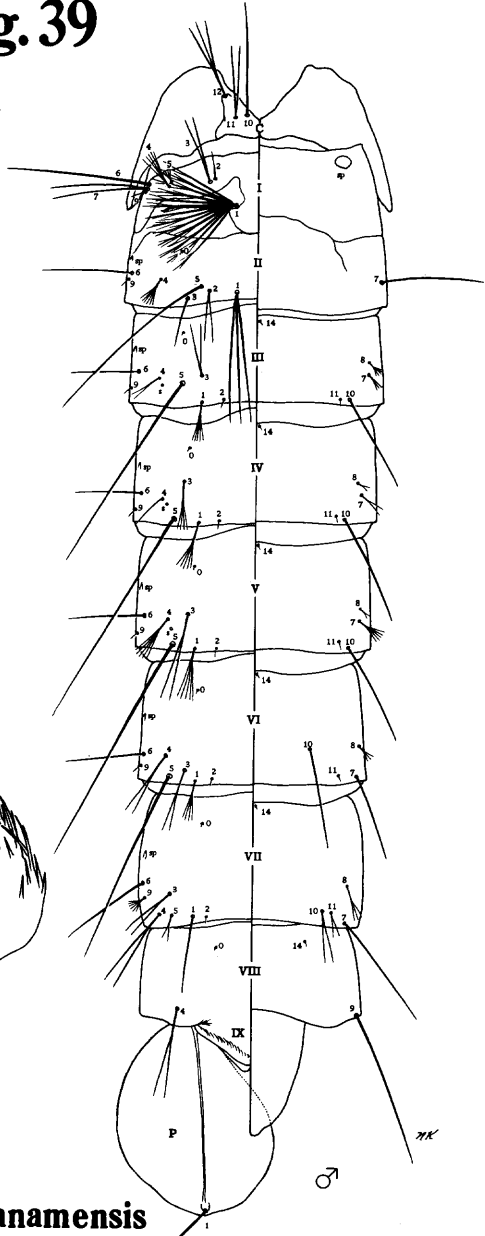
DEINOCERITES

Fig. 39

PA 1016
Colon
Panama



1.0

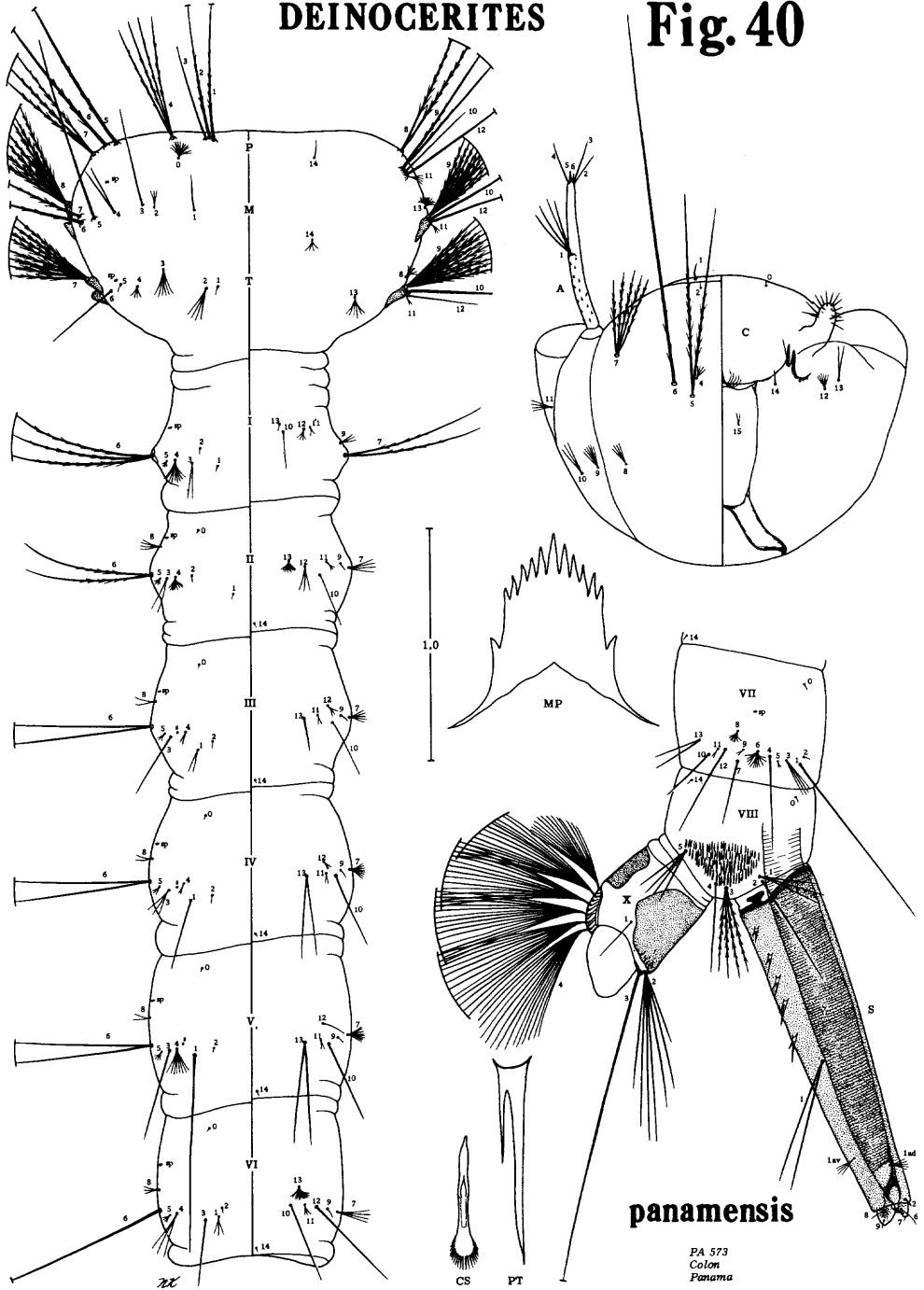


Canal Zone
Panama

panamensis

DEINOCERITES

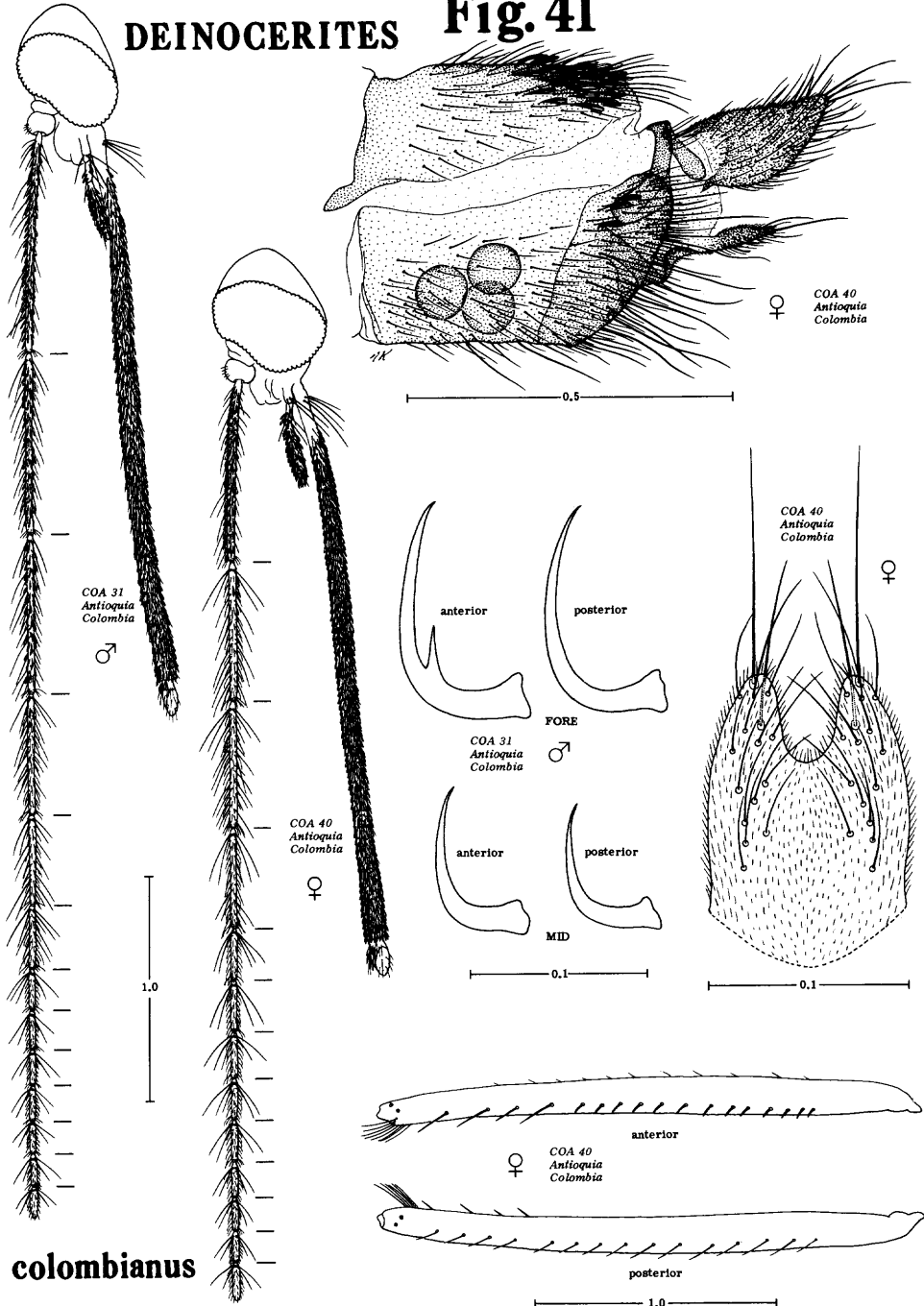
Fig. 40



panamensis

PA 573
Colon
Panama

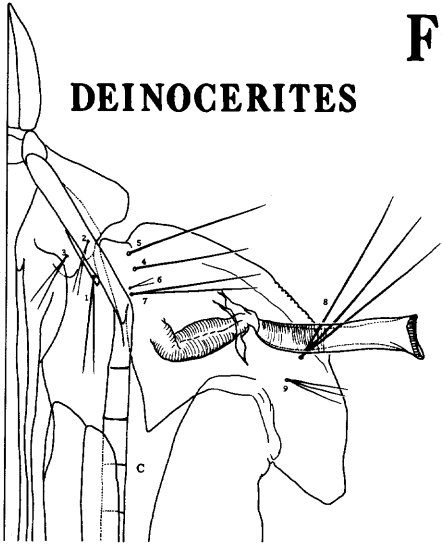
DEINOCERITES **Fig. 41**



colombianus

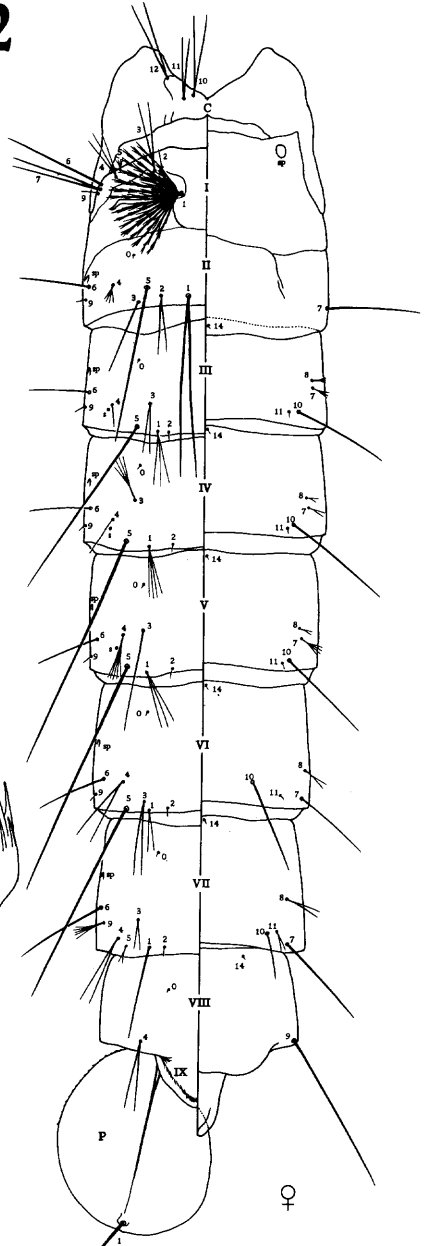
Fig. 42

DEINOCERITES



COA 40
Antioquia
Colombia

1.0



0.1

COA 31
Antioquia
Colombia

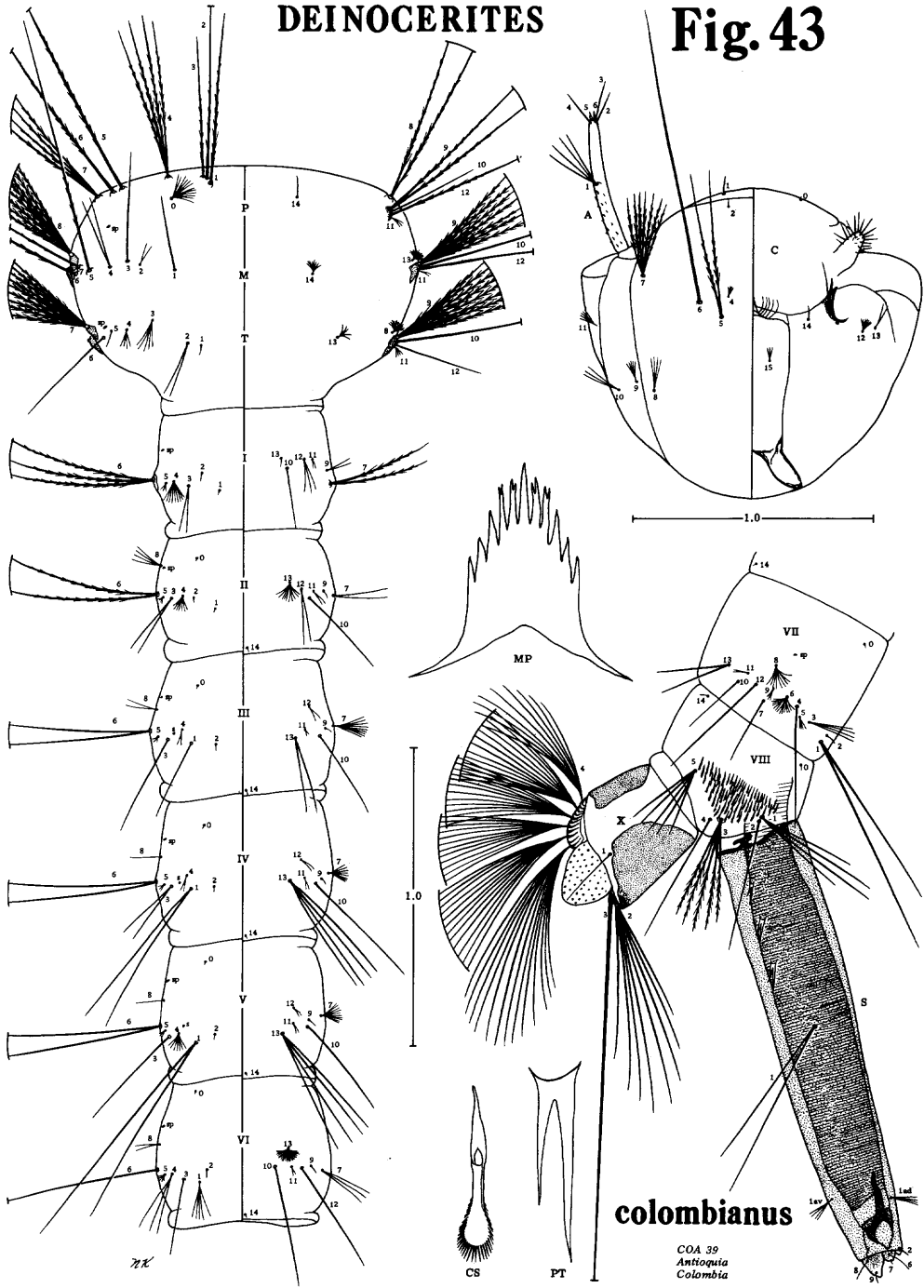
COA 40
Antioquia
Colombia

76K

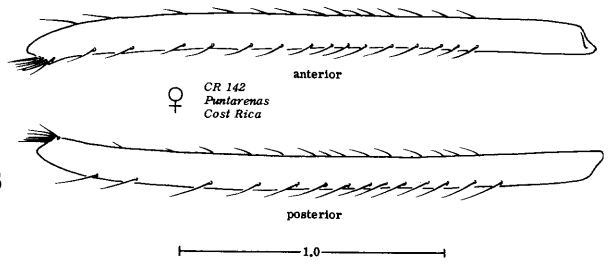
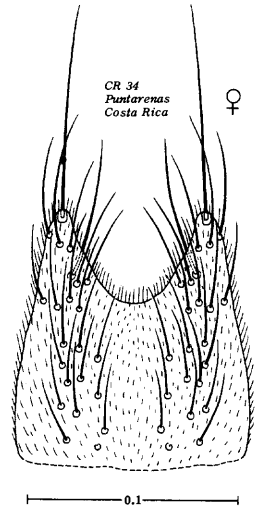
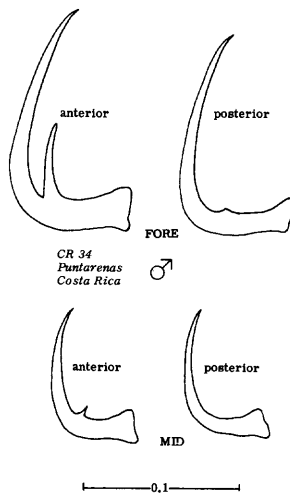
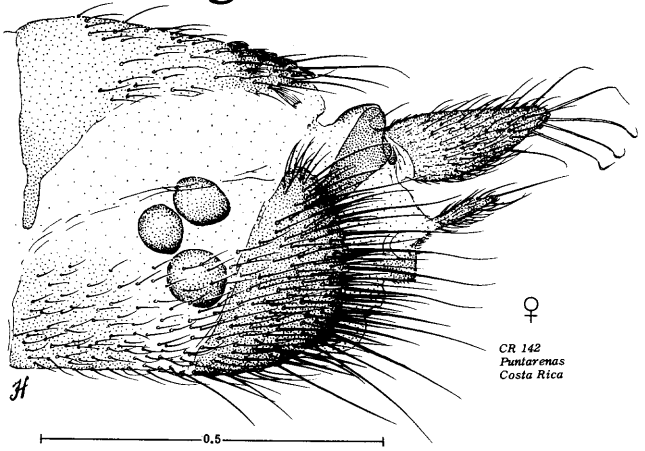
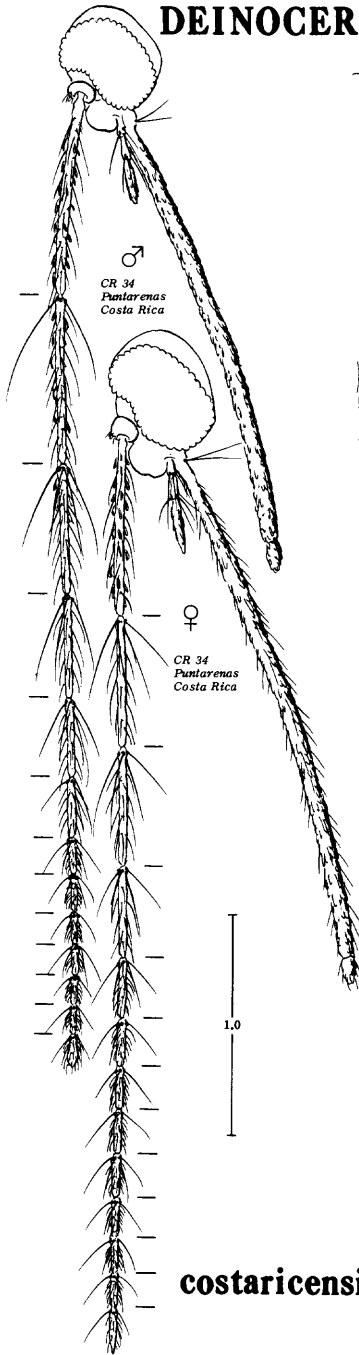
colombianus

DEINOCERITES

Fig. 43



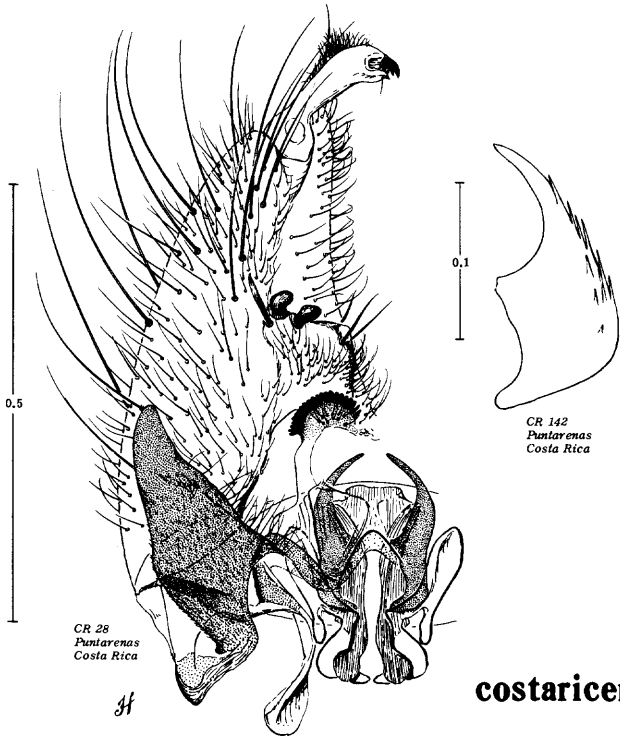
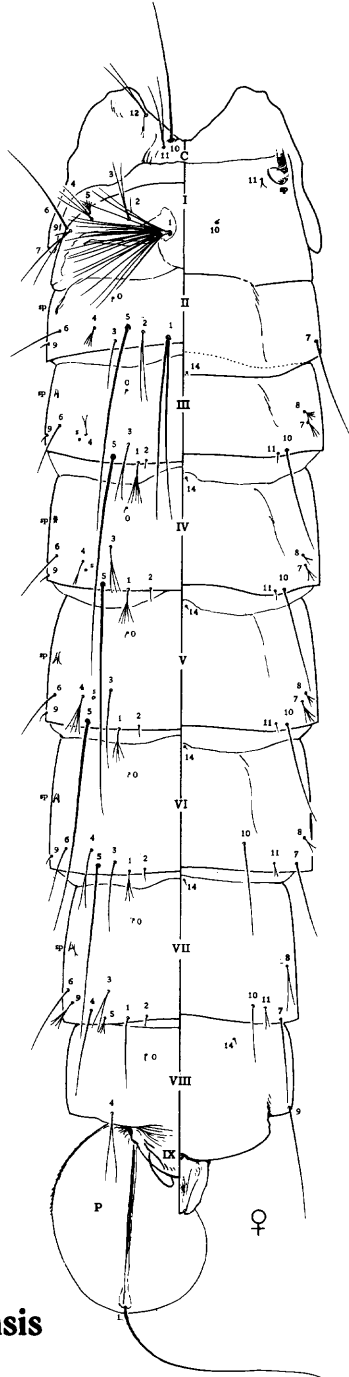
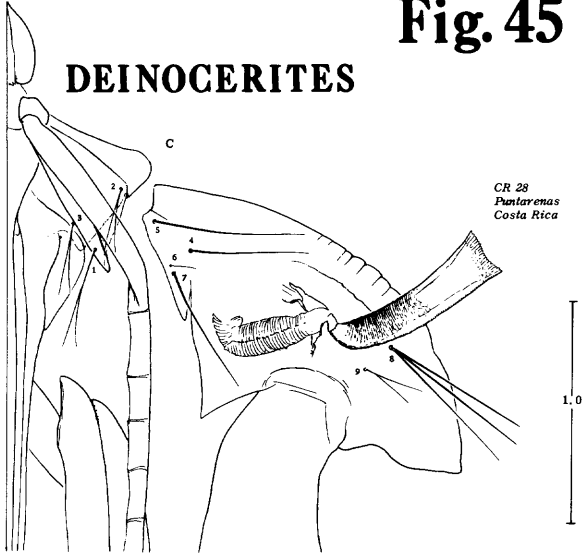
DEINOCERITES Fig. 44



costaricensis

Fig. 45

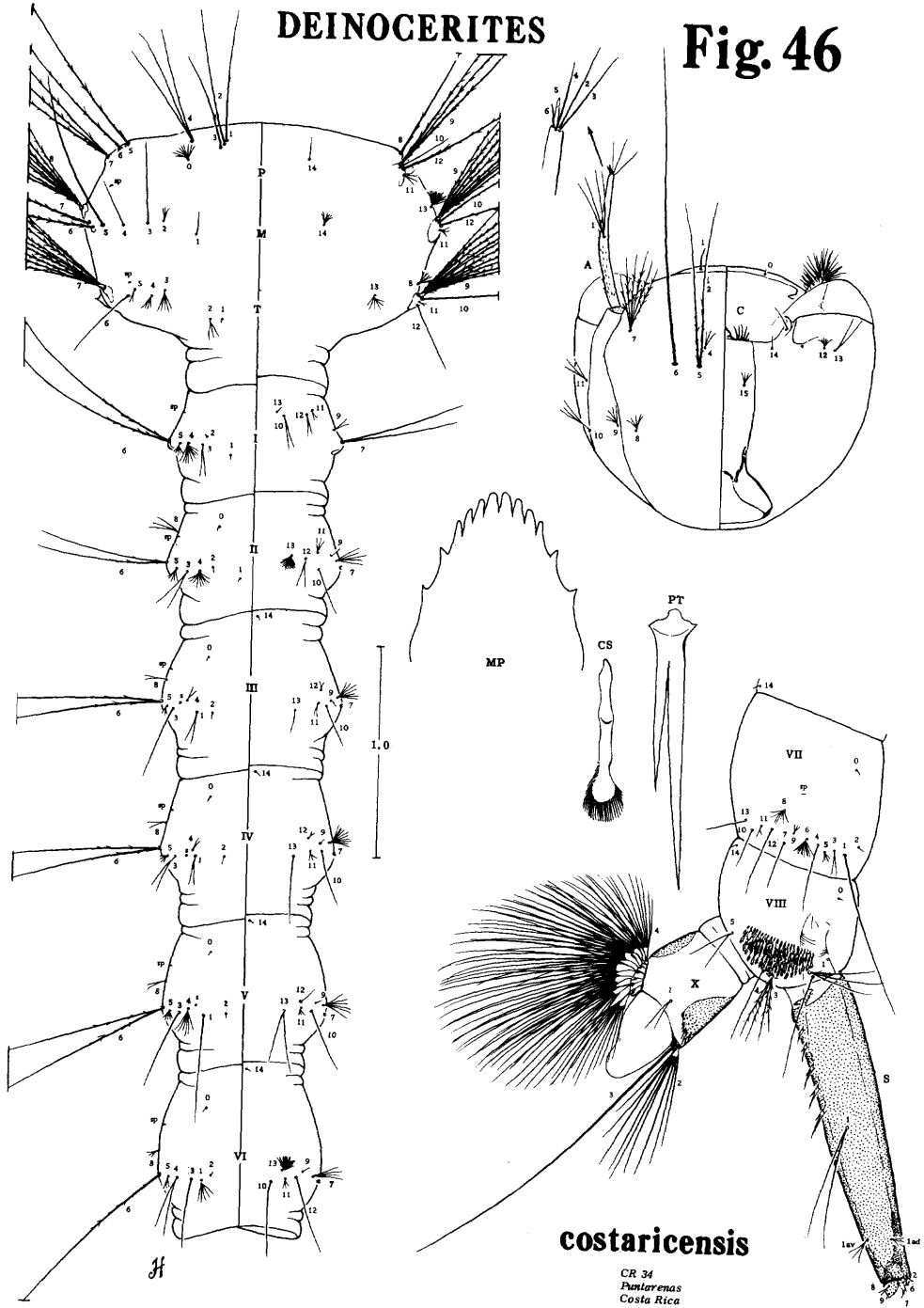
DEINOCERITES



costaricensis

DEINOCERITES

Fig. 46



costaricensis

CR 34
Puntarenas
Costa Rica

DEINOCERITES **Fig. 47**

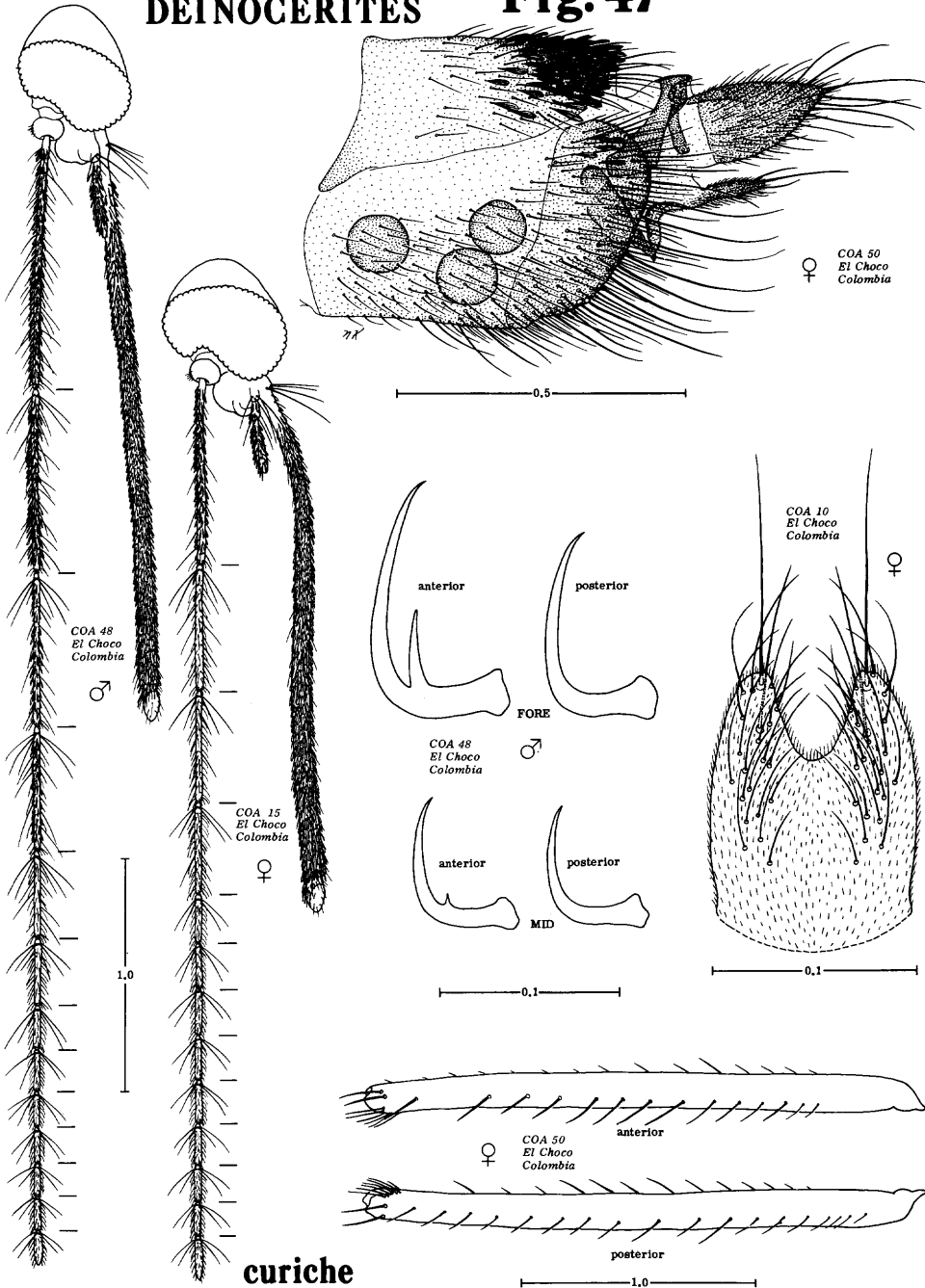
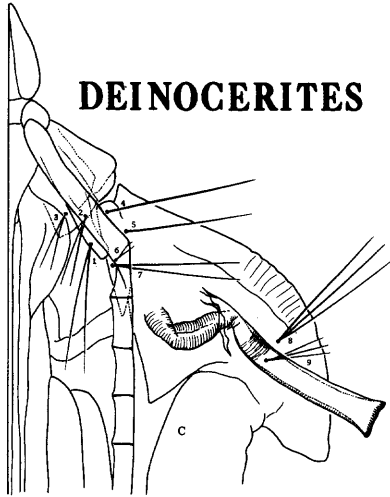
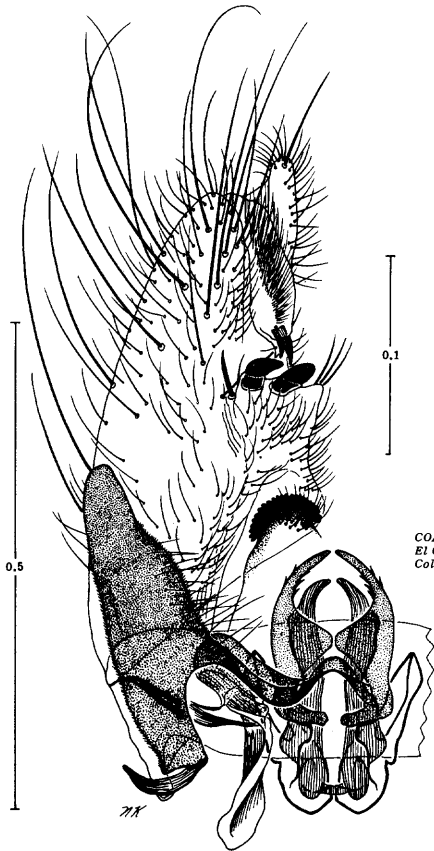
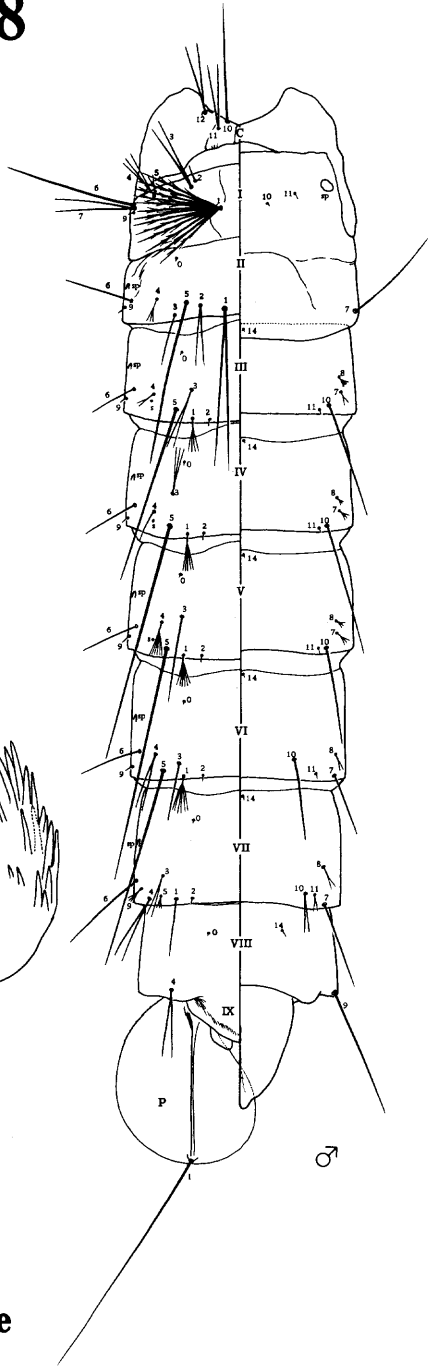
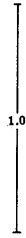


Fig. 48

DEINOCERITES



COA 48
El Choco
Colombia



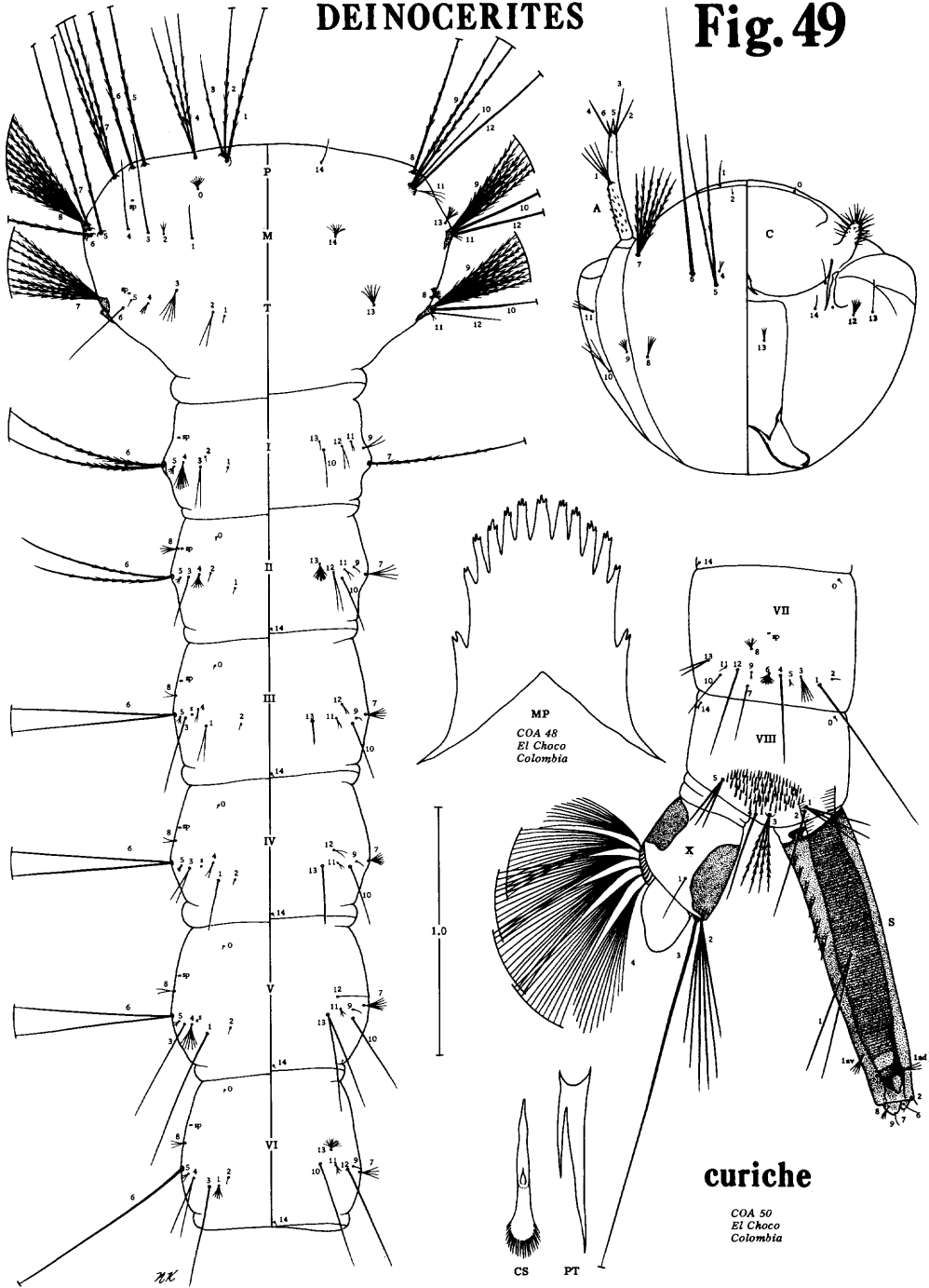
COA 43
El Choco
Colombia



curiche

DEINOCERITES

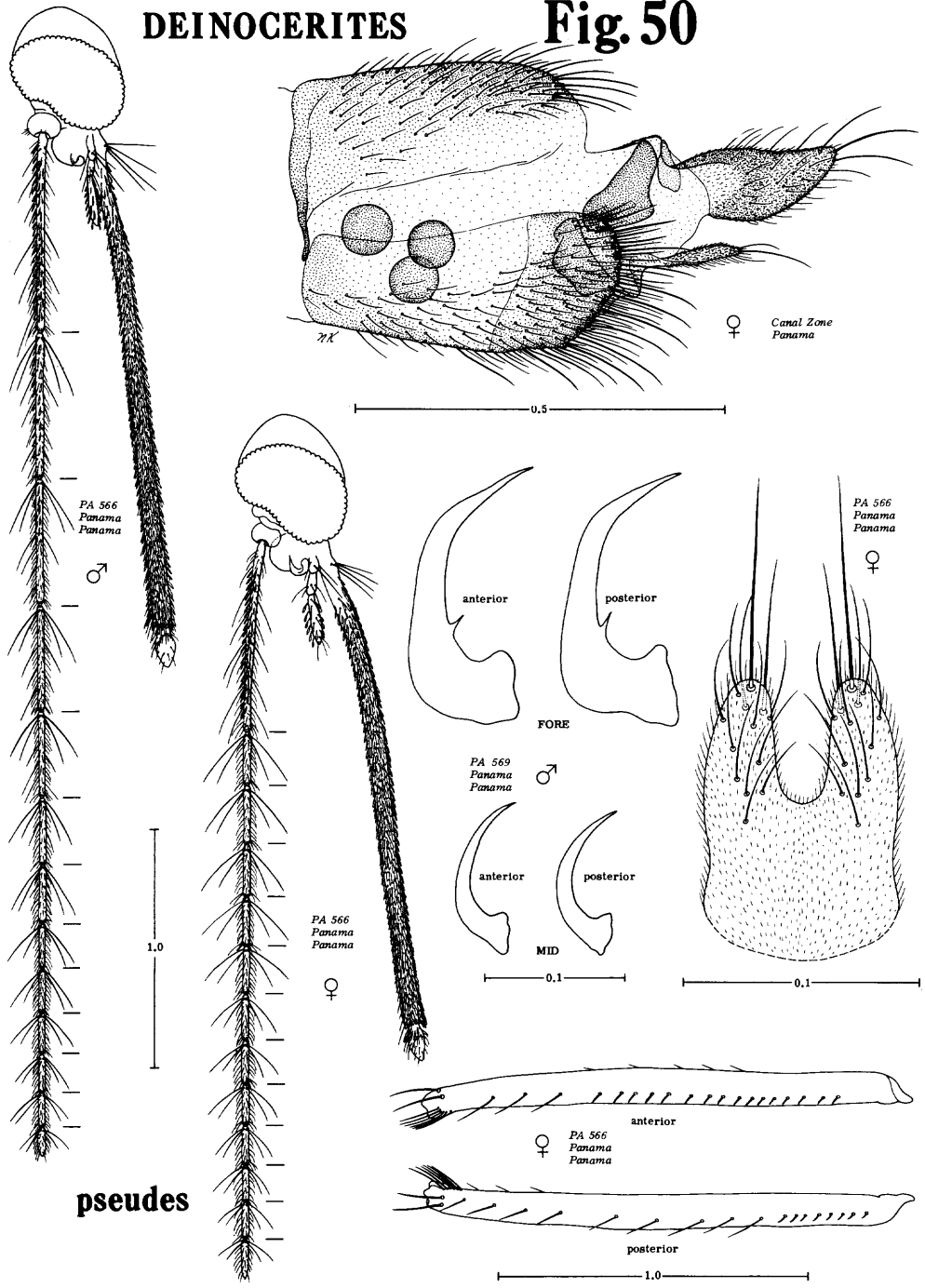
Fig. 49



curiche

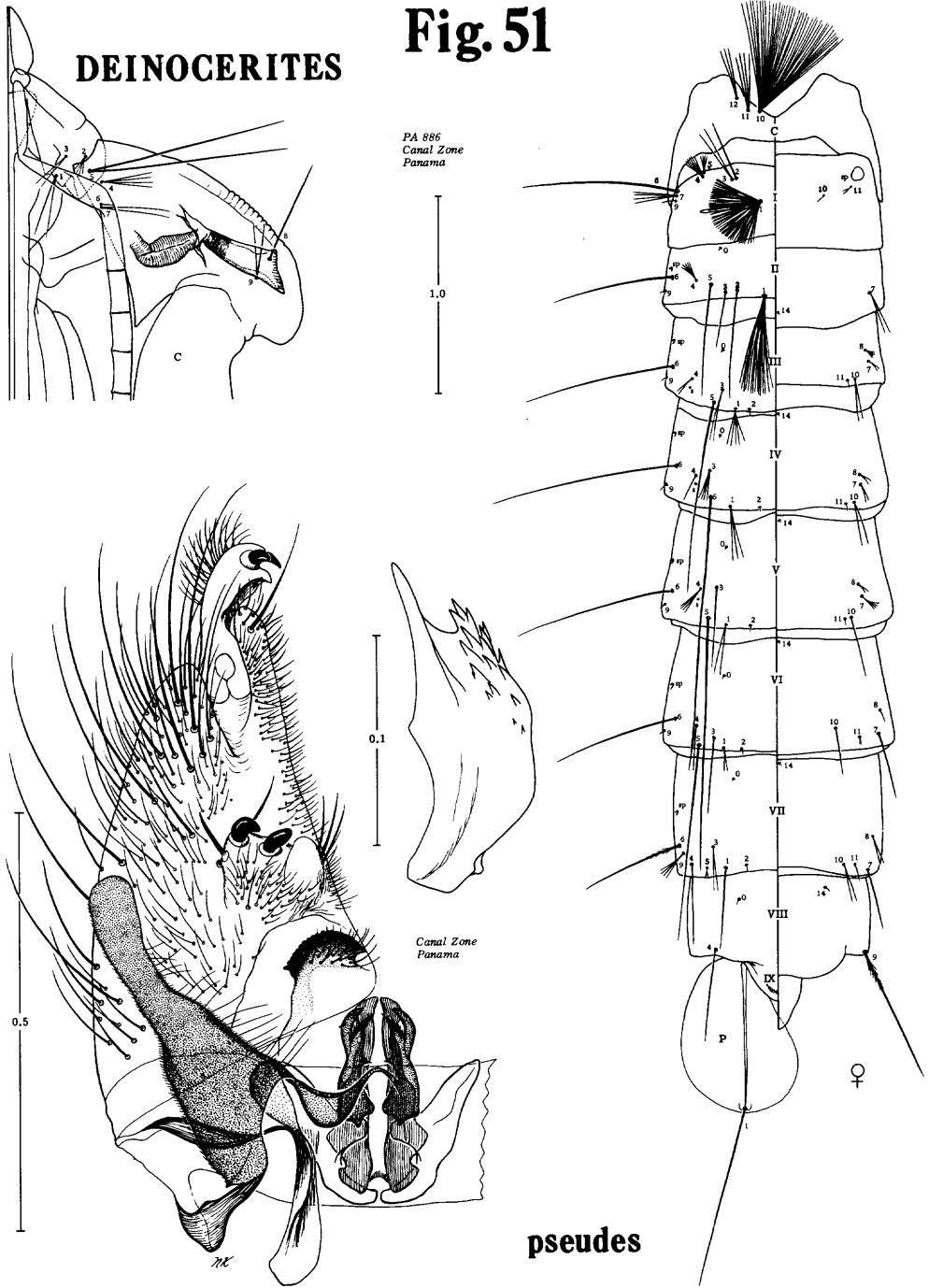
COA 50
El Choco
Colombia

DEINOCERITES Fig. 50



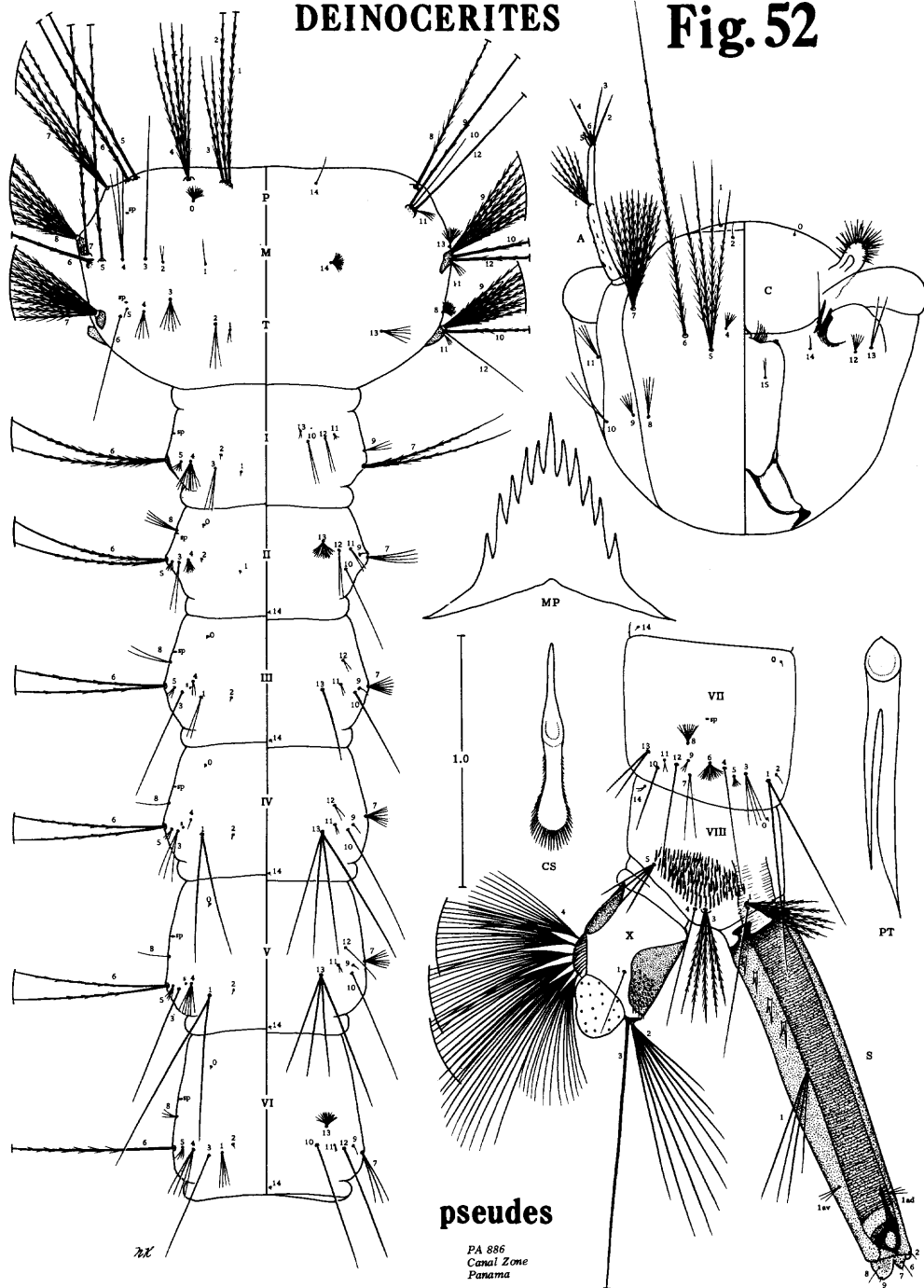
DEINOCERITES

Fig. 51



DEINOCERITES

Fig. 52



DEINOCERITES **Fig. 53**

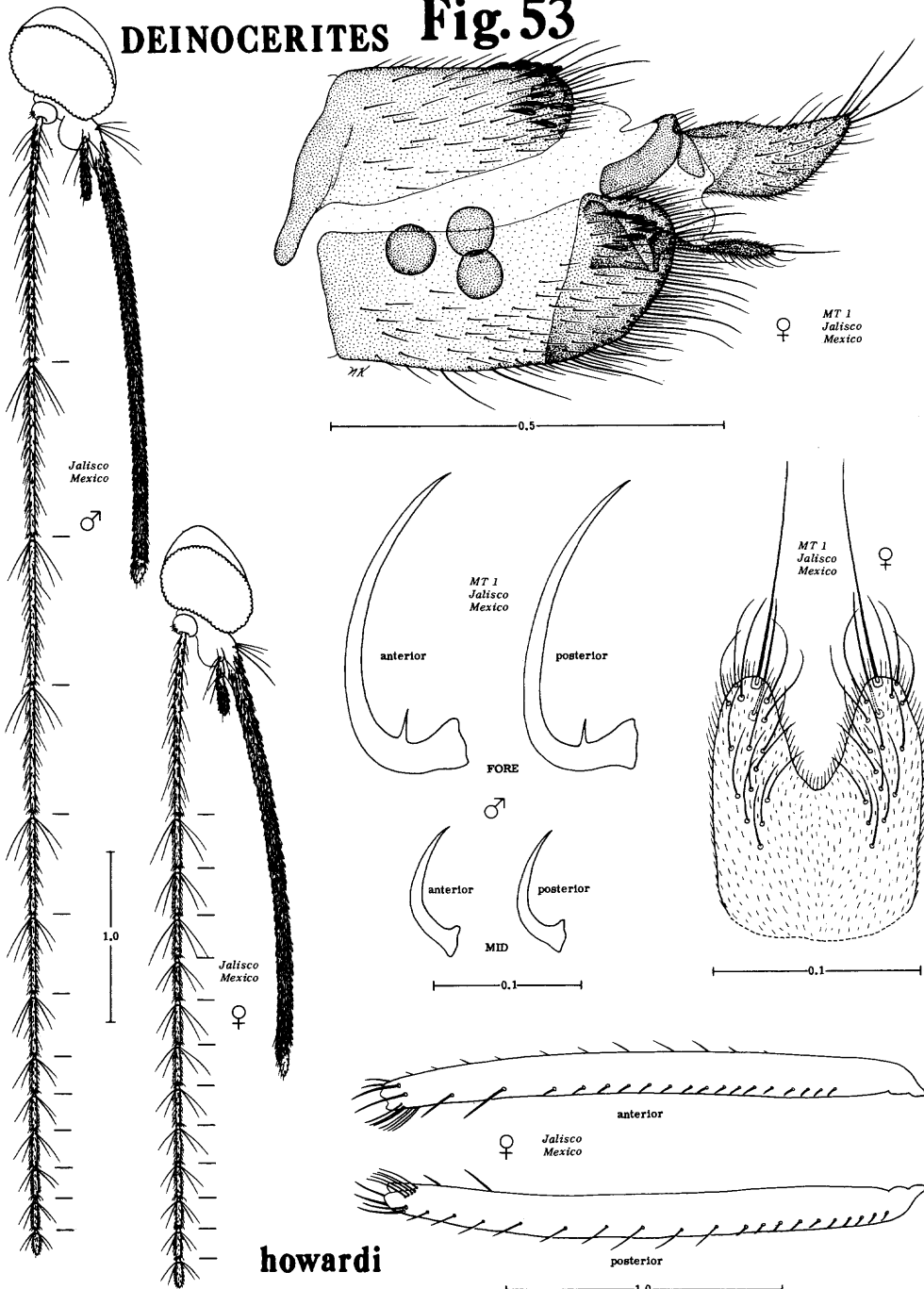
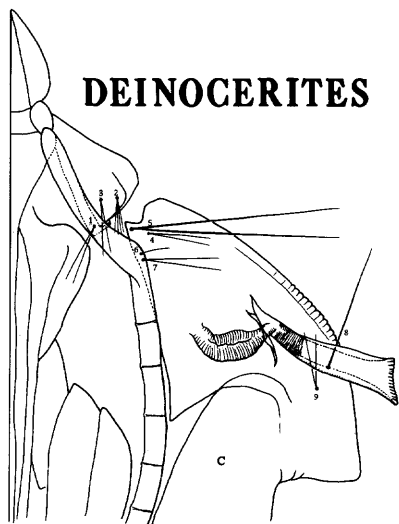


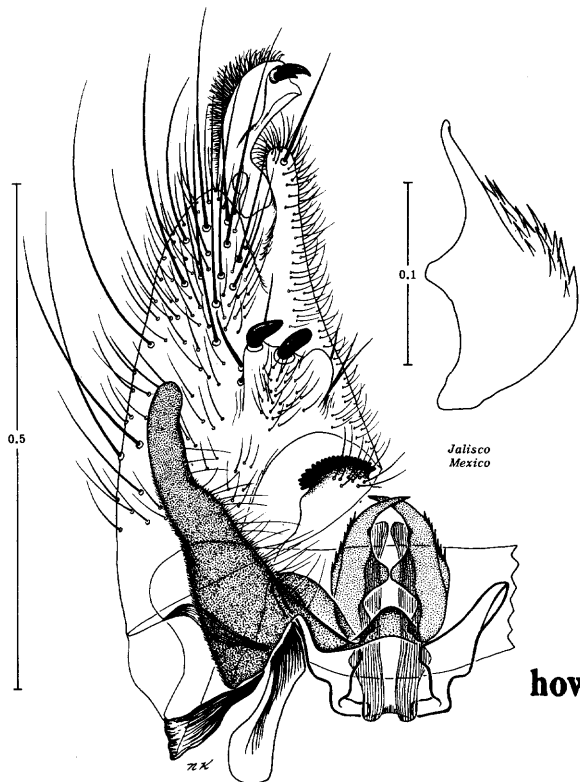
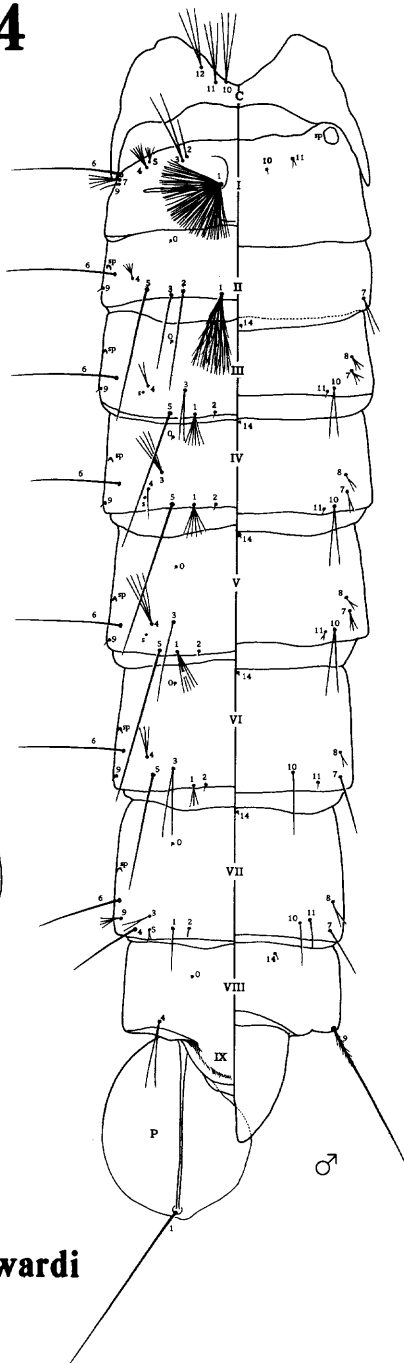
Fig. 54

DEINOCERITES



MT 1
Jalisco
Mexico

1.0

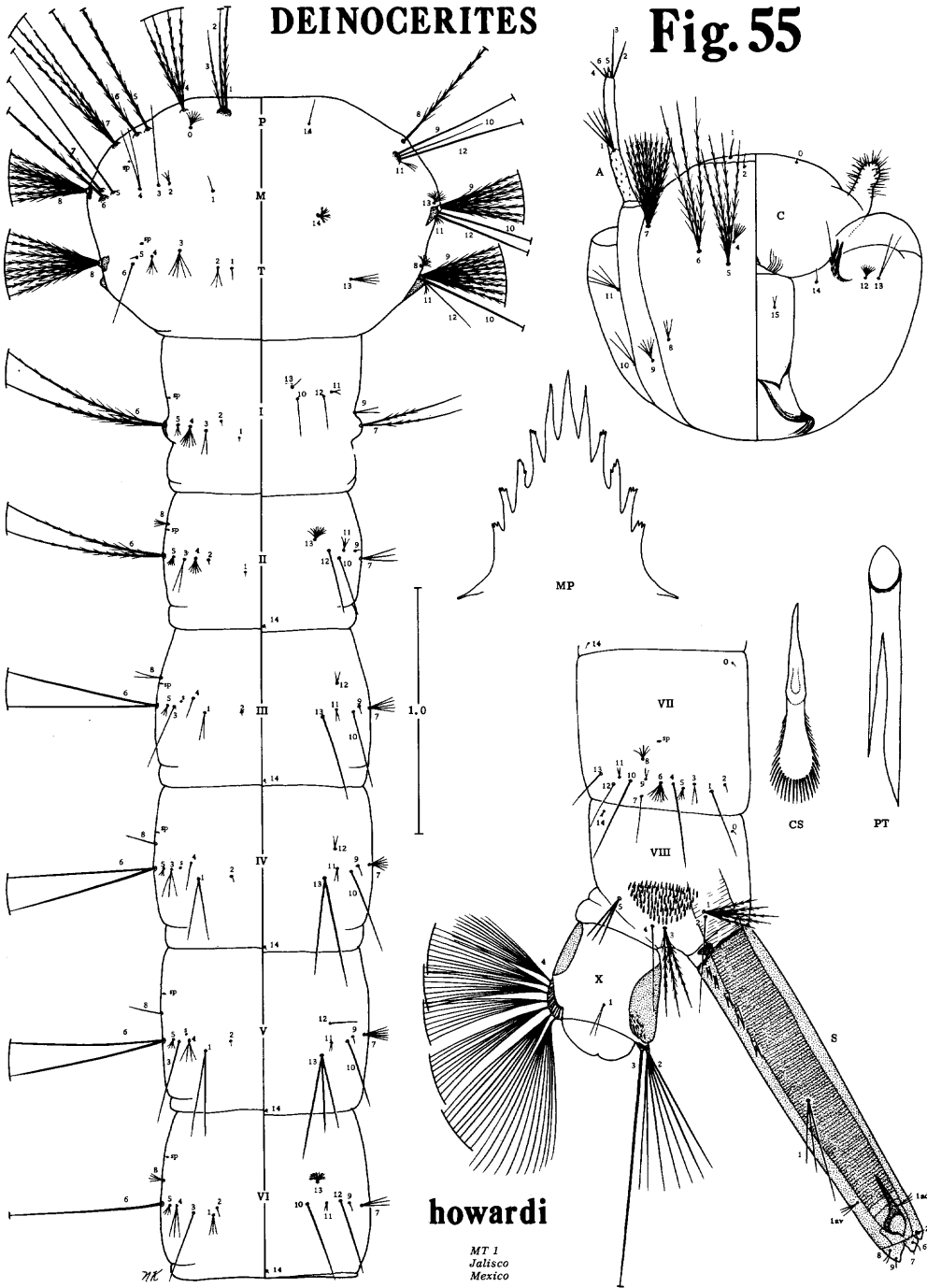


Jalisco
Mexico

howardi

DEINOCERITES

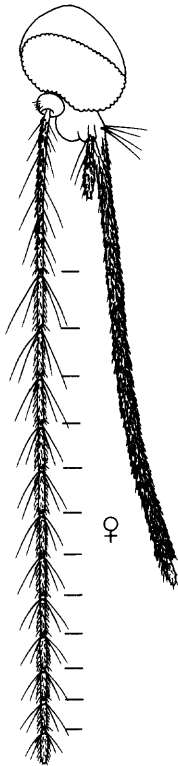
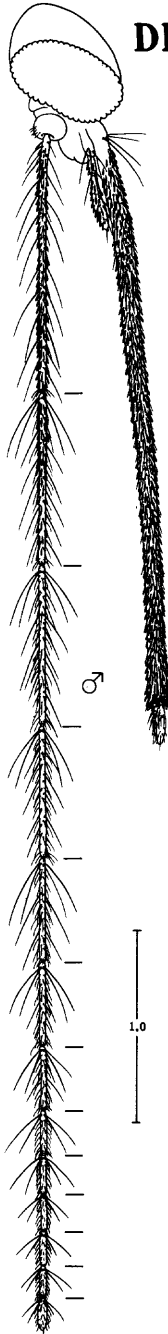
Fig. 55



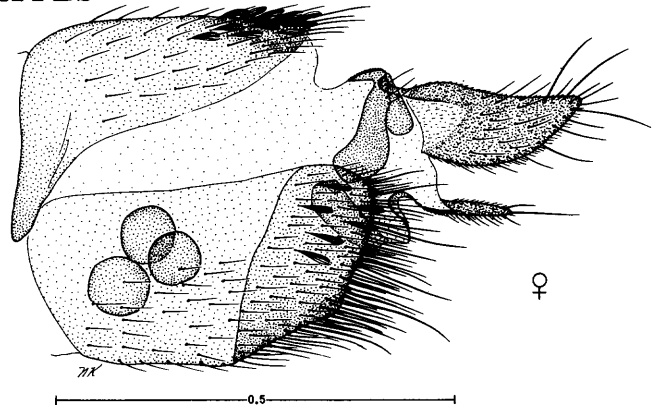
howardi

MT 1
Jalisco
Mexico

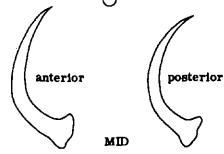
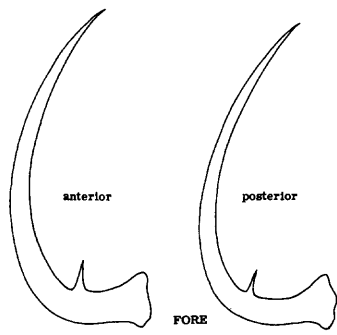
DEINOCERITES Fig. 56



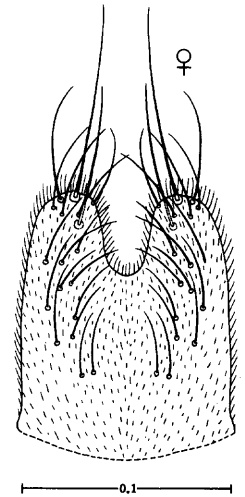
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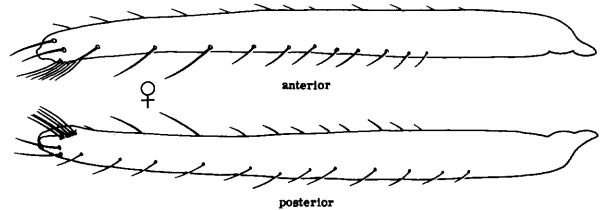
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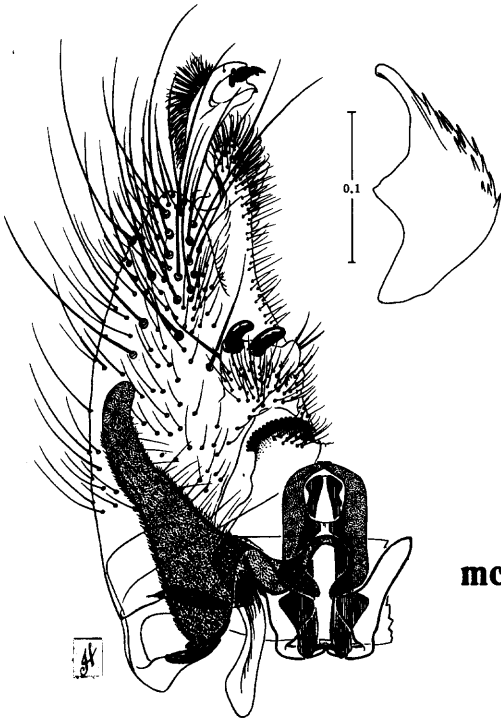
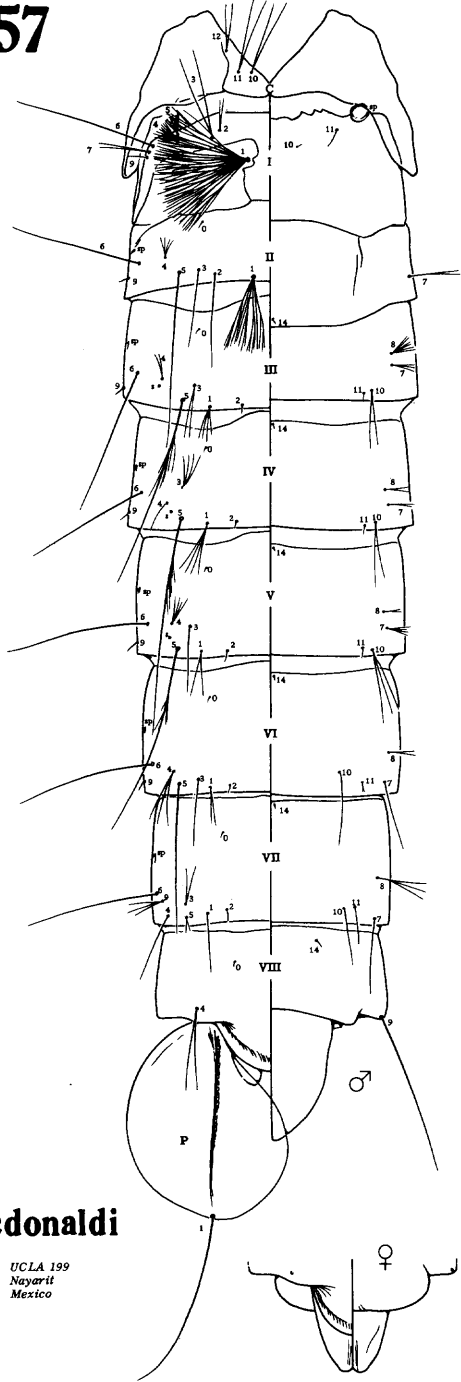
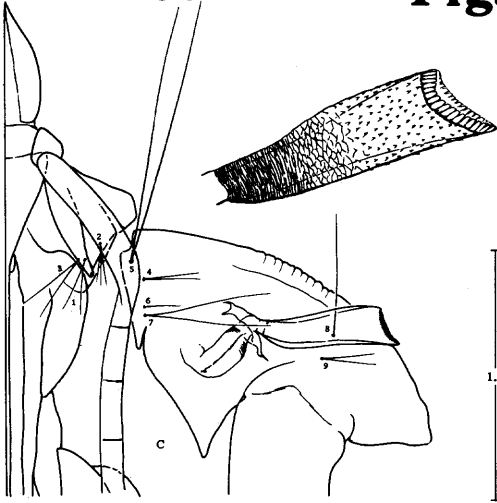


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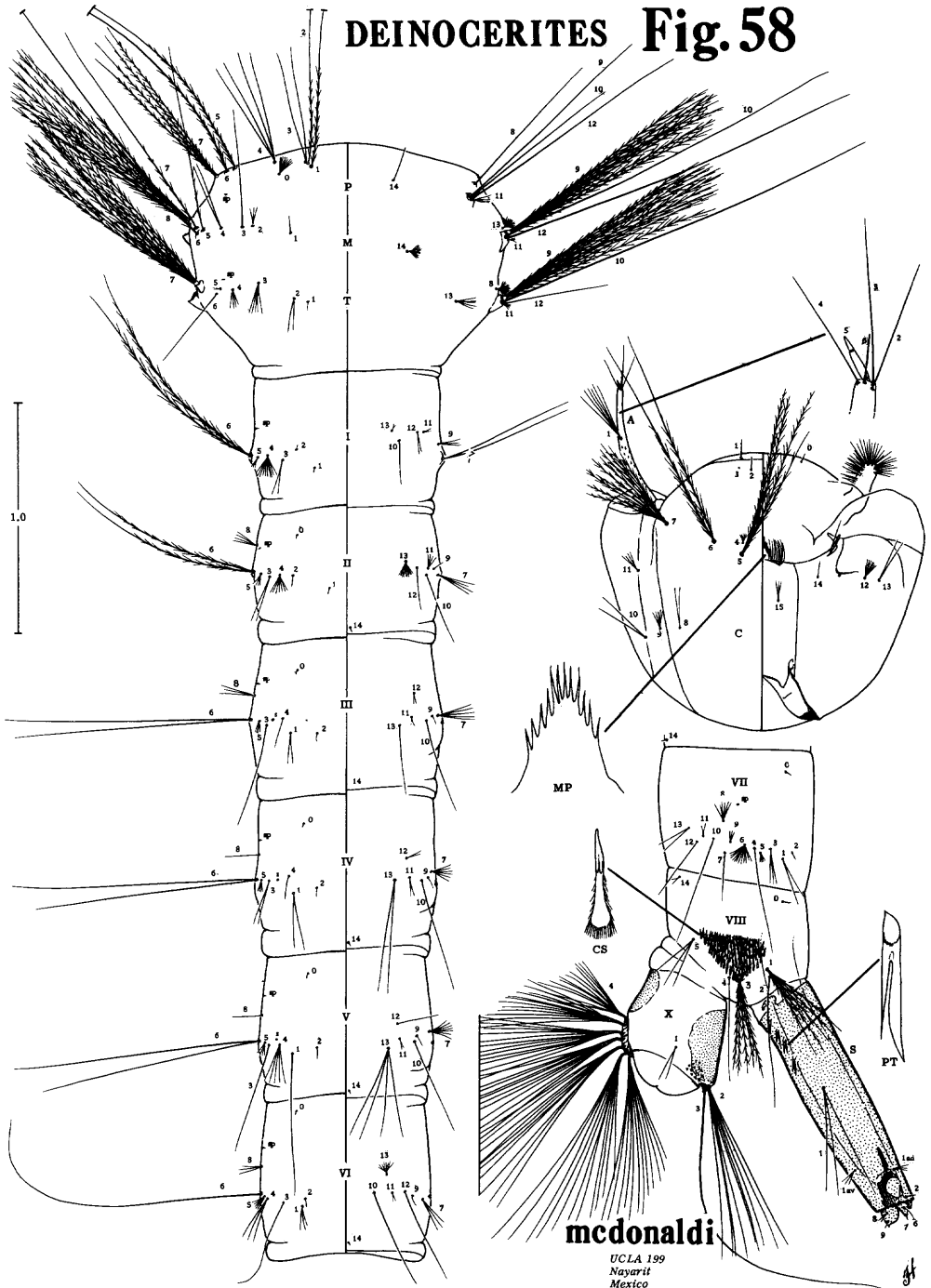
DEINOCERITES Fig. 57



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41

INDEX TO SCIENTIFIC NAMES

- albimanus (Anopheles), 9, 48
atlanticus (Deinocerites), 18k, 20k, 23k, 26, 27, 28, **28-31**, 31, 32, 34, 52; *figs. 3, 9-11*
- bahamensis (Culex), 9, 48
barretoï (Deinocerites), 18k, 19k, 22k, 23k, 36, 37, 39, **40-41**; *figs. 4, 21*
belkini (Deinocerites), 16, 18k, 20k, 23k, 24k, 26, 27, 32, 33, **34-35**, 81; *figs. 3, 15-17*
Brachiomyia, 11, 12
Brachiosoma, 11
- cancer (Deinocerites), 3, 8, 9, 10, 11, 13, 16, 17k, 19k, 20k, 23k, 25k, **44, 44-49**, 50, 51, 52, 54, 55, 61; *figs. 1, 5, 25-28*
cancer (Deinocerites) of authors, 50, 51, 52, 53, 55, 59, 61, 72, 75
Cancer Group, 4, 5, 6, 8, 17k-20k, 23k, 25k, 37, **43-44**, 55, 58, 67, 71; *fig. 5*
carcinophilus (Culex), 9, 48
Cardisoma, 72
chalcospilans (Haemagogus), 9, 68
colombianus (Deinocerites), 17k, 19k, 21k, 22k, 24k, 52, 57, 58, 61, 63, **64-65**; *figs. 6, 41-43*
conservator (Culex), 9, 68
Corethrella (Corethrella) sp., 9, 68
costaricensis (Deinocerites), 9, 17k, 19k, 21k, 22k, 24k, 58, 59, **65-68**, 68, 69, 75; *figs. 6, 44-46*
crassum (Cardisoma), 8, 43, 58, 68, 75, 81
Culex, 6, 7, 16, 26
Culex (Culex), 3, 7
Culex (Culex) sp., 55
Culex (Melanoconion), 7, 27, 37
Culex (Melanoconion) spp., 9, 55, 61, 68, 75
curiche (Deinocerites), 17k, 19k, 21k, 22k, 24k, 58, 63, 66, 67, **68-70**, 75; *figs. 6, 47-49*
- Deinocerites**, 2, 4, 5, 6, 7, 8, 9, 10, **11-16**, 26, 39, 51, 58, 76, 79; *fig. 2*
Deinocerites sp. of authors, 76
Deinokerides, 11
Dinanamensus, 11
Dinocerites, 11
Dinomimetes, 11
- dyari (Deinocerites), 8, 18k, 19k, 21k, 22k, 24k, 37, **37-40**, 40, 41, 42, 75; *figs. 4, 18-20*
dyari (Deinocerites) of authors, 40
Dyari Group, 5, 6, 8, 18k, 19k, 21k, 22k, 24k, **35-37**; *fig. 4*
- eiseni (Anopheles), 9, 63, 75
elevator complex (Culex), 9, 48
Epibolocera, 8, 47
epitedeus (Deinocerites), 11, 17k, 19k, 22k, 24k, 48, 58, **59-61**, 62, 63, 64, 65, 66, 67, 69; *figs. 6, 35-37*
epitedeus (Deinocerites) of authors, 62, 63, 72
Epitedeus Group, 4, 5, 6, 8, 15, 17k, 19k, 21k, 22k, 24k, 37, **56-59**, 71; *fig. 6*
- fascipes (Orthopdomyia), 9, 68
- Galindomyia, 3, 6, 7, 26
Gecarcinidae, 8
Gecarcinus, 72
grabhamii (Anopheles), 9, 48
guanhumii (Cardisoma), 8, 44, 47, 51, 75
- habilitator (Culex), 9, 55
howardi (Deinocerites), 7, 9, 17k, 19k, 22k, 23k, 25k, 71, 75, **77-79**, 81; *figs. 7, 53-55*
- inflictus (Culex), 55, 69
inflictus complex (Culex), 9, 31, 48, 52, 61, 63, 68, 75, 81
- jamaicensis (Psorophora), 9, 48
janitor (Culex), 9, 48
- lateralis (Gecarcinus), 9, 27, 33, 75
latisquama (Culex), 7, 9, 48, 61, 63, 65, 75
leei (Galindomyia), 6
- magnus (Deinocerites), 11, 17k, 19k, 20k, 23k, 25k, **44, 51, 52-56**; *figs. 5, 32-34*
magnus (Deinocerites) of authors, 45
mathesoni (Deinocerites), 8, 9, 10, 15, 16, 18k, 20k, 23k; 24k, 26, 27, **31-34**, 34, 35, 75; *figs. 3, 12-14*

- mcdonaldi** (Deinocerites), 7, 9, 17k, 19k, 22k, 23k, 25k, 35, 67, 70, 71, 77, 78, 79, 79-82; *figs.* 7, 56-58
- melanophylum** (Deinocerites), 17k, 19k, 20k, 23k, 25k, 31, 44, 46, 47, 49-52, 54, 55, 63, 65; *figs.* 5, 29-31
- melanophylum** (Deinocerites) of authors, 45
- monospathus** (Deinocerites), 49
- nicoyae** (Deinocerites), 8, 14, 18k, 19k, 21k, 22k, 24k, 37, 41-43; *figs.* 4, 22-24
- nigripalpus** (Culex), 9, 48
- occidentalis** (Ucides), 8, 37, 39, 43, 75
- Ocypodidae, 8
- opisthopus** (Culex), 9, 48
- panamensis** (Deinocerites), 17k, 19k, 21k, 22k, 24k, 52, 58, 61, 61-63; *figs.* 6, 38-40
- pseudes** (Deinocerites), 2, 6, 7, 8, 9, 10, 11, 17k, 19k, 21k, 23k-25k, 33, 39, 43, 68, 69, 71, 72-77, 77, 78, 79, 80, 81; *figs.* 7, 50-52
- pseudes** (Deinocerites) of authors, 50
- Pseudes Group**, 4, 5, 6, 7, 8, 16k, 17k, 19k, 21k, 23k, 24k, 37, 44, 58, 70-72; *fig.* 7
- Pseudothelphusidae, 8, 47
- pugilator** (Uca), 8, 33
- scapularis** (Aedes), 9
- scapularis complex** (Aedes), 55
- spanius** (Deinocerites), 11, 18k, 20k, 22k, 23k, 26, 27, 27-28, 29, 30; *figs.* 3, 8
- spanius** (Deinocerites) of authors, 16, 28, 31, 33
- Spanius Group**, 4, 5, 6, 8, 18k, 20k, 23k, 25-27, 33, 35, 37, 58; *fig.* 3
- sp. A** (Deinocerites) of authors, 65, 67
- subcylindrica** (Uca), 8, 33, 75
- taeniorhynchus** (Aedes), 9, 48, 55, 75, 79, 81
- tetraspathus** (Deinocerites), 45
- triseriatus** (Aedes), 9, 48
- troglydytus** (Deinocerites), 52, 53, 55
- Uca, 8, 27, 72
- Ucides, 72

(Continued from inside front cover)

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