

STUDIES ON THE FAUNA OF CURAÇAO AND OTHER  
CARIBBEAN ISLANDS: No. 158.

THE HETEROPTERA OF THE NETHERLANDS  
ANTILLES - IX

REDUVIIDAE (Assassin Bugs)

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The material of Reduviidae covered in this paper comprises 22 species, two of which new and four of doubtful identity. The material has been collected by R. H. COBBEN in 1956/57, unless otherwise stated. For details on the faunal region in question see WAGENAAR HUMMELINCK (1933, 1940a-c, 1953) and COBBEN (1960a). Families treated already in the present series are: Gerridae, Veliidae, Mesoveliidae (COBBEN, 1960a), Hebridae (DRAKE & COBBEN, 1960a), Saldidae (COBBEN, 1960b), Dipsocoridae (WYGODZINSKY, 1960), Tingidae (DRAKE & COBBEN, 1960b), Notonectidae (NIESER, 1967), Corixidae (NIESER, 1969a), Pleidae, Naucoridae, Nepidae (NIESER, 1969b), Berytinidae (ŠTUSÁK & COBBEN, 1975).

In this paper, first a list of the species collected on the Netherlands Antilles is given with general remarks on the species. Comparisons of structural details on eggs and genitalia follow in a special section. Contrary to the practice in the former contributions to this series, we refrain from giving long lists of bibliographic references pertaining to the nomenclature of the species treated here. Such data are not of great relevancy in faunistic papers; omitting them saves time and costs of printing. Drawings were made by COBBEN, except for Figs. 39-51 who are executed by WYGODZINSKY.

We are indebted to Dr. P. WAGENAAR HUMMELINCK (Utrecht) whose collecting activities contributed much to more completeness in the picture of reduviid distribution; he collected the new *Oncerothachelus* species from Saba. We express our thanks to drs. E. R. HART (Texas), N. A. KORMILEV (New York) and N. NIESER

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#### ABBREVIATIONS USED IN FIGURES

a	anus	p	paramere
aa	basal articulatory apparatus	pht	phallotheca
ail	aerostatic inner layer	pr	protractor plate
amp	ampulla	prg	proctiger
ap	aeropyle	pst	pseudospermatheca
bf	basal foramen	py	pygophore
bp	basal plate bridge	pyp	pygophore process
ce	cement	rg	ring gland
de	ductus ejaculatorius	sg	scent gland
df	ductifer	sp	spiracle
di	diverticulum	srg	subrectal gland
ded	diverticulum de	srt	strut
end	endosoma	sty	styloid
endp	endosomal process	r	rectum
gch	genital chamber	rt	retractor plate
gp	gonopore	t	tergite
lip	ligamentous process	vf	valvifer
mp	micropyle	vfg	vermiform gland
ov	oviduct	vl	valvula

## I. SURVEY OF THE SPECIES

### EMESINAE

These so called "thread-legged bugs" are characterized by elongate body shape, very long and slender legs and antennae, raptorial forelegs with elongate coxa and acetabula opening forward. Six species (4 Metapterini) were collected on the 6 Netherlands Antillean Islands, but one from Saba remains unidentified since only larvae are available. Additional material may be identified with the monograph of the subfamily (WYGODZINSKY, 1966).

1. **Empicoris barberi** (McAtee & Malloch, 1923)

CURAÇAO: Hofje Groot St. Joris, 6.XI.1956 (1♂), beaten in the net from high, dense vegetation.

Described from Puerto Rico, this species has also been collected in Cuba and Peru. It is the smallest (about 2.5 mm) and most delicate species met with in the islands under investigation. More than 50 species of *Empicoris*, all macropterous, are known from all zoogeographical regions. Fifteen occur in the new world, five of which may be encountered also in the Caribbean region in addition to *E. barberi*.

2. **Emesaya brevipennis** (Say, 1828)

Fig. 1

CURAÇAO: Willemstad, hofje, III.1934 (2♀, leg. brother M. Realino). Top of Seroe Christoffel, 21.X.1956 (1♂), beaten from a tree with Spanish moss. Klein Piscadera, Hofje van der Mark, III.1957 (1♂), taken in flight.

There are 12 large-sized species of this nearctic and neotropical genus known. The present species mostly lives higher above the surface on various trees; Spanish moss has been reported as a preferred habitat also for other emesines by ELKINS (1951). An excellent account of what is known of its biology has been given by READIO (1927).

The Curaçao specimens belong to the subspecies *australis* McAtee & Malloch known from the Gulf States, Mexico and Central America south to Panama, Colombia, Brazil (WYGODZINSKY, 1966). New records are Surinam (MALDONADO & VAN DOESBURG, 1966) and Venezuela (MALDONADO, 1966).

Male genitalia of the Curaçao specimen as in Figs. 27–28.

3. **Barce fraterna** (Say, 1831) (= *B. banksii* Baker, 1910)

Figs. 2–3

CURAÇAO: Emmastad, golf-field, X.1956 (1♂ apt.). Piscadera, inner bay, 13.XI.1956 (1♂, 1♀ macr., larvae). Savonet, 1.VII.1957 (1♂, 1♀ apt.)  
 BONAIRE: Goto lake, 19.V.1957 (1♂, 2♀ apt., larvae). Rooi Huba, Slag-

baai, 22.V.1957 (4♂, 3♀ apt.; 1♂, 1♀ macr., numerous larvae). — Between grasses, mostly *Sporobolus* standing in water, fresh or brackish.

The known distribution is: western, southwestern and southern United States, Mexico, Cuba, Jamaica, Colombia, Ecuador.

The male genitalia (Figs. 11, 32) agree with the many figures of the species given by WYGODZINSKY (1966; his figs. 135A–T). There is much variation between populations from the entire range; three forms can be recognized, but the biosystematic implications are not yet certain.

#### 4. *Ghinallelia pascoei* (Bergroth, 1906)? Figs. 4–5

ARUBA: Cura Cabai, 25.IV.1957 (3♂, 4♀).

CURAÇAO: Rio Canario, golf-field, X.1956 (1♂, 1♀, 1 larva). Klein Piscadera, Hofje van der Mark, 12.II.1957 (1♂). Pannekoek, 5.III.1957 (1♂, larvae).

BONAIRE: Onima, 1.V.1957 (1♀, larvae). Goto lake, 19.V.1957 (1♀). Rooi Huba, Slagbaai, 22.V.1957 (1♂, 1♀, larvae all stages).

All specimens are apterous. Same habitat as the previous species *B. fraterna*, on Curaçao occurring as mixed populations. In Aruba in dry situations under stones, pieces of wood and board.

The external ♀ and ♂ genital structures are drawn in Fig. 8 and 9, respectively. The material runs to *G. pascoei* in the key presented by MALDONADO (1960), but there is no redescription with structural details of this species in his revision. Type material is said to be in the Helsinki Museum but dr. M. MEINANDER of that museum kindly informed us that the BERGROTH specimens are not deposited there.

*G. pascoei* is known so far from Venezuela and Trinidad (WYGODZINSKY, 1966); new localities in Venezuela are recorded by MALDONADO (1968).

#### 5. *Ghinallelia spec.*

SABA: St. Chrispain, 16.XII.1956 (2♀ apt., 1 larva).

ST. MARTIN: Cul de Sac, 23.XI.1956 (1♀ apt.).

This species is probably new, but because of absence of males we refrain from describing it here. According to the female key charac-

ters given by MALDONADO (1960), it runs to a species intermediate between *G. brasiliensis* and *G. neivai*, both from Brazil:

"47(46). Hind margin of seventh sternum concave and with a rectangular median projection; ninth tergum pointed apically; length 23 mm. . . . . *brasiliensis*.

Hind margin of seventh sternum with a large median concavity and with a sharp short median projection inside; ninth tergum truncate apically; length 19.5 mm . . . . . *neivai*."

The Antillean females fit with the first sentence of the *brasiliensis* citation (see Fig. 7) and with the second sentence of *neivai* (see Fig. 6). Their total length is about 18 mm.

#### 6. Genus? spec.?

SABA: Hellgate – St. Cruz, 17.II.1956 (2 larvae which do not belong to any of the Emesinae listed above).

### SAICINAE

#### 7. *Oncerotrachelus sabensis* spec. nov. Figs. 33–34

SABA: Tom's Gut, S. of Lower Rendez-Vous, 350 m, 7.X.1963 (1♂, leg. P. Wagenaar Hummelinck), among high shrubs.

Male (Holotype) – Total length 4.2 mm; length of head and pronotum combined: 1.5, of wings: 2.7 mm. General colour of head and thorax light chestnut brown; tylus and rostrum yellowish; spine of scutellum somewhat lighter than its base. First antennal segment (only one preserved) yellowish at base, gradually darkening towards apex. Legs yellowish, femora somewhat darker. Hemelytra (not well preserved) light brown, veins dark brown.

Head as shown in Figs. 33–34, nearly as long as pronotum. Tylus shorter than postocular portion of head. Synthipsis wider than width of eye dorsally (10:7). Only fragment of first antennal segment preserved. Second rostral segment swollen, upper surface of this and other segments with numerous stiff bristles, these also on under surface of head. Prothorax as shown in Fig. 33, 34. Humeri without spines or tubercles. Tibiae of fore legs conspicuously swollen

apically; hairs of tibiae elongate, longer than diameter of tibiae. Disc of scutellum with median carina conspicuous. Remaining portions of hemielytra and the hind wings as shown in illustration (Fig. 33). Abdomen with posterior angles of connexival segments not salient or spined.

Genitalia as in Figs. 35–37.

Holotype ♂ (Saba) deposited in the Laboratory of Entomology, Wageningen.

The saicine genus *Oncerothachelus* ranges with 11 described species from Argentina to the southwestern United States. No rational system of the species within the genus has been developed. Therefore, although it can be said that the species from Saba is apparently new, no statement on its phyletic relationships and consequently on its zoogeographical significance can be made. Species of *Oncerothachelus* are known from Cuba and Haiti.

*O. sabensis* resembles *O. fuscus* Monte, described from Brazil, with which it agrees in the general head structure, the simple fore coxa, the absence of spines on the humeri, the long setae of the fore tibiae, and the absence of spine-like or tubercle-like connexival processes. The male of *fuscus* is somewhat larger (5 mm), the fore lobe of the pronotum is much lighter than the hind lobe, and the hemelytra are over twice as long as the length of head and thorax combined.

*Oncerothachelus sabensis* could also be compared to *O. geayi* Villiers (French Guyana), but, to judge from the short description of the latter, *geayi* differs, among possibly other characters, in the setae of the fore tibiae which are shorter than the diameter of this article, and by larger overall size (5.5 mm).

The pygophore of *O. sabensis*, having an open genital atrium (Fig. 37), and the phallus (Figs. 35–36) represent a special position amidst the other reduviid species listed in this paper. The simple phallus is slender, membranous and apparently not eversible.

## HARPACTORINAE

8. **Cosmoclopius curacavensis** spec. nov. Fig. 38

CURAÇAO: St. Martha, 13.X.1956 (2♂, 1♀, larvae). Hofje Knip, 3.XI.1956 (3♂). Westpunt, 4.XI.1956 (1♂). St. Cruz – Knip, 3.II.1957 (5♂). Piscadera Baai, 18.II.1957 (1♂). Pannekoek, III.1957 (3♂, 1♀). – At all localities collected from *Cleome viscosa*.

Male – Length to apex of hemielytra 10–11 mm. General aspect as in remaining species of the genus. Surface of body subshining. Bristles short, many covered with a wax-like substance, forming conspicuous white rounded patches behind bases of antennae dorsally on head, on constriction of prothorax (1 dorsally at center, 1 + 1 sublaterally on dorsum, and 1 + 1 laterally on pleura), several on prosternum and meso- and metapleura, 1 + 1 laterally on base of scutellum, 1 + 1 on corium of hemielytra at level of base of basal membranal cell, and 1 + 1 each on intersegmental sutures of abdomen laterally.

Head black above and at sides, yellowish white ventrally; exact distribution of pigment as in Figs. 38–39. Rostrum almost completely yellowish white, shining. First and second segments of antennae black, the first with 3, the second with one annulus yellowish; third and fourth segments light reddish brown. Thorax light yellowish brown, somewhat darkened on parts of pleura and sterna. Collar dark, its lateral processes yellowish white. Raised areas of fore lobe of pronotum yellowish, heavily beset with farinaceous setae; the rest of surface of fore lobe of pronotum piceous, subshining. Hind lobe of pronotum of the general color, somewhat darkened at center and behind. Scutellum piceous, posterior half yellowish white. General colour of hemielytra dark brown, almost imperceptibly lighter at extreme base; apex of corium yellow, strongly contrasting with rest of hemielytra. Legs yellowish, femora and tibiae with 5 dark annuli (Fig. 38). Abdomen yellowish white. Connexival segments dorsally on anterior third with a piceous transversal band; the same present also ventrally, but fainter. Sternites of the general color, with brownish pattern elements laterally.



General shape and proportions of body and appendages as in Fig. 38.

Head as in Figs. 38–39, longer than pronotum measured along its midline, not abruptly constricted behind in lateral view. Shape and proportion of rostral segments as in Fig. 39. First segment of antennae somewhat longer than head, its length 3 mm; relative length of segments of antennae = 1:0.45:0.7:0.35. Antennal segments lacking long hairs; the last two segments not noticeably thickened.

Pronotum and scutellum as in Fig. 38. Lateral angles of collar conical. Postero-lateral angles of pronotum rounded. Apex of scutellum subcylindrical, rounded.

Venation of hemielytra as in Figs. 38, 46, characterized by the relatively narrow basal cell of the membrane. Hemielytra attaining or very slightly surpassing apex of abdomen.

Genitalia of ♂ as in Figs. 40, 47–50. Postero-superior border of pygophore salient at middle, with a small two-pointed process (Figs. 40, 43); the chaetotaxy of the latter as in Fig. 42. Parameres slender, yellowish, slightly curved, with a few setae apically (Fig. 51). Phallus as in Figs. 47–50.

Female – Length 10–11 mm. General characters not different from male. External and internal ectodermal genitalia of ♀ as in Figs. 54–56.

First larval instar and chorionic structures as in Figs. 52 and 132–133, respectively.

Holotype ♂ (St. Martha, Curaçao, 13.X.1956) deposited in the Laboratory of Entomology, Wageningen.

All the known species of *Cosmoclopius* are very similar in general aspect and morphology. The main diagnostic characters seem to be certain not very striking differences in the colour pattern and the structure of the postero-superior border of the male pygophore; the parameres and the phallus are very similar in the species we have examined in detail. *C. curacavensis* n. sp. is very similar in colouring to the Brazilian *C. annulosus* Stål, 1872 and *nigro-annulatus* (Stål, 1860); it can be distinguished immediately from both (and from all other species we know) by the conspicuous yellow coloured apical

portion of the corium (uniformly coloured in all other species). The relatively narrow basal membranal cell is an additional differential character (Fig. 46); that cell is much wider in the Brazilian species mentioned above. The best specific character is probably the structure and chaetotaxy of the postero-superior border of the male pygophore: in *C. curacavensis* n. sp. it is as described above and shown in Figs. 40, 42–43; it is almost straight across and beset with numerous very short bristles in *annulosus* (Fig. 41) and of very complex structure and chaetotaxy in *nigroannulatus* (Fig. 44).

The actual center of speciation of *Cosmoclopius* seems to be southern South America (Argentina and southern Brazil), as the records of described and the examination of numerous undescribed species now before indicate. The new species here described is the northernmost representative of *Cosmoclopius*; the genus seems to be completely absent in Central America.

At all localities on Curaçao *C. curacavensis* was collected from *Cleome viscosa* L. (fam. Capparidaceae). This weed is known from Curaçao and Bonaire, not from Aruba (ARNOLDO, 1964; named as *Polanisia viscosa* DC). The plant was not seen by us on Bonaire, so that there is no definite proof that the reduviid indeed is absent on that island. The weed in question is covered by a sticky secretion. The reduviid associated with it, also has a more or less viscous layer covering the integument. This is obvious from the many particles of debris glued to body and appendages of both larvae and adults. Since also other Harpactorinae living on plants without any sticky secretion, often are camouflaged by debris material, it remains the question whether the glue substance of *C. curacavensis* originates from the plant (as actually happens in some Apiomerini) or from own integumental glands. The latter possibility is the most probable. Glandular hairs as shown in Fig. 53 of the first larval instar are scattered all over the integument, predominantly the tibiae, but not on the antennae. Rather similar hairs are found also in other Harpactorinae to be mentioned below. In contrast to the larvae of *Zelus* spp. studied, which have a fossa spongiosa on all legs, this structure is weakly developed and present only on the front legs in *Cosmoclopius*. This loss may have resulted from the adaptation of the bug to

the sticky substrate of the plant in question giving better hold fast in prey capturing.

The following observation of MILLER (1956) is of interest in this connection. *Rhinocoris fuscipes*, also a harpactorine, lives in South-East Asia on the same plant (*C. viscosa*) "feeding on insects trapped thereon". Nothing is known of the relations of S. American *Cosmoclopius* spp. to particular plants. A close study of such plant-insect relationships would be of value in order to deduce the speciation processes in this interesting genus of predatory bugs. *Cleome viscosa* is native in the Old World from tropical Africa to S. Arabia to tropical Australia. It is common throughout Malesia and a common adventive in the New World (literature data kindly presented by dr. J. J. F. E. DE WILDE, Wageningen). It is therefore unlikely that this weed played a decisive role in the speciation of *C. curacavensis*.

9. **Heza multiguttata** Champion, 1899 Figs. 58-59

CURAÇAO: Cas Corá, Plantentuin, 28.II.1957 (1♀, 1 larva IV), on lemon.  
Jan Thiel, 15.VI.1957 (1♂), on *Conocarpus erecta*.

Known only from Panama and British Honduras.

This uniformly brown-coloured species is easily recognized by its general appearance and the dots of whitish hair-warts on the corium.  
Egg as in Fig. 57.

10. **Atrachelus (Phorobura) fuscus** Stål, 1872 Fig. 60

CURAÇAO: Malpais, 24.I.1957 (1♂). Piscadera, 31.I.1957 (1♂, 1♀, larvae), swept from dense shrubs. Nieuwpoort, 12.III.1957 (1♂), on *Porophyllum macrocephalum*.

Described from Mexico.

In size, colour and other external features, this species resembles *Zelus tetracanthus* occurring on the same island. *Atrachelus* is recognized by the cephalic spines.

The male genitalia (Figs. 64-66), and dorsal scent glands as in Fig. 61.

11. **Sinea coronata** Stål, 1862 Fig. 67

ARUBA: Savaneta, 1955 (1♀, leg. J. G. van den Bergh), Oranjestad, 15.I.1963 (1♀, leg. P. Wagenaar Hummelinck).  
CURAÇAO: Piscadera Baai, 10.X.1956 (1♂); 22.X.1956 (1♀, larvae);

16.I.1957 (larvae); III.1957 (1♀); 11.VI.1957 (1♂); 12.VI.1957 (1♂); 25.X.1956 (1♀). Willemstad, St. Theresia cloister, 29.X.1956 (1♀). Klein Piscadera, Hofje van der Mark, 14.II.1957 (1♂). Plantage Noordkant, 26.VI.1957 (1♂). – Found on *Acacia tortuosa* and *Prosopis juliflora*, occasionally on *Caesalpinia coriaria*.

On Curaçao, this characteristic, cryptic species seems to be restricted to thorny Mimosaceae (*Acacia*, *Prosopis*), but it occurs occasionally also on Fabaceae trees (*Caesalpinia*).

Described from Mexico, and also reported from Texas, California and Guatemala.

When beaten in a net, adults (Fig. 67) and larvae (Figs. 150–152) are difficult to detect, because of their cryptic colour, shape, and dead-feigning behaviour.

Egg structures, male and female genitalia, dorso-abdominal glands as in Figs. 68–77, 142–145.

## 12. *Zelus longipes* (Linnaeus, 1767) Fig. 78

ST. EUSTATIUS: W. slope of Quill, Glass Bottle, sta. 431, 280 m, 12.VII.1949 (1 larval instar IV, leg. P. Wagenaar Hummelinck), pasture of *Panicum maximum* with small shrubs. Cultuurvlakte, 28.XII.1956 (1 larva V).

SABA: Windwardside, 10.XII.1956 (5♂, 2♀). Booby Hill, 10.XII.1956 (1♂). Hellsgate, St. Cruz, 17.XII.1956 (1♀). Hellsgate, 20.XII.1956 (3♀). Rendezvous, 11.XII.1956 (1♀), 26.XII.1956 (4♂, 2♀). St. Chrispain, 16.XII.1956 (2♂). The Bottom, 5.VII.1965 (1♂, 4♀, leg. D. C. Geijskes).

ST. MARTIN: Experimental Garden St. Peter, 24.V.1949 (1♀, leg. Hummelinck); 30.XI.1956 (3♂, 1♀, larvae V).

This strikingly orange-black contrasted reduviid is a typical Antillean species, and probably also occurs on the Central American mainland. On the Windward Islands mentioned above, the species was collected from dense herbaceous vegetation; a preference for any particular herb could not be settled.

Egg structures, female genital tract and dorso-abdominal gland as in Figs. 79–85, 137–141).

13. ***Zelus tetracanthus* Stål, 1862** Fig. 86

ARUBA: Spaans Lagoen, 5.IV.1957 (1♂, 1♀). Washington, 12.IV.1957 (1♂). CURAÇAO: Piscadera Baai, 22.X.1956 (1♂, 3 I IV); 3.IV.1957 (2♀); 12.VI.1957 (1♂, 2 I III). Rio Canario, 17.XI.1956 (1♂, 1♀). Klein Piscadera, Hofje van der Mark, II.1957 (1♀). Willemstad, II.1957 (2 I V). Cas Chikitoë, 18.II.1957 (1♂). Otrabanda, 27.II.1957 (1♀). Nieuwpoort, 12.III.1957 (1 I III, 2 I V). Hofje Blauw, 13.VI.1957 (1 I III). – Collected among others from *Bontia daphnoides*, *Acacia tortuosa*, *Prosopis juliflora*, and on Aruba from *Avicennia nitida*.

Known only from Central America.

A typical glandular hair occurring on legs and body of larvae (Figs. 87, 89), is drawn in Fig. 88. Such hairs alternating with peg-like setae, are found in all *Zelus* species listed here. Light-optically, the cuticle of these typically bent and truncate hairs seem to be traversed by many minute pores.

14. ***Zelus ruficeps* Stål, 1862**

CURAÇAO: Seroe Domi, 12.IV.1930 (1♂, leg. H. J. Mac Gillavry). Willemstad, 1934 (1♂, 1♀, leg. brother M. Realino). Piscadera, 10.X.1956 (1♂); 8.XI.1956 (1♂, 1♀); 11.VI.1957 (1♀); 19.VI.1957 (4♂, 1♀). Westpunt, near light-house, 1.XI.1956 (1♂). Rio Canario, 17.XI.1956 (1♀). St. Martha, 2.II.1957 (1♀). Malpais, 8.II.1957 (1♂). St. Willebrord, 10.II.1957 (1♂). Groot St. Joris, 20.II.1957 (1♂, 1♀). Christoffel, 22.III.1957 (1♂). Zapateer, 28.II.1957 (1♀). – Collected from *Acacia tortuosa* and *Laguncularia racemosa*.

Old records are from México, Guatemala and Panamá.

15. ***Zelus grassans* Stål, 1862**

CURAÇAO: Willemstad, Wilhelminapark, 17.II.1957 (1♀), on *Thespesia populnea*.

Old records are from México and Guatemala.

The first larval stage, reared from an egg-batch of the ♀ mentioned, is depicted in Fig. 80.

The young larval stages of this, and also other *Zelus* species, have a remarkable "praying" behaviour. The front legs are extended straight upwards and held motionless for long periods. This typical stance is certainly a lure for very tiny flying insects and it reminds of the prey capturing method of some Apiomerini.

## PIRATINAE

16. **Rasahus hamatus** (Fabricius, 1781) Fig. 91

CURAÇAO: Willemstad, 17.X.1956 (1♂). Jongbloed, I.1957 (3♂). Willemstad, Otrabanda, III.1957 (1♂). Piscadera Baai, Carmabi, 30.XI.1963 (1♂, leg. P. Wagenaar Hummelinck), 23.IV.1970 (1♀, leg. H. A. ten Hove).  
— At light.

All these captures, mostly males, were attracted to artificial light. The real breeding sites of this ground-dwelling species could not be detected.

The species occupies an extensive area from the Southern United States to Argentina.

Structural details of genitalia and abdominal glands as in Figs. 92–96.

## STENOPODINAE

17. **Stenopoda wygodzinskyi** Giacchi, 1969 Fig. 97

ARUBA: Savaneta, 1955 (3♂, 1 ♀, leg. J. G. van den Bergh), in a little barn. Cura Cabai, 25.IV.1957 (1 ♀).  
CURAÇAO: Hofje St. Kruis 21–27.IV.1930 (4 ♀, leg. H. J. Mac Gillavry). Willemstad, 17.X.1956 (3♂), at light. Rio Canario, 17.XI.1956 (1 ♀ III). Shore near Hato, 5.III.1957 (1♂).  
BONAIRE: Onima, 20.V.1957 (2 ♀).  
SABA: Rendez-vous, 25–26.XII.1956 (1♂, 1♀, 1 ♀ III).

This species was known to range from Northern Argentina to the Guyanas and Venezuela (Caripito).

The specimens from Saba are larger (nearly 1.9 mm, ♂) than those from Curaçao and Aruba (1.65–1.75 mm, ♂).

Structural details as in Figs. 98–102.

18. **Oncocephalus antipodus** Reuter, 1882 Fig. 103

ARUBA: Eagle Colony, 3.IV.1957 (1♂, 1♀ brachypterous). Cura Cabai, 25.IV.1957 (1 ♀). Bubali, 16.XI.1963 (1♂ at light, leg. P. Wagenaar Hummelinck).

CURACAO: Piscadera, West of the Seroe Pretoe, stat. nr. 213, 9.X.1936 (1 I V, leg. Hummelinck). Piscadera Baai, 24.X.1963 (4♂), 7.I.1964 (1♂, brachypterous, at light, leg. Hummelinck). Julianadorp, 12.XI.1962 (1♂, leg. E. J. van der Kuip).

Originally described from Ecuador, this species is also known from Panama and Bolivia.

Structural details as in Figs. 104–112, 134–136.

19. **Narvesus carolensis** Stål, 1859 Fig. 113

SABA: Proeftuin St. Peter, 30.XI.1956 (1 I III). Rendez-vous, 11.XII.1956 (1♂), 26.XII.1956 (1 I II, 2 I V). — Ground-dweller in dense herbaceous layer.

St. MARTIN: La Croisade, Qr. d'Orleans, 22.VI.1973 (1♀, leg. Hummelinck).

Abundantly distributed from the S. United States to Argentina.  
Structural details as in Figs. 114–119.

20. **Diaditus nocturnus** Hussey, 1954 Fig. 122

CURACAO: Willemstad, X.1956 (8♂, 1♀); XII (1♂). Piscadera, XI.1956 (1 I III), under stone. Julianadorp, V–VI.1957 (13♂, 2♀). Piscadera Baai, Carmabi, 10.XII.1963 (1♀, leg. P. Wagenaar Hummelinck). — All specimens were trapped in lamps, except for the larva.

Described from Colombia, probably also present in the Guianas.  
Structural details as in Figs. 120–128.

### TRIATOMINAE

21. **Triatoma maculata** (Erichson, 1848) Figs. 155–156

ARUBA: Eagle Petr. Comp., V.1955 (1♀, leg. P. Wagenaar Hummelinck). Savaneta, IV.1957 (2♂, 5♀). Bubali, 6, 15.XI.1963 (12♂, 4♀, leg. Hummelinck). Several hundreds of adults (about 2 × more males than females) were collected by E. J. van der Kuip and coworkers in the years around 1960.

CURACAO: Mundo Nobo, 4.XI.1936 (1♀, leg. Hummelinck). Willemstad, V.1946 (1♂, leg. Realino). Agricultural Station, 20.I.1949 (1♂), 2.II.1949 (1♂, leg. A. C. J. Burgers). Mahaai, 13.III.1955 (1♂, leg. Hummelinck). Jongbloed, XI.1956 (1♂), 11.I.1957 (1♂, leg. B. de Jong). Piscadera, 28.IX.1962 (1♂, leg. L. J. van der Steen). Piscadera Baai, X–XII, 1963

(16♂, 10♀), I.1964 (1♀), VII, X.1967 (10♂, 1♀), II.1970 (1♀, leg. Hummelinck), 1-18.VI.1970 (2♂, 2♀, leg. H. A. ten Hove). Otrabanda, II.1957 (2♂). Various localities 1960 (leg. van der Kuip). Curaçao (2♂, father Jansen).

BONAIRE: Hofje Fontein, 21-24.V.1930 (1♀, 1 larva; leg. H. J. Mac Gillavry). Dos Pos, 24.V-6.VI.1930 (1♀; leg. Mac Gillavry). Kralendijk, 10.X.1930 (1♀; leg. Hummelinck). Kralendijk, XI.1948 (1♂, 1♀, leg. Hummelinck), V.1957 (1♀, leg. sister Marie). Entriol, XI.1957, II.1958 (20♂, 6♀, leg. E. Pieters Kwiers). Hofje Bronswinkel, Washington, 19.III.1970 (1♂, leg. Hummelinck). Hato, VII.1970 (1♂, leg. H. A. ten Hove). Bolivia near Rooi Tuna, aloe field, 14.VIII.1973 (3 larvae, leg. Hummelinck). - Nearly all adults collected were attracted to artificial light.

The first record of this species on Curaçao and Bonaire was published by VAN DER KUIP (1949).

As to the habitat of this blood-sucking insect we refer to VAN DER KUIP (1966): "It is not an easy task to find a *Triatoma* during the daytime in Aruba's nature. Sometimes one is found by chance under a stone, in a crack or under a loose piece of bark of a tree. But without any trouble great numbers can be found in chicken - or pigeon houses. Especially in those that have been sloppily constructed and are seldom cleaned. These houses are probably the most important multiplication centres for the Aruban triatomas". Larvae of different stages, mostly single, were found by WAGENAAR HUMMELINCK and COBBEN under stones near drinking pools used by cattle, far away from human settlements.

The dark pattern elements on head, pronotum and hemelytra are consistently more extensive in the specimens from Aruba (Fig. 156), but no morphological characters can be found to differentiate these specimens from those of Curaçao (Fig. 155) and Bonaire. The animals of the last two islands, moreover, are in general somewhat larger: 17-22 mm (♂), 21-23.5 (♀). Specimens from Aruba measure 16-21 and 19-22 mm, respectively.

*T. maculata* is known from Brazil, Dutch and British Guiana, and Venezuela. It has been found to be a natural vector of Chagas' disease. This blood-sucking reduviid is known among the indigenous people of Aruba as "Chupa Chupa"; it is said that especially children suffer during night of the sucking activity of this insect, which causes large blisters.

The importance of *T. maculata* for public health in Aruba and its



association with *Trypanosoma cruzi* was investigated by VAN DER KUIP (1966). He found that a high percentage of the bugs indeed was infected with a strain of *T. cruzi* of low virulence. Serological examination showed that dogs, sheep, rats and cottontail rabbits very probably represent the reservoir of *T. cruzi* in Aruba. Human trypanosomiasis could not be detected, nor in Curaçao.

#### PHYMATINAE

22.

#### *Macrocephalus* sp.

Fig. 153

ST. MARTIN: Koolbaai-Marigot, 1.XII.1956 (1♂).

The species identity of this peculiar and attractive insect unfortunately remains obscure, because the male capsule, mounted separately on the label has been lost. According to dr. N. A. KORMILEV (New York) who has seen this specimen, a study of the parameres in this case would be the more important, since the present species could represent an intermediate type between two supposed subgenera of *Macrocephalus*; external features, in particular the scutellum, are suggestive of such an intermediate position.

### II. REMARKS ON THE EGGS AND ON EXTERNAL AND INTERNAL GENITALIA

#### EGGS

EMESINAE – The egg of *Emesaya brevipennis* has been described and figured by READIO (1926, plate X fig. 10). Figs. 16–26 show the egg and chorionic structures of *Barce* (deposited eggs) and the two *Ghinallelia* species (ripe ovarian eggs). The egg of *Barce* lacks an extending chorionic rim collar (Fig. 19). There are 70–80 aeropyles (Fig. 20), but the presence and number of micropyles could not be settled with certainty; this is an unusual situation, for the eggs of other emesines and reduviids in general, studied by COBBEN (1968), more or less clearly revealed micropyles. The operculum is rather flat and has a regular hexagonal pattern (Fig. 21), which seems

porous along the opercular margin only. The black egg is glued lengthwise to the substrate by means of irregular longitudinal ridges of transparent cement (photograph of egg *in situ* in WYGODZINSKY, 1966, plate 4). The data given do not agree with the drawing of the egg of *B. fraterna* as presented by READIO (1926, plate X fig. 11, egg more or less isoradial and with an opercular elevation). The two *Ghinallelia* species have the chorionic rim broken up into 12–15 stiff filaments. The egg of *G. pascoei*? (Fig. 23–26) has been described and figured by COBBEN (1968), but erroneously under *Metapterus banksii* (= *B. fraterna*). Each rim filament has one micropyle, which in *G. pascoei* lies consistently at the left side (Fig. 25–26, mp), but in *G. spec. 5* it is in the mid part of the filaments (Fig. 16). Each micropyle curves inside the eggs body to the left when the chorion is viewed from the outside. The aeropyles arise in the incisions of the rim filaments. Their number is smaller and more regularly distributed in *G. pascoei* than in *G. spec. 5* (Fig. 26 and 16, respectively). The operculum is two-layered. Particularly in the unnamed species, the porous outer layer encloses a large cavity (Fig. 18), which presumably functions as an air store for opercular respiration. The operculum of *G. pascoei* is more or less intermediate between the conditions in *G. spec. 5* en *B. fraterna*.

A summary of what is known of emesine eggs is given by WYGODZINSKY (1966, figures of 13 species belonging to 12 genera, according to various authors). The eggs differ in many respects: egg shape, extension and shape of rim collar, opercular process and cement ridges. If egg structures will play a role in future reanalyses of generic phylogeny, then a study of aeropyles and micropyles should be included. It is remembered that *Empicoris culiciformis* has only 3 micropyles and about 10 aeropyles (COBBEN, 1968), whereas these numbers are more than 4 times higher in the two *Ghinallelia* species studied here.

SAICINAE – Eggs of this subfamily were not known and remain obscure, since our material contains only 1♂. The data on egg structures are needed because the male genital apparatus suggests a special position of this taxon within the family.

HARPACTORINAE — Egg structures of four species have been studied in the present paper (*Cosmoclopius curacavensis*, Figs. 132–133; *Heza multigutata*, Figs. 57, 129–131; *Sinea coronata*, Figs. 68–69, 142–145; *Zelus longipes*, Figs. 79–80, 137–141). The remaining species listed (*Atrachelus* not studied) belong to the *Zelus* type. This is to be considered as typical for the subfamily and has its Old-World counterpart in the genus *Rhinocoris*. The *Zelus* type has been studied in detail by COBBEN (1968), COBBEN & HENSTRA (1968), SALKELD (1972). The opercular region has a rich ornamentation derived from the more or less highly elevated network region of the operculum proper (Figs. 79c, 138) and the single veil which projects from the rim-collar of the main shell body (Figs. 79a, 137). For the four species drawn here, it counts that there are 40–60 aeropyles and 2–3 micropyles (about 7 in *Heza*, very difficult to detect). The operculum of *Heza multiguttata* has a peculiar beret-form, which approaches the flat structure of the African *Nagusta punctaticollis* (Fig. 201 in COBBEN, 1968). The egg of *Sinea coronata* is characterized by its obvious dorsoventral dissimilarity (Fig. 68). This egg is so different from those of *Sinea diadema* and *S. spinipes*, described and figured by READIO (1926/1927) that one is inclined to question the validity of egg structures as a measure of relationship; or it must be that the species are wrongly placed in the same genus.

PIRATINAE — Our captures of *Rasahus hamatus* represent males and only 1 female, not containing ovarian eggs. We may refer, however, to READIO (1926) who gave a description and clear drawings of the eggs of *Rasahus biguttatus* and *Melanolestes picipes*. The rim of the chorion has long filamentous processes, which stand out as a rosette from the egg which is laid in the soil. MILLER (1953) mentioned that four days after deposition, the chorionic processes of the egg of *Pirates lugubris* expanded outwards; before that time these processes were close together. COBBEN had the opportunity to study the deposited eggs of two, still unidentified, Ethiopian species of Piratinae. The eggs conform in general appearance with *Rasahus biguttatus*. In one Ethiopian species living in very wet habitat, the chorionic filaments converged when the eggs were placed in air with high humidity. Under dry conditions the filaments opened with

visible speed towards the rosette-state. The second, dry-habitat species, however, did not reveal this reversible reaction; some of the eggs had an open corolla, other more closed, but change in humidity effected no change. The motility of chorionic appendages as a respiratory control mechanism, was first described for *Loricula* spp. (Microphysidae) (COBBEN, 1968).

As in *Loricula*, the appendages of the Ethiopian Piratinae studied proved to have a plastron structure, and this is in contrast with the superficially similar filaments of some Emesinae which are solid. Another difference with this latter subfamily is the enormous number of aeropyles in the piratine eggs studied by us; these aeropyles are closely packed without any spatial relation to the filaments; there are about 6 very thin micropyles. Before concluding that plastron-bearing processes are typical for the subfamily Piratinae, species from other subfamilies with chorionic rim-processes have to be studied under high magnification. MILLER (1956) gives examples of long chorionic filaments in some species of Reduviinae (*Sminthus*, *Tiarodes*). On the other hand, *Catamiarus nyassae* which he attributes to Piratinae, lacks any obvious differentiation at the upper egg-pole. The egg of the Harpactorine *Sinea diadema* has a reticulate rim which, according to BARBER (1923), stands upwards in new-laid eggs, but is spread out after hatching or drying. In these both situations it is drawn also by READIO (1927), who further observed that the process of expansion of the fringe-like collar required less than a minute under the heat of a microscope lamp. Thus a similar mechanism as for *Loricula* and some Piratinae is suggested.

STENOPODINAE – Not much can be added to our knowledge of this subfamily. Most specimens were attracted to artificial light. In females caught in this way during dispersal flight, oogenesis had not yet set in, and ovarian eggs are lacking. Only ovarian eggs of *Oncocephalus antipodus* could be studied (Figs. 105, 134–136). The number of aeropyles amounts to 350 and there are about 10 micropyles, which follow a curvature towards the inside of the chorion. *O. apiculatus* has rather similar eggs judging from external features (READIO, 1926). Although the shape of the eggs within the subfamily seems to vary quite a bit, a more or less uniform circumoper-

cular differentiation is suggested, when the egg-drawings of species of three other genera (MILLER, 1956) are taken into account.

Concluding this section it must be said that, notwithstanding the new additions given above, egg structures of Reduviidae remain an obscure tool for settling relationships above the species level. Much more species have to be studied carefully before the reticulate lines of what seems to be mosaic evolution of the egg stage in this family can be traced, supplemented with the types of embryogenesis. Egg characters no doubt are of great value distinguishing between species.

## GENITALIA

The morphology of the reduvioid genitalia and their systematic value for subfamily grouping has extensively been treated by DAVIS (1966). He elaborated more on the same subject in 1969 concluding to a reduction of the number of subfamilies with seven. In the following section, therefore only reference is made to some salient points of general interest. The many drawings may serve to augment more detailed knowledge as a help for future reassessment of taxa, especially on the specific and generic level.

EMESINAE – External characters of both ♂ and ♀ genital segments are very useful in emesine systematics (Figs. 6–11). Shape of parameres (e.g. Figs. 28–29) does not vary greatly within tribes and in some groups differences must be judged with care. There is an amazing diversity in the phallus proper, which as stated in the monograph of WYGODZINSKY (1966): “frequently surpasses that of the externally visible features of the bugs”. The 4 genera from the Netherlands Antilles demonstrate this diversity (Figs. 27–32). A full account and evaluation of all types occurring in the subfamily has been presented in the above-mentioned monograph of 1966. The internal duct system of the phallus will be considered elsewhere in relation to other families.

The female genital tract of *Barce* and *Ghinallelia*, both Metapterini according to current classification, likewise reveal great discrepancies. In *Ghinallelia* the normal reduviid constellation is found (Fig.

14, two pseudospermathecae and presence of vermiform gland), whereas traces of a large ring gland are visible in the cuticular lining of the genital sac. This gland runs transversely around the sac, whereas it occupies only the dorsal wall of the sac in the unidentified species of Saba and St. Martin. In the latter species it is seen (Figs. 12–13) that the common oviduct deviates entirely from the bilateral plane of symmetry. The ring gland seems to be absent in *Barce*, which shows otherwise more intricate conditions. The genital chamber protrudes anteriorly and ventrally of the common oviduct (Fig. 15); this extending sac bears two pairs of diverticulae; one pair is tubular (di 1), the other, more anterior pair is wider and has an apical swelling (di 2). The ventral wall of the common oviduct has another pair of projections, which on the basis of their insertion most probably are homologous with the pseudospermathecae of other Emesinae. This remarkable configuration of 6 diverticula was observed in the same species earlier (WYGODZINSKY, 1966). The ventral outgrowth of the oviduct was then found to be unpaired but bifid at the apex (specimen mentioned in 1966 referred to the form *banksii*). Both this structure and the processes 2, indicated at that time as pseudospermathecae, appeared to contain sperm. Lateral diverticula or one dorsal diverticulum on the genital chamber occur sometimes in species of other subfamilies (DAVIS, 1966); SCUDDER (1959) found two identical pairs of pseudospermathecae in the salyavatine *Petalochirus* spec. The extent of a structure which might be homologous with the true spermatheca ("vermiform gland" of DAVIS, l.c.) is shown in Figs. 12–15. It appears furthermore from these figures that the paired oviducts are not lined with cuticle; this is contrasting the normal conditions in other subfamilies, where the bifurcation of the oviduct is traceable in dried specimens (see e.g. Fig. 71, stained with Chlorazol-black).

**HARPACTORINAE** – The few species analysed here reveal rather wide fluctuations on the general plan. First, *Atrachelus fusca* (Figs. 62–63) and *Sinea coronata* (Fig. 76) are entirely devoid of parameres. MILLER (1956) stated absence of parameres in species of the Ethiopian *Phonolibes* and *Lophocephala* (Harpactorinae, Tegeini *sensu* DAVIS, 1969) and VILLIERS (1948) noticed their absence in *Diaspi-*

*dus* (Harpactorinae) and *Heteropinus* (Reduviinae). DAVIS (1966) in his general discussion on reduviid systematics, also mentioned that the parameres are absent in a few genera. The phylogenetic lines of repeated loss of parameres in the family should be traced by comparison of many species with reduced parameres. The consequences of paramere's absence for the copulatory act are unknown. Some remarks may suffice for as far as the phallus is concerned. Figs. 47–50, 64–66, 74–75, 82–83 show the development of the basal articulatory apparatus and the endosoma. The latter can best be analysed in inflated condition (Fig. 48a), so that the natural topography of gonopore and sclerifications become apparent (Fig. 8b–d). However, weakening and maceration of the pygophore of museum specimens rarely results in swelling and extrusion of the endosoma so that comparative study of the highly involuted membranes is not easy. In Figs. 64, 74, 83 and others, the endosoma depicted has been artificially stretched and stained with chlorazol-black. The phallosome has been detached circumferentially along its base and pulled forward in the direction of the secondary gonopore. In this way, a good view on the whole ejaculatory system is achieved and the dentate areas with spines or other differentiations, if any, can be located. Such spinose areas are faced to the interior of the secondary sperm conduit; these membranes must be opened and viewed inside out for further evaluation (*e.g.* Fig. 74a, b). Our figures show further great varieties in the basal articulatory apparatus (compare for example Figs. 49, 66 and 75). In *Sinea coronata*, the two ampullae of the ejaculatory duct lie within the base of the phallus (Fig. 77), whereas in all other reduviids studied they are entirely outside (*e.g.* Figs. 27, 65, 94, 100). The presence of such ampullae and the varying complexities of the phallus of reduviids have been discussed by DAVIS (1966), who evaluated their possible use in defining certain subfamilies.

The internal female structures which lack the true spermatheca (Figs. 56, 71, 81) show a consistent gross pattern with minor differences regarding the genital chamber and the pseudospermathecae. The genital chamber has seemingly wide lateral diverticulae (Fig. 71), but close inspection shows that these do not form part of the genital tract. It is a voluminous bilobed invagination of the integumental

membrane between the genital segments and the proctiger (middle arrow in Fig. 54). DAVIS (1966) located the opening of the gland between the second valvulae and the styloids, but in 1969 he rightly traced its origin and introduced the term: "*subrectal gland*". About its function, DAVIS mentioned that it is believed to be a scent or repugnatorial gland. The sac content is of a resistant, amorphous nature which is not destructed after long maceration with potash. It seems most plausible that the main function is related with the production of glutinous substance as an embedding for the egg-batch. More indirect evidence for this concept must come from comparisons of species, which deposit eggs with or without the tough embedding material, followed by a check whether the subrectal gland is present or not. The gland is found in most harpactorines according to DAVIS (1969), but should be absent in *Acholla*, *Sinea* and *Fitchia*; explicit naming of species investigated in this connection, however, are necessary. *Acholla multispinosa* lays eggs in compact masses, and a cement holds the eggs in place and protects them somewhat (READIO, 1927). In future analyses, distinction must be made between a bit of cement, which is practiced by nearly all heteropterons, and the additional copious tough sheath which in some species (e.g. *Isyndus heros*, cf MILLER, 1956) gives oothecal effect. Although *Sinea* is stated to lack the subrectal gland, our *Sinea coronata* from Curaçao and Aruba indeed possess such a gland, and the egg-mass is tightly glued together (Fig. 146).

Egg characters (see p. 19) are very distinctive from those of the two *Sinea* species studied by READIO (1927), so that the current genus may not comprise a natural unit. Differences in egg-fixing substance may occur in closely related species. In *Sinea spinipes* there is less adhesive material used than in *S. diadema* (READIO, 1927). The egg-laying behaviour of *Heza* is not known, so that our finding that *Heza multiguttata* from Curaçao lacks a subrectal gland, is incomplete. But, the palaearctic genus *Coranus* lacks the glands too and lays eggs singly (*C. subapterus* and *C. aegyptius* studied by COBBEN)! The subrectal gland is found in three of the six tribes of Harpactorinae and is said to be absent in Raphidosomini, Ectinoderini and Apiomerini (*sensu* DAVIS, 1969); the gland is further inexistent in all the many other reduviid subfamilies (numbers of spe-



cies with positive or negative results are not indicated). It appears from the data of MILLER (1953) that Raphidosomini lay eggs singly, so that a subrectal gland may be superfluous. The few Apiomerini studied, however, actually use a copious quantity of glutinous substance. The origin of the fixative in this group needs investigation. It is known that at least some Apiomerini, and also Ectinoderini, collect resinous exudates from trees for prey capture. One would think that this habit is not likely related to egg-deposition, since WYGODZINSKY (1947) observed for one species (*Heniarthes jaakkoi*) that the bug secretes a substance in a spongy state during oviposition, and that it rapidly becomes hard. On the other hand, READIO (1927, p. 152–153) quoted the following interesting record of CHAMPION (1899) about *Apiomerus vexillarius*, the last sentence of which is of great relevancy for our subject: "The females have the power of exuding a sticky fluid from the ventral surface, and probably from the tibiae also; the hairs on the venter are matted and stuck together with this substance in nearly all the specimens examined. From what I have observed of the habits of one of the largest species, *A. vexillarius*, which is quite common in forest clearings in the "terra caliente" of Chirique, this viscous fluid appeared to be used for the purpose of securing a firm grasp of its prey – freshly emerged Longicornia, etc., nearly as large as itself – during the process of suction. Doctor Sharp, however, has recorded a curious fact in connection with the mode of deposition of the eggs of an Amazonian reduviid (possibly a species of Harpactorinae or Apiomerinae), showing that this fluid is used for gumming them down on a leaf."

SWADENER & YONKE (1973) describe in detail the so-called grooming behaviour of ovipositing *Apiomerus crassipes*. From that description it is suggested that the metatibial comb helps in smearing the cement from the abdominal apex towards the ventral surface of the female abdomen. The cement is transferred subsequently on top of the eggs.

How it may be, scrupulous observations on egg laying behaviour will solve the problem about the subrectal gland function. Although no decisive proof for its supposed role is given, READIO (1927, p. 174) accurately described the oviposition as following for *Zelus exanguis*: "In the operation of depositing an egg, the female took great care

to first cover the sides of the eggs against which the unlaidd egg was to lie, and the portion of the leaf on which the base was to rest, with a cement-like material which comes from certain glands at the tip of the abdomen. The abdomen was moved up and down continually smearing the surfaces mentioned thoroughly. The preparation for the egg took much longer than the actual deposition". Even a more complex behaviour is mentioned for *Sycanus croceovittatus*, which ultimately uses its legs to pick up the colleterial liquid from the genital region in order to smoothen the oothecal wall (KERSHAW, 1909). Still, these observations give no unequivocal answer to the question whether the subrectal gland is involved with the plaster-activities of the bug, but the evidences are highly suggestive that the gland indeed has that function.

In the quotation of CHAMPION given above, the question of prey capturing was touched. It is not the place here to elaborate on the substances applied in feeding behaviour by Apiomerinae and related subfamilies. On page 13 of the present paper, the peculiar "preying" attitude of young *Zelus* larvae and the presence of secretory hairs (Fig. 88) have been mentioned. As for the oviposition discussed in the preceding pages, the same statement must be made here: it is not always clear whether the gluing material used in prey capturing is secreted by the predator insect itself or whether it is deliberately collected from an other source. It is known that some Apiomerini actually collect resinous substance (UYTTENBOOGAART, 1902), others not (SWADENER & YONKE, 1973). In this connection it is worthwhile to repeat an observation made by WYGODZINSKY and published earlier (1947) in concise form. The observation refers to the apiomerine *Heniarthes jaakkoi*. Adult specimens, as well as those from the second instar on, are covered to a larger or lesser degree by a non-hardening viscous substance which in all probability is produced by the bug itself; there are many hairs on the body and especially on the legs which seem to be specialized, somewhat clavate apically and apparently provided with an internal duct. First instar *H. jaakkoi* did not produce such a viscous substance; they would not feed either (small flies were offered). Finally, because WYGODZINSKY did not want to loose these little bugs, he offered them honey (nectar is sometimes taken by adult reduviids). Instead of eating the honey,

the little bugs took the honey with their fore legs and actively smeared themselves all over with the honey, and then proceeded successfully to capture small flies! As said, later instars and adults produce their own sticky substance. The use of glandular hair secretion for sticking camouflage material has been reviewed by LOUIS (1974).

**PIRATINAE** – The genital structures of *Rasahus hamatus* (Figs. 92, 94–96) show bilateral asymmetries in the parameres, the phallosome and the median pygophore process. Such asymmetries have been recorded several times in literature on species of this and other genera. The phenomenon most probably means that the copulatory act is performed always from a fixed unidirectional intromission by the male. Such asymmetries are quite aberrant in Reduviidae, but common in several other families. The records now at hand, show that, if the parameres are unequal in Piratinae, it is the right paramere which became reduced. Unfortunately the only female *Rasahus* from the Netherlands Antilles at hand, could not be studied on structural consequences of female organs. But interestingly, KUMAR (1962) found in *Ectomocoris cordiger* the right pseudospermatheca strongly reduced and simplified as compared with the long and complex left one. Even more interesting and biologically intriguing are the dimorphic *Pirates* species (GHAURI, 1964). There are males with larger parameres and males of the same species with smaller parameres; the latter have in addition to other deviations an extragenital movable process on the left hand side of the pregenital segment.

**STENOPODINAE** – Of the male structures of four species (Figs. 99–101, 106–110, 112, 117–119, 124–128) two features are worth to mention. The inner face of the dorso-median strip of the endosoma is densely beset with long cuticular hair-like projections (Figs. 112, 121). One wonders how this brush-zone may interfere with the seminal fluid or perhaps with a spermatophore. In *Narvesus* and *Diaditus* there is a dorsal extension of the ductus ejaculatorius which divides the basal foramen opening (Figs. 120, 126). There is no ductifer which in other reduviids sometimes is connected with the dorsal plate bridge by a median extension, called “ponticulus medianalis”

by DAVIS (1966). The structure of the Stenopodinae mentioned most probably is not homologous with this ponticulus; it is a continuation of the seminal duct and may have a glandular function. Regarding the female genital tract of *Stenopodus*, *Oncocephalus* and *Narvesus*, the variety in structure of the spermatheca (absent in *Oncocephalus*) and the pseudospermathecae must be mentioned, as well as the varying cuticular lining of the oviduct.

### III. ZOOGEOGRAPHICAL NOTES

Twenty two species are here analyzed. Very little is known about the reduviid population of the semi-arid Caribbean coast of Venezuela and Colombia, thus it cannot be decided definitely if the two species considered to be new (*Cosmoclopius*, *Oncerothelus*) are really endemic to the Caribbean Islands. However, their eventual encounter on the mainland would not change the overall picture very much. The identity of three Emesinae species could not be settled by incomplete data from the field or literature; at least one of these is probably new. Here it might be interesting to note that among the reduviids, it is the subfamily Emesinae that usually shows a disproportionately high percentage of specific (and sometimes even generic) endemism on islands (LESTON, 1957; WYGODZINSKY, 1966). Six species are apparently restricted to the Caribbean region generally (*Empicoris barberi*, *Heza multigutta*, *Atrachelus fuscus*, *Zelus longipes*, *Zelus tetracanthus* and *Diaditus nocturnus*), though it seems probably that the real range of several of these might be more extensive, in Central as well as in Northern South America; except for *Zelus longipes*, all these species were collected on Curaçao. Three species (*Emesaya brevipennis*, *Barce fraterna* and *Sinea coronata*) are found not only on the Antilles, but also in Central America and the southern part of the United States. As for the series just mentioned the general distribution pattern of these three species is not equal in the Netherlands Antilles; they were sampled only on the islands of the Leeward Group. Finally, 5 species (*Oncocephalus antipodus*, *Triatoma maculata*, *Stenopoda wygodzinskyi*, *Narvesus carolinensis* and *Rasahus hamatus*) are very common and extremely widespread neo-

TABLE 1

DISTRIBUTION OF THE REDUYIIDAE ON THE NETHERLANDS ANTILLES  
comparison with some other families

	<i>St. Martin</i>	<i>Saba</i>	<i>St. Eustatius</i>	<i>Bonaire</i>	<i>Curaçao</i>	<i>Aruba</i>	
1					x		<i>Empicoris barberi</i>
2					x		<i>Emesaya brevipennis</i>
3				x	x		<i>Barce fraterna</i>
4				x	x	x	<i>Ghinallelia pascoei?</i>
5	x	x					<i>Ghinallelia spec.</i>
6		x					<i>Emesinae, gen? spec?</i>
7		x					<i>Oncerothelus sabensis n. sp.</i>
8					x		<i>Cosmoclopius curacavensis n. sp.</i>
9					x		<i>Heza multiguttata</i>
10					x		<i>Atrachelus fuscus</i>
11					x	x	<i>Sinea coronata</i>
12	x	x	x				<i>Zelus longipes</i>
13					x	x	<i>Zelus tetracanthus</i>
14					x	x	<i>Zelus ruficeps</i>
15					x	x	<i>Zelus grassans</i>
16					x	x	<i>Rasahus hamatus</i>
17		x		x	x	x	<i>Stenopoda wygodzinskyi</i>
18		x			x	x	<i>Oncocephalus antipodus</i>
19	x						<i>Narvesus carolensis</i>
20					x		<i>Diaditus nocturnus</i>
21				x			<i>Triatoma maculata</i>
22	x						<i>Macrocephalus spec.</i>
	3	6	1	4	16	6	number of species by island
	13.5	27	4.5	18	73	27	percentage of the total of 22 species/island
	41	35	53	41	59	53	<i>Tingidae</i> , percentage of 17 species/island
				75	96	71	<i>Amphibicorisae, Saldidae, Hydrocorisae</i> ; percentage of 24 species/island of the Leeward Group only
	85	12	21	265	425	175	land area of islands in sq. km

tropical elements, the last two from Argentina to the Southern United States, the first three somewhat more restricted in range. The total picture of species shows a great discrepancy between the Reduviidae of the Windward islands and the Leeward islands. The former are inhabited by 16 species, the latter by 7 species; both groups of islands have only 1 species in common (Table 1).

Among the reduviids, the islands under consideration do not contain any elements related to the Old World tropics, such as found farther north on the Greater Antilles and the Sonoran region (examples: *Ectrichodiella* (Ectrichodiinae: Cuba); *Nesocastolus* (Harpactorinae: Cuba); *Pseudozelurus* (Reduviinae: Sonoran region). These elements do not reach the Lesser Antilles and the islands north of the Venezuelan coast. It thus can be said that the affinities of the reduviids of the islands under consideration are exclusively neotropical, though not purely South American.

73% of the total of 22 species under analysis occur on Curaçao. One could argue that this high number gives a false impression of the richness of the Curaçao fauna as compared with the species collected on Aruba (27%) and Bonaire (18%), because collections on Curaçao extended over a longer period of time (5 months divided over 3 periods in a year; 1 month collecting each on Bonaire and Aruba). There are reasons, however, that the picture would not have changed markedly, had more time been devoted to sampling on Bonaire and Aruba, although a few species certainly may have escaped sampling. First, the whole number of the species from Curaçao was almost reached during the first month of collecting. Nearly all species were collected again during the subsequent periods of capturing. There seems to be not much periodicity in the phenology of these reduviids, which predominantly like xerophytic conditions, and which are less susceptible to wet and dry seasons, unlike phytophagous species. Second, all species from Bonaire and Aruba occur also on Curaçao, whereas habitat conditions for Reduviidae are not markedly different on the three islands. Curaçao, the largest of the Netherlands Leeward islands (land areas given in column E, Table 1), always harbours more species of Heteroptera than the smaller islands (species numbers of other families in columns C, D, Table 1). The Curaçao score of Reduviidae, however, is disproportionate

with what is shown by other groups. The reason for this is not clear. When it is assumed that the spread potential of this family is poor in comparison with other families, it seems likely that the colonization of Curaçao came predominantly straight from the South American mainland, and that there was little migration from one island to the other. But the obvious paucity of species on Aruba (27 km off the coast of Venezuela; 76 km from Curaçao; 170 km from Bonaire) is difficult to explain. The presence of a form of *Triatoma maculata* on Aruba, different from the Curaçao – Bonaire form, may be due to independent colonization from different origins. There is only one species from the Leeward Group described as new (*Cosmoclopius curacavensis*); this full-winged species presumably occurs also on the mainland. It is the only reduviid species confined to one particular plant, which is absent on Aruba.

#### SUMMARY

A survey is given of the assassin bugs (Reduviidae) collected on the six Netherlands Antilles. All together 22 species were sampled: 6 Emesinae, 1 Saicinae, 8 Harpactorinae, 1 Piratinae, 4 Stenopodinae, 1 Triatominae and 1 Phymatinae.

Sixteen species were captured on the three islands of the Leeward Group, Aruba, Curaçao and Bonaire; seven species were found on the three islands of the Windward Group, St. Eustatius, Saba and St. Martin; both groups of islands have only 1 species in common. The local distribution of the species represented (Table 1) does not fit with their known gross distribution in the neotropics. Curaçao harbours more than 70% of the total number of species; zoogeographical aspects have been discussed. Two species are described as new: *Cosmoclopius curacavensis* (Harpactorinae), living on Curaçao as a predator exclusively on the weed *Cleome viscosa*, and *Oncerotractelus sabensis* (Saicinae) from Saba. The identity of some Emesinae and the single phymatine specimen captured remain unsettled for the present. *Triatoma maculata*, vector of a *T. cruzi* strain with low virulence, occurs in two colour forms; the dark one restricted to Aruba, the light-coloured form to Curaçao and Bonaire. Total drawings of most species are presented in addition to some 120 figures of structural details of eggs, larvae and adults. Features of eggs and genitalia are discussed on pages 17–28.

Some points of general interest are: The egg of *Sinea coronata* appeared to be quite different from what is known from other *Sinea* spp. Eggs of Piratinae have movable slips with plastron function. The harpactorines *Atrachelus fuscus* and *Sinea coronata* lack parameres. Behavioural aspects concerned with utilizing sticky material have been summarized. Evidence is presented that the subrectal gland, occurring in many Harpactorinae, secretes the colleterial liquid for the egg-batch. The asymmetrical genitalia of the Piratinae and the endosomal brush zone and basal differentiation of the ductus ejaculatorius in some Stenopodinae are stressed.

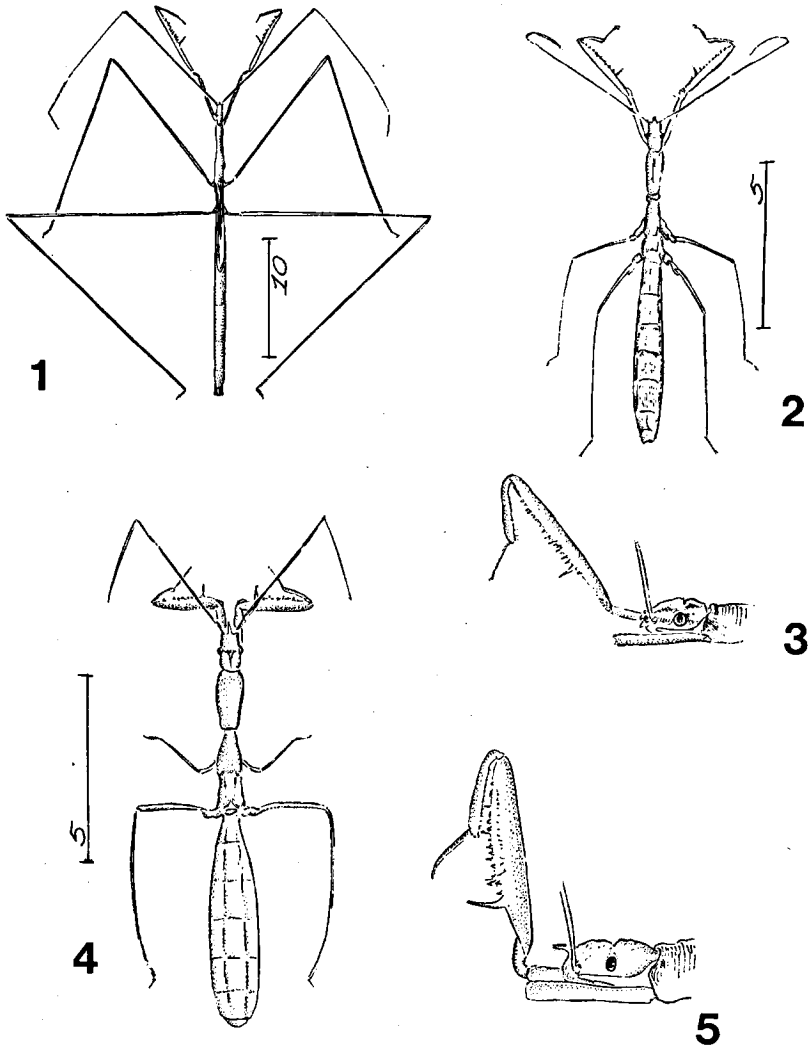
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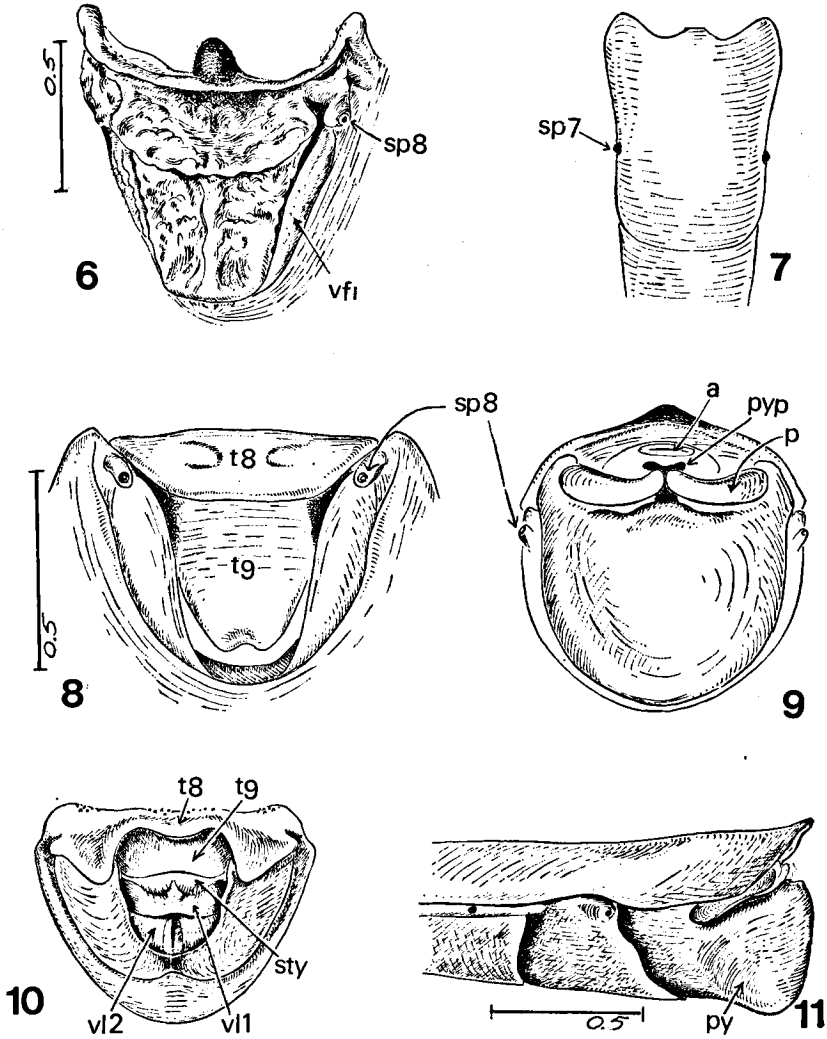


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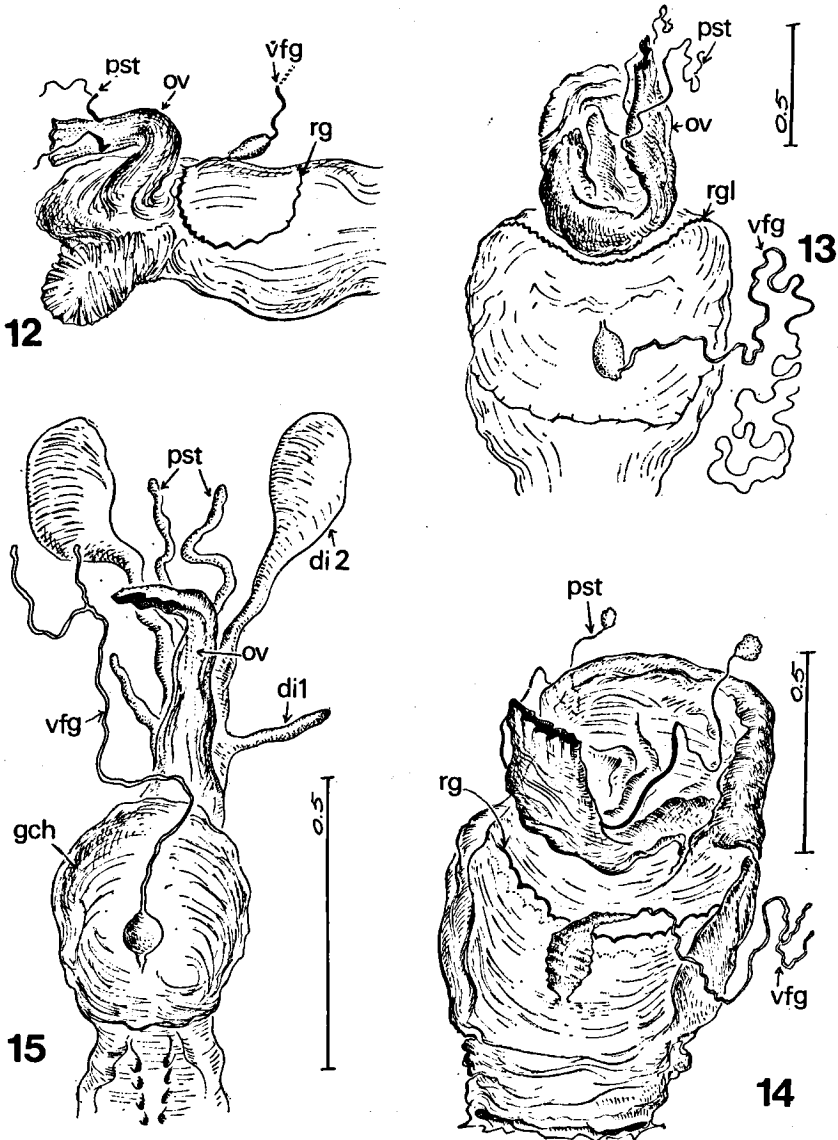
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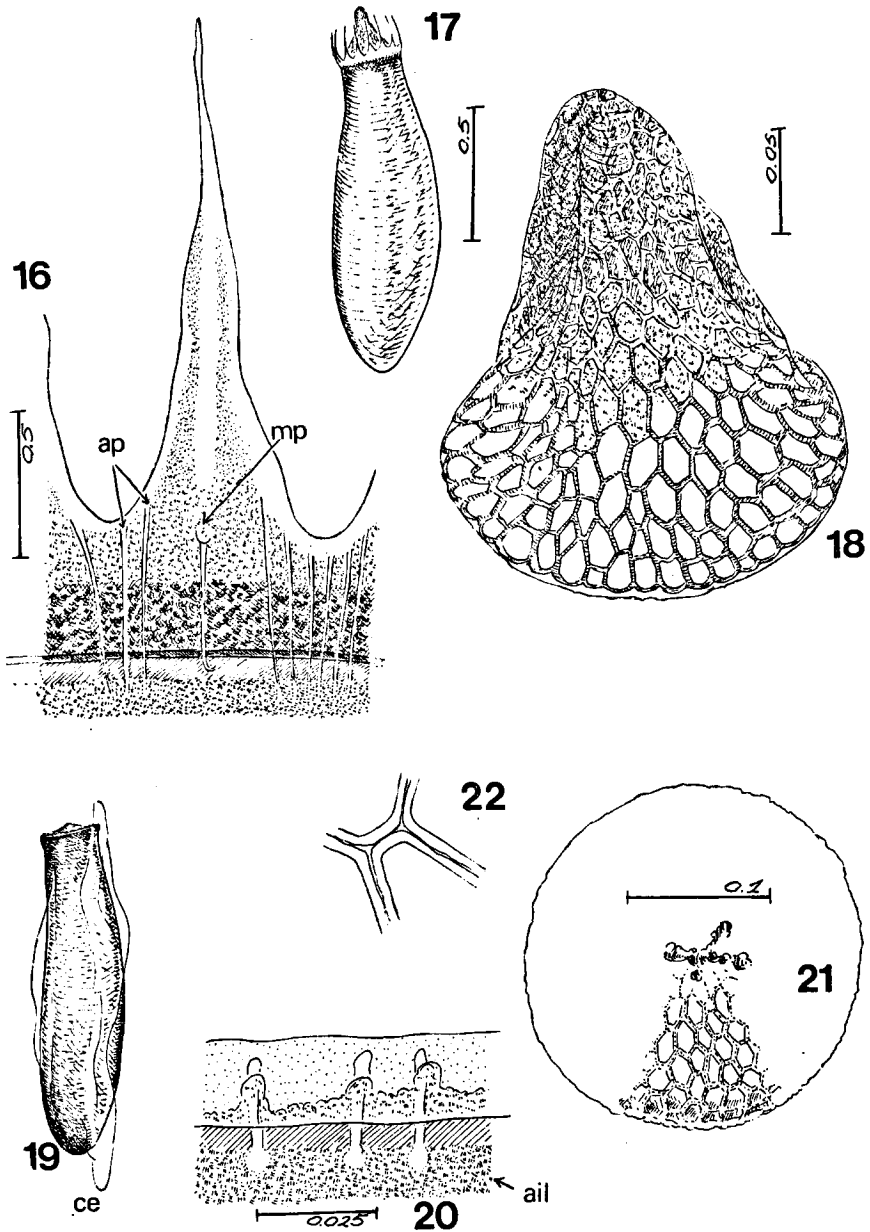
Figs. 1-5, *Emesinae*. - 1, *Emesaya brevipennis*, male. - 2, 3, *Barce fraterna*; 2, dorsal view of male; 3, lateral view of head and front leg. - 4, 5, *Ghinallelia pascoei*(?); 4, dorsal view of female; 5, lateral view of head and front leg.



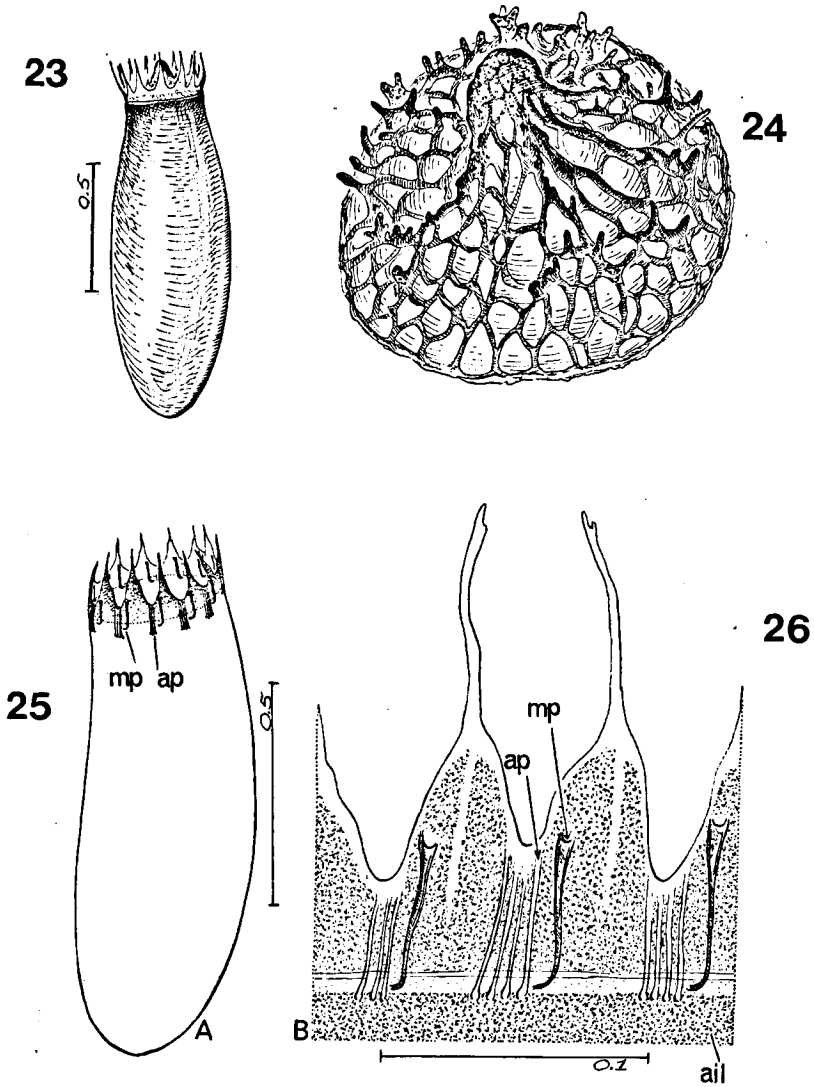
Figs. 6–11, *Emesinae*. – 6, 7, *Ghinallelia* sp. from St. Martin, caudal and ventral aspects of ♀, respectively. – 8, 9, *Ghinallelia pascoei* (?), caudal aspects of ♀ and ♂ genitalia, respectively. – 10, 11, *Barce fraterna* (Say), caudal aspect (♀) and lateral aspect of ♂ genital segments, respectively.



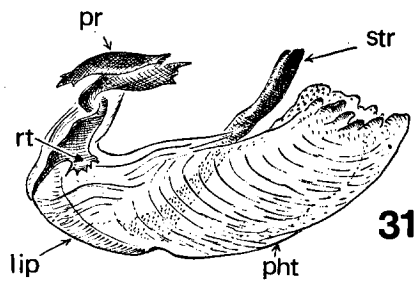
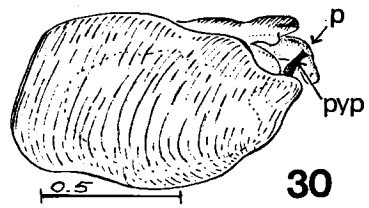
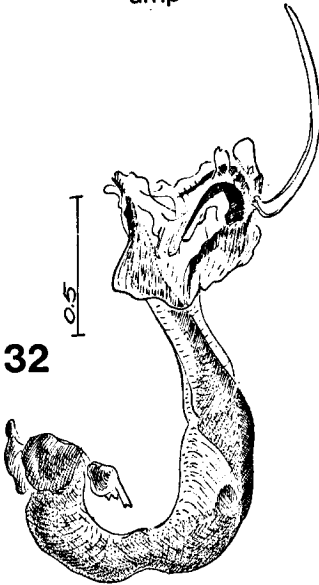
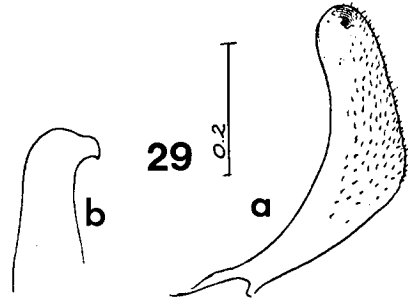
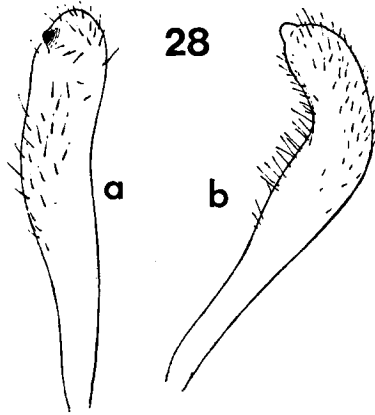
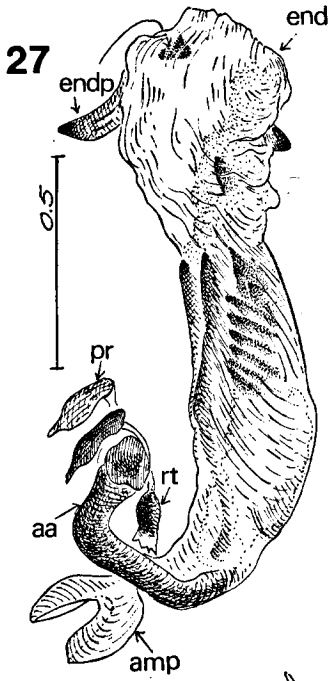
Figs. 12-15, *Emesinae*, female internal ectodermalia. - 12, 13, *Ghinallelia* sp. from Saba, 12, lateral view, 13, dorsal view. - 14, *Ghinallelia pascoei* (?), dorsal view. - 15, *Barce fraterna*, dorsal view.



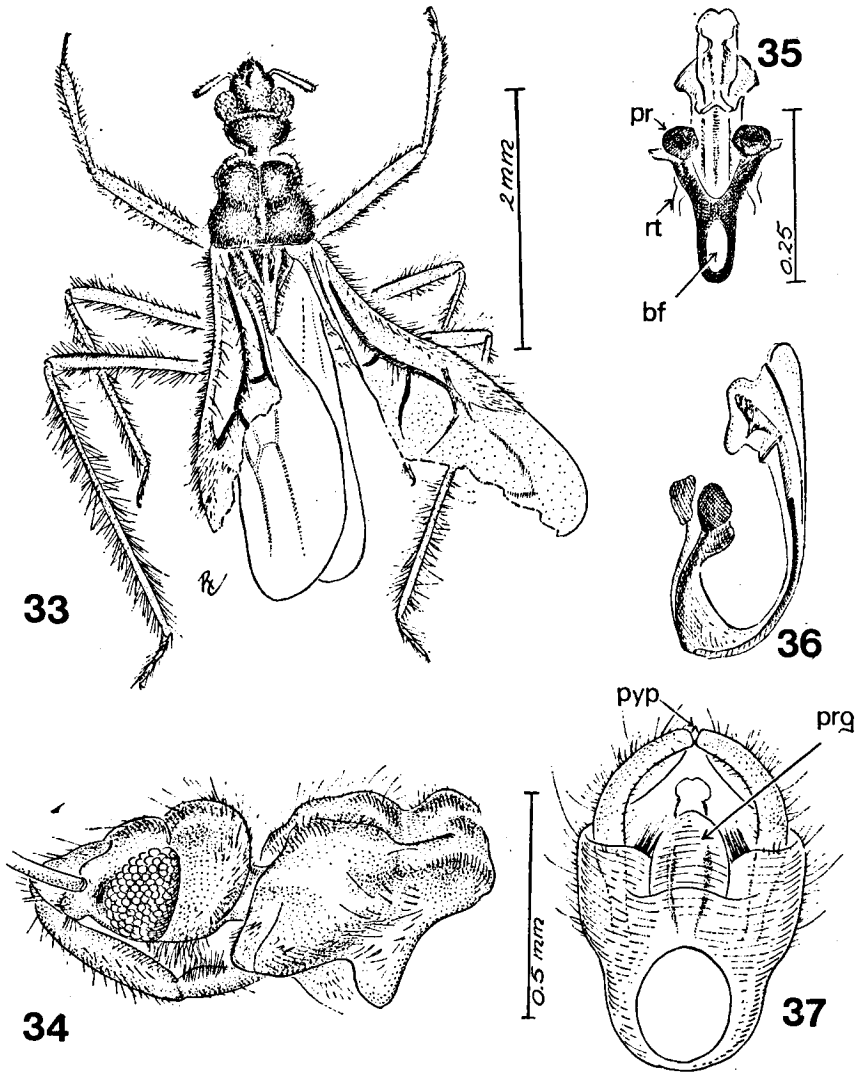
Figs. 16–21, *Emesinae*, egg structures. – 16–18, *Ghinallelia*, sp. from Saba; 16, internal view of chorionic rim collar; 17, ripe ovarian egg; 18, operculum. – 19–22, *Barce fraterna*; 19, deposited egg; 20, small part of chorionic rim collar; 21, dorsal view of operculum, with fragment of hexagonal pattern; 22, detail of hexagonal ridges.



Figs. 23–26, *Emesinae*, egg structures. – *Ghinallelia pascoei* (?); 23, ripe ovarian egg; 24, operculum; 25, egg with diagrammatic view of part of chorionic rim collar.







Figs. 33–37, *Saicinae*, *Oncerotrachelus sabensis* n. sp., holotype male. — 33, dorsal view; 34, lateral view of head and prothorax; 35, phallus, dorsal; 36, phallus, lateral; 37, pygophore, dorsal aspect.

← Figs. 27–32, *Emesinae*, male genital structures. — 27, 28, *Emesaya brevipennis*; 27, phallus semi-evaginated; 28, left paramere, dorsal (b), inner side (a). — 29–31, *Ghinallelia pascoei* (?); 29, left paramere, dorsal (a), innerside (b); 30, pygophore, left lateral view, left paramere omitted; 31, phallus, not inflated, left lateral view. — 32, *Barce fraterna*, phallus, normal condition, left lateral view.

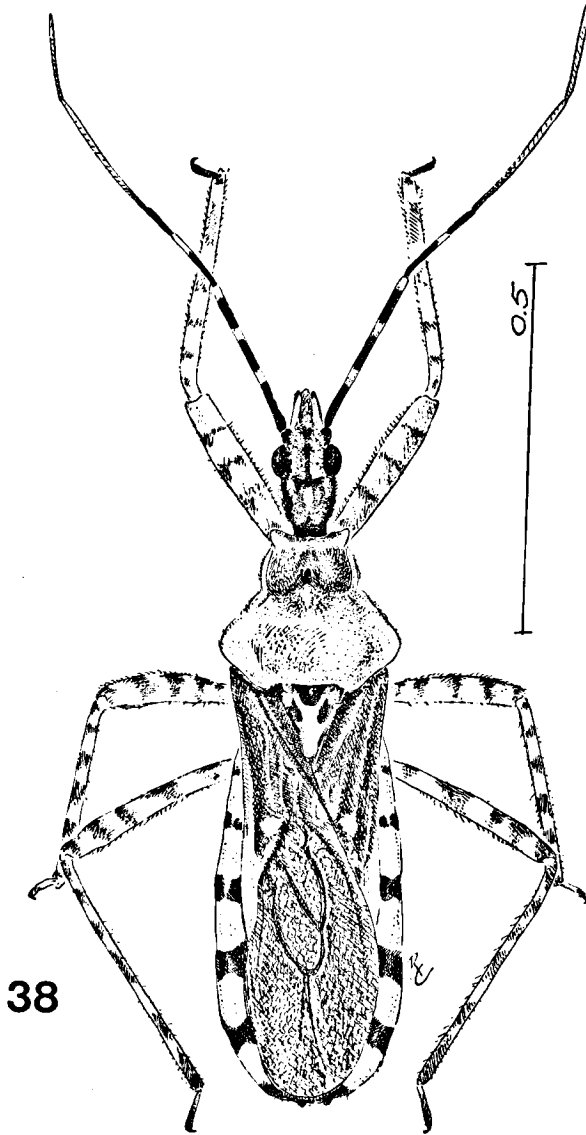
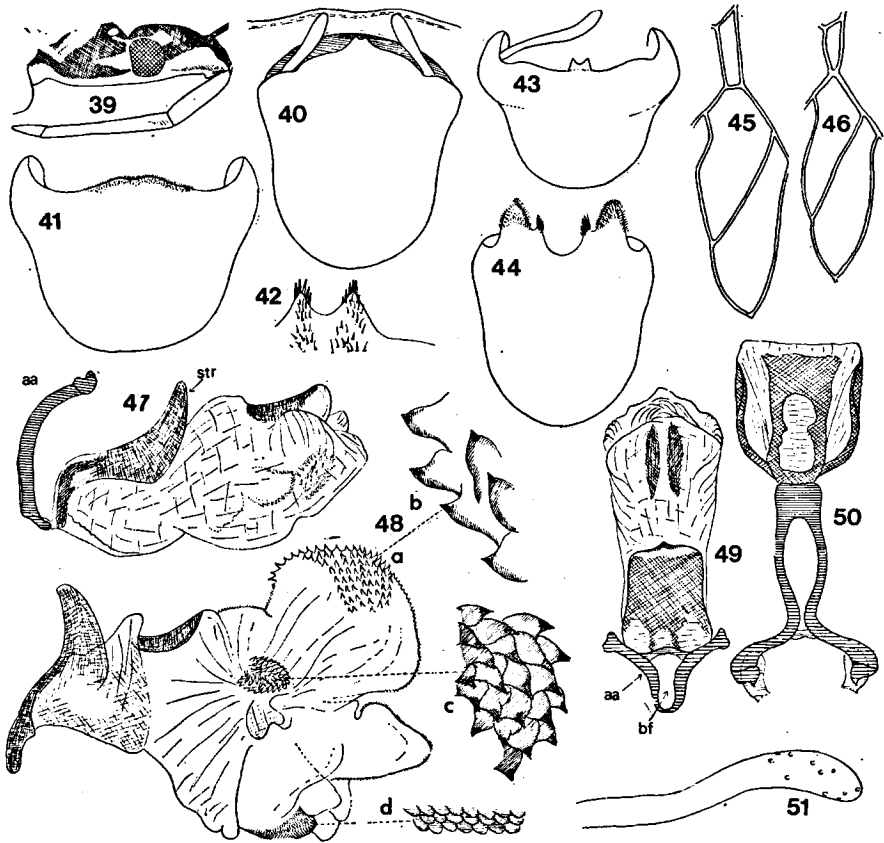
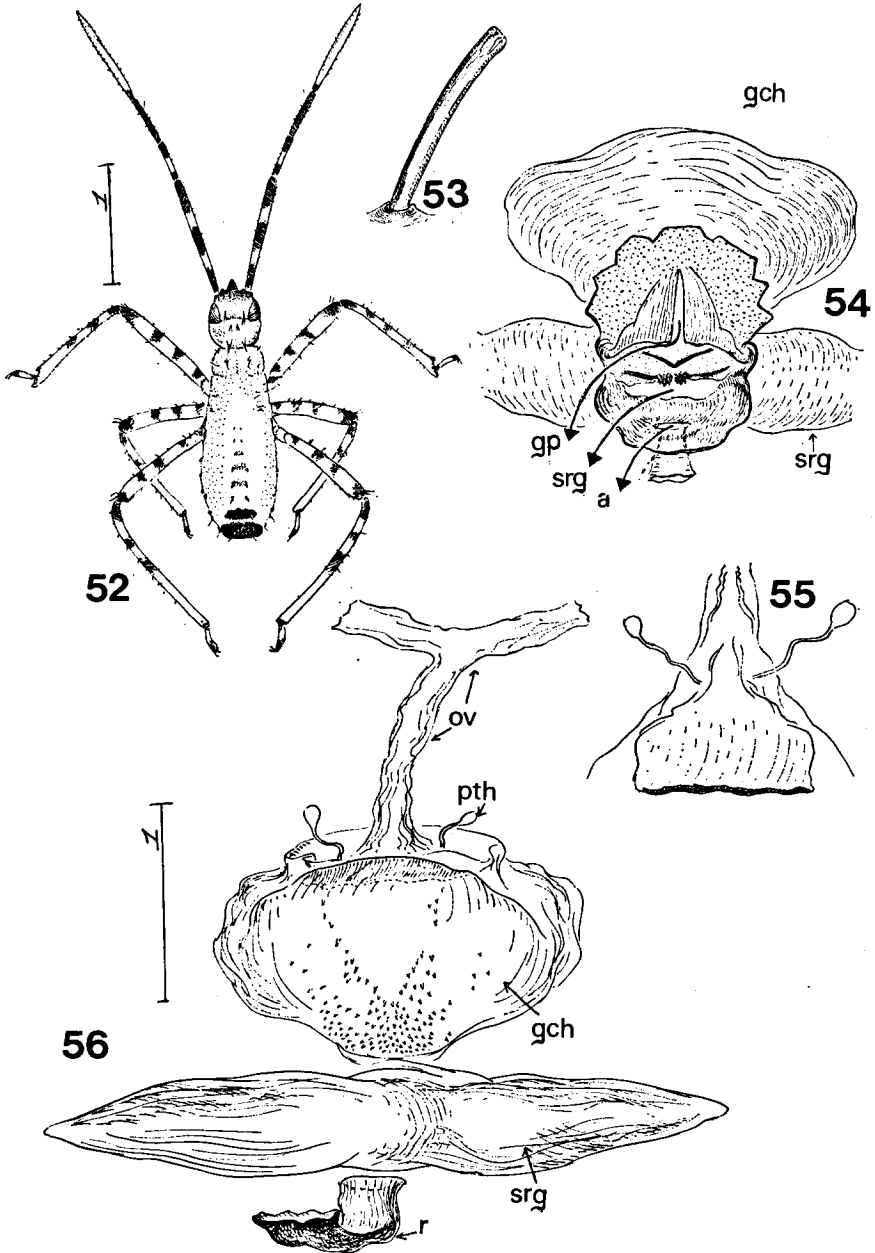
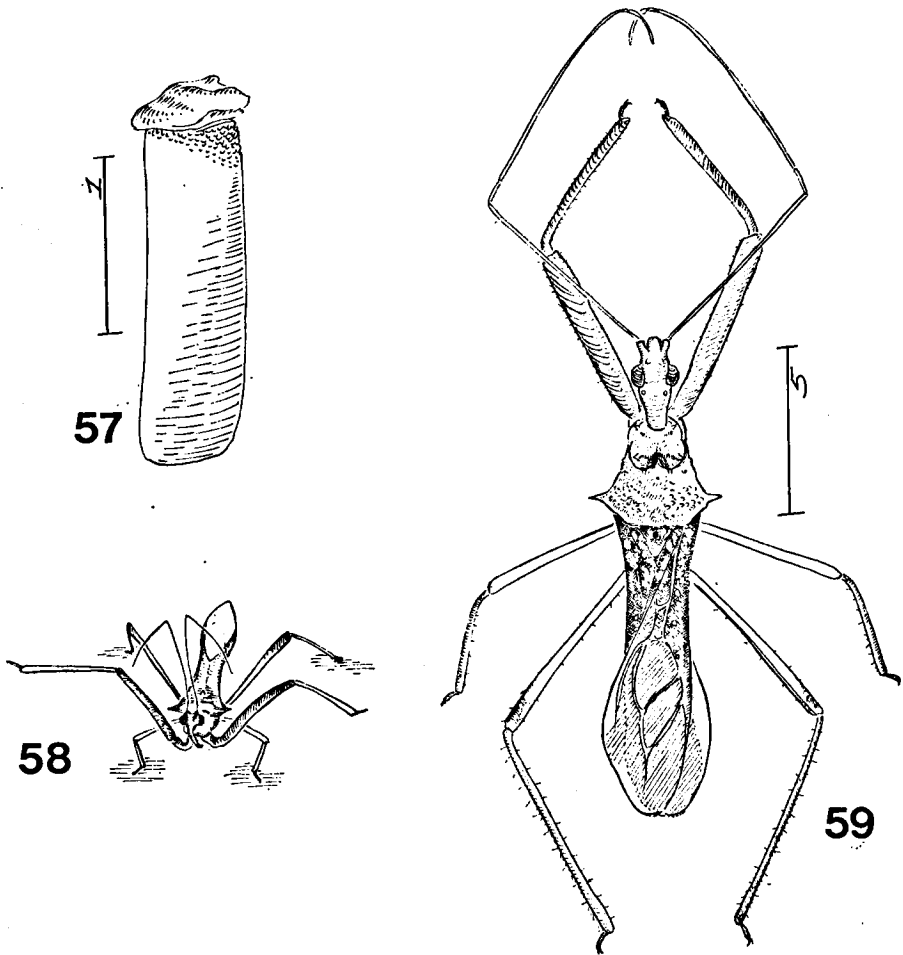


Fig. 38, *Harpactorinae*. — *Cosmoclopius curacavensis* n. sp. holotype ♂.



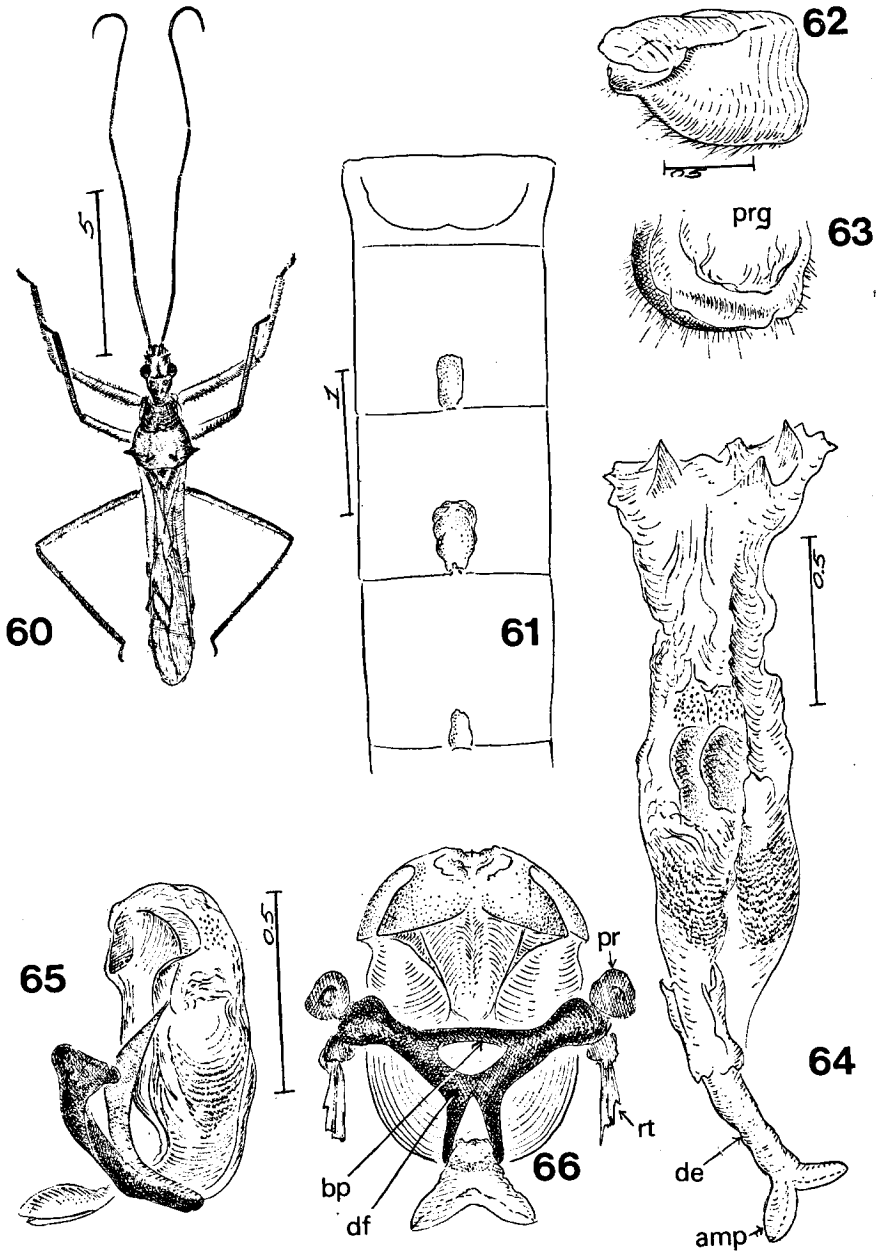
Figs. 39–51. *Harpactorinae*. – *Cosmoclopius curacavensis* n. sp. (except for 41, 44, 45); 39, head laterally; 46, cells of membrane of hemelytron; 40, pygophore in situ, seen from behind; 43, pygophore, dissected out; 42, detail of process of postero-superior border of pygophore; 51, paramere, bristles not drawn; 49, phallus seen from above, endosoma not evaginated; 50, articular apparatus and basal plate struts; 47, phallus, lateral view, endosoma not evaginated; 48, phallus, lateral view, endosoma evaginated, articular apparatus not shown; b, c, d, details of structures of endosoma with high magnification. – 44, 45, *C. nigroannulatus*; 44, pygophore, dissected out; 45, cells of membrane of hemelytron. – 41, *C. annulosus*; pygophore, dissected out.



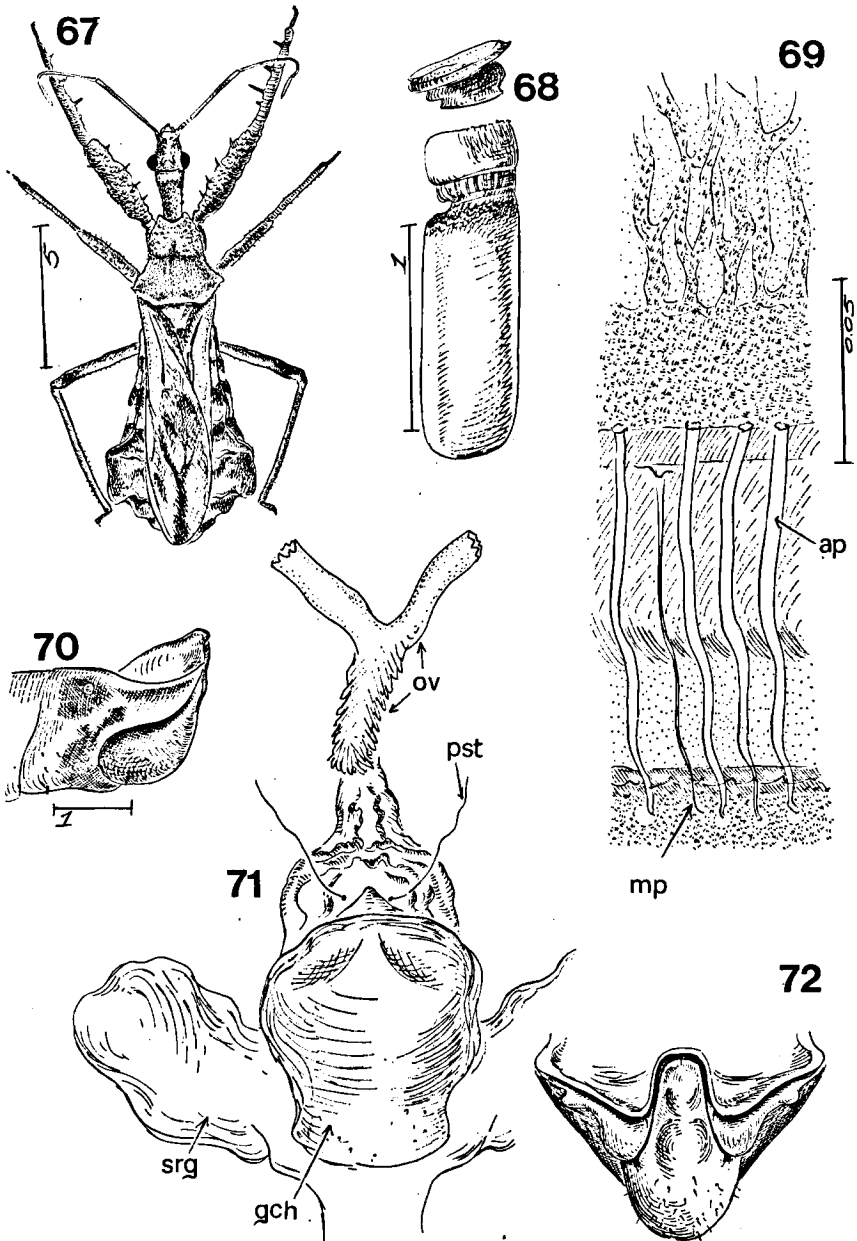


Figs. 57-59, *Harpactorinae*. - *Heza multiguttata*; 57, ovarian egg; 58, female in typical stance in wait for prey; 59, male.

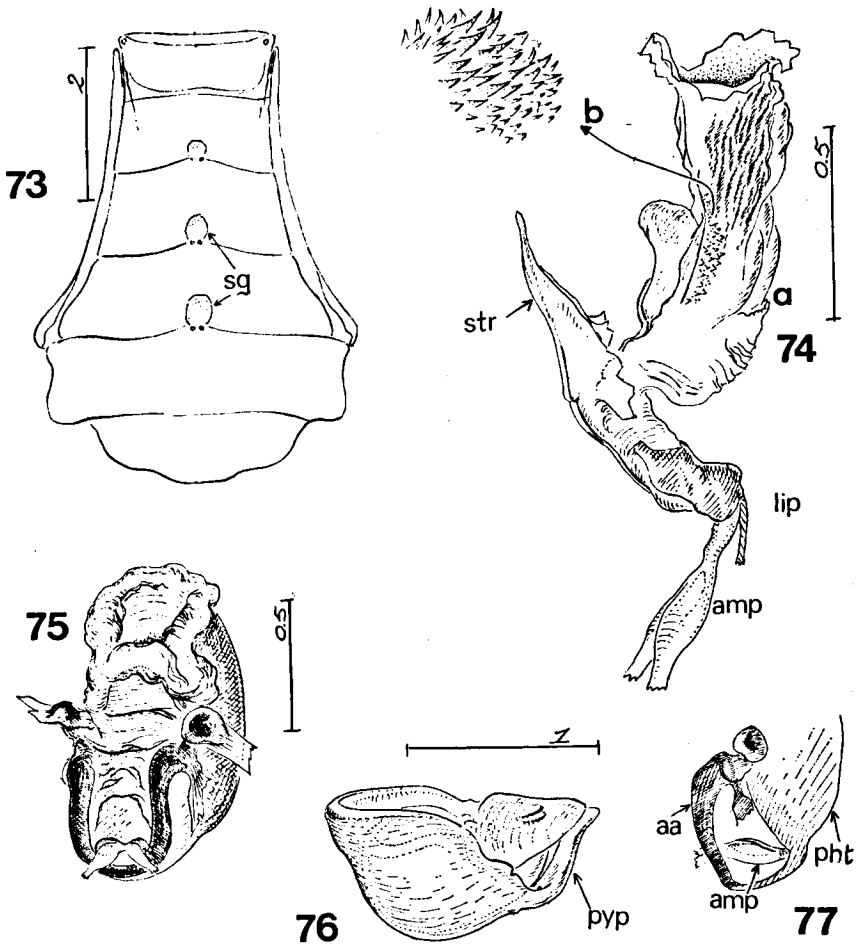
← Figs. 52-56, *Harpactorinae*. - *Cosmoclopius curacavensis* n. sp.; 52, first larval instar; 53, tibial seta of first instar; 54, tip of female abdomen, caudal view, with ectodermal cuticular linings; 55, transitional zone of female genital chamber and common oviduct, artificially stretched (compare with 56); 56, female abdomen, dorsal view cuticular invaginations.



Figs. 60–66, *Harpactorinae*. – *Atrachelus fuscus*; 60, male; 61, inner view of male tergites with scent gland reservoirs; 62, pygophore, right lateral view; 63, pygophore, obliquely from behind; 64, ejaculatory duct and endosoma (see p. 23); 65, phallus, left lateral view; 66, phallus, dorsal view.



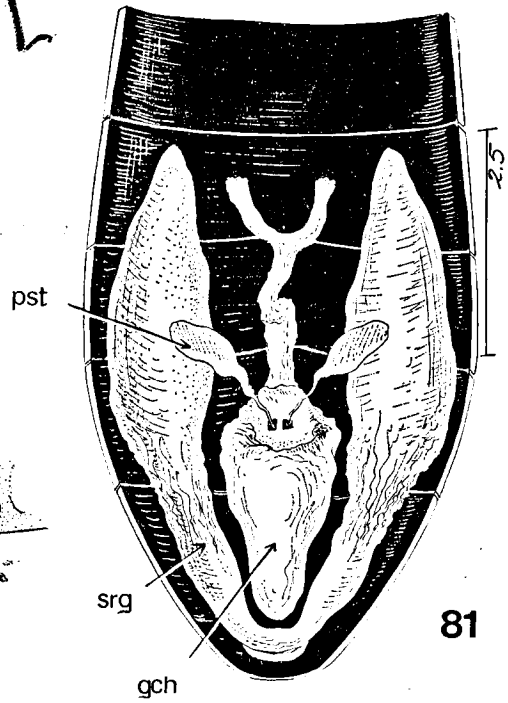
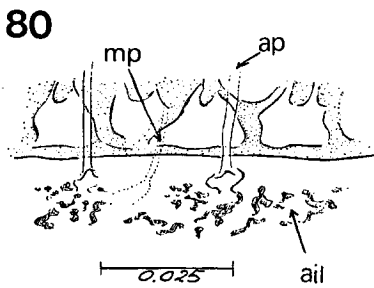
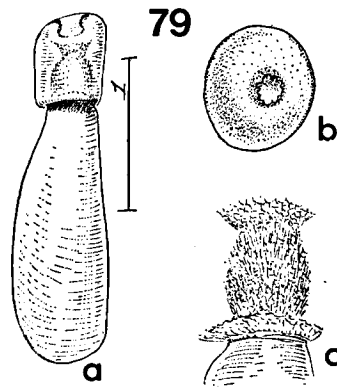
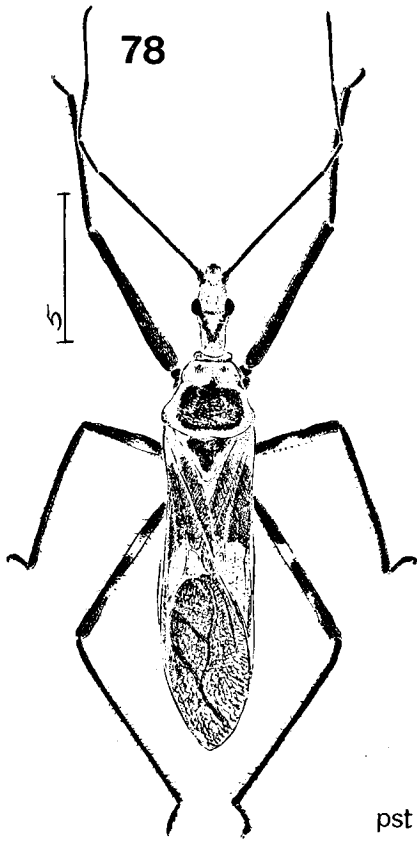
Figs. 67–72, *Harpactorinae*. — *Sinea coronata*; 67, female; 68, ovarian egg, operculum detached; 69, internal view of part of rim collar; 70, male genital segments, left lateral view; 71, female internal genitalia; 72, male genital segments from behind.

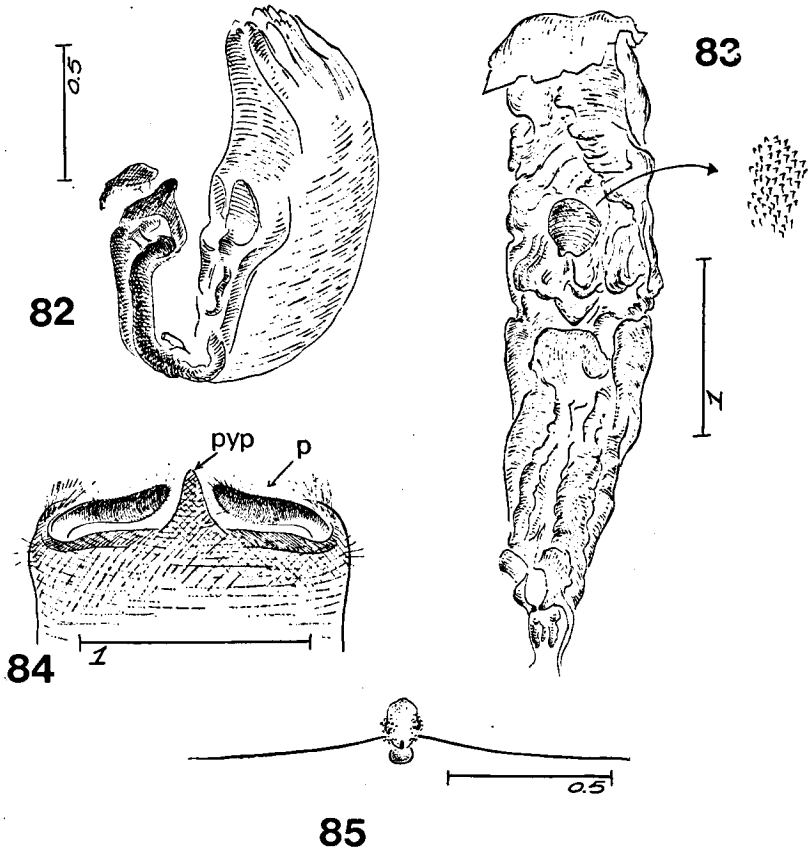


Figs. 73–77, *Harpactorinae*. – *Sinea coronata*; 73, innerside of abdominal tergum of female; 74, ejaculatory duct and endosoma; 75, phallus, dorso-lateral; 76, pygophore, left lateral view; 77, base of phallus, lateral.

Figs. 78–81, *Harpactorinae*. – *Zelus longipes*; 78, male; 79, ripe ovarian egg (a), top view (b), opercular region with rim collar omitted (c); 80, part of aero-micropylar system; 81, female reproductive system *in situ*.

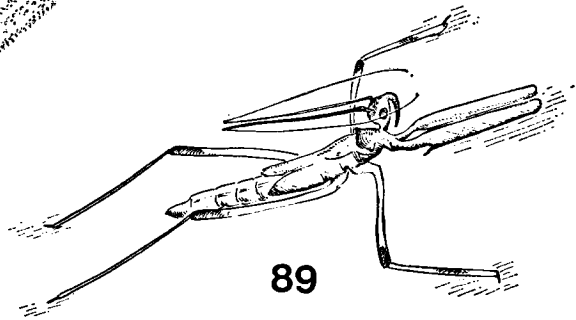
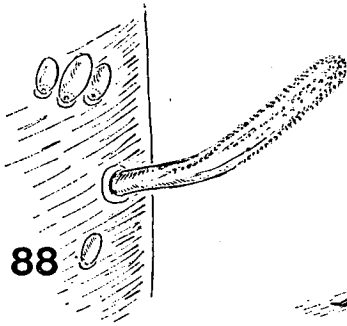
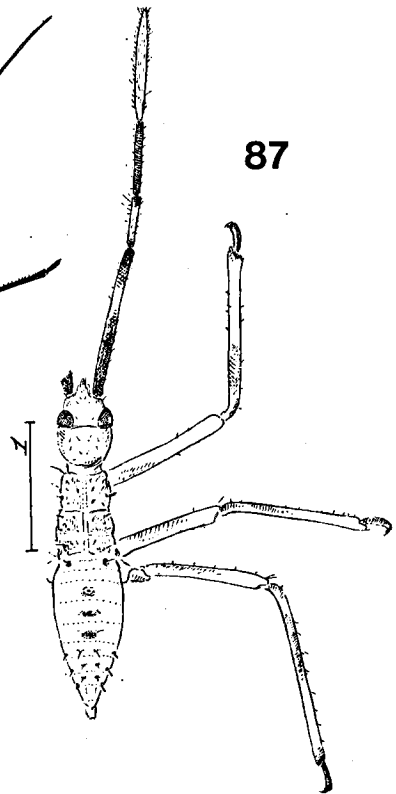
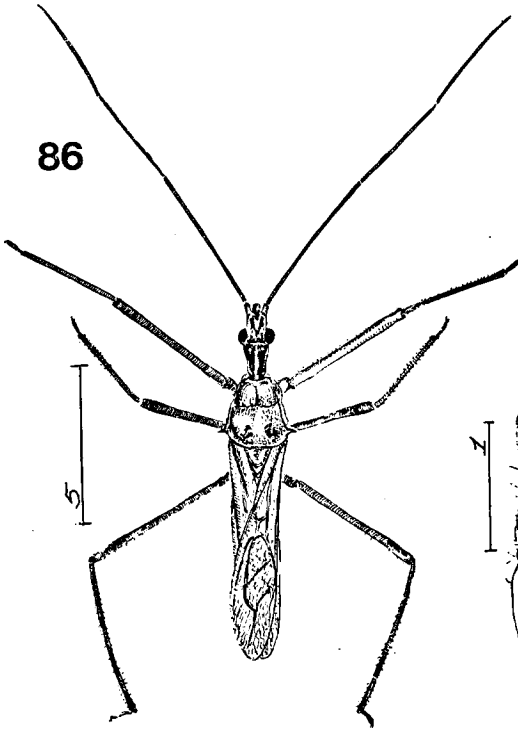






Figs. 82–85, *Harpactorinae*. – *Zelus longipes*; 82, phallus, oblique lateral view; 83, endosoma; 84, ventral-caudal aspect of pygophore; 85, dorsoabdominal scent gland of adult.

Figs. 86–89, *Harpactorinae*. – *Zelus tetracanthus*; 86, male; 87, first larval instar; 88, seta on legs of first instar; 89, typical resting position of last larval instar.



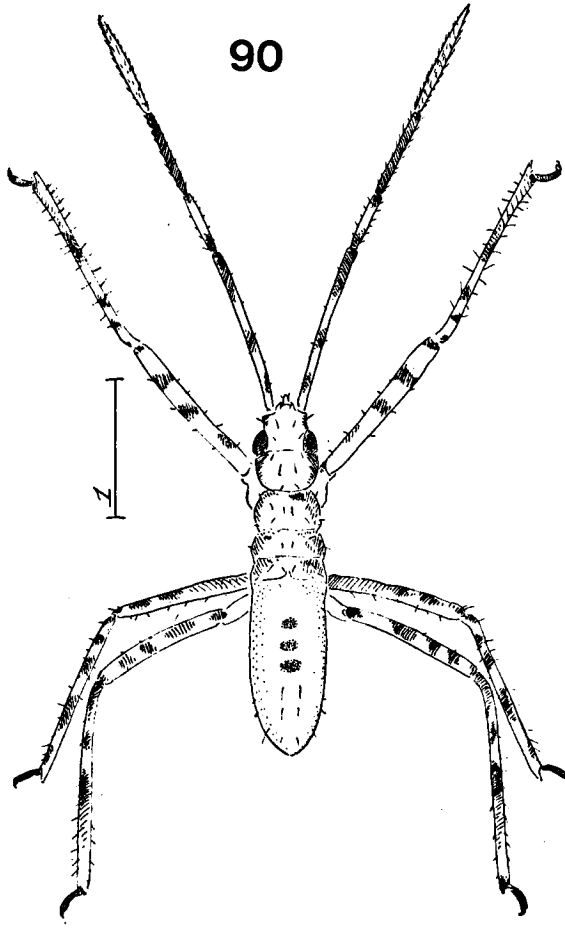
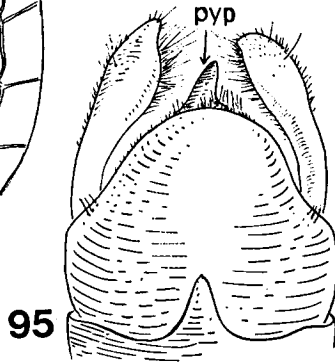
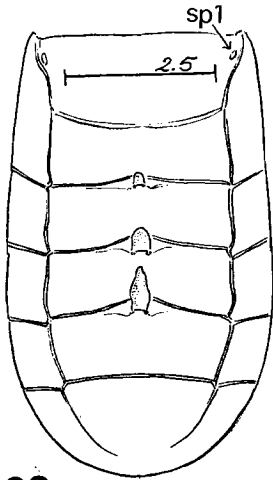
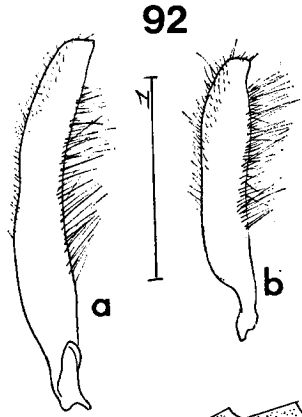
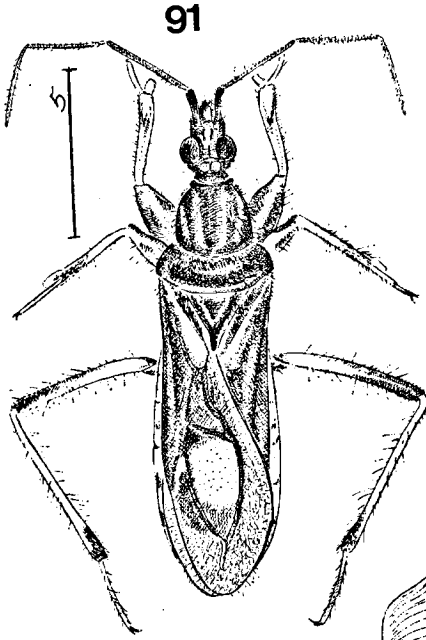
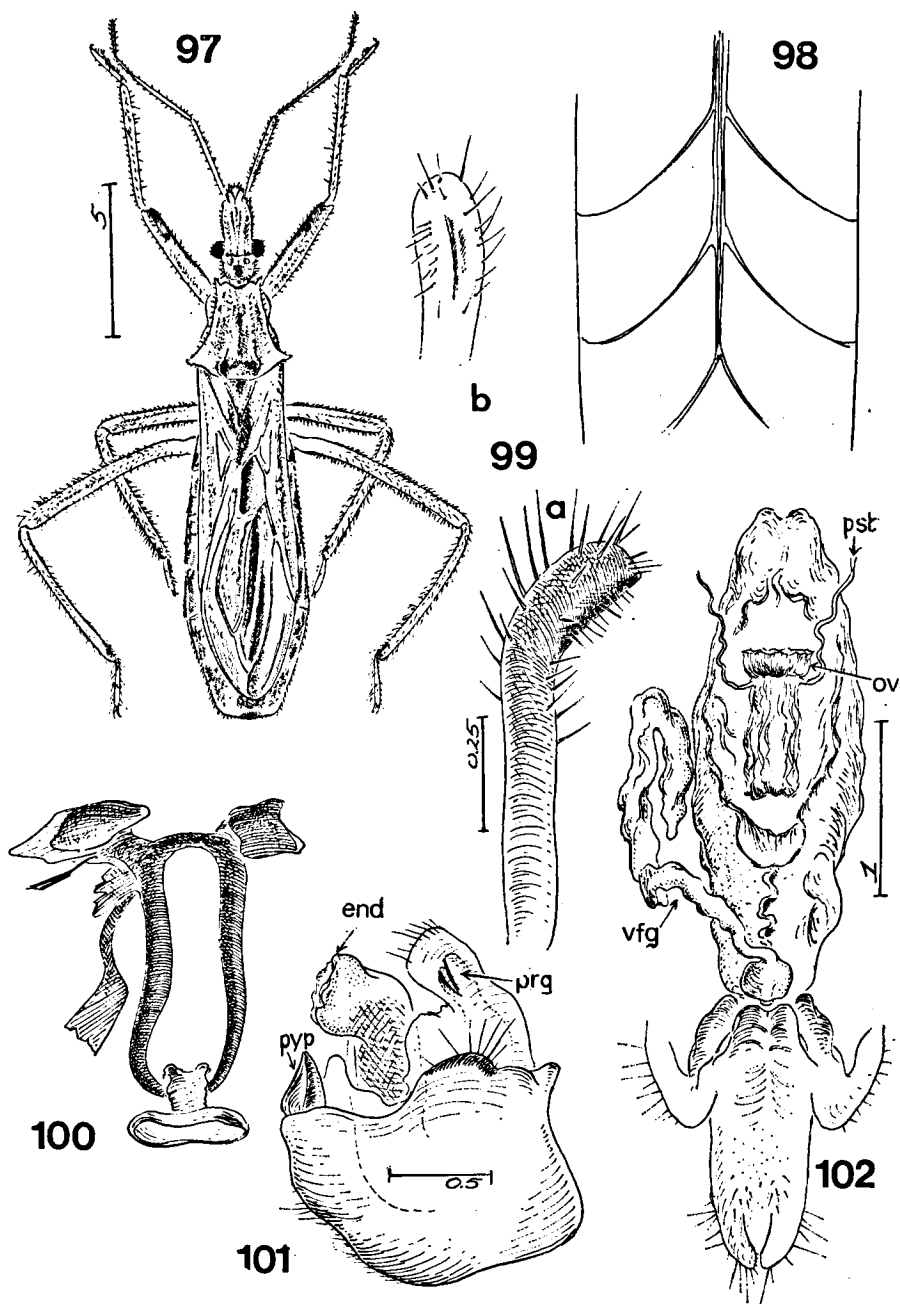


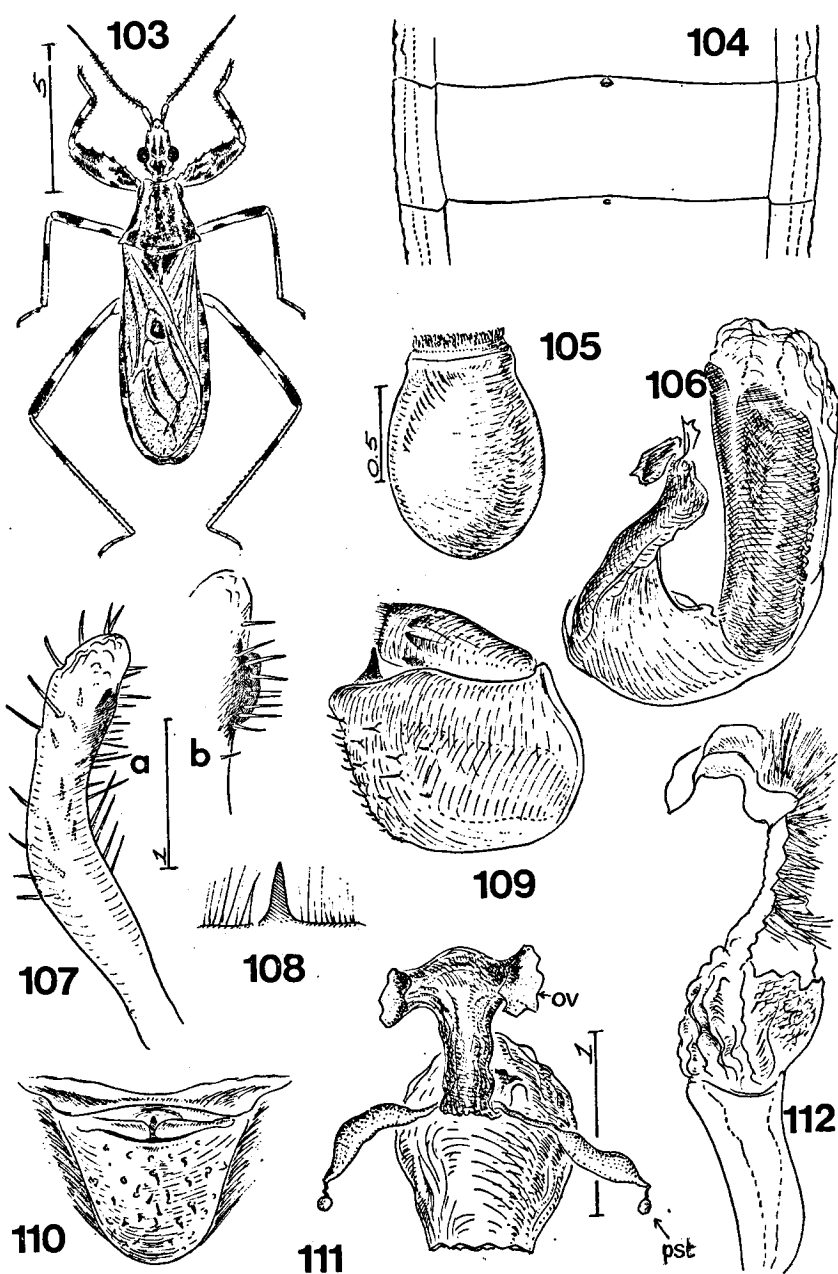
Fig. 90, *Harpactorinae*. — *Zelus grassans*; first larval instar.

Figs. 91–96, *Piratinae*. — *Rasahus hamatus*; 91, male; 92, left (a) and right (b) paramere under same magnification; 93, inner view of abdominal tergum; 94, phallus, dorsal view; 95, pregenital segment and pygophore, ventral view; 96, ductus ejaculatorius and endosoma.

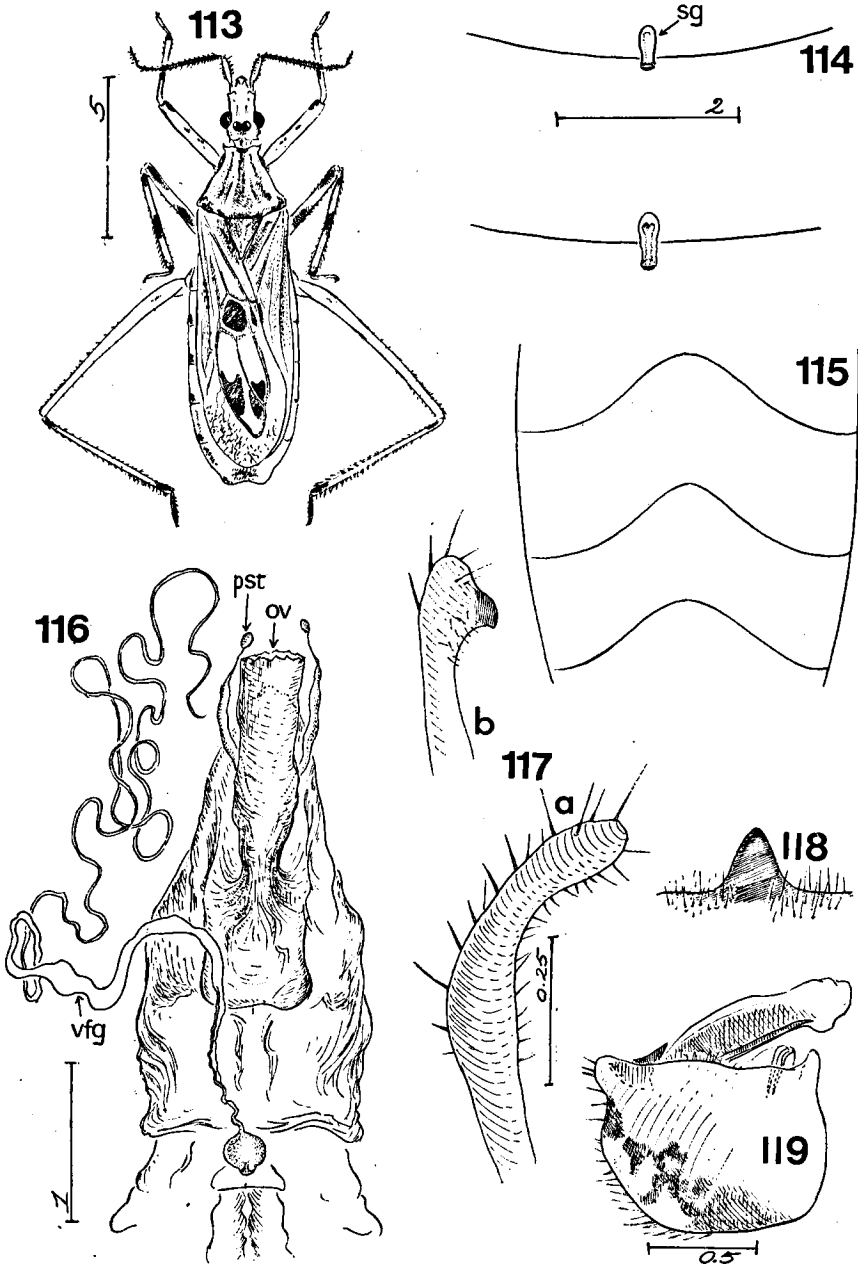




Figs. 97–102. *Stenopodinae*. – *Stenopoda wygodzinskyi*; 97, male from Curaçao; 98, inner view of abdominal ventrum; 99, left paramere, ventral view (a), inner view of apical part (b); 100, articulartory apparatus of phallus; 101, pygophore, right lateral view; 102, female reproductive organ, dorsal view.

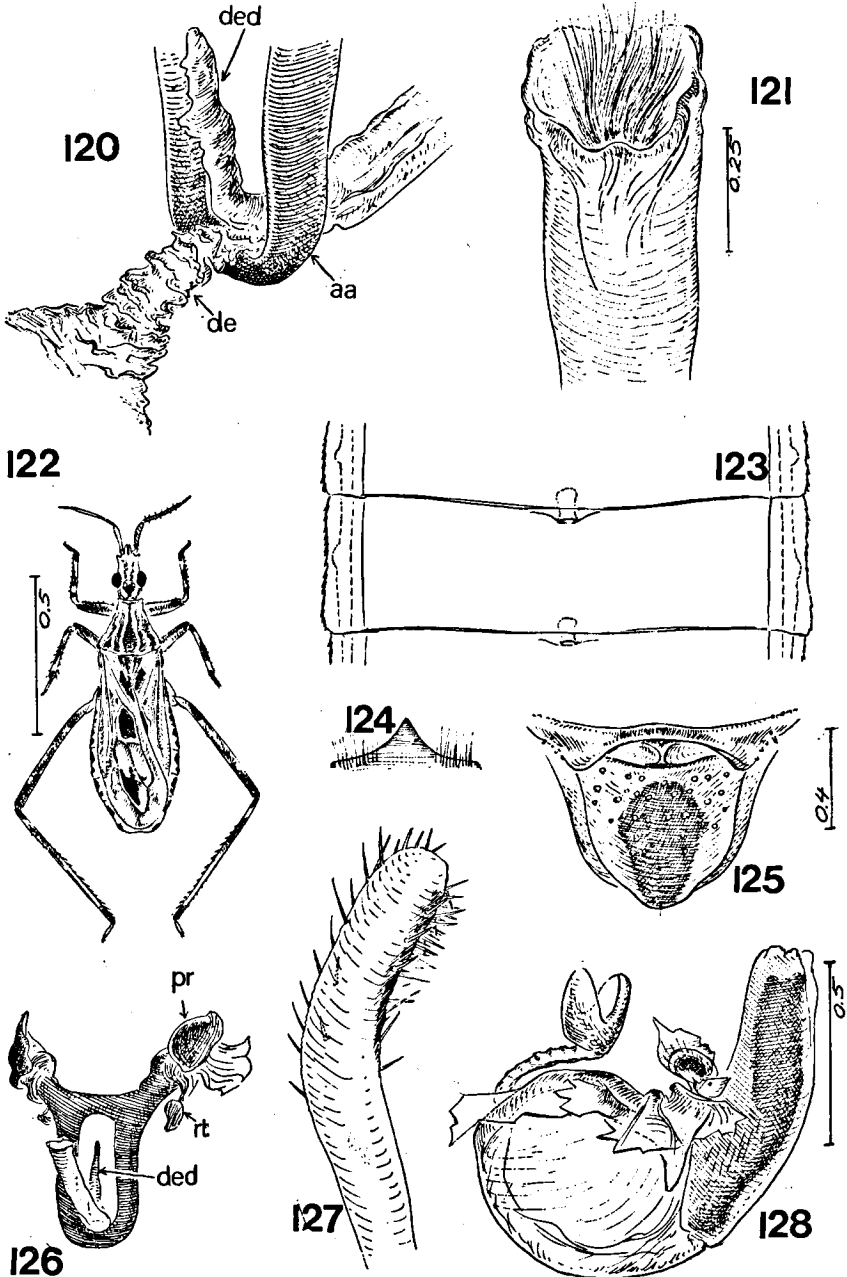


Figs. 103–112, *Stenopodinae*. — *Oncocephalus antipodus*; 103, male from Curaçao; 104, abdominal tergum of adult with remnants of scent glands; 105, ripe ovarian egg; 106, phallus, left lateral view; 107, left paramere, ventral view (a); apical part of same, slightly turned (b); 108, hind margin of pygophore; 109, pygophore, right lateral view; 110, male, aft view of abdomen; 111, reproductive internal ectodermal structures of female, dorsal view; 112, phallosome and endosoma evaginated, part of endosoma removed to show internal brushes.

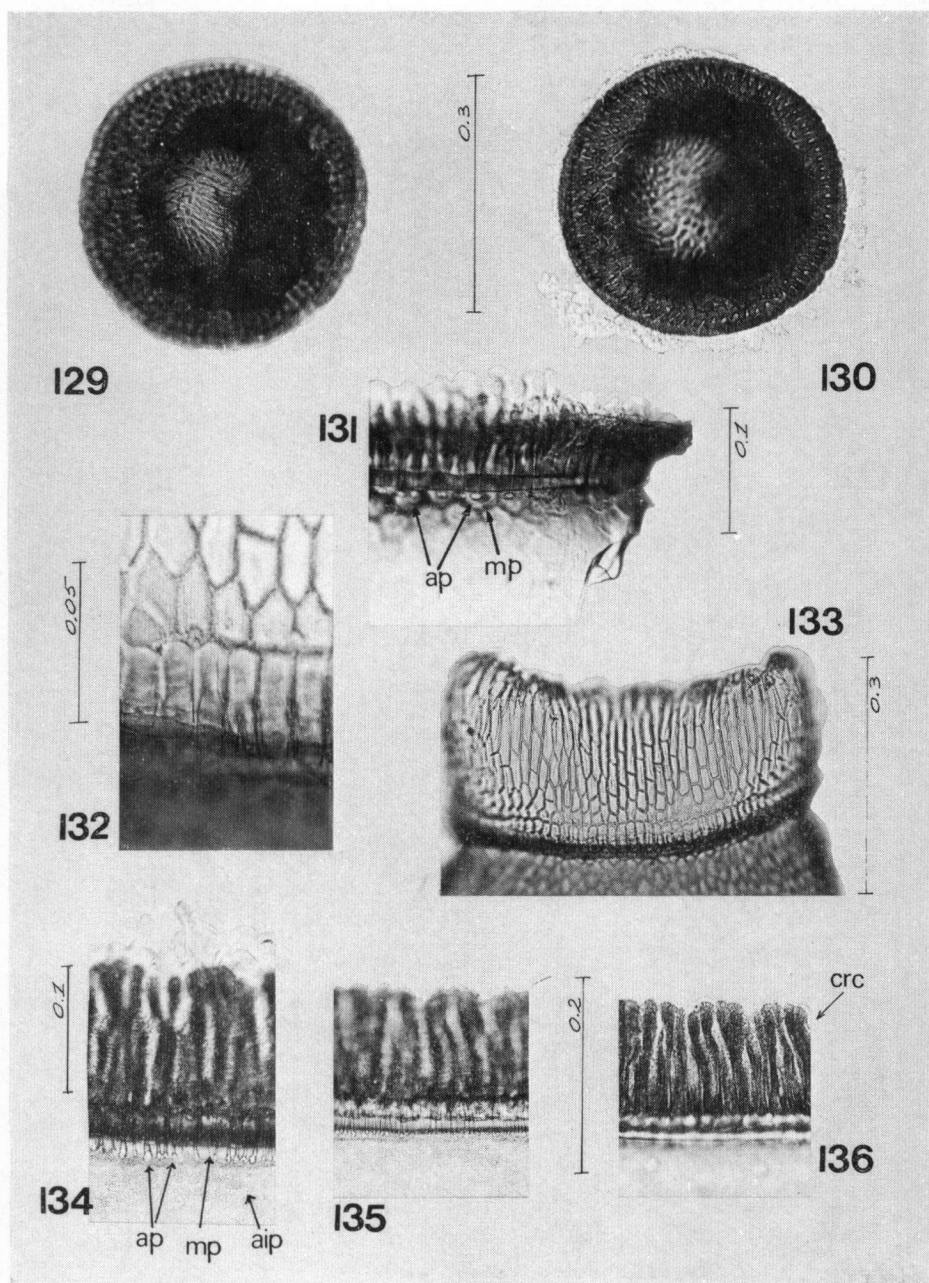


Figs. 113–119, *Stenopodinae*. – *Narvesus carolinensis*; 113, male; 114, inner view of some abdominal terga with adult scent glands; 115, some abdominal sternites; 116, reproductive internal ectodermal structures of female, dorsal view; 117, left paramere, ventral view (a); apical part of same, slightly turned (b); 118, hind margin of pygophore; 119, right lateral view of pygophore.

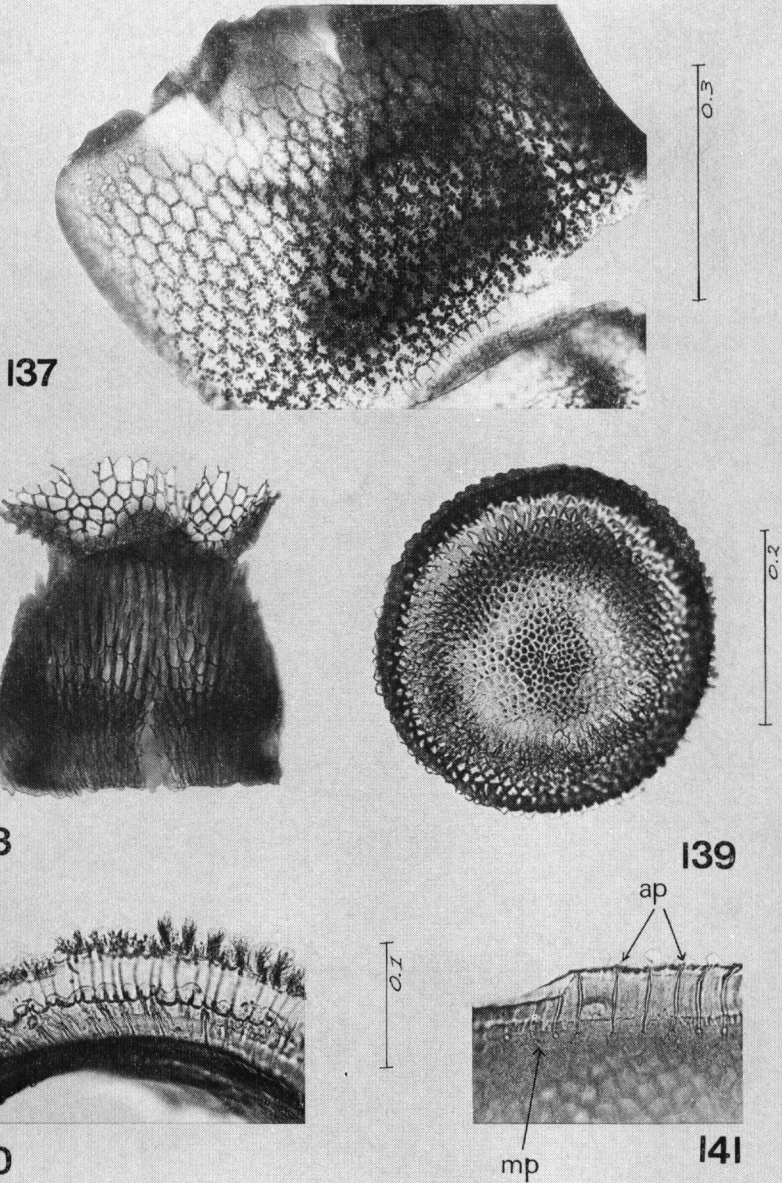




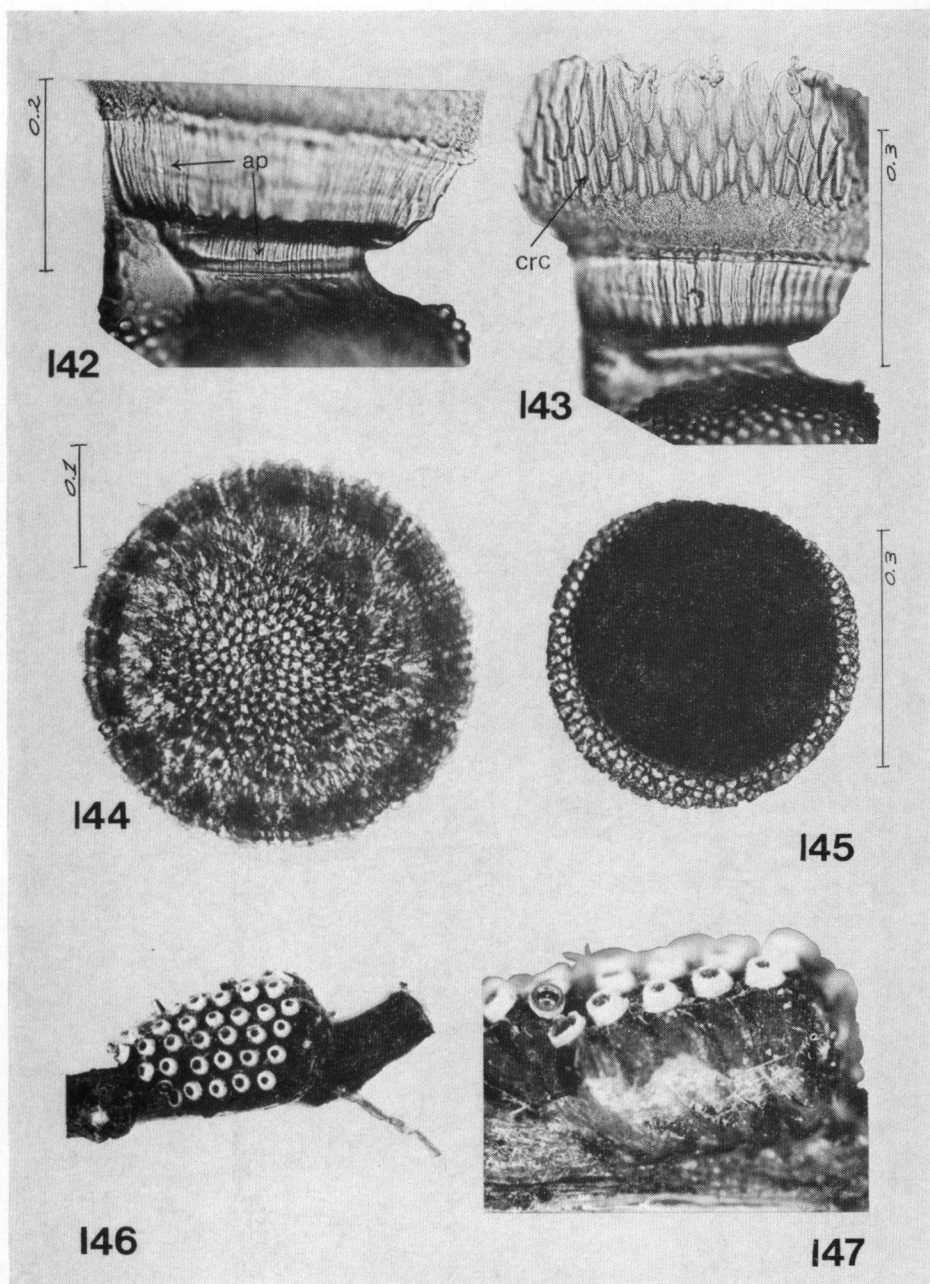
Figs. 120–128, *Stenopodinae*. – 120, 121, *Narvesus carolinensis*; 120, transition of sperm-duct through basal foramen; 121, tip of phallus. – 122–128, *Diaditus nocturnus*; 122, male; 123, sternites of adult with scent glands; 124, hind margin of pygophore; 125, male, aft view of abdomen; 126, basal articulatory apparatus of phallus; 127, left paramere, ventral view; 128, phallus, left lateral view.



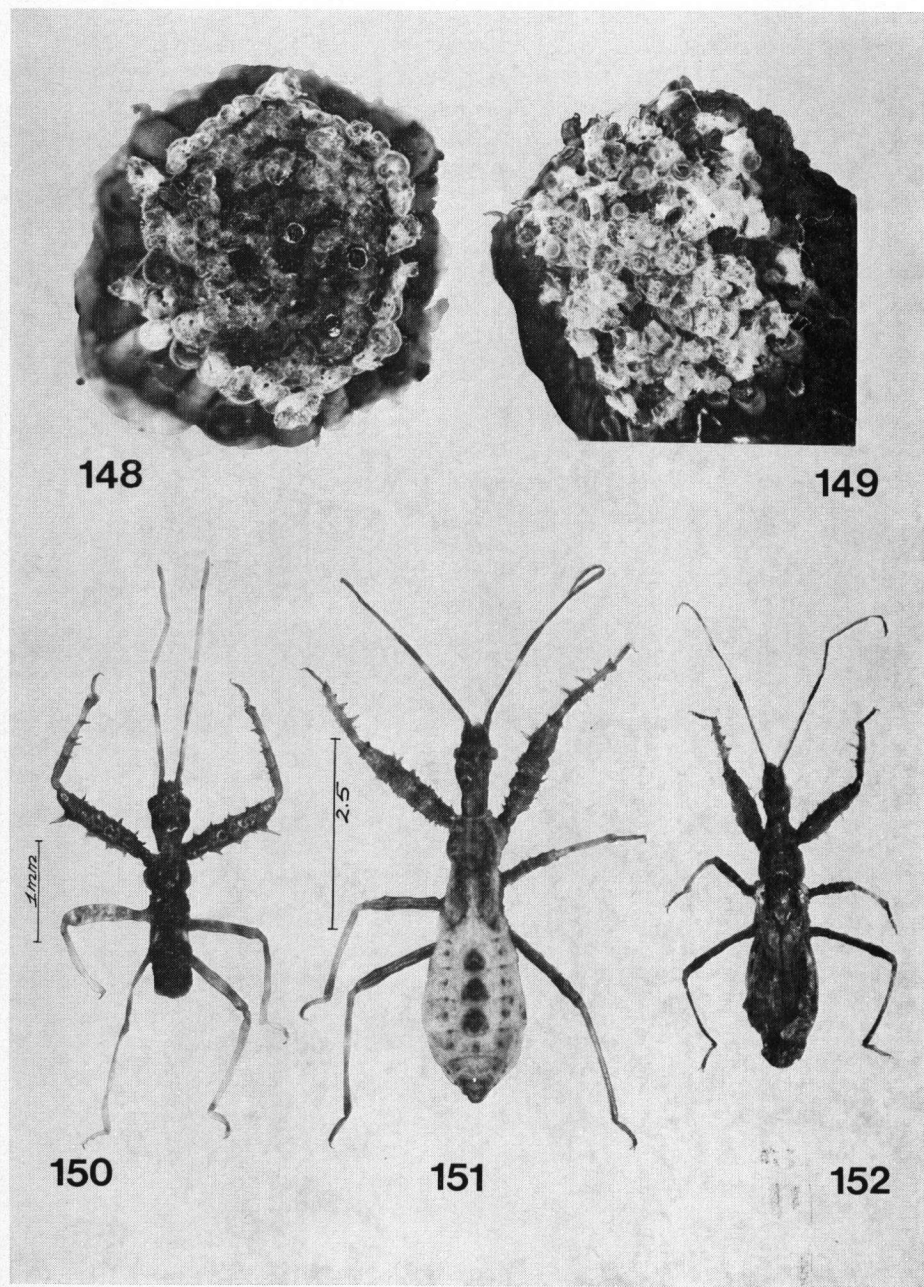
Figs. 129–136, egg structures. – 129–131, *Heza multiguttata*; 129, 130, operculum inner side at different focus; 131, part of chorionic rim. – 132, 133, *Cosmoclopius curacavensis*; 132, some aeropyles and one micropyle; 133, chorionic rim collar; 134–136, *Oncocephalus antipodus*, part of chorionic rim collar at different optical adjustments.



Figs. 137-141, egg structures. - *Zelus longipes*; 137, the elaborate rim collar; 138, upgrowth of the operculum; 139, underside of operculum; 140, lower part of chorionic rim collar from above; 141, the same, internal view.

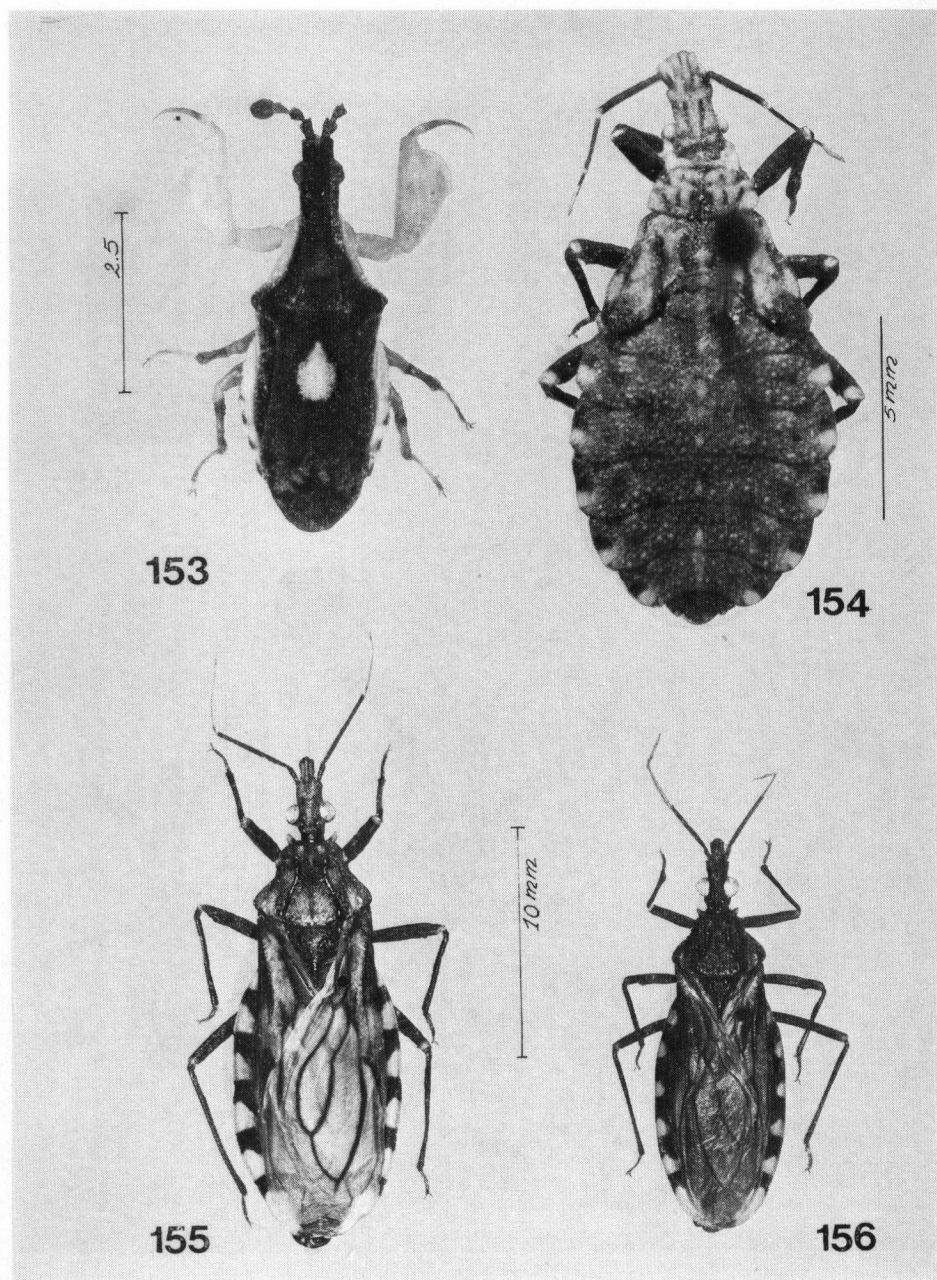


Figs. 142–147, egg structures. – *Sinea coronata*. 142, 143, aeropylar system; 144, operculum from above; 145, operculum underside; 146, 147, egg batch *in situ*.



Figs. 148–149, egg batch of *Zelus grassans*, eggs ecloded. – Fig. 150–152, first, third and fifth larval instar of *Sinea coronata*.





Figs. 153, *Macrocephalus* spec. — Fig. 154–156, *Triatoma maculata*; 154, last larval instar, Bonaire; 155, male from Curaçao, 156, male from Aruba.