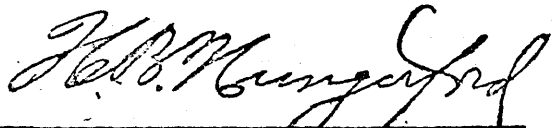


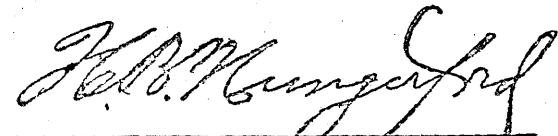
The Genus Rheumatobates

by  
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TABLE OF CONTENTS

	<u>Page</u>
Acknowledgment - - - - -	1
Introduction and Historical Account - - - - -	2
Biology - - - - -	4
Distribution - - - - -	6
Structural Characters Used in the Key and Description - - - - -	7
Key to the Species - - - - -	9
Description of the Genus - - - - -	11
Description of the Species - - - - -	12
Literature Consulted - - - - -	47
Comparative Study of the Genitalia of Some Male Gerridae- - - - -	49
Plates	

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## Introduction

The genus *Rheumatobates* is perhaps the most remarkable group of insects in the order Hemiptera. It is included in that very interesting family commonly known as the water striders. As none of the species are much over three millimeters in length the amateur often mistakes them for the immature stage of some of the larger striders and seldom gives them any attention. They are therefore usually taken only by the collector particularly interested in the group. As a result there are few specimens in our museums and the known distribution is very limited.

## Historical Account

The genus was erected by E. Bergroth in 1892. The preceding year Rev. J. L. Zabriskie, in collecting aquatic insects at Flatbush Long Island, found among his specimens a very curious one. Soon afterward C. V. Riley published a description and illustration of it in *Insect Life* without giving it a name. Upon the strength of this description Bergroth based his *Rheumatobates rileyi*. He gave as generic characters the curiously formed antennae and posterior legs and the presence of two ocelli. Ocelli, however, are absent in all species of the genus and since that time two species have been added with normal hind legs. In 1894 Uhler described a

species which he called Hymenobates imitator, this was the winged form of Meinerts R. bergrothi which he described a year later, thus Meinerts species and Uhler's genus fell into synonymy and the species became R. imitator Uhler. At the same time Meinert described R. tenuipes which is one of the two species with normal hind legs, the other was described in 1908 as R. prae posterus by Bergroth from the collection of Prof. James S. Hine. Dr. Riley was already familiar with tenuipes Mein, but he was mistaken in regarding it as the "normal" form of the apparently "abnormal" rileyi Berg. He was evidently misled by the fact that they are often found associated together and as the females are quite alike the mistake was easily made.

## Biology

Little is known regarding the biology of rheumatobates. At first these insects were thought to occur only on swiftly flowing streams but since then they have been collected from the back waters of sluggish streams and in the west even from the standing muddy waters of ponds. They are gregarious in habit, sometimes occurring in large numbers, often in association with other members of the Gerrid family particularly Trepobates pictus H. Sch. They are very active, their long intermediate legs propell them over the water with surprising speed. Grace O. Wiley writes that "The winged forms are very agile and hard to capture, they have the habit when disturbed of skimming over the surface of the water in astonishing leaps and bounds, aided no doubt by their wings even when truncated." Dr. Hungerford has made the following observations with regard to their habits: "In Kansas R. rileyi (var. Palosi Blatchlay) is common enough on the muddiest ponds and pools. Three summers have failed to disclose the nature of the oviposition. The ovipositor suggests that the eggs are laid in the tissue of a plant.

"They feed upon insects dropped upon the water and if watched in a pool teeming with ostracods they can be seen to scoop them out of the water and carry them on the upturned tip of the beak."

He describes the eggs as being .728 mm. in length and .208 mm. in width. Elongate cylindrical in shape, one end bluntly pointed and the other end rounded bearing a short micropyle.

Various functions have been ascribed to the curiously formed antennae, the most logical one seems to be that of clasping organs used during copulation. In all the species, except possibly those from South America, they seem to be well fitted to clamp around the antennae of the female. As the females have normal antennae it seems highly probable that they serve some secondary sexual function. It has been suggested also that they are prehensile in function, serving to catch and hold the insects and other organisms upon which they feed. However, if this were true the females would need this type also.

Nearly all of the species are known to be dimorphic, occurring in both the winged and wingless form. More extensive collecting will probably prove all species to be dimorphic. Generally the apterous form is the more common altho the macropterous form is very numerous at times. The winged form differs from the wingless mainly in the size and shape of the pronotum which is greatly enlarged to cover the base of the wings and almost the entire mesonotum. The venation of the wings is greatly reduced, the costal margin is thickened and sometimes fringed with short hairs. The membrane is separated

from the corium by a whitish vein which extends clear across the wing, there is also a whitish vein running the entire median length of the membrane. A vein follows the entire margin of the membrane, forming a loop. The clavis is quite narrow. The membranous hind wings are shorter and narrower than the hemelytra but they have approximately the same venation. As in other Halobatinae the winged individuals often break off their wings leaving only the corium and clavis, thus exposing the tip of the abdomen. The membrane always breaks off along the whitish vein which extends across its base.

Another curious difference between the winged and wingless forms is the presence of from five to eight long stiff hairs on the dorsal surface of the genital segment. They are arranged in a single or double transverse row depending upon whether the hairs are few or many. They are vertical or bent slightly backward. When the wings are folded back they rest upon these hairs. Only the males have these hairs and they never occur on the wingless forms of either the males or females.

#### Distribution

All of the species thus far described have been collected in the western hemisphere. Their presence in Europe seems doubtful as they have never been reported by any of the numerous aquatic Hemipterists of that



continent. It is interesting to note that for almost twenty years after the first species was described no specimens were taken far from the sea: Since that time R. rileyi var. palosi Blatchley has found as far west as the Rocky mountains and from Minnesota in the north to Arkansas in the south. R. imitator Uhler and its variety meinerti var. new, occurs in the Lesser Antillies. R. crassifemur Esaki, R. crassifemur var esakii var. new, and R. klagei sp. new occur in Argentina, Paraguay and Brazil, South America. R. praeposterus Bergroth has been collected only from Guatemala of Central America. All of the other species are found in the United States. The distribution of the various species seems to be quite limited with the exception of R. rileyi var palosi Blatchley as given above. This is probably due more to the lack of extensive collecting than to a local distribution.

#### Structural Characters Used

The structure of the antennae, the posterior legs and in one species the structure of the middle tibiae form the basis for separation of the species within the genus. In the North and Central American species the third segment of the antennae bears a peculiar spongy pit or fossa which varies to a considerable extent in size, shape and in the degree and manner of armature

the position of the tooth on the fourth segment is of some value, the hairs on the intermediate legs and the hairs and spines, but especially the manner and degree of incrassation of the hind legs easily separate other species.

The genitalia of four species were dissected and good specific characters were found. These are, however, not essential to the separation of the species and will be described in detail under the studies of the genitalia of some male Gerrids.

THE SPECIES OF RHEUMATOBATES BERGROTH  
(Key to the Males)

- A. Hind legs normal.
- B. Tibiae of middle legs strongly arched at the base, then straight to the tip.....praeposterus Bergroth.
- BB. Tibiae of the middle legs straight..tenuipes Meinert.
- AA. Hind legs incrassated, curved or deformed.
- B. Hind trochanter smaller than hind coxae.
- C. Hind femora hairless or at most with very short fine hair along the whole inner margin.
- D. Posterior margin of middle femora with a row of long straight hairs, base and tip bare.....  
.....hungerfordi Wiley.
- DD. Middle femora hairless...trulliger Bergroth.
- CC. Hind femora with long hairs on the basal third of the posterior margin....
- D. Spur on terminal antennal segment beyond the middle.....rileyi Bergroth.
- DD. Spur on terminal antennal segment before the middle.....rileyi var. palosi Blatch.
- BB. Hind trochanters incrassated, longer and larger than hind coxae.
- C: The hind trochanter inserted beyond the base of the femur.
- D. A dense tuft of bristles extending forward from the basal extremity of the hind femora.  
.....klagei sp. new.
- DD. Basal extremity of hind femora bare.....

- E. Terminal antennal segment with a row of a strong setae on the dorsal margin near the apex.....crassifemur var. esakii var. new.
- EE. Terminal antennal segment relatively bare  
.....crassifemur Esaki
- CC. Distal end of trochanter joining basal end of femur.
- D. Intermediate tibiae sinuate with long hairs at the middle.....imitator Uhler.
- DD. Intermediate tibiae straight, no long hairs at the middle....imitator var. meimerti var. n.

RHEUMATOBATES BERGROTH

Rheumatobates Bergroth, Insect Life, Wash. IV.  
p. 321. 1892.

Hymenobates Uhler, Proc. Zool. Soc. London,  
p. 214. 1894.

Halobatopsis Ashmead, Can. Ent. XXIX. p. 56  
1897.

Description of the genus from Blatchleys Hem. of  
Eastern U. S.

"Very small oblong or oblong oval species having the head quadrate wider across the eyes than long, its blunt tylus projecting forward between the basis of the antennae; eyes very large, coarsely granulated; antennae of males curiously curved and armed with several short acute spines; pronotum much wider than long, its front and hind margins truncate; mesonotum (brachypterous form) subquadrate, three or more times as long as pronotum; Elytra rarely present; front legs short, ~~stout~~, the tibia less than half the length of femur; basal joint of tarsi very small second joint with apical half flattened beneath and claws inserted near the middle; middle legs very long and slender, tibia and usually the femur of male fringed on the inner side with long hairs."

RHEUMATOBATES RILEYI BERGROTH

Rheumatobates rileyi Berg. Insect Life, Wash.

IV. p. 321. 1892.

Halobatopsis beginini Ashmead, Can. Ent.

XXIX. p. 56. 1894.

This is the first species described and is the one upon which the genus was erected. Blatchley's description is as follows:

"Length 2.8 -3 mm. Oblong robust, narrowed behind. Above velvety black; a transverse median spot on the pronotum, a diamond shaped median spot on the mesonotum, a rounded one above the middle coxae, the front femora and the reflexed connectivum yellow, antennae, beak and middle and hind legs fuscous brown, the bases of the antennals and of the femora yellow, under surface pale yellow, abdomen often with a dusky tinge. Male with first joint of antennae gradually thickened from the base, armed beneath at apical third with one or two short spines; second joint very short armed with a slender spine near the base; third strongly curved with a shallow spinose fossa at apical third; fourth with apical half curved acute, armed in front of the middle with a strong tooth. Middle tibia of male fringed with short hooked hairs on inner side of basal half; hind

femora of male swollen, strongly curved and fringed within on basal third with a tuft of long hairs, the apex also with two tufts of hairs; hind tibia narrowed and slightly curved at the base, fringed above on inner side with short stiff hairs and with a tuft of long hairs glued together projecting backward from inner side of basal fourth. Female with antennae and legs unmodified, the former beset with a few long stiff bristles."

Notes: The mesosternum is unicolorous varying from light yellow to dark yellow. The color variation in this species is much less than in rileyi var. palosi Blatchley. Even here however, the mesonotal spot becomes smaller and darker and almost disappears entirely in some individuals.

Distribution: The distribution seems to be very limited having been taken only near the Atlantic coast from New York to the District of Columbia.

RHEUMATOBATES RILEYI VAR. PALOSI, BLATCHLEYRheumatobates rileyi var. palosi Blatchley,

Hemip. of East. U.S. 1926

Blatchley gives the following description for this variety.

"Differs from rileyi in having the body of the male more slender, yellow spot on the mesonotum only about half the width of that of pronotum; tooth of apical joint; <sup>behind middle</sup> hind tibiae straighter, more slender, without tubercle on apical half and with a fringe of long black hairs along the entire inner side. Female with mesonotum wholly black!"

Notes: The hairs on the head are shorter while those on the inner margin of the hind femur are longer and more numerous than those in R.rileyi, Bergroth. The color characters given in the above description hold only for a very small number of individuals in the variety. Dr. Hungerford's collection contains specimens from a wide range of localities and the variation in color is remarkable. The spot on the mesonotum is not at all constant in size shape or color. Specimens from Hodgmen County Kansas have the spot almost a creamy white, covering more than half the width of the mesonotum, only slightly narrower than the spot on the pronotum. Even



the black band on the anterior margin of the mesoσsternum is broken between the anterior legs. Some of the females taken at the same place not only have a mesonotal spot, but it is even larger than that of the male, it runs the full length of mesonotum. The metanotum also has an irregular dark yellow spot. At the other extreme are specimens from Douglas Lake Michigan which, except for a small brown pronotal spot, are entirely black above. These specimens are also remarkable for their very large size, being by far the largest individuals in the genus, the males measure fully 3.1 mm. and the females 3.4 mm. in length, while the specimens mentioned above are only 2.7 mm. and 3. mm. in length for males and females respectively. Between the two extremes in color almost every gradation exists. Other specimens from Kansas have the pro-and mesonotal spots brown, the latter very faint in some cases. Specimens taken in Minn. are just as black as those from Michigan, but they are of normal size. In the past, color has played a very important part in separating the species especially the females. Where such a range of color exists it can be of little or no use in identification.

Distribution: Rh. rileyi var palosi Blatchley seems to enjoy a wider distribution than any other member of the genus. It has been taken in at least six states, these are: New York, New Jersey, Michigan, Minnesota, Arkansas and Kansas.

RHEUMATOBATES TENUIPES, MEINERT

Rh. tenuipes, Meinert Ent. Meddel. V. p. 7

1895.

Rh. tenuipes, Bergroth Ohio Natur. VIII. p. 381

1908.

Description according to Bergroth's key: \*

"Mesonotum scarcely (male) or slightly (female) broader than long, median yellow spot distinctly narrower than pronotal spot. Mesosternum yellow with the anterior margin and two posteriorly diverging bands brownish black, dilated near the anterior margin. Second male antennal joint beneath at the base with a small tubercle bearing a fine hair (not visible when joint is strongly deflected) the curved basal part of the third joint one-half the length of the whole joint, the spongy pit occupying the apical half with a long slender spine at its base, fourth joint scarcely shorter than third, curved near the base and at the extreme apex with the curved spine on the basal half. Middle tibiae in the male fringed with short hooked hairs on the inner side, almost to the apex. Hind legs in both sexes simple, straight and hairless."

Notes: The general form and appearance of this species is very much like that of the rileyi, Bergroth,

except that the hind legs are normal. The third antennal joint is a little shorter and the fossa or spongy pit occupies about one half the segment while in rileyi it covers only a little more than the apical fourth the tooth on the fourth segment is even nearer the base than in rileyi variety palosi, Blatchley. Except for the ventral spine, the first segment is entirely free from hairs and those on the third and fourth segment are much shorter and lighter. The macropterous male has the pronotum expanded as in other winged members of the genus it differs however, in being distinctly longer than wide, and in having about six or eight long stout black hairs scattered over each side of the anterior region. There are also a number of pits on each side of the mid-dorsal line between the two hairy regions. The entire costal margin of the corium bears a row of hairs, these are about twice as long as those on rileyi.

Distribution: The distribution of this species is the same as that of rileyi Bergroth, with which it often associates. It has also been taken in Georgia.

Types: One of Meinert's types taken by O. Heidemann at Glen Echo, Maryland, is in the Snow collection Kansas University, Lawrence.

RHEUMATOBATES IMITATOR UHLER

Hymenobates imitator Uhler Proc. Zoo. Soc. London. p. 214, 1894.

Rheumatobates bergrothi Meinert Ent. Meddel. V. p. 7, 1895.

Description taken from Bergroth's key.

"Mesonotum much broader than long. Second male antennal segment with a slender spine beneath near the base, third segment with a strong triangular tooth at the basal end of the not dilated spongy pit, the lower margin of the pit beset with stiff hairs, fourth segment much shorter than third, straight, unarmed. Middle coxae in the male not thicker than the hind coxae, trochanter many times smaller than the hind trochanter, femora fringed with long hairs on the inner margin near the base and apex, the remaining part glabrous, tibia somewhat curved in the middle where they are thickest, from the base to near the middle fringed on the inner side with short curved hairs then along a shorter space with long hairs. Hind trochantera of the male excessively incrassated, much broader and thicker than the coxae and femora, armed with a stout spine on the upper side, longly and thickly pilose on the inner side, femora incrassated and curved with a strong tooth on the upper side before the middle and a curved chitinous

process on the inner side behind the tooth, near the apex on the same side with another linear chitinous process (apparently made up of hairs glued together), tibia rather stout, slightly curved, the inner margin with scattered hairs from the base to near the middle, behind the middle fringed with long hairs."

Notes: This species is dimorphic occurring in both the apterous and macropterous forms. First described under *Hymenobates* by Uhler, and later as *Rh. bergrothi* by Meinert who described the apterous form as a new species.

Rheumatobates imitator var meimerti var new

Size: Male, length 2.7 mm. width 1.3 mm. female, length 3.24 mm. width 1.3 mm.

Color: body velvety black or blackish brown above; head dark brown along the posterior margin; pronotum with a large median rectangular yellow spot, anterior margin of spot almost as long as the width of the head, posterior margin shorter; mesonotum with a median yellow spot varying in shape from diamond to obovate lying closer to the anterior than to the posterior margin; a yellow spot lying above the acetabula on the posterior margin of the mesopleura; abdomen with a silvery bloom, condal two-thirds of the male connexiva yellow, outer margin of female connexiva yellow for almost the entire length; entire ventral surface yellow except the anterior margin of the mesosternum which is brown and the middle abdominal segments which are light brown.

Structural characters: Apterous male:

Head: distinctly longer than broad, three or four long stiff hairs scattered along the lateral margins.

Thorax: pronotum, length .21 mm. a stout hair directed backward from each lateral margin; mesonotum, length .75 mm. with an indistinct median line, metanotum, length .4 mm.

Antennae: first segment the longest almost as long as three and four together, thickened at the middle, base and apex about equal in thickness, armed at the outer under side at the middle with a brush of stiff bristles glued together, and a group of similar hairs just behind it, also a group of eight or ten stiff hairs on the dorsal side at the middle, second segment very short, half again as long as thick, a little thinner than the apex of the basal segment, the ventral base bears a tubercle armed with a brush of hairs glued together; third segment long, strongly curved at the basal third, armed at the angle with stout setae, thickened toward the apical third which bears a pit or fossa, armed with stout setae on the inner margin; fourth segment about one-third as long as the third, coated at the tip not conspicuously armed.

Anterior legs: coxae small trochanters enlarged and ventrally expanded, femur thinner than first segment of antennae, armed with a row of black setae on the ventral surface; tibiae about one-half as long as the femora, also armed with hairs on the ventral surface first tarsal segment very short, the two tarsal claws prominent.

Intermediate legs: coxae large, almost as thick

as long with a tubercle on the outer posterior margin surrounded by hairs which close over it; trochanters small only slightly thicker than femur; femora slightly over 2 mm. long and of uniform thickness throughout its length, unarmed except for a few hairs at the apex; tibiae 2 mm. long only very slightly sinuate, armed with short hairs along the middle; tarsi about 1.7 mm. long the first joint about three times as long as the second.

Posterior legs: coxae slightly longer than coxae of intermediate legs, but not as thick, with a small tubercle on the dorsal posterior margin; trochanter very large and globular .4 mm. thick, armed on the inner posterior margin with a broad edged projection the edge lying vertically, a dense row of long hairs, arising from the inner side extend to the median body line; femur thickened, almost as thick as the coxae, closely and broadly joined to the trochanter without constricting, curved at about the middle toward the median body line, armed at the angle on the dorsal surface with a curious clavate structure attached at about one-third of the distance from its anterior end by means of a short stem or pedicel, femur margined on the outer side of its point of attachment to this structure by a row of stiff hairs directed upward; a brush of long stiff bristles arise from the inner apical fourth, in the natural position of the



legs these brushes cross each other; tibia joined a little before the apex of the femur on the outer side, curved outward and thickened toward the apical third then tapering to about the same thickness as the base, about as long as the trochanter and femur taken together armed on the inner margin of the apical third of its length with a row of hairs. Tarsi a little more than half the length of the tibiae, first segment about twice as long as second.

Apterogus female structural characters:

Head slightly broader than long with two hairs on the lateral margins and one on either side of the base of the tylus, two hairs directed forward from the posterior margin of the eyes as in other species; pronotum with a hair on the lateral margin and the mesonotum with three hairs on the lateral margins; outer margins of the connexiva covered with long black hairs for their entire length; anterior legs small, trochanters not expanded as in the male, femora with a row of short black setae on the outer side and a row of fine hairs on the ventral side, two long setae on the ventral side, two long setae on the ventral side of the tibiae; intermediate coxae with a tubercle surrounded by hairs, femur straight with a row of very short black setae on the inner margin; posterior legs straight femora slightly thickened toward the apex tibiae about one-third shorter

than femora tarsi one-half as long as the tibiae.

Notes: The male of this variety differs from that of R. imitator Uhler mainly in the following respects. The tibiae of the intermediate legs of imitator are markedly sinuate with a short row of long hairs at about the middle with short hairs on either side of these. In variety meinerti var new. the tibiae are almost straight and only the short hairs are present. The middle femora of imitator have a row of long hairs at the base and apex while in var. meinerti. the femora are entirely bare. In this variety the clavate structure on the hind femur projects about one-fourth of its length beyond its supporting stem which is not the case in imitator.

The females of imitator Uhler and var. meinerti var new, can be easily distinguished from all others in the genus by the presence of the hairs on the connexia, which are lacking in all other species. The female of var meinerti has a comparatively broad dark band on the anterior margin of the mesosternum, this band is sharply broadened opposite each anterior coxa, there is also a dark band marking off the middle acetabula.

Distribution: taken only from Aux Cayes Hayti.

Types: holotype, apterous male, allotype apterous female, paratypes three apterous males and one female. All collected by H. Nepperschmidt.

RHEUMATOBATES TRULLIGER BERGROTH

R. trulliger Bergroth Bull. Brooklyn Ent. Soc.

p. 63, 1915.

R. trulliger Blatchley Hem. of Eastern U. S. 1926.

R. trulliger Hungerford Biology of Aquat. Hem.

North of Mexico. Kansas

University Sc. Bull. 1919.

Size: Male, length 2.6 mm. 2.8 mm. width 1 mm.

1.1 mm.

The original description is as follows:

"Color as in Rh tennipes Meinert, the pale losonge-shaped spot on the mesonotum <sup>being narrower than</sup> the spot of the pronotum and the mesosternum being marked with two longitudinal black bands. Mesonotum of the apterous form in both sexes somewhat broader than long.

Male: The spongy fossa of the third antennal joint occupying some what less than the apical half of the joint, being distinctly longer than in Rh. rileyi but shorter than in tennipes; fourth antennal joint somewhat shorter than third, being conspicuously longer than in R. rileyi but a little shorter than in R. tennipe, its spine placed in the basal half but nearer to the middle than to the base. Legs much as in rileyi but with the following differences. Middle femora perfectly straight, hairless from the base to near the apex, where there are a few hairs

on the inner margin. Middle tibia fringed with long straight hairs on the inner side from the base to beyond the middle, then with short straight hairs. Curved hind femora scarcely or slightly thicker at the middle than at the base and apex, with very short and tiny hairs along the whole inner margin. Hind tibiae on outer side between middle and apex with a distinct spine and the apex filled with a very thick tuft of rather long hairs."

Notes: In addition to the characters given above this species differs from rileyi Bergroth in having remarkably thick basal antennal segments, the vertical thickness being one third the length of the segment, also the dorsal and lateral surfaces are free from hairs. The pronotum of the apterous form and the corresponding area of the macropterous form has short black hairs scattered over the surface resembling tenuipes Meinert in this respect. The pronotum is decidedly longer and narrower than in rileyi but not as long as in hungerfordi Wiley. The apical third of the posterior tibia is flattened to form a spoon shaped concavity with a dense fringe of hairs covering the margins. The spine between the middle and the apex referred to above is composed of a tuft of long hairs glued together; in many individuals these hairs have either never been joined or

have become separated and no longer appear as a distinct spine, but only as a tuft of hairs somewhat longer than the adjoining ones.

Specimens taken in Arkansas are black with a bluish bloom especially on the abdomen; the mesosternum and the spots on the pro- and mesonotum are very light yellow. Specimens taken in Kansas are light brown with the same color markings given above except that the mesonotal spot is somewhat smaller and less clearly defined.

Distribution: Georgia (type locality), Kansas and Arkansas.

RHEUMATOBATES HUNGERFORDI WILEYR. hungerfordi Wiley Can. Ent. LV. 1923

Description after the original.

Velvety black, covered with a bluish-white bloom except on head, pronotum with a large yellow spot occupying the entire length, quadrate to twice as long as wide with sides rounded; mesonotum with a large median yellow spot quadrate or diamond shaped in some species. Connexivum of male yellow for at least half its apical length, in female along outer half for almost its entire length, small yellow spot above intermediate acetabula.

Structural characters: Apterous male

Head shorter than in rileyi Bergroth and tenuipes Meinert, slightly narrower than in rileyi. Pronotum long, longer than in any other species. Nearly twice as long as that in rileyi, but much narrower, mesonotum not as broad as long. Antennae with the basal segment very thick armed on the outer under side with a brush of hairs glued together and just beneath with a scattered bunch of coarse hairs. Second segment short, unarmed. Third segment almost as long as first, strongly curved at basal half, large fossa orbit occupying nearly entire apical half, and extending a little beyond insertion of segment four. Segment four as long as the third with a thick

tooth just before the middle, bent outward at the middle, apex curved back. Intermediate legs long and slender, femur of uniform thickness throughout, armed on inner margin with a row of long straight hair of uniform length, base and apex bare; tibia as in rileyi with long straight hairs near the base and shorter hooked hairs at the middle, apical third bare. Posterior legs; coxa and trochanter slender, linear; femur arched as in rileyi, but not thickened and free from hair; tibia joined to femur nearly at right angles. Angularly elbowed near the base, thickened and tufted at the angle with a stiff brush of hairs.

Notes: The macropterous form is very common. This is a very slender species resembling trulliger Bergroth in this respect.

Distribution: recorded only from Texas and Utah.

RHEUMATOBATES PRAEPOSTERUS BERGROTHR. praeposterus Bergroth Ohio Natur. VIII.

p. 379, 1908.

## Original description:

"Male: head, promotum and mesonotum together longer than the rest of the body; first antennal joint as long as the head, incrassated and compressed and with a submedian spine on the upper and under side, the apical part upturned with a tuft of hairs on the inner side of the tip, the upper margin almost straight from the base to beyond the middle, the lower margin angularly dilated, second joint inserted at right angles to the fore side of the apex of the first joint, third joint shorter than the first with the short basal part narrower than the second joint, straight and linear than moderately and suddenly incrassated, but not dilated and proceeding in a gentle curve to the apex, the curved apical part occupying more than two-thirds of the joint and provided on the posterior side with a very shallowly impressed spongy surface with some stiff hairs on the lower margin and a toothlike projection at the base, fourth joint a little longer than third, inserted at right angles to the back side of the apex of the third joint, unarmed, shortly pilose, rectangularly curved not far from the base; fore femora very slightly thickened



toward the base; middle femora as long as hind femora slightly incrassated and curved toward the base and with a spine on the inner side not far from the apex and a very short acute spur on the same side immediately before the apex, middle tibiae subsemicircularly curved at the base, turning the convexity of the curve outward, with a tuft of short hairs on the inner side of the tip of the curve, from which point to the apex the tibiae are straight with some rather short straight hairs on the outer side of the middle part; hind legs straight, simple, three-fourths longer than the body, the tip of the abdomen slightly passing the base of the hind femora when they are stretched straightly backwards.

Female: head, pronotum and mesonotum together shorter than the rest of the body; antennae simple, linear, the first joint a little shorter than the head, third joint a little longer than the first with a few rather long stiff hairs in the inner side near the base and apex, fourth joint as long as the third; fore femora linear; middle legs straight, simple femora longer than hind femora, tibiae a little shorter than femora and longer than tarsi; hind legs as long as the body, the tip of the abdomen reaching the apical fourth of the hind femora when they are stretched straightly backwards."

Notes: the outstanding characters of this species are the peculiarly joined antennae, the long fossa of

the third joint and the arched basal portion of the middle tibia.

Distribution: Guatemala Central America.

RHEUMATOBATES CRASSIFEMUR ESAKI

R. crassifemur Esaki Ann. Musei. Nat. Hung.

XXIII. p. 148, 1926.

Original description is as follows:

"Apterous form male: Body black or blackish brown. Head blackish brown with a bluish grey spot on the vertex. Eyes dark gray. Antennal black, with first joint yellowish white. Pronotum black or blackish brown with the central portion broadly yellowish white. Mesonotum black or blackish brown with a large bluish gray spot at the center. Metanotum black or blackish brown, much suffused with bluish gray. Underside of thorax black, anterior and intermediate acetabulae yellowish white beneath. Anterior legs with coxae trochanter, and femur except the apex yellowish white. Intermediate legs black or dark brown, trochanter and the base of femur pale yellow posterior legs dark brown, coxa and basal half of trochanter yellowish white. Abdomen above black or blackish brown suffused with bluish gray; genital segment, apical portion of connexiva, and posterior margin of dorsal abdominal segment yellowish white. Abdomen beneath black, with the sixth abdominal and the genital segments yellowish white.

Head nearly as long as broad between the eyes. Eyes moderately prominent laterally. Antennae: first

joint nearly as long as the head, much thickened at the middle, not armed with long setae, second joint very short, third joint a little longer than the second, but thinner than the latter, fourth joint the longest, a little constricted at about one-third from the base, and vertically dilated at the apex, with a tuft of long stout setae on the outer side at the base. Pronotum very short, comparatively much shorter than in rileyi or in tenuipes. Anterior and posterior margins moderately sinuate. Mesonotum somewhat broader than long. Metanotum about two-thirds the length of the mesonotum. Anterior legs small, trochanter about twice as long as coxa, femur not long, not incrassated, with a fringe of long hairs inwardly, though sometimes much obscured, tibia about equal to the half of femur in length, widened towards the apex, tarsus about two-thirds the length of tibia, flattened, first joint very small. Intermediate legs strongly developed, coxa very large nearly as long as thick, with a conspicuous tubercle on the outer side near the apex, trochanter very large, a little longer than coxa, femur very long and thick, nearly as long as body, club-shaped, much incrassated near the apex not curved, not fringed; tibia much longer than femur, about one and a half times as long as femur, much thinner than the latter, moderately tapering towards the apex, not

fringed; tarsus nearly equal to half the length of tibia joint about twice as long as second. Posterior legs comparatively short nearly as long as intermediate tibia; coxa nearly longer than thick; coxa almost globular at the base with a conspicuous tuft of long stout setae at the basal corner, which is curved inwardly near the middle, connected to the femur at a little after the base of the latter: femur one and a half times as long as trochanter, incrassated towards the base, with a fringe of five or six stout setae on the apical half of the superior surface; tibia long and slender, about one and a half times as long as femur, not armed; tarsus very short, shorter than half the length of the tibia, first joint a little shorter than the second. Dorsal of abdomen flat, dorsal abdominal segments very distinct, connexiva conspicuous, first dorsal genital segment somewhat tube-like a little shorter than twice the length of the sixth dorsal abdominal segment, second dorsal genital segment much shorter and narrower than the first."

Notes: The color of the female is much like that of the male, except in specimens taken in Argentina which have very little black and are a very pronounced bluish-gray; the female is flat and broad, especially across the abdomen.

This species differs from R.esakii sp. new, in having more massive appendages. The intermediate tibiae are somewhat longer and the brush is lacking from the anterior end of the posterior femora. It occurs in both the apterous and macropterous forms.

Distribution: R. crassifemur Esaki has been taken in Argentina and Paraguay, South America.

Types: One female is in the Snow collection, Kansas University, Lawrence. Others are in Hung. Nat. Mus. Budapest and Natur. Hist. Mus. Vienna.

REUMATOBATES KLAGEI sp. new

Apterous form male:

Size: Length 2.44 mm. width 1.2 mm.

Color: body dark velvety brown; head dark brown with lighter brown along the eyes; pronotum with a large rectangular lighter brown spot; mesonotum distinctly set off from the pleurae by a black suture; intermediate acetabulae yellow below and at the apex above; metanotum and abdomen very dark sometimes covered with a silvery bloom, the genital and sometimes the pregenital segment yellow; basal antennal segment yellow, second segment brown third and fourth black. Acetabulae of the prothorax, coxae, trochanters and basal three-fourths of anterior femora yellow; coxae, trochanters and base of femora of intermediate legs yellow, with black areas at the apices of the coxae and trochanters; coxae and basal half of posterior legs yellow, remainder of leg black.

Structural Characters

Head: quadrate, as broad as long, lightly tapering anteriorly, tylus very prominent, a stout hair between the eyes and the base of the antennae, two hairs directed forward from the posterior margin of the eyes. The beak is smooth and hairless.

Thorax: pronotum short as in crassifemur Esaki,

mesonotum sharply defined from the pleurae, length and width equal (.62 mm.), metanotum a little more than half as long as the mesonotum.

Antennae: basal antennae segment as long as the head including the tylus, slender, much thinner than the femur of the anterior legs, not or hardly thickened at the middle, unarmed; second segment very short about as thick as it is long, with two fine hairs on the outer margin; third segment thinner and about one and one-half times as long as the second with two hairs on the inner margin; fourth segment as long as the first, curved outward in a regular arc, basal third thin and apical two-third flattened laterally, apex pointed, but not hooked, armed with a few hairs scattered around the middle of the segment.

Anterior legs: anterior legs as in R. crassifemur Esaki with the apical half of the tibia expanded a little more. The ventral row of hairs on the femur extending over the basal third and apical third, the median third bare, hairs at the base very long.

Intermediate legs: coxa large, hairy at the apex, tubercle present, trochanter comparatively longer than in crassifemur var esakii var. new, also hairy at the apex. Femur not as greatly incrassated as in crassifemur Esaki and armed only with three or four stout setae near the base. Tibia about one-fifth longer than femur,



armed with a row of hairs at the apex, tarsus hairy at the base, basal segment a little longer than the terminal segment.

Posterior legs: posterior legs slightly longer than in crassifemur var. esakii var. new, base of trochanter thickened, but not globular as in crassifemur Esaki, the tuft of stout setae at the upper basal corner much lighter and shorter and not bent, two tufts of setae at the ventral base, a heavy ventral tooth a little beyond the middle. The trochanter is attached a little beyond the base of the femur, femur about one and one-half times as long as the trochanter, bowed and flattened laterally, armed with a short stout tooth on the anterior end and with a brush of long stout setae just below the tooth directed forward to the middle of the trochanter, a comb of short stout setae on the inner ventral edge opposite and somewhat beyond the point of attachment to the trochanter. The inner surface of the apical third is concave and has a fringe of hairs on each edge at the apex.

Description of Apterous female:

Size: Length 3 mm. width 1.4 mm.

Color: Body dark brown or black with bluish bloom on the mesonotum, metanotum, pleurae and dorsal surface of the abdomen. Head black with brown posterior and

lateral margins. Pronotum with a broad median light brown spot. Connexiva black except at the apex which is tipped with light brown. First genital segment is brownish yellow with a black anterior margin, last segment black. First, second and basal half of third antennal segment yellow, apical half of third and fourth black. Coxae, trochantera, femora and sometimes the base of the tibiae of fore legs light yellow, joint between femora and tibiae black, apical half of tibiae and tarsi black. Coxae, trochanters and base of femora of intermediate and posterior legs yellow, remainder black. Under side of head, prosternum and anterior half of mesosternum dark yellow with two divergent brown bands, abdomen light brown, pregenital segment yellow on the posterior margin.

Structural characters:

Body much flatter than in the male also broader and very spindle shaped. Head less angular at the corners than in the male, antennae slender, formula 23:8:20:30. Fourth joint slightly thickened toward the apex, four or five setae scattered around the third segment, fourth joint with one dorsal setae at a little beyond the middle. Pronotum very short, mesonotum four times as long as the pronotum, metanotum about one-half as long as the pronotum and mesonotum together. Anterior legs as in crassifemur Esaki but with a ventral row of long white

hairs on the femur, three or four long setae on the tibiae. Intermediate legs long and slender, coxa well developed trochanter somewhat thicker than femur, tarsus very slender, a little more than three-fifths as long as the tibia. Posterior legs one-half as long as intermediate legs, femur as long as tibia and tarsus taken together, tarsus less than one-half the length of the tibia, basal joint a little shorter than apical joint.

Notes: The male of this species differs from R. crassifemur Esaki and its variety esakii var. new, in being decidedly more spindle shaped. The eyes are not as parallel, being closer together in front. All appendages are much more slender except the femur of the anterior legs which are slightly thicker. The first segment of the antennae, instead of being thicker than the anterior femur is hardly two-thirds as thick. The apical two-thirds of the fourth segment is almost unarmed. The length of the middle femur compared to the tibia is as 5 is to 4 much more nearly equal than the 3:2 ratio given for crassifemur. The posterior legs are longer and more slender than those of either crassifemur or its var. esakii. The tooth on the protruding base of the femur is greatly reduced and the brush below it is absent in both crassifemur and its variety esakii. The ventral tooth of the trochanter in this species is

about twice as large as that of crassifemur var. esakii. The brush on the inner basal corner of the trochanter is also much lighter in this species; it is straight and much thinner not meeting across the abdomen when the legs are parallel.

R. crassifemur Esaki, its variety esakii var. new, and R. klagei sp. new, form a distinct group in the genus as they have characters in common that the other species do not have. The relative lengths of the antennal segments are entirely different as are also the segments of the posterior tarsi. In all other species the third antennal segment is at least as long as the fourth segment, while in these species the third segment is only about one-fourth as long as the fourth segment. The spongy pit of the third segment present in a fully developed form in the other species is entirely lacking in crassifemur and klagei with merely an indication of it in crassifemur variety esakii.

Distribution: Taken only from the type locality on the Solimoes River, Amazonas Brazil, South America.

Types: Holotype, male. Allotype, female, Paratypes, many males and females. All types are apterous. (The macropterous form is unknown.) Types deposited in the Snow collection Kansas University, Lawrence.

RHEUMATOBATES CRASSIFEMUR var. esakii

var. new.

Description of Apterous male:

Size: Male, length 2.5 mm. width 1.2 mm.

Color: Body brown or blackish brown, head with lighter brown along the posterior margin and the margin along the eyes, eyes black indistinctly mottled with brown; pronotum with a light brown sometimes yellow rectangular spot; middle acetabula yellow, dorsal half sometimes black, genital segment yellow, in some species the pregenital and the connexiva of the last three abdominal segments are brownish yellow. In the lighter species the posterior half of the ventral side of the abdomen is yellow, coxae trochanters and basal three-fourths of anterior legs yellow, coxae, trochanters and base of femora of intermediate legs yellow, sometimes the coxae are blackish brown, coxae and basal half of trochanters of posterior legs yellow.

Structural characters;

Head: Quadrate, slightly longer than broad, between the eyes, a prominent hair between the eyes and the base of the antennae, four or five short hairs on the margin near the eyes. Two hairs extending forward from the posterior surface of the eyes.

Thorax: Pronotum comparatively short about .2 mm.

long. Width and length of mesonotum equal (.67 mm.), a distinct suture separating at least the anterior portion of the mesonotum and the mesopleura. Metanotum slightly more than half as long as the mesonotum.

Antennae: Basal segment as long as the head, greatly thickened at the middle, much thicker than the anterior femur, unarmed. Second segment very short, as thick as it is long with two hairs on the outer side, more or less geniculately joined to the first segment. Third segment longer, but thinner than the second with two hairs on the inner side. Fourth segment much the longest, one-third longer than the first and almost as long as the first three taken together. Basal third thin with a sharp pointed clavate spine attached laterally at the extreme base, apical third dilated vertically toward the apex then sharply constricted into a recurved hook. Dorsal margin of dilation fringed with a row of very stout setae decreasing in length toward the apex. Three smaller setae near the middle of the segment. The whole segment is bowed outward.

Anterior legs: As in crassifemur except that the femur is slightly thickened a little beyond the middle, the ventral fringe of hairs is quite sparse, broken in the middle and develops into two rows toward the apex.

Intermediate legs: Strongly developed as in R. crassifemur, coxa very large with a tubercle on the outer apex, trochanter much larger than the base of the femur loosely joined to the coxa. Femur club-shaped, with a row of stout short setae along the inner margin. Tibia one-fifth longer than the femur, unarmed except for a few hairs at the apex. Tarsus hairy at the base, first segment about twice as long as the second.

Posterior legs: As in crassifemur but somewhat longer than the intermediate tibia. Coxa twice as long as thick. A small tooth directed downward from a little beyond the middle of the ventral surface of the trochanter; trochanter articulates dorsally a little beyond the base of the femur; a comb of very short stout setae on the inner ventral margin near the base, and a fringe of hairs on the dorsal apical third.

Notes: The general shape and appearance of this species is about the same as that of R. crassifemur Esaki. It differs, however, in the following manner: the middle tibia instead of being one and one-half times as long as the femur is only one and one-fifth times as long. The femur of the fore leg is somewhat thickened and the row of hair on the posterior margin is not continuous, the middle being bare. The fourth antennal segment of crassifemur is bowed outward regularly to the tip while in crassifemur var. esakii

var. new, the tip is sharply and almost completely recurved. The fringe of long stout setae near the apex of the fourth segment is absent in crassifemur. The description of crassifemur does not indicate the presence of the tooth on the ventral margin of the trochanter. The hind legs instead of being nearly as long as the middle tibiae are somewhat longer.

Distribution: All specimens in the collection were taken from the Solimoes River, Amazonas Brazil.

Types: Holotype apterous male, paratypes three apterous males all taken at the locality given above in association with R. klagei sp. new. Collected by Klages.



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A COMPARATIVE STUDY OF THE GENTALIA  
OF SOME MALE GERRIDAE

In recent years the genitalia have begun to play an important part in taxonomical work. At the suggestion of Dr. Hungerford that a study of the genitalia of Rheumatabates might be of value especially if made a comparative one with other members of the family the following brief treatment of a number of selected genera and species resulted.

The so called Hemipterous orders are among the last of the more common orders of insects to receive the attention of morphologists and taxonomists in their attempt to homologize the various structures and appendages of the male genitalia.

The first substantial contribution to our knowledge of the genitalia of Hemiptera was a paper by David Sharp on "The Structure of the Terminal Segment of the abdomen in some Male Hemiptera," which appeared in 1890. In this paper he described and illustrated the genital segment of numerous species of Pentatomidae. However as pointed out by Singh Pruthi and other morphologists since that time his conclusions were erroneous in several respects. He did not recognize the true interrelationship of the several parts of the

aedeagus. He considered the phallosoma, which he called the "theca" as merely a protective covering of the aedeagus proper. Closer examination would have shown the two to be a continuous structure and capable of being evaginated. He credited the parameres which he termed "lateral appendages" with being merely protective organs whose function was to serve as feelers to properly direct the aedeagus during copulation, and considered it improbable that they are clasping organs. Sharp was struck by the great differences between homologous structures, so much so in fact that it seemed incredible to him that species closely related systematically should have common ancestry.

In 1895 Peytoureau, in his paper "Contribution a l'etude de la Morphologie de l'armure genital des Insects" gives the results of his examination of Velia currens (Veliidae). He seemingly accepts Sharps conclusions without question as he too considers the phallosoma as a distinct structure from the rest of the aedeagus and like Sharp failed to mention the basal plates at all.

In 1899 Heymans first investigated the embryological development of the genital segment.

Berlese, in 1909 was the first morphologist to study the genitalia in greater detail and was the first to describe and figure the basal plates. Even he

however, confuses them with the parameres in certain instances.

In 1922 Christophers and Cragg gave an excellent description of the basal plates in their paper on the genitalia of Cimex lectularius in referring to it as a "circumphallic chitinization encircling the base of the phallosoma and usually forming a bed for its reception ..... from this the whole organ is slung."

In the same year Raymond Poisson investigated the chitinous structures of the aedeagus in an endeavor to determine their value as specific characters in taxonomic work. He considered the genitalia as arising from the eighth abdominal segment in which he is now generally believed to be in error. In 1924 he published his work "Contribution a l'etude des Hemipteres Aquatiques," including some of various species of Limnotrechus, Hygrotrechus and Velia.

The most important contribution to our knowledge of the genitalia of Hemiptera and Homoptera, especially the former, appeared in 1925 when Dr. Hem Singh Pruthi released his work on "The Morphology of the male genitalia in Rhynchota." For the first time detailed descriptions and drawings of the male genitalia of representatives of all the families and most of the subfamilies were made. However a paper covering so large a field must necessarily be brief at some points and his

treatment of the Gerroidea group is one of these. His descriptions are brief and his drawings lack the necessary detail to make them clear and comprehensive.

Singh Pruthi's work has done more to place the morphology of the male genitalia of these two orders on a firm and workable basis and to unify the terminology than has any other.

In 1926 Ekblom's "Morphology and Biology of the Swedish Families of Hemiptera-Heteroptera" appeared. In this paper six families are treated among these are the Hydrometridae, Veliidae and Gerridae. This paper is contemporary with the one by Singh Pruthi, consequently neither one could benefit from the work of the other; there is therefore not the uniformity of terminology of homologous parts which there otherwise might have been. Parameres and copulation hooks are synonymous terms, as are basal plates and lever. Ekblom refers to the whole aedeagus as the penis and calls the endosoma the swell body. Neither one definitely names the chitinous pieces in the endosoma merely referring to them as chitinous thickenings.

It is often quite difficult to determine the exact number of abdominal segments in an insect, which in turn makes it difficult to tell with any degree of certainty from which segment the genitalia arise. It is now generally supposed that there are ten abdominal

segments in Hemiptera, and that the genitalia arise from the eighth and ninth; the tenth bearing the end of the alimentary canal.

The external genitalia are composed of the aedeagus and the parameres. The aedeagus is an evagination of the intersegmental membrane of the ninth and tenth segments, or to be more exact the ninth and tenth sternites. It is therefore a tubular structure continuous with the body wall, having numerous appendages and chitinous thickenings, terminating in a gonopore through which the ejaculatory duct pours the seminal fluid. The attachment of the aedeagus to the abdomen is strengthened by the basal plates. This is a stirrup shaped structure composed of two triangular chitinized sclerites which have become fused at their base. The basal portion of the aedeagus lies cradled in the basal plates when in the resting position. These plates also serve as a point of attachment for powerful muscles which assist in protracting the aedeagus during copulation. Ekblom observed a definite relation between the basal plates and the ninth sternite as they lie close together and both form a basal support for the aedeagus, when the sternite is small the basal plates are well developed and when the sternite is large the basal plates are less strongly developed.

The parameres are a pair of appendages lying on either side of the aedeagus, attached to the apices of the basal plates on their inner side and to the abdominal wall on their outer side. The size of the parameres varies greatly, in some species they are very large and may be covered with hairs, in other they are quite rudimentary and may even be entirely absent as in *Rheumatobates*. When sufficiently developed they serve as instruments to grip the female during copulation. Ekblom states that they are also used to pry open the genital valves of the female.

The aedeagus lies in a cavity or genital chamber with the basal end caudad and the distal end pointing cephalad, the basal end as stated above resting on and partly surrounded by the basal plates. During copulation the aedeagus is raised upward and backward then down and forward transcribing almost a complete circle. This is accomplished by the contraction of the muscles attached to the base of the aedeagus and by contraction of the abdomen causing the body fluid to exert pressure upon the organs in question. Covering and protecting the aedeagus from above is the last abdominal segment bearing the anus and forming the anal lid. In some cases the anal lid has an under flap probably formed by the tenth sternite. In the normal resting



position the whole aedeagus and the parameres are protected and completely hidden from view. The only visible structures are the anal lid, its under flap when present and the ninth sternite which curves up to meet the anal lid.

The aedeagus is divided into three parts, the phallosoma, the endosoma and the conjunctiva which lies between the other two. In the resting position the phallosoma surrounds and encloses the endosoma and conjunctiva, its base is attached to the basal plates and communicates with the body cavity through the basal foramen. The Phallosoma is usually somewhat barrel shaped, open at the distal end through which the endosoma is extruded. The degree and manner of chitinization varies to some extent. It never bears any appendages, but serves as a base and protective covering for the rest of the aedeagus.

The conjunctiva joins the phallosoma to the endosoma being connected with the distal end of the former and the basal of the latter. In the resting position it serves as a lining between the two, and is of course turned inside out. It is always membranous except that either end may some times be slightly thickened. Like the phallosoma it never bears any appendages.

The endosoma is the distal portion of the

aedeagus and is the most complicated of the three. In the resting position it lies within the other two regions, the end often protruding beyond the mouth of the phallosoma. In the larger Gerrids the end is prolonged into a curious duck-bill shaped chitinization almost as long as the endosoma itself. The endosoma contains four appendages which we shall call: (1) the median dorsal shaft, (2) the median ventral shaft, and (3) a pair of lateral plates.

The median dorsal shaft is a heavily chitinized structure lying close to the dorsal wall of the endosoma for the greater part of its length. Its shape varies greatly in the different species usually, however, the ends turn down and may be forked and thickened.

The median ventral shaft articulates with the anterior end of the dorsal shaft and is in some cases so completely fused as to appear continuous. Like the dorsal shaft it also varies greatly with the species, being broad and membranous as in some of the Gerris species or it may be slender and heavily chitinized as in Trepobates. The median ventral shaft appears to carry the ejaculatory duct.

Lying close to the median lateral walls is the pair of lateral plates. These are chitinized structures

sometimes having the appearance of shafts and sometimes appearing as broad plates. Their point of attachment does not seem to be constant. In most species they fasten to the posterior end of the median dorsal shaft; in certain species of *Gerris* they seem also to be fastened to the endosom at their other end. In *Rheumatobats* they seem to have no definite point of attachment.

In making the dissections the specimens were first cleared in caustic potash. Because of the minuteness of the genitalia they were placed in glycerin and dissected with the aid of transmitted light. The drawings were made from a lateral view after the aedeagus had been turned out of its chamber and pointed directly backward. The dorsal views were drawn slightly from the left side to prevent the overlying structures from obstructing the view of the lower.

Trepobates pictus H. Sch. Plate IV Figure 4

Parameres well developed, tapering toward the apex which is curved upward, flattened only at the base. Basal plates not heavily chitinized except at the apices and at the point of attachment to the phallosoma where the chitinization continues as a keel almost to its mouth. Area around the mouth thickened somewhat, especially laterally. Conjunctiva with a narrow sagittate granular patch near the phallosoma, otherwise quite membranous. Endosoma also membranous except at the very end which is somewhat thickened. Median dorsal shaft well developed, recurved at the posterior end for almost one-third its length, not thickened or expanded; anterior end furcate, branches widely separated, curved down then back. Median ventral <sup>shaft</sup> simple and chitinized, articulating with the dorsal shaft between the tips of its branches and extending anteriorly as far as the shafts then doubling back half their length.

Metrobates sp. Plate IV. Figures 1 & 2

The parameres in this species are strikingly large. In the resting position they curve up over the aedeagus, being flattened and curved toward the

dorso-medial line, to give ample room for that organ, greatly dilated toward the apex. Basal plates well developed and heavily chitinized at the apices where they join the parameres. Phallosoma uniformly chitinized slightly thickened where it joins the basal plates. Conjunctiva very membranous. Endosoma membranous except for a large area on either side which is heavily chitinized and hides the lateral plates from view. The median dorsal shaft is curiously formed in that the anterior end is trifurcate forming two auricular structures and one median branch directly continuous with the shaft. The posterior end is curved downward ending in a slightly recurved hook, not enlarged or expanded. Articulating with the anterior end of the dorsal shaft are two triangular plates which probably form the base of the greatly reduced ventral shaft. Lateral plates large, ovoid and thin, the ventral half is bent outward along the longitudinal axis.

Gerris Fabr.

The species of this genus examined vary remarkably. As mentioned above the parameres are present, but hardly of sufficient size to be functional. In some species as in marginata, only the lower half of the

phallosoma is chitinized, the upper half being membranous. In orba as well as in some of the other larger species the end of the endosoma is greatly extended and expanded. The dorsal shaft is always furcate at the anterior end and usually thickened or broadened at the posterior end.

Gerris marginata Say. Plate IV. Figures 3 & 4

Parameres very short and stubby, basal plates strongly developed and heavily chitinized. The phallosoma is remarkable in that only the lower half is chitinized, the upper half being membranous giving the region a boat-like appearance. To compensate for the lack of protection afforded by the membranous portion the upper half of the endosoma is heavily chitinized. This arrangement is unusual. The conjunctiva is membranous. The dorsal shaft is comparatively slender, furcate at the anterior end. Ventral shaft has two chitinized ribs running the whole length and is not membranous as in some members of this genus.

Gerris gillettei L & S. Plates V. Figures 7 & 8

Dorsal shaft almost as broad as in buenoi, furcate at both ends, anterior and posterior ends quite similar in appearance. Anterior fork somewhat thicker and longer. Ventral shaft broad with the sides turned

up forming a trough but with the posterior end thin and flattened. Lateral plates long and slender. Parameres very small. Basal plates moderately developed.

Gerris buenoi Kirk Plate IV. Figures 5 & 6

Dorsal shaft very broad, developed into a broad thick head at the posterior end. Ventral shaft articulating well up in the fork of the dorsal shaft, two ribs as in *marginata* but not so heavily chitinized. Lateral plates very broad distinctly joined to the posterior end of the dorsal shaft, much larger than in any other species examined. Parameres and basal plates as in *gillettei*.

Rheumatobates Bergroth

The genitalia of this genus differ from the others examined in several respects. The most notable feature is the absence of the parameres. The shafts do not exist as two separate pieces, but are completely fused so that no joint is perceptible. The dorsal shaft does not extend so far caudad. The ventral shaft is long and slender and in some species terminates in a long slender coiled thread. The endosoma instead of opening on the ventral side opens at the extreme end with the coil, when present lying just outside the mouth.

Rheumatobates rileyi variety palosi Blatchley  
Plate VII. Figures 1 & 2

Parameres absent, basal plates well developed, Phallosoma only lightly chitinized. Conjunctiva has chitinous granular thickenings where it meets the endosoma otherwise it is very membranous. Endosoma with a chitinous thickening on either side. Dorsal shaft divided except for a short distance near the posterior end which is dilated into two broad lamellate structures. The ventral shaft is prolonged into a coiled thread which when extended is about four times as long as the whole endosoma. Lateral plates well developed about twice as long as wide. These plates lie in a vertical plane just outside the expanded base of the dorsal shaft.

Rheumatobates hungerfordi Wiley Plate VI.  
Figures 3 & 4

Parameres absent, basal plates well developed, but not as heavily chitinized as in rileyi. Dorsal shaft divided as in rileyi. The expanded lamella of the posterior end distinctly triangular and much smaller. The coiled thread of the ventral shaft somewhat shorter. The lateral plates are ovoid and tapering toward the anterior end.



Rheumatobates trulliger Bergroth Plate XVI.  
Figures 5 & 6

This species is closely related to rileyi and hungerfordi; it differs from them in the shape of the expanded area of the dorsal shaft which is sharply angled as in hungerfordi but not triangular and much smaller than in rileyi. The late plates are rectangular and about twice as long as broad. The coiled thread is about twice as long as in rileyi.

Rheumatobates klagli n. sp. Plate XVI.  
Figures 7 & 8

Parameres absent, Lamelle of the dorsal shaft very narrow and not angled. Bent cephaled dorsal shaft divided as in other species of this genus. Lateral plates greatly reduced very narrow. The ventral shaft is not prolonged into a coiled thread, the shaft extends only to the mouth of the endosoma.

PLATE I.

Fig. I. R. imitator var. meinerti var. new. Male.

Fig. II. R. imitator var. meinerti var. new. Female.

Third and fourth antennal joints missing.

Fig. III: R. trulliger Bergroth. Male.

PLATE I

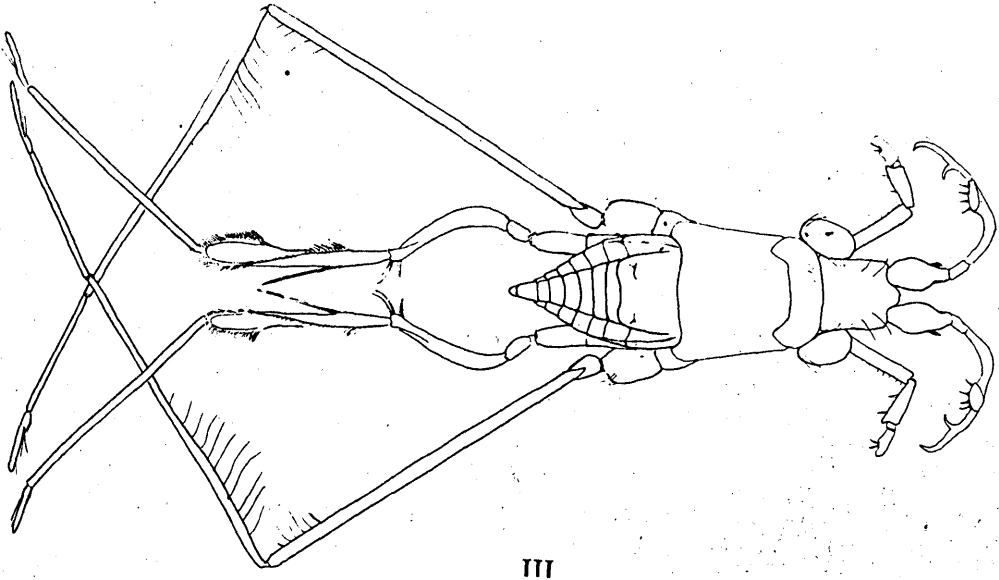
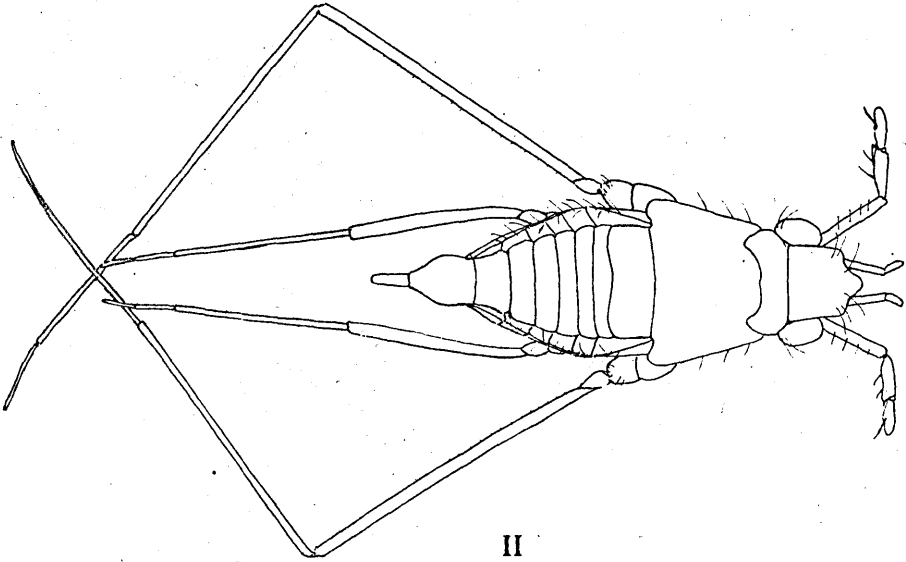
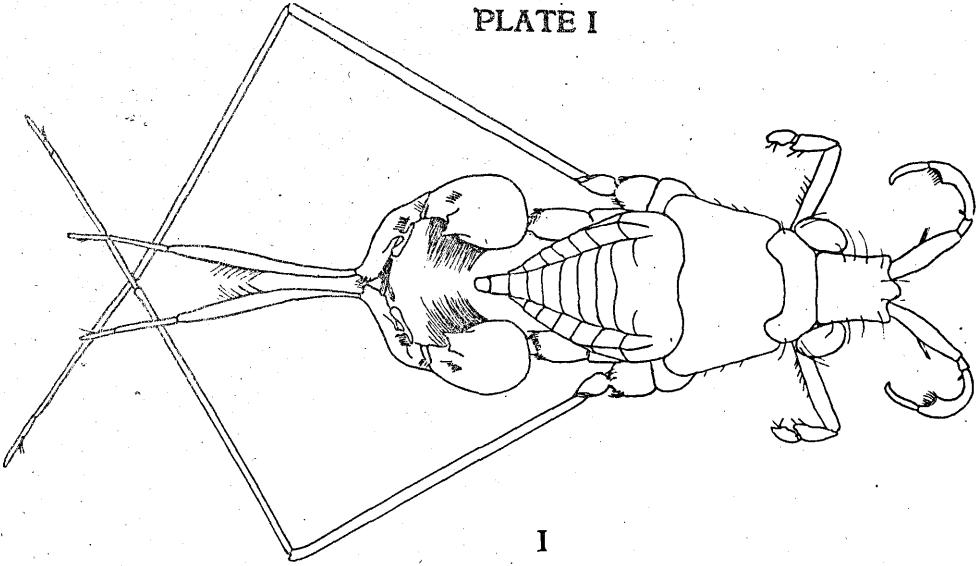


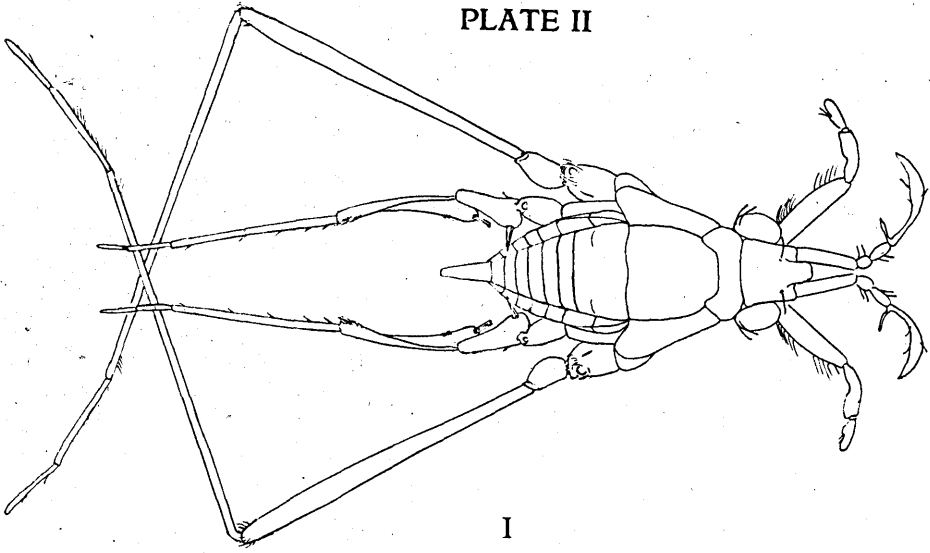
PLATE II.

Fig. I. R. klagei sp. new, Male.

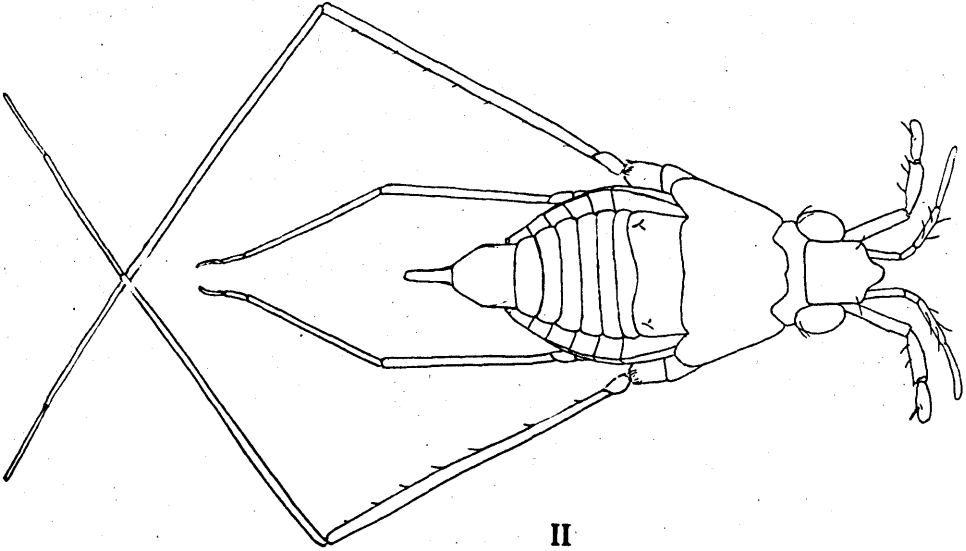
Fig. II. R. klagei sp. new, Female.

Fig. III. R. crassifemur var. esakii var. new, Male.

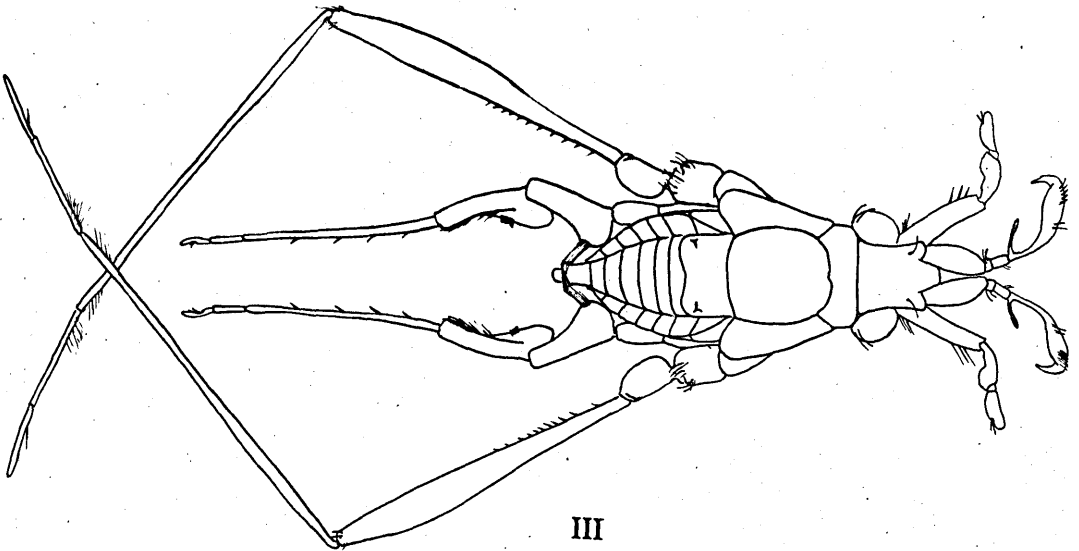
PLATE II



I



II

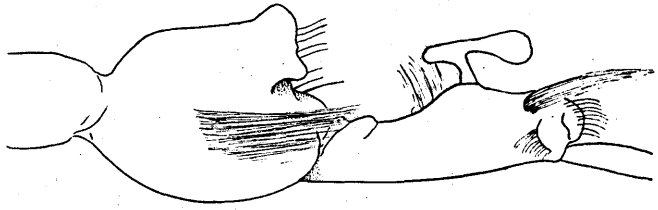


III

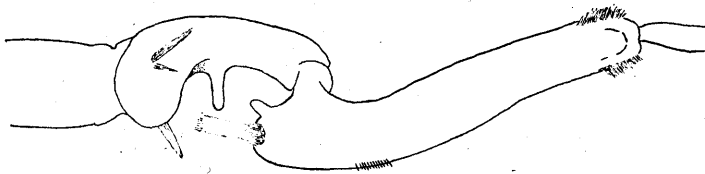
PLATE III:

- Fig. I. Trochanter and femur of right posterior leg  
of *R. imitator* var. *meinerti* var. new. male.
- Fig. II. Trochanter and femur of right posterior leg  
of *R. klagei* sp. new , male
- Fig. III. Trochanter and femur of right posterior leg  
of *R. crassifemur* var. *esakii* var. new, male
- Fig. IV. Right antenna of *R. crassifemur* var esaki var.new.  
Male.
- Fig. V. Left antenna of *R. klagei* sp. new . male

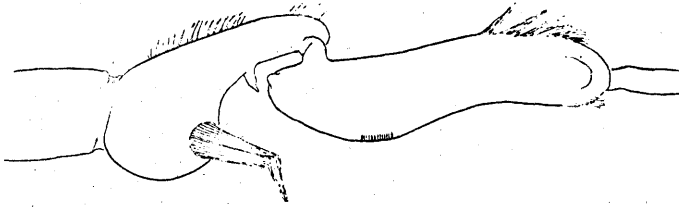
PLATE III



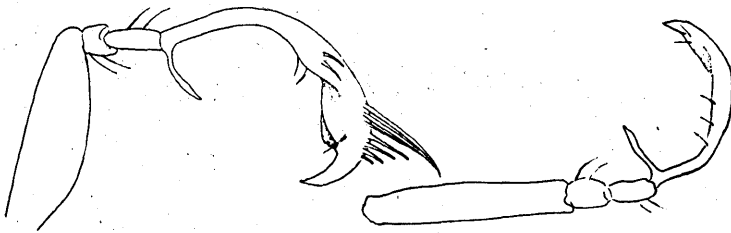
I



II



III



IV

V

PLATE IV

Fig. 1. Gerris orba. The endosoma has been removed from the phallosoma and the shafts and lateral plates are somewhat extruded, in the normal position these structures are completely enclosed by the endosoma.

Fig. 2. Dorsal view of shafts and plates of Gerris orba.

Fig. 3. Dorsal view of the curiously expanded tip of the endosoma.

Fig. 4. The genitalia of Trepobates pictus H. Sch. In the normal position the endosoma lies within the phallosoma and the whole swings forward resting between the parameres covered by the tenth tergite.

Fig. 5. Dorsal view of shafts and plates of T. pictus.

IX. Ninth segment of the abdomen.

X. Tenth segment of the abdomen.

bp. Basal plates or lever.

pr. Parameres.

ph. Phallosoma.

cj. Conjunctiva.

end. Endosoma.

ejd. Ejaculatory duct.

ds. Dorsal shaft.

vs. Ventral shaft.

lp. Lateral plates.



PLATE IV

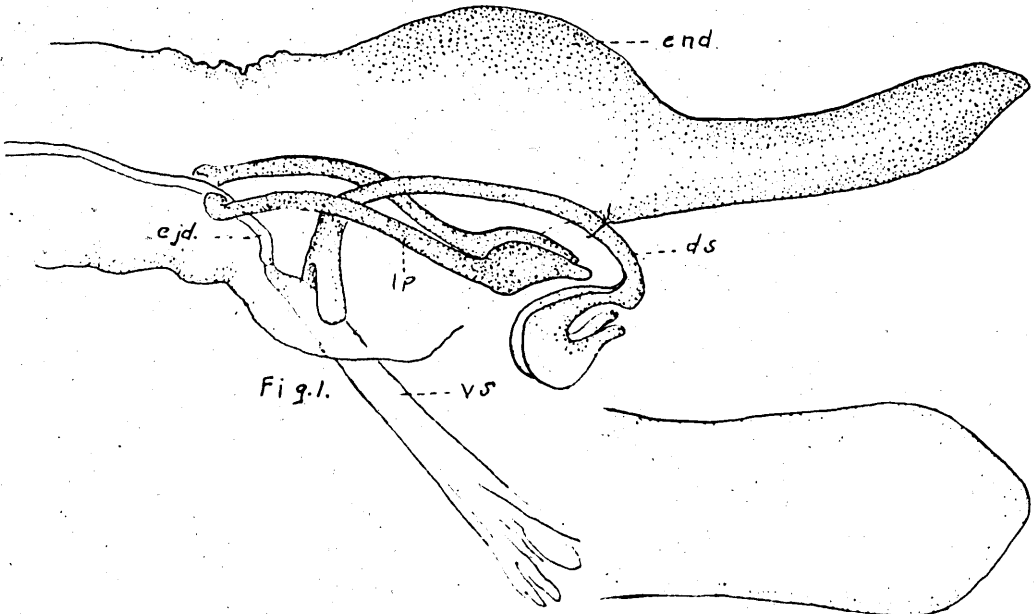


Fig. 1.

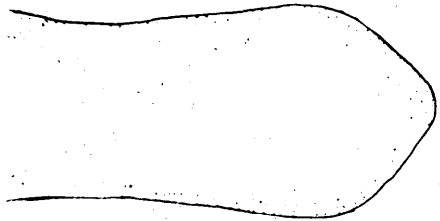


Fig. 3

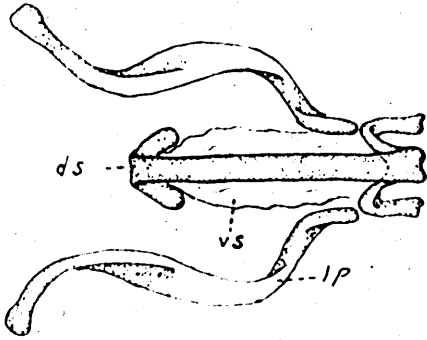


Fig. 2.

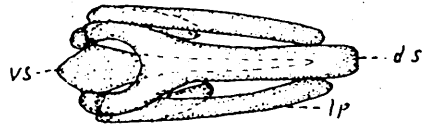


Fig 5

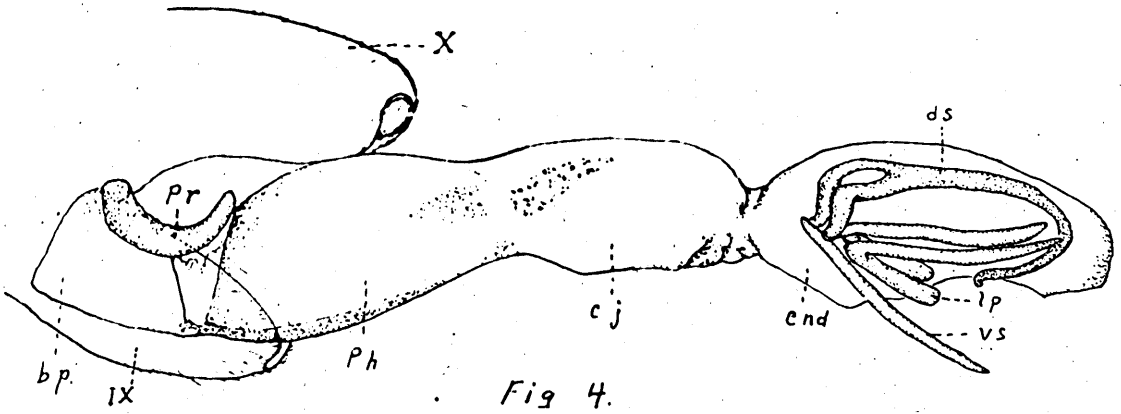


Fig 4.

PLATE V

Figs. 1 and 2. *Metrobates* sp.

Figs. 3 and 4 *Gerris marginata* Say.

Figs. 5 and 6. *Gerris buenoi* Kirkaldy.

Figs. 7 and 8. *Gerris gillettei* L. and S.

ds. Dorsal shaft.

vs. Ventral shaft.

lp. Lateral plates.

PLATE V

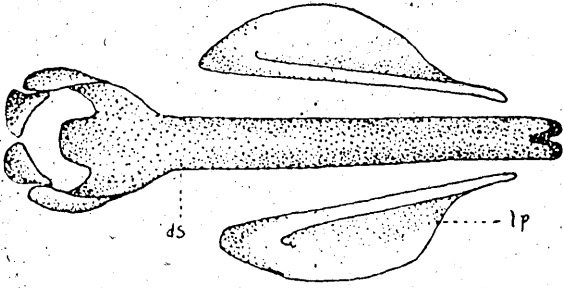


Fig. 1.

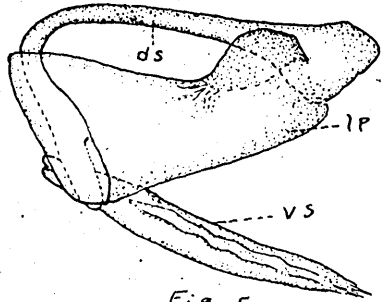


Fig. 5.

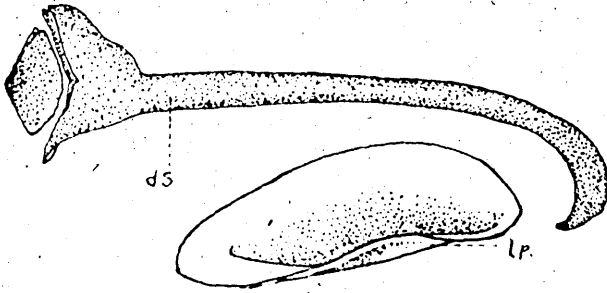


Fig. 2.

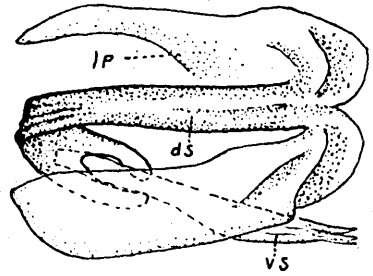


Fig. 6.

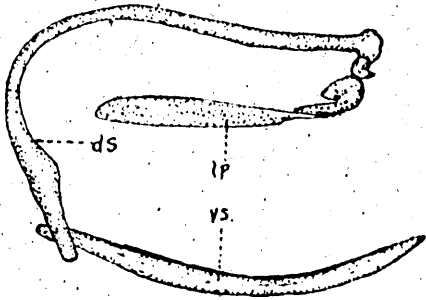


Fig. 3.

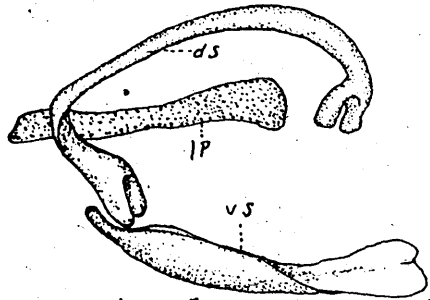


Fig. 7.

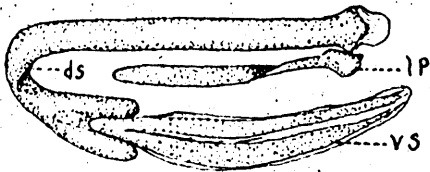


Fig. 4.

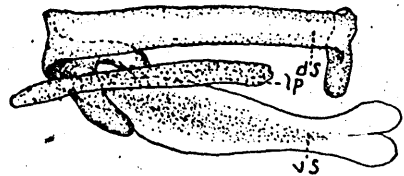


Fig. 8.

PLATE VI

Figs. 1 and 2. Rheumatobates rileyi var. palosi Blatchley.

Figs. 3 and 4. Rheumatobates hungerfordi Wiley.

Figs. 5 and 6. Rheumatobates trulliger Bergroth.

Figs. 7 and 8. Rheumatobates klagei sp. new.

ds. Dorsal shaft.

vs. Ventral shaft.

lp. Lateral plates.

PLATE VI

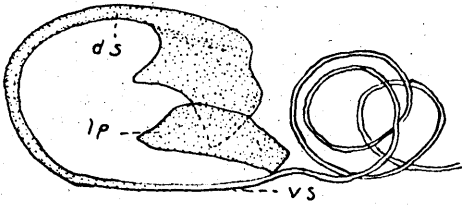


Fig. 1.

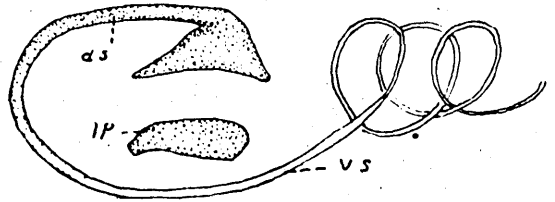


Fig. 3.

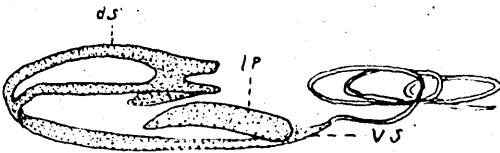


Fig. 2.

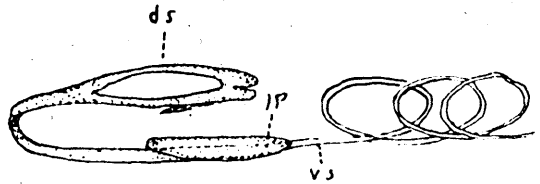


Fig. 4.

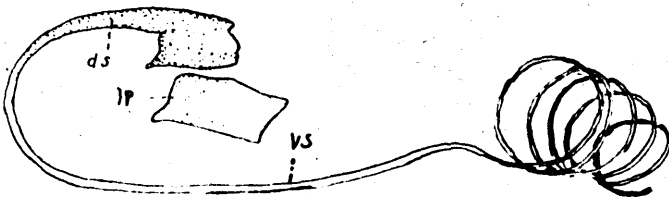


Fig. 5.

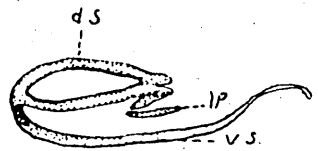


Fig. 7.

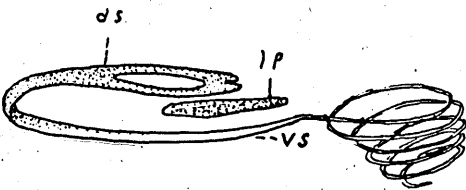


Fig. 6.

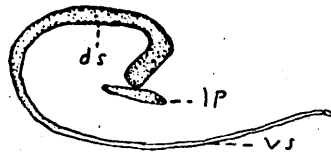


Fig. 8.