

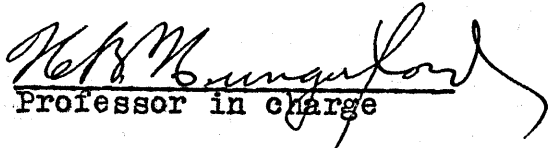
The Genus *Trepobates*

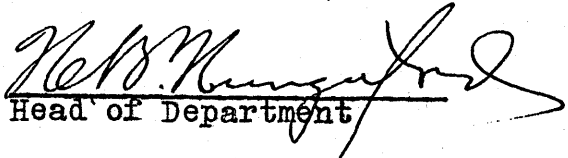
by

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Approved by:


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Plate:

Acknowledgment

The writer wishes to express his sincere appreciation for the helpful suggestions and kindly criticisms of Dr. H. B. Hungerford under whose direction this work was undertaken.

Introduction

The genus *Trepobates* is one of the most interesting groups of Hemiptera to study. It belongs to the family Gerridae, commonly known as water striders, and which includes many genera. Unlike most water striders, this genus is brightly and beautifully marked with yellow and black. The color pattern of *Trepobates* is very variable even within the same species which makes them very interesting but difficult to classify. This genus is composed of rather small insects, from 2.5 to 4 mm. in length. These insects are over-looked by most persons or taken for immature stages of larger species. This is no doubt the reason why so little has been done with this group.

Historical Account

The genus was named by Uhler in 1894. In 1848, Herrick-Schaffer described a new species under the name of *Halobates pictus*. This name stood until 1883 when Buchanan-White discovered

that H. pictus (H.Sch.) did not belong in genus Halobates so he erected the new genus *Stephania* giving the name Stephania pictus (H.-Sch.) to the only known member of the genus. Uhler in 1894 while working on several groups of water striders found the name *Stephania* to be preoccupied and gave the genus a new name, *Trepobates*, which still holds. Until 1894, very vague and short descriptions were written of H. pictus (H.-Sch.). The only important character given was that the posterior margin of the mesonotum was prolonged into a spine-like process. This character alone was very good until 1926 when Teiso Esaki studied some specimens with a process on the mesonotum. These he described and figured as being Trepobates pictus, (H.-Sch). On comparing his drawing and my specimens, of which I have only three, with the painted drawing of H.-Schaffer's Halobates pictus, I found Esaki's specimens to belong to a new species and propose to call it Trepobates esakii n.sp. There have been written several short papers dealing with the description and life history of

Trepobates pictus (H.-Sch.) but it is my belief that very few really concern Trepobates pictus (H.-Sch.). Trepobates pictus (H.-Sch.) does not appear to be generally described. Of the small number in our collection, nearly all came from Maryland and Pennsylvania close to the type locality. After Uhler gave the new name Trepobates to this genus in 1894, very little work was done on the genus until 1926 when Esaki described two new species, T. subnitidus and T. inermis. In 1928, Drake and Harris published descriptions of T. knighti, T. floridensis and T. trepidus.

Biology

Due to the difficulty in rearing Trepobates species, our knowledge of their life history and habits is limited. Trepobates is a fresh water genus found mostly on quiet eddies of moving water. The insects are gregarious and often found in a school of several hundred. They feed upon insects dropped in the water, and other small animals found in the water such as ostracods. They over-winter

as adults.

Trepobates must be handled with the greatest of care and kept in large containers for when frightened, they will injure themselves by dashing against the sides. Observations cannot easily be made if reared in a large container, so obtaining a complete life history requires the best skill. In 1919, Dr. H. B. Hungerford published the first information on the early stages. He found that "The eggs are laid in solid masses of gelatinous material on the under-side of leaves and sticks in the water. The eggs are placed side by side and imbedded in a pad or matrix of yellowish white gelatin. There are from three to ten eggs in a mass. Eggs hatch in about five days. Before hatching, the eggs become spotted with red, the large eye spots and sixteen other small ones. These spots are located in various places on the nymphs such as antennae and joints of the legs. The postnatal molt bears a black shiny "egg burster" like the Gerris. After hatching, the nymphs swim about in the water by means of their middle legs. They can stand several hours of

submergence at this time."

Description of stages: Egg:- .99 mm. long, .312 mm. wide. Shape: elongate oval; anterior end more pointed. Color: white turning to amber; marked with red spots before hatching!

First instar; length of body .676 mm., width .364 mm. Head, thorax and abdomen closely joined. The indentation between the prothorax and mesothorax being more marked than that between the head and prothorax. The sides of the body parallel and the abdomen extremely short. Tip scarcely reaching distal end of posterior coxae. Eyes dark red, some pink spots show in the 1st, 2nd, and base of 4th segments of antennae. These become obscure but are no doubt the spots which show on the embryo within the egg shell."

In 1923, William E. Hoffman reared what he called Trepobates pictus (H.-Sch.) from egg to adult. He states that in the aquaria they were observed to remain in coitu for long periods at a time. The female often jump about and feed while mating. A description of the stage given by Hoffman is as follows:

The egg: eggs were 1.057 mm. long, were slender and tapering at the end. The cephalic end of the egg is more pointed than the caudal end."

First instar: measured dorsally along the median line gave a length of 1.123 mm. for a first instar two days old, head across the eyes .297 mm.; length of posterior tibia .330 mm. Color brownish-yellow with head, antennae, legs and two elongated spots on the mesothorax brown, median pale line, had shape of an inverted V on the pronotum, a round spot on the line between the pronotum and the base of the head, and formed the outline of a glass tumbler on the head. Posterior margin of pronotum was pale. The pronotum and metanotum about subequal in length with their combined length being less than that of the mesonotum. Metanotum with two short and narrow transverse darker lines. On each abdominal segment, there are four dark transverse lines, a pair to either side of the pale median line. The median pale line gradually becomes narrow from the posterior margin of the pronotum to the apex of the abdomen."

Second instar: length 1.454 mm.; width, head across eyes .396 mm.; length of posterior tibia .363 mm. Color pattern becomes more prominent."

Third instar: length 1.983 mm. long; width of head across eyes .594 mm.; length of posterior tibia .396 mm. The nymph at this early stage had markings surprisingly near in appearance to those found in adult specimens. The dark portion on the top of the head looked like a capital W. with the center portion rather broad and extending forward toward the base of the rostrum. The dark markings on the pronotum can be likened to inverted, irregular capital U's. There were two such markings. Each half of the mesonotum had a yellowish spot on its center. This was surrounded by a black or at least dark circle and this in turn encircled by a yellow circle."

Fourth instar: this nymph was a few days old when measured. Length 1.983 mm.; width head across eyes .694 mm.; length of posterior tibia .429 mm.

Color markings such as in third instar excepting the yellow is more prominent."

Fifth instar: a specimen seven days old was measured to secure the data for this instar. Length along median line was 3.106 mm.; width, head across eyes .859 mm.; length of posterior tibia .892 mm. The black and yellow markings appear more contrasty in this instar. The yellow spots on the abdomen had arranged themselves in four rather definite rows."

Summary: six reared from egg to maturity out of 23 rearings, 4 males and 2 females all apterous.

First instar - 5 to 9 days.

Second instar - 5 to 8 days.

Third instar - 5 to 12 days.

Fourth instar - 8 to 10 days.

Fifth instar - 8 to 12 days.

39 days average for nymphal stage.

48 to 51 days for egg to adult."

All my winged specimens of T. inermis var. quadratus var. new have all four wings broken off about half way back over the abdomen. Torre-Bueno, after observing some specimens which he had in captivity, explains what he believes to be the reasons for such actions, and states as follows: "At first he was fussing with his wings, passing his hind legs under them repeatedly. Very soon he had one hemelytron so bent that the end stood straight up from the body. He continued those passes, so I imagined, to straighten the wing, but finally he succeeded in breaking off first the membrane of one hemelytron and then of the other. A great many specimens collected later had wings broken off."

Two seemingly reasonable explanations suggest themselves; the breeding habits, the hemelytra extend much beyond the end of the abdomen, being about twice as long as the latter. The male is smaller than the female and has a somewhat shorted abdomen. In conse-

quence the male has to sit quite far back on the female in copulation in order to approach her genitalia. Long wings in the female would be decidedly in the way of the male. In consequence, the female finds it imperative to shorten her wings in order to give access to the males, which she does by breaking them off at the line of weakness, thereby leaving a greater part of the abdomen exposed. But while this would seem to be an explanation of the act in the female, it scarcely covers the case of the male, since his genitalia are in no way covered or directly prevented from coming in contact with the female by his long hemelytra."

Trepobates rest very close to the surface of the water, so much so that the body seen from above seems to touch the surface. As pointed out above the males have to sit far back on the females, and in that position the tip end of the hemelytra would produce an indentation in the surface film or be slightly

submerged. The smallness of the bug would tend to make it appear that the former would be the case. This resistance, of course, would operate in two ways. It would be a great assistance to the unwilling and struggling female in getting rid of the male; and it would be decidedly in his way by preventing the approach of his genitalia to hers. Hence the male, for similar reasons to the female finds it necessary to rid himself of at least part of his wings."

Distribution

Trepobates is widely distributed over the western hemisphere but has never been reported elsewhere. While this genus seems to be well distributed over the western hemisphere, it seems to be most common in Southeastern United States and the West Indies.

Structural Characters Used

Color is so variable in this genus and within the same species that it is necessary to use

structural characters. In some species, the intermediate femora of the male are clothed with very long hairs, others not so long, and still others with very short hairs. The relative length of the abdomen is another character used in males. The shape of the posterior margin of the mesonotum, length of last segment of connexivum and hairs on last abdominal segment are characters used in females. Many other characters are useful such as comparative length of antennal segments, length and stoutness of the legs, and general shape of the body. The male genitalia have never been used in descriptions other than statements about the size of the claspers. From genitalia studied, I have found no characters of value in specific determination.

THE SPECIES OF TREPOBATES, Uhler
(Key to the females)

- A. Connexivum with last segment terminating into a long, erect, spine-like process.
- B. Cephalic angles of mesonotum with short, longitudinal yellow line...T. Knighti, D. & H.
- BB. Cephalic angles of mesonotum without short yellow line..... T. kaniensis^s sp. new.
- AA. Last segment of connexivum not terminating into a long erect, spine-like process.
- B. Posterior margin of mesonotum prolonged into a spine-like process.
- C. Process projecting straight back and without long hairs..... T. pictus, H.- Sch.
- CC. Process projecting upward, clothed with long brown hairs....T. esakii, sp. new.
- BB. Posterior margin of mesonotum truncate.
- C. Second and third segments of antennae equal in length.
- D. Large over 3.8 mm. in length, at least some yellow along median portion of

pronotum..T.subnitidus var. rotundus var. n.

DD. Small 3.4 mm. in length, median portion
of pronotum without yellow band...

..... T. subnitidus Esaki.

CC. Second segment of antennae shorter than
the third.

D. Broad black band on median portion
of pronotum.

E. Last abdominal segment clothed
below and along sides with long
hairs..T. trepidus, D. & H.

EE. Last abdominal segment without
long hairs...T. floridensis, D. & H.

DD. Median portion of pronotum with a
yellow longitudinal band.

E. Mesonotum with two median parallel
yellow bands more than one-half
the length of the mesonotum.

F. A short, longitudinal, yellow
line at each cephalic angle of
mesonotum.....T. inermis, Esaki.

FF. Cephalic angles of mesonotum
without such lines.....

..T. inermis var. quadratus var.n.

EE. The two median parallel yellow bands,
if present, not more than half the
length of the mesonotum; a short,
longitudinal yellow line present at
each cephalic angle of the mesonotum..

.....T. comitalis, D.& H.

TREPOBATES, Uhler

Stephania, Buchanan-White, Challenger Rep.

Zool. VII. 19, p.79 (1883)

Original description of the genus rearranged.

Size: Apterous forms; length 2.6 - 4.1 mm.

width 1 - 1.8 mm.

Color: The members of this genus are variously marked with yellow and black, black usually predominating on the dorsal side and yellow on the ventral side; a broad, black, longitudinal stripe is always present on the head; markings on the mesonotum vary greatly in the different species and often in specimens of the same species, a broad, longitudinal yellow stripe always present directly on the sides extending the full length of the mesonotum; abdomen above mostly black often frosted with blue-grey; venter of female always yellow, that of male yellow in some species, dark brown in others; mesosternum yellow in both sexes;

antennae dark fuscous with yellow at base of first segment; legs longitudinally striped with dark brown and yellow.

Structural Characters: the legs of *Trepobates* are long and slender, the intermediate and hind tibiae and tarsae being almost hair like, anterior femora curved (stouter in males), others nearly straight; first segment of antenna about equal in length to ll and lll combined, ll usually slightly shorter than lll; posterior margin of mesonotum in male always truncate, either truncate or pointed in females; connexivum broad in females, narrow in males; females always distinctly larger than males, and with a much broader connexivum.

Macropterous Forms: hemelytra curved and tapering at base, gradually becoming wider toward tip at which point it is a little triangular and rounded; the Corium subtriangular and about one-half as long as the membrane with three stout longitudinal veins of which the costal is more densely haired toward the base; the membrane has

a pale longitudinal suture throughout with a thick vein on the middle, two veins run parallel to the margin and converge on the tip; wings sooty black, shorter than hemelytra; no transverse veins; in some specimens, the acute tip of the scutellum projects from between the metanotal plates, in others it is atrophied; the pronotum is large extending back over the mesonotum, and triangular shaped behind; the posterior triangular process of pronotum is margined with yellow and the antehumeral part has an intra-lateral yellow vitta on each side which usually joins the yellow margin of the process but which in some specimens is abbreviated posteriorly.

TREPOBATES KNIGHTI, DRAKE AND HARRIS.

T. knighti, D. & H. Biological Soc. of Wash.

V. 41, p. 28, 1928.

Original description rearranged.

Size: Apterous male: length 3.33 mm.

width 1.45 mm.

Apterous female: length 3.95 mm.

width 1.8 mm.

Color: Apterous male: color markings somewhat variable, a broad longitudinal arrow-shaped black stripe on head, a more or less distinct line above eyes on each side yellow; a small anterior portion, the middle and side of pronotum black; anterior portion of mesonotum, a median line, a broad band on each side above (connecting a little in front of anterior margin with a broad irregular black band on each side), and an irregular band on each side at base black, a very short longitudinal line on each side of anterior portion of mesonotum yellow; in many specimens the mesonotum is almost

entirely black, having a spot on each side above, a short narrow stripe on each side of posterior half of median line, and the posterior margin yellow; metanotum black with a small transverse line on each side yellow; abdomen above black often frosted with blue-grey, except last abdominal segment which is yellow, sides dark brown; connexivum brownish-black with a small yellow spot on each segment; entire body beneath yellow; segment one of rostrum yellow with a triangular black spot, almost all of segments II and III black; antennae dark fuscous, the basal portion of a brown stripe on each side.

Apterous female: yellow markings very similar to those of male but more prominent and variable; pronotum usually with a narrow yellow stripe on posterior half of median line; posterior points and short lines on anterior portion of each segment of connexivum black.

Structural Characters: Apterous male: antennae long, first segment slightly curved, larger

at apex than at base, about equal in length of ll and lll combined, ll distinctly shorter than lll, the basal inside one-third of segment lll with a row of very long hairs; anterior femora strongly curved and stout; the under-surface of intermediate femora and basal portion of tibia clothed with long hairs, the length of the hairs being about equal to the diameter of the segment bearing them; last segment of venter clothed with short erect hairs; apex of abdomen blunt giving the appearance of the genital segments being drawn in; pronotum with a slight depression on each side of disc.

Apterous female: antennae similar to that of male but slightly longer, third segment without long hairs; anterior femora smaller and with less curve than those of male; intermediate femora long and slender 2.7 mm. in length, without long hairs; connexivum very broad, outer margin clothed with long hairs, except at base and apex, the last segment terminating behind in a very long, almost

erect, hairy, spine-like process; anterior sides of mesonotum almost in line with pronotum, gradually diverging posteriorly.

Macropterous Form: pronotum large, pentagonal, black with a longitudinal stripe on each side and posterior margin yellow, the longitudinal stripes usually diffusing with the yellow margin and their anterior ends enlarged into large spots, on females a small spot is present between these; hemelytra dark brown the basal portion darker, veins dark, fairly distinct, wings a little shorter than hemelytra, dark brown; membrane of hemelytra with pale longitudinal suture, two veins running parallel to margin and converging at the tip; all other characters same as in corresponding apterous form.

Location of Types: Holotype, apterous male and allotype apterous female, Missouri and Iowa.

Comparative Notes: this species closely resembles T. kansiensis sp. new but both sexes of T. knighti D. & H. have characters not present in T. kansiensis sp. new; the long hairs present on

third segment of antennae and on intermediate femora of male are absent in T. kansiensis sp. new; the abdomen of the male is short and blunt being about 1.4 mm. from posterior margin of mesonotum to tip of abdomen while those of T. kansiensis sp. new are much longer and tapering measuring nearly 2 mm. from the same points; the short longitudinal yellow stripe on each side of anterior portion of mesonotum is absent in T. kansiensis sp. new; the anterior sides of mesonotum in both sexes of T. knighti D. & H. are in line with pronotum and enlarges gradually while in T. kansiensis sp. new the enlargement is more abrupt giving it a more robust appearance.

Data on Distribution: this species seems to be very abundant in localities where it is found. In the collection are specimens from Arkansas, Oklahoma, and Kansas.

TREPOBATES KANSIENSIS, sp. new.

Size: Apterous male: length 3.5 mm.

width 1.4 mm.

Apterous female: length 4 mm.

width 1.7 mm.

Color: Apterous male: - color markings somewhat variable, a broad longitudinal arrow-shaped black stripe on head, a distinct line above eyes on each side black; a small anterior portion, the middle of sides of pronotum black, anterior portion of mesonotum, a median line, a broad band on each side above, (connecting a little in front of posterior margin with a broad irregular black band on each side), and an irregular band on each side black; the two median parallel yellow lines extending forward from the posterior margin of the mesonotum are often very short or entirely absent, leaving the mesonotum almost black, except for a spot on each side above, and an interrupted line on posterior margin yellow; metanotum black with a small irregular oblique line

on each side yellow; abdomen above black, often frosted with blue-grey, except last abdominal segment which is yellow, sides of abdominal segments, except last are dark; venter yellowish-brown; connexivum brownish-black with a small reddish-brown spot on each segment; first segment of rostrum yellow with a triangular black spot, all of ll and lll black; antennae dark fuscous, basal one-third of segment I yellowish; anterior femora with band at apex and anterior one-half above yellowish; intermediate femora with four narrow longitudinal brownish stripes, yellowish between, hind femora reddish-brown.

Apterous female: color markings very variable, more so than in male but with the same general color pattern; yellow markings sometimes very prominent covering a great part of mesonotum and most of pronotum; metanotum black with a broad irregular oblique stripe on each side yellow; abdomen above black except last segment and large spots on first three yellow; sides of abdominal segments with irregular black spots on upper half, lower half and

ventral side yellow; connexivum black along margin with a quadrate yellow spot on each segment.

Structural Characters: Apterous male: antennae 2.85 mm. long, first segment with slight curve near base, slightly larger at tip than at base, about equal in length to II and III combined, segments II, III and IV almost equal, II very little shorter than III; segment III without long hairs; anterior femora stout, strongly curved; intermediate femora stout, clothed with fine hairs as long as one-half the diameter of the segment bearing them; abdomen long with genital segments long and tapering to a point measuring nearly 2 mm. from posterior margin of mesonotum to tip of abdomen.

Apterous female: antennae similar to that of male; anterior femora more slender and with less curvature; intermediate femora stout with few short hairs; connexivum broad, outer margin often clothed with moderately long hairs, the last segment terminating in a very long, almost erect, hairy, spine-like process; mesonotum enlarges abruptly along

sides giving it a square appearance at anterior end.

Location of Types: Holotype, apterous male and allotype apterous female deposited in Snow collection at Kansas University, Lawrence, Kansas; the macropterous form is unknown to me.

Comparative Notes: this species is closely related to T. knighti D. & H. but is easily distinguished by the following characteristics: the male lacks the long hairs on third segment of antennae present in T. knighti D.&H.; the hairs on intermediate femora of male T. kansiensis sp. new is slightly shorter than the diameter of the femora while in T. knighti D. & H., they are as long as the diameter; abdomen of male is longer and more pointed than that of T. knighti D.& H.; the second and third joints of antennae are more nearly equal in length in this species; both sexes of this species have a more suddenly broadened mesonotum at anterior portion, and they lack the short yellow stripe at this portion.

Data on Distribution: Kansas.

TREPOBATES PICTUS, H.-Sch.

Halobates pictus, H.-Sch., Wanz. Ins. Vlll.

p. 111 fig. 882 et 883, 1848.

Uhler, Proc. Boston Soc. Nat.

Hist. XLX. p. 437. 1878.

Stephania pictus, B. White, Challenger Rep. Zool.

Vll. 19. p. 79. 1883.

Uhler, Stand. Nat. Hist. 11.

p. 270. 1883.

Trepobates pictus, Uhler, Proc. Zool. Soc.

London, 1894. p. 213.

Bergr., Ohio Nat. Vlll. p. 372

1908.

Original description rearranged:

Size: Apterous male: color markings slightly variable, head yellow with a longitudinal black stripe; pronotum with a broad stripe on each side and a median line black, a broad irregular yellow stripe on each side of median line, the three black

stripes often connected along anterior margin; mesonotum with yellow markings very prominent, a narrow, black median line parallel sided except at anterior portion where it widens, usually a black spot on each side of median line at center of mesonotum, which are sometimes coalesced with the median line; on each side above is a wavy, longitudinal, curved, yellow band turning its convexity outwards, this gives the appearance of an irregular yellow O, divided by a black median line and cut off square at the posterior end by the metanotum, next to and outside of each black band is an irregular longitudinal yellow band of equal width, these are then paralleled by a slightly broader black band which lies directly along lateral portion of mesonotum; metanotum black with an oblique irregular shaped yellow stripe on each side; abdomen usually in greater part yellow, a more or less distinct black line along basal portion of each segment, each line towards the apical segment becoming fainter; sides of ab-

domen yellow; venter yellow; connexivum yellow with black margin; entire body beneath yellow.

Apterous female: color markings variable, general color pattern same as male except that the black median band on pronotum is divided by a narrow yellow band which does not extend to anterior edge; the median line of mesonotum is broader than that of the male and extends to the tip of the projection of posterior margin; abdomen above mostly yellow but sometimes frosted with blue-grey, base of each segment with black lines as in male, sides of abdomen yellow; entire body beneath yellow; connexivum yellow with black margin.

Structural Characters: Apterous male; antennae 2.85 mm. long, first segment slightly curved, slightly larger on apex than at base, II, III and IV nearly equal in length, II very little shorter; anterior femora stout, curved; intermediate femora rather short and stout, posterior legs slender; hairs on intermediate femora very short.

Apterous female: antennae shorter, segment II

distinctly shorter than III, III and IV equal; anterior femora slender; intermediate femora stout, basal half of posterior femora with distinct curve; posterior margin of mesonotum prolonged into a spine-like process which projects directly backward, it has a broad base, and apical margins turned under making it more pointed at tip; connexivum with very short points at apex, clothed with black hairs; last abdominal segment clothed with long, light brown hairs along apical margin.

Macropterous Form: Posterior triangular process of pronotum is margined with yellow and the whole antehumeral part of the pronotum has an intralateral yellow vitta which usually joins the yellow margins of the process, but which in some specimens is abbreviated posteriorly; the sooty black wings are shorter than the hemelytra but much longer than the abdomen; the inner vein of the corium is shortly furcate at the apex; the median vein of the membrane is fold-like and usually reaches the apex of the loop formed by the elevated

outer and inner vein.

Comparative Notes: The spine-like process on posterior margin of mesonotum projects directly backward while in T. esakii sp. new, it projects more or less up-ward; the mesonotum of T. pictus H.-Sch is mostly yellow and that of T. esakii sp. new, is black except for two curved yellow bands.

Data on Distribution: Maryland, Mississippi, Tennessee, Pennsylvania, South Carolina, and New York.

TREPOBATES ESAKII, sp. new

Trepobates pictus, Esaki, Ann. Mus. Hung.
V. XXIII p. 140, 1926.

Size: Apterous male: - length 3.1 mm.
width 1.25 mm.

Apterous female: length 3.95 mm.
width 1.85 mm.

Color: Apterous male: a line on each side of head above the eyes and the posterior margin between these lines yellow; a small anterior portion, middle and sides of pronotum black, separated by two irregular yellow bands; mesonotum black with two longitudinal, curved yellow bands turning their convexity outwards forming an irregular, incomplete black O with one or both ends open; an oblique yellow mark at the caudal angles and a longitudinal yellow line at each cephalic angle; metanotum black with a narrow oblique yellow line on each side; abdomen above black except last abdominal segment which is yellowish brown, sides

brownish black; entire body beneath yellow; connexivum with yellow spot on each segment.

Apterous female: color markings same as that of male except black median band on pronotum divided by a narrow yellow band; the short yellow lines present at cephalic angles of mesonotum in males are extended the full length of the mesonotum running parallel and below this yellow band is a narrow black band then a much broader yellow one; metanotum black with an oblique yellow band on each side; abdomen above black with yellow markings on first three and last two segments; connexivum yellow with margin and base of each segment black; most of the anterior femora yellow; intermediate femora brown with two longitudinal yellow stripes.

Structural Characters: **Apterous male:** first segment of antennae slightly curved, larger at apex; anterior femora stout, intermediate femora with very short fine hairs beneath; margin of connexivum with fine brown hairs; claspers very long sharply curved inward.

Apterous female: antennae longer than that of male, second segment slightly shorter than the third; anterior femora slender; intermediate femora very short and stout; mesonotum with the posterior margin prolonged into a caudo-dorsal spine-like process clothed with long brown hairs.

Location of Types: Holotype apterous male, allotype apterous female and one paratype male deposited in Snow collection at Kansas University, Lawrence, Kansas. The macropterous form is unknown to me.

Comparative Notes: Teiso Esaki in 1926 published in *Annales Musei Nationalis Hungarici* Vol. XXIII descriptions of two new species along with a re-description and figure of what he called T. pictus, H-Sch. but which I have found to be a new species, T. esakii sp. new, with the following differences; the spine-like process on the posterior margin of mesonotum in females projects upward in T. esakii sp. new and in T. pictus H.-Sch. it projects directly backward; in both sexes of this species most of the mesonotum is black and

in T. pictus H.-Sch it is mostly yellow; in the males of T. egakii sp. new, the sides of the abdomen are brownish black while in T. pictus H.-Sch. they are yellow.

Data on Distribution: Only three specimens are in the collection, these being taken at different times and localities, the males were collected in the early spring of 1923 at Oriente, Ecuador, and the female was collected at St. Ann, Jamaica February 1928.

TREPOBATES SUBNITIDUS, var. rotundus, var. new.

Size: Apterous male; length 3.7 mm.

width 1.45 mm.

Apterous female; length 4 mm.

width 1.9 mm.

Color: Apterous male: color markings very variable; a broad, black, arrow-shaped medium band on head, a line on each side above eyes and posterior margin between these lines yellow; pronotum with side, a median band, and small anterior portion black; mesonotum mostly black, an elongate spot on each side above and two short bands on posterior margin yellow, the inner margins of the two short bands often extended forward as two parallel bands, sometimes these bands are not connected to the yellow margin; metanotum usually all black; abdomen above black, with the last abdominal segment sometimes yellow, sides brownish-black, venter yellowish-brown; connexivum with yellow

spot on each segment; antennae dark brown, base of first segment yellow; anterior femora with band at apex, and basal one-half above yellow; intermediate femora dark fuscous with longitudinal yellow stripes.

Apterous female: color markings extremely variable but similar to those on male; median black band on pronotum divided by a yellow stripe; the two parallel yellow bands, if present, along the median portion of mesonotum very often do not coalesce with bands on posterior margin, the two yellow spots on sides above greatly variable; metanotum black with a yellow band on each side; abdomen above black, sometimes with irregular yellow markings, sides mostly yellow; connexivum yellow with margin and line at base of each segment black; markings on legs and antennae same as those on male;

Structural Characters: Apterous male: antennae quite long, about 3 mm. segment I curved, II, III, and IV equal in length, II sel-

dom shorter than III; anterior femora stout and curved; intermediate femora usually large but varies greatly in different specimens, clothed beneath with fine hairs slightly shorter than the diameter of the segment bearing them, last abdominal segment clothed with dark brown hairs; pronotum impressed on each side of disc.

Apterous female: proportional length of antennal segments same as male; anterior femora quite slender; intermediate femora stout; pronotum impressed on each side of disc; mesonotum very rounding, sloping on the sides and anterior portion sloping forward with a broad impression along median line, posterior margin truncate; metanotum with a small portion in the center clothed with long dark brown hairs; apical one-half of connexivum densely clothed with dark brown hairs.

Macropterous Form: In this form, the posterior triangular process of the pronotum is margined with yellow and the antehumeral part

has an intralateral yellow vitta on each side which usually joins the yellow margin of the process but which in some specimens is abbreviated posteriorly, the anterior end of each vitta is enlarged into a large spot, in the female of this form, there is an additional spot between these; pronotum rounding behind; in some specimens the acute tip of the scutellum projects from between the metanotal plates, in others it is atrophied; hemelytra brownish-black, curved and tapering at base, gradually becoming wider towards apex at which point it is a little triangular; corium sub-triangular and about one-half as long as the membrane and darker with three stout, longitudinal veins; the membrane has a pale longitudinal suture, two veins running parallel to the margins and converging at the tip, no transverse veins; hind wings sooty black, shorter than hemelytra but extending beyond tip of abdomen, broad at base, a suture and veins similar to those of hemelytra; all other structural

characters very similar to those of the apterous form.

Location of Types: Holotype, apterous male; allotype, apterous female; homomorphotype, macropterous male; allomorphotype, macropterous female, and many paratypes in Snow collection, Kansas University, Lawrence, Kansas.

Comparative Notes: T. subnitidus Esaki is very similar to its variety except that in the variety the two longitudinal yellow vittae along median portion of mesonotum are often absent and when present are usually coalesced with the bands on posterior margin; the median portion of the pronotum of T. subnitidus Esaki is all black while that of T. subnitidus var. rotundus var. new has a narrow yellow band.

Distribution: Texas, Alabama, Louisiana, Mississippi, Kansas.

TREPOBATES SUBNITIDUS Esaki.

T. subnitidus Esaki Ann. Mus. Hung. 23
p. 141, 1926.

Original description rearranged.

Size: Apterous male: length 3.08 mm.
width 1.32 mm.

Apterous female: length 3.4 mm.
width 1.54 mm.

Color: Apterous male: a broad longitudinal black band on head, a line on each side above eyes and posterior margin between these lines yellow; pronotum with a small anterior portion, sides and a median band black, an irregular yellow band on each side of median band; mesonotum mostly black, with a broad yellow band along each side, an interrupted yellow line on posterior margin and a small yellow spot on each side above; metanotum black; abdomen above black except last abdominal segment which is yellowish-brown, sides black; venter yellowish brown; anterior legs

dark brown with a yellow band at the base of the femora; intermediate legs dark brown, the femora with a band at apex and under-surface yellow; antennae dark brown with the base of first segment yellow.

Apterous female: A broad longitudinal black band on head, a narrow line above eyes and a small anterior portion on posterior margin between these lines yellow; pronotum with anterior portion, sides and a broad median band black, a yellow band on each side of median band; mesonotum mostly black with a broad band along each side, an interrupted band on posterior margin and a small spot on each side above yellow; metanotum black with a small yellow spot on each side; abdomen above black, except a small spot on first segment, two spots on last abdominal segment and most of first genital segment yellow, sides mostly yellow; connexivum yellow with black margin and a dark line at the base of each segment; anterior legs dark brown, the femora being striped with yellow; antennae dark fuscous, base of first segment yellow.

Structural Characters: Apterous male: front femora quite stout; intermediate femora rather small, about 1.7 mm. in length, densely clothed with fine hairs, as long as two-thirds the diameter of the segment bearing them, basal one-third of intermediate tibiae clothed beneath with a row of long hairs, slightly longer than the diameter of the segment; pronotum practically twice as broad as long; the mesothorax is quite short and rounding, measuring .8 mm. from the pronotum to the metanotum and 1.3 mm. broad.

Apterous female: First antennal segment distinctly shorter than II and III combined, II may be slightly shorter than or equal to III; anterior femora much more slender than those of male; intermediate femora about the same size as those of the male; pronotum twice as broad as long; mesonotum slightly longer than that of male, posterior margin truncate; connexivum broad margin with very short fine hairs.

Location of Types: National Museum of Hungary.

Comparative Notes: This species very closely

resembles T. floridensis, D.& H. with my limited number of specimens, I am unable to find any striking differences between the two species. Some of the specimens which I have classified as T. floridensis, D.& H. closely resemble T. subnitidus Esaki but they also fit the description of T. floridensis, D.& H. Esaki has given in his original description of T. subnitidus Esaki, the length of the second and third antennal segments as being equal in length. I have found these two segments equal in some specimens of T. floridensis D. & H. and in others the second distinctly shorter, but I do not find them equal in the one female T. subnitidus Esaki which was collected from the type locality on the same date. The other specimens a type, male has its antennae broken off. Esaki's drawing of this species shows two short, longitudinal yellow lines along median portion of mesonotum but they are not present on the two specimens which I have observed. The females of T. subnitidus var. rotundus var. new have some characters similar to those of this species but

the males are quite different. The males of T. subnitidus var. rotundus var. new are much larger, the mesonotum is narrower in proportion to the rest of the body and the hairs on the intermediate femora are shorter. The females of T. subnitidus Esaki have a broader black band on the head than its variety T. subnitidus var. rotundus var. new and lack the yellow band along median line of pronotum.

Data on Distribution: The two specimens which I have observed were collected in Indiana, the type locality.

TREPOBATES TREPIDUS, D. & H.

T. trepidus, D. & H. Proc. Biol. Soc. Wash.

XLI p. 27, 1928.

T. trepidus, D. & H. Florida Ent. Apr. 1928

p. 8.

Original description rearranged.

Size: Apterous male; length 3.7 mm. width 1.4 mm.

Apterous female; length 4 mm. width 1.8 mm.

Color: Apterous male: median portion of head with a broad arrow-shaped black band, sides and posterior margin yellow; pronotum with anterior margin, a broad median stripe and a broad stripe on each side black; mesonotum mostly black with a curved yellow band on each side above, turning its convexity outwards, their posterior ends coalescing with the interrupted yellow band on posterior margin of mesonotum; metanotum black with an oblique yellowish stripe on each side; abdomen above black except last abdominal segment and two small spots on preceding one yellow, sides black, venter yellow; antennae dark brown, basal portion of first segment yellow.

Apterous female: color markings on head, pronotum, mesonotum and metanotum same as on male; abdomen bluish-black with irregular yellow spots on first three segments; connexivum dark brown with yellow spots on each segment; entire body beneath yellow.

Structural Characters: Apterous male: antennae short less than 2.5 mm. long, first segment shorter than common, less than 1 mm. in length, II, III and IV about equal, II slightly shorter; anterior femora stout; intermediate femora stout, clothed beneath with long hairs slightly shorter than the diameter of the segment bearing them; the last segment of venter broadly and roundly emarginate behind, as wide as the two preceding segments, the margin with long hairs; the first genital segment with numerous very long dark brown hairs on the basal portion, the median portion behind the shorter blackish hairs; claspers strongly curved, very stout; cephalic angles of mesonotum very broad and square almost at right angles to sides of pronotum.

Apterous female: much larger than male; cephalic angles of mesonotum very broad and square; anterior femora more slender, intermediate femora longer and stouter than those of male; yellowish stripes on each side of mesonotum broad; last abdominal segment clothed with numerous long dark brown hairs; posterior margin of mesonotum truncate.

Macropterous Forms: pronotum large, posterior portion triangular and rounded; a longitudinal stripe on each side and posterior margin yellow, the two stripes meeting the yellow margin about midway; the hemelytra with sooty black membrane and much darker corium, membrane with pale longitudinal suture throughout and two veins which converge on the tip, the same as in other species; last segment of venter of male and last abdominal segment of female clothed with long hairs the same as in the apterous forms.

Location of Types: Iowa State College.

Comparative Notes: this species is very easily recognized as there are no other species

in the genus with very similar color pattern, shape or structural characters; aside from other characters the long hairs on the first genital segment of the male, the hairy last abdominal segment of the female and the very broad anterior portion of mesonotum serve to separate this species from the other species of the genus.

Data on Distribution: Mexico, Central America, and West Indies.

TREPOBATES FLORIDENSIS, D. & H.

T. floridensis, D. & H., Ohio Journal of
Science V.XVllll, #5
Sept. 1928 p. 273

Original description rearranged.

Size: Apterous male; length 2.6 - 3 mm.
width 1 - 1.2 mm.

Apterous female: length 3 - 3.6 mm.
width 1.4 - 1.65 mm.

Color: Apterous male: color markings slightly variable; body above mostly black with a more or less velvety appearance; a line on each side of head above eyes and posterior margin between these lines yellowish brown; pronotum with a small irregular yellow spot on each side and more or less at posterior margin; mesonotum with an elongate spot on either side above; and an interrupted line on posterior margin yellow; body beneath and a broad stripe on each side of mesonotum yellow, metanotum black, sometimes with a yellow spot on

each side; abdomen above black, sometimes two reddish-brown spots on last abdominal segment; connexivum and sides of abdomen brownish-black; venter yellowish-brown; rostrum dark brown the basal segment yellowish; antennae dark fuscous, base of first segment yellow; intermediate femora dark brown above and yellowish brown beneath.

Apterous female: color markings nearly the same as those of male; yellow markings on pronotum larger; the two elongate yellow spots on mesonotum usually coalesce with those on the posterior margins; last abdominal and first genital segment sometimes yellow; a broad black band on outer margin of connexivum.

Structural Characters: Apterous male: size of both sexes varies in different localities but by far the smallest known species of the genus; first antennal segment curved near center, II, III and IV about equal in length, II slightly shorter; anterior femora quite slender, and curved; inter-

mediate femora short and stout, about 1.5 mm. in length, clothed beneath with short fine hairs; pronotum impressed on each side of the disc; mesonotum often uniformly impressed along median line.

Apterous female: distinctly larger than male; antennae slightly shorter; anterior femora smaller and intermediate femora larger than those of male, posterior margin of mesonotum truncate; connexivum broad, apex not produced outward, margin clothed with long brownish-black hairs.

Location of Types: in collection of authors, Iowa State College.

Comparative Notes: this species is easily determined because of its minute size and its much darker coloration, in some specimens the dorsal side is entirely black; T. trepidus D.& H. has a similar color pattern but is much larger and has long hairs on last segment of venter.

Data on Distribution: Florida, Georgia and Virginia; Florida is the type locality, the larger specimens being taken in Virginia.

TREPOBATES INERMIS, Esaki

T. inermis, Esaki, Ann. Mus. Nat. Hung. XXIII
p. 140, 1926.

T. inermis, Esaki, Biological Soc. of Wash.
V.41, p. 26, 1928.

Size: Apterous male: length 3.2 mm.
width 1.35 mm.

Apterous female: length 3.9 mm.
width 1.75 mm.

Color: Apterous male: color markings slightly variable; a broad arrow-shaped black band on head, yellow above eyes; the middle, sides and small anterior portion of pronotum black, separated by two irregular yellow bands; mesonotum with a very narrow black median line separating two narrow, parallel yellow lines which diffuse with the inside margins of two transverse yellow bands on posterior margin of mesonotum, forming two yellow L's with their base projecting outward,

these two parallel bands do not quite extend to the anterior margin of the mesonotum, two irregular curved yellow bands on sides above extending posteriorly from anterior portion, usually diffused with the outer points of the transverse yellow bands, a narrow longitudinal yellow line on each cephalic angle, each line extending back about one-fourth the length of the mesonotum; metanotum black with an irregular, oblique yellow band on each side; abdomen above bluish-black, except last abdominal segment which is yellow and the preceding segment usually with two yellow spots; sides of abdomen yellow; connexivum yellow with margin and short line at base of each segment black; entire body beneath yellow; antennae dark fuscous, base of first segment yellow; anterior femora with band at apex and basal one-half above yellow; intermediate femora with longitudinal brown and yellow stripes.

Apterous female: general color pattern same

as that of male, except on pronotum and abdomen; black median band on pronotum divided by a narrow yellow band; the black median band on mesonotum broader and more irregular; the yellow bands on metanotum larger; abdomen above frosted with blue-grey, with irregular yellow markings; connexivum with yellow markings similar to male; sides of abdomen and entire body beneath yellow.

Structural Characters: Apterous male: first segment of antennae long, over 1 mm. in length and curved, larger at apex, II distinctly shorter than III, IV about equal to III, a row of long hairs on inside base of segment III; anterior femora strongly curved, not so stout; intermediate femora rather slender, clothed beneath with long hair being about as long as the diameter of the segment bearing them; hind legs slender; claspers short and quite stout.

Apterous female: first antellal segment shorter, II very much shorter than III, no long

hairs on lll; anterior femora more slender; intermediate femora without long hairs; connexivum rather broad, the apex not produced outward, margin with a few long dark brown hairs; posterior margin of mesonotum truncate.

Macropterous Form: we have no winged specimens in the collection and no description is available.

Location of Types: National Museum of Hungary.

Comparative Notes: this species closely resembles its variety T. inermis var. quadratus var. new which has a color pattern almost the same as this species except that it lacks the narrow, longitudinal yellow line on each cephalic angle of the mesonotum; the abdomen of T. inermis Esaki is mostly yellow and the sides and venter of T. inermis var. quadratus var. new is brownish black except posterior half of last segment and all of first genital segment which

is yellow; the mesosternum of T. inermis var. quadratus var. new usually has four irregular dark spots on the female and two on the male, these spots are sometimes completely faded out while in T. inermis Esaki, they are never present; the third antennal segment of the male T. inermis var. quadratus var. new lacks the long hairs; the cephalic angles of T. inermis var. quadratus var. new are much broader and more square than those of T. inermis, Esaki.

Data on Distribution: Ohio, New York, Texas, Mississippi, Iowa, Kansas, Tennessee and Maryland.

TREPOBATES INERMIS, var. quadratus var. new

Size: Apterous male: length 3.5 mm.

width 1.36 mm.

Apterous female: length 3.95 mm.

width 1.8 mm.

Color: Apterous male: color markings somewhat variable; a broad longitudinal arrow-shaped black stripe on head and a distinct line above eyes yellow; the middle and sides of pronotum and a small anterior portion black, separated by two yellow bands; mesonotum with a narrow black median line, separating two narrow parallel yellow lines which coalesce with the inside margins of two transverse yellow bands on posterior margin of mesonotum forming two yellow L's with their base projecting outward, the two parallel yellow bands never quite extend to the anterior margin of the mesonotum, two irregular, curved yellow bands on sides above extending posteriorly from anterior portion often connected to the outer

points of the transverse yellow bands by a much narrower yellow line; metanotum with two irregular oblique yellow bands on sides; abdomen above black, frosted with bluish-black except last abdominal segment which is yellow; first genital segment above with large black spot; lateral and ventral sides of abdomen black except posterior half of last abdominal segment and most of genital segments, the median line of venter sometimes pale yellow; usually two irregular dark spots near posterior margin of mesosternum, these spots are very faint or absent in some specimens; antennae dark fuscous, small portion near base of first segment yellow.

Apterous female: color pattern small as male, except on pronotum and abdomen, black median band of pronotum divided by a narrow sometimes very short yellow line; all markings of mesonotum the same but larger than on male; abdomen above black frosted with blue-grey usually with much yellow on first three and last two

segments, lateral and ventral sides yellow; connexivum mostly yellow with margin and a short line along basal portion of each segment black; mesosternum with four longitudinal dark spots, sometimes very faint or absent; antennal and last two segments of rostrum shiny black, first segment of rostrum yellow with a triangular black spot, base of first antennal segment yellow.

Structural Characters: Apterous male: first antennal segment nearly 1 mm. long, curved, enlarged toward apex, second segment very short, III and IV slightly longer, III without long hairs; anterior femora stout, curved; intermediate femora stout, clothed beneath with long hairs as long as the diameter of the segment bearing them.

Apterous female: first antennal segment shorter, II very short, III and IV about equal; anterior femora slender and curved; intermediate femora stout; connexivum broad, the apex not produced outward, margin clothed with long dark brown hairs; posterior margin of mesonotum truncate.

Macropterous Form: pronotum large, pentagonal, the posterior margin yellow, a longitudinal yellow stripe on each side extending back from the anterior margin about one-third the length of the pronotum, a yellow spot is present between these in females but absent on males, the longitudinal yellow bands never extend to the posterior yellow margin as is the case in most species; the dark spots are usually present on the mesosternum, and all other characters are similar to the apterous form; the apical one-half of the wings are broken off on all my specimens but a generic description of the wings fully describes the wings of all species.

Location of Types: Holotype apterous male, allotype apterous female, holomorphotype winged male, allomorphotype winged female, a large number of paratypes, deposited in Snow collection at Kansas University, Lawrence, Kansas.

Comparative Notes: This variety is separated from the species T. inermis Esaki by

the following characteristics: lack of long hairs on third antennal segment of male; stouter intermediate femora in both sexes, absence of a short longitudinal yellow line at each cephalic angle of mesonotum in both sexes; by presence of dark spots on mesosternum; the mesonotum is much broader at the anterior portion than in T. inermis Esaki.

Data on Distribution: West Indies, Texas; all the winged and a few apterous forms were taken in Hidalgo County, Texas but most of our specimens were taken at Jamiaca and Havana, Cuba.

TREPOBATES COMITIALIS, D. & H.

T. comitalis, D. & H. Florida Ent. 12 p. 7.

Original description rearranged.

Size: Apterous male: length 3.3 mm.

width 1.33 mm.

Apterous female: length 3.7 mm.

width 1.7 mm.

Color: Apterous male: color markings slightly variable; a broad longitudinal arrow-shaped black band on head, a line on each side above eyes and posterior margin between these lines yellow; middle and sides of pronotum and a small anterior portion black; mesonotum mostly black, with a more or less oblique, short, yellow line at each of the cephalic and caudal angles, two very short slightly curved yellow lines on posterior margin and usually an elongate, curved yellow spot on each side above; metanotum black; abdomen above black except apical portion of last abdominal segment, sides brownish black; venter reddish brown with darker line at the base of each segment; connexivum dark with a

yellowish spot on each segment.

Apterous female: color markings very variable, some specimens almost black others with much yellow; general contour of yellow markings same as on male but usually more pronounced; black median band of pronotum divided by a yellow and usually short longitudinal band; the yellow lines on cephalic and caudal angles of mesonotum same as on male, but slightly more prominent; the inner margins of the two curved bands on posterior margin of mesonotum usually produced anteriorly into two converging lines which never quite meet, these lines are sometimes almost or entirely absent; an elongate yellow spot on each side above which sometimes extend back to the outer points of the bands on posterior margin of mesonotum; metanotum black, usually with an irregular yellow band on each side; abdomen above in some specimens entirely black, in others with irregular yellow markings, sides of abdomen mostly yellow; connexivum yellow with a dark line at the base of each segment; entire body beneath yellow; antennae dark brown; anterior, intermediate,

and hind femora with much yellow.

Structural Characters: Apterous male: second joint of antennae slightly shorter than the third; anterior femora stout; intermediate femora rather slender clothed beneath with hairs nearly as long as the diameter of the segment bearing them; claspers long and slender, curved at apex.

Apterous female: Proportional length of antennal segments same as male but all shorter; anterior femora much more slender; intermediate femora stout; posterior margin of mesonotum truncate; connexivum broad, margin with very few short brown hairs.

Macropterous Form: pronotum mostly black, long, rounded behind, the entire posterior triangular process with yellow margin two widely separated, posteriorly diverging vittae, extending back one-third the length of the pronotum, seldom reaching yellow margin of process, in females a narrow yellow line is present between these vittae on the anterior portion, membrane

of hemelytra brown, with base black, curved and tapering at base, gradually becoming wide toward tip, but triangular and rounded at tip; hind wings sooty black with veins and suture corresponding to those of hemelytra, hind wings shorter than hemelytra but extending beyond the tip of abdomen; on the mesosternum are two wide posteriorly diverging black bands extending nearly to the base of the abdomen, in some specimens these bands are interrupted near the posterior ends; other characters the same as given for apterous forms.

Location of Types: Iowa State College.

Comparative Notes: this species is distinguished from T. inermis Esaki by the absence of long hairs on the third antennal segment and the middle femora of males; the mesonotum is much darker in both sexes of T. comitalis, D. & H.

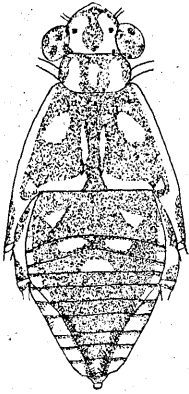
Data on Distribution: Grenada, West Indies, Trinidad, and Manacapuru, S. A.

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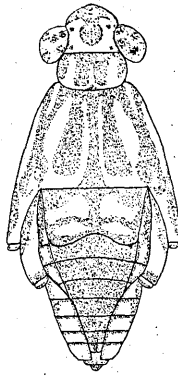
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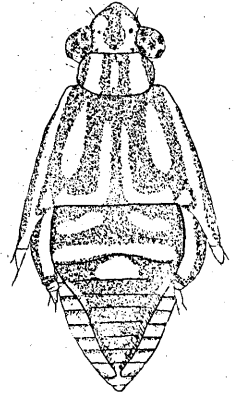
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2. T. inermis Esaki. Female.
3. T. inermis quadratus var. n. Female.
4. T. comitialis D. & H. Female.
5. T. knighti D.& H. Female.
6. T. kansiensis sp. n. Female.
7. T. esakii sp. n. Female.
8. T. pictus H.-Sch. Female.
9. T. trepidus D.& H. Female.
10. T. floridensis D.& H. Female.



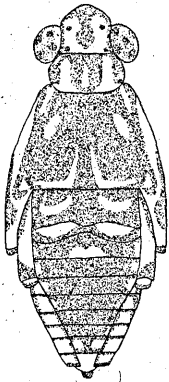
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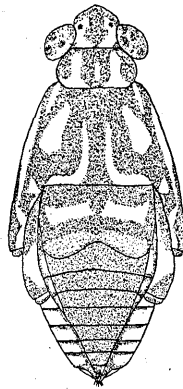
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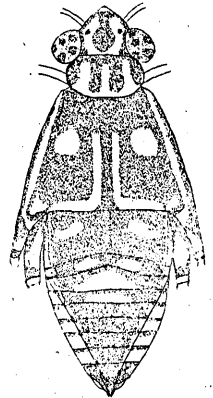
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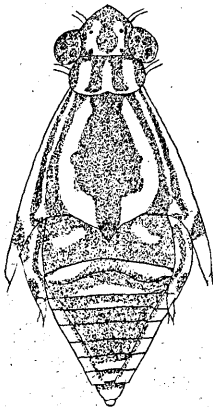
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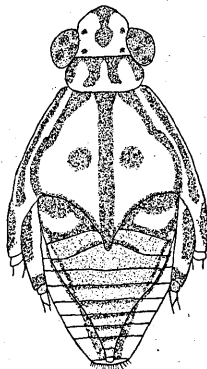
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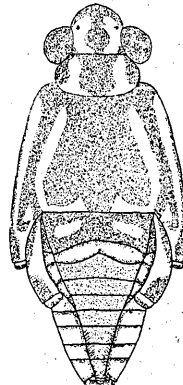
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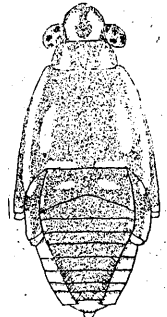
7. *T. esakii* sp. n.



8. *T. pictus* H.-Sch.



9. *T. trepidus* D. & H.



10. *T. floridensis* D. & H.