

IMMATURE STAGES OF SOME EASTERN NEARCTIC  
TABANIDAE (DIPTERA). VII. *HAEMATOPOTA* MEIGEN  
AND *WHITNEYOMYIA* BEQUAERT PLUS OTHER  
TABANINI<sup>1,2</sup>

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ABSTRACT

Descriptions of the larvae and pupae of *Haematopota punctulata* Macquart, *Whitneyomyia beatifica* var. *atricorpus* Philip, *Tabanus birdiei* Whitney, *T. imitans* Walker, *T. sackeni* Fairchild, and *T. trijunctus* Walker and the pupae only of *T. catenatus* Walker, *T. venustus* Osten Sacken, *T. zythicolor* Philip, and *Hybomitra cincta* (Fabricius) are provided. Also, the larva and pupa of an additional species not successfully reared are described as both stages exhibit characters sufficiently unique to indicate the species represents one of the un-reared tabanid genera.

Information on the immatures of Nearctic Haematopotini is limited to descriptions of the larva and pupa of *Haematopota americana* Osten Sacken furnished by Cameron (1926, 1934) and to brief comments on *H. punctulata* Macquart given by Jones and Anthony (1964). Knowledge of the immature stages of the Tabanini of the eastern Nearctic is limited to data on species of 3 of the 6 genera occurring there. Teskey (1969) characterized the immatures of *Tabanus* Linnaeus, *Atylotus* Osten Sacken, and *Hybomitra* Enderlein and described the larvae and pupae of 19, 7, and 18 species of each, respectively. The larvae and pupae of 8 additional species of *Tabanus* and the pupa only of another were described in Part III of this series (Goodwin 1973). Descriptions of the larvae of 4 species of *Tabanus* not treated in the above were furnished by Tidwell (1973).

Tidwell and Tidwell (1973) gave descriptions of the larvae and pupae of 5 other species of the same genus.

Below are found descriptions of the larvae and pupae of *Haematopota punctulata*, *Whitneyomyia beatifica* var. *atricorpus*, *Tabanus birdiei*, *T. imitans*, *T. trijunctus*, and *T. sackeni* and the pupae only of *T. catenatus*, *T. venustus*, *T. zythicolor*, and *Hybomitra cincta*. In addition, the larva and pupae of a species not successfully reared are described. The characters of this last species seem generically distinct.

No taxonomic keys are provided, but characters allowing separation of these taxa (using the keys in Teskey (1969) as a base) from other known juveniles of the eastern Nearctic fauna are noted in the comments. The reader is referred to Teskey (1969) or Goodwin (1972) for figures illustrating descriptive terminology.

<sup>1</sup>The opinions and assertions contained herein are the private ones of the author and are not to be construed as the views, either official or non-official, of the Department of the Air Force.

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*Haematopota* Meigen

Cameron (1926, 1934) described the larvae and pupae of *H. americana* from North America and *H. pluvialis* Linnaeus from Europe. Based on Cameron's descriptions and the descriptions of *H. punctulata* which follow, the immatures may be characterized as follows: larvae are small to medium size (11-22 mm), whitish with lightly contrasting pubescence; thoracic segments with anterior annuli and caudal projections from them; integument lacking integumentary striations; Cameron (1926, 1934) stated that living specimens appeared striated, but preserved larvae and exuvia were non-striated; midlateral pubescence present or absent (present in known North American species) on anal segment but when present not united with pubescence of anal lobes; respiratory siphon length and width essentially equal; 4 pairs of pseudopodia on each of the first 7 abdominal segments. Pupae are small, less than 14 mm long; abdominal fringes uniseriate; lateral preanal combs absent; dorsal tubercles of aster shorter than lateral or ventral tubercles.

*Haematopota punctulata* Macquart

*Mature larva* (Fig. 1): 12-15 mm long; whitish with faintly contrasting pubescent markings. Head capsule ca. 1.50 mm long, 0.39 mm wide. Anal segment rounded posteriorly, ca. 0.84 mm long and wide. Respiratory siphon small, ca. 0.27 mm long and 0.24 mm wide. No evidence of integumentary striations in exuvia or preserved specimens. Tracheal trunks ca. 0.1 mm in diameter, not noticeably tapered anteriorly. Pubescence on all segments, not sharply contrasting. Thoracic segments with anterior annuli, that of prothorax with 2 lateral caudal projections that are narrowly separated along midline; meso- and metathoracic annuli with 4 lateral caudal projections, these about 1/3 and 1/5 lengths of respective segments. Anterior pubescence encircles abdominal segments I-V, forms a small isolated ventrolateral patch on VI, absent from VII. Pseudopodial pubescence forms complete annuli on abdominal segments I-VII, united with anterior pubescence dorsolaterally on I-II and ventrolaterally on I-IV. Posterior pubescence only on anal segment where it forms a narrow annulus; a midlateral band extends anteriorly from the annulus to the middle of the anal segment, the band expanded in middle; a single small isolated dorsolateral spot above midlateral band; anal ridge and lobes pubescent but lacking dorsal extension.

*Pupa* (Fig. 9, 19): 10.5-12.5 mm long, light brownish yellow; spiracular prominences, antennal sheaths, and tubercles of the head a little darker. Antennal ridges sharply divided into median and lateral portions; median portions sharply ridged apically, not skewed, and elevated ca. 0.09 mm above median cleft; lateral portions represented by a low mound surmounted by 3-4 short, sinuous ridges. Frontal

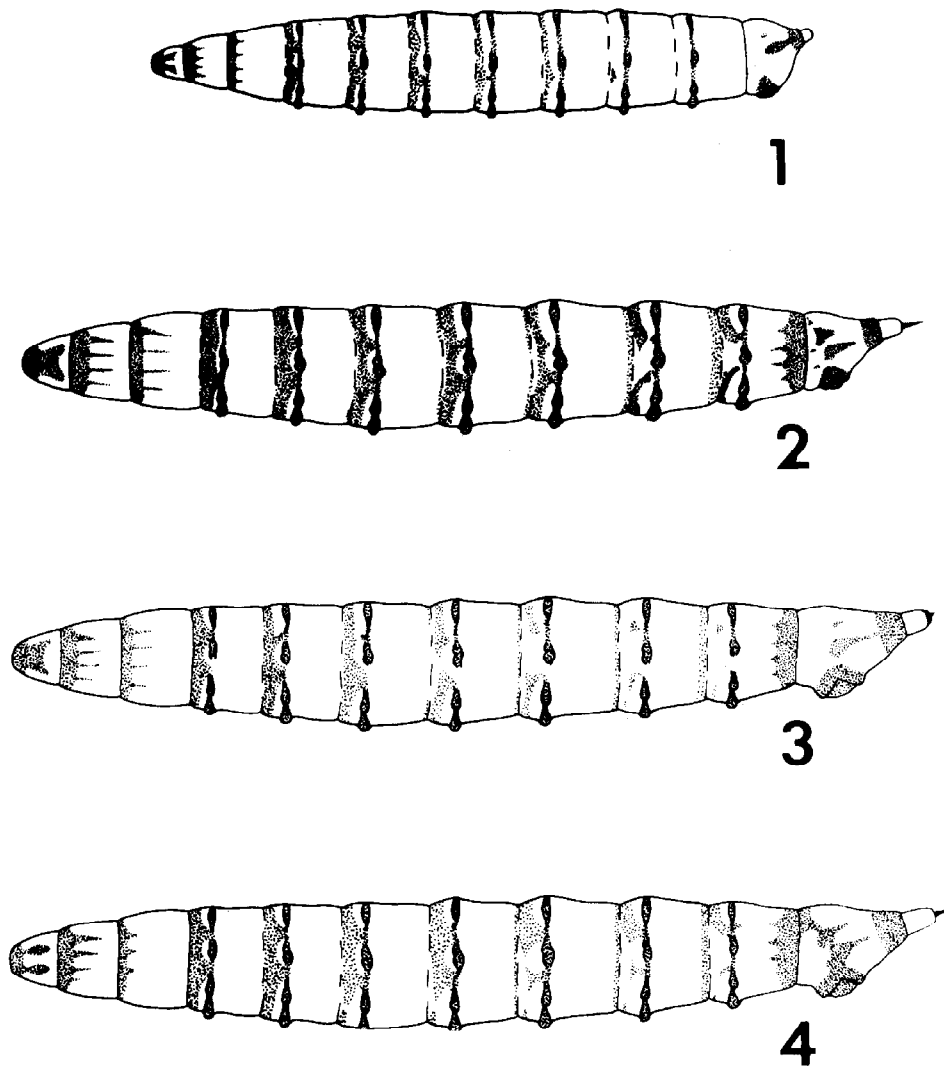


Fig. 1-4. Lateral views of larvae of Tabanidae: 1) *Haematopota punctualata*; 2) *Whitneyomyia beatifica* var. *atricorpus*; 3) Genus A; 4) *Tabanus birdiei*.

tubercles represented by a single, median, irregularly rectangular outline of low ridges; maximum elevation 0.02 mm. Callus tubercles unisetose elevated ca. 0.12 mm above frontal surface. Antennal sheaths 0.36 mm long, 0.27 mm wide; distinctly annulated, the basal annulation with a small median tubercle; not attaining epicranial suture in male, attaining or slightly exceeding epicranial suture in female. Vertical and orbital tubercles small; anterior and posterior orbital tubercles laterally compressed, others rounded. Thoracic spiracles nearly linear, only ca. 0.18 mm long; spiracular prominence not exceeding dorsal thoracic margin. Setae of meso- and metathoracic segments not tuberculate. Dorsolateral setae of first abdominal segment not tuberculate; lateral setae tuberculate. Spinous fringes uni-

seriate; present on all aspects of abdominal segments II-VII; fringe of tergite VII with 22-28 spines. Lateral preanal combs absent; dorsal and ventral or ventrolateral combs well developed with 2-4 and 5-7 or 18 spines, respectively. Tubercles of aster all gradually tapered to bluntly rounded apices; dorsal tubercles nearly parallel and directed dorsally; lateral and ventral tubercle on each side nearly parallel in side view and directed caudally, flaring slightly in lateral direction; lengths of dorsal, lateral and ventral tubercles 0.15, 0.21, 0.18 mm, respectively.

*Collections:* A total of 9 larvae was collected yielding 4 adults. Five larvae were collected at Torreya State Park, Liberty Co., Florida. Two were found in moss-covered silt near the margin of a small stream flowing through a valley between 2 hills. The others were in a decaying pine log lying near the stream. The entire valley and much of the 2 hillsides comprised a large silty, seepage area. Four larvae were found in wet mud and root mat about 2 feet from the edge of Wright Lake in the Apalachicola National Forest, Franklin Co., Florida.

*Comments:* Only 1 other North American species is known. Cameron (1926, 1934) provided descriptions and figures of *H. americana*. Based on these descriptions, pupae of the species cannot be separated. A single larval difference, however, exists. The midlateral pubescence of the anal segment is an isolated spot in *H. americana*, but it is connected with the posterior annulus in *H. punctulata*. Jones and Anthony (1964) included in their generic key for larvae the genus *Haematopota* (as *Chrysozona* Meigen) based on a single specimen of *H. punctulata*. They did not provide descriptions of the larva and pupa.

#### *Whitneyomyia* Bequaert

Larvae and pupae of *Whitneyomyia* are so similar to those of some species of *Tabanus* that they cannot be separated readily at the generic level. In fact, the generic characterization given by Teskey (1969) for his combined treatment of *Tabanus* and *Atylotus* readily encompass the immatures of *Whitneyomyia*. However, the following generic diagnoses allow separation of *Whitneyomyia* immatures from those of *Atylotus* and the majority of the known *Tabanus*.

Larvae of *Whitneyomyia* are characterized as follows: third antennal segment shorter than second; 4 pairs of pseudopodia on each of the first 7 abdominal segments; well-developed striations present only on the lateral surfaces of all segments and the ventral surface of the anal segment; anterior thoracic annuli with caudal projections on lateral surfaces, that of the prothorax a single broad fan-shaped band, those of the meso- and metathorax 4 slender pointed ones; evident pubescent markings on midlateral surfaces of anal segment; respiratory siphon longer than broad basally; stigmal spine present.

Pupae of *Whitneyomyia* exhibit the following: callus tubercles unisetose; antennal sheaths exceed epicranial suture, at least in female; frontal tubercles present; abdominal fringes biseriate; all preanal combs present, the dorsolateral and lateral ones reduced; dor-

sal and lateral tubercles of aster on decidedly different planes in lateral view.

*Whitneyomyia beatifica* var. *atricorpus* Philip

*Mature larva* (Fig. 2): 26.5 mm long, whitish with moderately dark brown pubescent pattern; respiratory siphon with a stigmal spine; 4 pairs of pseudopodia on each of the first 7 abdominal segments. Head capsule brown, 3.5 mm long, ca. 1.0 mm wide. Anal segment ca. 2.4 mm long, 2.0 mm broad basally. Respiratory siphon ca. 1.0 mm long, 0.83 mm broad basally; stigmal spine about same length as siphon, the upper and lower edges slightly concave in lateral view. Dorsal tracheal trunks ca. 0.35 mm in diameter in anal segment, markedly constricted anteriorly in region of first abdominal segment. Striations present laterally on all segments, also ventrally posterior to anal lobes on anal segment; spacings 0.038-0.042 mm on anal segment, 0.028-0.035 mm on remainder. Pubescence on all segments, brown, a little darker on last 2 segments. Anterior pubescence encircles thoracic and first 5 abdominal segments, absent midlaterally from VI and VII and also midventrally from VII, totally absent from anal segment; prothoracic annulus with a single broad, fan-shaped, posterior projection on lateral surface; meso- and metathoracic annuli each with 4 posterior projections laterally, these crossing 2/3 and 1/2 of non-pubescent areas on respective segments; anterior pubescence united with pseudopodial pubescence dorsolaterally and ventrolaterally on abdominal segments I-IV and VII, ventrolaterally only on V-VI. Pseudopodial pubescence encircles all pseudopodial segments, the pubescence predominantly velvety but with evident, small recumbent spines on anterior half of most pseudopodia. Posterior pubescence on all abdominal segments, very faint on first 3, obviously encircling last 5 or 6 segments, absent laterally from remainder; annulus of pre-anal segment laterally with 4 short, pointed, anterior projections, the most dorsal one on same line as a short caudal projection from pseudopodial annulus, the interval between the 2 projections with some very faint pubescence. Posterior annulus of anal segment broad with an anteriorly directed midlateral extension that curves ventrally to approach but not unite with pubescence of anal ridge and lobes; remaining pubescence of anal segment includes 2 faint spots (1 ventrolateral and the other nearly dorsal, very near anterior margin) and above the anterior end of the midlateral band a more obvious dark area that may be a single large irregular patch or composed of 2 patches, 1 much smaller than the other.

*Female pupa* (Fig. 8, 20): Ca. 18.5 mm long, uniformly light brown. Antennal ridges partially divided into median and lateral portions by a broad, shallow depression; median portion sharply crested, crescentic in outline, elevated above broad median cleft ca. 0.17 mm; lateral portions somewhat rounded apically, as wide as median portions but only half as high. A pair of low, frontal tubercles evident. Callus tubercles unisetose, ca. 0.17 mm high, slightly skewed laterally, with apex truncate. Antennal sheaths long, slender, uncurved, ca. 0.95 mm long and 0.54 mm broad, exceeding epicranial suture ca. 0.17 mm. Vertical and orbital setae tuberculate, the tuber-

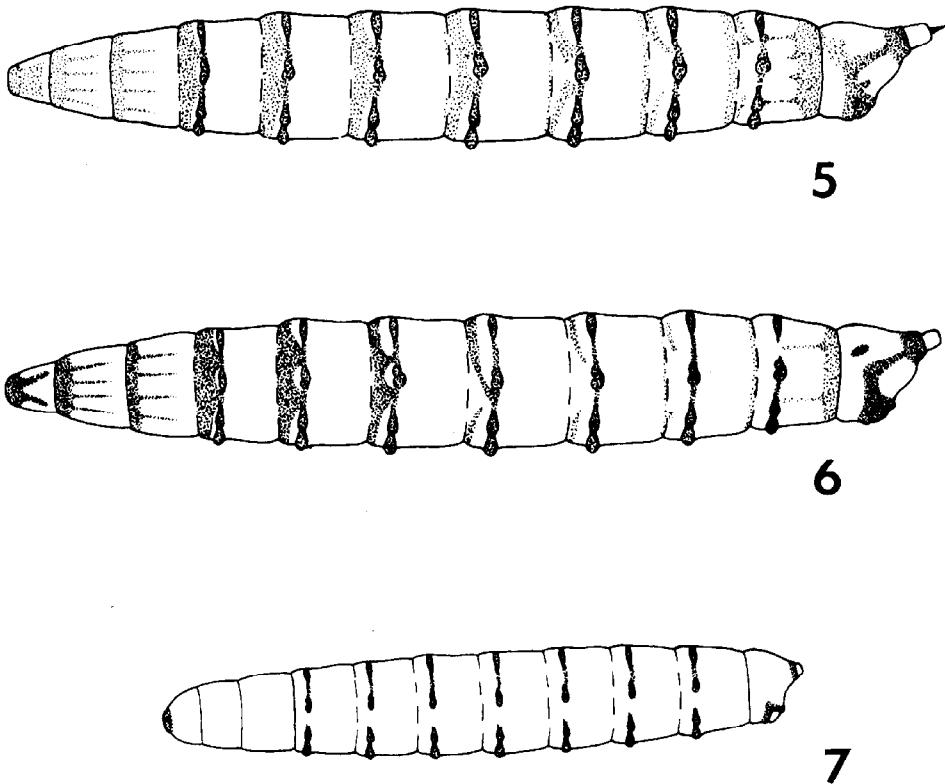


Fig. 5-7. Lateral views of larvae of Tabanidae: 5) *Tabanus tri-junctus*; 6) *T. imitans*; 7) *T. sackeni*.

cles of the anterior and posterior orbital setae obliquely compressed. Thoracic spiracle 0.67 mm long, nearly a question mark in outline; spiracular prominence very slightly exceeds anterior margin of thorax. Setae of meso- and metathorax not tuberculate. Dorsolateral setae of abdominal segment I not tuberculate, lateral setae tuberculate. Abdominal segments II-VII encircled by biseriate fringes of spines, those of anterior series less than half the length of posterior on same segment; fringe only slightly reduced ventrally; fringe of tergite VII of ca. 46 spines, the posterior series reduced to a dorsal and 2-3 lateral pairs of spines. Dorsolateral and lateral preanal combs reduced, composed of 3-4 and 1-2 short spines, respectively, these spines not on evident tubercles; ventrolateral preanal combs of 7-8 spines, most of moderate length. Entire aster very smooth; dorsal, lateral, and ventral tubercles broad basally, tapering rapidly to sharp apices; respective lengths of tubercles 0.23, 0.33, 0.13 mm.

*Collection:* I reared a single female from a larva taken from wet mud at the margin of a cattle pond on the Auburn University campus. Other species collected in the same general area included *T. aranti* Hays and *T. trimaculatus* Palisot. A second pupa, also female, was obtained on loan from Dr. Kirby Hays. It was taken at the same locality.

*Comments:* Immatures of *W. beatifica* seem closest to those of

*Tabanus* from which they cannot be separated at the generic level. However, the presence of a stigmatal spine in the larva distinguishes this species from all but a few species of *Tabanus*, and the full-grown larvae of all of these are noticeably larger and longer, exceeding 30 mm. In addition, a comparison of the pubescent pattern of the prothorax and anal segment likely would eliminate confusion with early instars of the *Tabanus* larvae. Pupae would not readily key beyond couplet 9 (Teskey, 1969), but the obliquely compressed anterior and posterior orbital tubercles and the fact that the thoracic spiracular prominences do not exceed the anterior thoracic margin indicate closer agreement with the first choice in that couplet. Taking that alternative, the length, size, and the degree to which the antennal sheaths exceed the epicranial suture would distinguish *Whitneyomyia*. Jones and Anthony (1964) reported rearing field collected larvae of this taxon, but they provided no descriptions of the immature stages.

*Tabanus birdiei* Whitney

*Mature larva* (Fig. 4): Ca. 36 mm long; living larva light green with dark contrasting pubescent markings, exuvia whitish with brown, pubescent markings. Head capsule ca. 4.55 mm long, 1.18 mm wide. Anal segment attenuate, ca. 2.73 mm long, 2.37 mm wide. Siphon ca. 1.18 mm long, 0.82 mm wide; stigmatal spine present. Striations present laterally at 0.03 mm spacings, dorsally on abdominal segments at 0.45 mm spacings, absent or broken and inconspicuous elsewhere. Pubescence on all segments, moderately dark. Thoracic segments with anterior pubescent annuli; prothoracic annulus with paired, lateral, club-shaped, caudal extensions; mesothoracic annulus with 4 lateral caudal projections, progressively shorter from dorsal to ventral; metathoracic annulus with 3 short lateral, caudal projections, the most ventral of the usual 4 projections absent. Anterior pubescence forming complete annuli on abdominal segments I-II; absent ventrolaterally from III-VII and midlaterally from V-VII. Pseudopodial pubescence forming complete annuli on abdominal segments I-VII; united dorso- and ventrolaterally with anterior pubescence on I-VII. Posterior pubescence forms complete annuli on abdominal segments IV-VIII; posterior annulus of VII with 4 short anterior lateral projections, the most dorsal on line with a short caudal projection from the pseudopodial annulus. Remaining pubescence on anal segment as follows; covering anal lobes and ridge and extending anterodorsally from anal ridge to anterior border of the segment, the cephalic border of the extension irregular, attaining anterior of segment dorsolaterally, the posterior border with 2 caudal projections, 1 on the midline and 1 dorsolateral, neither reaching posterior annulus.

*Female pupa* (Fig. 11, 21): 22-24 mm long; brownish yellow, with antennal sheaths and ridges, tubercles of head and aster, and spiracular prominences distinctly darker. Antennal ridges sharply crested and distinctly divided into median and lateral portions; median portions slightly skewed mesally, elevated ca. 0.21 mm above median cleft; lateral portions nearly half as high. Paired frontal tubercles each represented by 2 low, sinuous ridges; maximum elevation ca. 0.09 mm.

Remainder of front relatively smooth. Callus tubercles with irregular basal outline; skewed laterally; vertical surfaces rugose; apical surfaces concave; unisetose with seta arising laterally from concavity; elevated ca. 0.21 mm. Antennal sheaths annulated; each bearing a mid-basal tubercle; ca. 0.61 mm long, 0.54 mm wide; not exceeding epicranial suture. Anterior and posterior orbital tubercles moderately large, obliquely compressed; vertical tubercles moderately large. Thoracic spiracle ca. 0.67 mm long, comma-shaped; spiracular prominence not extending anteriorly beyond dorsal thoracic margin. Meso- and metathoracic setae not tuberculate. Dorsolateral setae not tuberculate on first abdominal segment; lateral seta tuberculate. Spinous fringe present on all aspects of abdominal segments II-VII; biseriate; posterior series reduced to a submedian and 2-3 lateral pairs on tergite VII. Fringe of tergite VII with 40-44 spines. Lateral preanal combs absent; dorsolateral and ventrolateral combs of 6-7 and 7-8 spines, respectively. Tubercles of aster swollen basally, only gradually tapered over basal 2/3, sharply tapered over remainder to acute apices; dorsal, lateral, and ventral tubercles all subequal, ca. 0.27 mm long.

*Collections*: Five larvae were taken at Carr Lake located on the Florida Game and Fresh Water Fish Hatchery near Holt, Santa Rosa Co., Florida. Four larvae were found at the soil-sand interface beneath a dense grass mat about 1 foot from the lake margin. One larva was in the cavity of a pitcher plant lying on the ground at the lake margin.

*Comments*: See comments following descriptions of *T. trijunctus* on succeeding page.

#### *Tabanus imitans* Walker

*Mature larva* (Fig. 6): Ca. 38.5 mm long, whitish with light brown pubescent markings; stigmatal spine absent. Head capsule dark reddish brown, ca. 6.3 mm long and 1.67 mm broad. Anal segment ca. 3.83 mm long, 3.0 mm broad basally. Respiratory siphon ca. 1.0 mm long and broad. Dorsal tracheal trunks ca. 0.5 mm in diameter in anal segment, sharply constricted in region of first abdominal segment. Striations fine and evenly spaced laterally on thoracic and all abdominal segments except anal, intervals ca. 0.03 mm on thoracic, 0.02 mm on abdominal segments; anal segment coarsely striate on all surfaces with intervals of 0.055 mm; striations absent or broken and inconspicuous elsewhere. Pubescence on all segments, brown, darker on thoracic and anal segments. Anterior pubescence encircles thoracic and first 3 abdominal segments, absent midlaterally from abdominal segments IV-VI and also dorsally and ventrally from VI, entirely absent from VII-VIII; prothoracic annulus laterally with 2 broad, apically-rounded, diverging, caudal projections; meso- and metathoracic annuli laterally with 4 slender, tapered, caudal projections which cross ca. 3/4 and 2/3 of otherwise non-pubescent surfaces of respective segments; anterior and pseudopodial pubescence united dorsolaterally on first 3 and ventrolaterally on first 4 abdominal segments. Pseudopodial pubescence encircles pseudopodial areas of first 6 abdominal segments, being absent from seventh between dorsal and lateral pseudopodia. Posterior pubescence encircles last 4 abdominal seg-



ments, faintly and narrowly on segments V-VI; annulus of VII broad, light brown with dorso- and ventrolateral anterior projections which attain or nearly attain pseudopodial pubescence. A midlateral pubescent band extends anteriorly from the posterior annulus of the anal segment crossing roughly 2/3 of segment, bending abruptly downward to unite broadly with pubescence of anal ridge and lobes. Also evident on anal segment is a large, ovoid, dorsolateral patch of pubescence.

*Female pupa* (Fig. 13, 27): Ca. 33 mm long, abdomen light yellowish brown, cephalothorax darker, reddish brown. Antennal ridges low, entire, with nearly uniform elevation over entire length, elevated above median cleft ca. 0.17 mm. Callus tubercles ca. 0.17 mm high, unisetose, with roughened surfaces and more or less gradual taper to rounded apex which bears the seta. Definitive frontal tubercles not discernible among numerous ridges. Antennal sheaths ca. 0.75 mm long and broad in male, 0.9 mm long and broad in female; not attaining epicranial suture in male, attaining or just exceeding suture in female; in both an anterobasal tubercle evident. Vertical and orbital setae tuberculate, those bearing the anterior and posterior orbital setae small but obliquely compressed. Thoracic spiracle ca. 1.07 mm long, evenly bowed; spiracular prominences low, truncate anteriorly, not exceeding the anterior thoracic margin. Meso- and metathoracic setae not tuberculate. Dorsolateral setae of abdominal segment I not tuberculate, lateral setae tuberculate. Abdominal segments II-VII encircled by biseriolate fringes, those of anterior series less than half the length of posterior on same segment; reduced ventrally, especially posterior series; fringe of tergite VII of 42-50 spines, the posterior series reduced to a dorsal and 3-4 lateral pairs. Dorsolateral, lateral, and ventrolateral or ventral preanal combs well developed, composed of 4-7 spines (moderately long in female, short in male), 3-6 short spines, and 8-11 short spines or ca. 20 moderately long spines, respectively. Dorsal, lateral, and ventral tubercles of aster 0.35, 0.83, 0.26 mm long, respectively; tubercles gradually tapered from base to apices; dorsal and lateral tubercles on different planes; entire aster with smooth surface.

*Collection*: Three larvae (2 reared) were taken at the margin of Wright Lake in the Apalachicola National Forest, Franklin Co., Florida. One larva was found in moist mud ca. 0.5 m from the edge of the lake under ca. 25 cm of earth. The other 2 larvae were taken from wet sphagnum moss growing in a flat depression at the lake margin.

*Comments*: Until recently *T. imitans* included 3 recognized varieties, *T. i. imitans*, *T. i. excessus* Stone, and *T. i. pechumani* Philip. *Tabanus imitans excessus* is now considered a synonym of *T. maculipennis* Wiedemann. The validity of the separation of *T. maculipennis* (= *T. i. excessus*) is well supported by the characters of the larvae. Tidwell (1973) described larvae of *T. maculipennis* noting the presence of a stigmatal spine and other characters indicating a close relationship of the species with a number of other species including several discussed in part III (Goodwin 1973) of this series and possibly *T. trifunctus* described herein (see comments on *T. trifunctus*).

On the other hand, larvae of *T. i. imitans* lack a stigmatal spine and seem most like those of *T. calens* Linnaeus described by Teskey (1969). In fact, the larvae would key to *T. calens* in Teskey's keys. Separation of the 2 can be made by comparison of the midlateral pubescence of the anal segment as follows: posterior annulus and anal ridge pubescence connected by a broad, continuous, curved, midlateral band of pubescence above which is a single, large, oval patch in larvae of *imitans* whereas in larvae of *calens* the area equivalent to the broad band noted above possesses 2 elongate, isolated, pubescent spots above which are 3 small, faint spots. Pupae of *imitans* would not key beyond couplet 9 in Teskey's keys. However, their size and the fact that the thoracic respiratory prominences do not exceed the anterior thoracic margin would separate them from species indicated by the second half of couplet 9. The evident difference in the sizes of the dorsal and lateral tubercles of the aster, length of pupa, and the shape of the thoracic spiracles would separate them from species indicated by the first half of the couplet.

*Tabanus catenatus* Walker

*Female pupa* (Fig. 10, 24): 33 mm long, yellowish brown. Antennal ridges sharply ridged, divided into median and lateral portions by a narrow notch; median portions elevated above the median cleft about 0.32 mm, the apical ridge transverse and maintaining a more or less uniform height; lateral portion only about half as high and with apical ridge rounded. Distinct frontal tubercles absent, but numerous well-defined ridges present, some nearly attaining the apical ridge on the antennal ridges. Callus tubercles truncate and smooth, about 0.16 mm high at middle, irregularly oval in basal outline; each bearing a single seta at apicolateral extreme. Antennal sheaths about 0.83 mm long and wide, not attaining epicranial suture; indistinctly annulate. Vertical and orbital tubercles tuberculate and tubercles low and rounded. Thoracic spiracles 0.83 mm long, comma shaped; spiracular prominence not exceeding mid-dorsal thoracic margin and only slightly raised above dorsal thoracic surface. Meso- and metathoracic setae not tuberculate. Dorsolateral seta not tuberculate on first abdominal segment; lateral seta tuberculate. Abdominal segments II-VII with biseriata fringes, those of anterior series about 1/3 length of posterior; fringes a little reduced ventrally on abdominal segments II-IV; posterior fringe of tergite VII not reduced; fringe of tergite VII of ca. 88 spines. Abdominal spiracles on low tubercles, crescentric with concavity anterior. Dorsolateral, lateral, and ventrolateral preanal combs composed of 11, 9, and 10 moderately long spines, respectively. Dorsal, lateral, and ventral tubercles of aster 0.33, 0.5, and 0.15 mm long, respectively; dorsal tubercles directed upward and curved slightly inward; lateral and ventral tubercles directed almost straight rearward; all broad basally and gradually tapered to pointed apices.

*Collection*: The single specimen of *T. catenatus* was collected by A. B. Champlain in 1911 at New Haven, Connecticut. No habitat data are available. This specimen was furnished by Dr. G. B. Fairchild.

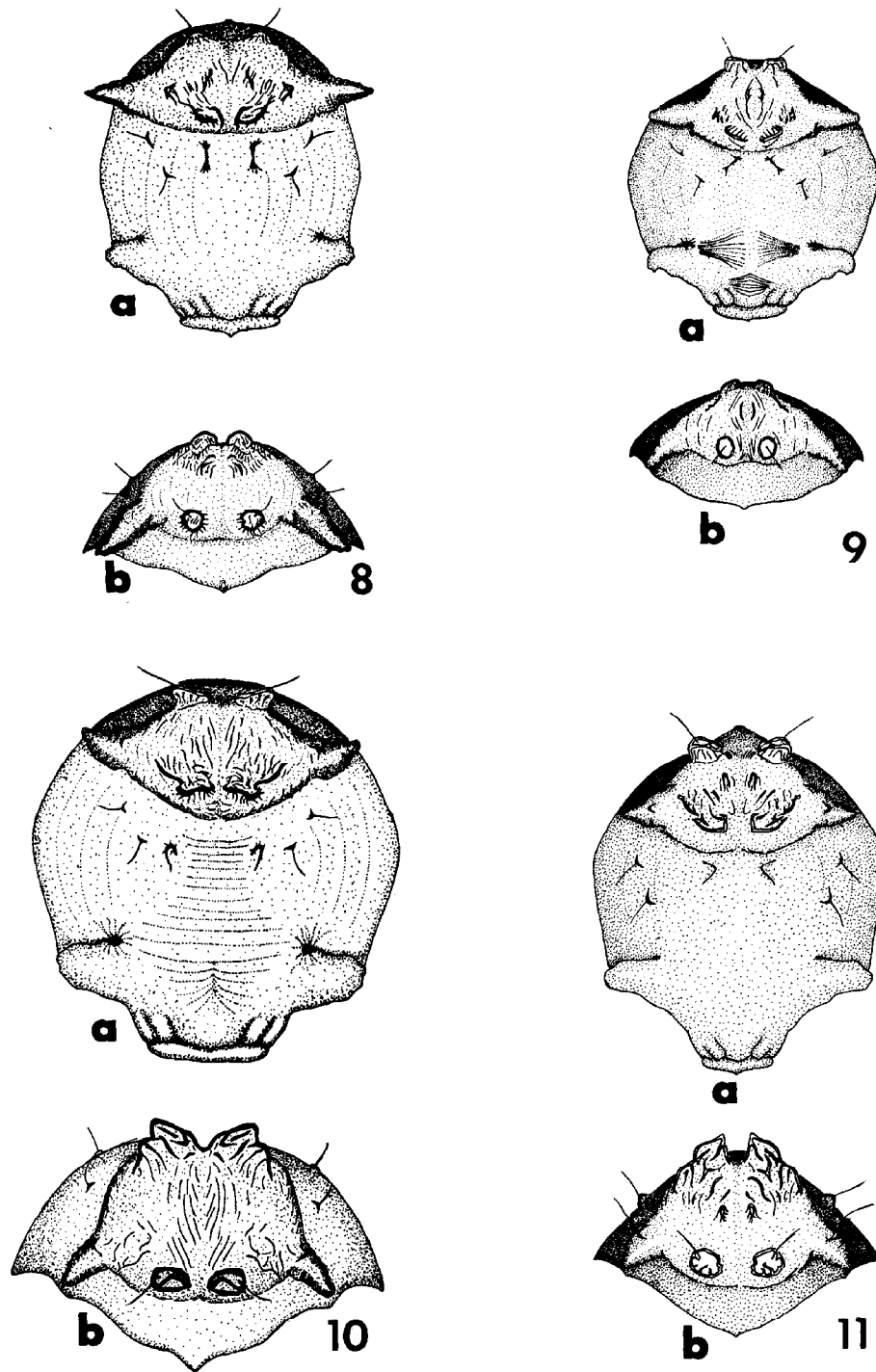


Fig. 8-11. Frontal plates of pupae of Tabanidae (a=ventral view, b=anterior view): 8) *Whitneyomyia beatifica* var. *atricorpus*; 9) *Haematopota punctulata*; 10) *Tabanus catenatus*; 11) *T. birdiei*.

*Comments:* Difficulty would be encountered in couplet 2 of Teskey's key because the posterior series of spines on tergite VII is complete, but included in this fringe is one submedian and a few sublateral pairs of spines that are evidently longer than remaining, but all of the spines in this series are long and any breakage of the fragile tips of the longer spines would prevent accurate judgment of the character. However, 28 mm represents the maximum length noted for any pupae included in the second half of couplet 2. Taking the route indicated by the first half of couplet 2, difficulty is immediately encountered in couplet 9. Again length of the pupa will separate *T. catenatus* from all species keying to couplet 9, except those keying beyond to couplet 13. Couplet 13 was modified in Goodwin (1973), and if this modified couplet is used, *T. catenatus* would key to *T. calens* Linnaeus, although the frontal ridges are a little more developed in *T. catenatus* than indicated by the key for *T. calens*. These 2 species may be separated on the basis of the spinous fringe of tergite VII which includes ca. 88 spines in *T. catenatus* and 45-55 in *T. calens*; the former also has all 3 pairs of preanal combs well developed, whereas in the latter the lateral combs are vestigial or absent, and the dorsal combs are often reduced. Pupae *T. catenatus* may be separated from those of *T. imitans* described above by differences in length of thoracic spiracles, fringe of tergite VII, and lengths of tubercles of aster.

*Tabanus sackeni* Fairchild

*Mature larva* (Fig. 7): Ca. 18 mm long; whitish with faintly contrasting pubescent markings. Head capsule ca. 2.45 mm long, 0.59 mm wide. Anal segment ca. 1.1 mm long, 1.4 mm wide. Respiratory siphon short and blunt, ca. 0.27 mm long and wide. Striations on all aspects of every segment, spaced ca. 0.03 mm laterally, 0.06 mm elsewhere. Tracheal trunks ca. 0.10 mm in diameter, not noticeably tapered anteriorly. Pubescence very light in color and greatly reduced. Prothorax with a narrow anterior annulus and no caudal projections; meso- and metathorax without pubescence. Anterior and posterior pubescence absent from abdominal segments I-VII: Pseudopodial pubescence not forming complete annuli, being absent between lateral and ventrolateral pseudopodia on abdominal segments I-VII. Anal segment with a narrow posterior annulus and with anal ridge and lobes pubescent; pubescence absent elsewhere.

*Male pupa* (Fig. 12, 29): Ca. 15.0 mm long; brownish yellow, the antennal sheaths and ridges, tubercles of head and aster, and spiracular prominence a little darker. Antennal ridges sharply crested; distinctly divided into median and lateral portions; median portions not skewed, nearly touching at midline, elevated above median cleft ca. 0.15 mm; lateral portions 1/3 as high as median. Frontal tubercle represented by an irregularly trapezoidal area; depressed in middle; border an irregular series of ridges; maximum elevation ca. 0.05 mm. Numerous low ridges in areas between frontal tubercle and antennal ridges; remainder of front smooth. Callus tubercles rounded basally; unisetose; lateral portion of apical surface a raised mound, seta arising from center of this mound; elevated ca. 0.15 mm. Antennal sheaths slender, pointed apically; ca. 0.61 mm long, 0.36 mm wide;

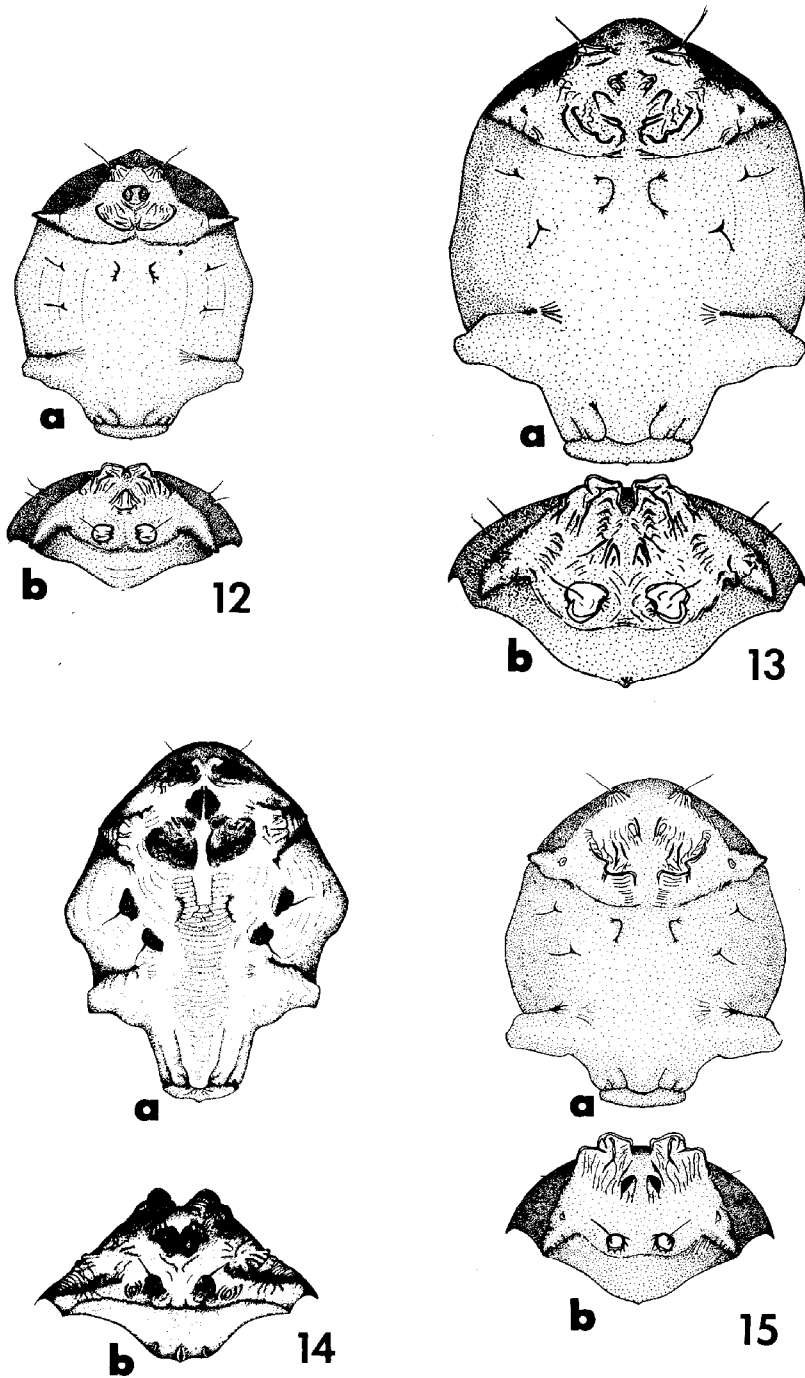


Fig. 12-15. Frontal plates of pupae of Tabanidae (a=ventral view, b=anterior view): 12) *Tabanus sackeni*; 13) *T. imitans*; 14) *T. venustus*; 15) *T. trijunctus*.

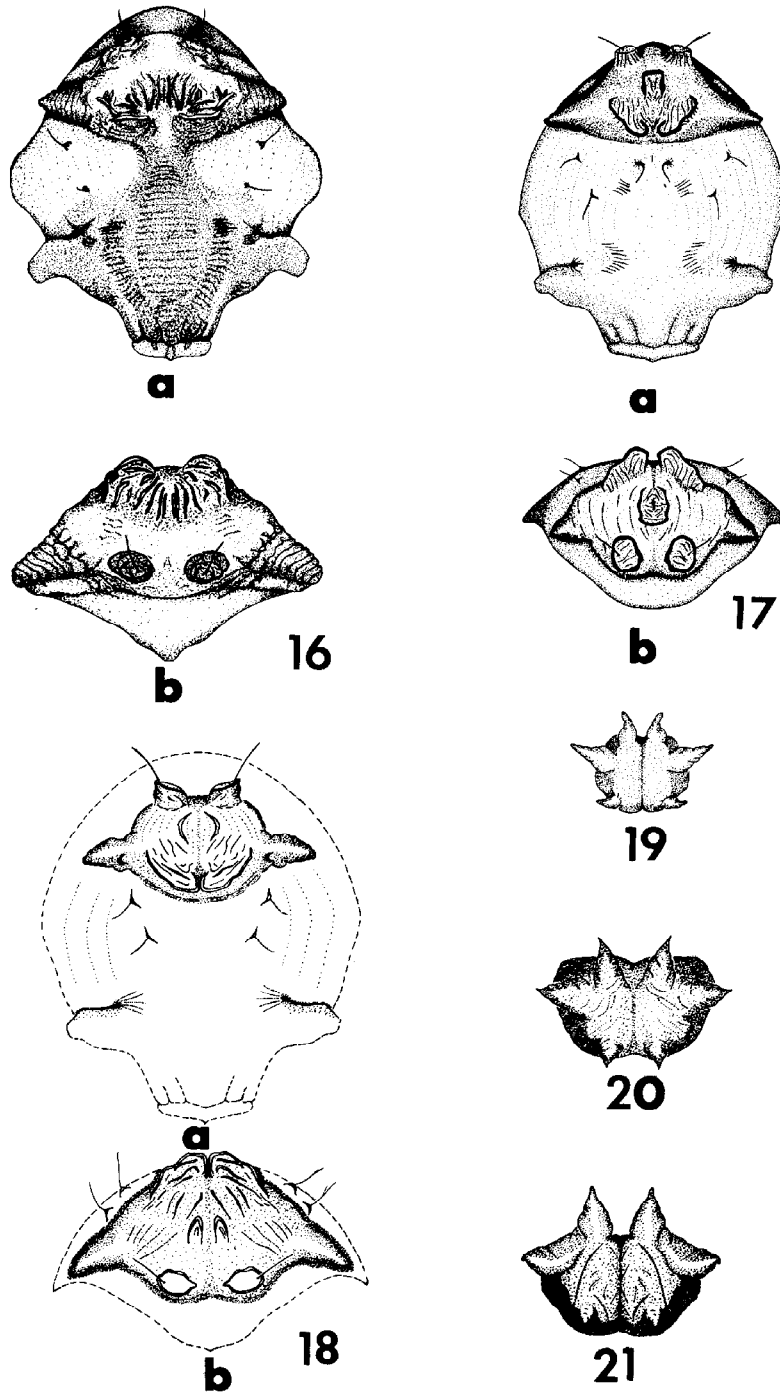


Fig. 16-18: Frontal plates of pupae of Tabanidae (a = ventral view, b = anterior view) 16) *Hybomitra cincta*; 17) *Tabanus zythicolor*; 18) Genus A. Fig. 19-21: Posterior view of asters of pupae of Tabanidae: 19) *Haematopota punctulata*; 20) *Whitneyomyia beatifica* var. *atricorpus*; 21) *Tabanus birdiei*.

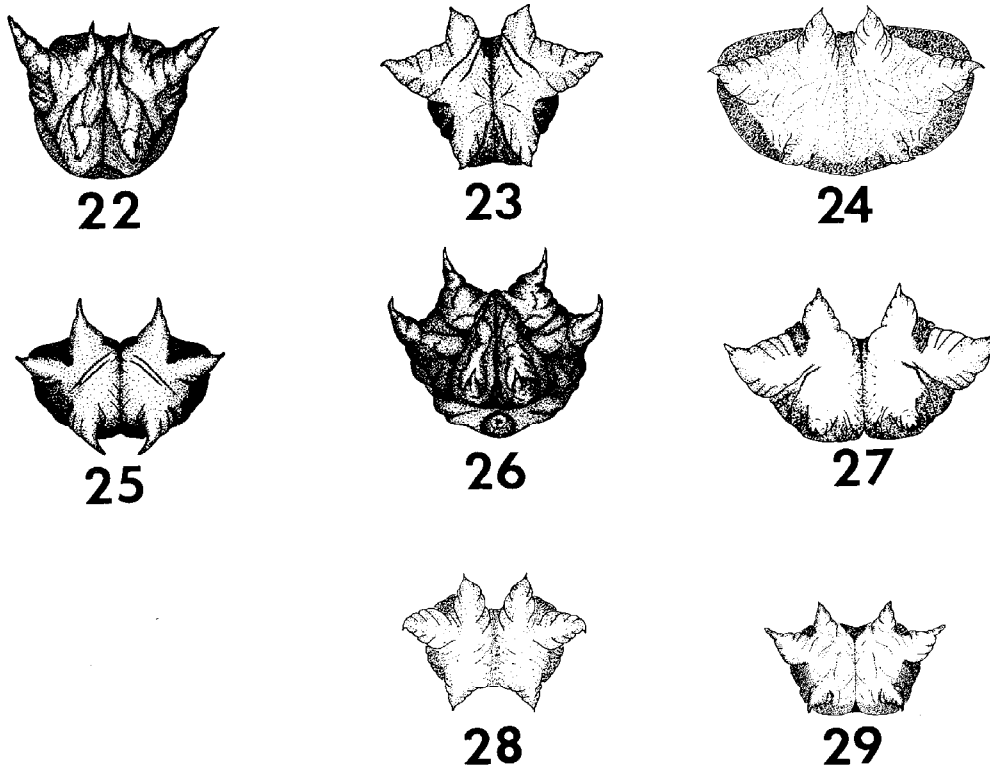


Fig. 22-29. Posterior view of asters of pupae of Tabanidae: 22) *Hybomitra cincta*; 23) *Tabanus trijunctus*; 24) *T. catenatus*; 25) Genus A; 26) *T. venustus*; 27) *T. imitans*; 28) *T. zythicolor*; 29) *T. sackeni*.

very slightly exceeding epicranial suture; annulated, but lacking mid-basal tubercle. Vertical and orbital tubercles small; anterior and posterior orbital tubercles laterally compressed. Thoracic spiracle ca. 0.21 mm long, comma shaped; spiracular prominence not exceeding dorsal thoracic margin. Meso- and metathoracic setae not tuberculate. Dorsolateral setae of first abdominal segment not tuberculate: lateral setae tuberculate. Spinous fringes on all aspects of abdominal segments II-VII; biseriate; posterior series 4-6 times as long as anterior on same segment; posterior series not reduced on tergite VII. Fringe of tergite VII with 30 spines. Dorsolateral and lateral preanal combs absent; ventral comb with 16 spines. Tubercles of aster gradually tapered to acute apices; dorsal tubercles sharply hooked posteriorly, others uniformly curved posteriorly; dorsal, lateral, and ventral tubercles ca. 0.21, 0.45, 0.21 mm long, respectively.

*Collections:* All larvae were collected just south of Fayetteville, Washington Co., Arkansas, at the same site discussed by Schwardt (1936) as the location where he collected immatures of *Goniops chrysocoma* (Osten Sacken). More than 75 larvae of *Goniops* were found on 4 different visits, all at the upper level of soil just beneath the leaf litter. Seven, 9, 0, and 1 larvae of *T. sackeni* were taken on the 4 visits, all but the last dying. These larvae were from 4-7 inches deep

in soil and appeared to always be near mats of small roots. A second species of *Tabanus* also was taken, but 1 specimen was injured at the time of collection, later dying, and the other escaped from the rearing container and was never found. The site was a steep hillside with an overstory of maple and a variety of low shrubby and viney plants. Although well-drained, the soil at a depth of 4 inches was moist during all visits. A much more thorough discussion of the site was given by Schwardt (1936).

*Comments:* Larvae of *T. sackeni* would not key readily to *Tabanus* in the keys to genera furnished by Teskey (1969). If not confused with *Leucotabanus*, they would key to *Hybomitra* and *Atylotus* in the first half of couplet 7. However, the lack of meso- and metathoracic anterior pubescent annuli, the lack of posterior pubescence except for the narrow annulus of the anal segment, the lack of any midlateral pubescence on the anal segment, and their size would separate them from known larvae of *Tabanus*, *Hybomitra*, *Atylotus*, and *Leucotabanus*. Pupae would key to the second half of couplet 5 in Teskey's key to *Tabanus* pupae. The extremely small size of the thoracic spiracles of the *T. sackeni* pupa would readily separate it from those of *T. quinquevittatus* and *T. nigrovittatus*.

#### *Tabanus trijunctus* Walker

*Mature larva* (Fig. 5): Ca. 36 mm long, whitish with contrasting brown pubescent pattern. Head capsule ca. 5.5 mm long, 1.39 mm wide. Anal segment ca. 3.5 mm long, nearly 1/3 greater than basal diameter. Respiratory siphon ca. 1.2 mm long, a little more than 1/3 greater than basal diameter; siphon with a stigmatal spine that is, in lateral view, broad basally and evenly tapered to pointed apex in contrast to the more usual spines with concave upper and lower margins and narrow bases and in contrast to the spines of some *Bouvieromyiini* in which the upper and lower margins are convex and the base is broad. Striations apparently absent dorsally and ventrally; present laterally with spacings of 0.045-0.06 mm. Pubescence present on all segments as follows: anterior pubescence on all segments except possibly the anal, encircling the first 7, being absent midlaterally from abdominal segments V-VII and ventrally also from VII; prothoracic annulus with a single, broad, fan-shaped, lateral caudal projection; meso- and metathoracic annuli with 4 slender lateral caudal projections crossing 3/4 and 2/3 of non-pubescent lengths of respective segments; anterior pubescence united with pseudopodial pubescence dorsolaterally on first 6 and ventrolaterally on first 5 abdominal segments. Pseudopodial pubescence completely encircling all pseudopodial segments. Posterior pubescence on last 6 segments, encircling last 3 or 4, absent midlaterally and sometimes dorsally and/or ventrally from others; faint except on last 2 segments; posterior annulus of preanal segment with 4 lateral anterior projections, the upper and lower ones faintly crossing and uniting with pseudopodial pubescence. Anal ridge and lobes pubescent, the former with a broad dorsal projection that bends sharply caudally and unites with posterior annulus midlaterally; a shorter caudal projection from the dorsal extension evident ventro-



laterally; a faint irregular anterodorsal extension projects from the bend to attain or nearly attain the anterior margin.

*Female pupa* (Fig. 15, 23): Ca. 26.5 mm long, abdomen brown, cephalothorax lighter yellowish brown except for the sides of the thoracic spiracular prominences and a large area of the head that is roughly trapezoidal and includes the stem and arms of the epicranial suture. Antennal ridges sharply crested, separated into median and lateral portions by deep V-shaped notch, elevated above median cleft ca. 0.3 mm; median portion about twice as high as lateral; outline of apex of median portion roughly in the shape of a question mark, the median end being recurved. Paired frontal tubercles well developed, ca. 0.36 mm long and 0.16 mm high, skewed ventrally. Callus tubercles apically smooth and truncate, unisetose, basally nearly circular, elevated ca. 0.19 mm. Antennal sheaths ca. 0.67 mm long and wide with a small evident median basal tubercle; sheaths ending just short of epicranial suture. Setae of head on small tubercles, none obliquely compressed. An obvious dark brown trapezoidal area of cuticle on anterodorsal surface, the venter running transversely across frontal plate on a line just above the tips of antennal sheaths; sides of dark area slightly concave and extending caudally to dorsal thoracic margin; dark area including epicranial arms and the vertexal tubercles, expanding slightly at caudal end. Thoracic spiracle ca. 0.94 mm long, comma shaped, the posterior end only very slightly straightened; spiracular prominence very slightly (ca. 0.03 mm) exceeds anterior thoracic margin; lateral portion of prominence included in the arc of the spiracle, dark reddish brown. Meso- and metathoracic setae not tuberculate. Dorsolateral setae of abdominal segment I not tuberculate, lateral setae tuberculate. Abdominal segments II-VII with biseriate fringes, those of anterior series evidently less than half length of posterior on same segment; series reduced ventrally especially on segments II-III where wide gaps exist ventrolaterally in both series; fringe of tergite VII of ca. 50 spines, the posterior series reduced to a dorsal and 4-6 lateral pairs. Dorsolateral, lateral, and ventrolateral preanal combs on low mounds and composed of 1-3, 4-5, and 6-8 short, stout spines, respectively. Dorsal, lateral, and ventral tubercles of aster 0.64, 0.67, 0.5 mm long, respectively, the dorsal and lateral tubercles on decidedly different planes; all tubercles broad basally, tapering uniformly to sharp apices.

*Collection*: The single female specimen was reared from a larva taken from a hummock in a cypress swamp which is located 13 miles north of Lukens, Levy Co., Florida along Florida Highway S-347. It was given to me by Dr. G. B. Fairchild.

*Comments*: Larvae of *T. trijunctus* and *T. birdiei* would key to *T. stygius* Say in Teskey's key. *Tabanus stygius* is the only larva of *Tabanus* with a stigmatal spine discussed by Teskey. In part III of this series (Goodwin 1973), a key to 5 species whose larvae possessed a stigmatal spine was presented. Since then, Tidwell (1973) described the larvae of 2 additional species exhibiting this character, namely *T. maculipennis* and *T. proximus* Walker. The latter species and *T. trijunctus* would key to *T. stygius* in Goodwin (1973), but differences

in the pubescence of the midlateral surface of their anal segments allows their separation. Larvae of *T. birdiei* do not agree fully with either alternative in couplet 3, but may be easily separated from other larvae by the pubescence pattern of the anal segment. Pupae of *T. trijunctus* agree most closely with the first half of couplet 9 in Teskey's key, even though the orbital tubercles are not noticeably compressed obliquely. If this alternative is taken, difficulty is encountered in using couplet 13. This problem was discussed and dealt with in part III in which couplet 13 was rewritten and an expanded key was given to deal with species indicated by the first half of couplet 13. In this expanded key, pupae of *T. trijunctus* could not be identified satisfactorily. Comparison with the available choices would likely indicate a closer resemblance with pupae of *T. fumipennis* Wiedemann. As noted in part III, this key serves only as "a possible means of separation of the pupae." However, it should be noted that the darkened areas of the head noted in the above description are not evident in any of the other species involved. Pupae of *T. birdiei* would key to *T. reinwardtii* in Teskey (1969). The subequal lengths of the tubercles of the aster allow its separation from *T. reinwardtii*. Jones and Anthony (1964) reported rearing this species, but they provided no description of the immatures.

*Tabanus venustus* Osten Sacken

*Female pupa* (Fig. 14, 26): Ca. 19.5 mm long, uniformly yellowish brown. Antennal ridges large, sharply crested, divided into median and lateral portions by both an obvious difference in elevation and by a broad shallow depression; median portions elevated above median cleft ca. 0.2 mm. Well-developed paired frontal tubercles present, ca. 0.33 mm long and 0.16 mm high. Callus tubercles unisetose, elevated ca. 0.23 mm; ventral and lateral walls nearly vertical, the dorso-mesal surface inclined ventrolaterally from base to small concave apex, the seta arising from the concavity. Antennal sheaths ca. 0.46 mm long and broad, not reaching epicranial suture, bearing an evident mid-basal tubercle. Anterior and posterior orbital tubercles large and obliquely compressed; vertical and lateral orbital setae on smaller, irregular tubercles. Thoracic spiracle ca. 0.76 mm long, comma shaped; spiracular prominence not exceeding anterior thoracic margin. Setae of meso- and metathorax, and first abdominal segment on low tubercles; occasional seta bifid near apex; anterior metanotal seta absent from one side. Fringes of spines biseriate on abdominal segments II-VII, only a little reduced ventrally; fringe of tergite VII of ca. 48 spines; posterior series on tergite VII reduced to a dorsal and 2-3 lateral pairs of spines. Dorsolateral, lateral, and ventrolateral preanal combs composed of 3-5, 1-3, and 6-7 spines, respectively, the lateral combs obviously reduced. Dorsal, lateral, and ventral tubercles of aster 0.3, 0.36, 0.2 mm long, respectively; all tubercles broad basally, tapering rapidly to pointed apices; dorsal and lateral tubercles on decidedly different planes.

*Collection*: The single female was reared from a specimen taken by O. Schonberg near Stillwater, Payne Co., Oklahoma, in 1950. The

stage collected is unknown, and no habitat data are available. The specimen was loaned for study by Dr. Kirby L. Hays.

*Comments:* Pupae of *T. venustus* would key to *T. reinwardtii* Wiedmann in Teskey's key. See the comments following *T. zythicolor* appearing below for characters useful in separation.

*Tabanus zythicolor* Philip

*Male pupa* (Fig. 17, 28): Ca. 17.5 mm long, light yellow-brown. Antennal ridges sharply crested, elevated ca. 0.22 mm above median cleft; median and lateral portions delimited mainly by an evident difference in elevation, the median areas crescentric in outline and projected well above general surface, the lateral areas about half as high at mesal end where they form a narrow step-like plateau which tapers rapidly to the general surface. Frontal tubercles represented by a median area ca. 0.33 mm long and wide, with a median dorso-ventral depression, the maximum elevations to each side of the depression ca. 0.09 mm. Callus tubercles large, truncate apically, unisetose, circular in basal outline, elevated ca. 0.11 mm, with general surface ridged. Antennal sheaths ca. 0.5 mm long and wide, not reaching epicranial suture. All setae of head tuberculate, the tubercles small and none noticeably compressed obliquely. Thoracic spiracle only 0.34 mm long, crescentric in outline; spiracular prominence low, not exceeding anterior margin of thorax. Setae of meso- and metathorax not tuberculate. Dorsolateral setae of abdominal segment I not tuberculate, lateral setae tuberculate. Abdominal segments II-VII encircled by biseriate fringes of spines, the anterior spines half or less the length of posterior on same segment, the series only slightly reduced ventrally; fringe of tergite VII of ca. 28 spines, the posterior series reduced to a dorsal and 3-4 lateral pairs. Dorsolateral preanal combs represented by low tubercles bearing 1-3 very short spines; lateral preanal combs absent, ventral preanal combs of ca. 20 moderately long spines. Dorsal, lateral, and ventral tubercles of aster of nearly equal size, lengths ca. 0.3 mm; dorsal and lateral tubercles on decidedly different planes.

*Collection:* A single male was reared from a pupa taken from moist sod ca. 4 m from the edge of shallow, water-filled depression in a pasture. The water covered nearly 1/2 acre except for numerous mounds, or islands, on which vegetation ranging from shrubby growth to large oak trees was growing. The deep hoof prints in the vicinity of the larval collection site indicated that the area had recently been very wet, and the general appearance of the entire area indicated that the depth and extent of surface water varied greatly, depending on precipitation. The pasture was on the west side of Florida State Highway 145, ca. 5 miles north of Madison, Madison Co., Florida. No other immatures of Tabanidae were taken in association with this species.

*Comments:* Pupae of *T. zythicolor* would not key readily beyond couplet 9 in Teskey (1969). Size, number of spines in the fringe of Tergite VII, and the fact that the spiracular prominence scarcely, if at all, exceeds the dorsal thoracic margin, separates it from species indicated by the second half of couplet 9. Of the species indicated

by the first half of couplet 9, only *T. reinwardtii* Wiedemann, *T. fairchildi* Stone, *T. venustus* Osten Sacken (described above), and *T. rufofrater* Walker (the last described by Goodwin, 1973) need close consideration, since all other species indicated exceed 25 mm in length. Comparisons of length, number of spines in the fringe of tergite VII, the elevation of the callus tubercles, and the length of the thoracic spiracles will facilitate separation of these taxa.

*Hybomitra cincta* (Fabricius)

*Female pupa* (Fig. 16, 22): Ca. 30 mm long, yellow-brown with some darker areas on cephalothorax as follows: epicranial suture narrowly outlined dark brown; venter of frontal plate posterior to antennal ridges dark brown, this dark area noticeably narrowed at level of frontal sutures. Antennal ridges with 2 sharp crests that overlap but do not unite, the narrow gap the only evidence of division into median and lateral portions, elevated above median cleft ca. 0.16 mm. Numerous low mid-facial ridges but distinct frontal tubercles absent. Callus tubercles small conical mounds, elevated ca. 0.07 mm, unisetose. Antennal sheaths ca. 0.83 mm long and wide, only faintly annulate, with a very small, mid-basal tubercle; sheaths slightly exceeding epicranial suture. Setae of head on very small, rounded tubercles. Thoracic spiracle ca. 0.67 mm long, evenly bowed; spiracular prominence not exceeding epicranial suture. Meso- and metathoracic setae not tuberculate. Dorsum of thorax darkened. Dorsolateral setae of abdominal segment I not tuberculate; lateral setae tuberculate. Abdominal segments II-III with uniseriate fringe of short, stout spines, the mid-dorsal ones evidently stouter; IV-VII with biseriate spines, the anterior spines stouter basally, especially mid-dorsally, and posterior series reduced dorsally on VI-VII; fringe of tergite VII of ca. 30 spines. Dorsolateral, lateral, and ventrolateral preanal combs of 1-3, 6-8, 11-13 short spines, respectively; all spines arising from evident tubercles or ridges. Dorsal, lateral, and ventral tubercles of aster 0.5, 0.88, 0.4 mm long, respectively; lateral tubercles broad basally, others slender, all with little taper over basal half, gradually tapered to pointed apices over remainder.

*Collection*: The single female was reared from a specimen taken on Cheaha Mt., Talledega Co., Alabama, in 1964, by L. G. Sanford. Habitat data are not available. The specimen was loaned by Dr. Kirby L. Hays

*Comments*: Pupae of *H. cincta* key to *H. criddlei* (Brooks) in Teskey (1969) indicating the same close relationship evidenced in the adults. Separation of the pupa, on the basis of very limited material, is possible on the basis of differences in overall length, length of antennal sheaths, and lengths of the tubercles of the aster.

Genus A

*Mature larva* (Fig. 3): Ca. 27.0 mm long; whitish with contrasting brown pubescent markings. Head capsule ca. 3.91 mm long, 0.91 mm wide. Anal segment attenuated, ca. 2.28 mm long, 2.0 mm wide. Respiratory siphon ca. 0.73 mm long, 0.59 mm wide; siphon unique

among known tabanid larvae in that the sclerotized spiracular lips are thickened so that they project caudally above siphon surface, and the middle of each lip is drawn out into a short spine-like point (without magnification readily mistaken for a siphon with a stigmal spine). Striations reduced to absent from thoracic discs, elsewhere spaced ca. 0.023 laterally and 0.045 dorsally and ventrally. Pubescence on all segments moderately dark. Thoracic segments with anterior pubescent annuli; prothoracic annulus with a single, broad, fan-shaped, caudal projection laterally; meso- and metathoracic annuli with 4 lateral caudal projections about  $1/2$  and  $1/3$  length of respective segments. Anterior pubescence forming complete annuli on abdominal segments I-III, absent midlaterally from IV-VII and mid-dorsally from V-VII or VI-VII. Pseudopodial pubescence absent between lateral and ventrolateral pseudopodia on abdominal segments I-VII; united with anterior pubescence dorsolaterally on I-II and ventrolaterally on I-V. Posterior pubescence faintly evident dorsally and ventrally on abdominal segment III, forming complete annuli on IV-VIII; posterior annulus of VII with 4 short anterior projections laterally. On anal segment the anal lobes and ridge pubescent without any dorsal extension; an evident midlateral pubescent band extends forward from posterior annulus, the band thicker anteriorly and down curved somewhat at middle of segment; a single, small isolated spot above the anterior end of mid-lateral band also present.

*Male pupa* (Fig. 18, 25): Ca. 15.0 mm long; brownish yellow. Antennal ridges sharply crested; divided into median and lateral portions by deep, narrow notch; median portions skewed mesally, elevated ca. 0.24 mm above median cleft; lateral portions half as high. Paired frontal tubercles represented by mounds elevated ca. 0.07 mm; apices crested. Numerous low ridges between frontal tubercles and antennal ridges; remainder of front relatively smooth. Callus tubercles circular in basal outline; obliquely truncate apically, being highest at lateral extreme; elevated ca. 0.15 mm; unisetose, seta arising at lateral extreme of apical surface. Antennal sheaths annulated; mid-basal tubercle present; ca. 0.24 mm long, 0.33 mm wide, not exceeding epicranial suture. Anterior and posterior orbital tubercles very large, obliquely compressed. Thoracic spiracle ca. 0.48 mm long, comma shaped; spiracular prominence extending anteriorly beyond dorsal thoracic margin ca. 0.24 mm. Meso- and metathoracic setae not tuberculate. Dorsolateral setae of first abdominal segment not tuberculate; lateral setae tuberculate. Spinous fringes on all aspects of abdominal segments II-VII; biseriate; posterior series reduced to a submedian and 3-7 lateral pairs on all tergites. Fringe of tergite VII with 26 spines. Dorsolateral, lateral, and ventral preanal combs of 2-3, 3-4, and 16 spines, respectively. Tubercles of aster swollen basally, gradually tapered on basal half, rapidly tapered on apical half to acute apices; dorsal, lateral, and ventral tubercles 0.27, 0.30, 0.27 mm long, respectively.

*Collection*: A single larva was taken from the bank of John's Creek, Shelby Co., Tennessee by Cathy Wu. The specimen was in wet clay-like soil 2-4 ft above the waterline at time of collection. How-

ever, this creek rises and falls many times during the year, depending on rainfall.

*Comments:* The single larva molted to a somewhat malformed pupa in early May, 1971. The pupa died 2 days later. Descriptions are given here because the uniqueness of 2 characters suggests it represents an unreared genus of Tabanidae. The unique structure of the respiratory siphon and the reduction of the posterior abdominal fringe series on all tergites to a submedian and several lateral pairs separate it from known immatures. Other characters indicate it represents a species of Tabanini, and based on those species known to occur in West Tennessee and surrounding areas, my speculative opinion is that it is *Hamatabanus* sp.

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