IMMATURE STAGES OF SOME EASTERN NEARCTIC TABANIDAE (DIPTERA). VI.
ADDITIONAL SPECIES OF CHRYSOPS MEIGEN¹

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ABSTRACT

Descriptions are provided of the larvae and pupae of Chrysops brunneus Hine, C. dixianus Pechuman, C. dorsovittatus Hine, and C. hinei Daeeke and the pupa only of C. pudicus Osten Sacken.

Teskey (1969) published descriptions, figures, and keys for the larvae and pupae of 36 species of Chrysops. I described the immatures of 2 additional species in Part I of this series (Goodwin 1972). No descriptions of additional species of the eastern Nearctic fauna have appeared, but Tidwell (1973) also provided descriptions of 12 species treated in one or both of the above.

Below are the descriptions of the larvae and pupae of 4 and the pupa of 1 species of Chrysops. Two of these species conform to the generic characterizations of the juvenile stages furnished by Teskey, however, 3 (C. brunneus, C. dixianus, C. dorsovittatus) exhibit the first departures from these characterizations known to me.

For figures illustrating the descriptive terminology see Part I of this series or the paper by Teskey (1969). No keys are provided, but points of separation based on the keys furnished by Teskey are noted in the comments following each description.

I am indebted to Dr. Kirby L. Hays, Department of Zoology and Entomology, Auburn University, Auburn, Alabama, for the loan of the specimen of C. pudicus described below.

Chrysops brunneus Hine

Mature larva (Fig. 1): ca. 19 mm long, whitish with contrasting moderately dark brown pubescent pattern. Head capsule 1.49 × 0.59 mm wide. Anal segment 1.06 mm long, ca. 1/4 greater than basal diameter. Respiratory siphon 0.5 mm long, ca. 1/3 greater than basal diameter; with a stigmal spine. Striations on all aspects of every segment, except prothoracic dorsum, spacings ca. 0.042 mm, not noticeably compressed laterally. Pubescence on all segments as follows: anterior pubescence present on all segments except anal, encircling thoracic and first 3-4 abdominal segments, absent from progressively wider areas medially on remaining; united with pseudopodial pubescence dorsolaterally on first 7 and ventrolaterally on first 6 abdominal segments; prothoracic annulus with 2, meso- and metathoracic

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Fig. 1-4. Lateral views of Tabanidae larvae: 1) *Chrysops brunneus*; 2) *C. dixianus*; 3) *C. hinei*; 4) *C. dorsovittatus*.

annuli with 4 short, slender, tapered, caudal projections laterally, those of meso- and metathorax crossing ca. 1/3 and 1/4 of otherwise non-pubescent areas of respective segments. Pseudopodial pubescence encircles first 6 abdominal segments, being absent between lateral and ventral pseudopodia on VII. Posterior pubescence encircles abdominal segments V-VIII, very faintly evident on V. Remaining pubescence of anal segment covers following: anal lobes and ridge and a dorsally and slightly anteriorly directed extension from latter, extension almost reaching lateral midlines; a longitudinal band on lateral midline iso-
lated from both dorsal extension of anal ridge pubescence and posterior annulus; 7 small, faint spots, 1 ventrolateral anterior to anal ridge, a ventrolateral pair posterior to anal ridge, a lateral pair anterior to midlateral longitudinal band, and a dorsolateral pair above anterior end of the midlateral longitudinal band.

**Female pupa** (Fig. 5): ca. 15 mm long, yellow brown, a little darker dorsally and anteriorly. Area of antennal ridges a pronounced swollen mound directed anteroventrally, the mound in lateral and posterior views narrowly and broadly rounded, respectively, except for the slender, paired, obliquely compressed projections at summit, these projections being elevated ca. 0.17 mm above the median cleft and apparently representing the median portions of the antennal ridges. Callus tubercles irregular in outline and elevation, highest point 0.1 mm; unisetose. Thoracic spiracle ca. 0.1-0.6 mm long; spiracular prominence exceeding anterior thoracic margin ca. 0.33 mm. Uniseriate fringes of attenuate spines encircling abdominal segments II-VII, the spines smaller ventrally but not absent from noticeable areas; fringe of tergite VII of 50 spines. Ventrolateral preanal combs each with 7-8 spines. Dorsal, lateral and ventral tubercles of aster 0.31, 0.49, 0.27 mm long, respectively.

**Collection:** The single larva was taken at the Wedge Plantation, near McClellanville, Charleston Co., South Carolina, in May, 1972. The larva was taken from between the basal portions of the leaves of a clump of *Spartina* sp. in a salt marsh. The particular plant was part of the previous year's growth, and all that remained above the roots was about 15 inches of the plant. The plant was in about 10 inches of water, and the larva was positioned just above the water line. It was in prepupal state at the time of collection.

**Comments:** Larvae of *C. brunneus* would key to *C. aberrans* Philip (couplet 16) in Teskey and may be distinguished as follows: the midlateral, longitudinal dash on the anal segment is not united with the narrow posterior annulus, and the remaining isolated pubescent spots on this segment are small and typically in pairs including a ventrolateral pair posterior to the anal ridge in *C. brunneus*; in *C. aberrans* the longitudinal dash unites with the posterior annulus, and the other isolated spots are large, unpaired, and no spots are located ventrolaterally posterior to anal ridge. The pupae of *C. brunneus*, *C. dixianus*, and *C. dorsocitratus* (the last two described below) have only 1 seta on each of the callus tubercles, a departure from the bisetate callus tubercles of all other known *Chrysops* pupae. They conform to all other characters noted in the generic characterizations given by Teskey (1969), and no difficulty should be encountered in recognizing them as *Chrysops*. They may be differentiated by comparing the portions of the descriptions and figures describing the frontal plates.

**Chrysops dixianus** Pechuman

*Mature larva* (Fig. 2): 14.5 mm long, whitish with extensive light brown pubescence, darker caudally. Head capsule 1.06×0.36 mm wide. Anal segment 1.06 mm long, nearly 1/3 greater than basal diameter. Respiratory siphon 0.5 mm long, ca. 1/3 greater than basal diameter;
stigmatal spine present. Striations on all aspects of all segments except prothoracic dorsum; spacings ca. 0.033 mm, only slightly more compressed on lateral surfaces. Pubescence on all segments as follows: anal segment entirely pubescent; anterior pubescence encircles all segments, that on abdominal segments V-VII fainter and light in color; prothoracic annulus with a single broad, fan-shaped, lateral caudal projection; mesothoracic annulus with 4 slender, tapered, lateral caudal projections, the middle 2 obviously shorter than the others which cross nearly 1/2 on non-pubescent length; metathoracic annulus with 2 short caudal projections, these on line with upper and lower projections of preceding segment; anterior and pseudopodial pubescence united dorsolaterally and ventrolaterally on all pseudopodial segments, appearing almost totally united on abdominal segments V-VII. Pseudopodial pubescence forms complete annuli on all pseudopodial segments. Posterior pubescence on abdominal segments II-VII, encircling at least IV-VII, absent midlaterally and dorsally and/or ventrally on II-III.

Female Pupa (Fig. 6): ca. 11.0 mm, yellowish brown, a little darker dorsally and on cephalothorax. Antennal ridges subdivided into median and lateral portions, the median portions sharply crested, elevated ca. 0.07 mm, ca. 0.22 mm wide, slightly skewed mesally; lateral portion represented by flattened projections only slightly raised above surrounding surfaces. Callus tubercles irregularly circular in outline, truncate apically, elevated ca. 0.09 mm, unisetalose. Antennal sheaths ca. 0.46 × 0.36 mm. Setae of head sessile, or vertical setae may be
very slightly tuberculate. Thoracic spiracle 0.40 mm long; spiracular prominence exceeds dorsal thoracic margin ca. 0.15 mm. Meso- and metanotal setae sessile. Tergal setae of abdominal segment I sessile, lateral setae tuberculate. Spinous fringes of abdominal segments II-VII unisierate, attenuate, without evident gaps ventrally although obviously reduced in size; fringe of tergum VII of 32 spines. Ventrolateral preanal combs of 4-6 spines. Dorsal, lateral, ventral tubercles of aster ca. 0.16, 0.22, 0.16 mm long respectively.

Collection: The single larva was taken at the same locality as noted for *C. brunneus*. The larva, however, was taken from the wet mud and decomposing leaves at the margin of a permanent freshwater lake. The area was shaded and essentially devoid of shoreline grasses. Larvae of *C. flavidus* Wiedemann and *C. montanus* Osten Sacken were taken in the same habitat.

Comments: Larvae of *C. dixianus* would key to couplet 7 in Teskey, agreeing most closely with *C. celatus* Pechuman from which they can be distinguished as follows: in *C. dixianus* the anal segment is entirely pubescent, the posterior annulus of the preanal segment lacks anterior projections, and the upper and lower of the 4 caudal projections from the meso- and metathoracic anterior annuli are decidedly longer than middle 2; in *C. celatus* some non-pubescent areas occur very near anterior margin of anal segment, the posterior annulus of the preanal segment bears at least 1 anterior projection laterally, and the length differences noted above are not evident on meso- and metathorax. Pupal distinctions are discussed above in comments on *C. brunneus*.

*C. dixianus* was described very recently (Pechuman 1974). Adults of the species had been considered variants of *C. pudicus*, the pupa of which is described below. The degree of difference between pupae of *C. dixianus* and *C. pudicus* indicates that the recognition of 2 species is valid.

*Chrysops dorsovittatus* Hine

Mature larva (Fig. 4): ca. 14.5 mm long, whitish with light brown pubescent pattern; stigmal spine absent. Head capsule 1.59 × 0.36 mm. Anal segment 1.06 mm long, a little more than 1/3 its basal diameter. Respiratory siphon 0.6 mm long, nearly 4 times its basal diameter. Striations on all aspects of all segments, spacings ca. 0.22 dorsally and ventrally, slightly more compressed laterally. Pubescence forming complete annuli on thoracic segments, these covering ca. anterior 1/4, 1/5, 1/6 of pro-, meso-, and metathoracic segments, respectively; thoracic pubescent annuli lack caudal projections; anterior pubescence absent midlaterally from abdominal segments I-VII, the non-pubescent area increasing in size caudally, absent middorsally from abdominal segments VI-VII. Pseudopodial pubescence forms complete annuli on abdominal segments I-II, absent between dorsal and lateral pseudopodia on III-VII and between lateral and ventral pseudopodia on VII; united with anterior pubescence dorsolaterally on I-VII, ventrolaterally on I-III. Posterior pubescence present only on preanal segment (VII) where it forms a complete annulus bearing a
single, short, midlateral, anterior projection. Pubescence of anal segment reduced; covers anal ridge and lobes; forms a short isolated midlateral band that curves ventrally at anterior end; forms 2 distinct, isolated dorsolateral spots above the midlateral band; forms 2 faint anterior spots, 1 dorsolateral and 1 ventrolateral.

Male Pupa (Fig. 8): ca. 12.3 mm long, light brownish yellow except for darker brown color of anterior half of thoracic dorsum and the area of the head dorsal to the antennal sheaths and extending laterally to the tips of the antennal sheaths. Antennal ridges small; elevated ca. 0.07 mm above median cleft; strongly skewed towards midline; lacking any evidence of a sublateral notch. Front smooth. Callus tubercles viewed anteriorly with an irregularly triangular outline; apical surfaces ridged; each unisetose; elevated above frontal surface ca. 12 mm. Vertical and orbital tubercles small, rounded. Antennal sheaths ca. 0.39 x 0.30 mm. Thoracic spiracles ca. 0.45 mm long; spiracular prominences extend anteriorly beyond dorsal thoracic margin ca. 0.24 mm. Spinous fringes present on all aspects of abdominal segments II-VII; spines attenuate and not much darker than abdominal surface. Fringe of tergite VII with 58 spines. Ventral preanal comb of 22 spines. Dorsal, lateral, and ventral tubercles 0.15, 0.24, 0.18 mm long, respectively.

Collection: A single specimen was taken at Torreya State Park, Liberty Co., Florida, in wet organic silt covered by moss a few feet from the margin of a small stream. The stream flowed in a valley between two hills. The entire valley floor and 1/3-1/2 of the hillsides bordering it were wet and silty. Numerous larvae of Tabanus petiolatus, T. melanocerus, and C. geminatus, plus 5 larvae of Haematopota punctatissima Macquart, also were found at this site.

Comments: Larvae of C. dorsovittatus would key to the first half of couplet 23 in the keys of Chrysops larvae furnished by Teskey (1969). Separation of larvae of C. dorsovittatus from C. macquarti may be made on the basis of anal segment pubescence. In the latter pubescence extends from the anal lobes upward to encircle the anal segment over the middle of the segment length; in the former only isolated pubescent spots exist laterally, there being no dorsal pubescence and no upward extension from the pubescence of the anal lobes. Pupae, because of the unisetate condition of the callus tubercles, do not conform to Teskey's characterization of the genus. However, were it not for this discrepancy, pupae would key to the first half of couplet 8 in Teskey's key to Chrysops pupae. The greater elevation of callus tubercles and antennal ridges and greater number of spines in the fringe of tergite VII of C. dorsovittatus would separate it from C. niger.

Chrysops hinei Duecke

Mature larva (Fig. 3): 13 mm long, whitish with light brown pubescent pattern. Head capsule 1.39 x 0.36 mm. Anal segment 1.16 mm long, slightly more than 1/3 basal diameter. Respiratory siphon 0.43 mm long, a little more than 1/2 greater than basal diameter. Striations on all aspects of every segment except prothoracic dorsum;
dorsally and ventrally spacings ca. 0.033 mm, noticeably compressed laterally where spacings ca. 0.02 mm. Pubescence on all segments as follows; anterior pubescence encircles all but last 2 segments, being absent midlaterally from abdominal segment VII, absent dorsolaterally and ventrally from VIII (anal); prothoracic annulus broad, covering nearly 2/3 of segment and lacking caudal projections; meso- and meta-thoracic annuli broad, crossing roughly 1/3 of segments, the former with 4 short lateral caudal projections, the latter with 2, these on line with most dorsal and most ventral projections of mesothorax; anterior pubescence united dorsolaterally and ventrolaterally with pseudopodial pubescence on first 7 abdominal segments. Pseudopodial pubescence always forming complete annuli. Anal segment entirely pubescent except for a narrow irregular ring in anterior 1/4 of segment.

Pupa (Fig. 7): 10-11 mm long, yellowish brown, a little darker on cephalothorax. Antennal ridges absent in male, small in female, ele-

Fig. 7-8. Frontal plates of Tabanidae pupae (a=ventral view, b=anterior view): 7) Chrysops hinei; 8) C. dorsovittatus.

vated at most 0.06 mm above median cleft, ca. 0.17 mm wide, lying entirely perpendicular to longitudinal axis, at most weakly divided into median and lateral portions by differences in elevation. Callus tubercles elevated ca. 0.06 mm, truncate, bisetose, with irregular, roughly circular basal outline. Antennal sheaths ca. 0.55 × 0.33 mm. Orbital setae on very low tubercles, or sessile; vertical setae on moderately developed tubercles. Thoracic spiracle ca. 0.36 mm long, comma shaped; spiracular prominence exceeds dorsal thoracic margin ca. 0.15 mm. Setae of meso- and metathorax not tuberculate; basal alar setae paired. Tergal setae of abdominal segment I sessile, pleural setae tuberculate. Spinous fringes of segments II-VII uniseriate, attenuate, not noticeably reduced ventrally; fringe of tergite VII of ca. 40
spines. Ventral or ventrolateral preanal combs composed of ca. 18 or 5-7 spines, respectively. Dorsal, lateral, and ventral tubercles of aster ca. 0.22, 0.33, 0.19 mm long, respectively; all tubercles gradually tapered to pointed apices; dorsal tubercles directed vertically, parallel, widely separated in female, slanted mesally in male so that ips nearly touch or slightly overlap.

**Collection:** Six larvae (3 reared) were taken from 2 areas. Four larvae were taken from a roadside borrow pit beside Georgia State Highway 177 approximately 6 miles west of U. S. Highway 23. This locality is in Ware Co., in the northeastern corner of the Okefenokee Swamp. The larvae were under 18 inches of water and nearly 20 ft. from shore. The bottom was silty, very wet, and highly organic. The other 2 larvae were taken from wet mud beneath, or mixed in, the roots of shoreline grasses at the margin of a roadside borrow pit about 5 miles south of the Georgia State line along U. S. Highway 441 in Columbia Co., Florida. The first collection was made in March and the second in late May, 1972. Pupation in all cases occurred in late August.

**Comments:** Larvae of *C. hinei* would key to couplet 3 in Teskey where neither alternative is applicable, because the prothoracic annulus is very broad and lacks caudal projections, and the meso- and metathoracic annuli are moderately broad and have 4 and 2 lateral caudal projections, respectively. These 2 characters taken together will separate these larvae from other known *Chrysops*. Pupae of *C. hinei* are dimorphic, the females bearing antennal ridges, the males lacking these ridges. Males would key to the combination of *C. parvus* Daecke, *C. nigribimbo* Whitney (couplet 1) and females to *C. univittatus* Macquart (couplet 7). Separation in either case is difficult.

*Chrysops pudicus* Osten Sacken

**Male Pupa** (Fig. 9): ca. 10.5 mm long, yellowish brown, the entire dorsum darker. Antennal ridges small, entire, slightly skewed mesally, elevated ca. 0.06 mm, apically crested. Callus tubercles bicestose, gnarled, irregularly ovoid, elevated ca. 0.06 mm. Antennal sheaths ca. 0.43 × 0.3 mm. Remaining setae of head on low, ridgelike tubercles. Thoracic spiracle ca. 0.43 mm long, evenly bowed; spiracular prominence exceeds anterior thoracic margin ca. 0.15 mm. Setae of meso- and metathorax not tuberculate. Dorsolateral setae of abdominal segment I not tuberculate, lateral setae tuberculate. Fringes of abdominal segments II-VII complete, shorter and weaker on venter; fringe of tergite VII of ca. 24 spines. Ventral preanal comb of ca. 24 spines. Dorsal, lateral, ventral tubercles of aster 0.26, 0.37, 0.22 mm long, respectively, slender and more or less gradually tapered to apices.

**Collection:** The single specimen was loaned for study by Dr. Kirby L. Hays. It was taken in Baldwin Co., Alabama, II-IV-1964, by R. L. Watson. Habitat data are not available.

**Comments:** The pupa of *C. pudicus*, like that of *C. hinei* noted above, would key to *C. univittatus* (couplet 7) in Teskey. However,
the spinous fringe of tergite VII numbers only ca. 24 spines, whereas pupae of *C. univittatus* and *C. hinei* have fringes of 30 or more spines.

Fig. 9. Frontal plate of Tabanidae pupa of *Chrysops pudicus* (a = ventral view, b = anterior view).

**LITERATURE CITED**


