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DESCRIPTIONS OF NYMPHAL INSTARS OF *THYANTA CALCEATA* (HEMIPTERA: PENTATOMIDAE)

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ABSTRACT

The external anatomy of each of the five nymphal instars of *Thyanta calceata* is described.

Thyanta calceata (Say) ranges from New England south to Florida, and west to Michigan, Illinois, and Missouri (McPherson 1982). Much is known of the biology of this phytophagous stink bug including its life cycle and food plants (McPherson 1982). Of the immature stages, however, only the eggs (Oetting and Yonke 1971) have been described. Presented here are descriptions of the five nymphal instars.

METHODS AND MATERIALS

Nymphs used for the descriptions were from F_2 laboratory stock; the stock had originally been established with individuals collected July–August 1981, in Greene County and Craighead County, Arkansas, and Jackson County, Illinois. They were reared to the desired instar as described by McPherson (1971) in an incubator maintained at 23.9 ± 1.1°C and a 24L:OD photoperiod and preserved in 70% ethanol. The description of each instar is based on 10 individuals. Drawings were made with the aid of a camera lucida, measurements with an ocular micrometer. Dimensions are expressed in millimeters as $\bar{x}$ ± SE.

DESCRIPTIONS

The 1st instar is described in detail, but only major changes that have occurred from previous instars are described for subsequent instars. Comparative statements refer to previous instars (e.g., more numerous). Length is measured from tip of tylus to tip of abdomen; width is measured across the mesonotum.

First Instar (Figs. A–B). Length, 1.16 ± 0.02; width, 0.84 ± 0.01. Body elliptical-ovoid, greatest width usually at abdominal segments 2–3. Minute setae present dorsally and ventrally, most numerous dorsally.

Head strongly declivent, dark brown, anterolateral margins subsinuate; tylus exceeding juga; line extending from eye posteromedially and disappearing beneath pronotum. Eyes pinkish to dark reddish brown. Antennae four-segmented, reddish brown, albidus at incisures; ratio of segment lengths ca. 10:17:15:33, apical segment longest, fusiform. Ventral surface of head brown. Beak four-segmented, brown.

Thoracic nota mostly concolorous with head, lateral margins entire, mediolongitudinal line extending from anterior margin of pronotum nearly to or reaching posterior margin of metanotum; pro- and mesonota sclerotized, posterior margins arcuate; metanotum with anterior one-half, and posterior margin medially, sclerotized, posterior margin straight medially and bending cephalad laterally. Thoracic pleura concolorous with nota; pro- and mesopleura fused to respective nota; metapleura separated from metanotal plates by mem-

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branous area. Spiracles located on posterior margins of pro- and mesopleura. Thoracic sterna concolorous with abdomen. Coxae and trochanters brown; femora and tibiae brown to reddish brown, tibiae slightly dilated distally, protibia with bifurcate spine on inner margin of distal one-third; tarsi two-segmented, yellowish brown to brown, apex of last segment darker; tarsal claws and pulvilli tinged with yellow, translucent.

Dorsum of abdomen generally brown to purple or gray with brown medial and lateral plates. A pair of oblong diagonal pale yellow to whitish spots extending across terga 2 and 3. Faint pseudointersegmental lines on all but the last segment, originating at inner margins of lateral plates. Five medial plates present, plate 4 may be weakly sclerotized; plate 1 narrowed medially; plates 2 and 3 subtrapezoidal, equal in size, ca. 4–6× as long medially and almost as wide as plate 1, plate 3 usually with posterior median V-shaped indentation; plates 1–3 bordered laterally by emarginate yellow areas; plate 4 narrow, markedly constricted medially, sometimes resulting in two plates, length ca. one-half to two-thirds that of plate 1 and width subequal to hind margin of plate 3; plate 5 fused to laterals. Paired ostioles of scent glands located on plates 1–3; area surrounding ostioles of 2–3 tuberculate. Nine lateral plates present, sub-elliptical, extending dorsally and ventrally from margin of abdomen; plate 1 small; plates 2–4 largest; remainder generally decreasing in size posteriorly. Sterna mostly concolorous with dorsal surface. No medial plates visible. Spiracles located on segments 2–8. A single trichobothrium located posteromesad to each spiracle on segments 3–7.

Second Instar (Figs. C–D). Length, 2.08 ± 0.04; width, 1.20 ± 0.02. Body broadly pyriform, strongly constricted dorsoventrally at metanotum; head and thorax coarsely punctate; dorsum of head, thorax, and lateral abdominal plates with long white setae. Abdomen with borders of medial plates 1–3 and usually lateral plates 2–5 and occasionally 6 coarsely punctate; other plates minutely punctate.

Head reddish brown to black; anterolateral margins more sinuate, slightly produced just anterior to eyes. Eyes dark reddish brown. Ratio of antennal segment lengths ca. 9:18:15:26. Venter of head concolorous with dorsum except for white to pink strip medially.

Pro- and mesonota with lateral margins light reddish brown, explanate, dentate, and sparsely punctate or impunctate; medial area of both segments extended posteriorly; paired calli present. Metanotum sclerotized except for lateral margins and narrow strip posteriorly; lateral margins of metanotal plates light reddish brown, and sparsely punctate. Thoracic sterna white to pink. Coxae yellowish brown to pinkish; femora and tibiae brown to reddish brown, tibiae flattened on outer surface, anterior and posterior outer margins carinate; tarsi brown to reddish brown, uniform in color.

Dorsum of abdomen pinkish purple to gray. Diagonal spots on terga 2–3 now white and ovoid. Medial plates 2–3 subrectangular, concolorous with head and nota, subequal in length and ca. 3–5.5× length of plates 1 and 4 medially; plate 3 with posterior margin entire; plates 1 and 3 ca. four-fifths to nine-tenths width of plate 2; emarginate yellow borders of plates 1–3 absent; plate 4 not constricted medially, ca. three-tenths to four-tenths width of plate 2. Ventrally, linear sclerite present posterior to each metacoxa. Sterna 6–9 with sclerotized medial plates; that of sternum 6 variable in shape; those of sterna 7–9 subrectangular. Two trichobothria posterior to each spiracle on segments 3–7.

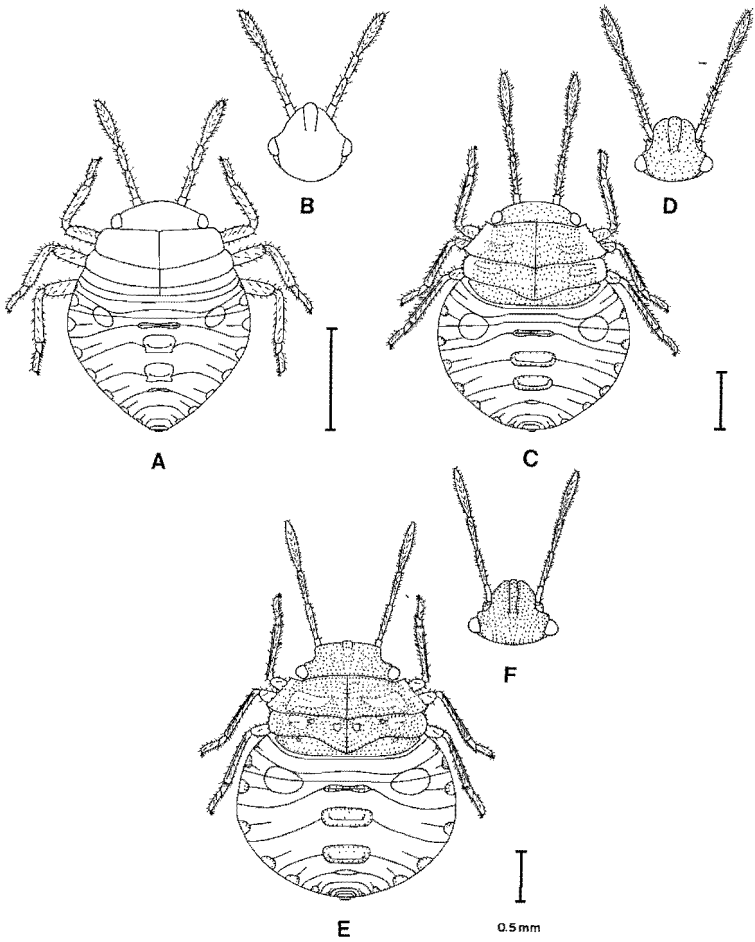
Otherwise similar to first instar.

Third Instar (Figs. E–F). Length, 2.60 ± 0.07; width, 1.81 ± 0.02. Body less constricted at metanotum; head and thorax with dorsal and ventral punctures more numerous; medial plates 1–3 more punctate; lateral plates 2–5 more punctate, 6–7 now coarsely punctate. Head and nota with calloused impunctate to sparsely punctate spots (described below).

Head occasionally less declivent, dorsum often with a yellowish brown to white spot mesad of each eye; anterolateral margins more sinuate, blunt tooth just anterior to each eye. Ratio of antennal segment lengths ca. 9:20:16:26.

Pronotum usually with transverse row of two or four white spots anteriorly and one additional white spot posterolaterally, occasionally no spots present. Mesonotum with transverse row of four white spots. Metanotum with a white spot about halfway between midline and each lateral margin. Explanate margins of thorax more punctate.

Abdominal terga 2–5 and 8 each with transverse white marking medially, variable in shape; terga 6 and 7 each with transverse white stripe ending near lateral margins; terga 1–5 with white elongate ovoid marking near anterior margin of each lateral plate, that of tergum 1



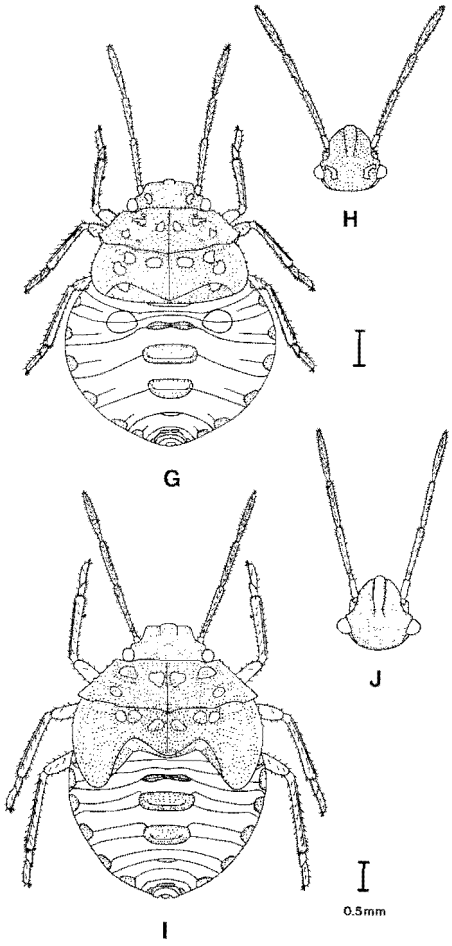
Figs. A–F. Immature stages of *T. calceata*. (A–B) 1st instar; (C–D) 2nd instar; (E–F) 3rd instar.

and sometimes 2 poorly defined. Medial plates 2 and 3 ca. 3.75 to 5× length of plates 1 and 4 medially; plates 1 and 3 ca. eight-tenths to nine-tenths width of plate 2; plate 4 ca. two-fifths width of plate 2. Tergum 8 occasionally with pair of weakly sclerotized medial plates. Sternum 5 with small medial plate, variable in shape. Lateral plates, ventrally, subtruncate on inner margin, dark brown to black.

Otherwise similar to second instar.

Fourth Instar (Figs. G–H). Length, 3.98 ± 0.09; width, 2.96 ± 0.04. Body less constricted at metanotum; head and thorax with dorsal and ventral punctures more numerous; medial plates 1–3 more punctate, plates 4 and 6 (plate 5 of 1st instar fused with laterals) occasionally punctate; lateral plates 1–7 more punctate, plates 8 and occasionally 9 coarsely punctate; long white setae absent.

Head less declivent, anterolateral margins more sinuate; dorsum varying from almost entirely black to black with juga and apical ½ of tylus yellowish brown; curved yellowish to white mark present mesad of each eye that replaces yellowish brown to white spot of 3rd



Figs. G–J. Immature stages of *T. calceata*. (G–H) 4th instar; (I–J) 5th instar.

instar; ventrally head black to yellowish brown. Antennae with segment 1 varying from yellowish brown to black, segment 2 varying from dark brown or black to brown with a dorsal longitudinal yellowish stripe, segments 3 and 4 dark brown; ratio of antennal segment lengths ca. 18:48:37:49.

Pronotum varying from black with dark brown explanate margins to black with anterior and lateral margins and median stripe yellowish brown to white; all individuals with anterior row of four–six yellowish to white spots and one–three yellowish to white spots posterolaterally. Mesonotum varying from black to black with anterior and lateral margins and median stripe yellowish brown to white; all individuals with anterior row of four yellowish to white spots and one spot posterolaterally. Metanotum varying from black to black with median yellowish brown to white stripe; all individuals with two yellowish to white spots as in previous instar. Meso- and metanotal wing pads approximately the same length, extending onto 1st abdominal segment. Explanate margins of thorax more punctate. Pleura varying from black to black with a longitudinal yellow to brown stripe. Coxae and trochanters

varying from yellowish brown to dark brown; femora and tibiae varying from black to yellowish brown, carinate margins and distal portions darker; tarsi dark brown.

Abdominal terga yellow to purplish gray; tergum 1 with transverse white stripe that may be incomplete; tergum 2 with medial white to yellow stripe often fading near large diagonal spots; tergum 3 with transverse white stripe that may be broken near inner margins of large diagonal spots; tergum 4 with white markings now in form of stripe extending to or almost to medial marking; tergum 8 often with transverse stripe. Medial plates 2 and 3 ca. 3.5–5× length of plates 1 and 4 medially; plates 1 and 3 ca. eight-tenths to nine-tenths width of plate 2; plate 4 ca. three-tenths to one-half width of plate 2. Tergum 8 with paired medial plates, which are occasionally fused to form one plate. Sternum 4 occasionally with small medial plate, variable in shape. Lateral plates varying from entirely black to white with black borders.

Otherwise similar to third instar.

Fifth Instar (Figs. I–J). Length, 5.29 ± 0.28; width, 4.48 ± 0.07. Body ovoid; head, thorax, and plates of abdomen more punctate.

Head white to yellow with black marking along posterior margin that often extends anteriorly both mesad of eyes and on either side of midline of head to middle of tylus, anterior extensions may be broken. Eyes dark red to bright red. Antennae with segment 1 yellow; segment 2 varying from yellow to yellow with two brownish lateral stripes, segment often reddish at apex; segment 3 varying from dark brown to dark brown distally and red to yellow proximally; segment 4 dark brown; ratio of antennal segment lengths ca. 23:74:53:61.

Pronotum yellow to white with black markings that vary from a solid mark extending from anterolateral corners posteromedially to near posterior margin of segment, to a series of marks in the same diagonal direction; white to yellowish spots of previous instar often contiguous or fused. Mesonotum yellow to white with scattered black areas, irregular stripe extending from near each anterolateral corner of segment to posteromedial corner of each wing pad, stripe may be obscure; spots of previous instar larger and may be contiguous. Metanotum yellow, yellowish to white spots absent, wing pads each with elongate black mark that may be obscure. Meso- and metanotal wing pads extending onto abdominal segments 3–4. Thoracic sterna white to yellow. Coxae, trochanters, femora, and tibiae yellow; tarsi with segment 1 yellow with apex darker, segment 2 black to reddish brown with apex darker.

Abdominal terga white to pale yellow with segmental and pseudointersegmental lines red; pseudointersegmental lines often continuous between corresponding lateral plates; all white to yellow markings of previous instars absent. Medial plates 1–3 varying from black with red to yellow ostioles to yellow with black borders; plates 2 and 3 ca. 5–6.5× length of plate 1 medially and 3–6× length of plate 4; plates 1 and 3 ca. nine-tenths to subequal width of plate 2; plate 4 two-fifths to one-half width of plate 2. Lateral plates white with black borders. Tergum 8 with paired medial plates often fused to form long narrow plate. Sterna white to yellow and speckled with red, medial plates light yellow to brown and generally weakly sclerotized. Lateral plates yellow to white, lateral margins often brown to black.

Otherwise similar to fourth instar.

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