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**DESCRIPTIONS OF NYMPHAL INSTARS OF *ABEDUS BREVICEPS*
(HEMIPTERA:BELOSTOMATIDAE)**S. L. Keffer and J. E. McPherson¹**ABSTRACT**

The 1st-5th instars of *Abedus breviceps* Stål, collected from a Texas population, are described and illustrated. They can be separated most easily by overall body length and width, and by the length of the mesonotal wing pads.

During a collecting trip to western Texas in early December 1984, graduate students from our laboratory discovered a reproducing population of *Abedus breviceps* Stål in Calamity Creek, Brewster County, ca. 32 km south of Alpine. The creek was clear, shallow, and fast-flowing with a rocky substrate and no vegetation. Representatives of all nymphal instars were captured, although these included only single individuals of the 1st and 2nd instars. All were preserved in 75% ethanol and returned to Carbondale, Illinois. The following descriptions are based on these specimens.

NYMPHAL DESCRIPTIONS

The 1st instar is described in detail, but only major changes that have occurred from previous instars are described for subsequent instars. Length is measured from tip of tylus to tip of abdomen, width across the 3rd abdominal segment. Additional measurements are given in Table 1.

First instar (Fig. 1A). Length, 6.40; width, 4.10; one specimen examined. Body broadly oval, greatest width at 3rd abdominal segment, dorsoventrally flattened; yellowish white with light to dark brown maculations. Dorsally, surface of thorax and abdomen with several short spines.

Head broadly triangular, anteriorly declivent. Dorsally, head yellowish white to imaginary line between midpoint of eyes, yellowish brown posterior to same line; brown stripe running from anterior margin of each eye along anterolateral margin of juga to midlateral point of tylus. Vertex with brownish urn-shaped mark on disc that is continuous with brown (or nearly so) tylus. Thin yellow line originating from inner margin of each eye anteriorly, both lines continuing posteriorly, meeting medially, and giving rise to short yellow line that is continuous with middorsal line of thorax and anterior part of abdomen. Tylus brown with pair of yellowish orange spots basally; elevated above and exceeding juga, apically reaching between bucculae; these 3 parts (bucculae and tylus) forming socket holding modified base of labium. Bucculae with anterior margin faintly edged with brown. Eyes brown dorsally, red ventrally; synthlipsis (i.e., interocular space; taken near anterior margin of eye) ca. 2.6 × width of 1 eye. Ventrally, head yellowish white. Antennae yellowish white, arising near anterolateral margin of eye; rodlike, directed anteriorly, segmentation unclear, 2 or 3 segments. Beak yellowish white,

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Table 1.—Measurements (mm)^a of *A. breviceps* instars^b.

	Nymph				
	1st instar	2nd instar	3rd instar	4th instar	5th instar
Body length	6.40	9.10	11.34 ± 0.09	15.54 ± 0.12	20.09 ± 0.19
Body width ^c	4.10	6.10	7.63 ± 0.10	10.21 ± 0.08	13.02 ± 0.12
Width at eyes	2.44	2.80	3.64 ± 0.05	4.40 ± 0.01	5.44 ± 0.01
Synthlipsis	0.92	1.00	1.35 ± 0.02	1.67 ± 0.01	2.09 ± 0.01
Head length ^d	1.16	1.42	1.65 ± 0.14	2.03 ± 0.05	2.39 ± 0.07
Pronotal length ^d	0.84	1.08	1.26 ± 0.02	1.74 ± 0.02	2.27 ± 0.02
Mesonotal length ^d	0.76	1.28	1.69 ± 0.04	2.49 ± 0.02	3.67 ± 0.05
Metanotal length ^d	0.68	0.88	0.94 ± 0.01	1.12 ± 0.02	1.23 ± 0.02
Leg lengths:					
profemur	2.20	2.60	3.10 ± 0.04	4.06 ± 0.04	4.99 ± 0.05
protibia	1.40	1.80	2.03 ± 0.02	2.61 ± 0.04	3.32 ± 0.03
protarsus	0.56	0.64	0.73 ± 0.02	0.91 ± 0.02	1.07 ± 0.01
mesofemur	2.05	2.65	3.45 ± 0.03	4.66 ± 0.04	6.10 ± 0.08
mesotibia	1.68	2.25	2.74 ± 0.05	3.65 ± 0.03	4.79 ± 0.07
mesotarsus	1.04	1.24	1.56 ± 0.04	2.06 ± 0.05	2.59 ± 0.04
metafemur	2.50	3.35	4.35 ± 0.02	6.02 ± 0.06	8.01 ± 0.06
metatibia	2.55	3.40	4.18 ± 0.06	5.68 ± 0.04	7.57 ± 0.09
metatarsus	1.40	1.64	2.19 ± 0.08	2.77 ± 0.06	3.63 ± 0.04

^a $\bar{x} \pm SE$.^bSample size: 1st instar = 1, 2nd = 1, 3rd = 4, 4th = 10, 5th = 7.^cMeasured across 3rd abdominal segment.^dmeasured along midline.

3-segmented, extending posteriorly as far as anterior margin of mesosternum; segments 1 and 3 subequal, each $\frac{3}{4} \times$ length of 2.

Thoracic nota yellowish brown with brown maculations. Pronotum trapezoidal, moderately convex, anterior margin arcuate medially, posterior margin nearly straight. Mesonotum subequal in length to pronotum along midline; shallow semicircular depression anteromedially; posterior margin straight medially, arcuate laterally; wing pads evident laterally. Metanotum narrowest of thoracic nota along midline; convex medially, tumescent anteriorly midway between medial line and lateral edge; posterior margin arcuate medially; ratio of mesonotal wing pad to metanotum along lateral edge ca. 9:11. Proepisternum largely hidden between coxa and head (see Parsons 1967); proepimeron yellowish white with longitudinal brown stripe. Mesepisternum yellowish white with anterolateral brown maculation; medially bordered by mesosternum, posteriorly by mesocoxal opening, laterally by mesepimeron, anteriorly by proepimeron. Mesepimeron yellowish white with brown maculation adjacent to mesepisternum, prolonged posteriorly to level of metacoxa and fringed with short hairs apically. Metepisternum yellowish white, large, prolonged posteriorly, partially encircling metacoxa, heavily fringed with hairs. Metepimeron hidden beneath mesepimeron (see Lauck 1959). Prosternum yellowish white with brown spot posteromedially; broad anteriorly and posteriorly, narrow medially; rounded anteromedian process present. Mesobasisternum yellowish white; broad anteriorly, narrowing medially then flaring before converging to form xyphus. Mesosternellum yellowish white; deflexed dorsally. Metabasisternum yellowish white; broad anteriorly, concave to receive mesocoxa, posteriorly similar to mesobasisternum. Metasternellum similar to mesosternellum in color and shape.

Prothoracic legs raptorial. Procoxa yellowish white, elongate, segment ca. $0.76 \times$ length of femur. Protrochanter yellowish white, subglobular with ventral patch of setae at

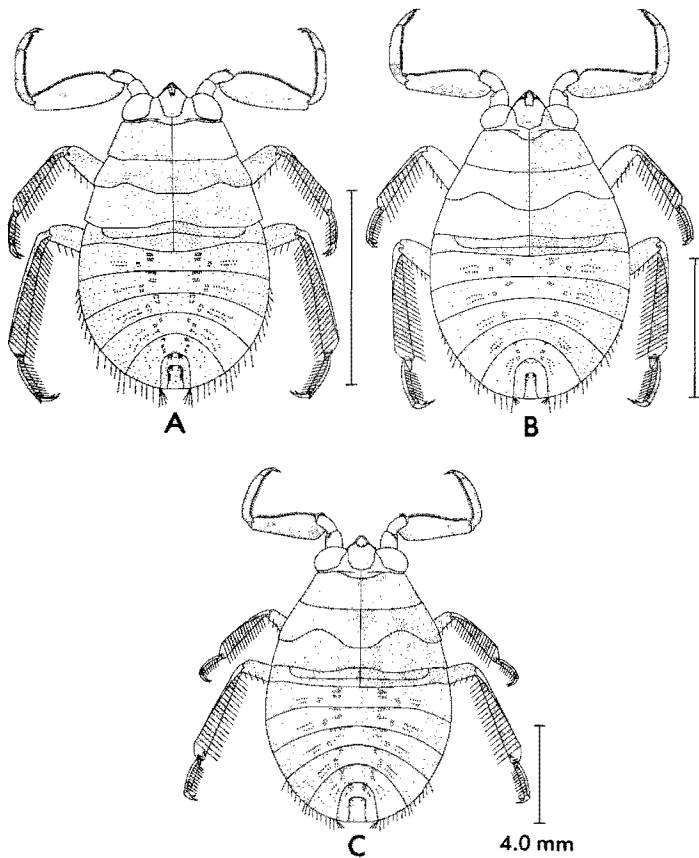


Fig. 1A-C. Immature stages of *A. breviceps*. A, First instar. B, Second instar. C, Third instar.

apex; segment ca. $0.24 \times$ length of femur. Profemur yellowish white with brown maculations; thickened proximally, narrowed distally; ventral surface nearly flat but with slight median groove basally, bordered by row of short dense hairs on either side; dorsal surface furnished with short spines. Protibia and tarsus yellowish white with faint brown, incomplete annulations; together less than length of femur; ventral surface of each segment flattened and bordered by dense row of hairs on either side, these rows fitting between those of femur when segments are apposed; tarsus 1-segmented, the 2 claws of unequal length.

Meso- and metacoxae broader than procoxa, with hairs on posterior surface apically. Meso- and metatrochanters more elongate than protochanter; mesotrochanter with diffuse patch of setae; metatrochanter also with diffuse patch of setae and with brown maculation on posterior surface apically. Mesofemur yellowish white with brown maculations on posterior surface; subequal in length to profemur but narrower; small spines along dorsal surface, most numerous apically; very poorly developed swimming hairs apically on posteroventral surface. Metafemur $1.22 \times$ length of mesofemur, yellowish white with

maculations on posterior and ventral surfaces; row of spines along dorsal, anteroventral, and posteroventral surfaces, those on dorsal surface heaviest distally. Mesotibia yellowish white with brown transverse stripes on posterior surface; row of spines on antero- and posterodorsal edges, and on posteroventral edge, and 3 rows on anteroventral edge; row of well developed swimming hairs on posterodorsal edge. Metatibia yellowish white with brown transverse stripes on posterior surface; row of spines on antero- and posterodorsal edges and 2 rows along antero- and posteroventral edges; well defined rows of swimming hairs on posterodorsal and anteroventral edges; apical transverse row of pectinate spines on posterior surface; segment $1.52 \times$ length of mesotibia. Mesotarsi yellowish white proximally, brown distally; well developed row of swimming hairs on posterodorsal edge; 2-segmented, 1st smaller, ca. $\frac{1}{4} \times$ length of 2nd; claws equal in length. Metatarsi yellowish white proximally, brown distally; row of spines along antero- and posteroventral, and antero- and posterodorsal edges; well defined row of swimming hairs on posterodorsal and anteroventral edges; segment $1.4 \times$ length of mesotarsus; 2-segmented, 1st segment smaller, ca. $\frac{1}{5} \times$ length of 2nd; claws equal in length.

Abdomen yellowish white dorsally with brown maculations. Ventrally, yellowish white; surface covered with long hairs and convex in middle $\frac{1}{3}$. Seven pairs of spiracles evident, 1st pair more medially placed and hidden by metacoxae.

Second instar (Fig. 1B). Length, 9.10; width, 6.10; one specimen examined. Head markings dorsally similar to those of 1st instar except demarcation between anterior yellowish white and posterior yellowish brown areas less evident; anterior margin of bucculae distinctly edged with brown. Synthlipsis subequal in width to eye. Color ventrally similar to 1st instar. Antennae directed posterolaterally, segmentation unclear, 2- or 3-segmented. Beak yellowish white, brown distally, segments 1 and 2 subequal and ca. $1.25 \times$ length of 3.

Thoracic nota color similar to that of 1st instar. Mesonotum ca. $1.2 \times$ length of pronotum along midline, posteromedial margin slightly arcuate; ratio of mesonotal wing pad to metanotum along lateral edge 1.1:1. Thoracic pleural and sternal color and markings similar to 1st instar.

Prothoracic leg color similar to that of 1st instar except procoxa with brown maculation on anterolateral margin; annulations on protibia and protarsus distinct. Procoxa $0.69 \times$ and protochanter $0.37 \times$ length of profemur. Meso- and metathoracic leg color similar to that of 1st instar. Mesotibia with row of swimming hairs on anteroventral and posterodorsal edges; segment $1.25 \times$ length of protibia. Metafemur $1.26 \times$ length of mesofemur. Metatibia with 3rd row of few spines on posteroventral edge; 2 transverse rows of pectinate spines apically on posterior surface; segment $1.51 \times$ length of mesotibia. Metatarsus $1.35 \times$ length of mesotarsus; 1st segment ca. $\frac{1}{4} \times$ 2nd.

Abdomen darker dorsally.

Third instar (Fig. 1C). Length, 11.34 ± 0.09 ; width, 7.63 ± 0.10 ; four specimens examined. Antennae 3-segmented; segments 1 and 2 subequal, ca. $\frac{1}{3}$ - $\frac{1}{2}$ length of 3; small lateral lobes apparent on segments 2, lobe on 2 larger than on 3. Beak segments 1 and 2 ca. $1.5 \times$ length of 3. Mesonotum ca. $1.3 \times$ length of pronotum along midline; submedial part of posterior margin more arcuate; ratio of mesonotal wing pad to metanotum 1.7:1. Metatibia with beginning of 3rd transverse row of pectinate spines apically on posterior surface; vertical row of setae present proximal to the 3 rows.

Fourth instar (Fig. 2A). Length, 15.54 ± 0.12 ; width, 10.21 ± 0.08 ; ten specimens examined. Antennal segment 1 $1.5 \times$ length of 2 and $0.6 \times$ length of 3; lateral lobes on segments 2 and 3 pronounced, lobe on 3 larger than lobe on 2. Beak segments 1 and 2 ca. $1.7 \times$ length of 3. Mesonotum ca. $1.4 \times$ length of pronotum along midline; medial margin extended posteriorly; ratio of mesonotal wing pad to metanotum 2.5:1. Metatibia with 3 distinct rows of pectinate spines apically on posterior surface; vertical row of setae longer.

Fifth instar (Fig. 2B). Length, 20.09 ± 0.19 ; width, 13.02 ± 0.12 ; seven specimens examined. Ratio of antennal segment lengths 2:1:3. Ratio of beak segments ca. 7:6:3. Mesonotum ca. $1.6 \times$ length of pronotum along midline; posterior margin extended further posteriorly, subarcuate. Wing pads of meso- and metanota (latter present but

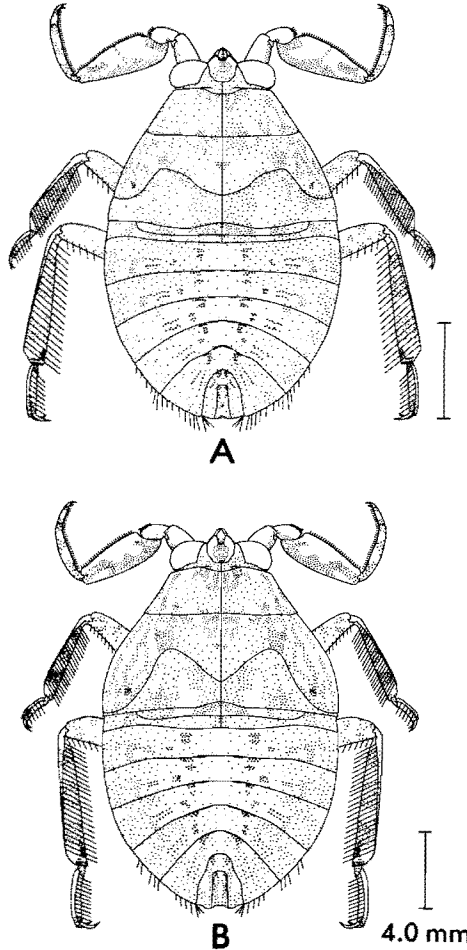


Fig. 2A-B. Immature stages of *A. breviceps*. A, Fourth instar, B, Fifth instar.

covered by mesonotum) extending to abdominal segment 2 laterally. Row of swimming hairs on posteroventral surface of meso- and metafemora well developed.

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