

within 4 h). Newly molted 4th instars (Fig. 23) (within 8 h) were compared with prepupae (Fig. 25, 26). Head widths of newly molted 3rd instars were compared with those of larvae ready to molt to the 4th instar. Head widths of newly molted 4th instars were compared with head widths of prepupae.

## Results

### *Description of Larval Instars—Minor Workers*

Four larval instars were determined on the basis of morphological characters.

**First Instar.**—Straight length 0.27–0.42 mm. Hair absent, but small, blunt microsetae (Fig. 1, 5, 6, 7) on mouthparts and head, in rows along anteroventral body region, and in perianal region. Rows of spinules in groups of 1 or 2 just posterior to anus, on ventral surface, continuing around posterior end of body and onto dorsal surface, always pointing anteriorly (Fig. 6). Head width 0.14–0.16 mm ( $\bar{x} = 0.15$  mm,  $N = 15$ ). Antenna represented by 3 indistinct sensilla (Fig. 7). Mouthparts unsclerotized (Fig. 7). Labrum with 2 prominent, dorsomedial microsetae and 6 smaller anteromedial microsetae. Mandible slightly longer than wide, bearing distinct apical tooth and poorly defined subapical tooth (Fig. 39). Maxillary palp (Fig. 8) poorly developed; appearing to consist of 3 sensilla, of which 2 bear a single spinule each and one with possibly 2 spinules. Galea not evident. Labium with a few minute spinules just posterior to indistinct opening of sericteries; palps like maxillary palps, each consisting of 3 or 4 sensilla with a minute spinule.

**Second Instar.**—Straight length 0.42 mm (newly molted) to 0.57 mm (ready to molt to 3rd instar). Hairs of body and head small, simple, smooth (Fig. 2, 9, 10) (6.1–15.2  $\mu\text{m}$ ); apical end enlarged and curved (Fig. 10); body hairs in rows along ventral and perianal region; rows of microsetae medial to ventral rows of hairs. Posterior rows of spinules as in 1st instar, but spinules slightly longer, more numerous, and usually found in groups of 2 or 3 (Fig. 10). Head width 0.16–0.19 mm ( $\bar{x} = 0.17$  mm,  $N = 33$ ). Antennae distinct, each bearing 3 sensilla with a spinule (Fig. 11). Mouthparts unsclerotized (Fig. 11). Labrum with 4 small dorsal hairs and 6 anterior sensilla. Mandible like that of 1st instar but with both apical and subapical teeth more distinct; at least 2 small papillae also visible (Fig. 39). Maxilla bearing 2 large microsetae; palp poorly developed but distinct, each with 5 (2 encapsulated and 3 bearing a spinule each) sensilla (Fig. 12); galea indistinct, represented by 2 sensilla each bearing a spinule. Labium with 2 large lateral, 2 large anteromedial, and 2 small medial microsetae just lateral to opening of sericteries; labial spinules more prominent than those of 1st instar, many in short rows; labial palps like maxillary palps (Fig. 11).

**Third Instar.**—Straight length 0.59–0.76 mm newly molted to 0.79–0.91 mm (ready to molt to 4th instar). Hairs of head and body short, smooth, numerous, and very variable (9.1–25.8  $\mu\text{m}$ ) (Fig. 3, 14, 16); apical ends simple, branched or bifid, and usually strongly hooked; pattern of head hairs like that of 2nd instar; ven-

tral body hairs in rows extending from head to anus. Posterior spinules similar to those of 2nd instar, but longer and usually in groups of 3–5 (Fig. 16). Anteroventral body region with a few spinules. Head width 0.20–0.25 mm ( $\bar{x} = 0.21$  mm,  $N = 17$  [newly molted]) to 0.21–0.25 mm ( $\bar{x} = 0.23$  mm,  $N = 41$  [ready to molt to 4th instar]). Antennae as in 2nd instar, but the 3 spinules longer (Fig. 14). Mouthparts unsclerotized (Fig. 13). Labrum with 4 small dorsal hairs and 6 anterior sensilla as in 2nd instar; a few pointed spinules anterolaterally. Apical and subapical mandibular teeth sharper and longer than those of 2nd instar; at least 2–3 small papillae present (Fig. 39). Maxilla with 2 lateral hairs homologous to the 2 microsetae of 2nd instar; palp and galea well developed, bearing same pattern of sensilla as on maxillary palp and galea of 2nd instar, but better developed (Fig. 15). Labium bearing short hairs homologous to the 6 microsetae of 2nd instar; palps similar to maxillary palps but less prominent; spinules similar to those of 2nd instar. Anteroventral body region bearing a few spinules (Fig. 13).

**Fourth Instar.**—Straight length 0.79–1.20 mm (newly molted) to 1.50–1.82 mm (prepupae). Body hairs papillose (Fig. 33–38) those of anteroventral body straight, simple (51.7–85.1  $\mu\text{m}$ ) (Fig. 4, 23, 37), and sometimes possessing minute apical branches (Fig. 38); all other hairs bifid (15.2–54.7  $\mu\text{m}$ ) (Fig. 4), usually with strongly hooked apical ends (Fig. 34). Head hairs similar to body hairs of 4th instar, and with pattern like that of 3rd instar; most straight, simple (54.7–97.3  $\mu\text{m}$ ), some posterior hairs simple or bifid, even within same pairs. Food basket (Petralia and Vinson 1978)<sup>3</sup> consisting of anteroventral body region, whose hairs flank laterally a medial hairless area bearing rows of spinules. Spinules of posterior segments pointing anteriorly, spinules of anterior segments pointing posteriorly or laterally (Fig. 18); chunks of solid food often anchored in this region. Posterior spinules (Fig. 19) similar to those of 3rd instar. Head width 0.26–0.33 mm ( $\bar{x} = 0.29$  mm,  $N = 82$  [new molted]) to 0.28–0.32 mm ( $\bar{x} = 0.30$  mm,  $N = 51$  [prepupae]). Antennae as in 3rd instar, but spinules more tapered (Fig. 21). Mouthparts (Fig. 18) partially sclerotized. Labrum with same hair pattern as in 3rd instar, but longer; anterolateral spinules abundant. Mandible with 2 prominent apical teeth, one prominent subapical tooth, and up to 4 small basal teeth or prominences, latter not always easily seen; sclerotization increasing with age (Fig. 39). Two (perhaps 3) sensilla on head near base of mandible, each with a central protuberance (Fig. 22). Maxillae, maxillary palp, and galea (Fig. 20), labium, and labial palp with sensilla and hair patterns as in 3rd instar, but larger; palp and galea at least as long as wide; labial spinules more laterally located on labium than in previous 3 instars; opening of sericteries well developed.

### *Description of Larval Instars—Reproductives and Majors*

Except for size, minor, major, and reproductive larvae are morphologically indistinguishable. Head width and mandibles of very large 4th instars are larger than those of minor worker prepupae. Head widths of mature larvae and prepupae of major workers were 0.30–0.3

<sup>3</sup> Wheeler and Wheeler believe this is not a true food basket (1976, and pers. comm.).