

Table 1.—Comparison of descriptions of instars of minor workers.

Petralia and Vinson (this report)			O'Neal and Markin (1975)		
Instar	Mandible	Hairs	Instar	Mandible	Hairs
1st	Un-sclerotized; only apical tooth prominent	Absent; a few microsetae present	—	—	—
2nd	Same as 1st	Few simple hairs, curved at apex	—	—	—
3rd	Same as 1st	Most head and ventral body hairs simple, curved at apex; bifid hairs numerous on body	1st	Partially sclerotized; apical tooth	Head and part of anteroventral body with simple, curved hairs; other hairs numerous
			2nd	Degree of sclerotization not described; apical tooth	Same as 1st
4th	Sclerotized; 3 large distal teeth and up to 4 smaller proximal teeth	Most head and antero-ventral body hairs simple, straight; other hairs strongly bifid	3rd	Sclerotized; 3 distal teeth	Same as 1st
			4th	Sclerotized; 3 large distal teeth and 3 small proximal teeth	Same as 1st

with the eggs and also have an adhesive coating. Because adult workers constantly groom the eggs and young larvae, the adhesive coating is probably either applied or at least kept moist by the adults. This has been suggested for other ants by Wheeler (1910). Third and 4th instars may be too massive to cling together by means of an adhesive coating on the cuticle; moreover, alcohol fixation which nullified the adhesive properties of eggs, 1st and 2nd instars, did not hinder 3rd and 4th instars from clinging to each other. From SEM studies, it appears that these larvae cling together by means of their hooked hairs. This function has been described in other ants (Wheeler 1910, Wheeler and Wheeler 1973). The function of the papillae on the hairs of 4th instars is not yet known. These papillae are solid parts of the hair (revealed by transmission electron microscopy).

In summary, the 4 larval instars of *S. invicta* are clearly distinguishable by changes in vestiture and mouthparts. These changes are correlated with changes in feeding and handling of larvae by workers.

Finally, we hope that the information presented in this paper will be useful to other researchers, for identifying the developmental stage of live larvae of the imported fire ant. This is most easily accomplished by placing larvae on thin, moist paper on a slide, examining them with a compound microscope at high magnification ( $> 100\times$ ), and comparing numbers and types of hairs observed with the figures in this paper. Also, sclerotization of mandibles is a definite indication of 4th instars, but one should note that the sclerotized apical ends of the mandibles of 4th instars are usually visible internally in 3rd instars preparing to molt. With practice, 3rd and 4th instars may be quickly and efficiently distinguished from each other, and from younger larvae, with a stereomicroscope.

## REFERENCES CITED

- Delage-Darchen, B. 1972. Le polymorphisme larvaire chez les fourmis *Nematocrema* d'Afrique. *Insectes Sociaux*, Paris 19: 259-78.
- Dyar, H. C. 1890. The number of molts of lepidopterous larvae. *Psyche*, 5: 420-2.
- O'Neal, J., and G. P. Markin. 1973. Brood nutrition and parental relationships of the imported fire ant *Solenopsis invicta*. *J. Ga. Entomol. Soc.* 8: 294-303.
1975. The larval instars of the imported fire ant, *Solenopsis invicta* Buren. *J. Kans. Entomol. Soc.* 48: 141-51.
- Petralia, R. S., and S. B. Vinson. 1978. Feeding in the larvae of the imported fire ant, *Solenopsis invicta* Buren: Behavior and morphological adaptations. *Ann. Entomol. Soc. Am.* 71: 643-8.
- Schmidt, F. H., R. K. Campbell, and S. J. Trotter, Jr. 1977. Errors in determining instar numbers through head capsule measurements of a lepidopteran—a laboratory study and critique. *Ibid.* 70: 750-6.
- Schuster, R. O., and A. E. Pritchard. 1963. Phytoseiid mites of California. *Hilgardia* 34: 191-285.
- Vinson, S. B. 1969. General morphology of the digestive and internal reproductive systems of adult *Cardiochiles nigriceps* (Hymenoptera: Braconidae). *Ann. Entomol. Soc. Am.* 62: 1414-9.
- Wheeler, G. C., and J. Wheeler, 1955. The ant larvae of the Myrmicine tribe Solenopsidini. *Am. Midl. Nat.* 54: 119-41.
1960. Supplementary studies on the larvae of the Myrmicinae. *Entomol. Soc. Wash.* 62: 1-32.
1973. The ant larvae of the tribes Basicerotini and Dacetini: second supplement. *Pan-Pac. Entomol.* 49: 207-14.
1976. Ant Larvae: Review and Synthesis. *Entomol. Soc. Wash.* 108 pp.
- Wheeler, W. M. 1910. *Ants, their Structure, Development and Behavior*. Columbia University Press. 663 pp.