Descriptions of the immature stages and biology of Peregrinus maidis (Ashmead) (Homoptera: Delphacidae)

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Peregrinus maidis (ASHMEAD) is a pantropical delphacid that has been implicated as an important vector of viral diseases of maize *(Zea mays* L.) in the lowland humid tropics (METCALF, Z. 1943. Gen. Cat. Hemiptera, Fasc. IV, Pt. 3; BREWBAKER, J. 1979. Econ. Bot. *33:* 101–118). *P. maidis* adults and immatures were reared on potted maize in an environmental chamber at 12L : 12D, and either 10°, 15.6°, 21.1°, 26.7°, or 32.2 °C, in order to obtain eggs and nymphs for descriptions and to determine the effects of temperature on development.

The major features useful for separating the five nymphal instars include the numbers of metatarsomeres (instars I–III with 2; IV with 2, one of which is partially subdivided; V with 3), antennal sensoria (I-0, II-2, III-4, IV-6, V-9), pits between each lateral frontal carina and compound eye (I-2, II-3, III to V-4), and pronotal pits (I to III-12; IV, V-14), and the shape, size and spination of the metatibial spur (longer and flatter as development progresses with the following number of small teeth: I-1, II-1, III-5, IV-10 to 12, V-16 to 20).

Rearing at 10° and 32.2 °C resulted in cessation of development and death by instar IV. Rearing at 15.6 °C resulted in a supernumerary instar VI. At 21.1° and 26.7 °C, development proceeded normally with shorter stadia at the higher temperature (Table 1).

In the United States, *P. maidis* is only found regularly in southern Florida. Our results indicate that the northward distribution of *P. maidis* into major maize producing areas is probably prevented due to its lack of complete development at

Tab. 1: Development (X ± SD in days) of *P. maidis* at various temperatures. N = number of nymphs beginning each stage.

	TEMPERATURE (°C)				
INSTAR	10	15.6	21.1	26.7	32.2
I	10.0 ± 6.3 N = 44	7.7 ± 2.8 N = 71	5.2 ± 1.5 N = 49	4.3 ± 1.5 N = 89	1.9 ± 1.1 N = 67
II	20.2 ± 10.0 N = 18	11.1 ± 2.8 N = 41	4.6 ± 1.6 N = 42	3.1 ± 1.4 N = 53	4.2 ± 1.5 N = 58
III	24.3 ± 10.2 N = 4	10.5 ± 4.1 N = 25	5.4 ± 2.3 N = 33	3.3 ± 1.6 N = 39	10.6 ± 5.8 N = 33
IV	10.0 ± 22.6 N = 2	13.5 ± 4.9 N = 17	6.0 ± 2.7 N = 26	3.3 ± 1.3 N = 35	16.8 ± 6.4 N = 6
V	-	12.7 ± 6.0 N = 15	6.0 ± 0.8 N = 15	4.4 ± 1.2 N = 17	-
VI	-	9.7 ± 4.0 N = 3	-	-	-

10 °C and apparent absence of an overwintering stage. Its lack of complete development and short adult longevity (Tsai & Wilson, unpubl. data) at 32.2 °C correlates with the low incidence of maize viruses in southern Florida in summer (Tsai, pers. obs.).

Diversity and seasonality of Panamanian cicadas

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Panama has a rich fauna of cicadas. In light-traps in 6 localities a total of 30 species was obtained. Prof. J. A. Ramos kindly identified these species for me. There were no significant differences between sites in diversity but there were large differences in species composition.

Cicadas in Panama tend to be much more seasonal in their presence as adults than most other insects. With one possible exception none of the species occur around the year. Some are present as adults in the early dry season, some in the late dry season, others in the early or middle rainy season. In Fortuna, a mountain area with no dry season but with heavy rains throughout the year, the 4 species sufficiently common for analysis are fairly seasonal and occur from late April through October, with a peak around May/June. Virtually no cicadas were collected here between November and March. The curious exception referred to above is *Selymbria stigmatica* (Germar), a species which I have found only on Barro Colorado Island (BCI). This species is either seasonally bimodal and dichromatic, or consists of two closely related species. For some of the species which were studied in more than one site, there are interesting differences in seasonality between these sites.

The proximate factors affecting the seasonal distribution seem to be easy to determine. A first glance at the seasonal distributions suggests that the major determining factors have to do with the onset and end of the rainy season. Many species appear in large numbers just after the beginning of the rains, others after they end. *Quesada gigas* (Olivier) appears in February when the soil usually really begins to dry up. However, observations over a number of years show that variation in timing of the season of each species is only partly related to the actual seasonality of the rains that year. *Quesada gigas* starts singing in mid-February whether the rains stopt early November or went on until the end of January. The first individuals of the early rainy season cicadas emerge weeks before the rains come. It seems that natural selection has timed the adult season of the cicadas in relation to the alternation of wet and dry seasons, but that the synchronising factor is something other than the rain or dryness. Possibly daylength has an effect through the plants on the roots of which the nymphs are feeding.

Fifth Auchenorrhyncha meeting in Davos, Switzerland August 28-31, 1984

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