Comparative Laboratory Rearing of *Mecidea major* and *M. minor* (Heteroptera: Pentatomidae)[1]

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Abstract The stink bugs *Mecidea major* Sailer and *M. minor* Ruckes were reared from egg to adult under controlled laboratory conditions at 25 ± 0.01°C, 79.3 ± 0.05% humidity, and a photoperiod of LD 14:10 h, on *Eragrostis lehmanniana* Nees. The incubation period for *M. major* eggs averaged 5.67 d, and the five stadia 3.54, 5.56, 4.94, 5.62, and 9.63 d, respectively. The incubation period for *M. minor* eggs averaged 6.00 d, and the five stadia 3.20, 6.53, 4.48, 5.56, and 8.81 d, respectively. Total developmental time averaged 34.96 and 34.58 d for *M. major* and *M. minor*, respectively, and did not differ significantly between sexes within each species. However, it did differ within females between species.

Key Words *Mecidea major*, *Mecidea minor*, Pentatomidae, laboratory rearing.

The stink bug genus *Mecidea* (Pentatomidae: Pentatominae: Mecideini), apparently associated with xeric and semixeric environments, occurs within the subtropical and adjacent temperate regions of the world (Sailer 1952). This phytophagous genus, which contains 17 species (Sailer 1952, Schuh and Slater 1995), is represented in America north of Mexico by only two species, *M. major* Sailer and *M. minor* Ruckes (Sailer 1952).

Mecidea major and *M. minor*, collectively, range within America north of Mexico, from the midwestern states to California (Froeschner 1988). Specifically, *M. major* ranges from southern Illinois (McPherson and Vogt 1981) and Missouri west to Arizona and *M. minor* from Iowa and South Dakota west to California (Froeschner 1988, Sailer 1952); both species have been reported from Mexico (Thomas 2000). Little is known about their biology, including their immature stages. However, recently, the egg of *M. major* has been described (Bundy and McPherson 2005).

Both species commonly are found from late spring-early summer to early-mid-fall but have been collected almost year-round (Jones 1993, Sailer 1952). They probably are grass specialists but have been found on both grass and nongrass species (Bundy 2004, Sailer 1952). They have been collected from, among others, side-oats grama, *Bouteloua curtipendula* (Michaux); black grama, *B. eriopoda* (Torrey); blue grama, *B. gracilis* (Willdenow ex Kunth); bermuda grass, *Cynodon dactylon* (L.);

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Lehmann lovegrass, *Eragrostis lehmanniana* Nees; and tobosagrass, *Pleuraphis mutica* Buckley (e.g., Sailer 1952, Watts 1963, Jones 1993, Bundy 2004).

Scattered notes have been published on the field life cycles of these bugs. Jones (1993) found second to fifth instars of *M. major* in Arizona on several grass species (e.g., bermuda grass, Lehmann lovegrass) from early March to early June and two fifth instars of *M. minor* from unidentified grasses in early April. He also reported that *M. major* females caged on potted *E. lehmanniana* (no date given) deposited eggs in two rows of 12-14 at the bases of the stems near the soil surface.

During 2003 and 2004, several reproducing populations of *M. major* and *M. minor* were found in the southern half of New Mexico on various species of range grasses but primarily on Lehmann lovegrass, grama grasses (*Bouteloua* spp.), and tobosagrass (Bundy 2004). The number of bugs and range of instars suggested that the populations were large enough for life history studies. Presented here are the results of laboratory rearing of both species, including brief comparisons within and between species.

Materials and Methods

From June to October 2004, ≈150 adults each of *M. major* and *M. minor* were collected from range grasses, including Lehmann lovegrass and tobosagrass, and used to establish laboratory colonies. From each colony, 30 males and 30 females were selected and placed in an ovipositional cage; dead individuals were replaced with additional field specimens as needed. Each cage consisted of a glass aquarium (61 × 32 × 41 cm) covered with a tight-fitting metal-framed lid lined with fine cloth mesh to allow air circulation and prevent insects from escaping. Food consisted primarily of freshly-cut Lehmann lovegrass and tobosagrass, depending upon availability. Stems with attached heads were placed in two 1-pint Golden Harvest® Mason jars (≈ 0.47 L) (Hearthmark, Inc., Muncie, IN), which were filled with distilled water and placed in the cage; plants were replaced weekly. A small plastic Petri dish (≈10.0 cm diam., 2.0 cm depth) filled with cotton and distilled water was placed in the cage to provide a water source for the bugs and footing if they entered the dish. Strips of cheesecloth, which served as oviposition sites, were suspended inside the cage and held in place by the lid.

The cages were examined daily for eggs. Plant material and cheesecloth, with attached egg clusters, were removed and placed on moistened filter paper in the bottoms of Petri dishes (≈10.0 cm diam., 1.5 cm depth), one cluster per dish.

The nonfeeding first instars, which always hatched on the same day and usually remained on the empty egg clusters, were kept in the Petri dishes. However, water tended to condense on the inner exposed surfaces of these dishes. Therefore, later instars were kept in larger Petri dishes (≈10.0 cm diam., 2.0 cm depth), which were less susceptible to water condensation; the bottoms of these dishes also were covered with moistened filter paper. All instars (including the firsts) were grouped by molting dates to accurately determine stadia. The second to fifth instars were fed fresh heads of Lehmann lovegrass.

Eggs, nymphs, and adults were kept in an incubator (Percival I-36 VL) at 25 ± 0.01°C, 79.3 ± 0.05% humidity, and a photoperiod of LD 14:10 h. Filter paper for Petri dishes was moistened daily with distilled water. The food was replaced every two days.

Statistical averages are expressed as means ± SE. The UNIVARIATE procedure of SAS was used to test for normality of data. Clustering of data points was not

normal; however, the distribution was symmetrical and heavy-tailed. Therefore, comparisons were made using the Student *t*-test. Level of significance was set at 0.05.

Results and Discussion

Eggs of *M. major* and *M. minor* were laid in regular alternating double rows on cheesecloth and heads of lovegrass. Eyespots and mouthparts were visible in 4-5 days. Egg bursters appeared within 2-3 days before hatching.

Mecidea major. A total of 97 eggs were laid in 11 clusters, ≈9 eggs per cluster (8.82 ± 0.77; range = 5-14). The incubation period averaged 5.67 d (Table 1). The first through fifth stadia averaged 3.54, 5.56, 4.94, 5.62, and 9.63 d, respectively. Total developmental period averaged 34.96 d and did not differ significantly between males (33.63 d, $n = 19$) and females (35.21 d, $n = 33$) ($t = 1.4971$, df = 50, $P = 0.1406$).

Mecidea minor. A total of 79 eggs was laid in 8 clusters, ≈10 eggs per cluster (9.9 ± 1.12; range = 5-14). The incubation period averaged 6.00 d (Table 2). The first through fifth stadia averaged 3.20, 6.53, 4.48, 5.56, and 8.81 d, respectively. Total developmental period averaged 34.58 d and did not differ significantly between males (34.04 d, $n = 24$) and females (33.04 d, $n = 24$) ($t = -0.9624$, df = 46, $P = 0.3408$).

Mecidea major* versus *M. minor. Total developmental time between the two species did not differ significantly ($t = 1.4954$, df = 98, $P = 0.1380$). However, when males and females were compared separately, total developmental time did differ significantly between females (FF: $t = 2.2542$, df = 55, $P = 0.0282$; MM: $t = -0.3615$, df = 41, $P = 0.7195$).

The importance of these results is difficult to interpret. As we were dealing with two species, we expected differences in the way they would respond to one or more of the four main parameters involved in the rearing (i.e., food, temperature, humidity, photoperiod). It certainly is possible that the results of these analyses might have been different had the sample sizes of the adults been larger.

Table 1. Duration (in days) of immature stages of *Mecidea major*

Stage	Sex	No. completing stadium	Mean ± SE	Range	Cumulative mean age
Egg*		97	5.67 ± 0.06	5-7	5.67
First instar		96	3.54 ± 0.13	2-6	9.21
Second instar		80	5.56 ± 0.15	2-12	14.77
Third instar		70	4.94 ± 0.15	3-7	19.71
Fourth instar		58	5.62 ± 0.27	2-12	25.33
Fifth instar		52	9.63 ± 0.34	6-15	34.96
Egg through fifth instar	Males + Females	52	34.61 ± 0.51	29-45	
	Males	19	33.63 ± 0.66	31-39	
	Females	33	35.21 ± 0.70	29-45	

* 97 eggs were oviposited.

Table 2. Duration (in days) of immature stages of *Mecidea minor*

Stage	Sex	No. completing stadium	Mean ± SE	Range	Cumulative mean age
Egg*		79	6.00 ± 0.13	5-8	6.00
First instar		78	3.20 ± 0.05	3-4	9.20
Second instar		71	6.53 ± 0.24	4-15	15.73
Third instar		65	4.48 ± 0.15	3-9	20.21
Fourth instar		62	5.56 ± 0.27	3-15	25.77
Fifth instar		48	8.81 ± 0.29	5-17	34.58
Egg through fifth instar	Males + Females	48	33.54 ± 0.52	29-47	
	Males	24	34.04 ± 0.86	29-47	
	Females	24	33.04 ± 0.58	29-41	

* 79 eggs were oviposited.

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