

NOTES ON THE BIOLOGY OF COSMOPEPLA BIMACULATA
(HEMIPTERA:PENTATOMIDAE) IN SOUTHERN ILLINOIS

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ABSTRACT.--A study of the biology of Cosmopepla bimaculata (Thomas) was conducted in southern Illinois between May 1972 and November 1974 and included field observations and laboratory rearing. Adults usually began emerging from overwintering sites in early May. Copulating pairs were noted at this time, and again in late June. The seasonal occurrence of the various nymphal instars is discussed. C. bimaculata was reared on green beans under constant light and temperature conditions. The incubation period averaged 7.0 days. The average durations of the 5 subsequent stadia were 3.5, 10.1, 9.6, 12.5 and 18.9 days.

Field and laboratory investigations of Cosmopepla bimaculata (Thomas) were conducted between May 1972 and November 1974 in southern Illinois. All field data were collected in the La Rue-Pine Hills Ecological Area (hereafter referred to as Pine Hills), Union Co.

C. bimaculata occurs from Nova Scotia and New England south to Georgia, Texas and Mexico, and west to British Columbia and Washington (Blatchley 1926). It has been collected from numerous plant species including wild columbine (Van Duzee 1894), currant, mint, blackberry, raspberry, mullein, thistle (Kirkaldy 1909), moth mullein (Olsen 1910), Stachys, pokeberry (Hart 1919), wild carrot (Stoner 1920), snapdragon (Balduf 1926), greater ragweed, oats, nettle, bouncing-bet (Blatchley 1926), beardtongue (Griswold 1937), goldenrod (Torre-Bueno 1939), Collinsia verna Nuttall, Ranunculus abortivus L., Hydrophyllum appendiculatum Michaux (Esselbaugh 1948), and Gypsophila (Hoffman 1971). It has been reared from egg to adult (Olsen 1910, Esselbaugh 1948, McDonald 1968), brief notes have been published on its life history (Balduf 1926, McDonald 1968) including reproductive behavior (Fish and Alcock 1973), and the eggs (Esselbaugh 1946, McDonald 1968) and 1st-5th instars (DeCoursey and Esselbaugh 1962) have been described.

MATERIALS AND METHODS

Samples of the Pine Hills populations were taken 1-2 times per week during the 1972-74 seasons (ca. May-October) and sporadically during the remaining months. Specimens were collected by sweeping and hand-picking. Plants upon which individuals were feeding and/or copulating were recorded. Data from the 3 years were combined to allow a better understanding of the annual life cycle.

C. bimaculata was reared in the laboratory on green beans (Phaseolus vulgaris L.). Field-collected adults were maintained in 1-qt mason jars following the technique of McPherson (1971), and the resulting offspring reared following the technique of McPherson (1974) for Euschistus politus Uhler.

Food, filter paper and towelling were changed every 3-5 days. All specimens were kept in incubators maintained at $23.9 \pm 0.6^{\circ}\text{C}$ and constant light of ca. 130 ft-c.

RESULTS AND DISCUSSION

A total of 103 adults and 56 nymphs was collected during this study. Adults usually began to emerge from overwintering sites in early May although an exceptional specimen was swept from roadside vegetation on 12 March 1973. They were collected continuously until mid-September, but were most abundant early to mid-May (51 adults), and late June-early July (21 adults). Those collected during the 2nd peak were newly emerged, as evidenced by cast 5th instar skins. Copulating pairs were observed in early May and late June which corresponded with the 2 adult peaks.

No eggs were collected. Young instars (seventeen 1sts, six 2nds, six 3rds) were collected late May-mid-July, with no peaks of abundance discernable. Older instars (six 4ths, twenty one 5ths) were found mid-June-mid-September but were most abundant during the last 2 weeks of June (four 4ths, eleven 5ths) and the 3rd week of August (four 5ths). Based on laboratory developmental time, the 2nd peak probably resulted from eggs laid in June-July. This would correspond with the emergence of the 2nd peak of adults. However, it is possible these eggs were laid by some long-lived spring adults. Thus, C. bimaculata may have been bivoltine at Pine Hills but, because the 2nd peak of older nymphs was so small, it is possible that it was partially bivoltine, or even univoltine.

C. bimaculata was observed feeding on curly dock (Rumex crispus L.), buckhorn (Plantago lanceolata L.), wild carrot

(Daucus carota L.), cheat (Bromus secalinus L.), blue speedwell (Veronica arvensis L.), Carolina cranesbill (Geranium carolinianum L.), and wood-sage (Teucrium canadense L.), copulating on blue speedwell, trumpet-creeper [Campsis radicans (L.)], and common mullein (Verbascum thapsis L.). It was also collected from timothy (Phleum pratense L.).

Approximately 20 adults were collect on 5 May 1972 and placed in mason jars in the laboratory. Some were in copulo when captured. The ♀♀ laid 26 clusters, all on cheesecloth, totaling 201 eggs ($\bar{x}$ = 7.7, range = 1-20). Esselbaugh (1946) reported his specimens averaged ca. 11 eggs/cluster (range = 2-24), McDonald (1968), 11.5 ± 1.0 eggs. The incubation period averaged 7.0 days (Table 1).

Table 1.--Durations (days) of immature stages of Cosmopepla bimaculata reared in the laboratory. Compare these results with those reported by Esselbaugh 1948(1), Olsen 1910(2), and McDonald 1968(3).

Stage	No. individuals	Days		Days		
		Range	Avg.	Avg. (1)	Avg. (2)	Avg. (3)
Egg	171 ^a	6-9	7.0	4.6	7.0	4.7
Nymph						
1st instar	170	3-5	3.5	2.7	4.0	3.2
2nd instar	133	7-19	10.1	8.3	6.0	4.7
3rd instar	108	5-16	9.6	6.8	5.0	4.2
4th instar	104	3-22	12.5	7.9	7.0	2.9
5th instar	96	9-26	18.9	10.3	9-13 ^b	6.4

^a201 eggs laid but 30 failed to hatch.

^bno average given.

The 1st instars emerged through pseudopercula and clustered atop the egg shells for the entire stadium, unless disturbed. No feeding was observed during this stadium. The durations of the 1st, 2nd, 3rd, 4th, and 5th stadia averaged 3.5, 10.1, 9.6, 12.5 and 18.9 days, respectively (Table 1).

Durations of the various stadia in this experiment differed from those in the experiments of Esselbaugh (1948), Olsen (1910), and McDonald (1968) (Table 1). Esselbaugh reared his animals (collected in Urbana, Illinois) on lettuce in a room affected by outdoor temperatures. Olsen (1910) apparently collected his specimens on Long Island, New York, reared them on moth mullein (Verbascum blattaria L.), but gave no additional information on rearing conditions. McDonald (1968) reared his animals (collected in Alberta, Canada) on Stachys palustris L. at ca. the same temperature (eggs = 23.5°C, 1st-5th instars = 23.0°C) as mine but under a 14L:10D photoperiod. It is probable that the differences in rearing technique account for the differences in developmental time between the 4 sets of data. Perhaps, however, the progressive decrease in the 2nd-5th stadia from southern Illinois to Alberta, Canada, reflects the progressive decrease in length of active season. This possibility warrants further investigation.

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