[3.0065]

THE LIFE HISTORY OF *Neurocolpus nubilus* (Say), THE CLOUDED PLANT BUG (Hemiptera, Miridae)[1]

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Introduction

Neurocolpus nubilus (Say, 1832), the clouded plant bug, is one of seven species in the genus: *N. arizonae* Knight, *jessiae* Knight, *johnstoni* Knight, *rubidus* Knight, *simplex* Van Duzee, and *tiliae* Knight. The species *N. nubilus* was originally described in the genus *Capsus* Fabricius, 1803 (LeConte, 1883). However, in 1876 Reuter described the genus *Neurocolpus* with *nubilus* as the only included species. This mirid occurs throughout the United States, Southern Canada, and Mexico (Crawford, 1916; Knight, 1941, and Van Duzee, 1889).

Crawford, 1916, wrote on certain aspects of the biology of this mirid when it became a pest on spy apples in Ontario, Canada, from 1912 to 1916. He reported that the eggs hatched about May 27 in 1915, and the nymphal period lasted for about a month. The population had almost disappeared by August 24 and was gone entirely by September 7.

A total of 42 hosts have been mentioned in the literature: Alsike clover, apple, alternate-leaved dogwood, burdock, button bush, Canadian blue grass, catnip, cone flower, cotton, cotton wood, *Croton capitatus*, curled dock, elder, evening primrose, false indigo, golden rod, ground cherry, hairy vetch, horseweed, Hungarian millet, Kentucky coffee tree, mesquite, mullein, old witch grass, orange milkweed, peach, peppermint, pigweed, poison sumac, ragweed, raspberry, red clover, round-leaved mallow, rye, spearmint, spy apple, staghorn sumac, stinking milkweed, sumac, teasel, timothy, and willow (Bibby, 1946; Crawford, 1916; Knight, 1941; Needham, 1903).

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The first specimen of the clouded plant bug, *N. nubilus*, collected in Arkansas was in 1924, with large populations found in northeast Arkansas beginning in 1958. This study on the life history of *N. nubilus* was carried out during the summers of 1966, and 1967, at the Northeast Branch Experiment Station in Keiser, Arkansas.

Methods and materials

N. nubilus were reared in the laboratory using as cages plastic Petri dishes with filter paper in the bottom. Fresh cut green beans, *Phaseolus vulgaris*, were picked daily and cut into two inch pieces. They served as food and oviposition sites. The eggs were left in the beans until hatching and the nymphs were placed in individual Petri dishes, and a record kept of their development. After they developed into adults, they were sexed, paired, and observed for mating and oviposition.

The temperature, humidity, and photoperiod in the laboratory was about ambiant. On rainy days, when the humidity was nearly 100%, the green beans containing eggs had to be placed in an air tight compartment with selica gel in the bottom to retard the growth of fungus. Otherwise, the tiny first instar nymphs would get tangled up in the mycelia.

Results

Adults.—A total of 468 *Neurocolpus nubilus* were reared to adults in the laboratory on green beans. There were 226 males and 242 females for an approximate 1:1 sex ratio. Adults lived an average of only 14.1 and 14.9 days respectively for males and females. The maximum longevity was 29 days for males and 34 days for females (Table 1).

The male is 6.5 mm by 2.5 mm. The rostrum is 2.7 mm and just reaches the posterior margin of the hind coxae. The first segment of the antennae is 1.3 mm and covered with heavy, flattened, black hairs with smaller white bristles intermixed. The second segment is 2.4 mm and enlarged apically on the terminal one-third. The third is .88 mm and the fourth is .86 mm. The pronotum is 1.4 mm long and 2.1 mm wide at the base. The pronotal disc has irregular brown marks. The scutellum is yellow with brown streaks. The hemelytra is brown to fuscous. The femora have brown markings with the hind pair with a brown band in the middle of the apical half. The tibia has a brown band in the middle.

The female is 7.0 by 2.6 mm and is more robust than the male. She has similar color and pubescence (Knight, 1941).

Mating was observed in the laboratory on seven occasions. The male usually flew frantically for several seconds upon being placed in the Petri dish of a

receptive female. A typical courtship and mating behavior pattern follows: Coming to rest near the female, the male approached the female with antennae pointing toward her, he stopped short of her. The female assumed a calling position by spreading her hind legs and raised her abdomen. The male began scissoring her abdomen with his antennae by alternately raising and lowering each antennae over her abdomen while both moved into copulatory position. She backed into him while he spread his fore and then his middle legs. All the while his antennae were alternately moving up and down, touching the dorsum of the female. All of a sudden copulation occurred–lasting only 7 seconds, and then the two insects separated.

A non-receptive female kicks the male away with her hind legs. Receptive females were between 6 and 9 days old and males were 8 to 10 days old (Table 2).

Egg.–A total of 228 eggs were laid in green beans in the laboratory by 11 females (Table 2). Almost all of the eggs were laid in the seam of the bean. The range was 7-36 eggs and the mean was 10.0. The pre-oviposition period ranged from 12-16 days with a mean of 14.5 days.

The eggs are 1.75 mm long and 0.3 mm wide. They are hard and shiny with a white, claw-shaped cap on one end containing the micropyle. Eggs laid in June hatched in 12 days, and those in July hatched from 13-14 days. Eggs laid in August hatched in 14 days.

Nymphs.–A newborn nymph has the appearance of a tiny, hairy spider with long legs. The antennae average 1.2 mm in length and his hind legs are 1.2 mm long. The body is greenish and covered with small black hairs. There are red bands on the legs and antennae. The eyes are very large and bright red.

One hundred and seventy-two nymphs were reared to adults in the laboratory on green beans. They passed through 5 stadia in 12.6 days in June, 12.8 days in July, and 12.3 days in August. It took from 12-15 days to pass from egg to adult at an ambiant temperature (Table 1). The first three stadia lasted an average of only two days each while the last two stadia took three days each (Table 2).

Discussion

Green beans did not appear to be adequate food or oviposition sites in the laboratory for *Neurocolpus nubilus*, the clouded plant bug. Most adults only lived 14 or 15 days in the laboratory and the majority of the females died without laying eggs. Only 11 out of 351 females laid eggs, leaving 340 that died before laying. Other food was tried, like cotton squares, button bush buttons, sliced apples, and sumac flowers, since *N. nubilus* is known to re-

produce on these in nature, but no eggs were ever found in any of these. Upon dissection, all of the females over 6 days old contained many mature eggs, so the females may not have been getting the proper ovipositing stimuli from the green beans.

The reproductive biology of this mirid should be studied further for the possibility of a sex attractant. Behavior in the field and in the laboratory indicate that the female does secrete a sex pheromone. Caged, virgin females were seen to attract males in the field. In the laboratory, males placed in female cages, especially with fecal material evident on the filter paper, remained still for several seconds and then flew frantically around the Petri dish. It did not appear as escape behavior because the male usually came to rest near the abdomen of the female and facing her. Olfactometer studies in the lab failed to show the presence of a sex attractant, but in the field, six times as many males were captured by sticky traps baited with virgin females as were caught by an empty sticky trap just 2-3 feet away. A total of 12 baited traps caught 19 males while the 12 control traps only had three stuck to them. Therefore, I suspect a sex pheromone is produced by virgin females.

From the 228 eggs laid in the lab by 11 females the eggs hatched in about 13 days; the nymphs passed through 5 stadia in 12.6 days. So, from egg to adult took about 25 days. Crawford (1916) reported that nymphal development took about a month at ambiant temperature in Ontario apple orchards. Adults mated at about 8 days of age and eggs were laid about 6 days later. Therefore, a generation takes about 40 days. Since the first adults appear in the field in late June and early July, then two to three generations may be possible in the field.

Diapausing eggs are probably laid in late August since 100% of the eggs collected from the field before this time hatched and almost none of the eggs collected from the field after the last week of August hatched. Crawford, in the only other study on the biology of *N. nubilus*, found that eggs hatched on May 27 in Ontario, Canada, and the population had almost disappeared by August 24 and was entirely gone by September 7. We cannot be sure that diapausing eggs are indeed laid in late August without controlled experiments in the laboratory monitoring various photoperiods and temperatures.

The wide distribution of this species, together with the large number of host plants (52), some of them field crops, makes *Neurocolpus nubilus* an important species in North America.

Table 1. Range and mean of life history data of *Neurocolpus nubilus* in the laboratory.

Event	Mean	Range	*n*
Incubation (in days)	13.1	11-14	228
Duration of nymphal development (in days)			
First stadia	2.1	1-3	172
Second stadia	2.4	2-3	172
Third stadia	2.4	1-3	172
Fourth stadia	2.6	2-4	172
fifth stadia	3.1	2-4	172
Age at mating			
Male	8.7	8-9	7
Female	8.0	6-9	7
Pre-oviposition (in days)	14.5	12-16	12
Number of eggs laid by 11 females	19.0	7-36	228
Longevity (in days)			
Male	14.1	1-29	80
Female	14.9	1-34	80

Table 2. Duration of nymphal development for 172 nymphs.

Days in	Numbers of individuals per stadium				
each stadia	1	2	3	4	5
1	8	0	4	0	0
2	136	108	104	80	20
3	28	64	64	84	100
4	0	0	0	8	52
5	0	0	0	0	0
Mean	2.1	2.4	2.4	2.6	3.1
Range	1-3	2-3	1-3	2.4	2-4

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3.0065 The life history of *Neurocolpus nubilus* (Say), the clouded plant bug (Hemiptera, Miridae). Abstract.—*Neurocolpus nubilus*, the clouded plant bug, was reared in the laboratory in Petri dishes on green beans at ambiant temperatures and photoperiod. The eggs hatched in 13.0 days and the nymphs passed through five stadia in 12.6 days. Mating occurred when the females were at least six days old and the males were eight days old. The pre-oviposition period was 14.5 days and the sex ratio was 1:1. **Richard L. Lipsey**, *Department of Entomology, University of Illinois, Urbana, IL 61801.*

Descriptors: Hemiptera; Miridae; *Neurocolpus nubilus*; clouded plant bug; Arkansas; life cycle.