THE MATING BEHAVIOR OF *PEUCETIA VIRIDANS* (ARANEIDA: OXYOPIDAE)[1, 2]

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No life history of a spider is complete without a description of its mating habits. Since this phase of the life history of the green lynx spider, *Peucetia viridans* (Hentz), has not been previously reported, we studied its mating behavior in detail.

Very few data have been published about mating behavior in American lynx spiders. Kaston (1948) states that *Oxyopes salticus* Hentz "assumes position II", by which he means that the male covers the female cephalothorax with his own, with the spiders facing in opposite directions. This is not true in *Peucetia viridans*. Brady (1964) infers certain limitations to the mating of *P. viridans* based on preserved specimens. These are not borne out by the activities of the living spiders.

Mating of the European *Oxyopes heterophthalmus* (Latr.) was reported by Gerhardt (1933), who observed that this species mates in the air, with both male and female suspended on threads and facing in the same direction. Our observations on the American *Peucetia viridans* show that its mating habits are quite similar to those of this European *Oxyopes*.

Most of our observations were made in the laboratory on spiders that had matured in captivity. A freshly-cut cotton plant with its base in a small jar of water was placed on a table near the edge. Mature male and female green lynx spiders were released on the plant. They made no attempt to escape. With the view unobstructed by a cage, they were easily observed from all angles. While not under observation, males and females were kept in individual pint ice cream containers covered with plastic petri dishes. The complete mating procedure was recorded on 16 mm. motion-picture film exposed at a rate of 64 feet per minute. The mating of 40 pairs in the laboratory and of two pairs in the field was observed. Mating behavior in the field was similar to that observed in the laboratory.

In a typical mating sequence, the male and female, when placed on the cotton plant, ran lightly across the tops of the leaves, pausing frequently. The male's recognition of the presence of a female was almost immediate, apparently by sight, and often at a distance of 12 to 14 cm. He demonstrated his awareness by vibrating his abdomen for periods of 8 to 10 seconds at two or three vibrations per second. While still vibrating his abdomen, he alternately moved his first and second pairs of legs up and down and concurrently drummed his palpi. Meanwhile, he gradually approached the female until he touched her forelegs with his first and second pairs of legs. In both cases, his tarsi touched the upper part of the female's legs, sometimes the femora, sometimes the patellae, and sometimes the tibiae.

If the female was not receptive, she rushed at the male, and he hastily

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retreated. If she was receptive, she responded by raising her forelegs in a bent position and holding them thus, until she and the male began touching each other's legs, with the tarsi touching the patellar regions. This was a back-and-forth exchange; for example, the male's right tarsus touched the female's left patella, followed by the female's left tarsus touching the male's right patella. They touched each other rapidly and repetitiously. After about 30 seconds, they moved apart briefly. The female turned, facing away from the male, and the male approached her from behind. This time, he stroked the dorsal and posterior surfaces of the caudal end of her abdomen and the upper parts of her third and fourth pairs of legs with the tarsi of his first and second pairs of legs. The female then ran for a short distance and dropped headfirst on a thread off the edge of a leaf. Sometimes, however, she ran about the plant for three or four minutes with the male following her, before she dropped from a leaf.

Once she descended, she hung in a vertical position, head downwards, at least an inch below the leaf. Immediately after the female dropped, the male touched the thread supporting her and twirled her with his first two pairs of legs until her venter faced him. Sometimes, he twirled her two or three times until this was accomplished. Often, he twirled her by only touching the thread, but at other times, he touched thread, legs, and body. To complete this maneuver, he frequently had to reach far out from the leaf. If the female's venter still did not face him, he twirled her again.

When the female was in position, the male dropped headfirst on a thread with his venter facing hers. As he reached a point slightly above the female, he began to drum on the tip of her abdomen with his palpi and the tarsi of his forelegs, his body often trembling concurrently. The female then bent into a shallow "U-shaped" position with the epigynum at the

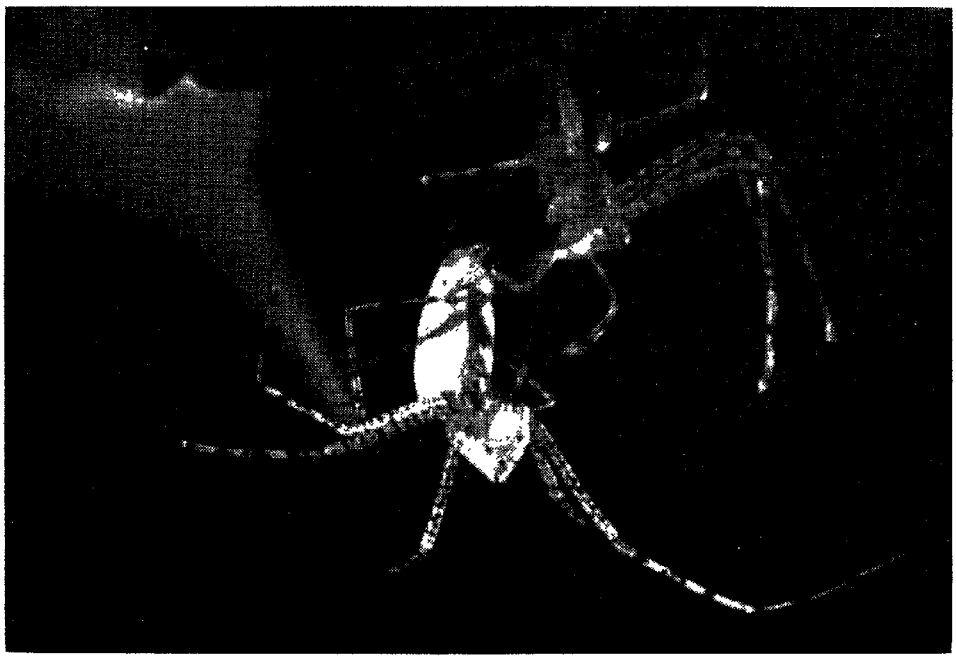

Fig. 1. Male (right) of *Peucetia viridans* moving toward epigynum of female (left) during mating.

base of the curve. With lightning speed, the male thrust his whole body forward and jabbed at the female's epigynum with his palpi, first one and then the other (Fig. 1). The left palpus of the male appeared to be applied to the right atrium, and the right palpus, to the left atrium of the epigynum. The action was so fast, and the palpi were alternated so quickly, however, that possibly the left palpus crossed over to the left atrium of the female, and the right palpus, to the right atrium. In fact, the action was so rapid that, during the first year of investigation, it was impossible for the eye to see the palpus approaching the genital opening. Pictures taken at high speed with a motion-picture camera caught the action during the second year of study. It was then found that the movements could be seen from below with the naked eye. From the beginning of the lunge forward until the palpi were withdrawn was timed at slightly less than 1/10th second by counting the required number of frames of motion-picture film when exposed at a rate of 64 feet per minute.

After copulation, the male sometimes drew back, turned, and climbed to the leaf. The female then paused for a few seconds and also mounted the leaf. While waiting for the female to return to the leaf, the male sometimes passed his palpi through his chelicerae. After a minute or two, the male tapped on the caudal part of the female's abdomen with the tarsi of his first two pairs of legs. She immediately dropped on a thread; the male twirled her into position and also dropped on a thread, and they copulated again. Frequently, the spiders copulated four or five times before returning to the leaf, and they usually dropped from the leaf five or six times before mating terminated (Table 1).

TABLE 1.—TYPICAL MATING RECORDS OF *Peucetia viridans*.

Number of descent	Time in seconds from beginning of drop of female to retreat of male	Number of Copulations*
Pair No. 1, 23 Oct. 1964		
1	—	3
2	—	5
3	132	7
4	25	2
5	—	2
6	40	2
7	10	1
8	10	1
Pair No. 2, 5 Nov. 1964		
1	112	5
2	196	6
3	61	3
4	113	2
5	142	2
6	23	1
7	67	4

* Each copulation consisted of an application of each palp to the epigynum.

Courtship, as defined by Meisenheimer (1921) and by Kaston (1936), consists of the preliminaries before the act of mating. In a typical mating sequence of the green lynx spider, courtship lasted 11 minutes. Mating took 10 minutes, consisting of several copulations measured from the first approach of a male palpus to the female's epigynum until the final separation. The female dropped six times, with the male applying his palpi from 5 to 6 times per descent, but with only one copulation on the last descent. After mating, the male retreated and remained under a leaf near the female for some time.

According to Gertsch (1949), in all higher spiders, the male's right palpus is applied to the right orifice of the female, and the left palpus is applied to the left orifice. Since the palpi of *Peucetia viridans* appeared to be thrust straight forward, the right palpus appeared to be applied to the left orifice. However, further investigation with more refined equipment may show that the right palpus crosses over to the right orifice.

Males mated freely on successive days. One male mated on three consecutive days, each time with a different female. However, after mating, the males did not mate again until they had recharged their palpi, usually 12 to 16 hours after mating. Brady's observations (1964) on epigyna and palpi of mated individuals of *Peucetia viridans* are not yet explained, considering the repeated copulation of one male and female and the mating of males on successive days with different females. Brady showed that, on microscopic examination of preserved specimens, each of the two openings of a mated female's epigynum is usually plugged with a hard, black material with the two-pronged portion of the male's palpal paracymbium imbedded in it. We found that this black, "resinous" material sometimes covered the entire epigynum. Plugging of the epigynum should make repeated copulation impossible for the female. The loss of the distal part of the male's paracymbium would be expected to prevent his repeated copulation with one female and repeated matings with other females, since without the aid of this portion of the paracymbium, the embolus possibly could not be oriented for entrance into the orifice.

Attempts to mate a female on successive days were unsuccessful; the female invariably rejected the male by vigorously rushing towards him. In one case, a large, shiny drop of fluid was observed on the female's epigynum shortly before she remounted the leaf after the last mating; it disappeared as she ascended to the leaf. Whether this accounts for the plug in the epigynum of mated females is not known. In our observations, the plug was not found in virgin females, but it was found in all mated females examined.

In general, the courtship of *Peucetia viridans* is similar to that of wolf spiders, as described by Montgomery (1903) and by Kaston (1936). In the initial stage, however, it appears that less reliance is placed on the tactile senses, and more reliance, on sight. Mating of the green lynx differs from that of wolf spiders in several respects: the male does not mount the female but meets her venter to venter while each spider is suspended in the air on a silken line; copulation takes place with great rapidity; and the male and female face in the same direction during copulation, not in opposite directions. Although it appears that the right palpus approaches the left atrium of the female, and the left palpus, the right atrium, Exline and Whitcomb (1965) showed otherwise.

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