

RESEARCH NOTES

STICKY BALLS IN WEBS OF THE SPIDER *MODISIMUS* SP. (ARANEAE, PHOLCIDAE)

Sticky or viscid balls have been found on thread of the webs of araneid, theridiosomatid, anapid, symphytognathid, theridiid, nesticid and linyphiid spiders; these families are all in the superfamily Araneoidea, and it has recently been proposed that the balls represent a synapomorphy for this group [Coddington, J. in press, In: *Orb Webs* (W. Shear, ed.). Stanford University Press; see this article also for a review of evidence].

This note documents the presence of balls in the webs of *Modisimus* sp. of the family Pholcidae, which is not related to the araneoids. It also shows that they are liquid and water-soluble and that they are produced during a particular stage in web construction.

Web construction was elicited by damaging webs. Some samples ("controls") were taken from undisturbed webs (presumably built the night before), whereas others were taken after interrupting spiders which were at various stages of web construction. The edges of a glass microscope slide were covered with vaseline, and the slide was held against one sector of the web which was cut free from the rest with scissors. Only one sample was

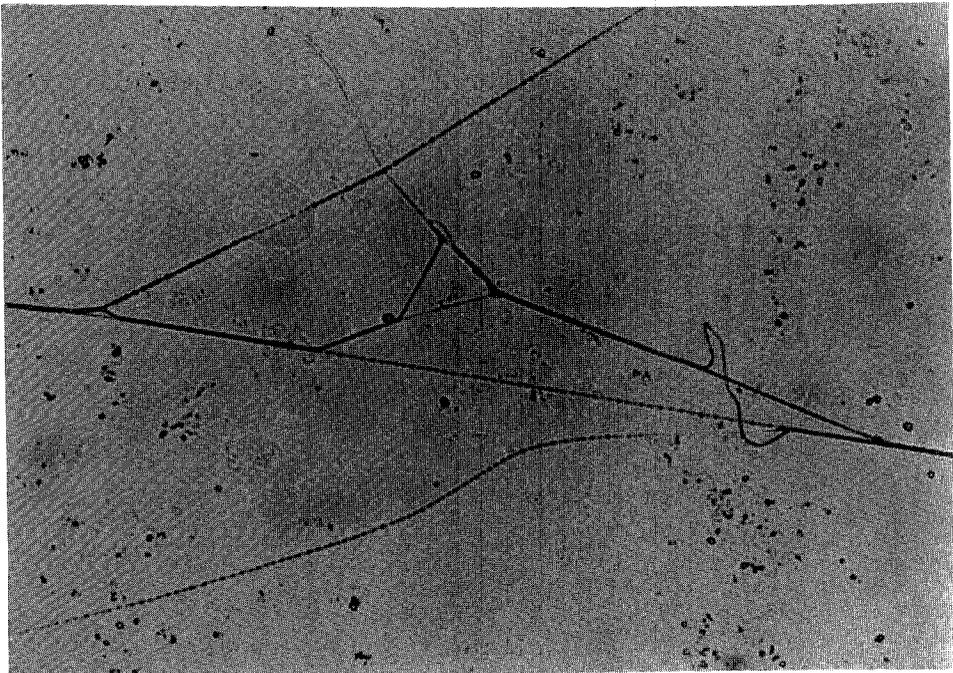


Fig. 1.—Photograph of a line with globules, from a mature female of *Modisimus* sp.

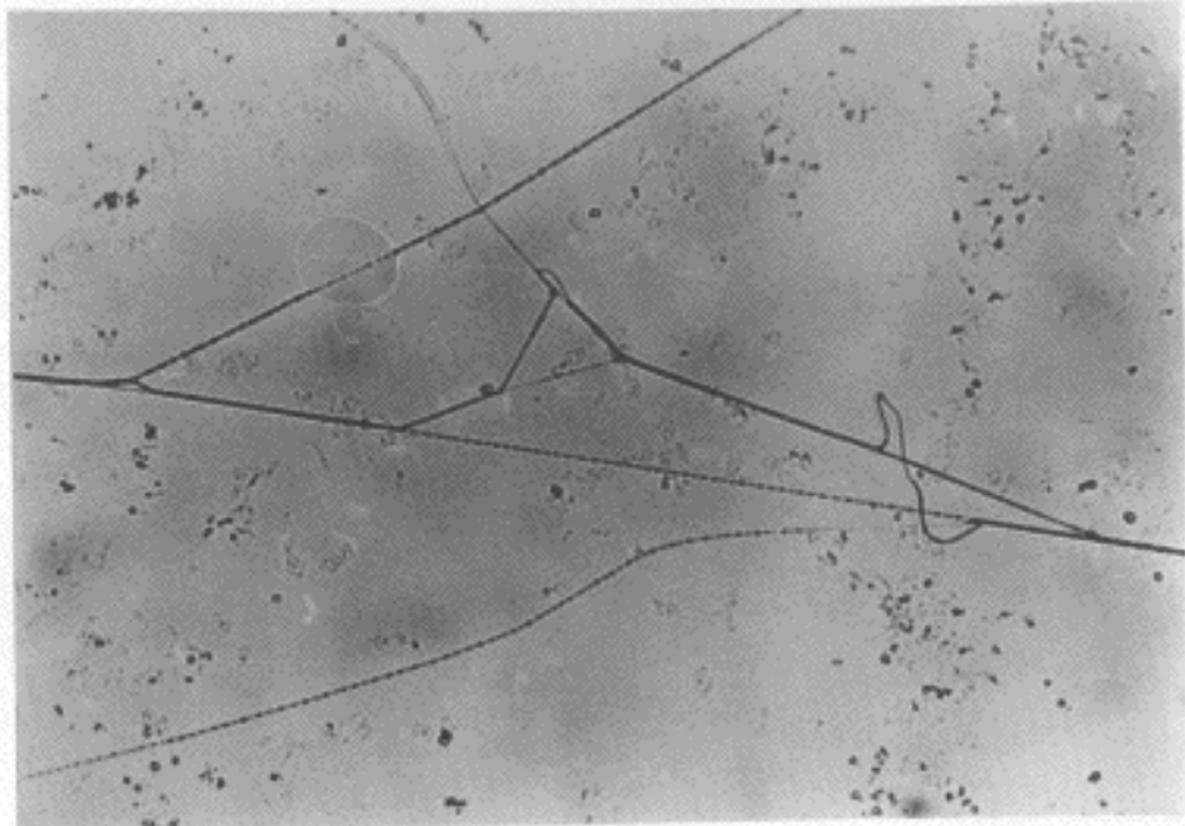


Fig. 1.—Photograph of a line with globules, from a mature female of *Modisimus* sp.

taken per web. The threads were observed under a compound microscope, in some cases several days after the web was built.

Voucher specimens of the spiders are deposited in the collection of the Escuela de Biología of the Universidad de Costa Rica, and in the Museum of Comparative Zoology in Cambridge, Mass.

In order to determine the relative numbers of different kinds of lines present on each, five surveys were made from left to right across the entire width of the slide at a magnification of 40X. Each time a new line was encountered it was placed at the extreme left of the field and all lines present in the field were classified into four categories: (a) thick without balls; (b) thin without balls; (c) thick with balls; and (d) thin with balls (see Fig. 1). The slide was then moved on until the thread at extreme right was at the left of the field. Then the slide was moved onward until the next thread was encountered, and the process was repeated. A total of 14 sample fields was examined in each pass across the slide, giving a total of 70 samples (5 x 14) per slide.

At least four types of line were seen in finished webs. In some cases an apparently "thick" line split into thin lines, so "thick" means, at least sometimes, several thin lines together.

The spiders' construction behavior had two distinct stages: (1) "Frame lines." The spider laid most lines at the edge of the web, expanding the area covered. Every attachment of the line being laid to other lines was made just posterior to the point where one leg III held it. (2) "Fill In." The spider walked back and forth across the area already covered, using its legs IV to push the line it was producing upward against the network of lines already in place. Only when it reached the edge of the web did it attach as above, using one leg III and touching the other line with its spinnerets. Once stage 2 had begun the spider did not return to stage 1 behavior. The lines laid in two stages were different, thick lines without balls being more common in stage 1 (Table 1).

The liquid nature of the balls was demonstrated by pressing lines with balls into contact with the slide, and noting that they spread out to form puddles.

The balls were shown to be water soluble just like those of at least some araneoid spiders (Kavanaugh, E. S. and E. K. Tillinghast. 1979. *J. Morph.*, 160:17-31) by placing drops of water on slides; all of the balls were gone from the threads when the droplet evaporated.

The wrapping thread of some theridiid spiders is covered with viscous balls, but samples of wrapping thread of *Modisimus* sp. showed no balls.

The liquid nature of the balls and the fact that they had not evaporated even days after being produced suggest that they are viscous and function by causing prey to adhere

Table 1.—Percentage of types of threads present during different stages of web construction in webs of *Modisimus* sp.

	Thin Thread		Thick Thread	
	with balls	without balls	with balls	without balls
Stage 1. (<25 lines)	0	15.0	0	85.0
Stage 2. (>25 lines)	40.7	48.7	6.9	3.7
Web repair completed	3.8	73.4	3.5	29.4
Completed webs (control)	41.8	48.4	4.9	4.9

to spider's web. The stickiness is only slight however, and attempts to localize ball-bearing threads in completed webs by dusting the webs with talcum powder and then jarring the web to knock the powder from non-sticky lines resulted in the powder being dislodged from nearly all the threads. The relative small sizes of the balls and their often relatively dispersed nature may account for this. The attack behavior of *Modisimus* sp. is extremely rapid, and perhaps only relatively brief retention is necessary to insure prey capture.

The prevalence of thick lines in the first stage of web buildings suggests that this stage serves to establish a scaffolding or frame for the rest of the web. The high frequency of thin threads both with and without balls in finished webs suggest that the webs may trap prey by entanglement as well as by adhesion.

The reason for the lower frequency of sticky balls in repaired webs as compared to controls is not clear. Possibly it is related to a lack of material from which sticky balls are made, or the control webs may contain threads that have accumulated over a period of days.

The question of whether the pholcid balls are homologous with those in araneoid webs cannot be answered at the moment. The pholcid *Pholcus phalangioides* is known to possess two pairs of ampullate (non-sticky silk) glands (Kovoor, J. 1977. Ann. Biol., 16:7-171) but their other silk glands are difficult to homologize with the silk glands of other spiders (Apstein, C. 1889. Arch. Naturgesch., 55:29-74) so the glandular source of the balls cannot be determined.

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