THE EFFECT OF *HYPTIOTES CAVATUS* (ULOBORIDAE) WEB-MANIPULATION ON THE DIMENSIONS AND STICKINESS OF CRIBELLAR SILK PUFFS

After constructing their vertical triangle-webs, *Hyptiotes cavatus* (Hentz) tense them by reeling in monitoring line thread and holding it between their second and third legs. When a prey strikes its web, a spider releases this slack silk, suddenly reducing web tension and causing the web to shake (Lubin 1986; Opell 1982). This behavior may also change the properties of the web's cribellar capture threads that extend across its four diverging "radii." Like the cribellar threads of other uloborids, those of *H. cavatus* are composed of torus shaped puffs of fine cribellar fibrils deposited around supporting axial fibers (Fig. 1; Opell 1989a). The reduction of web tension that occurs when spiders respond to prey may increase the width of these cribellar puffs, thereby exposing more surface area per unit length of cribellar thread and increasing its ability to hold prey. To determine if this occurs, we measured the properties of taut and slack cribellar threads of *H. cavatus*.

Sixteen adult females were housed individually in frames. From the first web each spider constructed, we collected a taut cribellar thread sample on a microscope slide with five raised adhesive supports spaces at 4 mm intervals (Opell 1989b). From the second web it spun, we collected a slack silk sample by prodding the spider with a brush and pressing the microscope slide against the web the instant the spider released its slack silk.

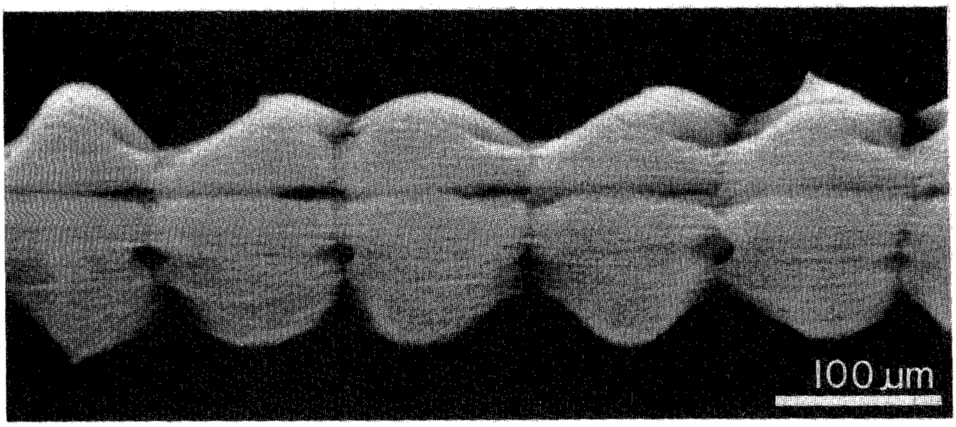

Figure 1.—Scanning electron micrograph of cribellar silk spun by an adult female *Hyptiotes cavatus*.

In two of the 32 web samples taken the cribellar silk puff dimensions of only three of a sampler's four sectors could be measured. In five of the samples the stickiness of cribellar silk in only three of the four sectors could be measured. We measured the width (perpendicular to the thread's long axis) of one puff and the length of a series of ten puffs of the cribellar thread in each sector of a sampler at 125X under a compound microscope equipped with Nomarski optics. The mean values of a thread's dimensions were used for comparisons. Using techniques described by Opell (1989b), we measured the force required to pull a 2.30 mm wide aluminum contact plate free from the cribellar thread in each sector of a sampler. Before each measurement was taken, this plate was gently rubbed with a tissue wetted with acetone and was initially pressed against the thread in each thread sector with a force of 3.03×10^{-5} Newtons. The mean value of a sample's sectors, expressed as the force per mm of contact required to pull the plate free of the cribellar thread, is used for comparisons.

Table 1 summarizes the results of this study. *T*-tests show no significant difference between the mean puff width, puff length, or stickiness ($P = 0.90$, 0.43, and 0.28, respectively) of cribellar thread samples taken from taut and slack webs.

Table 1.—Dimensions and stickiness of taut and slack cribellar threads from *Hyptiotes cavatus* webs. In each case, sample size is 16.

Variable	Mean	Range	SD
Puff length µm:			
Taut	78	53-103	17
Slack	83	56-116	17
Puff width µm:			
Taut	190	158-220	16
Slack	189	168-232	18
Stickiness in Newtons x 10^{-5} per mm width of contact plate:			
Taut	4.30	1.71-9.02	2.09
Slack	3.58	1.00-6.65	1.54

This study shows that changes in *H. cavatus* web tension resulting from web maniuplation during prey capture do not serve to alter the measured physical or functional properties of the web's cribellar threads. The failure of a spider's behavior to change the dimensions of cribellar thread puffs may occur either because the tensing force exerted on the web's radial elements is too acute to the cribellar threads to initially deform them or because the axial fibers of the cribellar threads resist this elongating force.

However, web-manipulation may yet increase a web's ability to retain prey. Unlike the aluminum plate used in this study, the surfaces of insects are beset with setae that can penetrate the fibril cloud of cribellar threads. By comparing the stickiness of cribellar threads before and after their tensions were altered, this study does not fully evaluate the effect of web-manipulation on a thread's ability to retain prey that remain in contact with it during these changes. By shaking a web and altering its tension, web-manipulation may enhance prey retention by permitting the cribellar thread's looped surface fibrils to better entwine a prey's setae, by causing a struggling prey to contact more cribellar threads, or by more forcefully pressing cribellar thread against the surface of a prey.

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