

CONJECTURES ON THE ORIGINS AND FUNCTIONS OF A BRIDAL VEIL SPUN BY THE MALES OF *CUPIENNIUS COCCINEUS* (ARANEAE, CTENIDAE)

Bristowe (1958) called the tiny web spun by courting males of *Xysticus cristatus* (Araneae, Thomisidae) over and around the female while circling upon her a bridal veil. To my knowledge, similar behavior of males has been reported for *Nephila clavipes* (Araneidae, Nephilidae; Robinson & Robinson 1973, 1980), for *Latrodectus tredecimguttatus* (Araneidae, Theridiidae; Stern & Kullmann 1981), for *Tibellus oblongus* (Araneae, Philodromidae; Stern & Kullmann 1981), for *Ancylometes bogotensis* (Araneae, Pisauridae; Merrett 1988) and for *Dictyna volucripes* (Araneae, Dictynidae; Starr 1988). In these species, the male places a few threads over the female. In *Pisaurina mira* (Araneae, Pisauridae), the female draws her legs I and II against her carapace (in a flexed position) and the male wraps them with a veil of silk prior to copulation (Bruce & Carico 1988).

Spiders of the neotropical genus *Cupiennius* live in close association with particular plants, mainly bromeliads, on which they receive vibrations (e.g., from prey and mating partner) and emit vibratory signals during courtship (Barth et al. 1988). In a recent behavioral study of species recognition and species isolation, we compared hetero- and intraspecific communication in three closely related species of the genus *Cupiennius* (Barth & Schmitt 1991, Schmitt et al. 1990). In 9 out of 14 trials, the females of *C. salei* (which are larger by about 30% than those of *C. coccineus*) responded to the vibratory courtship of *C. coccineus* males with their own vibratory courtship signals and both spiders finally met. When mounting the female, three of the 9 males spun attachment points onto the female's legs and circled upon her for minutes while depositing silk on her. The males interrupted this behavior to emit vibratory courtship signals. Whereas two males copulated after a few minutes, the third made increasingly longer excursions on the bromeliad consistently returning to the female and continuing both his spinning behavior and vibratory courtship. Finally, about two hours after the first contact between the heterospecifics, he was attacked and killed by the female when re-

turning to her. Obviously, the male silk did not seriously affect the female's mobility.

In *Cupiennius*, females are known to use silk as draglines, to wrap and tie large prey (e.g., grasshoppers) to the substratum, to construct irregular sheet webs partly or totally closing their retreats, to build egg sacs and loose and irregular "nursery webs" for the newly hatched spiderlings. Males use silk as draglines, to build sperm webs, and to immobilize large prey. During many years of experience in breeding spiders of the genus *Cupiennius*, we never observed the behavior described above for *C. coccineus* males. I suggest four interpretations, which are not mutually exclusive. (i) The male's spinning is the same behavior as that shown when tying large prey to the substratum. The male switches from courtship to predatory behavior and vice versa because the heterospecific female has attributes of both mate and prey. (ii) The observed behavior is a displacement activity. A heterospecific female that has attributes of mate and non-mate and prey raises conflicts in the male. The kind of displacement activity that arises (here: tying of prey) is a matter of chance or of prevailing attributes of the female. (iii) Bridal veiling is part of the male's repertoire which he uses only when confronted with a particularly large and potentially dangerous female. About 15% of the females responding to males during vibratory courtship attack the approaching male, and males smaller than females are at risk of being killed by the female. Knowing this, we use pairs matched in size for breeding. Thus bridal veiling could never have been observed in conspecific pairs of *C. coccineus* in our lab. (iv) Bridal veiling is an atavism. Males regress to a behavior inherited from, e. g., a pisaurid ancestor when confronted with a particularly large and potentially dangerous female. The behavior has never been observed in conspecific pairs for the same reason as given in (iii). With the knowledge I have on *Cupiennius*, I cannot refute any of the above conjectures. The above hypotheses are nevertheless testable. For example, one can compare films of males tying prey to the substratum with films of

males spinning a bridal veil (hypothesis i) or one can perform experiments using both female-larger and male-larger pairs of conspecifics, the prediction being to observe bridal veils with female-larger pairs and no veils with male-larger pairs (hypotheses iii and iv).

Let us assume now that application of silk onto the female is part of the male's courtship repertoire in the species enumerated above. What functions does this behavior have? If the behavior of the male handicaps the female during copulation or causes at least a brief delay of her activity after copulation, which seems to be the case in *Pisaurina mira* (Bruce & Carico 1988), then aggressive acts of the female and/or post-copulatory chases after the male (common in *Cupiennius coccineus* and *Latrodectus tredecimguttatus* and present in *Nephila clavipes*; Christenson et al. 1985) should be less efficient. In this view, the bridal veil "solution" is only purposeful in those spider species in which females are aggressive toward males during or after copulation. Hence the number of species in which the male applies silk to the female must depend on female behavior. The close phylogenetic relationship of Ctenidae and Pisauridae on the one hand, and the large taxonomic distance of Thomisidae and Dictynidae and Nephilidae and Theridiidae from each other and from the other two families (Homann 1975, Coddington 1990) on the other hand, suggest that silk binding of the female by the male has evolved separately several times. But in view of the potentially lethal weapons of spiders and of the fact that spiders need to overcome cannibalistic tendencies when mating, I wonder (as do Bruce & Carico 1988) why this behavior is not more widespread among male spiders. My answer is that aggressiveness of females towards males during or after (and even before) copulation is rare (Foelix 1982) or at least much less common than spider folklore says, which may explain why bridal veiling is so rare. Most spiders appease their mates before approaching them. The conjectures presented in this paragraph can be corroborated or refuted by investigating systematically the correlation between female and male behavior (and size) in as many spider species as possible.

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