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Abstract

The spider *Pisaura mirabilis* has a unique mating behaviour in which the male uses a "nuptial gift" in courtship. The gift consists of a prey wrapped up in silk and is visually displayed in front of the female. When the female grasps the gift with her chelicerae and starts to eat, the male transfers sperm to her. The *Pisaura*-female weaves a protecting sac around her clutch of eggs. She carries the egg sac with her in the chelicerae for about three weeks, and when spiderlings are ready to emerge she constructs and guards a nursery web around them.

In a field study, I found that males matured to adults earlier than females, that males were smaller, and that they had shorter life span. Female reproductive output was positively correlated with her body mass. Nursery webs also appeared late in the season, suggesting that at least some females produced a second brood.

From manipulations in the field, and from laboratory data, we estimated the lifetime reproductive success of three different guarding strategies and found that the benefits of egg sac guarding were large. Abandoned egg sacs were rapidly attacked by ants or birds, indicating that females are under severe selection favouring maternal care of the first egg sac. The long investment in the first clutch may therefore often hinder further egg production.

The nuptial gift from the male probably functions mainly as a mating effort: it entices the female to copulate and facilitates coupling during copulation. The larger the gift, the longer the male was allowed to copulate, and the more eggs were fertilised. Presence and size of the nuptial gift did not affect female fecundity or spiderling size. Courting males without gifts were less successful in obtaining matings, but they were not cannibalised.

In a laboratory experiment, I found that the more it resembled an egg sac (measured in brightness), the faster the female responded to the gift. This result supports the hypothesis that the nuptial gift works as a sensory trap. By producing a gift that resembles the female egg sac, the male can elicit female behaviours that enhance male fertilisation success.

Multiple matings may be beneficial for females in nuptial feeding species. In laboratory experiments, however, I found no support for this hypothesis. But females held under an abundant food regime during the adult stage had higher fecundity than food-restricted females, irrespective of number of matings. This indicates that females should maximise their food intake, and accepting donations from a male may be an adaptive foraging strategy.

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