Predatory behaviour in *Plectreurys tristis* (Araneae: Plectreuridae)

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Summary

Plectreurys tristis is an example of a weak sighted hunter, almost totally dependent on chemical and mechanical sensors. They tend to be generalized arthropod feeders, ambushing small prey that blunder into their webs. The bite is usually directed to the head or thorax of the prey, and causes an almost immediate paralysis. These spiders also seem immune or at least tolerant to the chemical defences of certain carabid beetles. Adult females occasionally allow their mates to share a prey item, a behaviour not usually observed outside the social spiders.

Introduction

The family Plectreuridae has been regarded as representing one of the most generalized families of araneomorph spiders based mainly on the extreme simplicity of the male palp and female external genitalia (Gertsch, 1949). The family is restricted to Mexico and the southwestern United States and has been little studied (Gertsch, 1949, 1958). The most closely related family, the Diguetidae, differs mainly in the reduction of eye number from the eight characteristic of Plectreuridae to six and in a slightly more complex palp in adult male diguetids (Gertsch, 1949).

Plectreurys tristis (Simon) constructs webs under stones in which it awaits passing arthropod prey (Gertsch, 1958, Levi and Levi, 1968). The web consists of a tubular retreat attached to the stone with numerous threads extending in all directions, many of which are destroyed as the rock is overturned.

These spiders have the cephalothorax and legs brown or black with isolated grey hairs on the abdomen (Comstock, 1912) and a body length, including the chelicerae and spinnerets, of 12.5 mm (Kaston and Kaston, 1953). This species is found throughout the southwestern United States to California (Kaston and Kaston, 1953).

The prey is left in the web in a relatively intact state, after being drained of fluids, providing a record of the spider's prey selection. The spider must create a microscopic aperture in the exoskeleton of the prey through which digestive fluids can be introduced and predigested body fluids withdrawn. When a part of the prey has been completely drained of fluids the spider repeats the procedure in other body sections until all available fluid has been ingested. Parry (1954) has determined that lycosids can achieve intake of capillary water against pressures as high as 150-200 mm Hg through the action of the sucking stomach. The narrow confines between rock and substrate in which the web is constructed prevents loss of these food fragments by the actions of either the spider or the wind. It was in response to the total lack of data relating to the predatory habits of these spiders that this work was undertaken.

Materials and Methods

Twenty-nine specimens of *P. tristis* were collected under stones in Molino Basin, Catalina Mountains, Pima County, Arizona at an altitude of 1350 metres from the middle of March to the end of May. These were taken into the laboratory and housed in vials 8.0 cm high and 3.5 cm in diameter, provided with soil substrate where they constructed webs. The temperature at which prey items were offered to the spiders ranged from 25° to 27°C. With the exception of crickets which were laboratory reared, prey items were collected from under rocks in the same location as were the spiders. Thirty-four webs were also collected and the prey remains examined and identified to class for non-insects, and family or genus for insects.

Results and Discussion

An analysis of the prey remains collected in the field revealed an array of arthropod fragments, including many small beetles, mostly of the families Carabidae and Tenebrionidae along with worker ants of the genus *Pogonomyrmex* which predominated. The carabid and tenebrionid beetles were abundant under the same rocks occupied by *P. tristis*, and probably used this environment as a means of avoid-

ing freezing temperatures which frequently occurred during the night at this time of year. Nests of *Pogonomyrmex* sp. were abundant throughout the area. Also represented were diplopods, burrower bugs (Cynidae: Hemiptera), scarab beetles (Scarabaeidae: Coleoptera), larvae of Lepidoptera, along with other fragments too small to permit determination. The web also contained items including pebbles and dead leaves that may have provided cover for the spider inside the tubular retreat which was attached to the underside of the rock for as much as 15 cm.

The silk composing the webs was extremely strong, though lacking any trace of adhesiveness. The silk fringes around the entrance of the tube (Gertsch, 1958), when disturbed, probably serve to alert the spider to the presence of prey in the area by the generation of web vibrations.

In the laboratory, once the spider was aware of the presence of prey, it would rush out and sieze it, burying the fangs of the chelicerae into either the head or thorax in most cases. The prey would struggle violently for a period of one to two seconds and was then rendered incapable of anything more than a series of feeble leg twitches which may continue for a prolonged period. In one case of a *Pogonomyrmex* sp. it took 22 minutes to become completely quiet.

Observations with crickets as the prey item indicate the usual capture sequence with the area of attack being the thorax, causing an almost immediate quieting of the prey, but occasional leg twitches could be seen well beyond this point.

When tenebrionid beetles were captured the spiders appeared to have great difficulty piercing the hard exoskeleton. One beetle escaped unharmed after grappling continuously with the spider for four minutes. Later this same spider was successful with another beetle and was seen feeding on its thorax.

The spiders seemed more able to pierce the carabid beetles and attacked the legs in preference to other areas. Carabids captured at the proximal area of the coxa were quieted immediately, while others of similar bulk required 35 minutes to be subdued when taken at the distal region of the tibia. Carabids possess a chemical defence (Eisner and Meinwald, 1966), but this seemed to be ignored by the spiders even though the prey left a highly repugnant odour on the author's hands.

Pogonomyrmex sp. workers when presented to the spiders were at once attacked. The spider employed its front legs to ward off advances on the part of the ant. Species belonging to this genus of ants are equipped with a powerful sting, of which the workers can make effective use, as has been experienced by the author. In addition the head is armed with formidable mandibles, capable of inflicting painful bites even to humans. One spider was observed to bite an ant in the head and then withdraw for 66 minutes before beginning to feed from it. Ants bitten in either the head or thorax show total paralysis within two seconds, and are capable only of feeble leg and antennal twitches. One adult female fed on a worker *Pogonomyrmex* sp. for four hours eleven minutes and a second adult female fed on another worker for five hours three minutes. The first spider fed from the head, then the abdomen, second leg, and ended at the thorax. The second spider also began at the head, then went to the abdomen, but returned to the head before finishing at the thorax, leaving an intact, hollow exoskeleton.

As in many spiders, adult females may consume their mate after mating. In *P. tristis* consumption of the male by the female may be a lengthy affair observed to require 48 hours in one case.

When a large cricket was offered to one pair used for mating observations, the female made the kill and began feeding on the posterior of the cricket's abdomen. The male which had an abdomen much shrivelled, probably due to starvation, was allowed to feed by the female from the thorax of this same cricket until his abdomen was fully distended. At no time did the female appear at all aggressive towards her mate. Females may tolerate males for periods exceeding 38 days after mating (Minch, 1976).

These observations suggest that *P. tristis* is a general feeder, taking anything that enters its web and is small enough to be overpowered. The rapid collapse of prey once bitten suggests the presence of a venom that may attack the brain or thoracic ganglia, the rate of paralysis depending on the site of the bite. A venom fraction capable of producing rapid paralysis of houseflies has been isolated from the black widow spider (Frontali and Grasso, 1964).

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