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SHORT COMMUNICATION

FISHING BEHAVIOR IN A GIANT WHIP SPIDER

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ABSTRACT. Whip spiders (Amblypygi) are a small and understudied group of arachnids characterized by long antenniform legs and raptorial pedipalps. Due to their nocturnal habits, secretive nature and geographical distribution there have been very few studies of feeding behavior in this group. Here, we report a remarkable foraging strategy adopted by the giant tropical whip spider *Heterophrynus cheiracanthus* (Gervais 1844) inhabiting rocky outcrops adjacent to mountain streams running through primary tropical rainforest on the Caribbean island of Tobago. *Heterophrynus cheiracanthus* positions itself close to the stream edge on a vertical rock surface with pedipalps fully extended and antenniform legs frequently entering the shallow water. Freshwater prawns of the genus *Macrobrachium* are caught while still submerged in the water despite the whip scorpion being unable to use the trichobothria on the walking legs. Possible mechanisms of prey detection are discussed.

Keywords: Amblypygi, Tobago, predation

Whip spiders (Chelicerata, Amblypygi) are a numerically small and little studied taxon of arachnids consisting of about 120 species that are restricted to the tropics and sub-tropics (Weygoldt 2000). They are characterized by strong raptorial pedipalps and thin antenniform forelegs bearing numerous multiporous sensilla and chemoreceptors making them exceedingly sensitive to both vibrations and olfactory cues (Igelmund & Wendler 1991; Hebets & Chapman 2000b; Hebets 2002). Moving prey are generally detected by the trichobothria on the walking legs while the feelers are primarily used to chemically investigate prey and to assist in distance recognition (Weygoldt 2000). Whip spiders with antenniform legs but without trichobothria can find only dead or slowly moving prey items (Weygoldt 2000).

Certain generalizations can be made from the few field studies that have been conducted on whip spider ecology and behavior (reviewed in Weygoldt 2000). All species are flattened with long legs and can move extremely quickly in attack and defence. They are often found under the bark of trees (Hebets 2002) or within rock crevices during the day. At night they emerge from their refuges to hunt for arthropods and even small vertebrates such as frogs and lizards (Reagen & Wade 1996; Kok 1998). The fearsome looking raptorial pedipalps are armed with an array of large spines, which are used to impale and immobilize prey. In the Phrynichidae, the distal parts of the tibia and the tarsus form hand-like chelae. Once captured, the prey is transferred to the mouth for dissection and ingestion. Like many large arachnids amblypygids do not possess a toxic bite and rely on speed, agility and strength to overpower prey.

Very few studies of amblypygids feeding under natural conditions have been made (see Hebets 2002 for notable exception) leading Weygoldt (2000, p 52) to state that ''for most species the food consumed under natural conditions is unknown''. This is mainly due to the difficulty of studying such secretive, nocturnal animals and the apparent infrequency with which they feed.

One particularly large (maximum body length 35 mm) and aggressive amblypygid, *Heterophrynus cheiracanthus* (Gervais 1844), can be easily found on the large rocks at the margin of mountain rainforest streams on the island of Tobago, off the Northeast coast of Venezuela (Ladle pers.obs.). Some of the least known amblypygids occur in the tropical forests of the Caribbean (Browne 1992) and *H. cheiracanthus* is no exception, with virtually no published information about its ecology and behavior. Over five field trips between 1999 and 2002 we made 320 observations over 35 nights that support the suggestion that this species, uniquely among amblypygids, regularly ''fishes'' for prawns in the rainforest streams adjoining the rocky outcrops on which they reside.

The data for our study of the fishing behavior of this species comes from several sources. First, ob-

servations of relative position and hunting behavior provide indirect evidence of its preferred prey. Large *H. cheiracanthus* are highly nocturnal and emerge from deep rock crevices as soon as the sun goes down. Mountain streams in Tobago are prone to frequent spates during the wet season and often have very steep sides incorporating huge slabs of metamorphic rock. The amblypygids share these vegetationless rock faces with a few small grapsid crabs although they were never observed to hunt or eat these either in the field or the laboratory.

During nocturnal sampling of streams in Castara and Little Englishmans Bay on the north side of Tobago several observations were made relating to the orientation and positioning of *H. cheiracanthus* relative to the watercourse. A total of 320 (60 adult male, 82 adult female, 178 sub-adults) observations of whip spiders on bare rock surfaces were made in which both adult males (68.3%) and adult females (52.4%) appeared to prefer vertical stone surfaces. In the vast majority of observations of males (66.6%), females (73.2%) and sub-adults (92.1%) on vertical surfaces individuals were found to be orientated directly towards the stream. Juvenile amblypygids were never seen on rock faces during the night (possibly due to potential cannibalism) but could be found at low densities during the day under accumulations of leaf litter and detritus. Both sexes were normally observed close to the water (mean distance from stream (mm) $\pm$ standard deviation; males 178.64 $\pm$ 113.78, $n = 22$; females 104 $\pm$ 92.23, $n = 23$). On 12 occasions individuals were actually observed with their extended forelegs under the water and their raptorial pedipalps raised and parted in the characteristic active hunting position.

Although some amblypygids have been reported to enter water bodies breathing through a plastron (Hebets & Chapman 2000a) we never observed any individuals with more than their antenniform forelegs immersed. This is interesting since prey detection is normally through trichobothria on the walking legs and the feelers are generally only involved with chemoreception. One possible explanation is that prey are detected when they come into physical contact with the antenniform legs. Since the density of *Macrobrachium* may exceed 200 per m^2 (Ladle pers. obs.) in these rainforest pools such contact would not be unusual. An interesting corollary to this is that both prawn and whip spider abundance appears to be lower in section of stream occupied by mountain mullet (*Agonostomus monticola*), a voracious predator on freshwater prawns (Ladle pers.obs.).

The results of laboratory feeding experiments to test the suggested behaviors were inconclusive. While in Tobago, two captive individuals were observed to feed on grasshoppers although no such insects were ever observed on the rock faces. They ignored grapsid crabs completely. It has so far proved impossible to keep prawns alive for long enough in still water to conduct controlled experiments.

Finally, we gained evidence of fishing behavior from two rare direct observations. Although amblypygids, like many large, long lived insects eat very infrequently, we have observed two instances of individuals (one male and one female) consuming recently caught prawns. On one of these occasions the capture was witnessed: an amblypygid was seen with its antenniform legs dipping in the water and its pedipalps raised in the typical hunting posture. A rapid strike into 2–3 cm of water resulted in the capture of a medium sized *Machrobrachium* (carapace width 5–10 mm approx.). This is the first reported direct observation of prawn capture in the arachnida as far as we can determine. Voucher specimens from this study are deposited in the Stuttgarter Museum für Naturkunde, Germany.

Prawn eating behaviour has only been described in one other species of arachnid, *Trechalea extensa* (O. P.-Cambridge 1896) (Trachaleidae), that inhabits small streams in the northwest of Costa Rica (Van Berkum 1982). Large individuals were seen hunting for and devouring the abundant freshwater prawns within these streams although actual capture was never observed in the field or the laboratory. The prey capture mechanism in these spiders seems to be very similar to that of *H. cheiracanthus*. Van Berkum (1982) watched prawns swim very near the spiders with no apparent reaction on the part of the spider and was left concluding that prey capture only occurred when the legs of the spider had been brushed by the prawn.

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