

## PREY OF THE JUMPING SPIDER *PHIDIPPUS JOHNSONI* (ARANEAE: SALTICIDAE)

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### ABSTRACT

Field data indicate that *P. johnsoni* is an euryphagous predator, whose diet includes organisms (aphids, ants, opilionids) sometimes considered distasteful to spiders. Other spiders are preyed upon, including conspecifics. Prey size tends to be one quarter to three quarters the size of the predator.

### INTRODUCTION

Since spiders are probably a dominant group of predators of insects (Bristowe, 1941; Riechert, 1974; Turnbull, 1973), there is considerable interest in their feeding ecology. Spiders have usually been considered to be euryphagous predators with a stabilizing, rather than regulative, effect on insect populations (Riechert, 1974). However, information concerning the prey taken by particular spider species, in the field, is limited. Field studies by Edgar (1969, 1970), Robinson and Robinson (1970) and Turnbull (1960) are especially noteworthy.

During the course of a study of the reproductive biology of *Phidippus johnsoni* (Peckham and Peckham) (Jackson, 1976), occasionally individuals of this species were found in the field holding prey in their chelicerae. Each prey discovered in this way is listed in Table 1. In addition, Ken Evans and Charles Griswold, who were familiar with this species, recorded observations of *P. johnsoni* with prey. (Their data are included in Table 1.) These data came from a variety of habitats in western North America, most of which have been described elsewhere (Jackson, 1976). It should be noted that observation of feeding in the field was a rare event. The results reported here are based on several thousand hours in the field, by the author. I found only 33 *P. johnsoni* with prey at the time of encounter, while over 4000 were found without prey. This number may be somewhat misleading, since a great many of these observations were carried out in the course of population censuses (Jackson, 1976). Censuses were generally carried out in the morning, when the spiders tended to be inside nests (retreats), built under rocks and in

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other similar places. Nests are tubular silk structures in which the spider resides at night, molts, oviposits, and mates. These devices are not known to function in prey capture in salticids. However, there were over 500 records of *P. johnsoni* observed outside nests, without prey, including observations at all times of the day. Possibly a feeding salticid is less prone to be in an exposed location than one that is not feeding, rendering observation of feeding in the field more difficult for the human observer. In the laboratory, when vegetation was present, it was noticed that feeding *P. johnsoni* tended to carry their prey under leaves and grass stems, although I do not have quantitative data concerning this.

*Phidippus johnsoni* is one of the largest and most commonly encountered salticid species in western North America. Adults tend to be about a centimeter in length and population densities range between two and thirty spiders per 1000 sp. m. (Jackson, 1976). Considering that *P. johnsoni* is apparently one of the most numerous spiders of its size range in many arthropod communities, the prey of this species is of particular interest.

## RESULTS AND DISCUSSION

Casual observations in the laboratory suggest that adult males of *P. johnsoni* feed less frequently than immatures and adult females. This is probably a reflection of a life style that emphasizes locating females and mating. Field data are consistent with these observations, since no adult males were observed feeding in the field, although they were frequently observed outside nests. In contrast, fifteen immatures and eighteen adult females were observed with prey in the field.

There was great variation in the size of the prey relative to the predator. The greatest discrepancy was an incident of an adult female (11 mm in length) feeding on an aphid (approximately 2 mm in length). In some cases, *P. johnsoni* were observed with prey as large or slightly larger than themselves. In most cases, prey tended to be between one quarter and three quarters the size of the predator. This is consistent with Gardner's (1966) studies with *Phidippus coccineus* (Peckham and Peckham) using laboratory models.

Bristowe (1941) concluded that the major predators of spiders are other spiders. Evidently *P. johnsoni* prey heavily on spiders (Table 1, Fig. 1). Other *Phidippus* species (Tolbert, 1975) and other salticids (Bristowe, 1941) are known to enter the webs of some spiders and feed upon the occupants. Although this has not been seen in *P. johnsoni*, a suggestive observation was made. An immature *P. johnsoni* was found in the web of a *Dictyna*, walking on an egg sac, in and around which there were second instar spiderlings. In the laboratory, *P. johnsoni* fed readily on the spiderlings. Also, a *P. johnsoni* was observed feeding on an adult male of a web-building spider (Theridiidae), in the field (Table 1), but no webs were seen in the vicinity. Most likely, this male was searching for female webs when he was preyed upon.

Cannibalism, in the sense of females preying on conspecific males, figures heavily in hypotheses concerning the function of courtship in spiders (Bristowe, 1941, 1958; Platnick, 1971; Savory, 1928), and the significance of this factor in the mating strategy of male *P. johnsoni* has been discussed elsewhere (Jackson, 1976). Although three adult females were observed feeding on adult males in the field (Table 1), it should be noted that it is not known whether the male was courting at the time of the predatory attack. Predation may have occurred before the male detected the female's presence. In the



Fig. 1.—Representation of arthropod orders in the diet of *P. johnsoni*, based on 33 observations of predation in the field.

lycosid *Pardosa lugubris* (Walckenaer), Edgar (1969) observed frequent incidence of another type of cannibalism in the field, adults preying on conspecific immatures. This was not seen in *P. johnsoni*.

Although Bristowe (1941) noted that spiders generally find aphids, ants, and opilionids distasteful, each of these was eaten by *P. johnsoni* in the field (Table 1). Since a number of spider species, including the salticid *Stoidis aurata* (Hentz), are now known to consistently prey on ants (Edwards, *et al.*, 1974), Bristowe's conclusions should be viewed with caution. In the laboratory, *P. johnsoni* readily accepted aphids and opilionids collected from the same habitats as the spiders. In the single case of ant predation (Table 1), observed by Ken Evans, an immature spider fed while standing on a milkweed (*Asclepias*) stem. Subsequently, immature *P. johnsoni* in the laboratory were provided ants, collected from milkweed in other locations frequented by *P. johnsoni*. In each case, the ants were avoided, despite the fact that in some cases the spiders were kept without food for as long as two weeks previous to the tests. Laboratory spiders were also exposed to milkweed bugs (*Oncopeltus fasciatus* Dallas and *Lygaeus kalmii* Stål), both nymphs and adults. In each case, the spider either avoided or attacked then released the bugs.

Other *Phidippus* species have been reported to feed on Diptera, Hymenoptera, Coleoptera, adult Lepidoptera and especially larval Lepidoptera, in addition to some insects not reported for *P. johnsoni*, such as Odonata and Orthoptera (Bilsing, 1920; Edwards, 1975; Fitch, 1963; Kagan, 1943; Lincoln *et al.*, 1967; Warren, Peck and Tadic, 1967; Whitcomb, Exline, and Hunter, 1963; Whitcomb and Tadic, 1963). Considering the small

sample size, it may be cautiously proposed that Diptera numerically constitute the major prey of *P. johnsoni* (Fig. 1.). However, Araneae, Lepidoptera, and Hymenoptera may be more important when biomass is considered. Evidently, *P. johnsoni* is most accurately described as an euryphagous predator of insects and arachnids.

Table 1.—Prey of *P. johnsoni*. All prey are adults, unless otherwise noted.

	Total no.	% of total
INSECTA	22	66.67
Diptera	10	30.30
Culicidae	2	
Tipulidae	1	
Bibionidae	1	
Syrphidae	1	
Calliphoridae	1	
Anthomyiidae	1	
Unidentified calypterates	3	
Homoptera	4	12.12
Aphidae	4	
Lepidoptera	3	9.09
Unidentified larvae	2	
Unidentified moth	1	
Hymenoptera	3	9.09
Apidae ( <i>Apis mellifera</i> L.)	2	
Unidentified ant	1	
Coleoptera	1	3.03
Cantharidae	1	
Dermaptera	1	3.03
Unidentified immature	1	
ARACHNIDA	11	33.33
Araneae	9	27.27
Lycosidae	4	
Salticidae	4	
<i>Metaphidippus</i> (immature)	1	
<i>Phidippus johnsoni</i> (adult male)	3	
Theridiidae (adult male)	1	
Opiliones	2	6.06

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