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DIET AND FEEDING PHENOLOGY OF THE GREEN LYNX SPIDER, *PEUCETIA VIRIDANS* (ARANEAE: OXYOPIDAE)

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ABSTRACT

Natural diet of the oxyopid, *Peucetia viridans*, was analyzed over a ten month period. This spider is a euryphagous predator; of the 189 prey items recorded in the field there were 65 species of prey. Major diet items included species of Hymenoptera, Diptera, Hemiptera, Lepidoptera and Orthoptera. Conspecifics represented the fourth major prey species, but interspecific predation was found to be relatively rare. Phenological analysis of prey composition indicates that there is a large change in major prey taxa with time. Monthly prey composition probably reflects relative prey availability. The percent of adult males feeding in the field was not significantly different from that of adult females. Prey size exhibited a highly significant correlation to predator body size.

INTRODUCTION

Only in recent years has the role of spiders as important components of arthropod communities been recognized, and considerable interest has been displayed in the analysis of spider predation in natural ecosystems (Moulder and Reichle 1972, Riechert 1974). Knowledge of actual diet for a particular species of spider is a primary requisite before the impact of spider predation on arthropod communities can be correctly assessed. However, with the exception of studies by Kajak (1965), Turnbull (1960), Edgar (1969), Yeargan (1975) and Jackson (1978), relatively little in-depth, quantitative field work has been conducted on spider prey.

The data presented here resulted from a study on the patterns of species co-existence in a guild of raptorial spiders (Turner and Polis, 1979) which included four species of Thomisidae and one species of Oxyopidae, *Peucetia viridans* (Hentz). It is the purpose of this paper to 1) examine the natural diet of the oxyopid, *P. viridans*, 2) investigate the feeding phenology of this spider, and 3) ascertain if a correlation exists between predator size and prey size.

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NATURAL HISTORY

The green lynx, *P. viridans*, is a large, non web-spinning spider with long, conspiciously spinose legs (Kaston 1972). This species lives among low bushes and herbaceous vegetation and adult females can often be found on flowers where they lie in ambush for potential prey. Once a food item has been captured the spider retreats down into the vegetation or to the underside of the flowerhead to consume its prey. Spiders digest their prey externally in a process which often lasts several hours. Thus, analysis of prey is facilitated as the prey exoskeleton is often left intact and can be identified.

Male lynx spiders wander during the mating season which runs from May through July in California (Icenogle, personal communication). Beginning in late June, fertilized females attach their eggsacs to the vegetation and remain with the sac until after the spiderlings have emerged. Once the young hatch they stay close to the eggsac (Whitcomb et al. 1966, personal observation), and disperse seven to ten days after emergence. Under California field conditions, the female can construct more than one egg sac. I often observed new eggsacs attached to older, empty eggsacs as late as December.

METHODS AND MATERIALS

The study was conducted over a ten month period (March to December, 1977) in a dry coastal sagescrub area immediately adjacent to the eastern border of Lake Perris State Park in Riverside County, California. The dominant vegetation is composed of several species of low (<1.5m) perennial shrubs: *Eriogonum fasciculatum* (Benth), *Artemesia tridentata* Nutt., *Encelia californica* Nutt., *Aster* sp., *Xanthocephalum californicum* (Greene), and one species of annual herb, *Brassica nigra* L.

Because *P. viridans* often blends cryptically with the plants it inhabits, surveys were carried out by systematically searching all vegetation in the area. At least four surveys per month were carried out. However, during the warmer months (e.g., July) up to eleven surveys per month took place. Observations of spider predation were made between 0900 hrs and 1800 hrs. When a spider was observed with a prey item, both the spider and prey were placed into a vial and preserved with 70% ethanol. Specimens were returned to the laboratory for measurement and prey identification.

Carapace width and raptorial leg length of each spider were measured to determine if correlations existed between predator size and prey length. Following precedent set by Dondale (1961) and Whitcomb et al. (1966), carapace width (rather than body weight or volume) was measured (±0.1mm) with an ocular micrometer as an indicator of body size. Prey length and raptorial leg length of each spider were measured (±0.5mm) with a standard metric ruler. In total, 189 prey items were recorded from the field.

To determine relative feeding specialization, niche breadth of prey species was calculated for *P. viridans* using Levins' (1968) method.

RESULTS AND DISCUSSION

Diet.—A list of the prey species taken by *P. viridans* (Table 1) indicates that this spider is a euryphagous predator, an observation which has been noted for a number of other spider species (Turnbull 1960, Moulder and Reichle 1972, Jackson 1978). By far the

Table 1.–Prey species of *Peucetia viridans*. The number in parentheses after a family name refers to the number of species recorded.

	No.	% of Total		No.	% of Total
Hymenoptera			Hemiptera		
Apidae			Coreidae (1)	2	1.06
Apis mellifera	26	13.76	Lygaeidae		
other species (3)	5	2.65	*Nysius* sp.	5	2.65
Anthophoridae (2)	5	2.65	other species (1)	1	0.53
Colletidae (1)	1	0.53	Miridae (2)	2	1.06
Chrysididae (1)	1	0.53	Nabidae (1)	1	0.53
Formicidae (1)	1	0.53	Pentatomidae (1)	2	1.06
Megachilidae (1)	1	0.53	Reduviidae (1)	3	1.59
Pompilidae (3)	5	2.65	Rhopalidae (1)	1	0.53
Halictidae			Coleoptera		
Dialictus microlepoides	8	4.23	Chrysomelidae (1)	2	1.06
other species (9)	10	5.30	Melyridae (2)	5	2.65
Sphecidae (9)	10	5.30	Lepidoptera		
Vespidae (1)	3	1.59	Pieridae		
Unknown family (2)	2	1.06	*Pieris protodice*	25	13.23
Diptera			Hesperidae (1)	1	0.53
Bombyliidae			Noctuidae (1)	1	0.53
Bombylius sp.	7	3.70	Unknown family (1)	1	0.53
other species (5)	7	3.70	Orthoptera		
Bibionidae (1)	1	0.53	Acrididae		
Calliphoridae (1)	1	0.53	*Melanoplus cinereus cyanipes*	13	6.88
Syrphidae (3)	3	1.59	other species (2)	3	1.59
Tachinidae (4)	8	4.23	Araneae		
Chloropidae (1)	1	0.53	Oxyopidae		
Stratiomyidae (1)	1	0.53	*Peucetia viridans*	11	5.82
			Salticidae (1)	1	0.53
			Thomisidae (1)	2	1.06
			Total	189	

greatest number of diet items were species of Hymenoptera with *Apis mellifera* L. constituting the single most important prey taxon. Diptera were the second most numerous diet items and were represented primarily by species of Bombyliidae and Tachinidae. The cabbage butterfly, *Pieris protodice* L. comprised a significant proportion of the diet along with spur-throated grasshoppers (s.f. Cyrtacanthacridinae). However, no cases of feeding on lepidopteran larvae were observed although the larvae commonly occurred in the vegetation inhabited by *Peucetia*. In a study of the prey of *Pardosa ramulosa* (McCook), Yeargan (1975) also found that despite their abundance in the study area (alfafa fields), larvae of Lepidoptera constituted only a small fraction of the diet. Although species of many Hemipteran families were eaten, one-third were represented by small seed-bugs from the family Lygaeidae.

Very few Coleoptera were used as prey, yet many species of beetles were present on the shrubs in the study area. This may be because the coleopteran cuticle is too hard to be penetrated by the spiders' chelicerae. The major group of beetles which were fed upon (Myrmelidae) are considered (Borror and DeLong 1971) to be soft-bodied species associated with flowers.

A number of previous studies have concluded that the most important predators of spiders are other spiders (Bristowe 1939, Edgar 1969, Yeargan 1975, Jackson 1978). In a study of the wolf spider, *Lycosa lugubris* (Walckenaer), Edgar (1969) found that 16% of the prey consisted of smaller members of their own species. Spiders represented the second most frequent diet item of *Phidippus johnsoni* (Pekham and Pekham) (Jackson 1978). Other spiders (particularly conspecifics) comprised a major portion of the diet for *Pardosa ramulosa* (Yeargan 1975).

During this investigation spiders contributed 7.4% to the total diet for *P. viridans*. A total of 14 spiders were recorded as prey items; three involved interspecific predation and eleven were cases of intraspecific predation. Overall, conspecifics represented the fourth major prey species. Most cases of cannibalism were of mature females preying either upon mature males (n=7) or immature spiders (n=3). The one case of cannibalism not involving a female predator was a penultimate male feeding on an immature individual. Although female lynx spiders stay with their young after emergence from the eggsac, no cannibalism was observed to occur near the nest site. However, females were observed to feed on insect prey during this period.

Feeding phenology.—Figure 1 depicts the proportion of major (most frequent) prey items taken through time. In the three month period from March to May the only prey observed to be taken were small flies (about 4 mm). Hymenopterans made up the largest proportion of prey in June and September. In July there was a decrease in the proportion of Diptera, Hemiptera and Hymenoptera; species of Lepidoptera, Orthoptera and Araneae first appeared in the diet. It is interesting to note that during the month of August there was a significant increase in the proportion of spiders in the diet and a relatively low proportion of insect prey. This fact may be correlated to an overall decrease in insect availability.

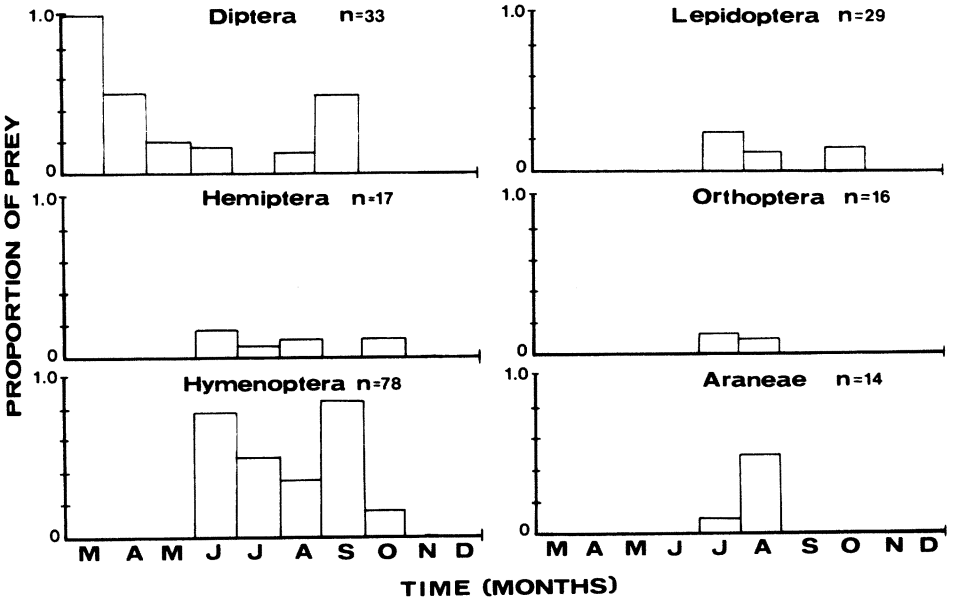

Fig. 1.—Percent of prey items taken monthly by *Peucetia viridans*. All data were collected in the field from March to December. Only the most common prey orders are shown. n represents the number of prey items of each order.

Sex specific prey analysis.–Turnbull (1962) found that mature males of *Linyphia triangularis* (Clerck) did not require food in the adult stage while adult females fed normally. From observation in the laboratory and field, Jackson (1978) also concluded that adult males of *P. johnsoni* fed less frequently than females. He correlated this finding to the life style of adult males which is concerned primarily with locating females and mating. Data obtained during the present study for *P. viridans* would initially appear to confirm the hypothesis that adult males feed less often than adult females. Only twelve mature males were observed with prey as compared to 131 mature females. However, relative to the total number of adult males censused in the field, the percent feeding (21.4%) was non-significantly higher than that of adult females (20.4%) (t test for difference in proportions: $t=0.03$, $p>0.5$). Therefore, this analysis suggests that per capita feeding rather than simple totals should be the criteria for feeding rates.

To determine if a correlation exists between predator and prey characteristics, prey length was analyzed as a function of body size (carapace width) and raptorial leg length. Significant positive correlations were obtained for both morphological features, with body size (Fig. 2) showing a higher correlation ($r=0.496$, $p < 0.001$). Thus, it appears that in the case of *P. viridans*, larger spiders take larger prey.

Niche breadth along a particular resource dimension such as food type is inversely related to ecological specialization. The smaller the niche breadth of an organism, the more specialized it is. Using Levins' method (1968) the niche breadth of prey species for *P. viridans* was calculated. A significantly high value ($\beta=3.58$) was obtained indicating that this spider is a generalist in the prey species it takes.

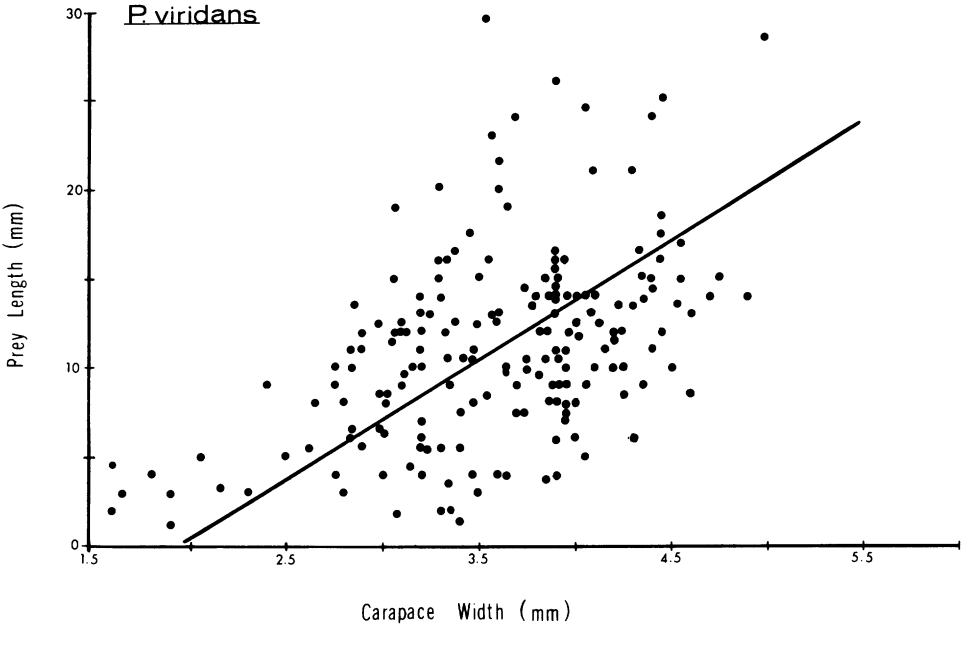

Fig. 2.–Prey length as a function of predator (*Peucetia viridans*) carapace width. There is a significant correlation ($r=0.496$, $p < 0.001$) between spider size and prey size. Equation for the regression line: $y = -2.27 + 0.496x$.

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