Subsocial behavior
in the spitting spider *Scytodes intricata*
(Araneae, Scytodidae)

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Résumé

Des observations de terrain suggèrent que les jeunes araignées de *Scytodes intricata* restent sur la toile maternelle où ils font de début de leur croissance; ensuite, ils partent et font leurs propres toiles individuelles. Une femelle mise avec des jeunes araignées ne partage pas les grandes proies avec ses jeunes, mais elle n'attaque pas les petites proies qui tombent dans sa toile. Les jeunes araignées se battent pour les petites proies et quelquefois ils s'entre-dévorent.

Group living is widespread in spiders. It occurs in at least 15 different families, and has probably evolved several times independently in some of these families (see reviews by Burgess 1978, Buskirk 1981). In some groups the transition from solitary to group life has occurred with relative ease (Darchen and Ledoux 1978). This note presents evidence of subsocial behavior in still another family, Scytodidae, in which no previous reports of social behavior appear to exist. As in many other group-living spiders, *Scytodes intricata* is "subsocial", and colonies generally consist of mother-offspring associations. The behavior of this species is somewhat unusual in that agonistic interactions within groups of siblings seem to be especially common and important.

Methods

Observations were made in July 1984 on the forested slopes of “Cerro Pelado”, a small hill adjacent to the town of Gamboa, Panama, near the edge of the Panama Canal. Living prey (muscoid flies, nasute termite soldiers) were dropped into webs with forceps to elicit predatory behavior; a vibrating tuning fork (440 Hz) was also used occasionally to attract spiders to prey. All but three observations were made during the day; the especially active responses seen at night suggest that the data presented below may underestimate the frequency of intracolony interactions. The approximate size of each prey relative to that of the spider that attacked it was estimated visually.

Colony members were counted in the field, using a flashlight to illuminate colonies from below to improve the visibility of spiders. The spiders were sometimes difficult to see, however, and some counts may underestimate colony size. Spiders’ sizes were estimated visually in the field; 17 colonies were collected and spiders were measured using an ocular micrometer in a dissecting microscope.

Results

Webs and websites

Scytodes intricata is known only from Costa Rica and Panama (Valerio 1981). Webs were always at least partially protected from above by a large object such as a rock, a tree trunk, a large palm leaf, etc.; the most common protection was a dead or dying palm leaf which had not yet fallen to the forest floor. The webs of solitary individuals seemed to be more common under single, living palm leaves, while those of colonies were more often near larger objects (tree trunks, etc.). The heights of websites varied from 0 to more than 4m above the ground.

The webs consisted of nonsticky lines arranged in a three dimensional mesh, usually with at least a suggestion of a sheet-like structure in the midst of the mesh. Adult females in colonies and all solitary individuals rested during the day pressed more or less tightly to the substrate at the edge of the web, and the edge of the sheet formed a very short, flaring tube bordering at least the upper portion of this retreat. Younger spiders in colonies were more or less dispersed in the mesh and sheet, although there were often several spiderlings on the roof of the female’s retreat.

Colony composition

The numbers of solitary and colonial webs are given in Table I; they should not be taken as indicative of the true composition of the population, since 1) colony webs were undoubtedly easier to see because of their larger size; 2) the solitary webs of larger instar spiderlings were also undoubtedly more easily seen than those of smaller individuals; and 3) it was difficult to equalize the search in microhabitats likely to harbor solitary and colonial individuals. However, these data at least serve to indicate the variety of groupings observed, and give some idea of their commonness.

The distributions of sizes of spiders showed several patterns: mature males occur with mature females that are both with and without young; adult females sometimes
Mature female alone..............................................3
Mature alone....................................................1
Mature female alone with eggs1............................1
Mature female and mature male............................2
Mature female and mature male and spiderlings...1
Mature female and first instar spiderlings only2........7
Mature female and at least some later instar spiderlings...13
First instar spiderlings without female3................3
At least some later instar spiderlings without female3.....4
Solitary immature individuals...............................11

1 “Web” was a closed ovoid about 5 cm long.
2 First instar taken as the first stadium in which the spiderlings disperse from the vicinity of the egg sac.
3 The size of the web and the strength of the lines strongly suggested that the web the spiderlings inhabited was made by a mature female.

Table I. Inhabitants of 46 different webs of Scytodes intricata.

either die or leave webs with juveniles; and adult females do not share webs. Colonies containing only first instars were larger ($\bar{x} = 17$, $N = 5$) than those with older spiderlings ($\bar{x} = 9.2$, $N = 14$). Spiders within a given colony tended to be more or less uniform in size; and when appreciable differences in spiderling sizes occurred within a colony, individuals of intermediate sizes were also present. The cephalothorax of the smallest solitary individual found was 1.52 mm long, probably corresponding to the third or fourth instar after spiders left the egg sac (first instars averaged 0.87 mm long). The cephalothorax of the largest spiderling in a colony was nearly the same (1.56 mm).

The patterns just noted suggest the following general trends in the natural history of the species: 1) males at least sometimes cohabit with mature females prior to oviposition but then leave or die (as do males in the related family Pholcidae; EBERHARD and BRICENO 1983); 2) since adult females do not occur together, and disparate-sized spiderlings do not occur together in colonies, members of colonies are probably usually offspring of a single female; 3) spiderlings either die or leave as they grow older, and colony size thus decreases as the offspring mature; 4) adult females probably sometimes abandon webs containing offspring; and 5) spiders leave their maternal web to build webs of their own as early as the third or fourth instar.

Attack behavior and interactions among colony members

Observations of responses to 23 prey dropped into 14 webs revealed several clear patterns. In all of the 19 cases involving immature spiders the prey was at least twice as large as the spider or spiders that attacked, and in 11 instances more than one spider attacked the prey as it struggled in the web. Nevertheless in no case did more than one spider feed on a prey after it had been subdued. Several attacks were “cooperative” in the sense that more than one spiderling spat silk on, wrapped and/or bit the prey as it struggled, but eventually one individual always chased the others from the vicinity of the prey. Often aggressive spiders jerked the web sharply in an apparent threat as they moved toward others, and in the two most intense interactions one spider actually spat silk at the other, causing it to retire and clean itself. In all four cases
in which the sizes of the interacting spiders differed, the larger one won. In only one of three fights between similar-sized rivals in which I was able to keep track of individuals did the first spider to attack the prey succeed in holding off later arrivals.

Four large flies (each approximately 50-75% of the volume of mature female S. intricata) were placed on different webs. The spiderlings near the prey either remained immobile or fled, but the adult female emerged from her retreat and attacked. The adults did not share the prey with spiderlings, but instead wrapped it and took it back to their retreats. In all but one of the interactions involving smaller prey, the adult did not respond while the spiderlings immobilized the prey. In the exceptional case, the female emerged from her retreat and moved toward the struggling prey, but after touching either the prey or a spiderling nearby (I could not tell which) she turned away and returned to the retreat.

In many cases I saw spiderlings come into contact with each other as they moved in apparent response to prey’s vibrations or to the movements of other spiders; in these cases either one or both of the spiders turned away immediately after contact. This apparent passive avoidance of webmates was not universal, however. On three different occasions I saw one spiderling in a colony feeding on another. It is likely that these cases of cannibalism resulted from intentional predatory behavior, as when I first noticed one interaction the victim was still moving and apparently attempting to escape while the other wrapped it in silk. Two cannibalisms involved a second instar spiders preying on another second instar (cephalothorax length = 1.12 mm), and the third involved an apparently second instar individual feeding on a first instar.

One further type of aggressive interaction was observed only once. The addition of a termite to a colony had elicited an aggressive interaction in which the first spider to attack was driven away from the prey and to the edge of the web. About 90 minutes later I returned and added a second termite about 5 cm away. The first termite was being fed upon by a spider at the original attack site, and another spider was at the site to which the original attacker had been driven (thus these may have been the original spiders; they were not marked). The spider without prey responded to the struggles of the second termite by moving toward it, and its path took it close to the feeding spider. After approaching to within 0.5-1.0 cm, it gave a quick lunge and snatched the prey cleanly from the chelicerae of the other spider and then moved quickly to the edge of the web; the other spider did not follow.

Discussion

It seems likely that S. intricata colony members are usually closely related (mother and offspring). The most dramatic self-sacrificing behavior was that of the mature female, which refrained from attacking smaller prey. Despite the probability that they are highly related, younger colony members were remarkably uncooperative in interactions involving prey. Even when the prey was much larger than any single spider, and could thus serve as food for several individuals, the spiderlings did not allow other spiders near it. The lack of prey sharing between the mature female and spiderlings, and between spiderlings contrasts strongly with many other group-living spiders (BURGESS 1978, BUSKIRK 1981). Scytodes spiders do not masticate their prey in any way, but instead leave a completely intact empty shell when finished, so pre-
venting interference with prey manipulation during feeding is not an acceptable explanation for the lack of tolerance of other individuals near prey. It is possible however that prey are fed upon by a succession of single individuals, especially if prey stealing such as that observed on one occasion is common, or if spiderlings often capture relatively large prey.

Contests among webmates for prey have been observed in some other social spiders in which individual spiders in a colony have their own webs (e.g. colonial orb weavers in the genera *Metabus* [BUSKIRK 1975], *Philoponella* [LAHMANN and EBERHARD 1980], *Cyrtophora* [LUBIN 1974], *Eriophora* [FOWLER and DIEHL 1978]). However, in species with "unitary" colony webs like those of *S. intricata* that are not divided into clear subunits, competition over food is apparently less common, and occurs only when the prey is relatively small compared to the spiders contesting it; struggles over such prey sometimes occur in *Anelosimus eximius* (pers. obs. and Y.D. LUBIN pers. comm.), an unidentified theridid (Y.D. LUBIN pers. comm.), and *Stegodyphus* sp. (pers. obs.). In other social species (i.e. *Achaearanea waui* no sign of aggression over food has been observed despite extensive observations (though in this species, as in others such as *Achaearanea disparata* [DARCHEN 1968] and *Stegodyphus* sp. [pers. obs.] the early stages of transportation of immobilized prey sometimes involve spiders pulling in different directions: whether these interactions are competitive [no aggressive behavior occurs] is not certain). The relative importance of cannibalism in other species of group-living spiders is not clear. It is thought not to occur in some (BURGESS 1978, HOREL et al. 1979, BUSKIRK 1981), but has been observed in *Cyrtophora citricola* (BURGESS 1978).

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**References**


