

ARTÍCULO:

Egg guarding and spiderling groupfeeding in crevice weaver spiders (Araneae: Filistatidae)

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Egg guarding and spiderling group-feeding in crevice weaver spiders (Araneae: Filistatidae)

James C. Cokendolpher & Kathryn MacDonald

Abstract:

The Filistatidae is historically known as a family of asocial spiders. Yet they demonstrate some behaviors that are typical of those species that are communal. Two of these behaviors, egg guarding and spiderling cooperative feeding, were observed in *Kukulcania geophila*. Alone these actions do not in themselves suggest that this species is social, but they may more accurately be classified as subsocial, or intermediate steps in the evolution of social behavior. In addition to the observations of *K. geophila*, this paper summarizes some other documentations of similar behavior in other crevice weavers species.

Key Words: Egg guarding, spiderlings, group-feeding, subsocial, Araneae, Filistatidae, Kukulcania, Filistatinella

Cuidado del huevo y alimentación en grupo de las crías en filistatidos (Araneae: Filistatidae).

Resumen:

A pesar de ser históricamente conocidas como arañas asociales, las especies de la familia Filistatidae muestran ciertos comportamientos que son típicos de especies comunales. En *Kukulcania geophila* se observaron dos de estos comportamientos, el cuidado de los huevos y la alimentación cooperativa de las crías. Estos comportamientos por sí mismos no sugieren que esta especie sea social, sino que podrían ser más exactamente clasificados como subsociales o etapas intermedias de la evolución del comportamiento social. Además de las observaciones en *K. geophila*, este artículo presenta otros registros de comportamientos similares en otras especies de la familia.

Palabras clave: Cuidado de los huevos, crías, alimentación cooperativa, subsocial, Araneae, Filistatidae, *Kukulcania, Filistatinella*

Introduction

Despite being known for their aggressiveness and intolerance, social behavior has been fairly well studied in many spiders, in part because much can be learned about the evolution of sociality through the range of behaviors represented in arachnid species (Kullmann, 1972; d'Andrea, 1987). Only species of spiders capable of weaving webs for routine hunting exhibit complex communities similar to those of social insects (d'Andrea, 1987). Spiders more commonly display limited behaviors that, when exhibited singly do not make spiders social, but as part of a group of behaviors may define social behavior (d'Andrea, 1987). Thus, these behaviors may be considered subsocial as they can exist in spiders that are more or less considered asocial during much of their lifetime (Kullmann, 1972).

The Filistatidae includes some 16 genera and 109 species with a worldwide warm temperature distribution (Platnick, 2007). Adult crevice weavers or filistatids live long (up to eight years, Edwards, 1983) solitary lives. In suitable habitats with plenty of food, their webs may be numerous and close together but never touching. Social behavior has been recorded in the Filistatidae, but little has been reported on these observations in reviews of social phenomena (Shear, 1970; Kullmann, 1972; Buskirk, 1981; Foelix, 1996; d'Andrea, 1987). One notable exception, a paper by Curtis and Carrel (1999), documents social behavior in captive juvenile *Kukulcania hibernalis* (Hentz, 1842). The present article seeks to extend some of the assessments of Curtis and Carrel (1999) by the addition of new information with another species, *Kukulcania geophila* Chamberlin and Ivie, 1935, as well as some observations of other filistatid species.

Results and discussion

EGG GUARDING

Egg guarding may be common in the Filistatidae. Although egg guarding is not listed in most articles concerning social behavior, brood care is a focus of primitive social behavior and is found in many asocial spiders (Kullmann, 1972). The guarding of an egg-sac may be an early precursor to brood care as the mother is ensuring the survival of her offspring. Evidence is available (Bonnet, 1939; Nørgaard, 1951) of such behavior in the Mediterranean *Filistata insidiatrix* (Forskal, 1745). A *Filistatinella* n. sp. from Lubbock, Texas, U.S.A, has been observed (JCC, personal observation) to guard eggs. In this species the young probably disperse shortly after hatching as the webs have not been observed to contain more than a single spider.

Egg guarding is better known from the genus *Kukalcania* Lehtinen (New World species formerly referred to as *Filistata* Latreille). Curtis and Carrel (1999) documented that the females of *K. hibernalis* which they focused on were observed to maintain contact with the egg-sac throughout incubation, but do not mention protection of the sac. Likewise, Edwards (1983) stated that *K. hibernalis* egg-sacs are "kept" (presumably guarded) with the female in the web.

The egg-sacs of some members of this genus are guarded by their mothers and the young are protected for a short time. While photographing in San Luis Potosí, México, Dr. Robert W. Mitchell found a female *Kukalcania* guarding an egg-sac and spiderlings (Fig. 1). On the same trip Dr. Mitchell also photographed a female with young in the web but the egg-sac was missing from the web. Presumably the sac was cut from the web by the female (Fig. 2). Because the spiders were not preserved and no record of this genus has been published for San Luis Potosí, a species identification is not possible at this time.

In the original taxonomic description of *K. geophila geophila*, Chamberlin and Ivie (1935) noted that females were found guarding egg-sacs during July and August in California, U.S.A., remarking "they guard over their eggs in the manner of the gnaphosids." The female holotype of *K. geophila wawona* (Chamberlin and Ivie, 1942) was collected in Yosemite National Park, California, while guarding an egg-sac on September 17.



Figures. 1-2. Maternal females *Kuklakania* sp. (from the state of San Luis Potosí, México). Fig. 1 (top), guarding egg-sac and spiderlings, Fig. 2 (bottom) guarding spiderlings after egg-sac was removed (cut loose by female?) (photographs by R.W. Mitchell).

On 27 June 1985, JCC (assisted by the late Vince Roth) collected a female *K. geophila geophila* guarding an egg-sac at Camp Switzer, Angeles Crest Highway, Los Angeles County, California, U.S.A. (Fig. 3). This female did not limit protective action to egg parasites, but aggressively protected the sac from all intruders including human fingers and probes.

The female *K. geophila* and egg-sac were transferred to Lubbock for observation. Shortly after arriving in Lubbock the female died and was preserved leaving the eggs unattended. Because other *Kukulcania* females live for many years, it is suggested this death was abnormal and that she would not have normally served as a meal for the newly emerged spiderlings as is done by some other spiders (Shear, 1970).

COOPERATIVE PREY CAPTURE / GROUP FEEDING IN SPIDERLINGS

Curtis and Carrel (1999) observed juvenile *K. hibernalis* to remain in close association and feed communally until eight weeks after emergence. Further they observed that maternal females actively discouraged (flicking of legs) contact by their spiderlings.

Because the female *K. geophila* mentioned above never spun a new web upon relocation, the egg-sac was cut open and placed on the web of a related species, *Ku*-



Figure. 3. Maternal female *Kuklakania geophila* guarding her egg-sac in California, U.S.A.

Figure. 4. Spiderlings of *Kuklakania geophila* group feeding on a small moth in the laboratory.

kulcania arizonica (Chamberlin & Ivie, 1935) that was also being held in captivity. The adult K. arizonica was removed prior to introduction of the egg-sac. The spiderlings left the egg-sac and molted with no difficulty, but did not appear to feed upon a partially eaten fly left in the web by the adult K. arizonica. However, Barrantes & Weng (2008) reported carrion feeding by spiderlings in some other families of spiders. A few days later the fly was removed so the web would not be overtaken by fungi. During this time the young stayed together on the web. About a week later while feeding numerous containers of arachnids, JCC dropped a small moth onto the web. Several hours later the moth was covered by feeding spiders. This procedure was repeated. This time JCC observed the spiderlings group kill and then group feed upon the moth (Fig. 4). As the web is responsible for entangling the prey, no credit for the capture can go to the young. By the next weekend the spiders had not molted, but were spread over the cage. Although no apparent aggression was noted, the spiderlings were separated into individual rearing vials. There they remained, building small webs and molting.

In some subsocial or maternal-social species of Coeletes Blackwell (Agelenidae), Araneus Linné (Araneidae), *Eresus* Walckenaer and *Stegodyphus* Simon (Eresidae), *Theridion* Walckenaers (Theridiidae), and *Nephila* Leach (Tetragnathidae), young spiderlings cooperate in prey capture, but are solitary as adults. The length of time the spiderlings remain together depends upon the species (Burch, 1979; Hill and Christenson, 1981; Krafft, 1982) and possibly availability of food (Krafft, *et al.*, 1986, but also see Curtis and Carrel, 1999, for other results).

Following the definition used by d'Andrea (1987), joint feeding is a means of food exchange in spiders. Such a food exchange only occurs when there is a mixing of digestive liquids. No experiments were conducted to determine if digestive liquids were actually exchanged between the K. geophilia young. Because the female died (due to unknown circumstances) prior to the spiderlings hatching, it is uncertain if she would normally feed with or regurgitate food to her young. Curtis & Carrel (1999) also gave no mention of a female regurgitating fluid. D'Andrea (1987) suggested maternal feeding of the young is a type of brood care where substances (maybe hormones) could be transmitted to the offspring. Previous experiments with F. insidiatrix did not concentrate on possible passage of digestive liquids between mother and young (Bonnet, 1939). Although some authors have noted cannibalism of the mother, this was not examined with the filistatids because the mother died prior to the egg sac hatching (Ythier, 1997).

Despite the fact that the Filistatidae are asocial creatures, under certain circumstances they can still demonstrate behaviors associated with social spiders such as egg guarding and cooperative feeding by spiderlings. Further studies of similar behaviors in filistatids and other asocial spiders are necessary to fully comprehend the development and evolution of these behaviors.

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