Title
Portia labia, a Cannibalistic Jumping Spider, Discriminataes Between Own and Foreign Eggsacs

Journal
International Journal of Comparative Psychology, 7(1)

ISSN
0889-3675

Authors
Clark, Robert J
Jackson, Robert R

Publication Date
1994

DOI
10.46867/C42598

International Journal of Comparative Psychology, Vol. 7, No. 1, 1994

PORTIA LABIATA, A CANNIBALISTIC JUMPING SPIDER, DISCRIMINATES BETWEEN OWN AND FOREIGN EGGSACS

Robert J. Clark
Robert R. Jackson
University of Canterbury

ABSTRACT: Eggsac recognition was investigated in *Portia labiata*, a jumping spider (Salticidae) that routinely feeds on the eggs of conspecifics, but does not normally feed on its own eggs. In laboratory experiments, we demonstrate that *P. labiata* females can discriminate between their own and foreign eggsacs. The cues by which these discriminations are made are discussed.

INTRODUCTION

Various types of parental care are known in spiders, including guarding eggs against predators (Eberhard, 1974; Kessler & Fokkinga, 1973; Pollard, 1984; Fink, 1986, 1987; Willey & Adler, 1989), providing food for young (Nørgaard, 1956; Bristowe, 1958; Kullmann, 1972; Shear, 1970) and opening the eggsac to allow emergence of spiderlings (Whitcomb & Eason, 1967). Generally, if a female that does not have eggs is offered eggs of a conspecific, she will reject, and sometimes eat, them (Bonnet, 1940; Palmgren, 1944; but see Nørgaard, 1956; Pollard, 1984). Yet females do not normally eat their own eggs.

In vertebrates, the stimuli by which females recognize their own offspring have been well studied (Fletcher & Michener, 1987), but the stimuli by which female spiders discriminate between their own eggs and those of conspecifics have received little attention. Previous studies suggest that eggsac discrimination by spiders is mediated by one or more of four cues (Kraft, 1982): (1) tactile cues based on the physical

Address correspondence to Robert J. Clark, Department of Zoology, University of Canterbury, Christchurch, New Zealand.

characteristics of the eggsac; (2) chemical cues associated with the eggsac's silk; (3) chemical cues associated with the spider's web; (4) cues based on the geographic location of the eggsac, the web or both.

Portia is a web-building jumping spider that specializes in preying on other spiders, including conspecifics (Jackson, 1992). *Portia* females enter the webs of conspecifics, where they attack or sometimes kill the resident female, then eat any eggsacs that are left behind (Jackson & Blest, 1982; Jackson & Hallas, 1986). Upon encountering eggsacs, *Portia* females open them by chewing and tugging with their chelicerae, then using their front pair of legs to rake the eggs forward into their mouths (Jackson & Blest, 1982).

Portia females have never been observed eating their own eggs. Yet females leave, then return to their webs during the incubation period (Jackson & Blest, 1982). Also, incubating *Portia* females in nature have been observed to eat eggs of conspecifics (Jackson & Blest, 1982; Jackson, unpubl. data). This suggests that *P. labiata* females have evolved an ability to recognize their own eggs or web. We investigated this hypothesis using a representative species, *P. labiata*, from Sri Lanka.

MATERIALS AND METHODS

Standard maintenance procedures were used, as described elsewhere (Jackson & Hallas, 1986). Tests were carried out in cages with removable glass sides (Fig 1A). An internal metal frame was positioned inside each cage (Fig 1B). Spiders attached their webs to the metal frame instead of to the glass, enabling the cages to be opened without damaging webs.

All females used in tests were randomly selected from the laboratory stock. Though a given female was used in more than one (maximum of two tests) test, no eggsac-female pair was used more than once. Also, no eggsac was used more than once, except for instances in which it had previously been paired with its parent. All eggsacs used in tests were of approximately (maximum difference of 3 days) matching age.

Before each test, the parent spider (test spiders and spiders that provided foreign eggsacs and webs) was deprived of contact with its eggsac and web for a 2-h period. After the 2-h period, the test female was placed in a cage containing one of the following treatments: (1) the test female's own eggsac in the test female's own web; (2) the eggsac and web of another conspecific female ('foreign eggsac in foreign web'); (3) the test female's eggsac in another conspecific female's web ('own eggsac in foreign web'); (4) the eggsac of another conspecific in the test

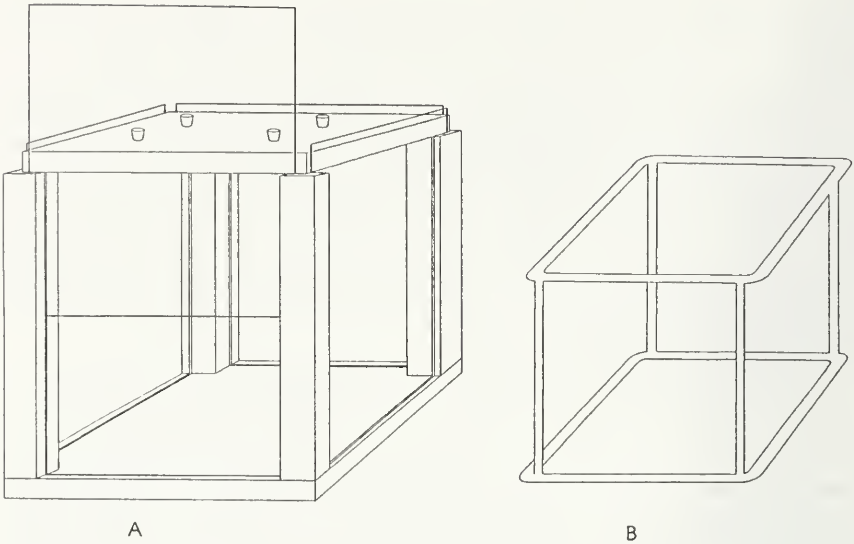

Figure 1. Cage (30 cm x 30 cm x 30 cm) used in testing *Portia labiata* for eggsac recognition. A: Wooden outer frame with sliding glass sides, one of which is shown partially raised. Prey were introduced through the four holes (plugged with corks) on top of the cage. B: Inner metal frame that is slightly smaller than the inside dimensions of outer cage. Inner frame is shown separately for clarity, but is normally positioned inside the outer wooden frame.

female's web ('foreign eggsac in own web'). The test consisted of leaving the test female in the cage for one week, during which time the eggsac was checked daily for evidence of having been fed upon.

Treatments 3 and 4 were obtained each time by taking a pair of incubating females' webs and trading the eggsacs: eggsac of female 1 placed in web of female 2 as close as possible to previous location of eggsac of female 2, and likewise for eggsac of female 2 placed in web of female 1.

RESULTS

Eggsacs encountered by test females in their own webs were treated differently depending on whether they belonged to the test female or another conspecific female (χ^2=47.62, N= 59): test females in their own webs resumed guarding their own eggsac in 19 out of 20 tests, and ate the foreign eggsac in only 6 out of 12 tests.

Test females in foreign webs resumed guarding their own eggsacs in 13 out of 14 tests and ate the eggsacs in 12 out of 13 tests. Eggsacs which the test female did not resume guarding were invariably eaten.

DISCUSSION

Evidently, *P. labiata* females can discriminate between their own eggsac and a foreign eggsac. In the present study, females usually guarded their own eggs and ate foreign eggs. How widespread eggsac recognition abilities may be in salticids is unknown because species other than *P. labiata* have not yet been studied. However, an ability to recognize their own eggs may be especially advantageous in *Portia* because this is a genus of salticids known to feed frequently on eggs of other spiders, including conspecifics.

This study raises questions about the cues by which *P. labiata* distinguishes between its own and foreign eggsacs. In some vertebrates, cues from the geographic locations of the eggs are known to be important (Colgan, 1983). However, for *P. labiata*, cues other than location must be of primary importance. In our tests, when females' own eggsacs were placed in foreign webs, they were not placed in a location comparable to their original positions in the parent webs but, instead, as close as possible to the previous location of the foreign eggsac. Therefore, if the location of the eggsac in the web was the most important cue for eggsac recognition, then test females would have been expected often to eat their own eggsacs. However, test females usually guarded their own eggsacs, instead of eating them, regardless of whether they were in foreign webs or the females' own webs. Probably, in *P. labiata*, eggsac discrimination is based primarily on chemical cues.

However, it is interesting that, when we placed foreign eggsacs in the webs of test females, the test females accepted (i.e., did not eat) the foreign eggsac half the time. Yet, when test females encountered foreign eggsacs in foreign webs, they usually ate them. This suggests that cues from the female's own web are important in addition to cues from her eggsac. It is probably unlikely in nature for a female to encounter foreign eggs in her own web and, therefore, it might be advantageous for females to be reluctant to eat eggsacs encountered in their own webs, despite dissenting chemical cues.

ACKNOWLEDGEMENTS

We thank Andrew McLachlan, Mary Whitehouse and Philip Taylor for useful comments on the manuscript and Tracey Robinson for her invaluable help in the preparation of the manuscript. Financial support was provided by grants from the National Geographic Society (3226-85) and the U.S.-New Zealand Cooperative Program of the National Science Foundation (BNS 8657078). Import permits were provided by the New Zealand Ministry of Agriculture and Fisheries.

REFERENCES

Bonnet P. (1940). L'instinct maternal des araignées à l'épreuve de l'expérimentation. *Bulletin Sociéte d'Histoire Naturelle Toulouse, 81*, 185-250.

Bristowe, W.S. (1958). *The World of Spiders*. London: Collins.

Colgan, P. (1983). *Comparative social recognition*. New York: John Wiley & Sons.

Eberhard, W.G. (1974). Maternal behaviour in a South American *Lyssomanes*. *Bulletin of the British Arachnological Society, 3*, 51.

Farley, C., & Shear, W.A. (1973). Observations on the courtship behaviour of *Lycosa carolinensis*. *Bulletin of the British Arachnological Society, 2*, 153-158.

Fink, L.S. (1986). Costs and benefits of maternal behaviour in the green lynx spider (Oxyopidae, *Puecitia viridans*). *Animal Behaviour, 34*, 1051-1060.

Fink, L.S. (1987). Green lynx spider egg sacs: source of mortality and the function of female guarding (Araneae, Oxyopidae). *Journal of Arachnology, 15*, 231-239.

Fletcher, D.J.C., & Michener, C.D. (1987). *Kin recognition in animals*. Chichester: John Wiley & Sons.

Jackson, R.R. (1992). Eight-legged tricksters: spiders that specialize at catching other spiders. *BioScience, 42*, 590-598.

Jackson, R.R., & Blest, A.D. (1982). The biology of *Portia fimbriata*, a web building jumping spider (Araneae, Salticidae) from Queensland: utilization of webs and predatory versatility. *Journal of Zoology, 196*, 255-292.

Jackson, R.R., & Hallas S.E.A. (1986). Comparative biology of *Portia africana, Portia albimana, Portia fimbriata, Portia labiata, Portia schultzi*, araneophagic jumping spiders (Araneae, Salticidae): utilisation of webs, predatory versatility and intraspecific interactions. *New Zealand Journal of Zoology, 13*, 423-489.

Kessler, A., & Fokkinga, A. (1973). Hymenopterous parasites in eggsacs of spiders of the genus *Pardosa* (Araneida, Lycosidae). *Tijdschrift voor Entomologie, 116*, 43-61.

Kraft, B. (1982). The significance and complexity of communication in spiders. In P.N. Witt & J.S. Rovner (Eds.), *Spider communication: mechanisms and ecological significance*. Princeton: Princeton University Press.

Kullman, E.J. (1972). Evolution of social behavior in spiders (Araneae: Eresidae and Theriididae). *American Zoologist, 12*, 419-426.

Nørgaard E. (1956). Environment and behavior of *Theridion saxatile*. *Oikos, 7*, 159-162.

Palmgren, P. (1944). Über die brutpfleginstincthandlung der wolfspinnen. *Societas Scientiarum fennica-Commentationes Biologicae, 9*, 1-19.

Pollard S.D. (1984). Egg guarding by *Clubiona cambridgei* (Araneae, Clubionidae) against conspecific predators. *Journal of Arachnology, 11*, 323-326.

Shear W.A. (1970). The evolution of social phenomena in spiders. *Bulletin of the British Arachnological Society, 1*, 65-76.

Whitcomb W.H., Eason R. (1967). Life history and predatory importance of the striped lynx spider (Araneida, Oxyopidae). *Proceedings of the Arkansas Academy of Science, 21*, 49-58.

Willey, M.B., & Adler P.H. (1989). Biology of *Peucitia viridans* (Aranae, Oxyopidae) in South Carolina, with special reference to predation and maternal care. *Journal of Arachnology, 17*, 275-284.