

This is a PDF version of PECKHAMIA 1(3): 36-39, September 1977. Pagination of the original document has been retained. Editor's note [15.1]: Many of the names used here have changed since 1977 (*Corythalia aurata*>*Anasaitis canosa*, *Eris marginata*>*E. militaris*, *Habrocestum*>*Naphrys*, *Metacyrba undata*>*Platycryptus undatus*, most *Pellenes*>*Habronattus*).

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ON THE RELATIONSHIP OF SEXUAL SELECTION TO SEXUAL DIMORPHISM IN JUMPING SPIDERS. D. B. Richman

Sexual selection is now recognized as a form of natural selection, but Darwin (1859, 1871) made a distinction between natural selection (selection by competition for resources due to the overproduction of progeny in variable populations) and sexual selection (selection of males by female choice and male competition). He even suggested the existence of some rudimentary aesthetic sense in females which allowed them to pick the most ornate male to fertilize their ova. Female choice has been demonstrated in a number of organisms, but often the selectional process which led to such apparent choice has been misunderstood. Mayr (1972) points out that there are other possible interpretations for the existence of sexual dimorphism without the necessity of invoking sexual selection. The advantage in having sexual dimorphism may be, as Mayr states, that males are more readily recognized as the correct sex and species. If male "ornamentation" proceeds to the point where predator and parasite pressures overcome the advantage gained in obtaining a mate, these males and their

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genetic line are eliminated.

Females invest more in each individual offspring than do males; thus it is to the female's advantage for her to refrain from copulating until the male demonstrates his "vigor" by performing the species-specific courtship correctly and by persisting in his attempts to mate with her (Williams 1966, 1976; Trivers 1972). Examples of this are found in the jumping spider genera *Pellenes*, *Habrocestum* and *Corythalia*. In some species of *Pellenes*, males may court for as much as 30 minutes before being allowed to mount. Females of *Habrocestum pulex* (Hentz) and *Corythalia aurata* (Hentz) raise their first legs and elevate their prosoma during courtship. Successful males have to climb over the elevated prosoma, while forcing the female's first legs down. On the other hand, females of some genera (those of *Metacyrba*, *Menemerus* and *Hentzia*) will, if virgin, mate with almost any male, even if the courtship display is not fully performed. Possibly these genera depend more on chemical cues, or they may act abnormally under laboratory conditions.

Sexual dimorphism is commonly found in salticid species. Males of many salticids are quite ornate, having colorful markings, iridescent scales and/or fringes or projections on their legs. Others do not differ significantly from the female pattern (e.g. *Metacyrba*, Fig. 1). During my study of courtship and agonistic display (Richman 1977), I found that there was a direct relationship between the degree of sexual dimorphism and the degree of complexity of the visual display. Some male structures (e.g., enlarged chelicerae) were found to be primarily related to agonistic display and fighting between males (Fig. 2).

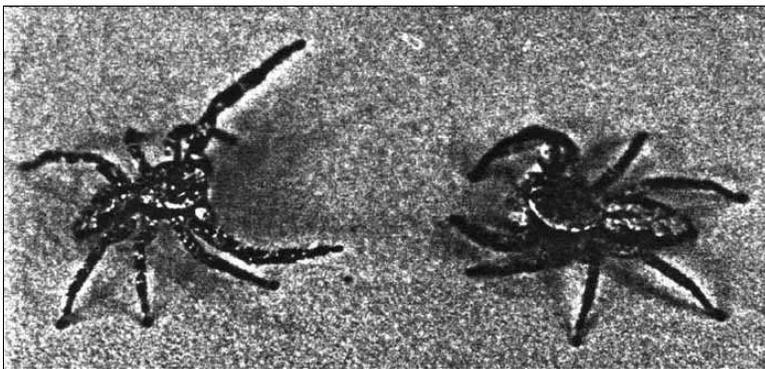


Fig. 1. Courtship pose of *Metacyrba undata* (DeGeer). Male is on left. Note that this pose differs from that illustrated by Peckham and Peckham (1889, Fig. 17). Photo by D. Richman.

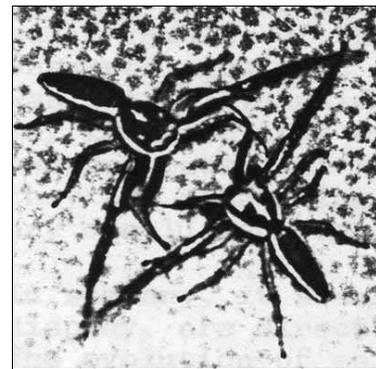


Fig. 2. Agonistic encounter of two male *Hentzia palmarum* (Hentz). Photo by G. B. Edwards.

The presence or absence of specific "ornamentation" and courtship movements may be utilized by females as criteria for rejecting or accepting the male they finally mate with. In the laboratory, males of *Pellenes* often would court females of different sympatric species (as also noted by Crane for several other genera, 1949, p. 210), but the display usually ended with the female either leaving or jumping at the male. Between some similar species which are geographically and/or ecologically isolated in nature, such mating barriers are not necessary and may not exist. Males of *Hentzia palmarum* (Hentz) and *H. grenada* (Peckham and Peckham) readily courted females of the other species and virgin females of either species would mate with them. Several masses of fertile

eggs resulted, but the young never matured. A large male of *Thiodina puerpera* (Hentz) successfully courted a virgin female of *T. sylvana* (Hentz), but the female laid only infertile eggs. Finally, G. B. Edwards (personal communication) successfully hybridized (reciprocally) *Phidippus regius* C. L. Koch with *P. otiosus* (Hentz), obtaining an F1 generation in which males were sterile and had a courtship display intermediate between the two species. All of these examples are of species which are ecologically isolated in the wild.

If females of a species are very aggressive, it is advantageous to the male to avoid direct contact until he has some indication of her reaction to his presence. If the male ran directly forward to the female he might be killed and eaten. This need for caution might explain the zigzag or spiral approach used by males of many species.

Not all courtship is visual in salticids (Jackson 1976), and there appears to be some relationship between a lack of sexual dimorphism and "cohabitation courtship" (non-visual courtship directed toward adult or subadult females within their silken retreats). Some species may rely more heavily on one method and some others may utilize both visual and non-visual courtship. It is probably advantageous to the males of most species to be able to recognize females within their retreats as well as those they encounter in the open.

Agonistic displays are less common, at least in the laboratory, than are courtship displays among salticids. Male competition for mates is probably the basis for such displays. It is rare in nature for more than one male to find a female at the same time, except in those species which usually have a very high population density (such as in species of *Hentzia* and *Corythalia*), or which perhaps utilize pheromones [such as in *Menemerus bivittatus* (Dufour) - see Richman 1977]. *Corythalia aurata* males seem to recognize superior size, and smaller males often retreat from larger males after only a short display. The behaviors of agonistic display and fighting between males have been selected for in many species which practice cohabitation courtship, as in the case of *Eris marginata* (Walckenaer) (Peckham and Peckham 1889) and *Phidippus johnsoni* (Peckham and Peckham) (Jackson 1976). Males of *Corythalia aurata*, *Metaphidippus galathea* (Walckenaer) and *Thiodina sylvana* have been found within or near the retreats of adult or subadult females of the same species in the wild. Also, in the one observed agonistic display of *Menemerus bivittatus*, one of the males was initially inside a silken retreat. Such circumstantial evidence may indicate that males of at least a few salticid species guard their own retreats, and thus may guard the retreats of females with which they are cohabiting. Further study of this problem is necessary before any conclusion can be made.

In summary, it seems that courtship, and to a lesser extent agonistic display, are directly related to sexual dimorphism in salticid spiders. The evolution of sexual dimorphism in jumping spiders is likely, however, to be more a direct result of selection for mate recognition than a result of sexual selection for more highly modified (and thus more "vigorous") males. In salticids, the sequence of courtship movements and persistence of the male are behaviors probably controlled through sexual selection by the female, as has been found in *Drosophila* flies (Maynard Smith 1956, and others). Agonistic display and certain morphological modifications of the male (e.g. enlarged chelicerae)

probably resulted from selection for control of a virgin female by a male to ensure that the offspring produced by the female would be his.

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