

NOTE

Observation of Unusual Courtship Behavior of the Spider *Nephila maculata* (Fabricius) (Araneae: Tetragnathidae) in Palau

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Abstract—In 1991, differences were observed between the courtship behavior exhibited by *N. maculata* in Palau and typical behavior reported for this species in Papua New Guinea. A female Palauan spider exhibited a courtship display that was omitted from courtship by the Papua New Guinea spiders. Male Papua New Guinea spiders exhibit web-binding of the female's appendages during courtship that the Palauan spiders omitted during 19 otherwise typical courtship behavior sequences.

The giant wood spider, *Nephila maculata* (Fabricius) is generally distributed in tropical Australasian and Oriental regions (Robinson et al. 1974). Roewer (1963) did not record *N. maculata* from Micronesia but Kerr (1991) reported it from Palau. I have examined an immature female and adult male *N. maculata* at the U.S. National Museum of Natural History (NMNH #1414) that were collected by H. K. Townes in 1946 on Babeldaob Is., in the modern state of Imeliik and have observed *N. maculata* on Babeldaob Island in the western states of Ngeremlengui, Ngetbang and Ngerdmau since my first visit in 1966. I consider the species generally distributed in Palau in forest, woodland and riparian habitats, also occurring in agricultural areas where giant taro (*Cryptosperma chamissonis*), banana (*Musa* spp.) and betel nut (*Areca catechu*) are cultivated.

The adult female (Fig. 1) is a large spider, ca 4.5 cm body length, that builds a conspicuous aerial orb-web. The adult male is 1/10 the size of the female and typically inhabits the upper portion of her web. The biology and behavior of *N. maculata* was extensively reviewed and studied by Robinson & Robinson (1973, 1976). Additional published notes on this species report on its insectivory in coffee plantations (Robinson & Robinson 1974) and its predation in Palau on synanthropic flies (Olsen et al. 1993). It has occasionally been used as human food (Bristowe 1932). Courtship and mating behavior of this species in Papua New Guinea were included in a wider comparative study of these behaviors in tropical araneid spiders (Robinson & Robinson 1980). I recently observed the following unusual courtship behavior, displayed by *N. maculata* in Palau, that was not mentioned by the studies cited above.

On July 19-21, 1991, I observed the behavior of one *N. maculata* in a web on the bank of a river that empties into Ngeremetengel estuary in Ngeremlengui

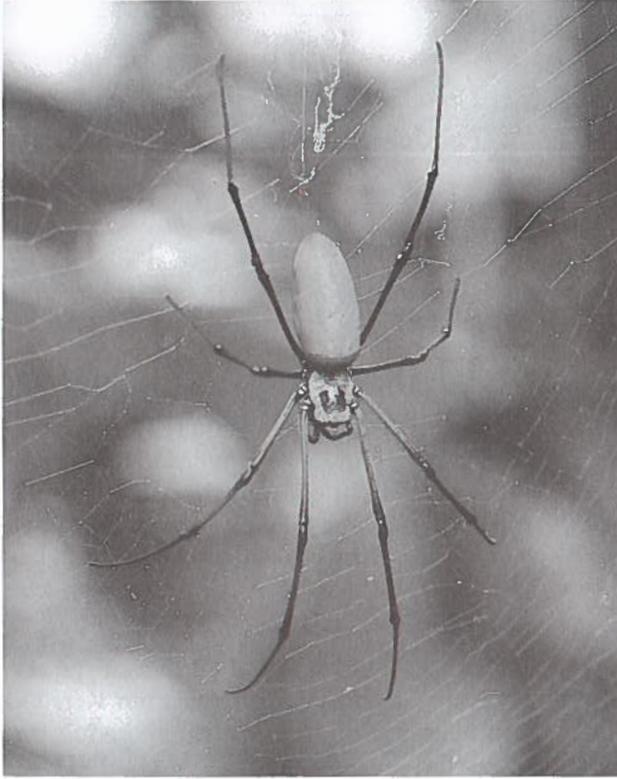


Figure 1. *Nephila maculata*. Adult female in resting position on her web (approx. life size).

State on the west coast of Babeldaob Island, Palau. The web was continuously occupied by a mature female *N. maculata* and five to six males during the entire observation period. The behavior of the spiders in this web was typical of the behavior described for this species in the previous studies conducted in Papua New Guinea (Robinson & Robinson 1973, 1976, 1980) except that I observed unusual courtship behavior.

The following behavior was exhibited once, early in the morning on the third day of observation. From a resting position at the hub, the female abruptly released the grip of legs I-IV on the right side of her body, simultaneously swinging her body outward to a position perpendicular to the web. The female remained in this posture for approximately 15 sec with right legs I-IV extended. Upon returning to a resting posture, she immediately repeated the maneuver, this time by releasing the grip of the legs on the left side and swinging outward. Within 5 min of the swinging behavior, the female gave 5 sharp, rapid tugs on the web, using all eight legs in unison to produce a violent bouncing of the entire web.

Prior to the female's swinging behavior, mating behavior by the males in the web had included only four opportunistic copulations of short duration and



Figure 2. Stamp panel issued by the Republic of Palau to commemorate the Palau-Pacific Women's Conference of 1991 and the tenth anniversary of the republic. The bottom left and right corners bear a spider motif drawn from traditional Palauan art. The spider design represents *mengidabrudkoel*, the mythical man-spider who is credited, among other things, with teaching natural childbirth to the Palauans and with planting a supernatural breadfruit tree that provided seafood when a branch was broken off. The name *mengidabrudkoel* is also the Palauan common name for the giant wood spider, *N. maculata*. Widely recognized in Palau as a living symbol of its mythical namesake, *N. maculata* is a culturally important species to many Palauans through its association with popular legends of Palauan folklore.

sporadic jousting and unsuccessful approaches to the resting female. The swinging behavior was followed by an immediate response from the males on the web. All of the males became active, moving about and waving their legs I in the air. Male jousting intensified over the next few minutes with jousting frenzies that involved all the males together. After the female bounced the web, the males engaged in almost continuous jousts and began making approaches to the female at short intervals of 5 min or less between approaches.

After the female display of swinging and bouncing, I observed 19 full courtship and mating sequences involving four different males. Seventeen of the 19 sequences included relatively short copulations that endured 30 sec or less. The other two sequences contained successful copulations involving different males that each completed several embolus insertions lasting over 2 min. These two full courtship and mating sequences with successful copulations lasted about 30 min in one case and over an hour in the other.

All 19 full courtship and mating sequences followed the typical behavior pattern described for this species except that the males omitted web-binding of

the female's appendages in every sequence. Over the three-day period, none of the males spent any time in the area of the female's appendages and never progressed further cephalad on the female than the epigynum. The omission of the expected web-binding behavior was confirmed by an examination of the captured female that found no webbing on her body or appendages.

The female swinging behavior that I observed in Palau was also reported for *N. maculata* in India (Hingston 1923). However, Robinson & Robinson (1980) found no "access posture" in *N. maculata* in Papua New Guinea and cast doubt on the validity of Hingston's observation. With orb-weavers, an access posture is a posture taken by the female to provide additional space between her body and the surface of the web for the male to maneuver into the copulating position. An access posture is usually maintained for the duration of each copulation. My observation confirms Hingston's report and suggests that the behavior in question is not an access posture as was assumed by the Papua New Guinea researchers. The swinging behavior that I observed occurred only once, at the beginning of a series of courtship and mating sequences involving several males. The posture assumed by the female Palauan spider was of short duration, rather than maintained during copulation, and did not improve access for the male to the space between the female's body and web. The female behavior observed in Palau and India is more appropriately described as a courtship display because its apparent effect, judging by the male response, was to excite the males in the web to court and mate with the female that performed the display.

The Papua New Guinea studies reported that male web-binding of the female's appendages invariably consumed a large proportion of the typical courtship sequence of *N. maculata* (Robinson & Robinson 1973). Furthermore, the reported omissions of web-binding occurred during infrequent (3% of the observed copulations) opportunistic matings where males also omitted many other components of typical courtship behavior (Robinson & Robinson 1973, 1976). Although my observations are preliminary, the fact that four male Palauan spiders omitted web-binding from 19 otherwise typical courtship sequences is a notable departure from the known typical behavior of this species.

My observations show that additional study of the courtship and mating behavior of *N. maculata* is needed and that future studies must account for unusual behavior, such as the female courtship display, that may either be anomalous or may simply occur with less frequency than other components of courtship behavior. More study of the behavior of Palauan *N. maculata* is needed to determine if the unusual behavior that I observed is typical of the Palauan spiders.

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References

- Bristowe, W. S. 1932. Insects and other invertebrates for human consumption in Siam. *Trans. Entomol. Soc. Lond.* 80: 387-404.

- Hingston, R. W. G. 1923. The giant wood spider (*Nephila maculata*) IV. Amours. J. Bombay Natur. Hist. Soc. 29: 70-76.
- Kerr, A. M. 1991. Arachnids of the Ngerukewid Islands Wildlife Preserve, Palau. Micronesica 24: 211-215.
- Olsen, A. R., T. H. Sidebottom & S. G. Bennett. 1993. The Oriental latrine fly, *Chrysomya megacephala* (Fabricius 1794) (Diptera: Calliphoridae), as an invading blow fly of public health importance. Bull. Soc. Vector Ecol. 18(2): (in press).
- Robinson, M. H. & B. Robinson. 1973. The ecology and behavior of the giant wood spider, *Nephila maculata*, in New Guinea. Smithson. Contr. Zool. 149: 1-76.
- Robinson, M. H. & B. Robinson. 1974. A census of web-building spiders in a coffee plantation at Wau, New Guinea, and an assessment of their insecticidal effect. Trop. Ecol. 15: 95-107.
- Robinson, M. H. & B. Robinson. 1976. The ecology and behavior of *Nephila maculata*: a supplement. Smithson. Contr. Zool. 218: 1-22.
- Robinson, M. H. & B. Robinson. 1980. Comparative studies of the courtship and mating behavior of tropical araneid spiders. Pac. Insects Monogr. 36: 1-218.
- Robinson, M. H., Y. D. Lubin & B. Robinson. 1974. Phenology, natural history and species diversity of web-building spiders on three transects at Wau, New Guinea. Pac. Insects 16: 117-163.
- Roewer, C. F. 1963. Araneina: Orthognatha, Labidognatha. Insects of Micronesia 3: 105-132.

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