Odonatologica 27(2): 249-252 *June 1, 1998*

POSSIBLE MORPHOLOGICAL AND BEHAVIORAL MALE MIMICRY IN A LIBELLULID DRAGONFLY, *ERYTHRODIPLAX UMBRATA* (L.) (ANISOPTERA: LIBELLULIDAE)

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Received August 6, 1997 / Reviewed and Accepted September 9, 1997

An andromorphic ♀ appeared to be ovipositing successfully in the midst of a high density of ♂♂ by both looking and acting like a ♂.

INTRODUCTION

Male dragonflies generally attempt to mate with any conspecific female they meet in their preferred habitats. In addition, the sex ratio is strongly skewed toward males at breeding sites. This situation assures receptive females of quickly obtaining a mate but also leads to severe harassment of females by males during oviposition. Adaptations to avoid this "mating harassment" include: (1) male closely attends female, guarding her against other males (this is common but becomes less effective as male density increases); (2) male and female remain in tandem for the duration of egg-laying (also common but not universal among dragonfly taxa); (3) female oviposits only at times when or in places where males are not present (a relatively uncommon strategy). Other than by these behaviors, females are unable to continue oviposition because of constant mating attempts when males are present in large numbers (CORBET, 1962, 1980).

Recently a fourth mode to avoid mating harassment has been proposed (ROBERTSON, 1985), that of male mimicry. Robertson found that andromorphic (male-colored) female *Ischnura ramburii* (Sel.) copulated half as often as heteromorphic females, and speculated that they are less likely to be approached by males and thus less likely to waste time and be exposed to predation while copulating

more than necessary. He further proposed that the polymorphism is balanced by frequency-dependent selection, with andromorphs more likely than heteromorphs to be taken by predators because of their more conspicuous coloration.

Differential mating success by female morph was also found by HINNEKINT (1987) for *Ischnura elegans* (Vander L.) and by CORDERO (1992) for *I. graellsii* (Ramb.). Hinnekint proposed a density-dependent model to explain female polymorphism. Because they look like males, at high densities andromorphs are more likely to avoid unnecessary matings, while at low densities they are less likely than heteromorphs to mate at all.

However, FINCKE (1994a, 1994b) presented evidence to refute the male-mimicry hypothesis in zygopteran species that had been studied to date. She showed that evidence presented thus far could be explained by a null hypothesis of selective neutrality and concluded that neither the adaptiveness of nor the mechanism maintaining female polymorphism in Odonata had been adequately demonstrated.

Nevertheless, the occurrence of female color polymorphism is surprisingly widespread among Odonata, although found as well in other taxa (STAMPS & GON, 1983). Furthermore, it characterizes only certain families (especially Coenagrionidae and Aeshnidae, less commonly Libellulidae). In my opinion, considerably more attention should be given such a phenomenon before it is dismissed as selectively neutral, and I present here an observation I interpret as male mimicry.

OBSERVATIONS AND CONCLUSION

Erythrodiplax umbrata (L.) is an abundant dragonfly in much of the Neotropical region. Mature males are black, with a conspicuous black band across each wing filling most of the space between the nodus and the pterostigma. Most mature females are brown with essentially clear wings (the extreme tip brown), but some mature females exactly resemble males in body and wing color. Of 80 females in my collection, 12 (15%) are andromorphs, the remainder heteromorphs. BORROR (1942) found 20.8% of the 269 females he examined to be andromorphs, excluding 3 that appeared intermediate.

On 17 November 1983 I was watching dragonflies at small rain puddles at Cancún, Quintana Roo, Mexico, when an *E. umbrata* that I had thought was a male began making oviposition movements, tapping the water a few times about once per second and then moving a short distance to repeat the process, as is typical of this species (PAULSON, 1966). On closer examination I found this individual to be an andromorphic female, easily distinguished at 1-2 m by the thickness of her abdomen. As I watched, males repeatedly flew at her, perhaps attracted by the oviposition behavior. Female dragonflies when approached by males usually attempt to escape if they are unreceptive to mating, but this female flew at each male that approached, fluttering in midair while the male did the same, the two facing each other and appearing exactly as did pairs of males that approached each other over the same puddle. With a density of about 1 male/10 m^2, these territorial interactions occurred almost constantly. Although usually rising over the puddle as high as about 0.5 m, on one occasion she merely turned toward the male and the two fluttered

only 10-15 cm apart and 2-3 cm above the water. The female tapped the surface about 30 times as I watched and was interrupted 6 times, but each time she returned to oviposit after repelling the male. These interactions lasted several minutes, until I approached too closely and the female left the puddle.

As males do not guard ovipositing females in this species (DUNKLE, 1989), a female would have little chance to oviposit undisturbed among a dense population of males, as there was at this site. In the Libellulidae, females unreceptive to a male's attempt at mating typically leave the area, often flying straight up and rapidly away. In thousands of hours of observing dragonflies, I cannot recall having seen another female libellulid reject a male's attentions in the way described for this female *E. umbrata*.

Nothing is known about sex recognition in *E. umbrata*. Abdomen thickness was found to be significant in sex recognition in *Leucorrhinia dubia* (Vander L.) (PAJUNEN, 1964) and *Cordulia aenea amurensis* Sel. (UBUKATA, 1983), similar-sized Anisoptera. However, in this instance, neither her thicker abdomen nor her oviposition behavior appeared to be sufficient to stimulate persistent mating attempts in the face of the female's male-like coloration and behavior. Nevertheless, KOTARAC (1996) reported an ovipositing andromorph female *Crocothemis erythraea* (Brullé) that was taken in tandem by a male and thus apparently readily recognized as a female.

Although a single observation and not matched by corresponding observations of heteromorph females at the same time and place, I present this as an example of a female mimicking the male of her species in both coloration and behavior, the mimicry allowing her to oviposit persistently with only minor disturbance by a dense population of males.

ACKNOWLEDGEMENTS

I thank GREG BUTCHER and SIEVERT ROHWER for valuable comments on the manuscript.

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