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Short Communication

Dragonflies (*Gynacantha nervosa* Rambur) Avoid Wasps (*Polybia aequatorialis* Zavattari and *Mischocyttarus* sp.) as Prey

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INTRODUCTION

All species of eusocial vespid wasps are equipped with venomous stings which are used in self-defense (Schmidt, 1990). Neotropical insects from several orders are visual mimics of eusocial wasps (e.g., Opler, 1980), and Müllerian mimicry complexes among species of eusocial wasps are common (Richards and Richards, 1951; Richards, 1978). Wasp mimicry often involves behavioral (posture and movement) characteristics as well as cuticle color and pattern. For example, wasp mimics often dangle their legs and fly in slow, looping arcs similar to foraging wasps (personal observation). Prey choice by visually hunting predators has presumably been a selective force favoring the evolution of wasp mimicry.

Dragonflies are abundant predators of insects in many Neotropical habitats, and their reliance on acute vision when hunting suggests that visual features of prey, including shape and size, are important in prey selection (Corbet, 1963; Sherk, 1978). Several species of dragonflies have been observed approaching and apparently rejecting potential prey items (Beatty, 1951), but the importance of visual cues in prey selection by dragonflies remains largely unexamined. Little is known about the selective forces favoring wasp mimicry, but the observations presented here suggest that prey selection by dragonflies could favor the evolution of resemblance to eusocial wasps.

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OBSERVATIONS

I observed interactions between the dragonfly *Gynacantha nervosa* and eusocial wasps at dusk (1745 to 1810 local time) on 15 April 1995. I was seated facing Southwest near three colonies of the wasp *Polybia aequatorialis*. The nests were located at approximately 1350-m elevation in Monteverde, Puntarenas Province, Costa Rica (10°18'N, 85°11'W). Foraging wasps returning to the nests were clearly visible as silhouettes against the open sky. I estimated that five dragonflies were feeding in the area, although a maximum of two were visible simultaneously. The dragonflies flew at heights of 2–5 m above the ground along the edge of a forest clearing and along the wall of a building where the wasp nests were located and were observed pursuing and capturing insects near the nests. However, on more than 10 occasions when two dragonflies were visible, and on more than 20 occasions when one was visible, dragonflies approached but did not capture incoming wasp foragers. The dragonflies oriented toward individual wasps, often from distances of several meters, and rapidly approached to hover within 10 cm of the wasps. The dragonflies then remained oriented toward the wasps and followed their slow, looping flight. In all cases the dragonflies flew off rapidly after following the wasps closely for 1–3 s. Most pursuits of wasps involved *P. aequatorialis* foragers, but on one occasion a *Mischocyttarus* sp. forager was similarly followed and not captured. *Polybia aequatorialis* workers are approximately 1 cm in length and are substantially smaller than honey bees; therefore, their size is within the range of prey taken by *G. nervosa* (see below). I captured two of the dragonflies at 1810.

DISCUSSION

Dragonflies and other predatory invertebrates that rely heavily on vision [e.g., jumping spiders (Salticidae)] may play an important role along with vertebrate predators in the evolution of insect aposematism and mimicry. Whether naive dragonflies avoid wasps as prey, or can learn to avoid wasps after being stung, remains to be tested. Stinging eusocial Hymenoptera are not immune to dragonfly predation, and dragonfly hunger levels and the availability of alternative prey may influence the probability of dragonflies attacking defended insects. Several species of Aeshnidae from North America and Europe, including *G. nervosa*, have been observed feeding on worker honey bees (*Apis mellifera*) in apiaries (Needham, 1945; reviewed by Pritchard, 1964). Dragonflies also feed on chemically defended adult Lepidoptera (White and Sexton, 1989; Alonso-Mejia and Marquez, 1994). Prey choice and prey handling suggest that dragonflies behave as to avoid defense compounds in captured butterflies. For example, dragonflies apparently avoided chewing on butterfly body parts with high concentrations of defensive compounds (Alonso-Mejia and Marquez, 1994).

However, dragonflies' choices and handling responses to defended Lepidoptera are not always the same as those of vertebrate predators (Alonso-Mejia and Marquez, 1994).

Vespid wasp stings vary in potency among species [at least to human subjects (Starr, 1985)], but all eusocial Vespidae are equipped with stings. Wasp workers may be uniformly unacceptable to predators relative to chemically defended butterfly species which exhibit palatability spectra (Brower, 1984). Therefore, learning or natural selection to avoid wasps may be easy to achieve in a diversity of predators, making wasps particularly effective as models in mimicry systems. Experiments on prey choice and avoidance learning in dragonflies will be of value in establishing their possible role as selective agents in the evolution of insect visual mimicry.

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