

CHANGES FROM TERRITORIAL TO FEEDING ACTIVITY IN ADULT *ANAX WALSHINGAMI* McL. BEFORE SUNSET (ANISOPTERA: AESHNIDAE)

Reduced feeding activity is common in male territorial odonates while defending reproductive areas. Although energy used in territorial activities is slightly below than that acquired in feeding in some anisopteran species (C.S. FRIED & M.L. MAY, 1983, *Ecol. Ent.* 8: 283-292), few observations have been made on feeding activities different to those carried out in territories. Here I describe the change from territorial to feeding behavior in *A. walsinghami* after normal territorial defense.

Observations were made in the San Juan river, Zivantz , Quer taro, Mexico (20 30'N 99 33'W) on 8 and 9 August 1993. Adult *A. walsinghami* were very common on this river, where males usually defended long areas (range 10-18 m, N = 12 observed territories) along the river. Males arrived at the river at 0800-0830 h and aggressively defended their territories, making long patrol bouts until 1800-1830 h. The operational sex ratio was significantly skewed in favour of males in territorial activity ($\chi^2 = 12.89$, d.f. = 1, $p < 0.001$). Most of the time males were flying, searching for females. Intruders were quickly threatened and pursued. In two hours (1200-1400) of detailed observations, I did not observe any apparent feeding in six territorial males. After

1800-1830 h, the owners of territories abandoned their territorial behavior and other males and females of *A. walsinghami* arrived at the river. At this time sunlight was less intense, but it was still clear and coincided with the flying of several species of small-sized flies (Diptera). No aggression nor sexual attempts apparently arose among males and females. At 1900 h, I counted more than 50 individuals above a 10 m stretch of the river. All individuals were flying as in a twilight feeding swarm (FRIED & MAY, 1983), moving in fast turns from one place to another. In order to determine the new operational sex ratio, I caught, at random, 46 individuals between 1845 and 1930 h on 8 August. However, the ratio did not differ ($\chi^2 = 1.26$, d.f. = 1, $p > 0.05$) from that observed earlier. Although the captures could have had an effect, I did not see any obvious change in the number of animals (an indicator of possible stress), because the individuals remained in the same activity. No other odonate species were seen while individuals of *A. walsinghami* were feeding. The feeding activity ended around 1930-1945 h. At this time, the light level had fallen considerably; however some few individuals still remained in the same activity.

Energy expenditure is especially high in territorial dragonflies (HIGASHI, K., 1973, *Rep. Ebino biol. Lab. Kyushu Univ.* 1: 109-116; MAY, M.L., 1984, *Adv. Odonatol.* 2: 95-116). However, detailed observations on how energy expenditures, as feeding, are increased before, during, or after territorial activity are scarce. Besides, the shifting of territorial behavior to feeding swarms is an unclear mechanism when considering their aggressive behavior. In *A. walsinghami* no aggression nor sexual behavior was observed while they were feeding. Such behaviors were probably diminished by the feeding stimulus. Feeding might be released by the state of some physical factor or by the sudden occurrence of flies at the river.

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