Public Abstract

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Title:Age effects on reproductive behavior in the treehopper *Umbonia crassicornis* (Hemiptera: Membracidae)

In many animal species females select mates based on male age. This choice is often linked to the reproductive benefits females derive. Age-based choice is also influenced by variation in the ability of males to find and solicit matings from females. My dissertation investigated the effect of male age in influencing patterns of female choice, and in affecting variation in male reproductive behavior, in the treehopper *Umbonia crassicornis* (Hemiptera: Membracidae).

The social environment of *U. crassicornis* includes synchronous maturation of siblings in family groups, followed by limited dispersal from the natal site. Under these conditions, siblings may encounter one other frequently during mate searching which increases their risk of inbreeding. Female *U. crassicornis* that mate with a brother suffer from inbreeding depression. Two hypotheses for inbreeding avoidance in this species are kin discrimination and age-based mating. I tested these hypotheses in an experiment that presented females with simultaneous choices of three kinds of males: siblings, same-age non-siblings, and older non-siblings. Females did not discriminate between siblings and same-age non-siblings as mates, suggesting a lack of kin discrimination. However, females mated significantly more often with older compared to younger non-siblings. Given that females do not discriminate kin, inbreeding avoidance may thus be an important benefit of mating with older males.

How might female *U. crassicornis* identify older males? Males produce vibrational signals to attract females, and age-dependent expression of these signals may provide females with useful age cues. To investigate this, I recorded signals from 66 males over four consecutive weeks beginning at the onset of signaling. Results showed that signals change significantly with age in several features, and thus contain useful age cues. In a subsequent experiment, I presented females with signals representing different aged males and assessed their choices. There was no difference in preference among signals, indicating that females do not use long-range advertisement signals to identify older males.

Age-related variation in mate searching tactics may offer clues to the mating advantage of older *U. crassicornis* males. I performed an experiment that monitored age-based changes in patterns of male movement, flight activity, and courtship behavior. I examined these factors over the same age groups used to characterize male vibrational signals. I found that as males aged, flight activity decreased while within-plant movement rates increased. The time needed to find females on a plant increased with age; however, once they were found older males tended to remain in courtship for longer periods compared to younger males. Taken together, these results indicate that active plant to plant mate searching by younger males is replaced by more sedentary behavior in older males, which includes increasing the time spent in courtship. In addition, variation in the spatial distribution of females may have an important influence on the type of tactic used to find females.

In summary, this dissertation found significant effects of male age on the reproductive behavior of *U. crassicornis*. Female mating patterns are biased towards older males, which provide an important mating benefit via inbreeding avoidance. Male vibrational signals vary significantly with age, which may reflect the costly nature of producing mate advertisement signals in this species. However, females do not favor the long-range attraction signals of older males. Finally, the tactics males use to find and solicit matings vary with age, which affects male mating success.