

Acoustic differentiation and reproductive isolation between reed feeding *Chloriona* planthoppers

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In a recent review of research on the acoustic behaviour of planthoppers, Claridge & de Vrijer¹ concluded that planthoppers provide an ideal group in which to study the nature and pattern of variation in Specific Mate Recognition Systems (SMRS), and the possible modes of their evolutionary divergence. The SMRS of planthoppers appears to have at least two major components: 1) the acoustic communication through specific vibration signals produced by male and female during mate location and courtship, and 2) the association with a specific host plant, which is the natural transmission channel for the exchange of these vibration signals.

Most studies so far on the differentiation of acoustic calling signals in planthoppers have concentrated on genera in which each species appeared to be associated with a different host plant species. Therefore, species isolation in these groups seems to be dominated by host plant differentiation, to which the differentiation of acoustic signals does not seem to contribute much additional effect. The evolutionary divergence of acoustic signals between these species then probably has to be explained as the result of other processes, like environmental adaptation, sexual selection or drift. Acoustic interactions are likely to be more significant in species feeding on the same host plant. We have, therefore, focussed our attention now on *Chloriona* species which are all feeding on the same host plant, viz. common reed (*Phragmites australis*).

In Northern and Western Europe five or six *Chloriona* species show overlapping distributions, and up to four species have been found to coexist in the same habitat. Most species show very similar univoltine phenologies, with largely overlapping periods of adult emergence. Males can be reliably identified to species on the basis of distinct genital morphology. Among many hundreds of specimens collected in the field, not a single case of possible hybridization was found. Females could not always be reliably distinguished on morphology and so morphometric and electrophoretic techniques were also applied to the samples. Pure species cultures were established with samples from different origins, which, under long-day conditions (18 hour photoperiod), are producing four to six generations per year.

Acoustic recordings were made of single adult males and females, which had been collected from the culture as fifth instars and kept isolated for 6 to 8 days after adult ecdysis. The male calling signal appeared to be of a specific pattern for each species. The female calls were of the familiar type, typical for planthoppers. On the basis of differences in female variables, viz. call duration, pulse repetition rate, and temporal changes in repetition rate, all but two species appeared to produce distinct specific calls. However, *C.dorsata* and *C.smaragdula* could not be separated on female call structure.

Single pair crossing experiments (1, 2 and 8 days confinement) resulted in very low cross insemination rates: 0 - 5%. Group crossings (20 pairs, 21 days confinement) gave somewhat higher

cross insemination rates (0 - 20%) in certain combinations, but no viable hybrid offspring was produced. Thus, both premating and postmating isolation between all species studied seems to be strong.

At present studies are continued to further analyze the role of acoustic signals in mate selection, using playback techniques. In addition, populations are sampled on a wider geographic scale in order to assess patterns of geographic variation. We can also report that efforts are being made to develop DNA-techniques for an independent analysis of genetic variation patterns and interspecific relationships.

References

- 1 CLARIDGE, M.F. AND P.W.F. DE VRIJER, 1993, In *Ecology and Genetics of Planthoppers*, R.F. Denno & T.J. Perfect [eds], Chapman and Hall, New York (in press).