

## Species Concepts and Auchenorrhyncha Biodiversity

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Auchenorrhyncha are among the most species rich groups of insect herbivores and may be used as indicators of biodiversity for terrestrial ecosystems. Species are generally taken as the units of such biodiversity, but as Ernst Mayr has emphasised, the species concept has consistently over the centuries remained controversial.

Insect species, including those of Auchenorrhyncha, are normally defined in terms of clear morphological differentiation, in practice on a basis of dead preserved material - the practical *morphospecies*. Two current concepts compete for use in biodiversity studies.

1. *Biological species* concept recognises species as groups of reproductively isolated populations characterised by different specific mate recognition systems. An important consequence of the biological species is the frequent recognition of reproductively isolated cryptic or sibling species that show no clear morphological differentiation but which are reproductively isolated. In practice biological species are characterised by markers that are most frequently morphological, but often also cytological, behavioural, molecular, etc. These markers indicate reproductive isolation.

2. *Phylogenetic species* concepts have been developed over the past twenty or thirty years as a result of the desire of taxonomists to apply strict cladistic techniques and objective methods. This led to the widespread rejection of the biological species. Phylogenetic species are broadly defined as diagnosably distinct clades. Important problems concern the difficulty of determining objectively what is diagnosable, and very importantly the probability of ignoring sibling species.

Arguments between protagonists of these two philosophically very different concepts and their many variants, make great difficulties for persuading the world of the important role taxonomy must play in documenting biodiversity.

The Auchenorrhyncha provide a perfect group to test these concepts, with enormous numbers of species and frequent problems of morphological differentiation. Most importantly we know that in most groups, acoustic signals dominate at least the early stages of mate recognition, so that it is relatively easy to test the validity of other markers against acoustic differentiation. Here we discuss problems of species delimitation in the genera *Nilaparvata*, *Nephotettix* and *Cicadulina*. We conclude that the biological species as broadly recognised provides the best tool for the documentation and understanding of Auchenorrhyncha diversity.



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