Microcharacters as Generic Criteria.

A study of microcharacters (as viewed under the compound microscope) in the Eupatorieae and Astereae (Compositae) was undertaken in order to evaluate their reliability as taxonomic markers. Character states of various microcharacters are widely distributed within the tribes Astereae and Eupatorieae. Correlations between microcharacters and yet other characters were used in order to evaluate their applicability in delimiting genera. A high degree of microcharacter correlation with yet other characters was found in some species groups suggesting that they are useful and consistent markers among such taxa, whereas in other groups they may be of little value.

Symposium: Phylogenetic Systematics and Speciation

INTRODUCTION

Usually workers in the study of speciation operate by creating (or adopting existing) historical explanations for their observations. Distributions are divided, barriers erected and various degrees of reproductive isolation are invoked. Observations from other organisms that can be explained by the same scenarios are gathered together and a 'mode' is born. This symposium is an attempt to treat the study of speciation in a more empirical manner. Various 'modes of speciation' and species definitions are tested against the patterns of relationship and distribution of taxa in birds, fish, cacti, composites and mosses. Using this method for examining speciation may allow us to differentiate between refuted and corroborated 'modes' and definitions in the various groups of taxa examined.

In the Compositae several groups have been studied enough to investigate speciation (i.e., cladograms are available). Close examination of the distribution of groups of sister species in ten Latin American genera in the flowering plant family Compositae (six genera in the Liabeae; one in the Seneconaece; three in the Heliantheae) indicates that a hypothesis of allopatric speciation is refuted least often. In addition, area cladograms for the genera (cladograms that indicate the distribution of the terminal taxa) indicate that speciation as a result of vicariance can be corroborated as well as speciation as a result of dispersal. Finally, the only useful definition for composite species is one of morphological uniqueness.

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- Speciation in western North American birds.

In the 50 years since the development of the new synthesis, parapatric avian taxa in western N.A. have been studied intensively in a search for hybrid zones or other evidence of interspecific gene flow. Evidence has been used to relegate distinct evolutionary lineages to subspecies status, in accordance with the tenets of the Biological Species Concept (BSC). However, when the results of these studies are used to examine critically the reasonableness of the BSC, it is found that the concept does not make good evolutionary, phylogenetic, or population genetic sense for birds, because such species taxa may represent more than one evolutionary unit and terminal taxon. This inconsistency has led to ambiguity in the examination and interpretation of modes and patterns of avian speciation. When the data are interpreted in terms of an evolutionary or phylogenetic species concept, several empirical generalizations emerge. First, sympatric and parapatric modes of speciation are not consistent with the geographical distributions and with what is known about the population ecology of these organisms. Second, it does not appear that the differences in plumage patterns commonly found between hybridizing sister taxa function as reproductive isolating mechanisms because the birds, themselves, do not use them for that purpose.

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- Patterns and processes in moss speciation. The connecting link between systematics and evolution is phylogeny and the basic phylogenetic unit is the species. As such, species, the most fundamental hypothesis in systematics, must be monophyletic and exhibit some degree of apomorphy within the context of what is known about the biology of the taxon, in this case Musci. No species concept has been prevalent in moss systematics, which may be an asset, but future studies must address this subject. Previous considerations of moss speciation have approached the subject from one of two perspectives. Either known or assumed mechanisms have been reviewed or patterns based solely on extant distributions have been derived through a basically phenetic approach. Several processes have been defined: at the chromosomal level, polyploidy and aneuploidy are apparently frequent; particularly significant is the suggestion that half or more of the taxa examined at the gametophytic level are functionally diploid; finally, apogamy, apospory, and diplospory are thought to be frequent. While mechanisms can be described for any single event, we shall never know if the result is unique or general unless we can compare it to other events within and between monophyletic lineages. At present very few systematic studies have produced testable phylogenetic patterns. We may best study speciation, those genetic and epigenetic processes involved in the production of taxa, if we know the phylogeny of the species we study. The need now is to make predictions of processes based on observed patterns, and predictions of patterns based on detected processes which would provide an independent test of the value of each in elucidating evolutionary history.

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- Patterns of speciation in South American birds. A phylogenetic hypothesis for the differentiated taxa (=species) of a group also describes a biogeographic pattern. Congruence in such patterns implies a common history and permits us to identify those parts of history which are unique to each group. Approximately 35-40 areas of endemicism can be described for the neotropical avifauna. Cladistic hypotheses for more than 30 genera and species-groups demonstrate a remarkable degree of congruence in their biogeographic patterns. The following implications will be difficult to test: (a) the biogeographic pattern of continents is predominately by vicariance rather than by founder effects, (b) avian speciation patterns