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# Relationships Among Astereae (Compositae) Genera Having $X=6$

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## 453

LA DUKE, JOHN C. Department of Biology, University of North Dakota, Grand Forks, ND 58202. - Systematic relationships in Sphaeralcea section Fendlerianae.

Sphaeralcea was last revised in 1935 by T.H. Kearney. He divided the North American species into 12 sections based primarily on morphological characteristics. Section Fendlerianae is one of Kearney's central sections, having affinities with many other sections. This section contains six species divided into eleven subspecific categories. Data from flavonoid chemistry, chromosome numbers, artificial hybridizations, and morphological studies are used to analyze relationships among the taxa. Chromosomally, they are diploid ( $x=5$ ), tetraploid, and hexaploid. Tetraploid taxa are usually those that are uncommon in nature. Widespread taxa are predominately diploid. A similar situation exists relative to the distribution of flavonoid compounds. It is clear from the high degree of variation in the group that it is still evolving and delimiting taxa based on strict morphological criteria is difficult. However, patterns of variation are detectable and characters that are most useful in delimiting taxa will be presented.

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LAMMERS, THOMAS G. Department of Botany, The Ohio State University, 1735 Neil Ave., Columbus, OH 43210-1293. - Origin and evolution of the baccate Hawaiian Lobelioideae (Campanulaceae).

The flora of the Hawaiian Islands includes over 100 species of Lobelioideae (Campanulaceae). The majority belong to four closely related endemic genera: Clermontia Gaud., Cyanea Gaud., Delissea Gaud., and Rollandia Gaud. These genera are distinguished by their baccate fruits, axillary inflorescences, and woody habit. This suite of features is unique among lobelioids and together with their common chromosome number ( $n=14$ ) suggests that these four genera are derived from a single ancestral stock. The baccate Andean genera Burmeistera Triana and Centropogon K. Presl have been suggested as ancestors by most previous authors. A reconsideration of morphological data suggests that the baccate Hawaiian lobelioids are more likely derived from certain Indo-Malayan species of Pratia sect. Colensoa (J. D. Hook.) Hemsl. Cladistic analysis suggests that among the baccate Hawaiian lobelioids, the most primitive members are certain species assigned to Cyanea sect. Delisseoideae (Hillebr.) Rock, and that the other three genera are derived from various groups within Cyanea.

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LANE, MEREDITH A.\* AND RONALD L. HARTMAN. Department of E.P.O. Biology, University of Colorado, Boulder, CO 80309, and Department of Botany, University of Wyoming, Laramie, WY 82701. - Relationships among Astereae (Compositae) genera having  $x=6$ .

Among the homochromous Astereae (Compositae), a group of taxa having  $x=6$  and a suite of micro- and macromorphological features in common has been identified by our earlier survey studies. This group includes the genera Grindelia, Isocoma, Olivaea, Prionopsis, Pyrrocoma, Stephanodoria, and Xanthocephalum, as well as three species of Hall's Haplopappus sect. Blepharodon (the 'phyllocephalus complex'). The present study of a number of additional characters such as anatomical features of achenes, trichomes, florets and pappus, micromorphology of the pericarp, and eco-geographic distribution of the taxa confirms the taxonomic alliance of these genera. In conjunction with traditional and earlier-studied characters, the features studied here indicate the following: 1) that Xylorhiza, a genus previously thought by us to be a member of the group under study although it is heterochromous, is probably a distinct derivation of  $x=6$ ; 2) the pattern of relationships among the genera within

the homochromous  $\bar{x}=6$  group; and 3) the possible alliance of the group as a whole to yet other taxa.

## 456

LEMKE, DAVID E. Department of Biology, Southwest Texas State University, San Marcos, TX 78666 - A preliminary generic revision of Flacourtiaceae.

Flacourtiaceae is a large family containing over 80 genera and perhaps 1200 species. Despite its size and evolutionary importance the family has received relatively little attention from taxonomists and as a consequence has developed a reputation as a taxon in which to place many genera of uncertain affinities. As circumscribed by Warburg (1894) and Gilg (1925), the family is rather heterogeneous and indeterminate. The most recent generic treatment, that of Hutchinson (1967), represents a considerable improvement in our understanding of the family, but Hutchinson's Flacourtiaceae still contains a number of disparate elements. The present preliminary treatment is based upon studies of gross morphology, wood anatomy, palynology and phytochemistry and attempts to provide a revised framework for future systematic studies of this diverse family. Nine well-delimited tribes (Berberidopsidae, Oncobeeae, Scolopieae, Homalieae, Prockieae, Pangieae, Flacourtiaceae, Caseariae, Bembicieae) comprising 84 genera are recognized. Paropsieae and Alzateae are excluded from the family, and the genera of Hutchinson's Banareae are redistributed among several other tribes.

## 457

LES, DONALD H. Department of Botany, The Ohio State University, Columbus, OH 43210. - The evolution of achene morphology in Ceratophyllum (Ceratophyllaceae): I. Fruit-spine variation and relationships of Ceratophyllum demersum, C. submersum, and C. apiculatum.

Systematic studies in Ceratophyllum have been hampered by the lack of appropriate variational studies of fruit (achene) characters, which ironically, are used most often to delimit taxa. Previously, phylogenetic affinities between Ceratophyllum demersum, C. submersum, and C. apiculatum have remained vague, complicated by the apparent variational continuum in basal appendage length displayed by these taxa. A statistical evaluation of fruit-spine variation in C. demersum has helped to clarify these relationships. In this species, basal spine lengths are highly correlated with stylar spine lengths, and there is a direct, linear relationship between the lengths. Although stylar spine lengths are normally distributed, basal spine lengths are bi-modal, with an inordinately high proportion of shorter lengths. The fruit phenotypes of both C. apiculatum and C. submersum are paralleled by discrete variational phases observed within the continuous range of fruit-spine variation in C. demersum. Lacking other differences, C. apiculatum is regarded as conspecific with C. demersum. Ceratophyllum demersum and C. submersum, however, are distinct with regard to several other characters. The relationships in the fruit morphology of C. demersum and C. submersum provide a plausible hypothesis explaining the evolution of fruit morphology in these species, and may indicate a closer relationship than has been considered previously.

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LEWIS, PAUL O. and TOD F. STUESSY\*. Department of Botany, The Ohio State University, Columbus OH 43210. - Condensation of phenetic, cladistic, and patristic relationships for constructing classifications.

One of the basic goals of evolutionary systematics is the construction of phylogenetic trees depicting the evolution of particular groups of organisms. Of the various types of diagrams that may be drawn, three-dimensional phylograms are maximally informative in that they incorporate cladistic, patristic, and phenetic aspects of the evolution of a group. We present an explicit method of condensing the information in a three-dimensional phylogram to two dimensions, leading to more informed decisions concerning classification. The positions of the taxa in