INCLUSION OF THE APIACEAE (UMBELLIFERAE) IN THE ARALIACEAE

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ABSTRACT. Reasons why the author has treated the Apiaceae as three subfamilies in an expanded Araliaceae are discussed. One basic reason is that the phylogenetic gap between the Araliaceae (s.s.) and the Apiaceae is at most only of subfamily width. Intermediate taxa like *Myodocarpus*, *Mackinlaya*, and the Hydrocotyloideae almost bridge that phyletic gap. Secondly, the three apiad subfamilies appear to have arisen separately along with the Aralioideae out of proto-araliad stock in different parts of the world at different times. As usually treated, therefore, the Apiaceae is a polyphyletic family. Thus, the only rational treatment seems to the author to be recognition of the four closely related groups as subfamilies of one expanded family, for which the name Araliaceae has clear priority over the more recent Apiaceae (though not over the alternate name Umbelliferae still used by some taxonomists). Taxa related to the Araliaceae (s.l.) are briefly considered.

INTRODUCTION

I have been asked to explain my inclusion of the Apiaceae (Umbelliferae) as three subfamilies in the expanded family Araliaceae. I welcome the opportunity, for certainly so radical a suggestion, by no means original with me (see Rodríguez, 1971), demands some explanation. In our conservative taxonomy the burden of proof must always be on the taxonomist suggesting any shift from current taxonomic treatment. First, somewhat facetiously, I should like to point out that umbellifers are among my favourite plants. Also an inordinate number of my closest taxonomic friends, at least former friends, are umbelliferophiles (Stafleu, 1972). Thus, I insist that I start with no bias against an exceedingly handsome, aromatic, and "natural" assemblage of plants, studied by an able, well-informed, and forward-looking taxonomic élite.

PHYLOGENETIC PHILOSOPHY

How then does one account for this apparent personal aberration that sinks into the Araliaceae an esteemed group of plants heavily studied and widely accepted by such a competent corps of systematists? As was expected, the publication of my Synopsis (Thorne, 1968) generated many communications, a sizeable number of which questioned my reduction of the Apiaceae. My correspondents were too polite to suggest that perhaps my sanity, my judgment, and my competence were really the basic items to be queried.

Actually the reduction stems from the phylogenetic code or philosophy that I have tried to adhere to over the years, largely since 1949, during which I have been attempting to build up a more nearly phylogenetic and rational system of classification of the Angiospermae. I have stated earlier versions of this code as a series of guiding or operating principles (Thorne, 1958, 1963), which I have expanded greatly in the book on angiosperm phylogeny that I hope ultimately will clarify all my realignments among the taxa of flowering plants.

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One rule in my personal phylogenetic philosophy pertinent here is that all equivalent taxa, such as families or subfamilies, should be separated from groups most closely related to them by phylogenetic gaps of approximately the same size. Thus, the gaps separating the Apiaceae from the Araliaceae or the Asclepiadaceae from the Apocynaceae should be of the same width, in so far as we can determine it from extant taxa, as that separating the Fabaceae from the Rosaceae, the Urticaceae from the Ulmaceae, the Cyperaceae from the Juncaceae, etc. I am aware, of course, that consistency is sometimes claimed to be the hobgoblin of small minds; yet without some standards of consistency the phylogenist is subject to personal whims, to pressures from colleagues, and especially to the over-riding argument of taxonomic tradition. Tradition does help to preserve our taxonomy from capricious, faddish, and ill-conceived changes. It also tends to perpetuate clearly obsolescent names and systems of classification and to hinder badly the proper realignment of members of artificial groups. One need mention only briefly here the long-overdue scrapping of the absurdities of the Englerian and Bentham & Hooker systems of classification and the long-delayed demolition of such artificial taxa as the Amentiferae, Herbaceae, Lignosae, and Tubiflorae.

Application of this rule of consistency in the size of phyletic gaps between related taxa in the case of the Araliaceae-Apiaceae immediately calls into question the acceptability of the Apiaceae as a family distinct from the very closely related Araliaceae. The gap between the two groups of plants simply is not of the width that we normally expect and should require of distinct families. I would not insult the readers by suggesting that they are unaware of the pertinent monographs by Baumann (1946), Baumann-Bodenheim (1955), and Rodríguez (1957). However, being aware of literature describing intermediate taxa is nothing like having intimate field experience with those same taxa. My acceptance of the Apiaceae as a distinct family was not really seriously shaken until I spent a year and a half (1959–1960) in Australasia, where I came in close contact with the Hydrocotyloideae, Mackinlayeae, and Myodocarpeae, especially the New Caledonian *Myodocarpus*. It is much harder to ignore intermediate taxa when one has studied and collected them where they are indigenous.

I am unable to define either of the two groups as families in such a way as to definitively exclude members of the other group. Usually the Araliaceae (s. s.) are described as primarily tropical woody plants with stipulate, simple to decompound leaves; flowers in simple umbels, variously compounded; ovary usually 5–carpellate and 5–loculate; and fruit a berry or drupe. The Apiaceae, on the other hand, are mostly temperate herbaceous plants with sheathing, decompound leaves; flowers in compound umbels; ovary usually 2–carpellate and 2–loculate; and fruit a schizocarp with two 1–seeded mericarps. However, the aralioids do have temperate herbaceous members and the apiads a few tropical members. There are even some woody apiads. Distinct stipules are not always present in the aralioids, and the hydrocotyloids do have stipules. Flowers may be in simple or compound umbels or in involucrate capitula among both the aralioids and the apiads. Finally, some aralioid genera have bicarpellate and biloculate ovaries, which in *Myodocarpus* mature into schizocarps with one-seeded, winged mericarps. There are even procarpophores, primary ribs, and oil-tubes present in the dry

Myodocarpus schizocarps. Yet *Myodocarpus* species are woody plants with undoubted aralioid vegetative anatomy, flowers, and umbels in compound panicles.

A second rule pertinent here that I have attempted to adhere to in my phylogenetic efforts is to avoid polyphyletic taxa. The three sub-families of the Apiaceae appear to have arisen separately, perhaps in different parts of the world at different times, from proto-araliaceous ancestors. The hydrocotyloids have stipules and fruit with a woody endocarp but no free carpophore and no vittae (oil canals) in the grooves, though they may be present in the primary ribs. The saniculoids and apioids lack stipules but have fruit with a soft, parenchymatous endocarp, a free carpophore, and vittae usually distinct. The two latter subfamilies differ in the position of the style inside or at the tip of the stylopodium and in less obvious ways. They seem somewhat less distinct from each other than either does from the hydrocotyloids or the aralioids. However, in brief, the Apiaceae as usually recognised today appear to be a polyphyletic group.

To treat the Apiaceae as a single family violates the rule that a taxon should be monophyletic. To avoid this violation there are three possible courses of action. One can perhaps define monophyly very broadly to include all groups derived from a large common ancestral group (all the proto-araliads). That seems to be cheating a bit, and could, if carried too far, destroy the concept of monophyly vs. polyphyly. A second possibility would be to treat the three subfamilies of the Apiaceae as three separate families. With the present tendency toward taxonomic inflation recognizable among many taxonomists and some phylogenists, this is not really a radical suggestion. Each of the three families thus would have rank equivalent to the Araliaceae (s.s.). However, I do not consider the gaps among the four groups of more than subfamilial significance. Phylogeny and the teaching of taxonomy seem much better served by retaining the four groups as equivalent subfamiles in the Araliaceae (this family name having priority over Apiaceae, though not over the alternative name Umbelliferae still adhered to by more tradition-bound taxonomists). The close relationship of the four subfamilies is thus emphasized at the same time that their differences and probable separate origin from common proto-araliad ancestors are recognized. Because of their greater evolutionary breadth and their retention of many more primitive features, the Aralioideae would seem to be closest to the proto-araliad stock.

Related Taxa

Because the excellent paper by Rodríguez (1971) on the relationships of the Umbellales covers the subject so thoroughly, I need discuss here only some considerations not evident from my Synopsis (Thorne, 1968) and a few recent changes in my classification. As should be apparent from the placement of my broad Cornales and the sympetalous Dipsacales in the same superorder Corniflorae, I hold the members of these two orders to be closely related. Less evident from the synopsis is my belief that the Corniflorae are also rather closely related to the Rosiflorae, especially the woody Saxifragaceae (as Escallonioideae), Cunoniineae, and Pittosporales, in one direction and the more specialized Asteriflorae in another. Possible phyletic ties to

the Rubiaceae, as suggested by chemical similarities between *Alangium* and the Rubiaceae (Budzikiewicz et al. 1964), deserve further investigation. I cannot find any close phylogenetic ties, however, to the Rutales despite certain chemical similarities between the Araliineae and the Rutaceae and Burseraceae (but see Eyde & Tseng, 1971).

Within the Cornales I have made a few changes. The suborders Rhizophorineae and Vitineae remain as before. Within the Cornineae the relict genera of the Cornaceae need intensive investigation from many different botanical and biochemical disciplines. The family is a varied collection of divergent and probably ancient genera. As pointed out by Eyde (1966) and Philipson (1967), *Corokia* is better treated in the Saxifragaceae-Escallonioideae. The eastern Asiatic *Aucuba* and Australasian-South American *Griselinia*, apparently related to one another, probably deserve at least subfamily and perhaps even family (Aucubaceae) rank distinct from the Cornoideae (Philipson, 1967), or possibly they would be better placed as a subfamily near the Escallonioideae in the Saxifragaceae. This last family is another constellation of diverse, relict, mostly southern hemisphere genera deserving of much more study than they have received. The Madagascar genera *Kaliphora* and *Melanophylla* seem out of place in the Cornaceae also, and may be closer to the Araliaceae. *Mastixia*, *Curtisia*, *Helwingia*, and *Torricellia*, though retained still in my classification as separate subfamilies in the Cornaceae, may ultimately, with adequate comparative investigation of their morphology, anatomy, embryology, palynology, and chemistry, be shown to deserve the family rank already accorded most of them by some taxonomists. The rather striking similarities of some of these genera of the Cornineae with members of the Araliaceae are pointed out by Philipson (1967) and Rodríguez (1971). Within the Haloragineae I would now accept *Gunnera* as the distinct family Gunneraceae, equivalent to the Haloragaceae and Hippuridaceae. Furthermore, on evidence from Orchard's recent investigations of the Haloragaceae (1972), which indicate closest relationships with the Cornaceae and less so with the Rhizophoraceae, I believe the suborder Haloragineae is now better placed immediately after the Rhizophorineae. Herewith is my revised synopsis of the Cornales (Umbellales):

Order Cornales
- Suborder Rhizophorineae
  - Family Rhizophoraceae
- Suborder Haloragineae
  - Family Haloragaceae
  - Family Gunneraceae
  - Family Hippuridaceae
- Suborder Vitineae
  - Family Vitaceae
    - Subfamily Vitoideae
    - Subfamily Leeoideae (Leeaceae)
- Suborder Cornineae
  - Family Nyssaceae
    - Subfamily Davidioideae (Davidiaceae)
    - Subfamily Nyssoideae
  - Family Cornaceae
    - Subfamily Cornoideae

Subfamily Mastixioideae (Mastixiaceae)
Subfamily Curtisioideae
Subfamily Torricellioideae (Torricelliaceae)
Subfamily Helwingioideae (Helwingiaceae)
Subfamily Aucuboideae (Aucubaceae)
Family Alangiaceae
Family Garryaceae
Suborder Araliineae
Family Araliaceae (Apiaceae s.l. Umbelliferae)
Subfamily Aralioideae
Subfamily Hydrocotyloideae (Hydrocotylaceae)
Subfamily Saniculoideae
Subfamily Apioideae (Apiaceae s.s.)

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