

The Ferns of Florida

by Clifton E. Nauman

Two things are special about Florida's fern flora—diversity, and a low percentage of endemics; both features appear to be a result of the state's geographic location.

With regard to diversity, Florida's fern flora of 154 taxa is the largest in the continental United States. It is exceeded within the United States as a whole only by those of Hawaii and Puerto Rico. Even the rich Hawaiian flora of about 180 species boasts only a number of genera equal to or less than that in Florida (Lamoureux, unpubl. checklist). Therefore, at the generic level, Florida's fern flora may even surpass that of Hawaii.

This large number of taxa can be attributed to at least two factors, 1. Florida's geographic location between two major species sources, the Caribbean and continental North America, and 2. the diversity of habitats in the state. Though interdependent, these two aspects can be independent. For example, the Bahama Islands are situated between several sources for literally hundreds of fern taxa, notably Cuba and Hispaniola, yet the Bahama Islands have only a meager fern flora of about 45 species (Correll & Correll, 1982). This indicates that the availability of rich spore sources alone is insufficient for the development of a rich fern flora. Only when there is a diversity of ecological conditions and spore sources do we get the numbers and kinds of species occurring in Florida.

With regard to endemism, the number of fern endemics in Florida is rather low, accounting for 4% of the flora (see Table). This low number is also attributable to the state's

geographic position. Florida is not sufficiently isolated to prevent gene-flow from swamping out any emerging endemics.

The plant communities in Florida with a significant number of fern taxa are, more often than not, hybridized communities (i.e., mixtures of temperate and tropical elements). Evidence for this "hybridity" of Florida's plant communities comes from the fact that of the six endemic ferns, five are hybrid taxa and the other is only an endemic subspecies. The endemic subspecies may not be worth recognizing and one of the hybrids is now extinct.

These two features of Florida's fern flora are illustrated in the numbers and kinds of taxa from each of the major species sources. The table lists five of the easily recognizable sources. The numbers should be considered highly tentative. With renewed efforts to study the Florida flora in detail, there may be additions and deletions, as well as shifts of species from one category to another.

The widespread category includes those taxa with a broad geographic range, generally extending both north and south of Florida. This

category accounts for only a small percentage of our fern flora, probably because there are so few widespread ferns in general. *Osmunda regalis* var. *spectabilis* is an example of a widespread species, ranging from Canada south to Jamaica and Honduras.

The temperate category includes taxa that probably migrated originally to Florida from the north. This category can be broken into two subcategories: 1) truly temperate taxa—those occurring north of the Coastal Plain region, e.g., *Onoclea sensibilis*, and 2) warm temperate taxa—those occurring primarily within the Coastal Plain region, e.g., *Selaginella arenicola*.

The truly temperate taxa barely reach Florida's panhandle region. The Coastal Plain taxa may extend to the extreme southern portions of the peninsula. Taxa in both of these subcategories, in general, end their southward distributions just north of Lake Okeechobee; becoming absent or rare farther south. No one seems able to satisfactorily explain why these taxa do not occur farther south. Truly temperate taxa may be limited by a requirement for a cold period or specific photoperiod (cf. Patterson & Freeman, 1963) to break their dormancy. Ecological studies and even general field observations are nearly non-existent for the temperate Florida ferns.

Tropical taxa represent the largest number of taxa in the state, accounting for 42% of the fern flora. This category includes taxa that probably migrated originally to the state from the south. These taxa show a trend opposite to that of the temperate taxa and end their northward limits of distribution south of Lake Okeechobee, becoming rare or absent farther north. Experimental studies have shown that limits in northward distributions of some species (e.g., *Nephrolepis*) are a result of intolerance to cold temperatures (Nauman, 1979, 1981).

Growth habits also differ between the tropical and temperate taxa. Both groups are represented by terrestrial and epipetric (growing on rocks) growth habits. The tropical taxa, however, are also represented by a large number of epiphytic (living on nutrients in the air) species, e.g.,

Species sources for Florida's fern flora.

| Source | No. of taxa | Percent of Total |
|------------|-------------|------------------|
| Widespread | 9 | 6 |
| Temperate | 41 | 27 |
| Tropical | 65 | 42 |
| Endemic | 6 | 4 |
| Exotic | 33 | 21 |
| Total | 154 | 100.0 |



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Campyloneurum phyllitidis, a growth habit not exhibited by any of the temperate taxa.

Endemics are here defined as taxa geographically restricted to Florida and thought to have evolved in Florida. The six endemic taxa are represented by one endemic subspecies and five hybrid species. The endemic subspecies (*Trichomanes punctatum* subsp. *floridanum*) may not be justifiably recognized. Wessels Boer (1962) recognized the Florida material on the basis of morphology and geographic location. The Florida subspecies is intermediate between subsp. *punctatum* and *sphenoides* in morphology, and occurs at the same longitude as, but not north of, the region of range overlap for the latter two subspecies. Unless subsp. *floridanum*'s occurrence in Florida genetically isolates it from the other subspecies, it may be no more than a portion of a larger morphocline. Since ferns as a whole have little trouble dispersing to Florida, subsp. *floridanum* does not appear to be genetically isolated and may not be worthy of taxonomic recognition. If the subspecies is excluded, we are left with five hybrid endemics of several tropical species, and not all of the remaining endemics are still present in Florida. Three of the extant hybrids are in the genus *Asplenium*, *A. x biscayneanum*, *A. x curtissii*, and *A. x plenum*, and the remaining two are *Pteris x delchampsii* and *Tectaria x amesiana*. The latter hybrid is now extinct and one of its putative parent species, *T. coriandrifolia*, is no longer present in the state. Florida's endemics are here because conditions exist favoring the existence of hybrids, i.e., hybridized plant communities.

The last category, exotics, includes taxa introduced from cultivation, either accidentally or on purpose. These plants account for 21% of the fern flora. The number is high, but approximately the same for vascular plants in Florida as a whole (Wunderlin, pers. comm.). However, if we combine the popularity of ferns in cultivation (and hence the availability of a large number of exotics (cf. Johnson, 1986)) with the ease of dispersal by wind-blown spores, it is surprising there are not more exotic ferns in our flora.

Among the exotics, different degrees of escape, or naturalization, are exhibited. Each degree of escape

reflects the different species' abilities to colonize new areas and to compete with native taxa. Some, *Maxonia apiifolia* for example, were first found in the early half of this century (cf. Wherry, 1964) and have since disappeared, i.e., were temporary. Many of these temporary forms, however, are still in cultivation and may be reintroduced from time to time.

Other exotics are more firmly established in our flora. *Lygodium microphyllum*, for example, was introduced in the 1950s and by 1968 was known only from a few colonies (Beckner, 1968). By 1978 the species had spread to numerous colonies in both Palm Beach and Martin counties (Nauman & Austin, 1978). Today, the species is known from Broward, Collier, Highlands, and Polk counties as well; the species continues to spread. *Thelypteris dentata*, probably arriving from Asia about 1930, is now widely naturalized throughout the American tropics, including Florida (Smith, 1971). The Chinese Ladder Brake, *Pteris vittata*, has also become thoroughly naturalized; so much so, it hybridizes with the native species *P. bahamensis* to produce one of our endemic hybrids, *P. x delchampsii* (Wagner & Nauman, 1982).

There have also been some recent discoveries of species whose persistence is uncertain. Two species of *Adiantum*, *A. anceps* and *A. trapeziforme*, were reported from Dade County by Herndon & Herndon (1984). They reported *A. anceps* to be persistent, but not spreading in a protected location, and *A. trapeziforme* to be spreading, but occurring in a location likely to be developed. The continued presence or disappearance of these species is difficult to predict. Dr. A. Murray Evans has reported *Rhumora adiantiformis* from Hernando County (Lellinger, 1985) and Dr. R.P. Wunderlin (pers. comm.) has reported the species from Lee and Pinellas counties. These plants have been in cultivation for many years, but appear to have naturalized without human aid, and are likely to persist.

Overall, Florida's diversity of ferns and fern allies may be attributed to the diversity of its species sources and variety of habitats. Temperate and tropical sources account for 75% of the pteridophyte flora, exotics represent 21%, a significant proportion, and endemics account

for the last 4%.

The low number of endemics seems to be a result of Florida's geographic position. Continued gene-flow from neighboring regions has apparently prevented the formation of non-hybrid endemics. Yet the mixtures of plant communities from various sources have brought together certain species capable of hybridizing and have provided havens for their hybrid forms. If *Trichomanes punctatum* subsp. *floridanum* is not treated as an endemic subspecies, then Florida may have the singular distinction of possessing an endemic fern flora consisting entirely of hybrids.

Similar types of species sources and hybrid combinations of plant communities, to my knowledge, do not occur anywhere in the world. For that reason the diversity and hybrid endemism found in Florida represent a truly unique floral heritage.

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