

Cystopteris × *illinoensis*: a New Natural Hybrid Fern

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Cystopteris is a relatively small, cosmopolitan genus of ferns comprised of about ten species and several hybrids. In eastern North America, the genus as currently interpreted consists of six taxa, two of which are known to be of hybrid origin (Blasdell, 1963). The hybrids are *C. tennesseensis* (*C. bulbifera* × *protrusa*) and *C. laurentiana* (*C. bulbifera* × *fragilis* var. *fragilis*). Both are fertile allopolyploids which reproduce themselves sexually throughout their respective ranges. This paper concerns a new *Cystopteris* hybrid having aborted spores and sporangia and presents evidence showing that *C. bulbifera* and *C. fragilis* var. *mackayi* are the parents.

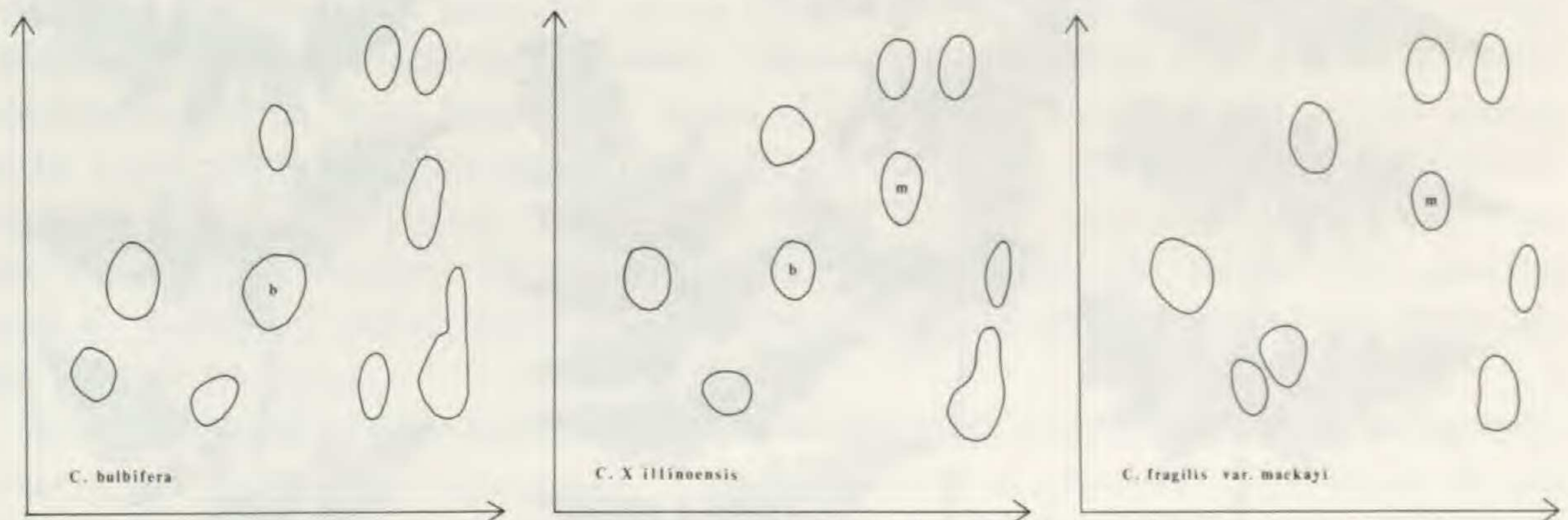


FIG. 1. Comparison of patterns of phenolic compounds separated by two dimensional paper chromatography in *Cystopteris* × *illinoensis* and its parents.

The writer first came across this unusual new hybrid fern when, as a graduate student at Southern Illinois University/Carbondale, he was asked to verify identifications of a box of fern specimens sent to the herbarium. The specimens were donated ten years earlier by Dr. Ralph C. Benedict, of Rockford, Illinois, who was a fern taxonomist and a long time active member of the American Fern Society. In the box of pressed unmounted specimens was a collection identified by Dr. Benedict as "*C. bulbifera* × *C. fragilis* var. *mackayi*". Location data stated that the hybrid was, "Very rare, found only once in Winnebago County, Ill. Old quarry with colony of var. *mackayi*—*Cystopteris bulbifera* a few yards away." The exact location of the quarry (almost certainly a dolomite quarry, since this is the only rock type in the area) was not given. However, Dr. Benedict removed the hybrid from the quarry and cultivated it in his garden in Rockford. The material sent to the Southern Illinois University herbarium (SIU) consisted of fronds gathered from the hybrid growing in cultivation. Since *C. bulbifera* × *fragilis* var. *mackayi* represented an undescribed hybrid, the writer decided to study the fern further.

Unfortunately, Dr. Benedict's house in Rockford was demolished years ago. A search of the vacant, weedy lot where the house once stood revealed no evidence of any cultivated ferns. Therefore, the current existence of the hybrid is unknown.

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HOLOTYPE

Cystopteris \times *illinoensis* R.C. Moran

(*C. bulbifera* \times *C. fragilis* var.
mackayi)

WINNEBAGO COUNTY, ILLINOIS

Exact location unknown. Collector's label reads: "Sterile, very rare, found only once in Winnebago County - old quarry with colony of var. mackayi - *Cystopteris bulbifera* a few yards away. I removed plant, now have propagated it. A very beautiful large black stemmed hybrid." These fronds are from Mr. Benedict's cultivated plants.

Coll. by: Ralph B. Benedict (s.n.)
Date: unknown (probably 1960's)

FIG. 2. Photograph of the holotype of *Cystopteris* \times *illinoensis*.

Morphological evidence indicates that the hybrid is intermediate between *C. bulbifera* and *C. fragilis* var. *mackayi*. The small, scaly bulblets, typical of other taxa of hybrid origin involving *C. bulbifera*, were found with the specimen material, but not attached to the fronds. Examination of the spores showed them to be aborted; in addition, many sporangia were also aborted. No known *Cystopteris* hybrid in eastern North America has aborted spores. Presumably this plant represents a sterile triploid hybrid, since *C. bulbifera* is a diploid and *C. fragilis* var. *mackayi* is a tetraploid (Blasdell, 1963). The large size of the fronds also suggests a triploid condition, for many triploid hybrid ferns are large in comparison to their parents (W. H. Wagner, pers. comm., 1980). The fronds have somewhat elongate apices with many pinna pairs and with occasional glandular hairs. These latter characters are typical of *C. bulbifera*. Dr. Benedict indicated on his handwritten label that the plant was, "a very beautiful large black stemmed hybrid." However, the pressed specimens have rich, red-brown, rather than deep black stipes. The dark, sclerotized stipe would appear to be a character acquired from *C. fragilis* var. *mackayi*. Unfortunately, the rhizome was not preserved; however, a short note found with the specimen stated, "Rhizome not creeping." Certainly the circumstantial evidence that the hybrid was growing with *C. bulbifera* and *C. fragilis* var. *mackayi* suggests the likelihood that these are the parents involved.

It was decided to gain further evidence of the plant's hybrid nature by using two-dimensional paper chromatography to study patterns of phenolic compounds. It was hypothesized that the hybrid's chromatogram might be additive with respect to different phenolic compounds observable in the two parental chromatograms. The phenolics were extracted in 80% methyl alcohol and examined by standard methods (Mabry et al., 1970). Plants of *C. bulbifera* and *C. fragilis* var. *mackayi* used in the chromatographic analysis were collected in Winnebago County, Illinois.

The results showed that all observable phenolic compounds present in the chromatogram of hybrid material were also present in one or both chromatograms of the parental material, i.e. the hybrid did not contain any unique compounds that were not present in either parent (Fig. 1). Most importantly, the hybrid material contained one phenolic compound present in *C. bulbifera* which was not present in *C. fragilis* var. *mackayi*, and one other phenolic compound present in material of *C. fragilis* var. *mackayi* but absent in material of *C. bulbifera*. Thus, the hybrid's chromatogram is, in large part, additive and supports the hypothesis that *C. fragilis* var. *mackayi* and *C. bulbifera* are the two parent species involved. The following is given as a formal diagnosis:

***Cystopteris* × *illinoensis* R. C. Moran**

Fig. 2.

Taxon originis hybridae ex *Cystopteride bulbifera* et *C. fragili* var. *mackayi*; parentibus ambobus sporis abortivis et vel bulbilis parvis squamosis statim distinctum. Frondes usque ad 50 cm longi; stipes et rhachis inferna atrorubella-brunnea; lamina morphologiae intermediae inter ambas parentes plerumque latissima basi; planta saxatilis saxis calcareis.

TYPE: Cultivated in the garden of Ralph C. Benedict at Rockford, Illinois, from wild material found once in an old quarry in Winnebago County, Illinois, date uncertain (probably 1960's), R. C. Benedict (ILL: isotypes ILLS, SIU).

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LITERATURE CITED

- BLASDELL, R. F. 1963. A monographic study of the fern genus *Cystopteris*. Mem. Torrey Bot. Club. 41(4):1-102.
- MABRY, T. J., K. R. MARKHAM, and M. B. THOMAS 1970. The Systematic Identification of Flavonoids. Springer-Verlag, New York.

REVIEW

"FLORA OF CHIAPAS, PART 2. PTERIDOPHYTES," by Alan R. Smith. 370 pp. California Academy of Sciences. 1981. \$30.00 + postage.—This is the first pteridophyte Flora of a state of Mexico to be published in twenty years, and the first modern pteridophyte Flora for any of the more tropical Mexican states. The number of pteridophytes is much greater than in the drier states of northern Mexico; Smith treats 46 fern allies in five genera and 563 ferns in 99 genera. The volume begins with an introduction, followed by a key to the genera of ferns; Smith notes that tropical ferns can be keyed more reliably to genus than to family because of the technical characters which must be used to distinguish ferns at the family level. The genera and species are treated alphabetically, rather than in systematic order. The synonymies pertain mostly to species described from Mexico and Central America, and include valuable data concerning types. Many species are handsomely illustrated, and literature references are given to illustrations in other works, which is useful to those who have access to good pteridological libraries. Original descriptions, habitat notes, and phytogeographical notes are included for each taxon. Some specimens, especially those collected by Dennis Breedlove, are cited. The fern-allies are similarly treated following the ferns. An appendix of abbreviations, an addendum, and an index to accepted names and synonyms concludes the volume. Because of the affinities of the Chiapas flora to that of Guatemala, neighboring countries, and to the adjacent Mexican states, Smith's Flora will be useful beyond the boundaries of Chiapas. Everyone concerned with Central American pteridophytes should have a copy of this book. Readers interested in a full discussion of the vegetation of Chiapas are directed to "Flora of Chiapas, Part 1. Introduction to the Flora of Chiapas," by Dennis E. Breedlove, who is the general editor of the entire "Flora of Chiapas," which is projected to appear in many volumes over several years. The California Academy of Sciences is to be congratulated for publishing these well prepared works at an affordable price.—*D. B. L.*