

# ECOLOGICAL NOTES ON *JAMESIANTHUS* *ALABAMENSIS* BLAKE AND SHERFF (*ASTERACEAE*) AND AN HYPOTHESIS ON ITS ENDEMISM

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*Jamesianthus* is a monotypic genus of the Asteraceae (Figure 1). Specimens of the plant were first called to the attention of Dr. Roland Harper in September 1937 by Mr. Robert Leslie James, an amateur botanist, who sent to Harper for identification a specimen of a yellow-flowered composite he had collected along stream banks near his home in Franklin County, Alabama. Harper, thinking it was a species of *Coreopsis* he had collected previously, but had not identified, put the specimen aside. In October 1940, Harper first observed *Jamesianthus* in the field and, realizing it was different from anything he had seen, sent specimens to Drs. Sherff and Blake at the Field Museum of Natural History in Chicago (Harper, 1943). After careful examination of the two specimens sent them by Harper, they concluded that the material represented a new genus and named it *Jamesianthus alabamensis* in honor of Mr. James (Sherff, 1940).

According to Sherff (1940) the closest relative to *Jamesianthus* is *Arnicastrum*, a genus with a single species and dubious variety described by Greenman. The epappose ray-achenes and 20–35 unequal, hipidulous, persistent, capillary bristles of the disc-achenes distinguish *Arnicastrum* from *Jamesianthus*, which has 6–8 unequal, deciduous capillary bristles arising from a whitish collar. At the time (1940) specimens of both genera were exceedingly rare, with *Jamesianthus* being known from only two Alabama specimens and *Arnicastrum* from three Mexican collections in Chihuahua and Durango. *Arnicastrum* remains exceedingly rare and may even be extinct (Marshall Johnston, pers. comm.).

The only other references to *Jamesianthus alabamensis* in the botanical literature are a report of its chromosome number ( $2n = 32$ ) by Johnson (1942), its inclusion in a list of Alabama endemics by Harper (1947), and its recent listings in Federal and State endangered species lists (U.S. Fish and Wildlife Service, 1975 and 1976; Thomas, 1976; Freeman et al., 1979). It was not included in any manual until the publication of Volume I, Asteraceae, of the Vascular Flora of the Southeastern United States (Cronquist, 1980). The present studies were initiated in September 1977 to determine the key elements in the life history of *Jamesianthus*, the extent and

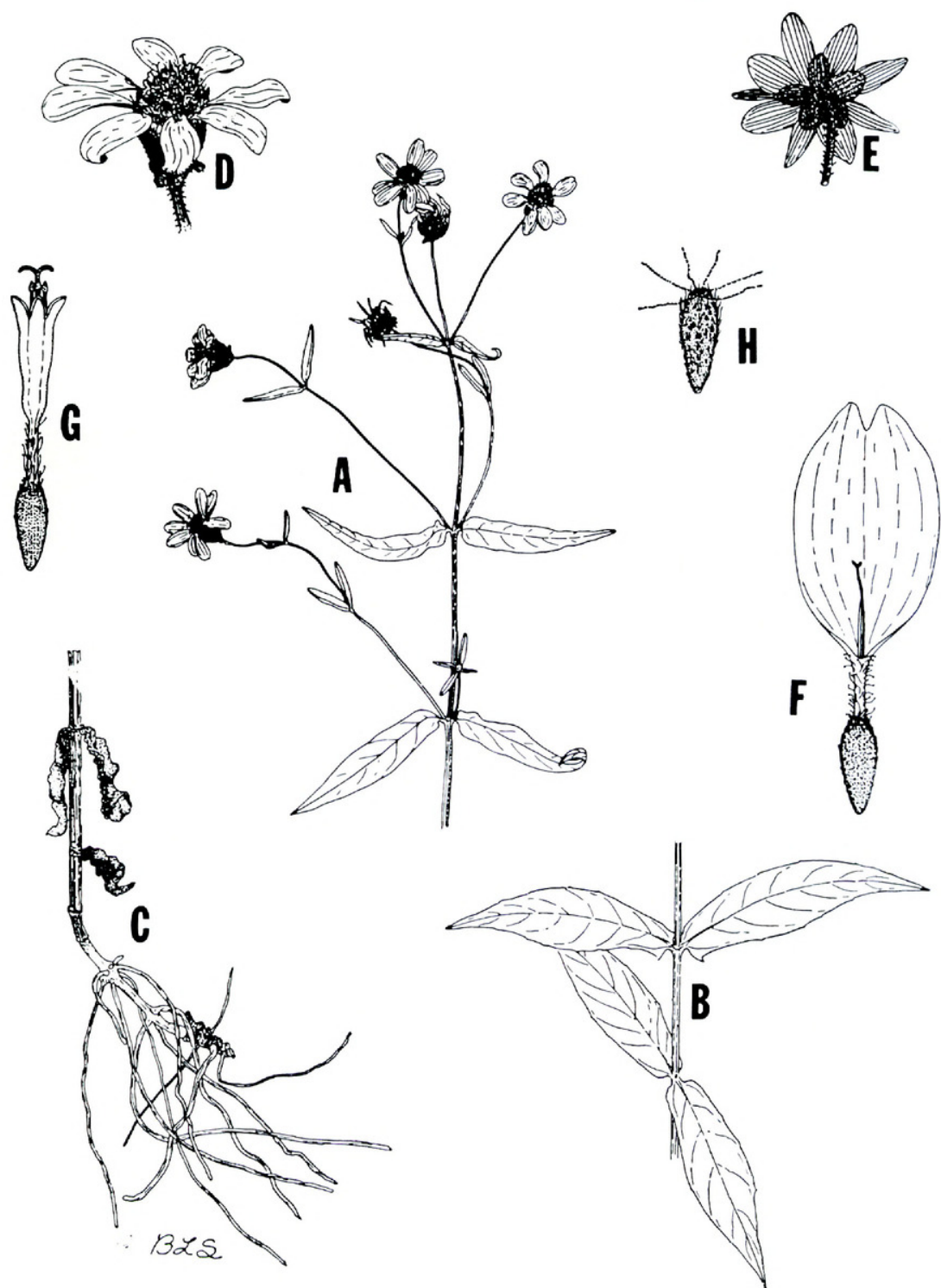


Fig. 1 *Jamesianthus alabamensis* A. Habit with flowers, X 4; B. Leaves, X 4; C. Base of plant, X 4; D. Head, X 16; E. Head with bracts, X 16; F. Ray flower, X 40; G. Disk flower, X 40; H. Achene, X 40.



condition of existing populations, and the factors contributing to its rarity.

*Jamesianthus* is a perennial species. All above ground parts begin to die back with the first killing frost, which usually occurs during the last week of October. Plants overwinter as conical buds on the fibrous rootstocks; no basal rosettes have been observed. Growth begins about the first of April as the conical buds unfold and small leafy rosettes appear. The stems elongate and vegetative growth continues through the spring and summer. Flower buds appear during July with anthesis beginning during mid-August and continuing until frost. The achenes mature during the late summer and fall. It appears that the perennating buds and achenes begin growth at the same time, as achenes planted in outdoor culture under ambient climatic conditions emerge at the same time as adjacent adult plants.

The habitat of *Jamesianthus* is found along the banks of small first- and second-order streams in an area known as the Little Mountain Formation. The stream beds are underlain by Hartselle sandstone which is covered to varying degrees by deposits of Tuscaloosa gravels and sand. The pH of the streams range from 7.3 to 8.2 and the conductivity ranges from 225 to 270  $\mu\text{mhos}$ . Sandstone streams typically are slightly acidic and the basic pH of the streams may be attributable to the limestone layer which overcaps the underlying sandstone. No plants of *Jamesianthus* have been found growing outside the riparian zone of these streams. In their natural state the streams would drain deciduous forests typical of the Interior Low Plateau physiographic province. Only second-growth forests remain and some areas along these streams have been cleared for cropland or pasture. *Jamesianthus* grows in both shaded and open areas, but seems to prefer partial shade. The woody canopy of the streams is composed of *Platanus occidentalis* L., *Acer negundo* L., *Liriodendron tulipifera* L., *Fagus grandifolia* Ehrh., *Acer rubrum* L., and *Fraxinus pennsylvanica* Marsh.; the subcanopy of *Cornus amomum* Mill., *Alnus serrulata* (Ait.) Willd., *Hamamelis virginiana* L., *Salix nigra* Marsh.; and *S. caroliniana* Michx.; and notable herbaceous associates include *Carex torta* Boott, *Chelone glabra* L., *Coreopsis tripteris* L., *Equisetum hyemale* L., *Helenium autumnale* L., *Helianthus microcephalus* T. & G., *Iris verna* L., *Justicia americana* (L.) Vahl, *Plantago cordata* L., *Rudbeckia fulgida* Ait., *R. hirta* L., *R. triloba* L., and *Verbesina virginica* L.

The extent of the distribution of *Jamesianthus* was determined by beginning at its type locality, four miles northwest of Russellville, and searching streams in northwestern Alabama and contiguous areas in northeastern Mississippi and southern Tennessee. No plants of *Jamesianthus* have been found further than six miles from its type locality, and most of the plants were within an area three miles on either side of the Colbert/Franklin County line northwest of Russellville. On a survey conducted September 10, 1980, the number of plants per 100 m of stream at seven localities varied from 20 to 100, with the median being 50. The number of plants of



*Jamesianthus* per 100 m of stream decreases with distance from the center of its distribution. In each of the seven localities there appears to be various age classes of plants present, indicating that the populations are viable and reproducing.

Why is *Jamesianthus* endemic to this small area of northwestern Alabama? Of the four types of endemism (paleoendemics, insular endemics, neoendemics, ecological endemics) discussed by Daubenmire (1978), *Jamesianthus* could best be explained as an ecological endemic. The geological habitat in which it occurs is unique. Three geological formations (Hartselle sandstone, Banger limestone, and Tuscaloosa gravel) outcrop in this region, coinciding with the range of *Jamesianthus*. The Tuscaloosa gravels are the youngest, overlapping Banger limestone which overlies Hartselle sandstone which rests upon other layers of limestone (Harris et al., 1963). In essence, there is a layer of sandstone exposed which is sandwiched between two layers of limestone. It is in the area where the small headwater streams have cut through the top layer of limestone to the sandstone, and into which gravels and sandy deposits of the Tuscaloosa group have washed, that *Jamesianthus* occurs. The streams cut back into limestone as they proceed in any direction from this sandstone region. Therefore, *Jamesianthus* is restricted to the streams of a small sandstone outlier.

Even though the distribution of *Jamesianthus* is limited to these small geologically unique streams of northwestern Alabama, its present restriction to this area cannot be explained on the basis of a narrow ecological amplitude and affinity for this particular habitat. Transplant studies over the past three years have demonstrated that *Jamesianthus* will grow perfectly well, flower and produce viable achenes in a variety of habitats from upland open pine to deciduous woods. Also germination experiments have shown that achenes will germinate with or without stratification in a pH range from 4 to 9 on such varied substrates as wet filter paper, peat, potting soil, and dolomite. The germination percentage in most tests was slightly greater than 30 percent.

It is believed that the present factor limiting the distribution of *Jamesianthus* is dissemination to suitable habitat. The achenes of *Jamesianthus* have only a deciduous pappus of capillary bristles. Therefore they are not suited for dissemination by animals or wind. They will float for short periods, and this appears to be its means of dispersal. As discussed previously, *Jamesianthus* is found only on the banks of small first- and second-order streams. As these are headwater streams which change in size, depth, flow and bank characteristics, it may be that habitat for successful establishment of the floating achenes downstream is simply lacking.

It is therefore proposed that *Jamesianthus* is an ecologic endemic that arose as Daubenmire (1978) states "through the rare concomitance of a mutation or hybridization producing an individual preadapted to an environ-

ment different from that of the parent stock(s)." The parent stock of *Jamesianthus* was conceivably widespread at one time, probably giving rise to both *Jamesianthus* and *Arnicastrum*, but for some reason has long since become extinct. The particular genetic characteristics that once restricted *Jamesianthus* to its unique niche and separated it from the parental stock apparently have been altered or lost, but it continues to be restricted due to lack of an effective dissemination mechanism.

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