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Lycopodium hickeyi: A New Species of North American Clubmoss

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Recent studies of North American Lycopodiaceae are relatively few, but they have led to some major changes from the taxonomic treatments of the first half of this century (e.g., Eaton, 1890; Fernald, 1950). At the generic level, pteridologists generally agree that the classical genus *Lycopodium* comprises several distinct genera (Øllgaard, 1987), but they do not generally agree as to how many segregate genera to recognize. At the specific level, pteridologists now generally agree that closely related taxa treated by previous workers as varieties of single species are better ranked as distinct species. In North America, examples of this change in rank can be found in the *Huperzia selago* group (Beitel, unpubl.), the *Lycopodiella inundata* group (Bruce, 1976), and the *Lycopodium complanatum* group (Wilce, 1965).

This paper deals with the question of rank for a taxon in the *L. obscurum* group, commonly referred to as the ground pines or tree clubmosses. Over the years, pteridologists have disagreed as to what rank members of this group should receive. In 1803, a half century after Linnaeus described *L. obscurum*, Michaux distinguished a close relative, *L. dendroideum*. The former was colloquially referred to as the "flat-branched" tree clubmoss, the latter as the "round-branched" tree clubmoss due to their different phyllotaxies, orientation, and relative development of the leaves of different ranks. In 1890, D. C. Eaton placed *L. dendroideum* as a variety of *L. obscurum* without comment. This placement was followed by nearly all flora writers and writers of popular fern books during the first half of the 1900s.

The situation changed when, from 1974 to 1978, Dr. R. James Hickey worked on the taxonomy of the *L. obscurum* group in North America and eastern Asia (Hickey, 1977, 1978). After detailed studies of geography, ecology, habit, and leaves of the central and lateral axes, he concluded that three species should be recognized: *L. obscurum* of eastern North America, *L. dendroideum* of northern North America and eastern Asia, and *L. juniperoideum* Sw. of eastern Asia. In addition, he concluded that a new variety of *L. obscurum* should also be recognized: var. *isophyllum*. The new variety resembled *L. dendroideum* by its equally spreading and equal-sized leaves which impart a cylindrical aspect to the branchlets. But the new variety more closely resembled *L. obscurum* by its phyllotaxy and its appressed leaves on the main erect stem below the first lateral branches. In essence, the new taxon was a round-branched variety of the flat-branched tree clubmoss. Hickey (1978) used the varietal category for his new

taxon, rather than the specific, to stress that *isophyllum* was more closely related to *obscurum* than to *dendroideum* (Hickey, pers. com.).

In 1982, Fusiak tested Hickey's classification by studying the flavonoids of *L. dendroideum* and the two varieties of *L. obscurum*. He found that only one flavonoid (chrysoeriol) was present in all three taxa and that it was restricted to the spores, sporophylls, and axes of the strobili. Thus, flavonoid evidence did not support the separation of three taxa, nor did it negate it. We feel that the absence of flavonoid markers is not surprising considering the overall lack of flavonoid diversity within the group.

In our own field studies, we have examined hundreds of populations of vars. *obscurum* and *isophyllum* nearly throughout their range. We are now convinced that var. *isophyllum* is a separate species. We came to this conclusion for two main reasons. First, when growing together in the same habitat, which they commonly do, their differences (Table 1) remain unchanged. Second, we have found no intermediates. If intermediates or hybrids exist they must be extremely rare. These observations suggest that the "varieties" would be good species under either the morphological or biological definition of species.

In addition, we use species rather than variety because the varietal category implies to many taxonomists a difference in range. The ranges of *obscurum* and *isophyllum* coincide almost entirely, except that *isophyllum* extends further north and west. We know of no true varieties in pteridophytes that have congruent ranges and co-exist in the same habitats.

TABLE 1. Differences between *Lycopodium hickeyi* and *L. obscurum* (modified from Hickey, 1977, 1978).

Character	*L. hickeyi*	*L. obscurum*	*L. dendroideum*
Distribution	Labrador and Newfoundland to Minnesota, south to S. Appalachians	Nova Scotia and New Brunswick to N. Michigan and Wisconsin, south to S. Appalachians	Labrador to Alaska, south to West Virginia and Washington, also Asia.
Habitat (overlap extensive):	drier woods, often on sandy soils	mesic woods, often on loamy soils	mesic woods, often on loamy soils
Leaf length	4 (2.5–5) mm	3.6 (1.3–6.3) mm	3.9 (2.4–5.5) mm
Leaf width	0.7 (0.4–1) mm	0.8 (0.4–1.2) mm	0.8 (0.5–1.2) mm
Ventral leaves	resembling those of the other ranks	much smaller than those of the other ranks	resembling those of the other ranks
Leaf divergence	all ranks divergent and equally so	dorsal and ventral ranks appressed	all ranks divergent and equally so
Leaf shape	linear-attenuate	linear-acuminate to linear-acute	linear-attenuate
Leaf apex angle (degrees)	27 (21–36)	40 (27–59)	37 (19–58)
Orientation of lateral leaves	not twisted	twisted into the same plane as the dorsal and ventral leaves	not twisted
Leaves on erect stem below first branch	appressed	appressed	spreading

On the basis of the above arguments, we recognize Hickey's new taxon as a distinct species. We do not, however, adopt his epithet because *isophyllum* is no more isophyllous than *L. dendroideum* or *L. juniperoideum*. Accordingly, we name the species for Dr. Hickey, in recognition of his careful work and insight in first recognizing this clubmoss after it had been overlooked by all previous workers in one of the most thoroughly studied floras in the world.

Lycopodium hickeyi W. Wagner, Beitel, & R. C. Moran, nom. et stat. nov.—*L. obscurum* var. *isophyllum* R. J. Hickey, Amer. Fern J. 67:47. 1977.—HOLOTYPE: United States. Pennsylvania: Crawford Co., Rte. 322, 2 miles W of Cochranton, woods and marsh next to Powell Hollow, 5 July 1974, *Williamson 91* (MU).

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