

A NEW LINDERA (LAURACEAE) FROM NORTH AMERICA¹

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THE GENUS *Lindera* Thunb., composed of upwards of 100 species, is primarily of eastern Asia (Wood, 1958), with only three species in North America. *Lindera benzoin* (L.) Blume (including *L. benzoin* var. *pubescens* (Palmer & Steyererm.) Rehder), the most common and widespread North American taxon, ranges generally throughout eastern North America from Maine, southern Ontario, and southern Michigan southward, and westward into Kansas, Oklahoma, and Texas. It occurs in mesic habitats along shaded streambanks and in damp woods and bottomland swamps. *Lindera melissifolia* (Walter) Blume, a rare and local species, inhabits mesic to hydric sites (i.e., bottomland hardwoods, depressions, and margins of sandy sinks and ponds). Extant populations are presently known from the Coastal Plain of North Carolina, South Carolina, Georgia, Mississippi, and along the Arkansas-Missouri state line (MAP 1). Populations from Alabama (Wilcox Co., *Buckley s.n.*, GH!, NY!, US!), western Florida (without specific locality, *Chapman s.n.*, NY!), and Louisiana (without specific locality, *Hale s.n.*, GH!) have not been seen in over a century and are probably now extirpated from these states. The nomenclatural history, ecology, distribution, and morphological features for separating *L. melissifolia* from *L. benzoin* were elucidated by Steyermark (1949).

During herbarium studies in preparation for a forthcoming treatment of Lauraceae for the *Vascular Flora of the Southeastern United States* (J. R. Massey, ed.), I encountered great difficulty in placing a number of collections of *Lindera* within the circumscription of either *L. benzoin* or *L. melissifolia*. Most of these collections were made from the Mississippi Gulf Coastal Plain by Drs. Sidney McDaniel and Ken E. Rogers. Subsequent field and herbarium studies have led me to conclude that these specimens are representative of a new species, described here.

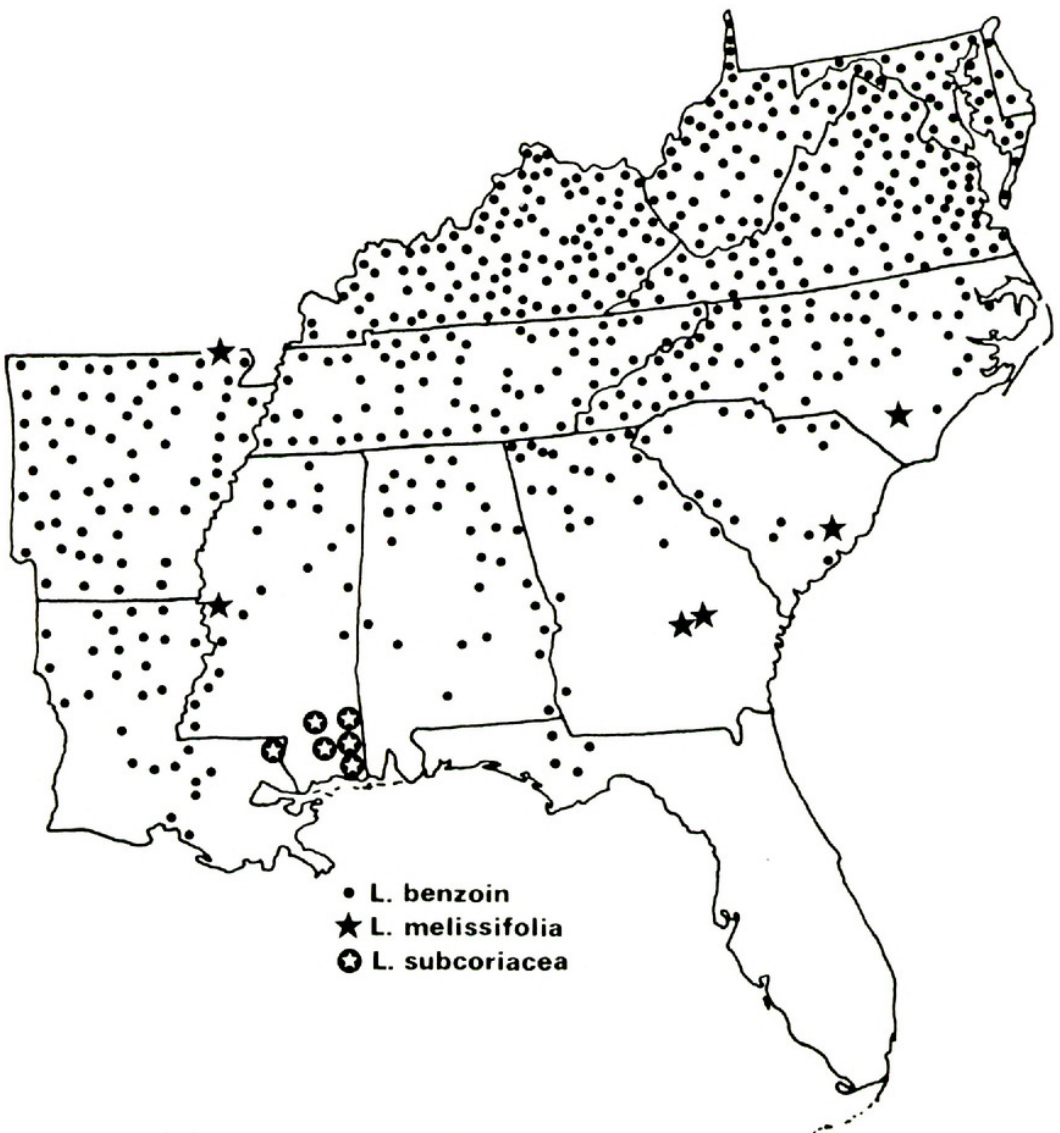
Lindera subcoriacea B. E. Wofford, sp. nov.

FIGURE 1.

Frutex parvus, ad 2 m alta, dioecious. Folia subcoriacea, vix aromatica, elliptica vel oblanceolata, 4–7.5 cm longa, 2–3.5 cm lata, apice obtusa vel rotunda. Drupa vivida rubra, ca. 10 mm longa, elliptica.

Dioecious, deciduous shrub to 2 m. Stems smooth, light gray and pubescent when young, becoming darker gray and glabrous with age. Leaves with petiole canaliculate, 3–10 mm long, pubescent; blade subcoriaceous, horizontal to ascending, elliptic to oblanceolate, 4–7.5 by 2–3.5 cm (lower stem leaves re-

¹Contributions from the Botanical Laboratory, The University of Tennessee, N.S. No. 543.



MAP 1. Distribution of *Lindera* in the southeastern United States.

duced), the apex obtuse to rounded, rarely slightly acuminate (mucronulate when young), the base cuneate, the margin entire (ciliate when young), the venation eucamptodromous, the lower surface pale green, glaucescent, moderately pubescent, the upper surface darker green, pubescent when young, becoming essentially glabrous with age. Flowers appearing before leaves in axils of preceding year's leaves on stout, supraaxillary branches 1.5 mm long and terminated by vegetative bud; inflorescences of 1 to 4 umbellike cymose clusters, each cluster 3- or 4- (rarely 5-)flowered, subtended by 2 pairs of concave, decussate, coriaceous, deciduous bracts, with outer pair 2.5 by 3 mm, inner pair 3 by 3.5 mm, the secondary bracts caducous, tepaloid, reduced. Flower buds globose, ca. 2.5 mm wide; flowers imperfect, regular; tepals 6, 2.2 mm by 1.8 mm, glabrous, pellucid-punctate, perianth tube short. Staminate flowers on pedicels to 4 mm long; stamens 9, introrse, 2-locular, yellow, those of series

I and II similar, 2.5 mm long, with anther 1 by 1 mm, those of series III 2.5 mm long, filament broadened, each with pair of conspicuous glands at base, those of series IV lacking; pistillodium 1.2 mm long. Pistillate flowers on pedicels to 1.5 mm long; tepals slightly smaller than those of staminate flowers; stamens variously developed, often reduced to glands resembling those at base of series III stamens of staminate flowers; stigma papillose, style 1 mm long, the ovary elliptic, 1 by 0.6 mm. Drupes bright red, ca. 10 mm long, elliptic, borne on pedicels to 4 mm long.

TYPE. Mississippi, George Co., hillside bog 1 mi NW of Escatawpa River and 100 yd SW of Hwy. 98, 27 July 1982, *B. E. Wofford 82-121*, with *D. L. Scott & M. G. Lelong* (holotype, A; isotypes, IBE, NY, RSA, TENN, VDB).

DISTRIBUTION AND PHENOLOGY. Open areas of permanently wet, peaty, evergreen shrub bogs on Gulf Coastal Plain of Mississippi and Louisiana (MAP 1). Flowering in mid-March; fruits maturing in late fall.

SPECIMENS EXAMINED. **Louisiana.** WASHINGTON PARISH: swampy woods beside La. 10 and Lawrence Creek, 2 mi E of Franklinton, sect. 29, T. 2 S, R. 11 E, *Thomas et al. 32367* (NLU). **Mississippi.** FORREST CO.: ca. 100 yd W of Hwy. 49, S of Hattiesburg ca. 7 mi from jct. of hwy. 98 and 49, S border of artificial pond, *Rogers 4932* (MISS). GEORGE CO.: 5.5 mi S of Agricola, common shrub in quaking bog, *McDaniel 4165* (FSU, IBE); 5.5 mi S of Agricola, *McDaniel 10345* (FSU, IBE, Miss. Mus. Nat. Sci., SMU), *10348* (FSU, IBE); quaking bog 5.5 mi S of Agricola, W side of Hwy. 613, sect. 32, T. 3 S, R. 5 W, *Gordon 2576* (Miss. Mus. Nat. Sci.); peat bog 5.5 mi S of Agricola and ca. 0.3 mi N of George/Jackson Co. line on W side of Hwy. 613, *Wofford 82-3* (TENN); boggy area on open hillside along S side of Hwy. 98, ca. 0.5 mi W of Alabama-Mississippi state line, NW¼ sect. 20, T. 2 S, R. 4 W, *Lelong 5199* (NCU); at Mississippi-Alabama line off Hwy. 98 ca. 200–300 yd S of hwy., *Rogers 2902* (MISS, MO, NCU); bog in longleaf pine woods S of U. S. 98 just W of Alabama state line, *Thomas et al. 43060* (LSU, NLU); Shipman bog, Wilmer Quad., sects. 18 (SW¼), 19 (NW¼), 13 (SE¼), T. 1 S, R. 4 W, *Rogers 45917* (TENN); 0.8 mi NW of Escatawpa R. off Hwy. 98 to Lucedale, *Lelong s.n.*, 3 April 1981 (TENN); ca. 0.8 mi W of Mississippi-Alabama state line on Hwy. 98, SE¼ sect. 13, T. 2 S, R. 5 W; SW¼ sect. 18, T. 2 S, R. 4 W, *Gordon et al. 2552* (Miss. Mus. Nat. Sci.); hillside bog ca. 0.8 mi W of Mississippi-Alabama line S of Hwy. 98, *Gordon & Burris 2749* (Miss. Mus. Nat. Sci.); Wilmer Quad., 1 mi NW of Escatawpa R. then 100 yd SW of Hwy. 98, *Wofford et al. 81-47* (A, TENN); upland bog ca. 1 mi W of Escatawpa R. and 100 yd SW of Hwy. 98, *Wofford et al. 82-1* (TENN). GREENE CO.: acid bog 2 mi SE of Leakesville, Hwy. 63, *Jones 8484* (FSU, MISS); bluff SE of Chickasawhay R. at Leakesville, *Jones 11225* (FSU, MISS). JACKSON CO.: evergreen shrub bog, ca. 1.5 mi W of LaRue and ca. 100 yd W of dirt road, sect. 23, T. 5 S, R. 9 W, *Wofford 82-2* (TENN). STONE CO.: Toc-O-Leen Lake, sect. 20, T. 2 S, R. 13 W, *Rogers 8769* (MO, NCU, NY, SMU, USF).

Salient features for recognizing *Lindera subcoriacea* include its subcoriaceous, elliptic to oblanceolate leaves (obtuse to rounded at the tip) that are less than 7.5 cm long and only faintly aromatic. Although several primarily northern deciduous woody taxa tend to produce more coriaceous or semievergreen leaves near the southern limit of their ranges, the thickened leaves of *L. subcoriacea* appear to be a genetic divergence; *L. benzoin* leaves remain membranaceous at roughly the same latitude in Florida, southwestern Mississippi, and Louisiana. Other characters that can be used to separate the three North American taxa are summarized in TABLE 1.



FIGURE 1. Holotype of *Lindera subcoriacea* Wofford.

TABLE 1. Character comparisons of the North American taxa of *Lindera*.

CHARACTER	TAXON		
	<i>L. subcoriacea</i>	<i>L. benzoin</i>	<i>L. melissifolia</i>
Leaf			
Texture	Subcoriaceous	Membranaceous	Membranaceous
Length \times width (cm)	4–7.5 \times 2–3.5	6–15 \times 3–6	8–16 \times 3–6
Shape	Elliptic to oblanceolate	Obovate	Ovate to elliptic
Apex	Obtuse to rounded	Acuminate	Acute
Base	Cuneate	Cuneate	Widely cuneate to rounded
Pubescence (abaxial side)	Present	Present or absent	Present
Orientation	Horizontal to ascending	Horizontal to ascending	Drooping
Fragrance	Faint, piny lemon	Strong, "spicy"	Strong, sassafras-like
Fruit			
Length (mm)	10	10	12
Pedicel	Not thickened at apex; deciduous	Not thickened at apex; deciduous	Thickened at apex; persistent

Lindera subcoriacea is restricted to open areas of permanently wet, peaty, evergreen shrub bogs on the Gulf Coastal Plain of Mississippi and Louisiana. These highly organic, acidic microhabitats are fire dependent and offer abundant sunlight, moisture, and few competitors. In small (up to ca. 5 m in diameter) areas of deep peat accumulation, they simulate the "quaking" nature usually associated with the more familiar peat bog formations of cooler regions of the Northern Hemisphere. Dominant woody plant associates include *Cliftonia monophylla* (Lam.) Britton ex Sarg., *Magnolia virginiana* L., *Persea palustris* (Raf.) Sarg., *Myrica heterophylla* Raf., *M. cerifera* L., *Ilex glabra* (L.) A. Gray, *Hypericum brachyphyllum* (Spach) Steudel, and *Smilax laurifolia* L. Herbaceous associates are more variable in frequency and reflect the seral stage of each individual bog. Some of the more common of these include *Sarracenia alata* (Wood) Wood, *Oxypolis filiformis* (Walter) Britton, *Lophiola americana* (Pursh) Wood, *Sabatia macrophylla* Hooker, *Dichromena latifolia* Baldwin, *Zigadenus glaberrimus* Michaux, *Rhexia alifanus* Walter, *R. petiolata* Walter, *Polygala cruciata* L., *P. cymosa* Walter, *Fuirena squarrosa* Michaux, *Cacalia lanceolata* Nutt., *Muhlenbergia expansa* (DC.) Trin., *Panicum spretum* Schultes, *P. scabriusculum* Ell., *P. nudicaule* Vasey, *Stokesia laevis* (Hill) Greene, and *Eupatorium recurvans* Small.

Conversely, both *Lindera benzoin* and *L. melissifolia* occur on mostly shaded, mesic or slightly hydric sites but never in areas that are saturated throughout the growing season. In the southeastern United States *L. benzoin* is associated with taxa characteristic of shaded alluvial woods and eastern deciduous forests

(e.g., *Acer saccharum* Marsh., *Liriodendron tulipifera* L., *Fagus grandifolia* Ehrh., *Aesculus glabra* Willd., *A. octandra* Marsh., *Sanguinaria canadensis* L., *Erythronium americanum* Ker-Gawl., *Claytonia virginica* L., *Polystichum acrostichoides* (Michaux) Schott, *Dentaria* spp., and *Trillium* spp.). Similarly, *L. melissifolia* occurs on mesic or slightly hydric sites that are occasionally inundated for several months during the growing season. Along the Mississippi Embayment in Mississippi and Arkansas, I have observed this taxon in low depressions of bottomland forests dominated by species of *Ulmus*, *Liquidambar*, *Celtis*, *Fraxinus*, and *Quercus*. Such forests are somewhat transitional in species composition between swamp forests and eastern deciduous forests. These local depressions, however, are often filled with dense clonal stands made up almost exclusively of *L. melissifolia* with essentially no characteristic herbaceous associates. On the Atlantic Coastal Plain *L. melissifolia* occurs around the margins of limestone sinks and pineland depressions. Competition with herbaceous associates, with the exception of *Woodwardia virginica* (L.) Sm. and occasional *Xyris* and *Eupatorium* spp. (R. Porcher, pers. comm.), is also minimal here.

Distributional and phenological data provide additional evidence for the recognition of *Lindera subcoriacea* as a distinct species. On the Gulf Coastal Plain it is disjunct from the nearest known population of *L. benzoin* by ca. 75 miles, and from the nearest population of *L. melissifolia* by ca. 150 miles (see MAP 1). Field studies in the spring of 1982 showed that *L. subcoriacea* reached peak anthesis on March 18–20, while the Mississippi population of *L. melissifolia* 150 miles to the north had flowered about seven to ten days earlier. More importantly, by March 21 nearby populations of *L. benzoin* in West Feliciana Parish, Louisiana, and Wilkinson Co., Mississippi (both at roughly the same latitude as *L. subcoriacea*), had half-expanded leaves, young fruits, and only a few scattered remnants of withered staminate inflorescences. Although more detailed phenological studies are needed, it is safe to conclude that existing geographic and phenological barriers preclude opportunities for gene exchange between *L. subcoriacea* and either *L. benzoin* or *L. melissifolia*.

Fragrances from crushed leaves and stems provide additional characters for species delimitation. *Lindera benzoin* emits a distinct and familiar "spicy" fragrance. *Lindera melissifolia* exudes an odor similar to that of sassafras (Steyermark, 1949; Godfrey & Wooten, 1981). Both of these fragrances are easily detected in fresh material throughout the growing season. *Lindera subcoriacea*, on the other hand, emits a scarcely detectable piny lemon fragrance when stems and leaves are young but becomes essentially odorless during late summer and fall. Analyses of these compounds are currently underway. Additional preliminary data from flavonoid studies show distinct interspecific chromatographic profiles from leaf extracts, with similar profiles from flower extracts. These data will be presented later.

In summary, *Lindera subcoriacea* can be separated from both *L. benzoin* and *L. melissifolia* on the basis of morphological, ecological, distributional, and phenological data. In morphological features (TABLE 1) it appears to be more closely related to (and perhaps shares a common ancestor with) *L. benzoin*. In ecological characters, however, its affinities differ: it shares a preference

for more hydric sites with *L. melissifolia*, yet it requires open, sunny sites unlike those of either *L. benzoin* or *L. melissifolia*. It appears equally distinct from both taxa in distribution, phenology, and chemistry. Therefore, additional field studies along with chemosystematic and cytological data are needed before more definitive phylogenetic relationships can be theorized. Its closest relationships may prove to be among the numerous species of eastern Asia.

Finally, *Lindera subcoriacea* appears to be quite rare and in need of protection and habitat management. Additional plants have not been located at sites of several of the earlier collections, and some of the known populations are presently threatened by construction projects or occur on unprotected private land. Bog habitats, in general, are rapidly disappearing subsequent to man's control of naturally occurring seasonal fires combined with the construction of drainage ditches, farm ponds, and highways. Folkerts (1982) recently estimated that approximately 97 percent of the former Gulf Coast bog communities have been destroyed or seriously altered since pre-Columbian times.

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