THE LYTHRACEAE OF OHIO[1]

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ABSTRACT

The distribution of Ohio representatives of the family Lythraceae was studied by examination of all specimens of this family in ten in-state and one out-of-state herbaria. Six species of the Lythraceae were found to be native to Ohio and are discussed herein: *Decodon verticillatus, Rotala ramosior, Ammannia coccinea, Peplis diandra, Lythrum dacotanum,* and *Cuphea viscosissima.* Three introduced taxa are also deemed worthy of inclusion: *Lythrum hyssopifolia, L. salicaria,* and *Lagerstroemia indica.*

Lythrum hyssopifolia and *Peplis diandra* are rare in Ohio, each being known but from a single locality. *Rotala ramosior* and *Ammannia coccinea* are infrequent, the southern part of their Ohio distribution being directly related to the path of the Ohio and/or Scioto rivers. Though infrequent at present, *Lythrum salicaria* is spreading and is now locally abundant at several stations. *Decodon verticillatus* is rated in this treatment as frequent, but its distribution is scattered. It will certainly become less frequent if further destruction of its natural marsh habitat occurs. *Lythrum dacotanum* and *Cuphea viscosissima* are of common occurrence in the state. *Lythrum dacotanum* is broadly distributed in moist, low-lying, prairie situations; *Cuphea viscosissima* occurs in moist or dry habitats and is the only representative of the Lythraceae common in the Appalachian uplands of southeastern Ohio. County distribution maps are presented for all species included except *Lagerstroemia indica* (crape-myrtle), which is only occasionally planted as far north as Ohio.

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The Lythraceae, a widely dispersed dicotyledonous family of about 24 genera and 450 species, is represented in Ohio by six native species, each a member of a different genus: *Decodon verticillatus*, *Rotala ramosior*, *Ammannia coccinea*, *Peplis diandra*, *Lythrum dacotanum*, and *Cuphea viscosissima*. In addition, two European species, *Lythrum hyssopifolia* and *L. salicaria*, have been introduced, *L. salicaria* now being adventive in several stations. An Asian introduction, *Lagerstroemia indica* (crape-myrtle), is occasionally planted in Ohio and is consequently included in this treatment. Temperate-zone representatives of the Lythraceae are primarily herbs, whereas a number of the tropical taxa are shrubs or small trees. Members of the family are distinguished from related families (Onagraceae, Myrtaceae, Punicaceae, etc.) by a superior ovary and the rather constant anatomical feature of intraxylary phloem.

Four of the native species of Ohio Lythraceae are characteristically found at the water's edge, viz. *Peplis diandra*, *Ammannia coccinea*, *Rotala ramosior*, and *Decodon verticillatus*. *Peplis diandra*, which is rare in Ohio, is often found submerged throughout much of its range, but may grow entirely out of the water. Although usually growing exposed in muddy soil near the water margin, *Ammannia coccinea* and *Rotala ramosior* may also be completely submerged, particularly during seasonal innundation. Submerged individuals are usually sterile. Only the basal portions of the stems of *Decodon verticillatus* are actually beneath the surface of the water, because of its larger stature. *Cuphea viscosissima* frequently occupies habitats drier than those occupied by other Ohio Lythraceae, although it is also to be found in moist situations. *Lythrum dacotanum* is characteristically found in moist, low-prairie habitats. Of the introduced taxa, *Lythrum salicaria* is also typically found along pond margins and has in some cases become a weedy invader. *Lythrum hyssopifolia* is known from only one station in the state, occurring in moist fields near the town of Thatcher in Pickaway County.

Most members of the family are entomophilous. Bees seek nectar in the cup-like base of the hypanthium, where the nectar is often secreted by an hypogynous disc. Various adaptations to entomophily are apparent. In flowers of some specimens of *Lythrum dacotanum* (pin flowers), the stamen length places the anthers at about the level of the hypanthial rim, with the style extending several millimeters beyond. In thrum-flowered individuals, the anthers are exserted, whereas the stigma reaches only the mouth of the hypanthium. Although this dimorphic condition is apparently a device to promote outcrossing through the vehicle of insect pollination, the specifics of the process are not well understood. Flowers of *Lythrum salicaria* and *Decodon verticillatus* are actually trimorphic, the pattern being complicated by an additional row of stamens and three style lengths (see Purcival, 1965, p. 49–50, for an interesting account of trimorphy in *Lythrum salicaria*). Although some species (non-Ohio taxa) of the genus *Cuphea* are adapted to hummingbird pollination, *Cuphea viscosissima* is entomophilous. In other genera of the Lythraceae, a reduction from the primary entomophilous condition may be evident (Sculthorpe, 1967). *Ammannia coccinea* and *Rotala ramosior* have small flowers with minute, deciduous petals; flowers of *Peplis diandra* have no petals at all. Such reduced flowers are seemingly self-pollinating and in some cases even cleistogamous. No insect pollination has been reported for the genus *Peplis*. The reproductive biology of our local representatives of the family needs careful investigation.

In this study, distribution, frequency, and habitat data were compiled by examination of Ohio specimens of the Lythraceae deposited in herbaria of the following institutions: Antioch College, Bowling Green State University, Denison University, Kent State University, Miami University, The Missouri Botanical Garden, Oberlin College, The Ohio State University (OS), Ohio University, Ohio Wesleyan University, and the University of Cincinnati. Appreciation to the curators of these herbaria for their cooperation is gratefully acknowledged. State-

ments of the frequency of occurrence of each species are based on the following scale, which follows the pattern of Hauser (1963, 1964): *rare* if known from less than 10 collecting stations, *infrequent* if from 10–30 stations, *frequent* if from 31–50 stations, and *common* if from more than 50 stations. With the exception of *Lagerstroemia indica*, county distribution maps are provided for all species of the Lythraceae known to occur within the state boundaries, whether native or introduced. Dots are placed at exact localities; a circle in the center of the county

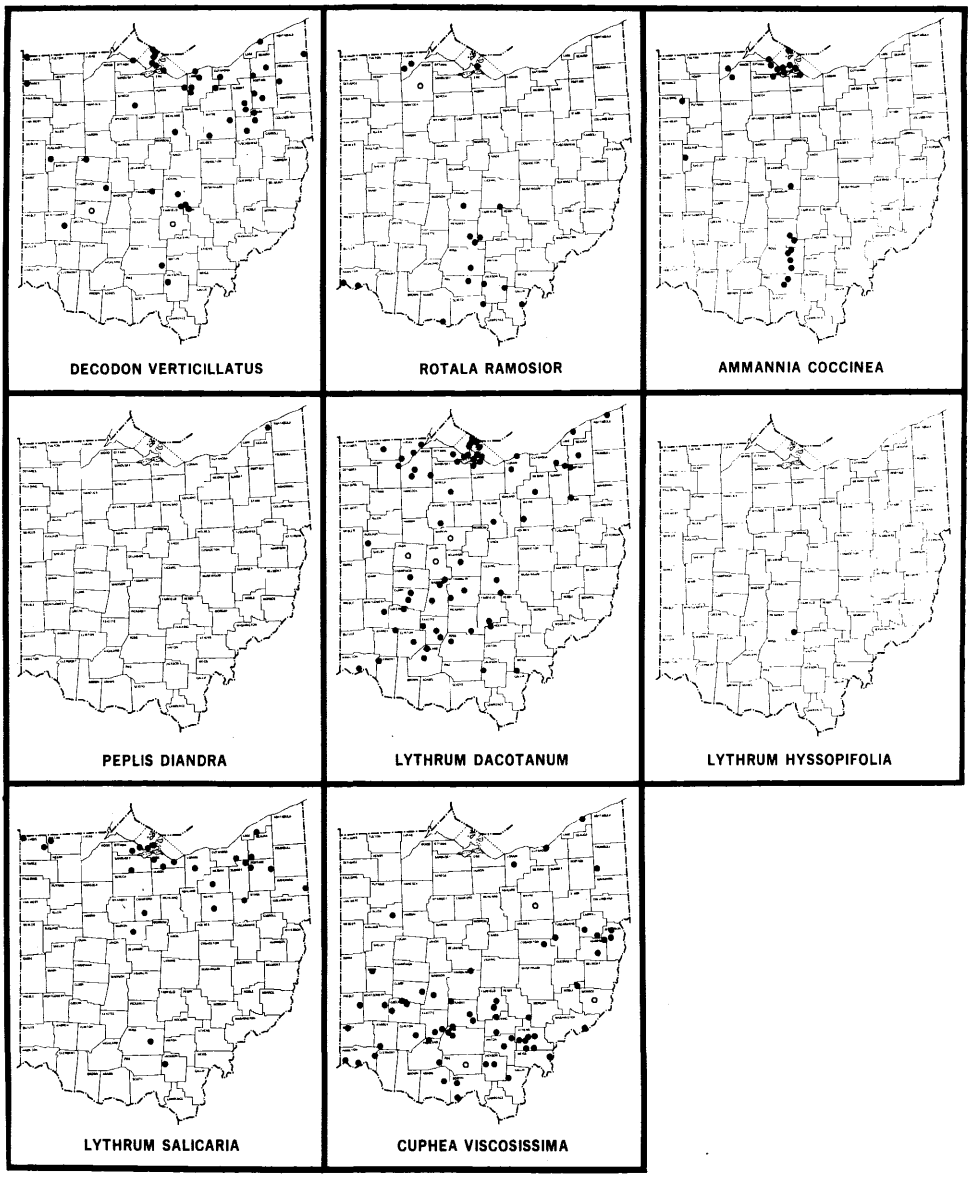

FIGURE 1. Distributions of species of Ohio Lythraceae. Dots identify exact localities; circles identify occurrence of specimens for which no exact location was given.

indicates that no precise locality was given on the label of the herbarium specimen or that the collecting station could not be located on available maps. A complete card file record of all specimens studied is available at the Miami University Botany Department.

LYTHRACEAE (LOOSESTRIFE FAMILY)

Herbs, shrubs, or trees with simple, entire, usually opposite (occasionally alternate or whorled) leaves, which are essentially estipulate. Flowers axillary or terminal, bisexual, regular or infrequently zygomorphic, perigynous, (3)4 to 6(–15)-merous; hypanthium globose or tubular, often ribbed; sepals herbaceous, separate, attached to the rim of the hypanthium; small sepal-like hypanthial appendages (epicalyx) often present, external to and alternating with the sepals; petals crumpled in the bud, pink, red, or purple, separate, attached to the hypanthial rim, alternating with the sepals, clawed, fugacious, sometimes reduced or absent; stamens the same number as the petals or twice as many, rarely numerous or reduced to one, sometimes unequal, inserted on the inner surface of the hypanthium, often toward the base; ovary superior, completely or incompletely 2- to 6-loculed, the placentae axile; style simple or obsolete, the stigma capitate or bilobed. Fruit a thin-walled capsule, variously dehiscent, closely surrounded by, but not fused with, the persistent hypanthial cup; seeds small, usually numerous, with little or no endosperm.

KEY TO GENERA OF THE LYTHRACEAE FOUND IN OHIO

1. Hypanthium campanulate or globose, about as broad as long
   2. Herbs (stems woody at base in *Decodon*), often growing at water's edge; leaves usually linear or lanceolate; flowers axillary; petals usually short-clawed
      3. Perennial, often over one meter high; leaves opposite (occasionally alternate or subopposite) or in whorls of three; flowers often conspicuously pedicellate; stamens 8 to 10; petals conspicuous, typically 5 to 15 mm long; sepals 4 to 5(–7)....*Decodon*
      3. Annuals, usually shorter than 50 cm; leaves opposite; flowers essentially sessile (in Ohio taxa); stamens (1–)4; petals small (less than 3 mm long) or absent, early deciduous; sepals 4
         4. Leaves markedly broadened or markedly attenuate at the base; flowers with small petals and with sepal-like appendages in the sinuses of the calyx lobes; fruit dehiscent
            5. Leaves strongly attenuate at the base or narrowed to a petiole; flowers solitary in the leaf axils; capsule septicidal, the outer wall surface finely striate.....*Rotala*
            5. Leaves broadened and somewhat clasping at the base; flowers (1–)3 to many per axil; capsule irregularly dehiscent, the outer wall surface smooth.*Ammannia*
         4. Leaves neither broadened nor strongly attenuate at the base; flowers lacking petals and hypanthial appendages; fruit indehiscent.....*Peplis*
   2. Cultivated shrub or small tree; leaves ovate or obovate; flowers in terminal panicles; petals long-clawed.....*Lagerstroemia*
1. Hypanthium tubular, at least twice as long as broad
      6. Plants glabrous or pubescent but not viscid; leaves sessile or subsessile; flowers regular; hypanthium not gibbous; petals equal.....*Lythrum*
      6. Plants viscid-hairy; leaves petiolate; flowers irregular; hypanthium gibbous or spurred at the base on one side; petals unequal.....*Cuphea*

DECODON J. F. Gmelin (Swamp Loosestrife)

A monotypic genus occurring in eastern North America from Florida and Louisiana to Nova Scotia, Quebec, and Minnesota. Some authors have treated *Decodon* as a section of *Nesaea* Commerson ex H.B.K., but most have regarded it as a separate genus.

1. *Decodon verticillatus* (L.) Elliot
   Nesaea verticillata (L.) H.B.K.

Frequent but scattered. Absent in much of the unglaciated Allegheny Plateau region; infrequent in the northwest portion of the state where its natural habitats have been largely destroyed. Apparently limited to marshes, bogs, swamps, mud flats, and pond and lake margins. Stem bases are often submerged in shallow standing water. Flowers in Ohio from late July to late September. Native tall perennial herb, often woody at the base.

Stems of *Decodon* grow vertically, but are distally weak and arching, often bending to such an extent as to contact water. Submersed or floating portions of the stems commonly become spongy-thickened and beset with adventitious roots. The cork cells normally produced by the cork cambium are replaced or accompanied by aerenchyma (Schenck, 1889; Schrenk, 1889; Graham, 1964; Sculthorpe, 1967), a tissue composed of thin-walled parenchyma cells and large intercellular air spaces. Vertical stem growth may eventually resume from the apical meristem of the floating spongy portion.

ROTALA L. (Tooth Cup)

A genus of 40–45 species, the majority in the Old World tropics. Virtually all taxa are annual, glabrous herbs of aquatic or marshy habitats. Only the following species occurs in eastern United States.

1. *Rotala ramosior* (L.) Koehne

Infrequent. In southern Ohio distributed primarily near the Ohio and Scioto rivers and adjacent regions; in northern Ohio essentially limited to the western lake counties. River banks, ditches, pond margins; on damp soil or occasionally submerged. Flowers from late July through early October. Native.

Rotala ramosior is a broadly distributed species occurring in eastern and coastal western United States, as well as in tropical America. In eastern United States, the supposedly more robust inland forms are sometimes distinguished as a separate variety, var. *interior* Fernald and Griscom, from those of the Atlantic coastal plain. Ohio plants would thus persumably belong to var. *interior*. However, in a cursory comparison of herbarium specimens, I observed little or no morphological difference between coastal and inland forms and consequently question the value of this varietal separation.

AMMANNIA L. (Tooth Cup)

A broadly distributed genus of about 20 species, the majority in the Old World. As in *Rotala*, the plants are small, glabrous, annual herbs of semi-aquatic habitats. Only *Ammannia coccinea* is known to occur in Ohio, although the more westerly *A. auriculata* Willd., a closely related species (distinguished primarily by longer pedicels), reaches southern Indiana. Identification of species of *Ammannia* is sometimes difficult. Graham (1964) points out the need for a re-evaluation of the descriptive limits of the species.

1. *Ammannia coccinea* Rottboell

Infrequent. In southern Ohio apparently limited to the immediate vicinity of the Scioto River; occurring primarily in the western lake counties in the north; known from one station each in Paulding and Auglaize counties. Mud flats, marshes, pond margins, muddy river banks. Flowers from mid-July through early October. Native. *Ammannia coccinea* shows an overall distribution pattern similar to that of *Rotala ramosior*—eastern and western United States and tropical America.

PEPLIS L. (Water Purslane)

A small genus of rather delicate aquatic or semi-aquatic herbs, submersed or else rooted in mud near the water margin. As indicated by Graham (1964), *Peplis diandra*, endemic to the United States, has been recognized as a monotypic genus by various authors, being delimited from the other seven species of *Peplis*, all European and/or Asian, by its 4- rather than 6-merous flowers and its lack of hypanthial appendages. When recognized as a separate genus, the name *Didiplis diandra* (DC) Wood is correct. However, Graham (1964) believes that generic status is unwarranted, based on the total number of morphological traits shared with the other species.

1. *Peplis diandra* Nuttall ex A. P. DeCandolle
   Didiplis linearis Raf.
   D. diandra (Nutt. ex DC) Wood

Native, but apparently rare; only one Ohio collection seen. LAKE: Madison, in damp places near Grand River, 27 Sep 1927, *F. J. Tyler s.n.* (OS); specimen without flowers or fruit. Reportedly flowers from June through August; flowers are apetalous and suspected of being cleistogamous. Florida and Texas north to Minnesota, Ohio, and Virginia.

Graham (1964) mentions the existence of a terrestrial form of *Peplis diandra* with cuneate-lanceolate leaves and a short style, and an aquatic form possessing longer, narrower, linear leaves, shorter internodes, and no style. Such variation, particularly in leaf size and form, is well known in a number of unrelated species of angiosperms growing both in submerged and exposed habitats (Sculthorpe, 1967). In the case of *Peplis diandra*, it is uncertain whether these morphological forms represent ecotypes or merely an ecological response of the same genotype to different habitats.

LAGERSTROEMIA L. (Crape Myrtle)

Lagerstroemia indica L.

Native to Asia, but widely cultivated in southeastern United States. Planted only infrequently as far north as Ohio, where it is much less hardy. A long-lived shrub or small tree with a fluted trunk. The long-stalked, crisped petals are characteristic. Rarely if ever naturalized, but often persisting for many years and indicating the location of former dwellings.

LYTHRUM L. (Loosestrife)

Virtually a world-wide genus of approximately 30 species, consisting of perennial and annual herbs and small shrubs. The majority of the species occur in the north temperate zone, with the greatest development in North America. Graham (1964) cites the need for a revisionary

study of the North American taxa of this genus. Three species, one native and two introduced, are components of the Ohio flora.

KEY TO OHIO SPECIES OF *LYTHRUM*

1. Plants glabrous; the upper leaves (on at least the distal one-half of the plant) alternate, the lower usually opposite; flowers 1 or 2 per axil, not terminally clustered, the pedicels arising directly from the leaf axils; stamens the same number as the petals
   2. Branched perennial; leaves often subclasping at the base; hypanthium distinctly 12-nerved; either the stamens or the style conspicuously exserted (flowers dimorphic); petals often 4 to 5 mm long ..... *L. dacotanum*
   2. Small, simple or loosely branched annual; leaves usually narrowed (cuneate or attenuate) at the base; hypanthium smooth or but slightly nerved; neither the stamens nor the style exserted; petals 2 to 3 mm long ..... *L. hyssopifolia*
1. Plants pubescent, at least in the region of the inflorescence; leaves opposite or sometimes whorled (occasionally the most distal leaves of branchlets alternate or subopposite); flowers showy, numerous, seemingly aggregated in terminal spike-like inflorescences, the pedicels attached to small axillary branches; stamens twice the number of petals ..... *L. salicaria*

1. *Lythrum dacotanum* Nieuwland

L. alatum Pursh, auct. pl., not as to type

Common. Rather broadly distributed in midwestern United States in moist prairie situations; throughout Ohio, but apparently infrequent in the Appalachian highlands of the southeast portion of the state. Wet fields, prairies, bogs, near ponds, and near streams. Flowers from mid-June to late September.

Shinners (1953) has demonstrated that the well-known name *Lythrum alatum* Pursh has in all probability been misapplied by most authors in North American floristic treatments, and that it actually applies to a rare, narrowly restricted endemic of southern Georgia. Following Shinners' interpretation, *L. dacotanum* Nieuwland is accepted as the correct name for our native midwestern low prairie species.

2. *Lythrum hyssopifolia* L.

Probably a native of Europe, *L. hyssopifolia* is now rather widely distributed in the New and Old Worlds. Shinners (1953) gives an excellent historical resume of its reported introduction and spread in the United States. Now occurring mostly on wet soil bordering salt marshes along the Atlantic coast from Maine to Pennsylvania, and on the Pacific coast from Washington to California; reported from both Michigan and Ohio, although the precise locality in Ohio has not previously appeared in the literature. *Lythrum hyssopifolia* is rare in Ohio. The seven herbarium specimens seen (in the herbaria of Ohio State University and of Ohio University) are all from approximately the same location: wet fields, Pickaway County, near the town of Thatcher. It is not known to be established elsewhere in the state.

3. *Lythrum salicaria* L.

An Eurasian species introduced into eastern United States and Canada; in Ohio, mainly in the northern counties, probably having spread westward along Lake Erie. Infrequent by standards used in this paper, but adventive in damp ground or shallow water around lakes and water-courses, and becoming increasingly abundant or locally common at several stations. Although seeds and fruits of *L. salicaria* sink when they fall into the water, young seedlings rise to the surface and may float for several weeks before becoming permanently rooted (Sculthorpe, 1967). The buoyancy of the seedlings probably enhances the chances for local spread of the species.

A tall perennial, readily recognized in the field by its decussate or occasionally whorled leaves and spike-like clusters of showy purple flowers, which appear from June to mid-September.

CUPHEA P. Browne (Blue Waxweed, Clammyweed, Tarweed)

An American genus of more than 200 species, predominantly subtropical. Graham (1964) reports four species from southeastern United States. Only the widespread *C. viscosissima* occurs as far north as Ohio.

1. *Cuphea viscosissima* Jacquin

C. petiolata (L.) Koehne

Parsonsia petiolata (L.) Rusby

Common. Occurring from Georgia and Louisiana to eastern Kansas, Iowa, and Massachusetts; in Ohio most frequent in the southern half of the state; the only member of the Lythraceae commonly found in the Appalachian highlands of southeastern Ohio. Although often reported to occur primarily on dry, open soil (e.g. Fernald, 1950), many herbarium specimens bear such habitat descriptions as "creek bottom," "marl bog," "streambank," "moist ground," etc. It is said on occasion to become a weed in pastures and to be avoided by livestock. The sticky, "clammy" pubescence found on all parts of the plant is a useful character in field identification.

Cuphea petiolata (L.) Koehne has been accepted and used as the correct name for this species in the major floristic treatments of northeastern North America (e.g. Fernald, 1950; Gleason, 1952), but this is a later homonym for *C. petiolata* Pohl ex Koehne and hence cannot be used.

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