ASARUM ARIFOLIUM (ARISTOLOCHIACEAE) NEW FOR TEXAS (U.S.A.)

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ABSTRACT

Asarum arifolium (Aristolochiaceae) is reported as new to the Texas flora.

RESUMEN

Asarum arifolium (Aristolochiaceae) se cita como nueva para la flora de Texas.

Asarum L. (Aristolochiaceae) is a north temperate, especially east Asian genus of ca. 80–100 (to even 128 species) (Kelly 2001; Stevens 2001 onwards to present; Sinn et al. 2015; Mabberley 2017; Takahashi & Setoguchi 2017). The majority of the species are in Asia (China, Taiwan, and Japan to Vietnam and the Korean Peninsula), with up to ca. 25 in North America, and 1 in Europe (Sinn et al. 2015; Mabberley 2017; Kenner & Todia 2021). The genus has often been treated in the broad sense (Kelly 1998; Stevens 2001 onwards to present; Sinn et al. 2015, 2018; Mabberley 2017; Diamond 2023). Alternatively, it has been divided into as many as six segregate genera including *Hexastylis* Raf. (HEART-LEAF), a North American group of ca. 18–19 species (e.g., Blomquist 1957; Whittemore & Gaddy 1997; Kelly & Gonzalez 2003; Weakley et al. 2012; Kartesz 2015; Keener 2020; Weakley & Poindexter 2020; Keener & Todia 2021) including the species that is the subject of this paper. It is generally agreed that the genus treated broadly is monophyletic (e.g., Kelly 1997, 1998; Sinn et al. 2015, 2018), and we are treating it in this broad sense following Sinn et al. (2015), who based on both plastid and nuclear molecular data, argue that "*Asarum* is best recognized as a single genus of three subgenera and six sections" with *Hexastylis* as one of these sections. Takahashi and Setoguchi (2017) supported recognizing *Asarum* in the broad sense and provided molecular evidence that *Hexastylis* is possibly polyphyletic; therefore, recognizing it as a segregate genus may not accurately reflect evolutionary history. There has been considerable work on the genus in recent years in North America, with four new species named from the southeastern U.S. (Sinn 2015, 2017; Keener 2020; Keener & Todia 2021). Neither the genus *Asarum* nor this species (*Asarum arifolium* Michx.) have previously been reported from TX (e.g., Correll & Johnston 1970; Hatch et al. 1990; Jones et al. 1997; Diggs et al. 1999; Kartesz 2015, 2024; USDA Plants Database 2024).

Voucher photographs for *Asarum arifolium*: **TEXAS. Tyler Co.:** Watson Pinelands Preserve near Silsbee, Hardin Co., the plants reported to have been transplanted from the "canyonlands" in the Big Thicket National Preserve, Tyler Co., TX by Geraldine Watson (*G. Diggs*, photos taken 2003, BRIT). (Fig. 1)

Geraldine Watson [(1925–2012), artist, botanist, writer, conservationist, and one of the individuals responsible for creation of the Big Thicket National Preserve (see more detailed biographical info. in Diggs et al. 2006 and Lipscomb & Diggs 2012)], reported (pers. comm. to G. Diggs in 2003) finding this species in the "canyonlands" in the northeastern part of the Big Thicket National Preserve (Tyler Co.); she transplanted some plants to her preserve where they were growing well and flowering at the time of our observation (G. Diggs, pers. obs.; Photos: *G. Diggs*, 2003, BRIT; figs. 2 & 3). To the best of our knowledge, no herbarium specimens from the canyonlands location are known and it is not known if the location still exists in unaltered form. We did not make an herbarium specimen from the Watson Preserve because of the paucity of plant material; only

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Fig. 1. Distribution map of *Asarum arifolium* showing the combined ranges of var. *arifolium* and var. *callifolium* (from FNA).

photographs were taken. It should be noted that it is possible that Geraldine Watson was mistaken about where she found the plants. However, almost all plants growing at the Watson Pinelands Preserve are either native to or transplanted from the Big Thicket National Preserve. Because of our limited knowledge of the species and because our photographs do not have a scale, we are not attempting to assign the plants to an infraspecific taxon. However, our plants almost certainly fall within either *Asarum arifolium* var. *arifolium* or *Asarum arifolium* var. *callifolium* (Small) Barringer. The range map in Figure 1 reflects the combined ranges of these two varieties. The third variety, var. *ruthii* (Ashe) Barringer, has a limited range quite distant from Texas to the north and east (Whittemore & Gaddy 1997). Since this species is known in Texas from only the single occurrence in Tyler Co., we consider it to be of conservation concern in the state. We are publishing this record at the current time in advance of the upcoming publication of volume 2 of the *Illustrated Flora of East Texas*, which will contain the Aristolochiaceae. While a photograph of transplanted plant material is not ideal as a voucher, we feel that getting the information into the botanical literature to encourage other botanists to be aware of this species in East Texas is valuable. This example is superficially similar to the naming of a new species of *Asarum* (as *Hexastylis rollinsiae* B.R. Keener & Todia) from Alabama based on cultivated material (Keener & Todia 2021)—the similarity being that the exact location in the wild/provenance of both were unknown at the time of discovery.

While the occurrence of this species far to the west of its documented occurrence in Louisiana may at first seem surprising (Fig. 1), many herbaceous species common farther north and east in the U.S. occur either at the extreme southwestern limit of their ranges or are slightly disjunct in Texas and have extremely limited distributions—they only rarely and erratically occur in the Pineywoods. Kral (1966) and MacRoberts and MacRoberts (1997) discussed a number of these "northern woodland elements" south of their normal range

Fig. 2. Photo of *Asarum arifolium* flowers (*Diggs* 2003; voucher BRIT).

(e.g., *Erythronium rostratum* W. Wolf (yellow trout-lily), *Lilium michauxii* Poir. (Carolina lily), *Sanguinaria canadensis* L. (bloodroot), *Silene stellata* (L.) W.T. Aiton (widow's-frill), *Trillium recurvatum* L.C. Beck (prairie trillium), *Uvularia sessilifolia* L. (sessile-leaf bellwort)), and indicated that they appear to be relicts of glacial times surviving in areas that still have particularly favorable soil and moisture conditions (i.e., refugia). Other examples of species disjunct to the Pineywoods of east TX or at least at their range margins include *Gaylussacia dumosa* (Andrews) A. Gray (dwarf huckleberry) from Newton County near the Louisiana border (along White Oak Creek off of county road 3038 S of county road 3060 W of TX 87 ca. 5 mi N of Bleakwood, 22 Mar 2007, *C. Allen et al. 19694* (BRIT, BRIT373032)—fide Peter Fritsch, pers. comm.) disjunct from eastern Louisiana, *Leucothoë axillaris* (Lam.) D. Don (coastal dog-hobble) also from Newton County (*C. Allen 21371.1*, BRIT—fide Allen & Lewis 2023), slightly disjunct from two parishes to the east in Louisiana, and *Lyonia lucida* (Lam.) K. Koch (fetter-bush), again from Newton County (*Brown & Elsik 24436*, SBSC, BRIT—fide Brown & Elsik 2002), previously known from just across the Neches River in Louisiana, *Dryopteris celsa* (W. Palmer) Knowlt , W. Palmer, & Pollard (log fern) at the extreme southwestern limit of its range in Bowie County (its only Texas location) and disjunct slightly from the Ouachita Mts. in AR to the north (see Diggs & Lipscomb 2014 for a detailed discussion), and *Dryopteris ludoviciana* (Kunze) Small (southern wood fern) slightly disjunct to Hardin, Jasper, and Polk counties from central Louisiana (Diggs & Lipscomb 2014).

Numerous other examples of disjunctions involving Texas could be given, including many species and genera typical of East Texas which appear disjunctly in isolated pockets on the Edwards Plateau—examples include: *Apios ameriana* Medik. (groundnut), *Bignonia capreolata* (cross-vine), *Hamamelis virginiana* (witch-hazel), *Lindera benzoin* (spicebush), *Prenanthes barbata* (barbed rattlesnake-root), *Rosa carolina* (Carolina rose), *Sabal minor* (dwarf palmetto), and *Tilia americana* (American basswood). Biogeographers traditionally have two alternative explanations for such disjunct distributions (Sanmartin 2009). Based on what is known

Fig. 3. Photo of *Asarum arifolium* leaves (*Diggs* 2003; voucher BRIT).

about the flora of the eastern United States, and about how Texas climate has changed dramatically since the last glacial maximum, it is likely that all of the examples of disjunction given above are caused by *vicariance* (= the species was once much more widespread but has become fragmented [vicariated] with survivors in only parts of its former range). The other explanation of disjunction is by *long-distance dispersal* (= with the disjunct population founded by a seed or spore transported by wind or an animal over a great distance and happening to fall in a favorable spot).

The "canyonlands" of Tyler Co. are an example of a microhabitat or microclimatic refugium. Kral (1966) noted that he could walk for miles and then find a large colony of one of the "northern woodland elements" species, apparently reproducing predominantly via vegetative means. These species may thus be "Ice Age holdovers hanging on precariously to the older geologic terraces in the coolest locations in the forest" (MacRoberts & MacRoberts 1997). Even the presence of the drought-intolerant tree species American beech (*Fagus grandifolia* Ehrh.) in East Texas is interesting, given its ecological requirements. This species reaches its southwestern limit in the U.S. in Montgomery County (not far north of Houston)—here beech appears to do best when protected from the intense Texas summer sun by a canopy of associated trees (McLeod 1975). Perhaps more surprisingly, a single plant of yellow lady's-slipper orchid (*Cypripedium parviflorum* Salisb. var. *pubescens* (Willd.) O.W. Knight was found somehow surviving near Muleshoe in Bailey County in the Texas Panhandle—it was possibly a relict of a widespread northern coniferous forest that at one time extended to the south during a colder and wetter period of the Pleistocene Epoch (Liggio & Liggio 1999). Likewise, a large disjunct population of *Arisaema triphyllum* (L.) Schott, jack-in-the-pulpit (Araceae), was discovered disjunct to Parker County (by Bob O'Kennon *16024*, BRIT) in a cool, moist "rockhouse" microhabitat in the West Cross Timbers west of Fort Worth with the nearest known East Texas location (Henderson County) being at a distance of approximately 140 miles (225 kilometers) (Diggs & O'Kennon 2003). All of these examples may be relicts of populations much more widespread during glacial times when the climate in Texas was quite

different and conditions much more mesic (Palmer 1920; Kral 1966c; O'Kennon 1991; Delcourt & Delcourt 1993); i.e., they are disjuncts caused by vicariance. It is not surprising that isolated populations are able to persist in small areas of special microclimate or unusual geology—in fact, such persistence would be expected. Thus, the flora of Texas is in part a unique reflection of glacial times—when northern species like *Fagus grandifolia* (American beech) and *Carya alba* (L.) Nutt. (mockernut hickory) were brought together with southern plants like *Magnolia grandiflora* L. (southern magnolia) and *Sabal minor* (Jacq.) Pers. (dwarf palmetto) (Fritz 1993) [this discussion adapted from Diggs et al. 2006 and Diggs & Lipscomb 2014]. When viewed in this light, the occurrence of *Asarum arifolium* in Texas is not surprising. Conversely, it is highly unlikely that *Asarum arifolium* is in Texas via long-distance dispersal. *Asarum/Hexastylis* taxa have low to ground level flowers and fruits with seeds bearing elaisomes (= sugar, lipid, and/or protein-rich appendages attached to seeds that are often dispersed by ants)—thus the chance of long-distance dispersal seems negligible (Brian Keener, pers. comm.).

Asarum arifolium can be recognized by the following description (modified in part from Whittemore & Gaddy 1997).

Asarum arifolium Michx., (refers to the resemblance of leaves to those of the *Arum* plant, which have an arrowhead shape), LITTLE BROWN JUG, ARROW-LEAF GINGER, ARROWHEAD W LD GINGER. Rhizomatous, evergreen, aromatic perennial herb; aerial stems absent; stipules absent; leaves alternate, petiolate foliage leaves and sessile, triangular scale-leaves both present; petiolate leaves with the blades variable, but usually triangular-sagittate to subhastate, leathery, glabrous, variegated; inflorescences of a single flower, borne on a peduncle at end of rhizome, sometimes a number of inflorescences present per rhizome (flowers often not obvious under leaves and in leaf litter, etc.); calyces corolla-like, the sepals fused for much of their length, the tube urceolate-campanulate, not curved, the lobes spreading; corollas absent; stamens 12, the anthers with terminal appendage absent or rudimentary; ovary ca. 1/3 inferior; styles 6, 2-cleft; fruit a capsule; seeds with a fleshy appendage; 2n = 26 (Soltis 1984). [*Hexastylis arifolia* (Michx.) Small in Britton] Flowering Apr–May.

Only one other similar species of Aristolochiaceae, rather easily distinguished, occurs in nearby areas: *Asarum canadense* L., (CANADIAN WILD GINGER) is a related species that occurs just north of East TX in McCurtain Co. OK, just n of Bowie Co. TX, and in nearby Arkansas (Kartesz 2015). It differs from *A. arifolium* as follows:

Leaf blades membranous, deciduous, roughly kidney-shaped, not variegated; sepals distinct; anthers tipped with a prominent appendage; styles fused to form a column; ovary inferior _____ **A. canadense**

Leaf blades leathery, evergreen, elongated so as not to be kidney-shaped, often distinctly variegated; sepals connate for most of their length; anthers not tipped with an appendage or appendage vestigial; styles distinct; ca. 1/3–inferior _____ **A. arifolium**

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