

ARCTIUM MINUS (ASTERACEAE): HISTORICAL REVIEW,  
ECOLOGICAL CONSEQUENCES, AND ADDITION TO TEXAS FLORA

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ABSTRACT

*Arctium minus*, a European native, is currently known to have been introduced throughout most of continental United States except for Florida, Delaware, and Texas. The species is reported in Texas in the *Flora of North America*, but without specimen documentation. Numerous historical nomenclature complexities and confusion involved in proper documentation of this species' spread and distribution are discussed. It is here reported as new to Texas, based upon a collection in Oldham County in the northern Panhandle. The species is considered to be weedy and may have the potential to be invasive in the High Plains and Rolling Plains regions of Texas. Brief descriptions of historic distribution and spread based on early botanical literature, and various economic and ecological associations of *A. minus* are summarized.

RESUMEN

*Arctium minus*, nativa europea, es conocida actualmente por haber sido introducida en la mayor parte de los Estados Unidos continentales excepto en Florida, Delaware y Texas. La especie se reporta de Tejas en la flora de Norteamérica, pero sin documentación de especímenes. Se discuten numerosas complejidades históricas de nomenclatura y confusión involucradas en la documentación apropiada de la propagación y distribución de esta especie. Se reporta aquí como nueva para Tejas, mediante una colección del Condado de Oldham en el norte del Panhandle. Se considera que la especie es una maleza y puede tener potencial para ser invasora en las regiones de las llanuras altas y llanuras onduladas de Tejas. Se resumen breves descripciones de la distribución histórica y distribución basadas en la literatura botánica temprana, y varias consecuencias económicas e implicaciones ecológicas de *A. minus*.

INTRODUCTION

*Arctium* (Asteraceae) is an Old World genus, of Mediterranean origin, comprising 17 species (Global Compositae Checklist) some of which are widely distributed as ruderal plants, three of which (*A. lappa* L., *A. tomentosum* Miller, and *A. minus* (Hill) Bernardi) are introduced to North America (Keil 2006). *Arctium minus*, common or lesser burdock, also known as *petite bardane* (Ferron & Cayotte 1975) and *cibourroche* (Moore & Frankton 1974), is a perennial herbaceous plant that is introduced throughout the majority of the continental United States except Delaware, Florida, and Texas (Kartez 2015). Keil (2006), in his treatment of *Arctium* in the *Flora of North America*, mentions that the species has been reported in both Delaware and Texas, but with this caveat: "I have not seen specimens." The species is listed as a "potential" for the Texas flora (USDA, NRCS 2018), which appears to be assumed from the distribution of the species in neighboring states and the invasiveness of the species in the United States. The present report, however, removes all speculation and tentativeness of the occurrence of the species in Texas.

**Geographic Distribution**

*Arctium minus* is native to Eurasia and arrived in the United States via accidental or unintentional introduction. Native distribution of *A. minus* includes continental Europe (excluding southern regions of Italy), British and

Mediterranean Islands, and introduced in the Macaronesian islands (Hansen & Sunding 1993). Distributed in Asia (Israel, Lebanon, Syria, Turkey), Georgia, Baltic countries (Tutin et al. 1976; Euro+Med. 2006), Norway, Scandinavia, eastern Turkey to the Caspian Sea, and northwest to Finland (Clapham et al. 1952; Moore & Frankton 1974). *Arctium minus* is distributed along the European part of Russia from Baltic and Lagoda-Ilmen Region south to Crimea and Black Sea and southeast to the Trans-Volga (Shishkin & Bobrov 1998). This plant is a successful global invader with a wide naturalized distribution in North America (Moore & Frankton 1974) and South America, as well as Australia and New Zealand (Webb 1988; Keil 2006; NSW 2018). Areas and timing of invasion are likely sympatric to initial transport areas of domesticated hoofed stock, fire suppression, and subsequent dispersal with anthropogenic expansion and agricultural pursuits (Mink et al. 2010).

The inflorescence of this species resemble those of thistles (*Carduus*, *Centaurea*, *Cirsium*, *Cnicus*, *Cynara*, *Echinops*, *Saussurea*, etc. (all from the Mediterranean-Irano-Turanian [Tethyan] thistle tribe Carduinae of Asteraceae)), but *A. minus* may be distinguished by its more mesophyllous habit with extremely large leaves of up to 50 cm in length and its hooked (uncinate), spiny-tipped involucrel phyllaries. Cauline leaves are ovate while lower leaves are cordiform and have very sinuous margins. Petioles are hollow, but sometimes only at the base. The species grows a deep taproot of up to 30 cm in length. *Arctium minus* may attain a height of 1.5 m (or more) and may produce multiple branches (Fernald 1950; Radford et al. 1968), thus appearing bushy. Capitula are prickly and pink to lavender in color and are about 2 cm wide. The plant flowers from July through October.

Voucher specimen. **U.S.A. TEXAS. Oldham Co.:** Cal Farley's Boys Ranch, 0.5 mi E of Hwy 385 and State Loop 233 on State Loop 233, then N 0.4 mi near upper end of Tascosa Creek, 21 Jun 2017, J.R. Singhurst 21,181 and Amie Treuer-Kuehn (BAYLU).

A single population of *Arctium minus* was growing in a shaded riparian wetland with an overstory that included *Celtis occidentalis*, *Populus deltoides*, and *Salix nigra* (Figs. 1, 2). About 10–15 plants, clustered in a 10 × 10-meter area were growing in association with *Bidens laevis*, *Carex emoryi*, *Eleocharis rostellata*, *Leersia oryzoides*, *Teucrium canadense*, and *Verbena scabra*.

This record extends the known distribution of *Arctium minus* into Texas. The nearest known distribution records include Union County, New Mexico, approximately 150 km to the northwest and Woods County, Oklahoma, which is approximately 320 km east-northeast from Oldham County.

#### DISCUSSION

##### History of Misdetermination, Indetermination, and Misdistribution

*Arctium minus* has long been reported as part of Texas flora (USDA 1971; Shetler & Skog 1978; Gross et al. 1980; Hultén & Fries 1986) likely based on ubiquitous distribution in the continental US, as well as various publications from surrounding states. However, lack of a voucher specimen is specifically noted in literature sources (e.g., Keil 2006), thus rendering this claim unsubstantiated and absent from numerous Texas flora descriptions (e.g. Cory & Parks 1937; Gould 1962, 1969; Correll & Johnston 1970; Hatch et al. 1990; Johnston 1990; Diggs et al. 1999; Turner et al. 2003). Based on this lack of voucher documentation, *Arctium minus* was removed from the state flora by Nesom (2009), who speculated on potential for future collection based on existing specimen vouchers from adjacent US states (McGregor et al. 1977; Martin & Hutchins 1980; Smith 1988; Thomas & Allen 1993).

There is an interesting sequence of nomenclatural conventions and documentation of this species' occurrence in North America worthy of reiterating. Josselyn (1672) first noted plants he called "lesser clot-bur" (pg. 44) and "the great clot-bur" (pg. 86), thereby discriminating between two species of *Arctium* in colonial America. Qualifying these plants by "lesser" and "great" terms suggest *A. minus* and *A. lappa*. However, Latinized binomials were not standard, and thus this genus was undescribed until 1753, when *A. lappa* was named by Linnaeus. Based on Josselyn's observations he determined "lesser clot-bur" to be native and "the great clot-bur" as a plant associated with cattle brought from England. Presumably, a difference in abundance was the basis for a native designation for *A. minus*. Josselyn (1672) also recognized agriculture and cattle pursuits as mechanisms of establishment and seed dispersal (Moore & Frankton 1974). This may suggest *A.*



FIG. 1. Photo of *Arctium minus* in Oldham County, Texas, *Salix nigra* in background, 21 June 2017 (photograph by J.R. Singhurst).

*minus* was the first *Arctium* species established in North America, and possibly one of the first Old World exotic species mentioned in the New World.

*Arctium minus* appears frequently and widespread enough in distribution throughout North America today to be denoted in floral summaries of North America. However, either historic literature accounts lack *A. minus* as part of the flora in regions where it should be expected or nomenclature misapplications complicate evidence of historic dispersal. For example, early North American botanical literature (e.g., Eaton 1836; Darlington 1853) often recognized only *A. lappa* (syn. *Lappa major*), resulting in *A. minus* being absent from certain floristic accounts. However, in *Flora Cestrica* (Darlington 1853), the description of *A. lappa* clearly refers to *A. minus*, signifying that *A. minus* was likely a common species in the northeastern US by the mid-nineteenth century. Correspondingly, Moore and Frankton (1974) discussed evidence, based on current abundance values, supporting the implication that *A. minus*, and not the reported *A. lappa*, was the species of interest in descriptive accounts of Canadian provincial lands (Gross et al. 1980).

Subsequent botanical studies propagated these earlier complications and nomenclatural obstacles in documenting *A. minus*' relative abundance and continuing distributional expansion. *Arctium lappa* var. *minus* A. Gray (*A. minus*) was cited as "very common" by some early authors (Gray 1889; Dame & Collins 1888) and "relatively uncommon" by others (Macoun 1883; Beal & Wheeler 1892) working in sympatric regions of North America. Billings (1858) inventoried an area in Ontario where he collected and assessed *A. lappa* (syn. *Lappa major*) as "common" in late 1850s (Billings 1858; Penhallow 1897). Over one hundred years later, in 1960, Dore conducted a survey in the same region of Ontario as Billings collected. *Arctium minus* was the only species documented in this inventory and survey of Ontario (Dore 1961; Moore & Frankton 1974). Given that the



FIG. 2: Photograph of *Arctium minus*, capitulum with uncinata involucrellary phyllaries (JRS 21, 181 and ATK, BAYLU), collected in Oldham County, Texas, 21 June 2017. (Scale in cm; photograph by J.N. Mink).

most current botanical work available to Billings at that time (Gray's Manual, 2<sup>nd</sup> ed., 1856) neglected to list *A. minus*, and presented a sole *Arctium* species (*Lappa major*). It is plausible that *A. minus* was the collective plant of Billings' original floristic description of the area based on existing abundance values (Moore & Frankton 1974).

It is curious that Gross et al. (1980) included *A. minus* as a part of Texas flora in their *Arctium* treatment, as they described a long history of misdetermination and nomenclature complexities of *Arctium* in general and *A. minus* in particular. Several authors discussed discrepancies in classification of *Arctium* species and subspecific status, and varietal or forma designation, in various treatments. This historical classification and disagreement involved all three species in North America (Fernald & Wiegand 1910; Arènes 1950; Moore & Frankton 1974; Keil 2006). However, no known species of naturalized *Arctium* in North America have been known and documented from Texas (Nesom 2009), until now.

### Economic Importance

Evaluated by frequency, widespread distribution and ruderal introduction as weedy, this consideration is mostly an aesthetic problem since mechanical cultivation controls this weed in crop fields (Frankton & Mulligan 1970; Moore & Frankton 1974). Because of the biennial/perennial nature of *A. minus*, it tends to be confined in areas not disturbed annually by tilling. *Arctium minus* can become a problematic invader of pastures, hay fields, and open prairie ecosystems (Gross et al. 1980; Swearingen & Barger 2016). The role of disturbance in establishment, coupled with its potential for long-distance dispersal, makes heavily grazed areas prime colonization sites. *Arctium minus* appears frequently and widely enough to prompt several western

US states and Canadian Provinces to list the species as noxious (Moore & Frankton 1974; Nawrocki 2010; Kartez 2015). This life history can promote local abundance. However, it has not received continent-wide noxious status.

Georgia (1931) described a predilection dairy cows have for foraging on *A. minus* and how plentiful consumption adulterates milk with a bitter aftertaste, thus rendering the dairy products unmarketable. Steyermark (1963) noted dry capitula clinging to and reducing value of wool, a feature first noted in observations of Old World hoofstock, and enterprisingly made famous by the invention of Velcro®. Without doubt, the most interesting economic aspect about *A. minus* is its hooked (uncinate), spiny-tipped phyllaries which function in attachment and dispersal served as a model for the hook and loop fastener. The idea was conceptualized in 1941, but not marketed until the late 1950s. The inventor of this fastener was George de Mestral, a Swiss engineer. Because of imprecise application of common names and similarity of structure and function, the model for this fastener is sometimes stated to be the cocklebur (*Xanthium strumarium*, Asteraceae) (Levetin & McMahon 2015).

The species of *Arctium*, particularly *A. lappa*, *A. minus*, and *A. tomentosum* are ancient medicinal plants (Shiskin & Bobrov 1998). These plants are popular among many nations, with roots and the seed oil (burdock oil) being used for different health problems (Shiskin & Bobrov 1998). Pharmaceutical applications, or the potential thereof, have recently been described, specifically potent antioxidant properties (Erdemoglu et al. 2009). Long cultivated as a medicinal herb (Gross et al. 1980), *A. minus* is the basis of several treatments in traditional medicinal usage and consumption (Rousseau & Raymond 1945; Moore & Frankton 1974; Fujita et al. 1995). The roots of some *Arctium* are edible, root extracts may be used in the food supplement industry, and *A. lappa* may be grown as a minor crop (Keil 2006). Both Old World preparations and aboriginal Americans utilized *A. minus* as a staple food (Yanovsky 1936; Fernald et al. 1958) or tea and coffee alternatives (Hegi 1929; Youngken 1948).

### Ecological Considerations

*Arctium minus* occurs in old fields, prairies, pastures, hay fields, forest clearings, ruderal meadowlands, and shaded moist ground near springs and disturbed wetlands. It has been suggested that the growth habit in bare ground and local density facilitate establishment of other non-native species, as well as *A. minus* recruitment (Gross et al. 1980). Given the large, broad surface areas of mature basal leaves, and *A. minus* height, native vegetation could potentially be out-shaded and suppressed, thereby reducing native floral species diversity and impacting community composition in localized areas of colonization.

Ecologically, *A. minus* has been a part of the flora of the United States for at least 350 years, before any significant collecting surveys were performed, so that some authors considered the plant a natural part of the flora (Josselyn 1672 [cited by Moore & Frankton 1974]). As such, local ecological influences and impacts, in terms of alien plants and invasive disruptions, on native flora and plant community landscapes went undetected.

In contrast, many species of insectivorous bats and birds have been fatally ensnared by the capitula of the fruiting *Arctium*, presenting a dangerous, macabre consequence of this Old World exotic plant on native fauna (Hager et al. 2009). Numerous accounts, for over 100 years, document these fatalities of bird and bat species including important pollinators and insectivorous species across the naturalized distribution of *A. minus* in North America (e.g. Needham 1909; Little 1925; Lyon 1925; Johnson 1933; Raloff 1998; Hendricks et al. 2003; Hinam et al. 2004).

Despite the seemingly negligible effect of single, or sporadic occurrences of bird and bat species affected by *Arctium* entanglement (McNicholl 1988), it potentially poses a serious threat under circumstances of *A. minus* abundance at particular times. *Arctium minus* reaching high densities along pathways of migratory stopovers, fruit development coinciding with fledging periods, or inflorescences attracting hummingbirds in areas lacking putatively preferred nectar-producing plant species. Based on life history of *A. minus* fruiting bodies, fire suppression, or species shift in livestock stocking regimes, (e.g. cattle to goats), risk potential may possibly inflate. The growing number of reports of *A. minus* related deaths may in fact be more significant than

previously understood. Identifying those factors or combinations of events facilitating future consequences of this mechanism in Texas is problematic.

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