

Distribution and Ecology of *Corydalis curvisiliqua* Engelm. var. *grandibracteata* Fedde (Papaveraceae) in Illinois

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ABSTRACT

Corydalis curvisiliqua Engelm. var. *grandibracteata* Fedde (large-bracted corydalis), a species listed as threatened in Illinois, was first reported for the state in 1986. Presently this taxon is known from the major sand areas of western Illinois (Cass, Henderson, Morgan, and Scott Counties), and from adventive populations in four additional counties. Large populations, some exceeding 23,000 #/ha, were in fallow fields. In sand prairies, the large-bracted corydalis populations averaged a few hundred #/ha, being associated with small disturbance patches.

INTRODUCTION

Corydalis curvisiliqua Engelm. var. *grandibracteata* Fedde (large-bracted corydalis), is a yellow-flowered, winter annual native to northeast Texas, Oklahoma and Kansas (Ownbey 1947, Brooks 1986), with outliers in Iowa (Ownbey 1947) and central Illinois (Colin et al. 1987). First collected in Illinois by R. T. Rexroat in 1953 (ISM 42544 and ISM 51932), the collections were mis-identified as *Corydalis micranthus* (Engelm.) Gray. Recognized as *C. curvisiliqua* var. *grandibracteata* by Colin et al. (1987), this taxon is now considered to be a native component of the Illinois flora (Mohlenbrock 1986). It is presently listed as threatened in Illinois (Herkert 1991), mostly because it was recently recognized as a distinct taxon (Colin et al. 1987), and its limited distribution in the state.

The large-bracted corydalis is mostly restricted to the Illinois River and Mississippi River Sand Areas Natural Division (Schwegman 1973), occurring in Cass, Henderson, Morgan and Scott Counties (Tables 1 & 2). Also, adventive populations, which may persist for only a few years, have been found along roadsides and railroads in Brown, Mercer, Pike, and Sangamon Counties. This study was undertaken to determine the distribution of this taxon in Illinois, and to outline the conditions necessary for its continued survival.

MATERIALS AND METHODS

All known populations of the large-bracted corydalis were visited during the spring of 1996 and 1997, and selected sites were sampled using ten 100m² circular plots located at 15 m intervals along a line transect. In each plot all large-bracted corydalis plants were counted, the amount of vegetation cover estimated, and the density (#/ha) of the large-bracted corydalis determined.

At each site 60 individual plants were randomly selected and the number of inflorescences and the number of flowers per inflorescence were recorded without disturbing the plants. Seed set was determined in mid-June when the fruits developed.

DESCRIPTION OF STUDY AREAS

Cass # 1: A 60 ha fallow field 4 kms south of Beardstown, Illinois (SE1/4 S3 T17N R12W). Watermelons were cultivated in the field the previous year (1995).

Cass # 2: A 20 ha pine plantation in a sand prairie 4 kms south of Beardstown, Illinois (SW1/4 S3 T17N R12W).

Cass # 3: A sand prairie about 100 ha in size just west of the Burlington Northern railroad, 2.5 kms south of Beardstown, Illinois (NE1/4 S35 T18N R12W).

Cass # 4: A disturbed sand prairie about 20 ha in size near an old landfill 0.5 kms south of the junction of the Burlington Northern Railroad and Stock Lane (SW1/4 S35 T17N R12W).

Henderson # 1: A fallow wheat field about 2.5 kms west of Bald Bluff, Illinois (NE1/4 S19 T12N R4W). More than 50 ha in size, the field had been fallow for several years.

Morgan # 1: A hog lot about 10 ha in size 2.5 kms south of Meredosia, Illinois (SE1/4 S27 T16N R13W). Hogs were present in this lot during the fall of 1995.

Scott # 1: A fallow field near Coon Run Creek 2.5 kms northeast of Naples, Illinois (SW1/4 Sec 5 T15N R13W). More than 50 ha in size, the field was fallow a few years before the study.

Scott # 2: A disturbed sand prairie about 8 ha in size, at the edge of an old dump 2.5 kms northeast of Naples, Illinois (NE1/4 Sec 5 T15N R13W).

RESULTS AND DISCUSSION

Seeds of the large-bracted corydalis germinate from October to early March, usually forming a branched rosette of bipinnatifid leaves. These stems elongate in early spring and develop a terminal, bracteate raceme with 1-20 (averaged 4-11 at the sites studied), two-lipped, long-spurred flowers exceeding 16 mm in length. As the inflorescence matures, axillary branches develop, each with a terminal inflorescence. Commonly 5-10 inflorescences develop from each plant, but sometimes as many as 45 (Table 1). The

fruits (capsules) mature about three weeks after anthesis, and produce 5-13 (averaged 7.1-9.3 at the sites studied) seeds with an oily appendage (elaiosome). Depending upon available moisture the plant dies between the middle of May and the end of June, disintegrating rapidly. The seeds do not germinate upon dispersal, an after-ripening period being required.

Ants were commonly associated with the large-bracted corydalis, and their hills were frequently located at the base of the plants. After seed set, piles of seeds lacking elaiosomes were found near the ant hills. The only ants observed carrying seeds of the large-bracted corydalis were individuals of *Pheidole bicarinata* Mayr. Myrmecochory is undoubtedly associated with this species, this phenomenon being reported for other species in the genus (Hanzawa et al. 1985, Nakanishi 1994).

Large-bracted corydalis occurs in two distinct habitats: sand prairies, fallow fields and other extensively disturbed sandy habitats (Table 1). In the least disturbed sand prairies (Cass # 3 and 4) individuals of the large-bracted corydalis were widely scattered, less than 200 #/ha. Cover usually exceeded 80%, the large-bracted corydalis individuals were restricted to small disturbance patches and open sand between clumped perennials. In a pine plantation (Cass # 2) and at the edge of an old dump (Scott # 2), where the sand prairies were disturbed, the number of large-bracted corydalis plants increased significantly, sometimes exceeding 13,000 #/ha. In recently fallowed fields and other extensively disturbed habitats of the sand areas (Cass # 1 and Henderson # 1), the corydalis plants were abundant, densities usually exceeding 22,000 #/ha (Table 1).

Large-bracted corydalis plants have also been observed in a few other disturbed habitats, particularly railroad ballast and gravelly and sandy roadsides. These populations tend to be transient and easily extirpated. One population in a hog lot (Morgan # 1) averaged 660 #/ha (Table 1). At this site, dominated by annual weeds, the vegetative cover averaged 75%. A list of all known large-bracted corydalis populations in Illinois are included in Table 2. Some of these populations extend across parts of three to six sections, others are small and isolated, covering only a few ha. These larger populations are not always contiguous, being interrupted by cultivated field and woodlots.

All of the large-bracted corydalis sites in Illinois occur on private land, none are in nature preserves or other state-owned sites. The data suggests that, at least in Illinois, disturbance is necessary for large populations to thrive. In the past, fire, blow-outs, and overgrazing, were probably important for this species' survival in sand prairies. Also, density and seed set can vary greatly due to rainfall patterns. Spring droughts severely decrease population sizes, and several years may be required before populations return to high levels, suggesting a poor seed bank.

This taxon has been cultivated since 1981 at Rivendell Botanic Garden, Schuyler County, Illinois. By maintaining an open habitat in sand, the large-bracted corydalis was easy to cultivate and made an excellent ornamental. Current agricultural practices will probably allow for the survival of this species in Illinois, but protected sand prairies with a moderate disturbance regime would be advisable.

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Table 1. Habitat, vegetative cover (%), density (#/ha), floral and fruit characteristics at the *Corydalis curvisiliqua* var. *grandibracteata* sites.

Study site	Habitat	Density (#/ha)	Cover (%)	Infl./ Plant	Flowers/ Infl.	Seeds/ Fruit
Henderson #1	fallow field	23,760	60	6.8	11.0	7.8
Cass #1	fallow field	22,540	60	9.9	7.9	9.1
Cass #2	sand prairie (disturbed)	13,440	70	6.3	8.3	5.8
Scott #1	fallow field	4,090	75	5.6	6.0	9.3
Scott #2	sand prairie (disturbed)	1,310	70	5.1	3.9	7.1
Morgan #1	hog lot	660	75	10.2	8.6	8.8
Cass #3	sand prairie	170	80	7.1	4.4	7.2
Cass #4	sand prairie	140	80	5.0	5.4	8.1

Table 2. Known Illinois populations of *Corydalis curvisiliqua* var. *grandibracteata* as of 1998.

County and map coordinants	general location	size (ha)	First Seen
<u>Brown Co.</u> SW1/4 S35 T2S R2W	5 kms SE of Versailles	2	1983*
<u>Cass Co.</u> S23, S26, S35 T18N R12W and S1, S2, T17N R12W	railroad SE of Beardstown	580	1983
S3, S9, S10 T17N R12W	6.5 kms S of Beardstown	660	1984
<u>Henderson Co.</u> NE1/4 S19 T12N R4W	2.5 kms W of Bald Bluff	75	1955
<u>Mercer Co.</u> exact locality not found	N of New Boston	--	1955*
<u>Morgan Co.</u> S27, S33, S34 T16N R13W	2.5 kms S of Meridosia	660	1983
<u>Pike Co.</u> NW1/4 Sec 1 T35N R2W	1 km NW of Meridosia	2	1984
<u>Sangamon Co.</u> SW1/4 S19 T15N R6W	2.5 kms SW of Curran	2	1988
<u>Scott Co.</u> S4, S5, S6 T15N R13W	2.5 kms NE of Naples	600	1984
S19 T15N R13W and S13, S24 T15N R14W	2.5 kms S of Naples	600	1984

* probably extirpated