



PERSPECTIVES OF THE PROTECTION OF *CARLINA ONOPORDIFOLIA* BESSER
IN POLAND

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ABSTRACT. The paper is a resume of the studies conducted in the years 2005-2008 on abundance of all populations of the rare species in Poland, i.e. the thistle *Carlina onopordifolia* Besser. It is the first work which includes all known stands, both natural (7) and anthropogenic (5). The natural stands occur in the Małopolska Upland and the Lublin Upland, and introduced ones are in the Kraków-Częstochowa Upland. In majority of natural stands the threefold increase of population abundance, after period of intense flowering, was noted. The flowering is very varied, what is connected with the biology of monocarpic species. However, abundance of anthropogenic stands was similar over time.

KEY WORDS: *Carlina onopordifolia*, population dynamics, steppe plants, protected plants, endemic plants

INTRODUCTION

Rare species of flora, known from single, isolated stands attracts special attention aiming at proper prevention from civilisation and environmental threats. One of such plant species is the thistle *Carlina onopordifolia* Besser, growing in seven natural stands (DENISIUK et AL. 2008 a, 2009) as well as in five secondary stands. Due to a small number of localities (ATLAS... 2001, POZNAŃSKA and KAŻMIERCZAKOWA 2001) and low abundance, ecological instability of grassland communities in which it grows, the species is listed as vulnerable one (V) (ZARZYCKI and SZELĄG 2006). Because of the fact that the nature reserve is the best method of nature conservation, three natural stands of the thistle were encompassed by nature reserve protection (in Miechów, Chełm and Zamość districts), and fourth one is proposed to be a nature reserve (DENISIUK et AL. 2008 b).

There is a common opinion that the thistle is endangered plant (POZNAŃSKA 1988 c, POLSKA CZERWONA KSIĘGA... 2001), what is supposed to be reflected in high variation in abundance of particular populations especially the smallest ones. Also the lack of flowering phase during long period is highlighted, what is especially important in the case of monocarpic plant whereas seeds production takes place only once during the lifespan. The latest research showed that this opinion is weakly based on the data and probably should be verified. Numerous data indicate that natural populations, particularly, the most abundant, reveal high development dynamics and hopefully they will maintain permanently.

The goal of the performed studies was to recognise abundance of specific natural and anthropogenic populations and to gain data about intensity of flowering. The major task was to point out such directions of management which can let protect the most abundant or the most precious stands and maintaining the small populations, quite unstable in relation to abundance and habitat conditions.

Description of the species and history of the research

The thistle is a species of family Asteraceae. It is perennial, semelparic plant, i.e. it blooms and fruits only once in lifespan but flowering is the last phase, after which an individual plant dies (POZNAŃSKA and KAŻMIERCZAKOWA 2001). In vascular plant flora *C. onopordifolia* represents Pannonian element (PIĘKOŚ-MIRKOWA and MIREK 2003) with endemic type of range known only in southern-eastern Poland and in the western Ukraine where populations are not too abundant (DENISIUK et AL. 2008 a, JASIEWICZ 1972, MOTYKA 1947, POZNAŃSKA 1985, ZAVIERUCHA 1981, 1996, CZERWONA KNIGA UKRAINI... 1996). In the territory of Poland natural stands of *C. onopordifolia* occur in two geographical regions: in the Lublin and the Małopolska Upland (POZNAŃSKA and KAŻMIERCZAKOWA 2001). The first known stand was in Stawska Góra near Chełm, published in 1880 by Maria Hempel (ŁAPCZYŃSKI 1881, KARO 1883). The second was found by Władysław Szafer in 1920 near Skowronno at Pińczów Hill (KAZNOWSKI 1929). The third one was described by JASIEWICZ and PAWŁOWSKI (1956) in the hill Wały close to Raclawice, the fourth was described by FIJAŁKOWSKI (1959) in the

vicinity of Grabowiec near Zamość, and the fifth one was explored by POZNAŃSKA (1985) on the slope of the hill close to northern-western border of Pińczów. The two latest ones were described by PEŁKA (1997) in villages Pasturka and Bogucice lying eastwards from Pińczów (Fig. 1).

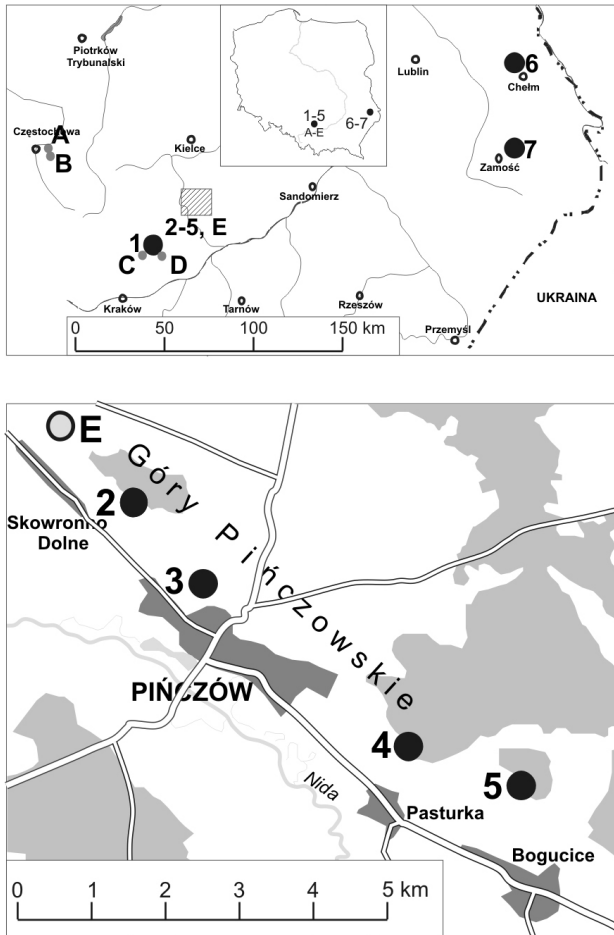


FIG. 1. The distribution of natural (1-7) and anthropogenic (A-E) stands of *Carlina onopordifolia* in Poland: 1 - nature reserve "Wały", 2 - Skowronno Dolne, 3 - Pińczów, 4 - Pasturka, 5 - Bogucice, 6 - nature reserve "Stawska Góra", 7 - nature reserve "Rogów"; A - Góra Wał, B - Polana Golizna, C - Raclawice, D - nature reserve "Dąbie", E - Skowronno

THE STUDY AREA AND METHODS

The investigations on numbers of barren and flowering specimens of the thistle were conducted in the years 2005-2008 in all known natural and secondary stands (Fig. 1), but in first year only general overview of population state was performed, because almost nowhere, except several cases, flowering specimens were encountered. The gathered data on numbers of barren specimens was used as a material for comparative studies with results by other authors and further own studies. Since 2007 the studies included introduced stands, because all former sites of metaplantation of the species from 80s of the 20th century were found and identified in the field.

RESULTS

The population state of Carlina onopordifolia

In the territory of Poland the thistle scores northern-western border of the range and occurs in seven natural stands. These are: nature reserve "Wały" near Raclawice (Miechów district), surroundings of Skowronno Dolne, Pińczów, Pasturka and Bogucice on Pińczów Hill (Pińczów district) and nature reserve "Rogów" closed to Grabowiec (Zamość district) (BZDON and CIOSEK 2007, DENISIUK et AL. 2008 a, 2009). The research was also performed on abandoned former arable field of an area of 2.8 ha, adjacent to reserve "Wały", where the most abundant population of *C. onopordifolia* with numerous flowering plants (DENISIUK et AL. 2008 a) was found. For more than ten years arable practices were stopped, probably due to high steepness of the slope. The search of sites occurrence of the thistle given by KOSTUCH and MISZTAŁ (2007) did not enrich the list of natural stands of this plant. The aforementioned site of ecological interest "Wierciszów", a known stand in Pasturka and "Binek", is the population in Bogucice, whereas in Szczepanowice no stand was found. Probably there the species was erroneously identified.

Abundance of population. In particular stands the numbers of specimens varied in the years 2005-2008 (Table 1). The population abundance from the reserves "Wały", "Stawska Góra" and Pińczów showed distinct increasing tendency. After 2005 where distinct decrease in flowering occurred, the next 2006 year was the poorest in relation to total number of specimens. Then, in all natural stands more than 13 thousands of specimens were recorded, whereas a year later their number increased twofold amounting more than 30 thousands (there were a lot of seedlings) and in 2008 the abundance was estimated at ca 30 thousands of specimens. However, the year 2006 was very abundant in flowering specimens which number amounted to almost 1000 individuals i.e. 7.9% of all populations (from 4.5% to 15.7%). Next year number of flowering the specimens decreased threefold, whereas in 2008 total 1547 flowering plants were counted (4.4% of whole population).

The state of populations of Carlina onopordifolia in secondary stands

In order to prevent from tendency in decrease of abundance of the thistle, especially in stands of this plant outside of the reserves, some actions succoring reserve protection through establishing anthropogenic stands were taken.

The secondary stands were established in the Kraków-Częstochowa Upland and the Małopolska Upland. The first introduced populations were founded owing to the initiative by prof. Romuald Olaczek and prof. Maria Ławrynowicz of the Łódź University. In May and June of 1985 easterwards from Mstów (Częstochowa district), on slopes, they established two stands on "Góra Wał" Mt. and "Polana Golizna" (WENDA 2002, 2003). Two years later POZNAŃSKA (1988 a, b), of the Institute of Nature Conservation in Kraków, established two further stands: near Raclawice in the Miechów Upland and close to Skowronno Dolne (Pińczów district). In 1989 the third introduced stand in Małopolska Upland in the reserve

TABLE 1. Abundance of natural populations of *Carlina onopordifolia* in the years 2006-2008

Lp.	Stand	Area (ha)	Year											
			2006				2007				2008			
			A	B	C	D	A	B	C	D	A	B	C	D
1	Reserve "Wały"	5.81	7 350	640	7 990	8.01	20 380	82	20 462	0.40	15 840	342	16 182	2.11
1a	Fallow to the E from the reserve	4.00	-	-	-	-	4 800	77	4 877	1.58	7 640	535	8 175	6.54
	Together	5.81	7 350	640	7 990	8.01	25 180	159	25339	0.63	23 480	877	24 357	3.60
2	Skowronno Dolne	1.50	490	22	512	4.30	518	7	525	1.33	260	5	265	1.89
3	Pińczów	2.50	110	135	1 245	10.84	1 618	57	1 675	3.40	2 520	170	2690	6.32
4	Pasturka	0.25	470	34	504	6.75	306	13	319	4.08	710	72	782	9.21
5	Bogucice	0.05	59	11	70	15.71	2	0	2	0.0	48	3	51	5.88
6	Reserve "Stawska Góra"	4.00	3 130	154	3 284	4.69	4 000	54	4 054	1.33	6 530	420	6 950	6.04
7	Reserve "Rogów"	0.95	29	0	29	0.0	33	0	33	0.0	64	0	64	0.0
	Total	4.95	18 988	1 636	21 624	58.31	56 837	449	57 286	12.75	57 092	2 424	59 516	41.59

Explanations: A – barren individuals, B – flowering individuals, C – total (sum A + B), D – % of flowering individuals.

"Dąbie" near Klonów (Miechów district) was founded (POZNAŃSKA 1991 a, b, c, KAŹMIERCZAKOWA 2003).

Abundance of populations. From the data gathered in the period 2001-2008 it can be inferred that the most abundant was the population in Raclawice which in 2002 contained 65 plants and despite the fact that in 2007 there were only 18 individuals, in 2008 their number reached 32 including one flowering plant. Similar situation is in the reserve "Dąbie", but different is in Skowronno and Mstów, where percentage of flowering plants was higher (Table 2). The mean percentage of

flowering in the introduced stands in 2008 amounted to 5.6% and varied from 3.12 to 33.3%. In the years 2001-2002 this percentage was twofold higher (9.15%), whereas in 2007 there were no generative plants at all (Table 2).

Idea of integrated protection of isolated populations of steppe plants

The thermophilous grasslands and swards are very valuable in relation to species richness and species diversity, thus from long time they received attention of

TABLE 2. Abundance of anthropogenic populations of *Carlina onopordifolia* in the years 2001-2008

Lp.	Stand	Area (ha)	Year											
			2001-2002**				2007				2008			
			A	B	C	D	A	B	C	D	A	B	C	D
1	Mstów – Góra Wał	0.02	7	1	8	12.50	5	0	5	0	4	2	6	33.33
2	Mstów – Polana Golizna	0.10	19	2	21	9.52	16	0	16	0	19	1	20	5.00
3	Raclawice	0.02	65	0	65	0	18	0	18	0	31	1	32	3.12
4	Reserve "Dąbie"	0.10	12	0	12	0	4	0	4	0	21	0	21	0.0
5	Skowronno*	0.01	26	10	36	27.78	21	0	21	0	26	2	28	7.14
	Total	0.25	129	13	142	9.15	64	0	64	0	101	6	107	5.61

Explanations: A – barren individuals, B – flowering individuals, C – total (A + B), D – % of flowering individuals.

*In 2006 in Skowronno there were 35 plants, including six flowering i.e. 17.14% (BZDON and CIOSEK 2007). There is no data for years 2001-2005.

**The data for 2001-2002 are given after the following sources: for Mstów (WENDA 2002, 2003), for Raclawice and the nature reserve "Dąbie" (KAŹMIERCZAKOWA 2003), for Skowronno (BZDON and CIOSEK 2007). For the years 2003-2005 – lack of data.

botanists and conservationists (BĄBA 2003). They are biotopes for many rare species of plants and animals, characteristic for steppe vegetation. They usually form isolated and small populations in fragmented landscape (DZWONKO and LOSTER 2008).

The protection of steppe flora and vegetation has a long tradition but practice of reserve protection was considered as the most effective one. In network of reserves divided into nine types xerothermic communities are protected within steppe reserves and partially in floristic reserves. However, they are mainly small, in regard to the area, and their number is low. Amongst 1420 nature reserves in Poland only 35 are steppe reserves of total 525 ha and of 125 floristic reserves including more than 10 are established for steppe species (DENISIUK and DENISIUK 2007, DENISIUK 2008).

The most of steppe reserves were founded in świętokrzyskie region (9 units) and lubelskie region (7), and less in małopolskie region (5), and in eight other voivodships there are from one to three, but in the remaining provinces there are no steppe reserves at all. Other category in nature conservation is an area NATURA 2000, which can encompass other forms of nature protection. Integration of these forms can prevent optimal functioning and the maintenance of scattered and isolated in the landscape steppe phytocoenoses. The integral protection of small populations should comply their connection into common larger area, which is supposed to function as ecological corridor, enabling gene flow (VERKAAR 1990).

Considering integral system of nature conservation three areas should be taken into account: establishment of large steppe reserve in Góry Pińczowskie Mts., enlargement of the reserve "Wały" through inclusion of abandoned arable field with abundant stand of *Carlina onopordifolia* and foundation of sites of ecological interest in Mstów near Częstochowa ("Góra Wał" and "Polana Golizna"), which, in the future, should be transformed into nature reserves protecting anthropogenic stands of the thistle and growing there xerothermic grasslands.

The most urgent task is the protection of steppe grasslands situated on the Pińczów Hill. The phenomenon of this area is connected with the accumulation of floristic rarities as submediterranean species i.e. *Dorycnium germanicum*, *Lathyrus latifolius* and *Reseda phyteuma* (MEDWECKA-KORNAŚ 1952, GŁAZEK 1984, DENISIUK et AL. 2008 b). Moreover, there are other steppe species, represented by small populations, included on the list of species under legal protection.

The unique vegetation of xerothermic hills on the Pińczów Hill was observed first by botanists after the end of World War I. The first concrete attempts aiming at the legal protection of this area were done only after World War II, when the project of the reserve "Góry Pińczowskie" with the area 14.62 ha was born (GŁAZEK 1984). This project has never been realised so far. However, it is worth to stress that the proposed area was too small in order to protect enough efficiently whole species and phytocoenotic diversity of this hill. Góry Pińczowskie is a huge area which encompasses the existing nature reserve "Skowronno". The future reserve will protect not only the populations of *C. onopordifolia* but also other important species. The vegetation of this area is

too rich in order to narrow its value to single representatives of flora and fauna. Many precious species have their populations in direct contact zone with arable fields and are exposed to further fragmentation and even complete elimination from biotopes (DENISIUK et AL. 2008 b).

The latest project of steppe reserve under the name "Góry Pińczowskie" of 192 ha (including western part 136 ha and eastern part 56 ha), was introduced to Voivodeship Council for Nature Conservation in Kielce on 26th 2008. According to this proposal, the protection area must include the reserve "Skowronno" covering 1.93 ha of an area, two natural stands of *C. onopordifolia* in Pińczów and in Skowronno Dolne and anthropogenic stand near the mentioned nature reserve. It would be the western part of the proposed protection area. The eastern part, divided by building area, will include stands of the thistle in Pasturka but declining population in Bogucice ought to be protected within a site of ecological interests. Thus, the new nature reserve may fulfill its integral role in protection of small isolated populations of various steppe species.

The establishment of the steppe reserve "Góry Pińczowskie" is a reasonable from the viewpoint of popularisation of environmental values of Nadnidziański Landscape Park both for educational and touristic-recreation purposes. Amongst 120 existing landscape parks (DENISIUK 2004) Nadnidziański LP is an exceptional object, because it protects elements of steppe, scrub, forest vegetation on calcareous hills and swamp meadows and mires of the Nida River Valley. Such physiography is an excellent value and an argument for promotion of this region at both country and even Europe scale.

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