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# NEW DATA ON THE DISTRIBUTION OF *ARABIS RECTA* (BRASSICACEAE) IN POLAND

MARCIN NOBIS, MACIEJ KOZAK & WACŁAW BARTOSZEK

**Abstract**. Polish locations of *Arabis recta* are situated at the absolute northerly distributional limit of the European range. Until recently this spring therophyte was regarded as an extinct plant in Poland. During field studies the authors confirmed a number of stations and discovered new ones for this species. This work examines the distribution, habitat preferences and plant communities in which the species was reported, gives information on the size of the population at each of the localities, and provides a distribution map.

**Key words**: *Arabis recta*, distribution, endangered plants, habitat, Poland

*Marcin Nobis, Maciej Kozak & Wacław Bartoszek, Institute of Botany, Jagiellonian University, Kopernika 27, PL-31-501 Kraków, Poland; e-mail: nobis@ib.uj.edu.pl*

## INTRODUCTION

Annual rockcress *Arabis recta* Vill. (*A. auriculata* sensu DC., non Lam.) (Brassicaceae) is a spring therophyte belonging to the (sub)Mediterranean-Irano-Turanian pontic element (Meusel *et al*. 1965). In Poland, its localities, isolated from the continuous distribution range, mark the northernmost limit of this taxon in Europe. *Arabis recta* is one of the rarest species of vascular plants in Poland, known almost exclusively from the area of the Niecka Nidziańska basin (SE part of the Wyżyna Małopolska upland; Kondracki 2001). By 2001, of four localities known from the territory of Poland, only one was confirmed (cf. Mirek & Kaźmierczakowa 2001). Because of its extremely rare occurrence and very evident reduction in the number of localities, the species was listed in the *Polish Red Data Book of Plants* (Mirek & Kaźmierczakowa 2001) as 'critically endangered' (CR). In the most recent edition of the *Red List of the Vascular Plants in Poland* (Zarzycki & Szeląg 2006), *Arabis recta* is noted as extinct within Poland (Ex).

## OCCURRENCE OF *ARABIS RECTA* IN POLAND

Annual rockcress was first recorded in 1937 by B. Pawłowski, in a sward on the rocky gypsum slopes of a gorge in Skorocice near Busko Zdrój (16 May 1937, *leg. B. Pawłowski* – KRA 165712, KRAM 320607; 26 May 1951, *leg. A. & J. Kornaś* – KRA 004731; 04 May 1968, *leg. A. Jasiewicz* – KRA 023422 & 443269; 19 May 1971, *leg. J. Wróbel* – KRA 73646; 2000, observation of R. Kaźmierczakowa), and in the present-day Przęślin Nature Reserve near Chotel Czerwony village by B. Jaroń (16 May 1937, *leg. B. Jaroń* – KRA 165713). The first published record of its occurrence appeared only after World War II (Medwecka-Kornaś 1959). About the same time, J. Kornaś reported another finding in the Rudawa River valley, on a meadow near a railway embankment between Mydlniki and Zabierzów localities in the vicinity of Kraków (20 May 1955, *leg. J. Kornaś*, hb. A. & J. Kornaś; Kornaś *et al.* 1959). The next locality in Poland was found in the late 1990s near Stawiany village close to Pińczów (Trzcińska-Tacik *et al*. 1998).

By 2001 only one of these four localities was confirmed (Skorocice Reserve near Busko Zdrój; cf. Mirek & Kaźimierczakowa 2001); several hundred individual *Arabis recta* were found there.

## Material and methods

In field studies in the spring of 2004 and 2006, most of the localities of *Arabis recta* were located by means of a Garmin eTrex Legend GPS receiver in the WGS-84 grid. For every finding of the species, the population number was either estimated or determined by counting. At the sites where *Arabis* plants and accompanying plants formed homogenous patches of vegetation, phytosociological relevés were made by the standard Braun-Blanquet method, or floristic checklists compiled. The list of localities is presented, based on the ATPOL grid of 2.5 × 2.5 km squares (Zając 1978), and their distribution is visualized (Fig. 1) on an ATPOL cartogram map (10 × 10 km).

The nomenclature for vascular plant species follows Mirek *et al.* (2002), for mosses follows Ochyra *et al.* (2003), and for lichens follows Fałtynowicz (2003). The names of syntaxa were taken from the works of Medwecka-Kornaś *et al.* (1972) and Matuszkiewicz (2001).

The herbarium specimens of *Arabis recta* collected in the course of this study are deposited in the Herbarium of the Institute of Botany, Jagiellonian University, Kraków (KRA).

## Results

In the course of the field research, six locations of this species were found, including four new ones (not reported in the literature and not found in herbarium collections). These locations are situated in the Niecka Nidziańska basin in the mesoregions of the Niecka Solecka basin and the Garb Pińczowski hump. Annual rockcress occurs there on highly insolated swards at mainly southerly-exposed sites, on shallow limestone soils (rendzinas) whose parental rocks are gypsum or chalk. The majority of localities for the species were found within patches of the association *Sisymbrio-Stipetum capillatae* (Dziub. 1925) Medw.-Korn. (1959). The relevés showed a significant proportion of species typical of the alliance *Cirsio-Brachypodion pinnati*; phytocoenoses of this alliance frequently occur in the immediate proximity of *Sisymbrio-Stipetum capillatae* patches (Table 1). Apart from species characteristic of the order *Festucetalia valesiacae* and class *Festuco-Brometea*, the plants are also typical of edge communities (*Trifolio-Geranietea sanguinei* class) and grasslands on sands (*Koelerio glaucae-Corynephoretea canescentis* class).

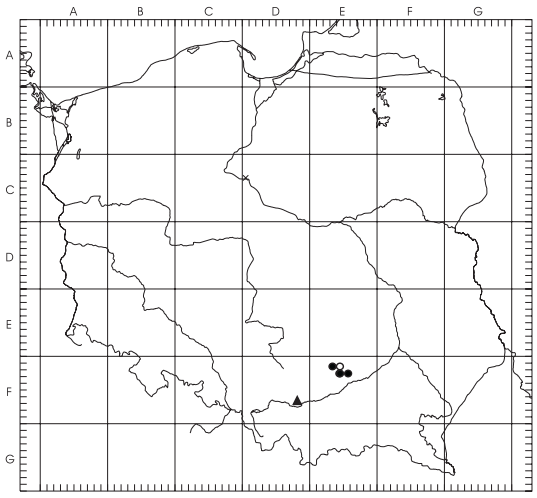


**Fig. 1**. Distribution of *Arabis recta* Vill. in Poland: (●) presently existing locality, (○) locality not confirmed, (▲) anthropogenic locality.

### List of localities found

1. Skorocice near Busko Zdrój – in gaps of a xerothermic grassland on a fairly steep SSE-facing slope, on the left bank of Potok Skorocicki stream (50°25′20.6″N/20°40′26.3″E; 210 m a.s.l.) and on a small hill with gypsum outcroppings facing SSE, on the right bank of Potok Skorotnicki stream (50°25′27.8″N/20°40′30.0″E; 212 m a.s.l.) – EF24 13 grid square; 24 May 2004, observation of W. Bartoszek; 28 May 2006, 06 June 2006, observation of M. Kozak and M. Nobis. These latest records confirm its continued presence at a locality known for more than half a century. During the whole period of our field studies, *ca* 200 individuals of *Arabis recta* were found there. However, as reported by Mirek and Kaźmierczakowa (2001), their numbers have varied enormously in recent years (thousands of specimens were observed in 1995, and only a few hundred in 2000). An average of data taken over a longer period would give a better estimate of their number.

2. About 100 m NW of the border of the Skorocice Reserve near Busko Zdrój, in gaps of a small

**Table 1**. Plant communities with *Arabis recta* Vill.

| No. of record | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Area of record [m²] | 20 | 15 | 10 | 15 |
| Exposure | SSE | SSE | SE | SW |
| Inclination [°] | 40 | 10 | 3 | 40 |
| Altitude a.s.l. [m] | 200 | 210 | 210 | 215 |
| Cover of herbaceus plants [%] | 75 | 60 | 60 | 60 |
| Cover of D layer [%] | 3 | 15 | 20 | 5 |
| No. of species | 27 | 39 | 30 | 25 |
| Ch. Ass. *Sisymbrio-Stipetum capillatae* | | | | |
| *Arabis recta* | + | + | + | + |
| *Carex supina* | 3 | + | . | · |
| *Festuca valesiaca* | 3(4) | + | + | . |
| *Sisymbrium polymorphum* | + | . | . | . |
| *Veronica praecox* | + | + | + | + |
| Ch. All. *Festuco-Stipion* | | | | |
| *Koeleria macrantha* | . | + | + | + |
| *Stipa capillata* | + | 2 | . | 3 |
| Ch. O. *Festucetalia valesiacae* | | | | |
| *Potentilla arenaria* | 2 | 1 | 3 | 1 |
| *Thymus marschallianus* | 1 | + | . | 2 |
| *Thymus pannonicus* | . | + | 2 | . |
| Ch. Cl. *Festuco-Brometea* | | | | |
| *Anthyllis vulneraria* | . | + | . | + |
| *Artemisia campestris* | + | 2 | . | 2 |
| *Centaurea stoebe* | . | 1 | + | 1 |
| *Euphorbia cyparissias* | 1 | 1 | + | 1 |
| *Festuca rupicola* | . | 1 | 1 | . |
| *Ortantha lutea* | . | + | . | 1 |
| Ch. Cl. *Trifolio-Geranietea sanguinei* | | | | |
| *Galium verum* | 1 | + | + | + |
| *Medicago falcata* | + | 1 | 1 | . |
| Ch. Cl. *Koelerio glaucae-Corynephoretea canescentis* | | | | |
| *Erophila verna* | + | + | . | + |
| *Gypsophila fastigiata* | . | + | . | 1 |
| *Sedum acre* | . | + | 1 | . |
| Others | | | | |
| *Alyssum alyssoides* | + | + | . | . |
| *Bryum* sp. (D) | . | 2 | . | + |
| *Camelina microcarpa* subsp. *sylvestris* | + | + | . | . |
| *Cladonia foliacea* (D) | . | + | . | 1 |
| *Draba nemorosa* | + | . | + | . |
| *Elymus hispidus* subsp. *barbulatus* | 2 | + | . | . |
| *Syntrichia ruralis* (D) | + | 1 | 1 | . |

SPORADIC SPECIES: Ch. O. *Festucetalia valesiacae*: *Asperula tinctoria* 2; *Astragalus danicus* 3; *Campanula sibirica* 4; *Carex praecox* 1(1); *Eryngium campestre* 1(r); *Ornitogallum collinum* 2; *Thesium linophyllon* 2(1); *Thymus glabrescens* 3(1). Ch. Cl. *Festuco-Brometea*: *Acinos arvensis* 3; *Arabis hirsuta* 3; *Carex humilis* 2(2); *Dianthus carthusianorum* 2; *Filipendula vulgaris* 2; *Helianthemum nummularium* subsp. *obscurum* 4(1); *Linosyris vulgaris* 4; *Poa compressa* 3(1); *Stachs recta* 1. Ch. Cl. *Trifolio-Geranietea sanguinei*: *Fragaria viridis* 3(r); *Peucedanum oreoselinum* 2(1). Ch. Cl. *Koelerion glaucae-Corynephoretum canescentis*: *Cerastium semidecandrum* 1; *Festuca psammophila* 4(1); *Silene otites* 2(1); *Thymus serpyllum* 3(1). Others: *Abietinella abietina* (D) 3(2); *Achillea* sp. 3; *Arenaria serpyllifolia* 1; *Artemisia* sp. 4; *Ceratodon purpureus* (D) 1(2); *Cladonia pyxidata* (D) 2; *Echium vulgare* 2; *Elymus hispidus* subsp. *hispidus* 3; *Falcaria vulgaris* 1; *Festuca trachyphylla* 2; *Fulgeusia bracteata* (D) 4; *Holosteum umbellatum* 2; *Peltigera rufescens* (D) 2; *Poa pratensis* s.l. 3(1); *Polygala vulgaris* 3; *Salvia pratensis* 3(1); *Scabiosa* sp. 4; *Sedum maximum* 3; *S. sexangulare* 4; *Toninia sedifolia* (D) 4; *Trifolium montanum* 3; *Veronica arvensis* 3.

LOCALITIES OF RECORDS: 1 – Skorocice Reserve near Busko Zdrój, on the left of the Potok Skorocicki stream (50º25′20.6″N/20º40′26.3″E), 6 June 2006; 2 – Skorocice Reserve near Busko Zdrój, on a small hill with gypsum rock outcrops, on the right of the Potok Skorotnicki stream (50º25′27.8″N/20º40′30.0″E), 6 June 2006; 3 – *Ca* 100 m NW of the border of the Skorocice Reserve (50º25′41.2″N/20º40′29.6″E), 6 June 2006; 4 – *Ca* 20 m SE of the asphalt road linking the Winiary and Nowa Zgość villages near Busko Zdrój, near the top of the hill (50º25′54.6″N/20º37′31.6″E), 14 June 2006.

field of xerothermic grassland on a SE-facing scarp (50°25′41.2″N/20°40′29.6″E; 210 m a.s.l.) – EF24 13; 6 June 2006, *leg. M. Kozak & M. Nobis* (KRA 0303781). At this location there were *ca* 80 individuals of *Arabis recta*.

3. About 200 m north of the border of the Skorocice Reserve (close to the previous locality), in small gaps in an overgrown field sward on gypsum substrate on the descending slope of a small hill facing E (50°25′44.6″N/20°40′36.8″E) – EF24 13; 6 June 2006, observation of M. Kozak and M. Nobis. At this locality there were *ca* 40 individuals of *Arabis recta*.

4. About 20 m SE of the asphalt road linking Winiary and Nowa Zgość villages near Busko Zdrój, on initial rendzina soil, within a xerothermic sward on gypsum rock outcrops on a moderately steep SW exposed slope, near the top of the hill (50°25′54.6″N/20°37′31.6″E; 215 m a.s.l.) – EF24 12; 14 June 2006, observation of M. Nobis. At

this locality there were significantly more than 200 individuals.

5. On the edge of the Skowronno Reserve, in Skowronno Dolne village near Pińczów (50°33′N/20°29′30″E) – EF13 02; 19.05.2004, observation of W. Bartoszek. *Arabis recta* specimens grew there over a surface of several square meters, in gaps of xerothermic sward, relatively poor in species, with the grasses *Stipa capillata* and *Elymus hispidus* subsp. *hispidus* as dominant species, developed in the upper part of a steep slope on chalk rendzina soil (facing SW, *ca* 220 m a.s.l.). This *Arabis recta* population was small (20–30 specimens). Despite a very thorough search in the reserve and its immediate vicinity, the species was not found outside this site. Perhaps the species established itself there when the vegetation cover and soil were broken for installation of a reserve information sign (since removed). Very close to the rockcress plants the following species were found: *Achillea* sp., *Adonis vernalis*, *Artemisia campestris*, and *Asperula* sp., *Brachypodium pinnatum*, *Centaurea scabiosa*, *C. stoebe*, *Cerinthe minor*, *Dianthus carthusianorum*, *Festuca* sp. (Ovinae), *Galium mollugo*, *G. verum*, *Hypericum perforatum*, *Medicago falcata*, *Peucedanum oreoselinum*, *Potentilla arenaria*, *Primula veris*, *Salvia verticillata*, *Sanguisorba minor*, *Seseli annuum*, *Thalictrum* cfr. *minus*, *Thymus* sp., *Verbascum lychnitis*, *Veronica spicata*, *Vincetoxicum hirundinaria*. Gradually invading shrubs *Rhamnus cathartica*, *Rosa* sp. and *Syringa vulgaris* may shade the patch in future, causing the xerothermic species to disappear.

During revision of herbarium materials in KRA, a specimen of *Arabis recta* was found, collected '*between Skowronno and Pińczów on a flattened hill*' (15 May 1984, *leg. J. Wójciak* – KRA 0234382), from the collection of the late Professor Tadeusz Głazek; probably this locality had not been published, and as such it is not listed in the newest publication devoted to *A. recta* in the *Polish Red Data Book of Plants* (Mirek & Kaźmierczakowa 2001). It cannot be excluded, that the 1984 specimen was also collected in the Skowronno Reserve.

## POPULATION NUMBERS

As already mentioned, many years of observation are required for correct determination of the number of individuals of *Arabis recta* in a given locality, the numbers of this therophyte fluctuate markedly from year to year. Their small size also handicaps accurate estimation. Spotting them in gaps of xerothermic grassland calls for particular care, as they are obscured by leaves of grasses, chiefly *Stipa capillata*, as well as by other plants. All these problems are aggravated by the short life cycle of the species, which lasts a mere two to three months from germination to seed dispersal, after which time the plant cannot be seen.

## THREATS AND PROTECTION

In most cases, *Arabis recta* populations are situated in legally protected areas, in the Skorocice, Przęślin and Skowronno Reserves, which are covered at least in part by active forms of protection applied to conserve the unique flora and very valuable plant communities occurring there. Measures such as cutting and mechanical removal of growing shrubs eliminate excessive shading of these localities. It is also important not to allow the needle grass sward to become too compact and to leave gaps, because annuals such as *Arabis recta* reproduce only by seeds. In order to germinate, the seeds require direct access to the soil surface and light.

## CONCLUSIONS

Eight localities of *Arabis recta* are presently known in Poland, four of them reported for the first time here. The continued occurrence of the species in the Skorocice Reserve was also confirmed. An attempt to confirm the locality of annual rockcress in the Przęślin Reserve near the village of Chotel Czerwony was unsuccessful, despite a detailed search; the last finding of the species at this locality dates back to 1995 (Kaźmierczakowa & Perzanowska, unpubl.). The occurrence of the species at the Stawiany village locality has not been confirmed since 2000. It is possible that small

populations of *Arabis recta* persist at those two places, because suitable habitat conditions (at least in the Przęślin Reserve) still prevail there.

The anthropogenic locality found in 1955 by J. Kornaś, in a meadow near a railway embankment (between Mydlniki and Zabierzów near Kraków) has not been confirmed since the time of that finding, and is probably not extant. It may have been only an ephemeral station.

More localities of *Arabis recta* are likely to be found in future. The chances are great because there is no shortage of potential localities for this species in the Niecka Nidziańska basin, that is, loose xerothermic swards developing on gypsum and chalk, as well as fragments of calciphilous swards.

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