



## Rediscovery of *Polycnemum majus* (Amaranthaceae) in Belgium due to a 152 year old herbarium specimen

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**Illustrations:** botanicalcollections.be (Fig. 1) en A. Jacobs (Fig. 2-4).

**ABSTRACT.** – In 2018 a population of *Polycnemum majus* was rediscovered near Rochefort (province of Namur). The species had long been considered extinct in Belgium. The label of a herbarium specimen from 1866 led to a formerly known historical site where more than a century and a half later a population is still present. The paper recounts how the species was rediscovered and describes the site and the characteristics, ecology, status and distribution of the species.

**RÉSUMÉ.** – Redécouverte en Belgique de *Polycnemum majus* (Amaranthaceae) grâce à un spécimen d’herbier vieux de 152 ans. En 2018, une population de *Polycnemum majus* a été redécouvert près de Rochefort (province de Namur). L’espèce était considérée comme éteinte en Belgique depuis longtemps. L’étiquette d’un spécimen d’herbier datant de 1866 a permis de redécouvrir un site historique, où plus d’un siècle et demi plus tard, une population subsiste toujours. L’article décrit la redécouverte, la station et les caractéristiques, l’écologie, le statut et la répartition de l’espèce.

**SAMENVATTING.** – Herontdekking van *Polycnemum majus* (Amaranthaceae) in België dankzij een 152 jaar oud herbariumspecimen. In 2018 werd een groeiplaats van *Polycnemum majus* herontdekt nabij Rochefort (provincie Namen). De soort werd geruime tijd als uitgestorven beschouwd in België. Het etiket van een herbariumspecimen uit 1866 leidde tot een historisch gekende locatie waar meer dan anderhalve eeuw later nog steeds een populatie aanwezig is. Het artikel beschrijft de herontdekking, de vindplaats en de kenmerken, de ecologie en de status en verspreiding van de soort.

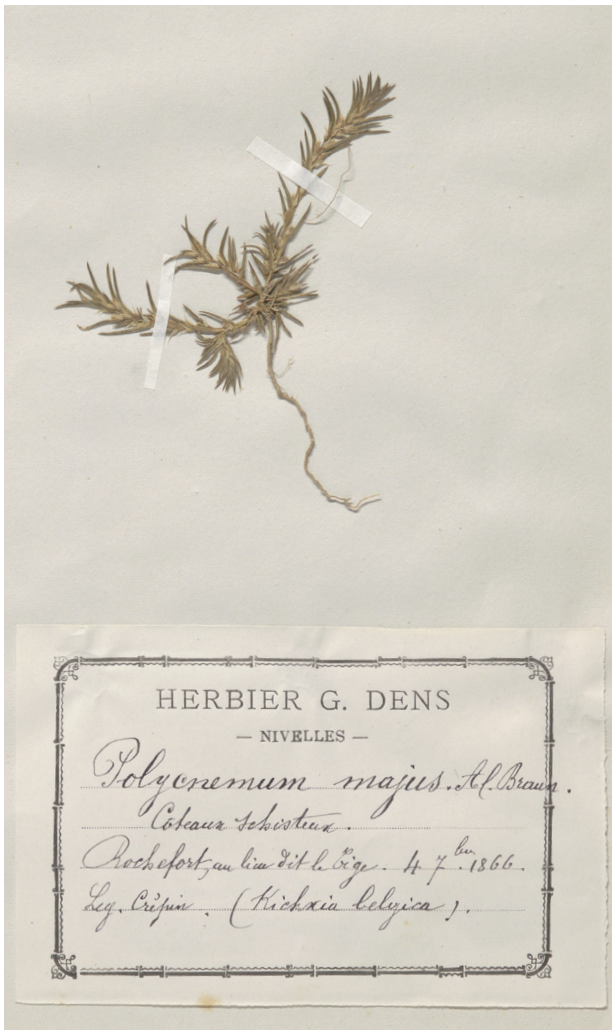
### Introduction: lost and found

Historical data provide valuable insight into the former distribution range of plant species. An important and underestimated source of historical data are herbarium collections. The labels can contain precise information on spatial data. Since 2018 the Belgian herbarium at Meise Botanic Garden (BR) has been digitized and is now open to public consultation at [www.botanicalcollections.be](http://www.botanicalcollections.be). The platform greatly enhances the accessibility of herbarium specimens.

The first author scanned through herbarium specimens of plant species that are considered threatened or extinct in Belgium. In August 2018 a specimen of *Polycnemum majus* A. Braun from the herbarium G. Dens (now kept in BR) and dated 4 September 1866 caught the attention of the first author. This species has been considered extinct in Belgium since 1946 (Lawalree & Delvosalle 1969). The label of the specimen included an accurate site description: “Côteaux schisteux. Rochefort, au lieu dit

le Tige.” (Schist hillside. Rochefort, at the place called *le Tige*); see Fig. 1 ([botanicalcollections.be/specimen/BR0000012434343](http://botanicalcollections.be/specimen/BR0000012434343); accessed August, 2018). The precise location and collection date (4 September 1866) were confirmed by another herbarium sheet taken from the exsiccata *Kickxia Belgica*, published by A. Thielens and A. Devos (BR BR0000011137481; Cent. II, 1866, N° 163). The labels of both these collections furthermore indicated that the specimens had been gathered by François Crépin.

Geographic research revealed that ‘Le Tige’ is still used as a toponym nowadays. The road that connects the municipalities of Rochefort and Éprave is called ‘Rue du Tige’. The road in line is named ‘Rue Pêcheron’ and is adjacent to the nature reserve ‘Tige d’Éprave’ (prov. Namur, IFBL J6.24.21). Aerial photographs from the 1970s to the present show that the landscape has remained quite unchanged over the years. We were strongly interested to visit the area of ‘Le Tige’. On 9 September 2018 we explored the site and rediscovered a population of *P. majus*.



**Figure 1.** *Polycnemum majus*. Scan of a specimen from the herbarium G. Dens (now in BR), gathered in 1866.

### Species description and ecology

*Polycnemum majus* is an annual species belonging to the Amaranthaceae family (Masson & Kadereit 2013). Plant height varies between 5 and 30 cm (Lambinon *et al.* 1998). The plant has several stems that branch at ground level. They are procumbent to erect, hirsute or glabrous and often red-coloured at the base (Shultz 2004, Lauber *et al.* 2012) (Fig. 2). The leaves are 0.6-2 cm long, thin, stiff and needle-like with a spiny tip (Shultz 2004, Leurquin 2011), as indicated by the English vernacular name Giant needle-leaf. The inflorescence is composed of solitary, hermaphroditic flowers located in the upper leaf axils (Fig. 3). The perianth is 2-2.5 mm long and consists of five scarious, papyraceous petaloid tepals (Lauber *et al.* 2012, Masson & Kadereit 2013). The flowering period in northwestern Europe extends from July to October (Lambinon *et al.* 1998). The fruit consists of a one-seeded nut. *Polycnemum majus* has been proven to be potentially self-fertilizing (Tomšovic & Krahulcová 1991). Species identification within the genus *Polycnemum* is complex and must be carefully done. *Polycnemum majus* differs from the other *Polycnemum* species (*P. arvense* L., *P. verrucosum* Láng, *P. heuffelii* Láng, *P. fontanesii* Durieu & Moq., and *P. perenne* Litv.) by the bracteoles longer than the perianth (>2.5 mm), larger fruits (>1.5 mm) and thicker leaves (in the middle part thicker than 0.7 mm) (Tomšovic & Krahulcová 1991). The only other *Polycnemum* species that has been recorded so far from Belgium is *P. arvense*; as a neophyte it has last been recorded in 1903 (Verloove 2006).

*Polycnemum majus* is a therophyte that completes its life cycle when environmental conditions are favourable. It has a persistent seed bank, proven to remain viable up to 50 years or more (Kohler *et al.* 2011). The species occurs



**Figure 2.** General aspect of *Polycnemum majus*, growing in the vicinity of the nature reserve 'Tige d'Éprave' in Rochefort (province of Namur).





**Figure 3.** Flowers of *Polycnemum majus* located in the upper leaf axils.

in dry, open, disturbed habitats with shallow, usually calcareous, sandy or stony soils, such as extensively farmed arable fields, wastelands, and open grasslands (Tomšovic & Krahulcová 1991, Shultz 2004). It is also found as a casual at railway embankments and roadsides (Tomšovic & Krahulcová 1991, Lambinon *et al.* 1998).

### Distribution and status

The distribution range of *Polycnemum majus* extends from Europe – mainly the Mediterranean region and Central Europe – to the Middle East and Central Asia (Lambinon *et al.* 1998, GBIF Secretariat 2017). The species is also found as a neophyte at a number of locations in Europe, such as in the Czech Republic (Tomšovic & Krahulcová 1991), Germany (Weicherding 2011), Italy (Podda *et al.* 2012), the Netherlands (FLORON 2019), North America and Canada (Tomšovic & Krahulcová 1991, Shultz 2004). The species is declining throughout its indigenous range, seemingly due to the enlargement of scale and the intensification of agricultural practices (Tomšovic & Krahulcová 1991). *Polycnemum majus* has an endangered status in several different European countries such as Germany (Ludwig & Schnittler 1996), Switzerland (Bornand *et al.* 2016), Austria (Niklfeld & Schrott-Ehrendorfer 1999), and several regions in France (Auvert *et al.* 2011, Haugel & Toussaint 2012, Vangendt *et al.* 2014) and Italy (Buffa *et al.* 2016).

In Belgium, *P. majus* has been considered extinct since 1946 (Saintenoy-Simon 2006). The only documented location in Flanders is Lanaken (prov. of Limburg), where *P. majus* was collected in 1865 and 1866 (Lawalrée 1953, Lawalrée & Delvosalle 1969; BR0000011905905 and BR0000011904977). Seven other records are documented in the southern part of the Meuse district. They are situated in the Calestienne region in four IFBL grid cells (4 × 4 km, IFBL J5.24, J6.15, J6.24, J6.34). One locality was situated in the municipality of Doische (prov. of Namur; Lawalrée 1953). Most observations were concentrated in

the municipalities of Rochefort, Éprave, Han-sur-Lesse, Belvaux, Ave-et-Auffe, Genimont and Lavaux-Saint-Anne (prov. of Namur; Lawalrée 1953). This region is typically known for its mosaic of alternating bands of limestone and schists, which can be calcareous. With the exception of Genimont, Crépin (1860) already mentioned *P. majus* from the same municipalities in Namur. The last record of *P. majus* in Belgium (1946, Lavaux-Saint-Anne) was considered a rediscovery, but this population was lost afterwards due to the intensification of agricultural practices (Lawalrée & Delvosalle 1969).

In *Prodrome de la Flore belge*, Durand (1899) cited isolated records from the provinces of Liège, Hainaut, Limburg (Lanaken; see collections mentioned above) and Brabant (Diest; no herbarium collection seen by us!), adding that outside the province of Namur all records should probably be considered as casual introductions.

### Site description

The rediscovered population of *Polycnemum majus* is situated at the border of the nature reserve ‘Tige d’Éprave’ at 50° 09’ 06.7” N and 5° 11’ 03.1” E. The reserve is adjacent to the road between Éprave and Rochefort (prov. Namur, IFBL J6.24.21). It includes a south-exposed schist-limestone slope covered by a half-open, semi-dry calcareous grassland (*Mesobromion erecti*), mixed with species typical of the *Alyso-Sedion albi* communities. An extensively-managed arable field is situated next to the reserve. Arable weeds such as *Anagallis arvensis* subsp. *arvensis*, *A. arvensis* subsp. *foemina*, *Euphorbia exigua*, *Galeopsis angustifolia*, *Kickxia elatine*, *Sherardia arvensis*, and *Viola arvensis* are found at the edges of the field. Approximately 55 individuals of *P. majus* were found on the adjacent rural road with calcareous schists (Fig. 4; SPW 2005). The major part of the population was located in the bend of the unpaved road that has been used for the maneuvering of agricultural vehicles. The main accompanying species at the time of visit were *Echium vulgare*, *Erodium cicutarium*, *Malva neglecta*, *Plantago lanceolata* and *Polygonum aviculare*. A few individuals of *Polycnemum majus* were furthermore found at the base of the stony roadside, growing together with *Sedum album*, *S. rupestre* and *Teucrium botrys*.

Most individuals of *Polycnemum majus* were fruiting at the time of visit. Many individuals contained ripened seeds at the base of the plant and were still flowering at the top. A seed sample of ± 30 individuals was collected for *ex situ* conservation purposes; it is kept in the seed bank facilities at Meise Botanic Garden.

### Is there more to find?

The rediscovered population of *P. majus* at the border of Tige d’Éprave is not situated in a local hotspot for wild flora, and the exact growing location is remote from the road and lies outside the nature reserve. Consequently, it is likely that only a limited number of botanists visited this spot in the last decades. A comprehensive botanical





**Figure 4.** Overview of the recently discovered locality of *Polycnemum majus*. The plants grow in the bend of an unpaved, rural road with schists at the border of the nature reserve Tige d'Éprave.

inventory was made in May 2006 (Limbourg 2006) and in April 2010 (<http://biodiversite.wallonie.be/fr/2383-tige-d-eprave.html?IDD=251659834&IDC=1881#>; accessed September 2018). Both visits were during spring and thus failed to document *Polycnemum majus*, since the species only starts to appear in late summer, which is not the best period for botanists to make inventories on dry grasslands. The timing of visit is crucial to detect *P. majus*. Because of its persistent seed bank, it is possible *P. majus* is a cryptic species that only germinates in years when the environmental conditions are favorable. Furthermore, it is inconspicuous and does not display in the vegetation cover to a considerable extent (Tomšovic & Krahulcová 1991). These three reasons could explain why *P. majus* has been overlooked and why it has been considered extinct in Belgium.

The label of the herbarium specimen from 1866 provided a unique opportunity to relocate an exact historical site. The land use at Tige d'Éprave has almost certainly remained constant during the last decades, which is an essential factor in the subsistence of the species. The location has not been built upon, not been forested or strongly encroached by shrubs and has not been subjected to intensive agriculture. The open character of the surroundings and the small-scale patchiness of the rural landscape have remained largely intact. All the necessary conditions are

still present to sustain a population of *P. majus*. It is likely that the majority of historical sites in the region have been lost by the enlargement of scale and the intensification of agricultural practices. Rediscovering a population of *P. majus* is a rare event and botanists must be aware of the occurrence of the species in order to find it. They must pay specific attention to its flowering or fruiting season, and look in suitable habitats, preferably within its former distribution range.

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#### References

- Auvert S., Filoche S., Rambaud M., Beylot A. & Hendoux F. (2011) – Liste rouge régionale de la flore vasculaire d'Île-de-France. Paris, Île-de-France/Natureparif/DRIEE-IF.
- Bornand C., Gyax A., Juillerat P., Jutzi M., Möhl A., Rometsch S., Sager L., Santiago H. & Eggenberg S. (2016) – Rote Liste

- Gefässpflanzen. Gefährdete Arten der Schweiz. Bern, Bundesamt für Umwelt/Genf, Info Flora. [Umwelt-Vollzug Nr. 1621.]
- Buffa G., Carpenè B., Casarotto N., Da Pozzo M., Filesi L., Lasen C., Marcucci R., Masin R., Prosser F., Tasinazzo S., Villani M. & Zanatta K. (2016) – Lista Rossa regionale delle piante vascolari. Venezia, Regione del Veneto.
- Crépin (1860) – Manuel de la Flore de Belgique. Bruxelles, Emile Tarlier.
- Durand Th. (1899) – Prodrôme de la Flore belge. Tome III. Phanérogames. Bruxelles, Alfred Castaigne.
- FLORON (2019). – Knarkruid. In: (Anon.), NDFV Verspreidingsatlas planten. [<https://www.verspreidingsatlas.nl/5211>; accessed 10 March 2019.]
- GBIF Secretariat (2017) – GBIF Backbone Taxonomy. Checklist dataset. [<https://doi.org/10.15468/39omei>; accessed via GBIF.org on 10 March 2019.]
- Haugel J.-C. & Toussaint B. (coord.) (2012) – Inventaire de la flore vasculaire de la Picardie (Ptéridophytes et Spermatophytes) : raretés, protections, menaces et statuts. Version n° 4d, novembre 2012. Amiens, Centre régional de phytosociologie agréé Conservatoire botanique national de Bailleul & Société Linnéenne Nord-Picardie. [Mémoire n.s. n° 4.]
- Kohler F., Vandenberghe C., Imstef R., Gillet F. (2011) – Restoration of Threatened Arable Weed Communities in Abandoned Mountainous Crop Fields. *Restoration Ecology* 19 (101): 62-69.
- Lambinon J., De Langhe J.E., Delvosalle L. & Duvigneaud J. (1998) – Flora van België, het Groothertogdom Luxemburg, Noord-Frankrijk en de aangrenzende gebieden. Derde druk. Meise, Nationale Plantentuin van België.
- Lauber K., Wagner G. & Gygax A. (2012) – Flora Helvetica. 5. Auflage. Bern, Haupt Verlag.
- Lawalrée A. (1953) – Spermatophytes. In: Robyns W. (ed.), Flore Générale de Belgique, vol. 1, fasc. 2. Bruxelles, Jardin Botanique de l'Etat.
- Lawalrée A. & Delvosalle L. (1969) – Ptéridophytes et Spermatophytes rares, disparus ou menacés de disparition en Belgique. Bruxelles, Minist. Agric., Adm. Eaux et Forêts, Serv. Conserv. Nature. [Travaux 4.]
- Leurquin J. (2011) – Etude des Chénopodiacées de la Belgique et des régions voisines. [<http://naturalistesdelahautelesse.be/Publications/CLES%20BOTA%20DE%20JEAN%20L/Ch%C3%A9nopodiac%C3%A9es.pdf>; accessed September 2018]
- Limbourg P. (2006) – Samedi 27 mai: prospection botanique à Eprave (I.F.B.: J6-24-21). *Les Barbouillons* 230: 53-55.
- Ludwig G. & Schnittler M. (Red.) (1996) – Rote Liste gefährdeter Pflanzen Deutschlands. Münster, Landwirtschaftsverlag. [Schriftenreihe für Vegetationskunde 28.]
- Masson R. & Kadereit G. (2013) – Phylogeny of Polycnemoideae (Amaranthaceae): Implications for biogeography, character evolution and taxonomy. *Taxon* 62: 100–111.
- Niklfeld H. & Schratt-Ehrendorfer L. (1999) – Rote Liste gefährdeter Farn- und Blütenpflanzen (Pteridophyta und Spermatophyta) Österreichs. 2. Fassung. In: Niklfeld H. (Hrsg.), Rote Listen gefährdeter Pflanzen Österreichs. 2. Auflage. Band 10: 33-152. Wien, Bundesmin. für Umwelt, Jugend und Familie.
- Podda L., Lazzeri V., Mascia F., Mayoral O., Bracchetta G. (2012) – The Checklist of the Sardinian Alien Flora: an Update. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca* 40(2): 14-21.
- Saintenoy-Simon J. (coll. Barbier Y., Delescaille L.-M., Dufrêne M., Gathoye J.-L. & Verté P.) (2006) – Première liste des espèces rares, menacées et protégées de la Région wallonne (Ptéridophytes et Spermatophytes). Version 1 (7/3/2006). [<http://observatoire.biodiversite.wallonie.be/especes/flore/LR2010/liste.aspx>; accessed September 2018.]
- Shultz L.M. (2004) – Polycnemum L. In: Flora of North America Editorial Committee (Eds.), Flora of North America North of Mexico. Vol. 4. New York & Oxford, Oxford University Press.
- SPW [Service public de Wallonie] (2005) – Carte des Principaux Types de Sols de Wallonie à 1/250000. [<http://geoportail.wallonie.be/catalogue/ce3b6602-1c52-483f-9133-770009cdd02b.html>; accessed March 2019.]
- Tomšovic P. & Krahulcová A. (1991) – Polycnemum majus (Chenopodiaceae), a disappearing species in Czechoslovakia: its taxonomy, distribution and karyology. *Folia Geobotanica et Phytotaxonomica*, 26(3): 341-347.
- Vangendt J., Berchtold J.-P., Jacob J.-C., Holveck P., Hoff M., Pierne A., Reduron J.-P., Boeuf R., Combroux I., Heitzler P. & Treiber R. (2014) – La Liste rouge de la Flore vasculaire menacée en Alsace. CBA, SBA, ODNAT.
- Verloove F. (2006) – Catalogue of neophytes in Belgium (1800-2005). Meise, National Botanic Garden of Belgium. [Scripta Botanica Belgica 39.]
- Weicherding F.J. (2011) – Zur Verbreitung, Ökologie und Soziologie von Polycnemum arvense L. (Acker-Knorpelkraut) und Polycnemum majus A. BRAUN (Großes Knorpelkraut) (Chenopodiaceae) im Saarland und in angrenzenden Gebieten. *Delattinia* 37: 31-56.