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OCCURRENCE OF *EUPHORBIA MACULATA* L. (EUPHORBIACEAE) IN POLAND

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Abstract.

The distribution of Euphorbia maculata L. (spotted spurge) in Poland was studied on the basis of published and original records as well as digitized herbaria and online databases. This North American species was first observed in the Botanical Garden in Kraków in 1864. Since then, data on 22 localities of E. maculata in Poland have been collected, primarily in the southern and central parts of the country. The species was reported initially from botanical gardens (six locations), where it still grows along roadsides, pathways, and flower beds. It also occurs in ruderal habitats, primarily in cracks between paving stones. Notably, half of the local populations (12) were observed for the first time in 2024-2025. These findings indicate that the species is expanding its range in Poland.

Key words: *Euphorbia maculata, Central Europe, botanical garden, ruderal habitat, alien species, distribution range*

1. Introduction

The rate of spread of plants under human influence in the modern world is increasing on all continents (e.g., Roberts 2014; Steffen et al. 2017; Pullaiah and Ielmini 2021). As a result of intercontinental migration, many taxa later become permanent components of regional floras. The primary causes of this phenomenon include the rapid development of transportation networks (roads, railways, and waterways), trade with distant countries, horticultural activities, travels—including intercontinental journeys—as well as climate change (e.g., Mack and Lonsdale 2001; Tilman and Lehman 2001). After an acclimation period, alien species often begin to expand their range, integrating into local ecosystems (e.g., Jackowiak 2023). Moreover, some of the alien species become invasive (e.g., Tokarska-Guzik 2005; Masters and Norgrove 2010).

One of the genera currently undergoing global range expansion is *Euphorbia* L. This genus includes plants naturally occurring worldwide (except Antarctica), but mostly in drier areas of the tropics (Jinshuang and Gilbert 2008). It comprises over 2000 species, including 105 wild species in Europe (Mabberley 2017; Hassler 2025; POWO 2025). In the flora of Poland, 20 species of this genus grow spontaneously and half of them are anthropophytes or possible anthropophytes, while another 2 species are ephemerophytes, and 3 are only cultivated (Tokarska-Guzik et al. 2012; Mirek et al. 2020). Alien *Euphorbia* species almost exclusively colonize plant communities developed on anthropogenic sites, shaped by human activity; only *E. epithymoides* L. is also found in semi-natural habitats (Tokarska-Guzik et al. 2012).

Euphorbia maculata L. is one of the species that have been spreading recently in Poland. Its natural range extends from the United States and southeastern Canada to Mexico, Cuba, the Bahamas, and Belize. Within its native range, it occurs in gardens, disturbed areas, fallow fields, sidewalk cracks, along railroads as well as on roadsides, at elevations of up to 1500 m a.s.l. (Steinmann et al. 2016). It primarily grows in the temperate zone but has been introduced to numerous countries across all continents except Antarctica. In Europe it is found in its western, southern, and central parts (FoNA 2017; POWO 2025; WFO 2025). The first confirmed record of the species being cultivated in Europe dates back to 1660 in the London Botanical Gardens (Hegi 1925). Introduced to various botanical gardens in West and Central Europe during the 19th century, it subsequently escaped from cultivation and became fully naturalized (Ascherson and Graebner 1917; Galera and Sudnik-Wójcikowska 2004, 2010, and references therein; Tokarska-Guzik 2005). In Poland it was first reported in 1864 from the botanical garden in Kraków (Galera and Sudnik-Wójcikowska 2004) and later was documented from a limited number of localities scattered across the country (Zając et al. 2019).

The aim of this study is to present the updated distribution of *E. maculata* in Poland, including local populations discovered in 2024-2025, and to characterize its habitats.

2. Materials and Methods

The species *Euphorbia maculata* has many synonyms, such as *Anisophyllum maculatum* (L.) Haw., *Chamaesyce jovetii* (Huguet) Holub, *Ch. maculata* (L.) Small, *Ch. pseudonutans* Thell.; Asch. & Graebn., *Ch. supina* (Raf.) H.Hara, *Ch. tracyi* Small, *Euphorbia depressa* Torr. ex Spreng., *E. jovetii* Huguet, *E. polygonifolia* Jacq., *E.*

Figure 1. Leaves of *Euphorbia maculata* (photo by P. Szkudlarz, July 2024).

supina Raf., *E. thymifolia* Pursh, *Tithymalus maculatus* (L.) Moench, *Xamesike depressa* (Torr. ex Spreng.) Raf., *X. littoralis* Raf., *X. maculata* (L.) Raf., *X. supina* (Raf. ex Boiss.) Raf. (Hassler 2025, POWO 2025). It is an annual plant, branched and hairy at the base, with shoots 10–45 cm in length. Leaves are opposite, from elliptic-ovate to oblong-ovate (4–15 mm × 1.5–5 mm), with a dark red spot on the midrib, obtuse apex, and denticulate margin (Figure 1). Stipules are 1.5 mm long, fimbriate, and nectaries obovate, red-brown (Jinshuang & Gilbert 2008; FoNA 2017; Urbisz 2019).

The study is based primarily on a review of relevant literature, an analysis of available databases (including GBIF), and digitized herbarium collections (e.g., AMUNATCOLL). Additionally, its newly discovered localities, identified during field research in 2024-2025, have been taken into account. The collected specimens are deposited in the Herbarium of the Department of Systematic and Environmental Botany (formerly the Department of Plant Taxonomy) at Adam Mickiewicz University, Poznań, Poland (POZ). Species nomenclature follows *Plants of the World Online* (POWO 2025).

Figure 2. Flowering shoot of *Euphorbia maculata* (photo by P. Szkudlarz, July 2024).

3. Results

By the end of August 2025, *Euphorbia maculata* had been recorded at 22 localities in Poland, listed below.

- Bielsko-Biała (Silesian Province), parking lot near a store at Mostowa Street, ATPOL square DF9323. Observed and photographed by Karol Łanocha in July 2024 (iNaturalist 2025). Growing in gaps between pavement blocks, accompanied by *Galinsoga parviflora* Cav.
- Bielsko-Biała (Silesian Province), parking lot near Municipal Hospital, Wyspiańskiego Street, ATPOL square DF9332. Observed and photographed by Karol Łanocha in August 2024 (iNaturalist 2025). Growing in pavement gaps in a parking lot, accompanied by *Eragrostis minor* Host.
- Bylew (Konin County, Wielkopolska Province), plot no. 159/3, between pavement blocks on a driveway to property no. 14D, elevation 89.1 m a.s.l., ATPOL square CD1819, 52°20’14’’N, 18°24’30’’E. Observed and collected in August 2024 (Figure 3) (leg. & det. J. Chmiel, POZ-V-0168975). About 50 individuals, accompanied by *Eragrostis minor* Host, *Erigeron*

Figure 3. Distribution of *Euphorbia maculata* in Poland.

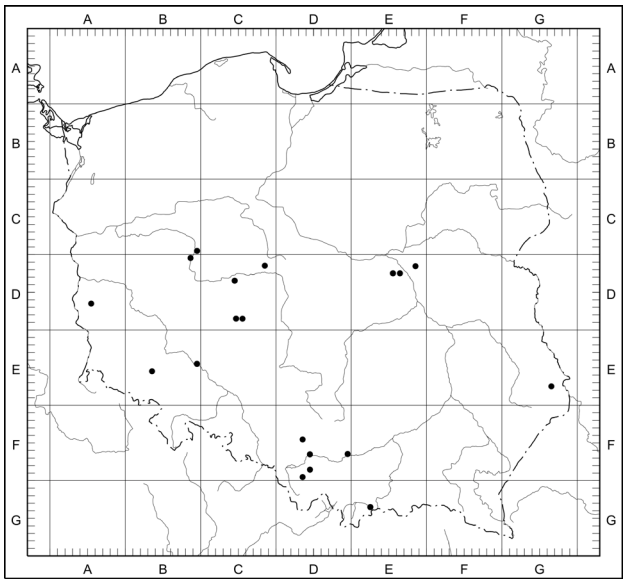

Figure 4. *Euphorbia maculata* among paving stones in Bylew (photo by J. Chmiel, August 2024).

canadensis L., *Plantago major* L., and *Polygonum aviculare* L.

- Chełm Śląski (Bieruń-Lędziny County, Silesian Province), Śląska Street, ATPOL square DF6414. Observed and photographed by Tomasz Wilk in November 2024 (iNaturalist 2025).
- Czorsztyn (Nowy Targ County, Małopolska Province), Drohojowskich Street, ATPOL square EG3256. Listed in Plant Vegetation Database (Swacha and Kącki 2024).
- Jawor (Jawor County, Lower Silesian Province), Park Pokoju, ATPOL square BE5312. Observed and photographed in June 2014 by Alexander Wünsche (iNaturalist 2025).
- Katowice (Silesian Province), tram stop "Szopienice Pętla", Wiosny Ludów Street, ATPOL square DF4347. Observed in June 2018: several individuals between pavement tiles (Urbisz 2019).
- Kęty (Oświęcim County, Małopolska Province), Wiśniowa Street, ATPOL square DF8466. Observed and photographed by Karol Łanocha in July 2024 (iNaturalist 2025). Growing between paving stones, accompanied by *Polygonum aviculare* L. and *Setaria* sp.
- Kraków (Małopolska Province), Mikołaja Kopernika Street 27, Jagiellonian University Botanical Garden, ATPOL square DF6959. First recorded there in 1864 (KRAM, leg. Jabłonowski), since then frequently noted and collected. Classified as wild, established, and common, growing along roadsides, paths, and flower (Galera 2003; Galera and Sudnik-Wójcikowska 2004).
- Lubsko (Żary County, Lubusz Province), cemetery at Jodłowa Street, ATPOL squares AD6542 and AD6552. Growing between pavement slabs (Ryś and Kobierski 2019).
- Ostrów Wielkopolski (Ostrów Wielkopolski County, Wielkopolska Province), between stones in a parking lot near Ostrovia shopping mall at Kaliska Street, ATPOL square CD8570, 51°39'26.2"N 17°50'42.1"E, elevation 127.3 m a.s.l. Observed and collected in July 2024 (leg. & det. P. Szkudlarz, POZ-V-0168974). More than 100 individuals (Figure 4), rarely intermixed with other ruderal species, such as *Bromus hordeaceus* L. subsp. *hordeaceus*, *Equisetum arvense* L., *Oxalis corniculata* L., *Senecio vulgaris* L., *Stellaria media* L., and *Taraxacum officinale* F.H.Wigg. Some individuals robust, densely branched, up to about 25 cm in diameter.
- Ostrów Wielkopolski (Ostrów Wielkopolski County, Wielkopolska Province), as a weed in a flowerpot at a Garden Center on Chłapowskiego Street, ATPOL square CD8485. Observed in August 2025 (J. Pawłowski, pers. comm.).
- Ostrów Wielkopolski (Ostrów Wielkopolski County, Wielkopolska Province), between pavement blocks near a restaurant on Witosa Street, ATPOL square CD8489. Observed in August 2025 (J. Pawłowski, pers. comm.).
- Ożarów Mazowiecki (Warszawa County, Mazovian Province), monastery garden, ATPOL square ED2552. Observed in 1972 (Rostański 1992).
- Poznań (Wielkopolska Province), Naramowice (within Poznań), Burysława Street, ATPOL square BC9960. Observed and photographed in July 2024 (iNaturalist 2025). Growing in association with *Sagina procumbens* L.
- Poznań (Wielkopolska Province), Botanical Garden of Adam Mickiewicz University in Poznań, ATPOL square BD0816, 52°25'11.5"N 16°52'57.6"E, elevation 79.8 m a.s.l. First recorded in 1993, introduced with *Opuntia* seedlings from Wrocław. Reported as occurring along roadsides, pathways, and in cultivated plant beds (e.g., Galera 2003; Galera and Sudnik-Wójcikowska 2004). Currently more than 100 individuals, mostly between pavement blocks in an

Figure 5. *Euphorbia maculata* forming dense patches on stones in a parking lot at the Ostrovia shopping stall in Ostrów Wielkopolski (photo by P. Szkudlarz, July 2024).

open area near an educational-exhibition pavilion and less frequently along walking paths. Small, reaching up to 10 cm in diameter. Infrequently associated with, e.g., *Eragrostis minor* Host, *Oxalis corniculata* L., and *Portulaca oleracea* L. s.l. Observed and collected in August 2024 (leg. & det. P. Szkudlarz, POZ-V-0168976).

- Pyzdry (Września County, Wielkopolska Province), 11 Listopada Street, ATPOL square CD3400. Collected in August 2013 from crevices between paving stones (leg. M. Kraska, det. K. Latowski, POZ-V-0149398, POZ-V-0149397, POZ-V-0149396, POZ-V-0149395, POZ-V-0045124, POZ-V-0149393, POZ-V-0149394, POZ-C-0000771) and confirmed in 2024 by J. Chmiel.
- Sulejówek (Mińsk Mazowiecki County, Mazovian Province), Szosowa Street, ATPOL square ED1896. Observed in July 2024 by Katherine Mashen (iNaturalist 2025).
- Warsaw (Mazovian Province), Aleje Ujazdowskie 4, Botanical Garden of Warsaw University, ATPOL square ED2638. Found by Galera (2003) along roadsides, pathways, and in cultivated plant beds.
- Werbkowice (Hrubieszów County, Lublin Province), ATPOL square GE7686, recorded in Plant Vegetation Database (Swacha and Kącki 2024).
- Wrocław (Lower Silesian Province), Henryka Sienkiewicza Street 23, Botanical Garden of Wrocław University, ATPOL square BE4963. First recorded in 1960 (Rostański 1961), now naturalized and established, occurring along roadsides, pathways, and in cultivated plant beds (e.g., Galera 2003; Galera and Sudnik-Wójcikowska 2004).
- Wrocław (Lower Silesian Province), Kardynała Hlonda Street, ATPOL square BE4963. Observed and photographed by Deana Láníková in July 2024 (iNaturalist 2025). Close to Botanical Garden of Wrocław University. Growing in association with *Lysimachia arvensis* (L.) U.Manns & Anderb.

Euphorbia maculata localities are distributed exclusively in the southern and central parts of Poland (Figure 5). The highest number of occurrences was recorded in the Wielkopolska Province (seven sites), followed by Silesia (four sites) and Mazovia, Lower Silesia, and Małopolska (three sites each). The oldest record dates back to the 19th century from the botanical garden in Kraków (1864). However, more than half of the total number of localities (12) were recorded in 2024-2025. Six sites are associated with botanical and monastic gardens and their immediate surroundings, where the species grows along roadsides, pathways, and within cultivated plant beds. The remaining sites are associated with cracks in pavement blocks on sidewalks. *E. maculata* thrives in environments with low competition from other plant species. It is often accompanied by ruderal taxa, such as *Eragrostis minor*, *Erigeron canadensis*, *Oxalis*

corniculata, *Plantago major*, *Polygonum aviculare*, and *Portulaca oleracea*.

4. Discussion

Euphorbia maculata is classified in Poland as a persistent component of the flora with the status of an alien species, naturalized in anthropogenic habitats (epecophyte) (Zając et al. 1998). The same applies to neighbouring countries (cf. Shevera et al. 2014).

The first observations of *E. maculata* in Europe date back to the 17th century, from botanical gardens in London and Amsterdam (Ascherson and Graebner 1917; Galera and Sudnik-Wójcikowska 2010). In Poland, the earliest records are also linked to botanical (and monastery) gardens: in Kraków (1864), Wrocław (1960), Ożarów Mazowiecki (1972), Poznań (1993), and Warszawa (2003) (e.g., Rostański 1961, 1992; Galera 2003). The same applies to neighbouring countries: in 1913 in Prague, Czech Republic (Kaplan et al. 2023), in Jena, Germany (Hegi 1925), and in Ukraine: Lviv (1932) and Nikita in Crimea (1954) (Shevera et al. 2024). Its distribution is due to the introduction of *E. maculata* seeds or self-sown seedlings during the exchange of plant material between botanical gardens (see Galera 2003) and horticultural nurseries (Shevera et al. 2024).

Since the early 21st century, *E. maculata* has spread in Poland from botanical gardens to urbanized areas – primarily to ruderal habitats in cities (Urbisz 2019). These are places devoid of other plant species or with minimal plant diversity, especially cracks between paving stones and sidewalk slabs, which are part of parking lots, and other road infrastructure elements (sidewalks) as well as ornamental plant beds. These habitats are located near newly constructed single-family houses, hospitals, stores, and shopping malls. *E. maculata* occupies similar habitats in neighbouring countries, for example in the Czech Republic (Černoch 1955; Chrtek and Křísa 1992; Kaplan et al. 2023), Germany (Hegi 1925; Hügin and Hügin 1997; v. Schlatti 2014), Slovakia (Eliáš 2009; Dudáš et al. 2023), and Ukraine (Shevera et al. 2024). In Central and Eastern Europe, *E. maculata* is associated with communities from the class *Stellarietea mediae*, namely *Eragrostio-Polygonetum avicularis*, *Portulaco-Euphorbietum maculatae*, and *Polygono-Euphorbietum maculatae* (Brandes 1993; Eliáš 2009, 2019; Shevera et al. 2024).

According to GBIF, the species occurs primarily in the western and southern parts of Europe. In Germany, Ukraine, and Poland, its populations are concentrated in the southern regions of these countries (Hügin 1998; Bettinger et al. 2013; Shevera et al. 2024, cf. Figure 5). However, it is inconspicuous and could have been overlooked by researchers in other regions. In Ukraine, the species has been recorded at over 93 sites, most of which were observed after 2017. The majority of these sites are ruderal habitats (e.g., roadsides, cracks between sidewalk slabs, railway tracks, courtyards, lawns, green spaces), but its first occurrences on segetal sites have also been recorded, which could indicate a potential threat to agricultural crops (Shevera et al. 2024).

In conclusion *Euphorbia maculata* is extending its distribution range in our country but its occurrence is limited to anthropogenic habitats. Thus currently it does not seem to compete with any threatened native plant species.

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