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SHORT COMMUNICATION

Damasonium polyspermum (Alismataceae), new to the Netherlands, with thoughts on the nativeness of plant species allegedly introduced by migratory birds

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Key words

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Abstract – In the summer of 2024, a small population with a few dozen plants of *Damasonium polyspermum*, a vulnerable Mediterranean species, was found on a gravel bank of the River Meuse. Its nearest extant populations are located in the south of France, at a distance of almost 1,000 km. Although the introduction vector can only be speculated about, an introduction by migrating waterfowl seems most likely. For the Dutch flora, this discovery may turn out to be merely anecdotal, as the species probably will not be able to survive in this locality. However, the discovery of a new species for a country inevitably involves determining its residence status (native versus non-native). The status assigned may have major consequences for certain ecological and/or policy perspectives (respectively the possible protection versus eradication of the species concerned). Although the importance of this status cannot be underestimated, it must be accepted that it is rarely unambiguous and often a mere educated guess. A number of aspects are considered and relevant literature is assessed. Although the species probably arrived at the Meuse in a natural way (through ornithochory, without any human intervention) but probably will disappear again in the short term, it should be classified as an ephemeral species, without the question of indigeneity arising. This could of course change if the species were to become permanently established, e.g. as a result of a warming climate.

Samenvatting – In de zomer van 2024 werd op een grindoever van de Maas een kleine populatie van enkele tientallen planten aangetroffen van *Damasonium polyspermum*, een kwetsbare mediterrane soort waarvan de dichtstbijzijnde actuele populaties zich in het zuiden van Frankrijk bevinden, op een afstand van bijna 1000 km. Hoewel de introductievector uiteraard onbekend is, lijkt een aanvoer door migrerende watervogels het meest aannemelijk. Voor de Nederlandse flora heeft deze vondst wellicht slechts een anekdotisch karakter, aangezien de kans klein is dat de soort zich blijvend zal vestigen. De ontdekking van een nieuwe soort voor een land gaat echter onvermijdelijk gepaard met het bepalen van haar indigeniteitsstatus (inheems versus niet-inheems). De toegekende status kan grote gevolgen hebben voor ecologische en/of beleidsmatige perspectieven (respectievelijk de eventuele bescherming versus verdelging). Hoewel het belang van deze status dus niet onderschat kan worden, dient aanvaard te worden dat deze zelden eenduidig is en vaak slechts een ‘educated guess’. Een aantal aspecten wordt in overweging genomen en relevante literatuur wordt beoordeeld. Hoewel de soort waarschijnlijk op natuurlijke weg (door ornithochorie, zonder menselijke tussenkomst) aan de Maas is beland maar er wellicht op korte termijn opnieuw zal verdwijnen, wordt ze best als een efemere soort beschouwd, zonder dat de indigeniteitskwestie zich stelt. Dit kan uiteraard veranderen mocht de soort zich alsnog blijvend vestigen, bijvoorbeeld als een gevolg van een opwarmend klimaat.

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INTRODUCTION

As a result of major works along the River Meuse (Province of Limburg, the Netherlands), many new gravelly and sandy habitats have recently emerged that are very suitable for the germination of interesting plant species. This concerns both native species and recently or formerly introduced species (in the latter case, species that germinated from the long-lived seed bank). In recent years, remarkable plant species have appeared on the banks of the River Meuse. Many of these germinated from the old seed bank that was exposed as a result of the works. Many are likely associated with the former wool processing industry further upstream in Belgium (the so-called wool alien plants). For example, more than 20 Australasian *Juncus* species were observed (Verloove et al., in prep.), as well as many other species, from other families, that are native to the southern hemisphere (mostly Australia, South Africa and South America) that were previously introduced with wool and ended up in the river together with the waste water (Verloove et al. 2025).

In addition to undoubtedly exotic species, species were found whose residence status is much less clear. Because they are native in neighbouring countries, especially along rivers, they may have arrived as a result of a natural range expansion. A good example is *Chaiturus marrubiastrum* (L.) Ehrh. ex Rchb. (syn.: *Leonurus marrubiastrum* L.), which was recently found for the first time in the Netherlands in the floodplain of the River Meuse. The same goes for *Bolboschoenus planiculmis* (F.Schmidt) T.V.Egorova, another recent newcomer in the flora of the Netherlands.

Rivers serve as important introduction and dispersal routes for flora and fauna (many references, e.g., Jacquemyn et al. 2010, Leuven et al. 2009). Because these routes are very diverse, the status of the species encountered is also quite heterogeneous. In addition to species that were introduced, whether or not intentionally, as a result of human intervention (e.g., as contaminants in wool brought from distant regions), other species arrived in a natural way. An important and well-known vector for the natural dispersal of foreign diaspores is undoubtedly waterfowl. Seeds easily attach to migratory birds while foraging (or are eaten and later excreted); quite often they are only 'released' many tens or even hundreds of kilometres away (Viana et al. 2016). Ornithochory, as the phenomenon is called, is a well-known form of long-distance dispersal.

In addition to the remarkable observations already mentioned above, another species deserves special attention, namely *Damasonium polyspermum* Coss. (Alismataceae), a species that was discovered in July 2024 on the gravel banks of the River Meuse. It is a strictly Mediterranean species; the closest (undoubtedly also non-native) locations where it occurs are in the South of France, almost 1000 km away. Although this observation in itself may only have limited relevance for the Dutch flora (the chance that the species will establish itself permanently is rather small), the observation raises some interesting questions regarding the possible introduction routes for this species and – assuming that an introduction by waterfowl is the most likely route – what status should be granted to species that are introduced by birds.

THE GENUS *DAMASONIUM* IN EUROPE AND THE WORLD

The most recent revision of the genus *Damasonium* Mill. (Rich & Nicholls-Vuille 2001) accepted three species in Europe: *Damasonium alisma* Mill., *D. bourgaei* Coss. and *D. polyspermum*. Three additional species are distributed in other parts of the world: *Damasonium californicum* Torr. (the southeastern United States: California, Idaho, Nevada, and Oregon), *D. constrictum* Juz. (Altay and Kazakhstan) and *D. minus* (R.Br.) Buchenau (most of Australia: New South Wales, Queensland, South Australia, Tasmania, Victoria, and Western Australia) (POWO 2024). In the regions bordering the Netherlands and Belgium only one species occurs naturally, *D. alisma*. The northernmost known populations were in the region north of Paris, but the species has long since become extinct there (Verloove & Van Rossum 2024). Across the Channel this species is also extremely rare in southern England (Stace 2019). The species has been assessed as vulnerable and decreasing throughout its entire distribution area (IUCN 2024).

Species of *Damasonium* typically have follicular carpels that are arranged in a whorl; the carpels are stellately radiating at maturity, hence the vernacular name 'starfruit' (Fig. 1). On this basis the genus cannot be confused with any other genus of the Alismataceae.

A RECORD OF *DAMASONIUM* IN THE NETHERLANDS

On 28 July 2024, a small population of low *Alisma*-like plants with stellately arranged fruits was discovered by one of us (SG) in Grevenbicht (Province of Limburg). About 25 specimens were observed on the edge of a dried-out shallow depression near the River Meuse, in an area that had been excavated a few years before (Fig. 2). Given the number of plants observed, the species was almost certainly already present there in 2023, but remained unnoticed then. The species was accompanied by other typical species of this type of habitat, such as *Cyperus fuscus* L., *Eleocharis acicularis* (L.) Roem. & Schult., *Limosella aquatica* L., *Lindernia dubia* (L.) Pennell, etc. (Table 1). The species was immediately recognized as a species of *Damasonium*, presumably (and most logically) *D. alisma*, the only species occurring in parts of Western Europe, albeit very rare and without historical records in the Netherlands or Belgium (records from Belgium on GBIF refer to specimens formerly collected in the Botanical Gardens of Brussels and Leuven, not to plants found in the wild). However, when dissecting fruits, the follicles were found to contain 10–12 seeds each, while in *D. alisma* only 1–2 seeds are found per follicle (Rich & Nicholls-Vuille 2001, Talavera & Talavera 2010, Tison & de Foucault 2014). This prompted us to check the other *Damasonium* species, as the plants from the River Meuse could impossibly belong to *D. alisma*. After checking, our plants could soon be identified as *D. polyspermum* [syn.: *Damasonium alisma* subsp. *polyspermum* (Coss.) Maire], a closely related species that only occurs naturally in the Mediterranean region. According to POWO (2024) the species is known from Algeria, France, Greece, Lebanon-Syria, Libya, Morocco, Palestine, Portugal, Sicilia, and Spain. In addition, it is also known from Croatia, Jordan, and Tunisia (Euro+Med 2006+). The most northern, more or less recent and almost certainly non-native locality is Réauville, which is located southeast of Montélimar in the Drôme Department in France. The species was found there in 2009 near a pumping station in a rather anthropogenic habitat (pers. comm. J.-M. Tison, 6 August 2024). The majority of the species' recent French populations are probably ephemeral (pers. comm. J.-M. Tison l.c.). Like *D. alisma*, *D. polyspermum* is a vulnerable and decreasing species throughout its distribution area (IUCN 2024). In Croatia, for instance, it is threatened to critically endangered (Boršić & Posavec Vukelić 2012, Šegota et al. 2019, Vuković & Jelaska 2015).

Fig. 1. Fruits of a plant of *Damasonium polyspermum* Coss. growing in a dried-out shallow depression near the River Meuse in Grevenbicht (Province of Limburg, the Netherlands) in July 2024. The carpels are stellately radiating at maturity, hence the vernacular name ‘starfruit’. Photo: Sipke Gonggrijp, 28 July 2024.

Fig. 2. The habitat of a small population of *Damasonium polyspermum* Coss. in Grevenbicht (Province of Limburg, the Netherlands) in July 2024. The population was found in a dried-out shallow depression near the River Meuse, in an area that had been excavated a few years before. The backpack is for scale. Photo: Sipke Gonggrijp, 28 July 2024.

STATUS AND INTRODUCTION VECTOR OF *DAMASONIUM POLYSPERMUM* IN THE NETHERLANDS

Given the strictly Mediterranean natural distribution of *Damasonium polyspermum*, the species will probably not be able to establish itself permanently in the Netherlands. The local Dutch climate undoubtedly is unfavourable for the species (on average too cold and too wet). This discovery is therefore, as far as the Dutch flora is concerned, probably purely anecdotal, nothing more than a remarkable and unexpected discovery without much further relevance. However, the record itself raises a number of questions regarding possible introduction routes and, in particular, what status should be given to such species and records. There appear to be only two possible introduction vectors, one where the species reached the River Meuse in a natural way and one under the influence of human activities.

As mentioned earlier, a large proportion of the exotic plant species found on the banks of the River Meuse in recent years are very likely (and most even undoubtedly) inextricably associated with the former import of raw wool for the (now long abandoned) wool processing factories further upstream in Belgium along the River Vesdre. Theoretically, *Damasonium polyspermum* could just as well have been introduced in the past with wool and now finally germinated after the disturbance of the long-lived seed bank due to the recent works on the banks of the River Meuse. The species, or at least the closely related *D. alisma*, is known for its very long-lived seeds (likely up to 87 years according to Birkinshaw 1994). Furthermore, *Damasonium polyspermum* does occur in North Africa in areas from where part of the wool was obtained. Although most wool adventives were plants belonging to species of (very) dry semi-deserts (e.g., the karoo in South Africa or the pampa in South America), species were also introduced from much wetter, marshy habitats, such as the numerous exotic species of *Juncus* L. (Verloove et al., in prep.) and several species of *Cyperus*. The star-shaped infructescence of *D. polyspermum*, similar to that of some *Trigonella* species that were frequently found as wool aliens in the past, may easily adhere to animal fur. Furthermore, the production of hydrophilic mucilage – essential for the dispersal of the aforementioned *Juncus* species – has also been documented in the Alismataceae (Leme et al. 2021). However, no species of the Alismataceae have been recorded as wool aliens elsewhere in Europe (e.g., Clement & Foster 1994, Probst 1949), although that in itself is of course not an argument against this option. A second, possibly more plausible introduction vector is the unintentional introduction by migrating waterfowl. The related species *D. bourgaei* is known to be dispersed by waterfowl, from the Guadalquivir estuary to more northerly, remote areas in Spain (Rodríguez García 2019). Waterfowl are also likely to be important vectors for the dispersal of *D. alisma* (Rich & Nicholls-Vuille 2001) and thus doubtlessly of *D. polyspermum* as well. Since it was initially assumed – logically, given its natural distribution – that we were dealing with *D. alisma*, a natural range expansion could be put forward: the species reached the Meuse Valley without human intervention, from a relatively nearby region where the species is native (although one may immediately wonder how close 'relatively nearby' is allowed to be; for *D. alisma*, the nearest more or less recent populations are located almost 400 km away from the River Meuse, in the Paris area in France). However, the natural populations of *D. polyspermum*, the species to which our plants belong, are much further away, the nearest being as much as 1000 km further south, and even there the species is very rare. Although nothing else changes in the circumstances of the record, i.e., a species that was most likely inadvertently introduced by migrating waterfowl, questions arise regarding the species' residence status: can a species that reached a new location in a natural way, without any human intervention, be considered indigenous if the nearest population is about 1000 km away, or even more?

Plants whose seeds are dispersed over long distances by migratory birds present an interesting case when considering whether they are native or non-native to a given area. Dispersal by migratory birds is a natural process: birds consuming seeds and later excreting them in different locations is a natural method of seed dispersal, known as endozoochory. The same applies to seeds or fruits that attach to the waterfowl during foraging and are later released. Based on this reasoning, it could be cautiously concluded that the recently discovered population of *Damasonium* along the River Meuse in the Netherlands is a new native plant species, provided it was indeed introduced by waterfowl. In his authoritative article on this subject, Webb (1985)

Table 1. Vegetation relevés of two plots with plants of *Damasonium polyspermum* Coss. growing on the edge of a dried-out shallow depression near the River Meuse in Grevenbicht (Province of Limburg, the Netherlands). The relevés were recorded on 3 August 2024 at 9:45 h.
Abundance is according to Tansley (1946): D = dominant, C = co-dominant, A = abundant, F = frequent, O = occasional, R = rare, S = sporadic, and L = local.

	Relevé 1	**Relevé 2**
Area	2 m²	2 m²
Coverage	< 50%	c. 50%
Heigth	≤ 50 cm	≤ 50 cm
Species number	22	24
Species		
Damasonium polyspermum (individuals)	R (10)	R (2)
Lythrum salicaria	A	F
Plantago major	A	O
Bidens tripartita	F	O
Eragrostis multicaulis	F	O
Veronica catenata	F	O
Artemisia biennis	O	F
Cyperus fuscus	O	O
Persicaria hydrolapathum	O	O
Mentha aquatica	O	R
Phragmites australis	S	F
Juncus bufonius	S	O
Echinochloa crus-galli	R	R
Eleocharis palustris	R	O
Gnaphalium uliginosum	R	R
Juncus effusus	R	R
Polygonum aviculare	R	O
Potamogeton nodosus	R	R
Xanthium orientale s.l.	R	R
Cyperus esculentus	F	–
Rorippa sylvestris	R	–
Salix alba	R	–
Schoenoplectus spec.	R	–
Agrostis stolonifera	–	A
Alisma plantago-aquatica	–	A
Cuscuta campestris	–	O
Juncus inflexus	–	R
Limosella aquatica	–	R
Rumex crispus	–	R

defined a native plant as “one [...] which arrived [...] by a method entirely independent of human activity”, which our record meets without any problem. Such natural dispersal of seeds or fruits, far beyond the known range and, for vascular plants, over extremely long distances (also called ‘extra-range long-distance dispersal’), is rare but has been known and studied (e.g., Nathan et al. 2008, Wu et al. 2022). In invasion biology, such plants are sometimes called ‘colonizers’ (Pyšek et al. 2004). Ecologically, such a colonizer differs little or not at all from any alien species, for example due to the lack of natural enemies, which means it can compete without restriction with ‘truly’ native species. Let’s consider a somewhat similar case. The origin of the first established populations of the South African invasive species *Cotula coronopifolia* L. in Europe is not entirely clear. The species was unintentionally introduced with wool long ago, but these ephemeral records are probably not at all related to the more recent establishment of the species. However, the species is certainly spread by migratory birds (e.g., Sánchez-García et al. 2024). If the species was dispersed by waterfowl from Angola, where it is native, to North Africa and from there further north, what residence status then should be assigned to North African and European populations, if the species indeed reached these areas without human intervention? If the above logic is followed, is the species native and by definition no longer invasive? Under this premise, *Damasonium polyspermum* can be considered native to the Netherlands if the species were to establish itself permanently. But what if it is a wool alien that was introduced, albeit unintentionally, through human intervention? This would change everything and make the species non-indigenous. This shows that granting a residence status is a very subjective matter. Much depends on factors about which there is often no absolute certainty, in this case whether or not the species was introduced by human intervention. Next, it is crucial whether the species establishes itself or not. If we assume that *D. polyspermum* will soon disappear from its Dutch locality, then it can be regarded as a mere ephemeral species, without much further importance and without the question of nativeness arising. However, what if, as a result of a changing climate (and shifting migration patterns), the species can survive? This adaptability could be considered part of natural ecological dynamics, aligning with the definition of a native species.

Granting residence status (native versus non-native) may seem like a trivial detail, but the status assigned may have major consequences for certain ecological and / or policy perspectives (respectively the possible protection versus eradication of the species concerned). Although the importance of this status cannot be underestimated, it must be accepted that it is rarely unambiguous and that in some cases the question remains unresolved (Pearman 2017, Webb 1985). Especially in the case of species whose seeds are dispersed by wind or birds, assessing residence status may turn out to be problematic (Healy & Edgar 1980).

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REFERENCES

Birkinshaw CR. 1994. Aspects of the ecology and conservation of Damasonium alisma Miller in Western Europe. Watsonia 20: 33–39.

Boršić I, Posavec Vukelić V. 2012. New locality and threat status of Damasonium polyspermum Coss. (Alismataceae) in Croatia. Nat. Croatica 21(2): 349–356.

Clement EJ, Foster MC. 1994. Alien plants of the British Isles. Botanical Society of the British Isles, London.

Euro+Med. 2006+ (continuously updated). Euro+Med PlantBase – the information resource for Euro-Mediterranean plant diversity. Published at www.europlusmed.org, accessed on 13 August 2024.

Healy AJ, Edgar E. 1980. Flora of New Zealand, Vol. 3. Manaaki Whenua Press, Wellington.

IUCN. 2024. The IUCN Red List of Threatened Species. Version 2024-2. Published at www.iucnredlist.org, accessed on 13 August 2024.

Jacquemyn H, Van Looy K, Breyne P, Honnay O. 2010. The Meuse river as a corridor for range expansion of the exotic plant species Sisymbrium austriacum: evidence for long-distance seed dispersal. Biol. Invasions 12: 553–561. (https://doi.org/10.1007/s10530-009-9461-0)

Leme FM, Bento JPSP, Fabiano VS, González JDV, Pott VJ, Arruda RCO. 2021. New Aspects of Secretory Structures in Five Alismataceae Species: Laticifers or Ducts? Plants (Switzerland) 10(12): 2694. (https://doi.org/10.3390/plants10122694).

Leuven RSEW, van der Velde G, Baijens I, Snijders J, van der Zwart C, Lenders HJR, bij de Vaate A. 2009. The river Rhine: a global highway for dispersal of aquatic invasive species. Biol. Invasions 11: 1989–2008. (https://doi.org/10.1007/s10530-009-9491-7).

Nathan R, Schurr FM, Spiegel O, Steinitz O, Trakhtenbrot A, Tsoar A. 2008. Mechanisms of long-distance seed dispersal. Trends Ecol. Evol. 23(11): 638–647. (https://doi.org/10.1016/j.tree.2008.08.003).

Pearman DA. 2007. ‘Far from any house’ – assessing the status of doubtfully native species in the flora of the British Isles. Watsonia 26: 271–290.

POWO. 2024. Plants of the World Online. Royal Botanic Gardens, Kew. Published at powo.science.kew.org, accessed on 13 August 2024.

Probst R. 1949. Wolladventivflora Mitteleuropas. Verlag Vogt-Schild, Solothurn.

Pyšek P, Richardson DM, Rejmánek M, Webster GL, Williamson M, Kirschner J. 2004. Alien plants in checklists and floras: towards better communication between taxonomists and ecologists. Taxon 53: 131–143. (https://doi.org/10.2307/4135498).

Rich TCG, Nicholls-Vuille FL. 2001. Taxonomy and distribution of European Damasonium (Alismataceae). Edinburgh J. Bot. 58: 45–55. (https://doi.org/10.1017/S0960428601000464).

Rodríguez García A. 2019. Damasonium bourgaei Coss. (Alismataceae), novedad corológica para Castilla y León (España). Acta Bot. Malac. 44: 73–75. (https://doi.org/10.24310/abm.v44i0.5321).

Sánchez-García R, Green AJ, Tomasson L, Hortas F, Ortiz MA. 2024. Invasive Buttonweed Cotula coronopifolia (Asteraceae) Is Halotolerant and Has High Potential for Dispersal by Endozoochory. Plants (Switzerland) 13(16): 2219. (https://doi.org/10.3390/plants13162219)

Šegota V, Hršak V, Kovačić S. 2019. Rare and threatened Damasonium polyspermum Coss. (Alismataceae) discovered in Krka National park. Glasn. Hrvatsk. Bot. Društva 7(1): 27–32.

Stace CA. 2019. New Flora of the British Isles, 4th ed. C&M Floristics, Middlewood Green, Suffolk.

Talavera S, Talavera MM. 2010. Damasonium. In: Castroviejo S. (ed.), Flora Iberica, vol. XVII. Real Jardín Botánico, CSIC, Madrid.

Tansley AG. 1946. Introduction to plant ecology. Allen & Unwin, London.

Tison J-M, de Foucault B. 2014. Flora Gallica. Flore de France. Biotope, Mèze.

Verloove F et al. (in prep.). Wool alien rushes (Juncus; Juncaceae) along the River Meuse, the Netherlands. Gorteria.

Verloove F, Gonggrijp S, Ondersteyn R, Vercruysse W, Barendse R. 2025. Witnesses to industrial history: the recent return of wool alien plants on the banks of the River Meuse (the Netherlands, Belgium). Gorteria 47: 14–51.

Verloove F, Van Rossum F, (coll. Devriese H, Matysiak J-P, Ronse A, Van de Beek A, Zwaenepoel A). 2024. Nouvelle Flore de la Belgique, du Grand-Duché de Luxembourg, du Nord de la France et des Régions voisines. Septième édition. Jardin botanique national de Belgique, Meise.

Viana DS, Santamaría L, Figuerola J. 2016. Migratory Birds as Global Dispersal Vectors. Trends Ecol. Evol. 31(10): 763–775. (https://doi.org/10.1016/j.tree.2016.07.005).

Vuković N, Jelaska SD. 2015. A contribution to the knowledge on the distribution of Damasonium polyspermum Coss. (Alismataceae) in Croatia. Glasn. Hrvatsk. Bot. Društva 3(2): 23–25.

Webb DA .1985. What are the criteria for presuming native status? Watsonia 15: 231–236.

Wu ZY, Milne RI, Liu J, Nathan R, Corlett RT, Li DZ. 2022. The establishment of plants following long-distance dispersal. Trends Ecol. Evol. 38(3): 289–300. (https://doi.org/10.1016/j.tree.2022.11.003).