British & Irish Botany 5(1): 63-68, 2023

First record of the pan-tropical Yellow Water Pea *Vigna luteola* (Fabaceae) seed from a NW European shore

Dan Minchin*[1,2], Rosemary Hill[3], Gwilym Lewis[4]
[1]Marine Organism Investigations, Ballina, Co Tipperary, Ireland; [2]Marine Research Institute, Klaipėda University, Lithuania; [3]Spunkane, Co Kerry, Ireland; [4]Royal Botanic Gardens, Kew, Richmond, TW9 3AE, UK

***Corresponding author**: Dan Minchin: moiireland@yahoo.ie

This pdf constitutes the Version of Record published on 14th February 2023

Abstract
The first record of a seed of the Yellow Water Pea *Vigna luteola* (Jacq.) Benth. stranded in Northwest Europe was collected along with other trans-Atlantic disseminules from a south-west facing beach in County Kerry, Ireland (v.c.H1) during March 2022.

Keywords: bean; disseminule; Ireland; Leguminosae; ocean drift; peregrine

Introduction

Vigna is a widely distributed genus of annual or perennial herbs in the tropics and sub-tropics of the Indo-Pacific and Central Atlantic realms. Many of these species are climbers (Acevedo-Rodríguez 2005). The genus consisted of more than a hundred species (Schrire, 2005) until Delgado-Salinas (2011) transferred nearly 20 neotropical species to several segregate genera; many *Vigna* sensu stricto are economically important plants. Some, such as *Vigna unguiculata* (L.) Walp. subsp. *unguiculata* (synonym: *Vigna sinensis* (L.) Savi ex Hassk.) (Cowpea) are grown in monocultures for ruminants because of a high protein content. Others are used for human consumption such as Mung-bean *Vigna radiata* (L.) R. Wilczek, and several have medicinal properties (Pandey, 2019).

Vigna luteola (Jacq.) Benth. is a perennial vine with a generally pan-tropical and sub-tropical distribution which occurs over a wide range of habitats that include grasslands, the edges of swamps and lakes, on riverbanks, in low salinity marshes (Chankaew *et al.,* 2014) and coastal sand dunes (Aguirre-Jaimes *et al.,* 2018). In the dune flora of Belize, *V. luteola* is as abundant as *Ipomoea pes-caprae* (L.) R. Br. (Convolvulaceae) (Pringle, 1982). Plants occur from near sea-level inland to 1450 m elevation (Aguirre-Jaimes *et al.,* 2018). In the Americas, the species ranges from Northern Argentina to North Carolina in the USA (POWO, 2022) and was introduced to Bermuda in the western Atlantic (Lefroy, 1884). On the Atlantic coast of Africa, it is distributed from Senegal southwards to South Africa (POWO, 2022). In the Indo-Pacific it occurs from southern China to Australia and the eastern coast of Africa to Egypt. It is an economically important plant widely used as an animal feed in many African countries. *V. luteola* has not been reported from the temperate regions of the North Atlantic; in part this may be because the species is intolerant of frost, with

an optimal growth at 20° to 30° C (Tropical Forages, 2022). According to Delgado-Salinas *et al.* (2011), *V. luteola*, along with *V. marina* (Burm.) Merr. and *V. vexillata* (L.) A. Rich., are believed to have arrived naturally to the Americas and are widely distributed among tropical islands. For *V. luteola* and *V. marina* due to the capability of their seeds to float in the sea (Muir, 1933; Hamann, 1984). The closely related *V. marina*, with which *V. luteola* is sometimes confused, is also a trailing vine with yellow flowers (Chankaew *et al.,* 2014). The seeds of both species, when mature and dry, have a hard impermeable testa that enables them to float in seawater accounting for them being stranded on shores (Muir, 1933; Smith, 1990).

Here we report the first record of a drifted seed of *V. luteola* from a temperate environment.

Methods

On 6 March 2022 a visit took place to the shore of St Finan's Bay, County Kerry on the south west coast of Ireland at V390685. This bay is bordered with vegetated cliffs and has a theoretical capture area of 5.5 km across its entrance that funnels to a 140 m wide coarse sand beach. Drift disseminules, with an American origin, are frequently collected at this location among drift that normally collects on the high shore. Under different weather conditions, such materials accumulate at different levels and parts of this shore. The bay faces in a south-westerly direction, the principal wind direction, and has a wide capture area for drifting materials (Fig. 1). Normally, disseminules are exposed and easily recognised although this may require displacement of accumulations of drift. Sifted sand passed through a standard household sieve may reveal buried smaller seeds.

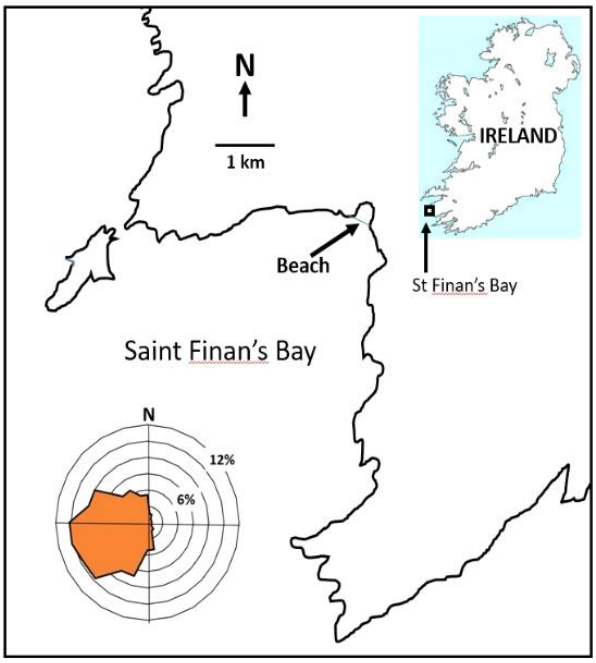

Figure 1. **The beach where the seed of *Vigna luteola* was collected in St Finan's Bay on the southwest coast of Ireland. The wind rose is redrawn from the 1980-2010 climatological dataset for the Valentia meteorological station**

The seed under discussion was compared with the morphological characters of other species of the genus *Vigna* housed in the Herbarium of the Royal Botanic Gardens, Kew.

Results

During 6 March 2022, following a south-westerly wind, several small sized seeds were collected. These consisted of the sea pea *Lathyrus japonicus* Willd. and members of the Convolvulaceae family that included *Ipomoea alba* L. and a *Calystegia* sp. Among the collections was an unfamiliar Fabaceae seed found in a drift line together with plastic pellets (nurdles) on the mid-shore. This seed is a perfect match with herbarium collections of *V. luteola* by having a seed of 5.2 mm long by 3.8 mm wide across the hilum, and a depth of 4.0 mm. It has a slightly sunken hilum 2.9 mm in length. There are clear bulges of the lens and the area of the micropyle at either end of the hilum (Fig. 2). The seed is dark brown with paler brown mottled flecks and is distinguished from its close congener *V. marina*, which has a uniform pale brown to pinkish testa that becomes an even dark brown on weathering (Lawn, pers. comm.)

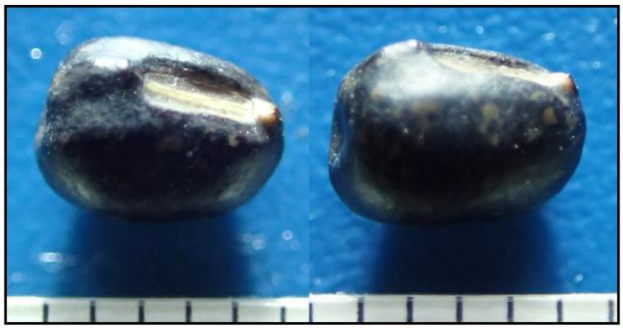

Figure 2. ***Vigna luteola* seed with mm scale**

Discussion

In Ireland there are not known to be any cultivated species of *Vigna* and there are no previous records of a stranding of this genus in the drift seed lists compiled by Nelson (2000) for north-western Europe. *V. luteola* has a more restricted distribution within the Atlantic than does *V. marina*. In North America the collections of drift disseminules on Floridia shores do not include *Vigna.* Most probably this is because both *V. luteola* and *V. marina* are native to this region (Isely, 1986). An origin in Africa is possible but unlikely.

Vigna marina and *V. luteola* are sometimes confused with each other because of their similar morphology, and they are capable of cross-fertilisation, being genetically close (Palmer *et al.,* 2002). *V. marina* is restricted to seashores whereas *V. luteola* has a wider habitat range, including along riverbanks and on lake shores, as well as in coastal dunes. Seeds of *V. luteola* can be dispersed by rivers to the sea or, jointly with those of *V. marina*, perhaps following tidal surges and storms, directly into the sea from coastal habitats. Hurricanes effect coastal regions, and inland flooding may increase the opportunities for seeds to enter the sea. Such events, occurring regionally, over the course of the stormy season may cover areas within 10° and 45° N in the western Atlantic. Such weather conditions usually occur

between August and October (NOAA, 2021). Subsequent ocean currents, as well as wind strength and direction, may then result in seed dispersal beyond the natural range of the plant.

The duration that seeds can remain viable in sea water is unknown. Seeds of *V. marina* have been recorded to remain viable after 25 years in seawater in an aquarium (Lawn & Cottrell, 2016). The tough testa of *V. luteola* seeds is similar to that of *V. marina*; for successful germination, the testa of both species needs to be scarified. The seeds of *V. luteola* are relatively small and their long-distance dispersal will be subject to the vagaries of ocean currents and greatly influenced by wind strength and direction. In a study of the Sea Pea, *Lathyrus japonicus*, its seeds have often been accompanied by plastic fishery tags (Minchin, 2021) indicating a provincial origin within North America where the Sea Pea is abundant on coastal shores. Some of these tags appear to have successfully crossed the Atlantic within less than a year and also were recovered from St Finan's Beach during March 2022.

Most surface drifting plastics accumulating on northern European shores do so in a region ten degrees to the south and fifteen degrees to the north of north-western Ireland at 55° N (Bosi *et al.,* 2021). Shores along the Irish coastline are less prone to collect surface refuse from continental Europe. The transmission of seeds by means of the Gulf Stream and the North Atlantic drift have resulted in several other tropical disseminules arriving on the Irish coast (Nelson, 2000). The majority of these have also been collected on the eastern coast of Florida (Perry & Dennis, 2010) and arrive, together with American plastic drift, on the Irish coast, thus providing a convincing connection by means of oceanic currents.

As with many drift seeds that occur along the north-west Atlantic coasts of Europe, it is not always certain that these are entirely peregrine or if there was some anthropogenic involvement. As *V. luteola* is widely distributed as an animal feed its true origin as a drift seed on the Irish coast is uncertain. There may be losses from ships' cargo at sea, as in the case of plastic nurdles that commonly drift onto Irish shores. Nevertheless, at least part of the transmission of our *V. luteola* seed to Ireland will have taken place naturally within the North Atlantic.

Conclusion

The bean *V. luteola* is likely to have drifted across the North Atlantic Ocean. Disseminules of other plants ranging from tropical to boreal environments from the Americas are frequently recovered from Irish Atlantic facing shores; this includes St Finan's Bay on the south-west coast. It is likely many small seeds arriving on exposed shores are overlooked or misidentified.

Acknowledgements

We thank Bob Lawn for information on the seed testa colour of *V. marina* and Alfonso Delgado-Salinas for helpful initial comments on the seed identity. The seed is retained in the collection of the Herbarium of the Royal Botanic Gardens, Kew.

References

Acevedo-Rodríguez, P. 2005. Vines and Climbing plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium, Volume 51: 483pp. Washington: Department of Botany, National Museum of Natural History, Washington, DC.

Aguirre-Jaimes, A., Dáttilo, W., Rodríguez-Morales, D., Canchola-Orozco, S., Cocoletzi, E., Coates, R. & Ángeles, G. 2018. Foraging ants on the extrafloral nectaries repel nectar thieves but not the effective pollinator of *Vigna luteola* (Fabaceae) in a Mexican coastal sand dune. *Sociobiology* 65(4): 621-629. https://doi.org/10.13102/sociobiology.v65i4.3466

Bosi, S., Broström, G. & Roquet, F. 2021. The role of Stokes drift in the dispersal of North Atlantic surface marine debris. *Frontiers in Marine Science* 8: 697430. https://doi.org/10.3389/fmars.2021.697430

Chankaew, S., Isemura, T., Naito, K., Ogiso-Tanaka, E., Tomooka, N., Somta, P. & Srinives, P. 2014. QTL mapping for salt tolerance and domestication-related traits in *Vigna marina* subsp. *oblonga*, a halophytic species. *Theoretical and Applied Genetics* 127(3): 691-702. https://doi.org/10.1007/S00122-013-2251-1

Delgado-Salinas, A., Thulin, M., Pasquet, R., Weeden, N. & Lavin, M. 2011. *Vigna* (Leguminosae) sensu lato: The names and identities of the American segregate genera. *American Journal of Botany* 98(10): 1694-1715. https://doi.org/10.3732/ajb.1100069

Hamann, O. 1984. Plants introduced into Galapagos - not by man, but by EI Niño? *Noticias de Galapagos* 39: 15-19. http://hdl.handle.net/1834/25272

Isely, D. 1986. Notes on Leguminosae: Papilionoideae of the Southeastern United States. *Brittonia* 38(4): 352–359. https://doi.org/10.2307/2807080

Lawn, R.J. & Cottrell, A. 2016. Seeds of *Vigna marina* (Burm.) Merrill survive up to 25 years floatation in salt water. *Queensland Naturalist* 54(1-3): 3-13.

Lefroy, J.H. 1884. The Botany of Bermuda. *Bulletin of the United States National Museum* No. 25, 3 Part 2. 141pp

Minchin, D. 2021. Evidence of transatlantic drift of the sea-pea *Lathyrus japonicus* subsp. *maritimus* (Fabaceae) and its recent establishment in Ireland. *Cahiers de Biologie Marine* 62: 303-312. https://doi.org/10.21411/CBM.A.EF0EDCC3

Muir, J. 1933. The beach drift of South Africa. *The Journal of the Botanical Society of South Africa* X: 5-10.

Nelson, C. 2000. *Sea beans and nickar nuts: a handbook of exotic seeds and fruits stranded on beaches in north-western Europe*. London: Botanical Society of the British Isles.

NOAA. 2021. National Hurricane Center and Central Pacific Hurricane Center. Available at: https://www.nhc.noaa.gov/nationalsurge/

Palmer, J.L., Lawn, R.J. & Adkins, S.W. 2002. An embryo-rescue protocol for *Vigna* interspecific hybrids. *Australian Journal of Botany* 50:331–338.

Pandey, S. 2019. Review on medicinal importance of *Vigna* genus. *Plant Science Today* 6(4): 450-456. https://doi.org/10.14719/pst.2019.6.4.614

Perry, E. & Dennis, J.V. 2010. *Sea-Beans from the tropics: a collector's guide to sea-beans and other tropical drift on Atlantic shores*. Malabar, Florida: Krieger Publishing Company.

POWO. 2022. Family Fabaceae Lind. Genus: *Vigna* Savi, *Vigna luteola* (Jacq.) Benth. Available at: <https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:525419-1>

Pringle, J.S. 1982. Floristic observations on south water and Carrie Bow cays, Stann Creek district. *Atoll Research Bulletin* 259. 12pp. https://repository.si.edu/bitstream/handle/10088/5021/00259.pdf

Schrire, B.D. 2005. Tribe Phaseoleae. In: Lewis, G., Schrire, B., MacKinder, B. & Lock, M., eds., *Legumes of the world*, 393 – 431. London: Royal Botanic Gardens, Kew.
Smith, J.M.B. 1990. Drift disseminules on Fijian beaches. *New Zealand Journal of Botany* 28(1): 13-20. https://doi.org/10.1080/0028825X.1990.10412339
Tropical Forages. 2022. *Vigna luteola*. Available at: <https://www.tropicalforages.info/text/entities/vigna_luteola.htm>

ISSN: 2632-4970

https://doi.org/10.33928/bib.2023.05.063