

# *Lactuca tatarica* (Asteraceae) in embryonic dunes on Wolin Island (NW Poland)

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**Abstract:** By the end of the 19th century, *Lactuca tatarica* was reported for the first time from an adventive occurrence on the North Sea and Baltic Sea coasts. In Wolin Island, the species has become established in the natural habitat and is clearly spreading in recent years. The community with *L. tatarica* was studied currently on the western point of Wolin Island along the stretch between the mouth of the Świna (Swine) River and a newly constructed breakwater of the external harbour. The taxon occupies relatively low parts of the sandy elevations of dune ridges, in patches of the *Honckenyo-Agrophyretum juncei* association (habitat 2110). Furthermore, *L. tatarica* has been reported in recent years from some locations in Świnoujście (Usedom (Uznam) Island), Międzyzdroje, Wiselka and Międzywodzie.

**Key words:** *Honckenyo-Agrophyretum juncei*, distribution, Baltic Sea coast, neophyte, embryonic shifting dunes, habitat 2110

## 1. Introduction

*Lactuca tatarica* (L.) C.A. Mey. (*Sonchus tataricus* L., *Mulgedium tataricum* (L.) DC.) is an Asian-Southeastern European plant, also reported from adventive occurrences in Northwest and Central Europe (Feráková 1977; Lebeda *et al.* 2001). It belongs to the Oriental-Turanian floristic elements of flora. Its geographical range includes the area of the Caucasus and the Iranian Plateau, southern Siberia (reaching to the east to the Lena River), as well as Central Asia (to the Pamir Mountains) and China and Tibet (Hultén & Fries 1986). In Europe, it is a native species in Bulgaria, Romania, Russia and Ukraine (Feráková 1977; Jehlik 1980). The taxon is characteristic for steppe vegetation in southeastern Europe, from Volhynia (W Ukraine) to the western coasts of the Black Sea and the Bosphorus. It can be found on the banks of water reservoirs and running waters, on sandy and clayey soils, also on seashores, mainly at saline locations, as well as in fields where it is sometimes a troublesome weed (e.g. Golub *et al.* 1995; Wucherer *et al.* 2001; Kravchenko *et al.* 2004;

Tzonev *et al.* 2005; Ajmal Khan & Qaiser 2006; Bano & Qaiser 2011; Fägära 2013).

By the end of the 19th century, *L. tatarica* was reported for the first time from an adventive occurrence on the North Sea and Baltic Sea coasts, in Germany and Great Britain (Knapp & Jage 1978) and, then, from inland locations, mainly ruderal ones in many sites in Central and Northern Europe (Feráková 1977; Knapp & Jage 1978; Jehlik 1980). On the Baltic Sea coasts, the first location of *L. tatarica* was reported on Rügen (Rugia) Island. The Pallas's sandgrouse (*Syrhaptus paradoxus*), seen in Europe in the late 19th century and the early 20th century, is presumed to be responsible for its introduction (Jehlik 1980; Hordowski 2014). For the first time, *L. tatarica* was found in 1902 near Thiessow, i.e. a dozen or so years after the greatest invasion of the Pallas's sandgrouse, and these birds were repeatedly seen on the island where they were nesting (Preuss 1909; Kovanda 1958; Hordowski 2014). Occurrences of *L. tatarica* on the North Sea and Baltic Sea coasts could be also associated with maritime transport (ballast) (König 2005, and the literature cited there).

Leick (1926) reported that, in 1921, the geographical range of this taxon included the south-eastern coast of Rügen (Rugia) Island and the coast of the Greifswalder Bodden. Hegi (1929) determined the eastern limit of *L. tatarica* range of occurrence to be the mouth of Peene (Piana) River. Its occurrence on the coasts of Usedom (Uznam) Island was confirmed by Holzfuss (1937). According to Jäger & Werner (2005), the Baltic range of this taxon in Mecklenburg is limited to the coasts of the Greifswalder Bodden and Usedom (Uznam), Rügen (Rugia) and Hiddensee Islands. The problem of *L. tatarica* spreading dynamics in the area of Baltic coasts of Mecklenburg-Vorpommern and in the north-eastern Germany was studied by numerous authors (Fukarek 1969, 1989; Krisch 1990; Burke & Grime 1996; Grosholz 2002; Litterski & Berg 2000; Kowarik 2003; König 2005; Berg & Barth 2008). Detailed information on this species was collected in a floristic database and herbarium collection of the University of Greifswald (AG Geobotanik MV. 2005).

Kovanda (1958) and Urbański (1958) gave the first information referring to the occurrence of *L. tatarica* on the Polish coast from Międzyzdroje and the western part of Świnoujście. The latter author did not report the occurrence of this taxon on Wolin Island despite his explorations, both along the Szczecin Lagoon (Stettiner Haff) and along the sea section stretching from Przytor to Międzywodzie. Piotrowska (1966) found the species under discussion at two locations in Świnoujście, one at the state border and another at a breakwater. Misiewicz (1976) confirmed the first one and found another one on the right bank of the Świna (Swine) River in the area around a harbour construction site (current ferry terminal).

This study aimed at documenting a plant community with *L. tatarica* at a location in Świnoujście-Warszów on

Wolin Island and presenting a temporary map of its distribution in the western part of the Polish Baltic coast.

## 2. Material and methods

The occurrence of *L. tatarica* on the coast of the east part of the Świna (Swine) River was observed in 2011 and then in 2012-2014 during the monitoring surveys of natural habitats conducted by the first author (WK) in connection with the construction of LNG (Liquefied Natural Gas) terminal. On 28/07/2014, five phytosociological relevés were made by the Braun-Blanquet method. Chemical analyses of basic parameters of sandy soil, i.e. salinity and nitrogen, phosphorus and potassium contents were measured in Regional Agrochemical Station in Szczecin using standard methods. The herbarium material was deposited at the *Herbarium Stetinensis* of the University of Szczecin. The map of *L. tatarica* distribution on the Western Pomeranian seashore was made, based on a database of the Western Pomeranian Atlas of Distribution of Vascular Plants and Fungi (ZARRiG), using the cartogram method, with a basic unit of 2.5 x 2.5 km (Popiela *et al.* 2013a, 2013b, see also: [http://212.14.14.38/zarrig/zarrig\\_www/](http://212.14.14.38/zarrig/zarrig_www/)).

## 3. Results

### 3.1. Distribution of *Lactuca tatarica* in the western part of Polish Baltic coast

*L. tatarica* is found in the Polish part of Usedom (Uznam) Island and on Wolin Island (Fig. 1). Its locations are concentrated along the Baltic coast on white dunes. So far, its occurrences in the central part of the Wolin Island seashore (i.e. between Międzyzdroje and Wiselka – with a cliffy coastline) have not been re-

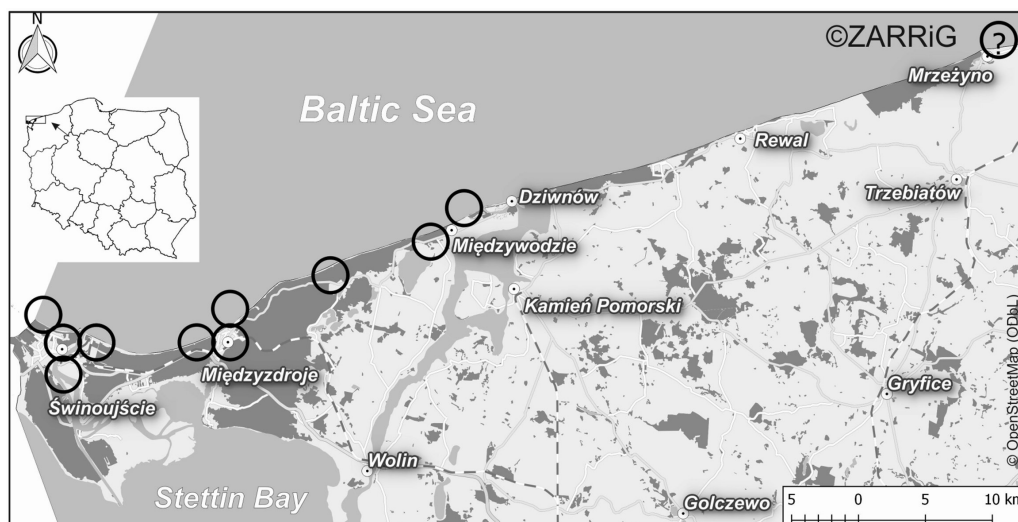


Fig. 1. Distribution of *Lactuca tatarica* in the western part of the Polish Baltic Sea coast

ported. In 2011-2014, blue lettuce was reported from a few locations in Świnoujście-Warszów, near the LNG terminal construction site. It was not found to the east of external harbour breakwater along the section of about 1.5 km. Furthermore, this taxon has been recorded in recent years from some locations in Świnoujście (Usedom (Uznam) Island), Międzyzdroje, Wiselka and Międzywodzie. In the ATPOL database, there is also a floristic datum from Mrzeżyno given by E. Ćwikliński in 1973. Because this datum has not been published and a herbarium specimen is not available, this location is marked on the map as a presumptive one.

### 3.2. Association *Honckenyo-Agropyretum juncei* with *Lactuca tatarica* at a Świnoujście-Warszów location

The community was found on the western point of Wolin Island along the stretch between the mouth of the Świna (Swine) River and a newly constructed breakwater of the external harbour (Fig. 2). Single specimens of *L. tatarica* were observed for the first time in this area in 2011, whereas in 2014 five large patches were localised over a distance of 250 m. They were all located in the formation zone of the initial stages of coastal sand dunes, outside the area of winter storm surge impact. Patches with *L. tatarica* occupy relatively low parts of the sandy elevations of dune ridges, formed by the aeolian processes (Fig. 3). They are loose, fine-grained sands initially deposited by sea waves on the sea shore and moved to the upper parts of the beach by wind. Their specific feature is their salinity reaching the value in the range of 0.08-0.14 g·dcm<sup>-3</sup>, with total nitrogen content

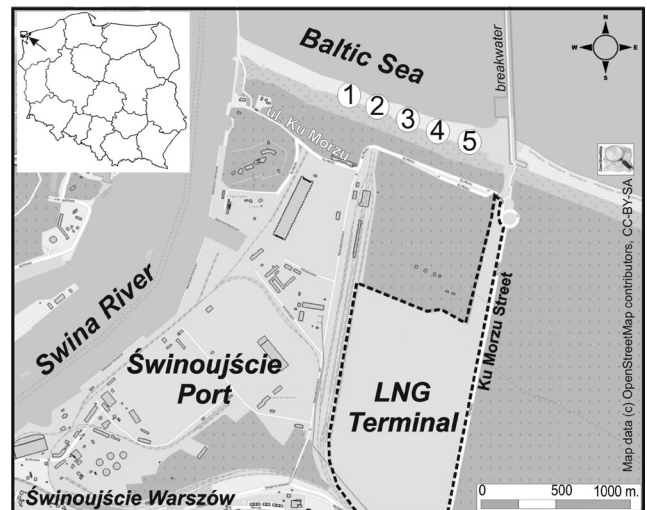


Fig. 2. Occurrence of populations of *Lactuca tatarica* near LNG terminal, Świnoujście-Warszów

Explanations: 1, 2, 3, 4, 5 – localities of relevés

of 0.3-0.9 mg·dcm<sup>-3</sup>, and phosphorus and potassium concentrations of 11.0 mg·dcm<sup>-3</sup> and 7.0-14.0 mg·dcm<sup>-3</sup>.

The plant association favouring the spread and migration of *L. tatarica* includes different developmental forms of the *Honckenyo-Agropyretum juncei* R.Tx. 1955 of the *Ammophiletea* Br.-Bl. et R.Tx. 1943 class (Fig. 4). Characteristic species are: *Honckeya peploides* and *Elymus farctus* subsp. *boreoatlanticus*, a rare species in the Polish flora found on the Wolin Island only (Wróbel & Banaś-Stankiewicz 2015, Wróbel & Kowalski

Table 1. *Honckenyo-Agropyretum juncei* with *Lactuca tatarica* in Świnoujście-Warszów (Wolin Island)

Successive number of relevé	1	2	3	4	5
Date: Day/Month/Year			28.07.2014		
Area of relevé [m <sup>2</sup> ]	25	20	25	24	26
Cover of layer c [%]	55	50	35	30	55
Number of species in relevé	6	9	6	7	7
Ch. Ass. <i>Honckenyo-Agropyretum juncei</i>					
<i>Elymus farctus</i> subsp. <i>boreoatlanticus</i>	1.2	.	2.2	1.2	2.3
<i>Honckeya peploides</i>	2.2	3.2	2.3	+	+
Ch. All. <i>Agropyro-Honckenyon peploides</i>					
<i>Ammophila arenaria</i>	2.2	1.2	1.2	+	.
<i>Ammocalamagrostis baltica</i>	+	+	.	.	+
<i>Festuca rubra</i> var. <i>arenaria</i>	+	+	+	+	1.1
Ch. Cl., O. <i>Ammophiletea</i>					
<i>Leymus arenarius</i>	.	2.1	.	1.2	1.2
Other					
<i>Lactuca tatarica</i>	3.3	2.2	1.2	3.3	3.3
<i>Hieracium umbellatum</i> ssp. <i>dunense</i>	.	1.1	+	.	.
<i>Chondrilla juncea</i>	.	+	.	.	+
<i>Conyza canadensis</i>	.	+	.	.	.
<i>Salsola kali</i> ssp. <i>kali</i>	.	.	.	+	.



Fig. 3. Costal dunes with *Lactuca tatarica* in Świnoujście- Warszów

2015). Our *Honckenyo-Agropyretum juncei* relevés show a vascular plant species number of  $7 \pm 1.22$  with plot size of  $24 \text{ m}^2 \pm 2.34 \text{ m}^2$ . The cover values fluctuate at about  $45 \% \pm 11.7\%$  (mean data from Table 1 with given standard deviation,  $n=5$ ). The participation of *L. tatarica* in the studied patches is 10 to 50% with, 10 to 20 specimens on  $1 \text{ m}^2$  area. In most patches, young plants in early developmental stages predominate. The

salinity level of beach sands is generally very variable, which results from high movement dynamics of  $\text{Na}^+$  ions. The sodium salts are delivered and accumulated by sea water flooding the beach or come out with the wind-blown sand, or are washed away by precipitation. The content of total nitrogen, phosphorus and potassium should be regarded as trace amounts.



Fig. 4. *Honckenyo-Agropyretum juncei* with *Lactuca tatarica* at Świnoujście-Warszów location

#### 4. Discussion

*Lactuca tatarica* in Wolin Island is a species naturalised in the natural habitat and clearly spreading in recent years. Patches of the *Honckenyo-Agroropyretum juncei* association, where this species is found, are rather poor in terms of flora. The salinity of habitats studied as well as values of other basic chemical parameters are characteristic for fine-grained beach and dune sands. *L. tatarica* is found in adventive occurrences on the southern Baltic seashore also in the north-eastern Germany and Lithuania and Latvia (Ploompuu 1997; Litterski & Berg 2000; Laime 2013). In Germany, around Greifswald and on Rügen (Rugia) Island, *L. tatarica* is commonly found both on initial dunes and in dense communities of the *Ammophiletea* and *Koelerio-Corynophoretea* classes on white and grey dunes, as well as in coastal halophilous communities of the *Cakiletea maritima* class (Litterski & Berg 2000; Berg *et al.* 2001; König 2005), as well as the authors' own observations on Rügen (Rugia) Island in 2014). In Latvia and Lithuania, *L. tatarica* was reported on single beaches and gravel lagoon shores in the initial associations of the *Ammophiletea* and *Cakiletea maritima* classes and on coastal halophilous meadows (Ploompuu 1997; Rove 2013). It follows from the above that habitats where *L. tatarica* is found in Świnoujście are typical for this species in terms of its adventive, coast range in Central Europe

and it is possible that it increases its populations. It is also possible that, in the future, the species will enter communities other than those of the *Ammophiletea* class (e.g. on grey dunes). In Poland, *L. tatarica* has a status of a taxon established at synanthropic locations (Tokarska-Guzik *et al.* 2012). Among countries in the Baltic Sea basin, it is treated as an “established” species in Germany and Latvia, whereas as an “invasive” or “potentially invasive” one in Estonia, Lithuania and Sweden (according to DAISIE and NOBANIS). Open habitats, poor plant density and, consequently, lack of competitive species facilitate the entry of *L. tatarica* into natural communities and its vegetative spreading via stolon runners (Ploompuu 1997; Rove 2013). In north-eastern Germany, in the immediate vicinity to the Polish border, this species increases the number of its locations along the seashore; however, no evidence of threat to the native dune vegetation was found (Litterski & Berg 2000; Berg & Barth 2008). In view of the foregoing, the status of known coastal populations in Poland should be monitored, especially since *L. tatarica* was found in the initial stages of dune formation (habitat 2110) under legal protection (see also Popiela *et al.* 2015).

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