
Anthropogenic influence on population of *Lathyrus maritimus* (L.) Bigelow on the Lithuanian protective coastal dune

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Results of a research conducted from 1991 to 1999 on the Lithuanian coastal protective dune concerning the effects of the anthropogenic influence on *Lathyrus maritimus* (L.) Bigelow are presented. This species is not only a decorative plant: its long and spread rhizome also performs the important function of strengthening the dunes. Unfortunately, it is very sensitive to trampling and has vanished from the parts of the protective dune with the greatest lead of visitors. *Lathyrus maritimus* grows throughout the coastal protective dunes, particularly in the association of *Elymo–Ammophiletum Br.–Bl. et de Leeuw*. On the protective dunes of the mainland seacoast and in their environs the density of *Lathyrus maritimus* individuals in 1999 was 0.2 thousand per ha. In the territories more remote from the beach the density of the plants fluctuates around 1.2 thousand individ. /ha. At the same time, populations of *Lathyrus maritimus* on the Curonian spit coastal protective dune are two times denser than those on the mainland seacoast. The highest density of the seashore plants was observed in those seacoast relief elements where the average grass vegetation projection covering fluctuates between 50% and 60%. From 1991 to 1999 the number of *Lathyrus maritimus* individuals on the coastal protective dune had decreased by 36% on the Curonian spit dune and by 43% on mainland protective dune.

Key words: Lithuania, coastal protective dune vegetation, *Lathyrus maritimus* (L.) Bigelow population, dynamics, anthropogenic influence

INTRODUCTION

Lathyrus maritimus L. on the coastal protective dune grows among *Ammophila arenaria* (L.) Link, *Festuca arenaria* Osbeck, *Hieracium umbellatum* L., *Gypsophila paniculata* L., *Carex arenaria* L. and other psammophytes. Tuber bacteria settle in the roots of *Lathyrus maritimus* and capture the atmospheric nitrogen to produce compounds desirable in grasses. The plant, with its long rhizomes, also strengthens the coastal protective dune. This plant grows well in moist, salty sand and is widely spread on the Northern Hemisphere seacoasts, although it is a protected plant on the coastal protective dune [1]. It has been destroyed in densely visited areas such as beaches, as it is extremely sensitive to trampling as well as to cars moving on the dune [2; 5; 6]. The purpose of the present work was to determine the influence of anthropogenic activities (recreation) on the state of *Lathyrus maritimus* population on the Lithuanian coastal protective dune.

BRIEF CHARACTERISTIC OF THE HABITAT

Lathyrus maritimus population research was conducted on the Lithuanian coastal protective dune (on the territory of about 100 km²). The protective dune began at the Lithuanian–Latvian border in the North and ended at the Lithuanian–Kaliningrad district border in the South, covering 92 kilometers along the coast of the Baltic Sea. The territory shows classic features of a sub-Atlantic climate. The coastal protective dunes are composed primarily of quartz sand; the pH ranges from 6.5 on the western slope to 5.0 in the lowlands. The amount of humus varies from 0.30 to 0.62%. The average amount of active P₂O₅ is 14.7 mg and of active K₂O 17.3 mg in 100 g of soil.

METHODS

We conducted a complex research of *Lathyrus maritimus* on the Lithuanian coastal protective dune in

1991, 1994, 1997 and 1999 in order to find out the spreading dynamics of *Lathyrus maritimus* under the influence of anthropogenic factors. The total of 94 traverse profiles crossing the coastal protective dune and the lowlands were used. Each profile began at the base of the pine stands on the lowlands and ended at the foot of the dune of the western slope. The average length of the mainland profiles was from 30 to 120 m. On the Curonian spit the profiles reached 150–250 m. Altogether the profiles made a total of 6.3 km in length. The average distance between two transverse profiles was 1000 meters. On the Curonian spit the profiles were marked with section markers standing on the top of the dune, and on the mainland the profiles are marked with natural and artificial landmarks. The counting fields were 12.56 m² circles spread out so that there were 10 m between their centers. The number of *Lathyrus maritimus* plants and the average projecting covering of the vegetation was determined in the counting fields. The data were analysed statistically and the density of *Lathyrus maritimus* population was stated in thousand individuals/ha.

RESULTS AND COMMENTS

The study showed that *Lathyrus maritimus* occurred primarily in the association of *Elymo–Ammophiletum*. The highest density was found on the Curonian spit in 1991 (4.2 thous. ind./ha). In the same year on the mainland coastal protective dune the density was 2.1 thous. ind./ha. From 1991 to 1999 a decrease in the number of *Lathyrus maritimus* was observed, by about 36% on the Curonian spit and 43% on the mainland coastal protective dune.

The density of *Lathyrus maritimus* populations individuals on the coastal protective dune varied widely. In density visited areas only isolated plants had survived, while in less used areas the density was 8 thous ind./ha. In 1991 there were nine areas of this density on the Lithuanian coastal protective dune and two on the mainland seacoast.

The fourth survey in 1999 showed four patches of *Lathyrus maritimus* individuals numbering eight thous. ind./ ha, all on the Curonian spit. In the same year only isolated plants were found on the beaches of Šventoji, Palanga, Giruliai, Melnragė and Smiltynė.

On the belt of the Lithuanian coastal beach the winds constantly drift the sand and conditions for growing of *Lathyrus maritimus* individuals are not favorable. Wind, sea waves and human traffic constantly erode the western slope of the coastal protective dune. There, hard grasses spread by rhizomes and resistant to sand, and the footsteps of hikers establish themselves. These include *Ammophila are-*

naria, *Leymus arenarius* (L.) Hochst., and *Festuca arenaria*, *Cakile baltica* Jord.ex Pobed., *Gypsophila paniculata*, *Honckenya peploides* (L.) Ehrh., *Hieracium umbellatum*, *Petasites spurius* (Retz.) Rchb. and occasionally *Lathyrus maritimus*. Thus, the western slope of the coastal dunes has a scanty grass vegetation: the average projection covering in 1999 fluctuated from 4% on the western slope of the mainland seacoast to 11% in the corresponding element of the Curonian spit protective dune relief. In comparison with the 1991 survey, this shows a decrease by 50% on the Curonian spit and by 77% on the mainland coastal protective dune. The patches of *Lathyrus maritimus* on the western slope of the mainland coastal protective dune are rare: their population density in 1999 was 0.6 thous. ind./ha. This index is by 40% as bad as on the western slope of the Curonian spit coastal protective dune and by 54% less than in 1991.

Plants that can resist drought, strong winds and intensive traffic grow on the wavy top of the coastal protective dune. There, in the association of *Elymo–Ammophiletum*, *Lathyrus maritimus* grows among other plants. In this element of the coastal protective dune relief the average protection covering of grass plants in 1999 ranged from 25% on the top of the mainland coastal protective dune to 41% in the corresponding element of the Curonian spit. The average density of *Lathyrus maritimus* population in 1999 was found on the top of the Curonian spit protective dune (4.5 thous. ind./ha i.e. by 17% less than in 1991).

The eastern slope of the coastal protective dune has favorable conditions for the grass plants. The soil is richer in humus, the west winds are not so strong and there are fewer visitors walking down the upright slopes. The grass vegetation on the eastern slope is by about 40% denser than on the top of the dune (data from 1999). The average projection covering of grass vegetation in the corresponding area of the Curonian spit protective dune was 63%, while it was 40% on the eastern slope of the mainland coastal protective dune. From 1991 to 1999 the density of the *Lathyrus maritimus* population on the mainland coastal protective dune and the Curonian spit protective dune decreased by 28% and 33%, respectively. Those plants which grow well in shifting sand give way to vegetation in the later stage of development, such as *Jasione montana* L., *Helichrysum arenarium* (L.) Moench., *Carex arenaria* L., *Corynephorus canescens* (L.) P. Beauv. These plant species form an association of *Helichryso–Jasionetum* Libbert. in which *Lathyrus maritimus* grows side by side with the other plants.

The thickest plant covering in 1999 was found on the protective dune plain (lowland). The vegeta-

tion projection covering of the lowland decreased by 31% from 1991 to 1999, and during the same period in the protective dune plain (lowland) of the Curonian spit it had decreased by 20%. The decrease on the mainland coastal protective dune was more evident than on the Curonian spit. From 1991 to 1999 the density of *Lathyrus maritimus* population in the dune protective plain (lowland) of the mainland seacoast decreased by 35% and in the protective dune plain (lowland) of the Curonian spit by 55%. During the period of investigation (1991–1999) the density of *Lathyrus maritimus* population obviously decreased on all coastal dunes, especially on the areas where the protective cover of grass vegetation was close to zero. In 10–20% of the grass vegetation projective cover the density of plant species decreased by 50%. The highest density of *Lathyrus maritimus* population was found on protective dune places, where the projective cover of grass vegetation on the average reached 30–90%. The number of *Lathyrus maritimus* individuals in grass associations with lower or higher projective cover was evidently smaller.

CONCLUSIONS

On the Lithuanian coastal protective dune the *Lathyrus maritimus* population decreases with every year. The plant cannot resist trampling; the trampled plants wither whenever a group of visitors passes. The visitors like to pluck the branches of *Lathyrus maritimus* in blossom, so the crop capacity diminishes. On beaches and in surrounding areas the population of *Lathyrus maritimus* has been almost fully exterminated, but in more remote territories the densities of 8 thous ind./ha and more can be found. There are patches of *Lathyrus maritimus* in which up to 10 individuals grow in a square meter. The population on the Curonian spit coastal protective dune is denser because there are fewer visitors. On the other hand, in the places where the visitors' density is higher (the Senoji (Old) Palanga dune), the *Lathyrus maritimus* is very rare.

Thus, we see that the highest density of *Lathyrus maritimus* population is found on the top of the protective dune where the covering vegetation fluctuates between 30% and 90% (Tables 3, 4). Perhaps this is due to the factors of lighting, nutrient balance, and humidity among others.

In order to restore the population of *Lathyrus maritimus* on the mainland coastal protective dune, the best thing would be to gather the seeds at the end of summer and then to scarify and sow them in spring.

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ANTROPOGENINĖ ĮTAKA *LATHYRUS MARITIMUS* L. POPULIACIJOS AUGIMVIETEI LIETUVOS PAJŪRIO APSAUGINĖJE KOPOJE

Santrauka

Lietuvos pajūryje pajūrinis pelėžirnis (*Lathyrus maritimus* L.) auga įvairiuose apsauginės kopos reljefo elementuose (vakariniame šlaite, kopos viršūnėje, rytiniame šlaite) ir užkopės lygumoje (palvėje). *Lathyrus maritimus* populiacija dažniausiai aptinkama *Elymo-Ammophiletum Br-Bl., et de Leeuw. Hieracio-Festucetum sabulosae* Bandž., *Helichryso-Jasionetum* (Libb.) Bandž. asociacijoje.

Per 8 metų laikotarpį (1991–1999) *Lathyrus maritimus* populiacijos gausumas Kuršių nerijos pajūrio apsauginėje kopoje sumažėjo 36%, žemyninio pajūrio apsauginėje kopoje – 43% (koreliacijos koeficientas 0,97 ir 0,98). Populiacijos gausumui įtakos turi ir žolinių augalų projekcinis padengimas. Kopų plotuose bežolių augalų populiacijos gausumas mažėja sparčiausiai. *Lathyrus maritimus* populiacijos gausumas stabilėnis ten, kur žolinių augalų projekcinis padengimas svyruoja nuo 40 iki 90%. *Lathyrus maritimus* populiacijos nykimą pajūrio apsauginėje kopoje ir užkopės lygumoje skatina antropogeninė (ūkinė, rekreacinė) veikla. Rūšis intensyviausiai nyksta Kuršių nerijos ir žemyninio pajūrio apsauginės kopos vakariniame šlaite. Populiacijos gausumas sparčiausiai mažėja lankytojų susitelkimo vietose – Palangos, Melnragės, Smiltynės ir Nidos jūros paplūdimių apsauginėje kopoje. Tai turi takų įtakos tinklo per kopas formavimasis, automobilių važinėjimas rytinio šlaito papėdėje ir užkopės lygumoje. Pajūrio lankytojai, vaikščiodami po apsauginę kopą, ištrypia, išguli ir išlaužo *Lathyrus maritimus* sąžalynus. Dėl šios priežasties populiacija mažiau subrandina sėklų ir blogiau atsiželdina. Taip pat lankytojų ir automobilių ratų supurentame smėlyje sunkiau įsikabina dykstančių sėklų šaknys. Pajūrio apsauginė kopa *Lathyrus maritimus* populiacijai yra vienintelė augimvietė Lietuvoje. Čia žydintys rūšies individai puošia kopų aplinką, sutvirtina smėlį, o fiksuodami atmosferinį azotą, varpiniams augalams, pagrindiniams kopų smėlio tramdytojams, gerina augimo sąlygas.