

Distribution and characteristic habitat of *Convolvulus persicus* L. in South-East Romania: threats and protection solutions

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Abstract. *Convolvulus persicus* is a critically endangered species, endemic to the embryonic shifting dunes of Caspian Sea and Black Sea. The distribution of this species in Romania includes also the sand dunes on the seashores of Sfântu Gheorghe and Sulina. This paper presents new data about the endangered species *Convolvulus persicus* regarding the distribution and the effective population size in Romania. The conservation status of the embryonic shifting dunes, found in the mentioned sites in 2019, was reviewed, along with the threats for both the habitat and the species. Several protection methods were proposed.

Keywords: conservation, critically endangered species, endemic.

Introduction

Some of the main features of the Anthropocene era are the decline of biodiversity and the high rate of species extinction (Waters *et al.*, 2016). Coastal areas with habitats suitable for *Convolvulus persicus* are constantly modified, destroyed or reduced by human pressures, but also by natural processes, such as coastal erosion and dramatic changes in beaches caused by sea level fluctuations (Golubtsov and Lee, 1997, Golitsyn *et al.*, 1998, Ignatov *et al.*, 1983, Beni *et al.*, 2013). *C. persicus* is a pioneer species for habitat 2110 (Strat and Holobiuc, 2018), forming associations with high importance due to its status as critically endangered species (CR) in Romania (Dihoru and Negrean, 2009) and its limited distribution (Făgăraș and Jianu, 2015).

The bibliography mentions Sfântu Gheorghe and Sulina among the places where populations of *Convolvulus persicus* exist (Oprea, 2005; Dihoru and Negrean, 2009). This study establishes the approximate distribution of the population in the two mentioned sites and at the same time evaluates the habitat status, to identify the possible threats and to propose some methods of protection for both the habitat and *Convolvulus persicus*.

Materials and methods

The paper examines the bibliography regarding the distribution of this species, its biology and ecology, and also the references and the management plans regarding the habitat 2110. In addition, during the period 3-11 July 2019, field trips were made, in which we marked with the GPS (GPSmap 61s GARMIN) approximately the extreme limits where the phytoindividuals of *C. persicus* were located both on Sfântu Gheorghe and Sulina beach. Using ArcGis-ArcMaps, a Stereo 70 projection map with the approximate population distribution was created. At the same time, we consulted the *List of activities to indicate the impacts, respectively of the current and past pressures and of the future threats* and evaluated them on the ground. The scale on which the estimation of the population numbers of *C. persicus* was made is taken from the management plan of *ROSCI0073* from 2011 (Management plan *ROSCI0073*, 2011).

Study area

The Black Sea coast of Romania covers 256 km and is divided into two major sections: the northern part, with sandy beaches in the deltaic area and the southern part, composed largely of cliffs with soft rocks (Strat and Holobiuc, 2018). The pressures are exerted more strongly in the southern part, being more pronounced in the metropolitan area of Constanța, the ancestral form of the beaches being irreversibly changed, along with the habitats present there (Strat and Holobiuc, 2018).

Sulina is the most eastern city in Romania, located in the coastal area of the Danube Delta. It is crossed by the Sulina canal, one of the three channels of the Danube. Sulina beach is located south of the Sulina canal and responsible for the beach management are the City Council and the Danube Delta Administration (Făgăraș and Jianu, 2015). The beach of Sfântu Gheorghe, 7.5 km long, is located in the central part of the Danube Delta coast (Vespremeanu and Preoteasa, 2006). Most of the economic activities in Sulina and Sfântu Gheorghe are represented by fishing and tourism.

Convolvulus persicus – biology and ecology

C. persicus (Fig. 1) is distinguished from the rest of the species of the genus *Convolvulus* by its woolly appearance, with the sudden axis from which flowering stems rise. The leaves are elliptic-oblong and short petiolate, its corolla (Fig. 1 right) is white (Ciocârlan, 2009; Sârbu *et al.*, 2013; Dihoru and Negrean, 2009). The flowers are bisexual and 4 lobes bloom from bottom to top on the stem. The fruits are capsules with 2-3 seeds. (Strat and Holobiuc, 2018). *C. persicus* is amphimycitic, apomictic by vegetative reproduction and polycormia (Dihoru and Negrean, 2009).



Figure 1. *Convolvulus persicus* L

It is a psammophile, xeromezophile plant that prefers dry, neutral and poor sands in nitrogen (Dihoru and Negrean, 2009). It forms populations that develop in the form of large colonies, the accompanying species being mainly confined to the periphery of the association. *C. persicus* forms the association *Convolvuletum persici* Borza, 1931 (Făgăraș and Jianu, 2015). The floristic composition of the association is poor in species (37 taxa). The following species from the orders *Festucetea vaginatae* and *Festuco-Brometea* were mostly present: *Alyssum borzaeanum*, *Alyssum hirsutum*, *Bromus tectorum*, *Secale sylvestre*, *Medicago falcata*, *Silene conica*, *Astragalus varius*, *Euphorbia seguieriana*, *Centaurea arenaria* subsp. *borysthenica*, *Stachys atherocalyx*, *Scabiosa argentea*, *Ephedra distachya*, *Linaria genistifolia*, *Silene borysthenica*, *Sideritis montana*, *Marrubium peregrinum*, *Senecio vernalis*, *Cynanchum acutum*, *Papaver rhoeas*, *Cerastium pumilum*, *Polytrichum piliferum*, etc. (Management plan ROSCI0073, 2011).

Habitat 2110 – Embryonic shifting dunes

Coastal formations represent the first stages of the formation of dunes (Fig. 2), consisting of undulating or elevated sand surfaces of the upper beach, or a seaward edge at the base of the high dunes (Gafta *et al.*, 2008).

Structure: Phytocenoses are structured on two levels: the shortest is composed of annual species such as: *Bromus tectorum*, *Secale sylvestre*, *Plantago arenaria*, *Apera maritima*, which use sand moisture during the spring, and ends its vegetative cycle at the onset of the dry season. In addition to the annual species, some psammophile, perennial plants make up the upper floor, such as: *Leymus sabulosus*, *Agropyrum junceum*, *Centaurea arenaria* subsp. *borysthenica*, *Gypsophila perfoliata*, *Artemisia arenaria*, *Corispermum nitidum*, *Eryngium maritimum* (Doniță *et al.*, 2005).

Floristic composition

Edifying species: *Leymus sabulosus*, *Artemisia arenaria*, *Agropyron junceum*.

Characteristic species: *Artemisia arenaria*, *Leymus sabulosus*, *Agropyron junceum*.

Other important species: *Centaurea arenaria* subsp. *borysthena*, *Gypsophila perfoliata*, *Eryngium maritimum*, *Cakile maritima* subsp. *euxina*, *Secale sylvestre*, *Astrodaucus littoralis*, *Euphorbia seguieriana*, *Bromus tectorum*, *Salsola soda*, *Crambe maritima* (Doniță et al., 2005).



Figure 2. Habitat 2110 – Sfântu Gheorghe beach

Results and discussions

Distribution and state of the population of C. persicus

Sfântu Gheorghe beach has a size of 60.02 hectares, among them, the populations of *C. persicus* identified in the field campaigns carried out within the POCU project (Fig. 3) occupy 2.76 hectares (population A) and 0.03 hectares (population B). It can be seen from figure 3 that there is a fragmentation of 1,048 km between the two populations. This fragmentation is due to the presence of the arranged beach and the commercial areas (bars and restaurants).

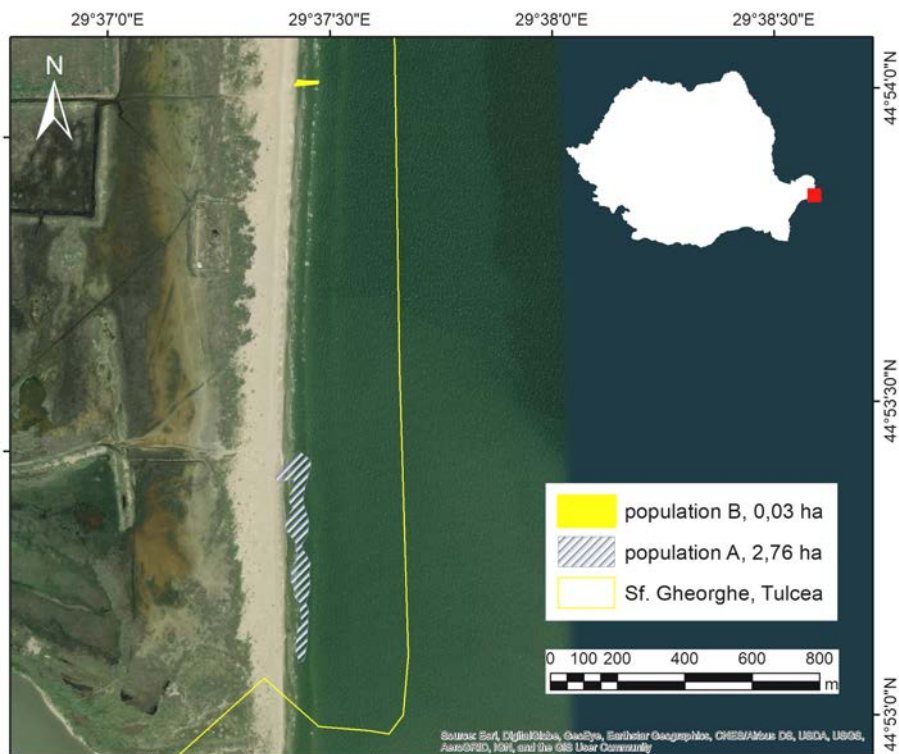


Figure 3. Stereo 70 projection map - Populations of *C. persicus* (population A – blue and white and population B – yellow) on Sfântu Gheorghe beach identified in 2019.

The risk factors for the populations of *C. persicus*, both on Sfântu Gheorghe and Sulina beach are: tourism, plastic pollution, irresponsible breeding of animals (cows and horses), use of pesticides, appearance of paths and trails, dispersed habitation, harvesting flowering phyto-individuals, outdoor sports and recreational activities and developing resting complexes. At the same time, the covering of embryonic shifting dunes with steppe species, the solifaction and humification of the sands, the penetration of problematic native species, the extension of bushes on the sand dunes and their ruderalization were observed.

Current status of habitat 2110 – Embryonic shifting dunes

A number of 16 threats were identified (Tab. 1), but the main problems for the habitat are of anthropic origin, being represented by the presence of bars and beaches, macro-pollution with plastic and micro plastic (Fig. 4), irresponsible growth of livestock and outdoor recreational activities. The conservation state of the population on the beach of Sfântu Gheorghe is good, having average population

numbers (Medium effective population size). This is due to the not very large number of tourists who frequent the beach. In contrast, on the beach of Sulina we could not identify any phytoindividual (Fig. 5 and Tab. 1).

The embryonic sand dunes are widespread on the beach of Sfântu Gheorghe, the present habitat being in a good, semi-natural state, the anthropic impact on it being low.

The habitat is also in a semi-natural state, but the current anthropogenic impact on it is of medium intensity. Sulina beach is much more populated than Sfântu Gheorghe beach, and with the increased number of tourists, the number of risk factors on the habitat increases. Three risk factors not encountered on Sfântu Gheorghe beach were identified: beach cleaning, improving access in the area and extinction of *C. persicus* species (Fig. 5).



Figure 4. Sulina beach - Terrestrial macro-pollution with plastic and micro plastic represented by cigarette butts.



Figure 5. Sulina Beach - *Eryngium maritimum* indicates the presence of habitat 2110, which is in a state of degradation, due to the grazing of horses and cows (left) and the presence of commercial areas (right).

Table 1. Threats identified in the field for *C. persicus* and habitat 2110: list of activities to indicate the impacts, respectively of the current and past pressures and of the future threats (** present only on Sulina beach)

CODE	IMPACT
A04.01.01	cattle grazing
A04.01.03	horse grazing
D01.01	paths, trails, routes for cycling
D05**	improving access in the area
E02.05	other industrial or commercial areas
E03.01	storage of household waste
F04	sampling of land plants in general
F04.02.01	manual assembly
G01.02	walking, horseback riding and non-motorized vehicles
G01.03.	motor vehicles
G01.08.	other outdoor sports and recreational activities
G05.05**	cleaning the beaches
H05.01	garbage and solid waste
I02	problematic native species
J03.02	reducing connectivity between habitats due to anthropogenic causes
M02.03.**	decline or disappearance of species

The following proposed protection methods could prevent the extinction of the remaining population of this critically endangered species:

- Restricting *C. persicus* populations with an electric fence to prevent horses and cows from settling.
- Location of information panels about *C. persicus* near the populations
- Carrying out and publishing studies on *C. persicus* for a better understanding of the ecology and biology of the species
- Prohibition of outdoor recreational activities on the area of *C. persicus* populations
- Periodic greening (garbage cleaning) on the beach

Drafting of tourist materials that promote and present the need for protection of this species and its close connection with habitat 2110.

Conclusions

Although *C. persicus* is an endangered species, at present, the population numbers and the habitat to which it is closely linked have a good state. Instead, the anthropization, the excessive tourism and the effects that the man produces in the natural habitats can lead in the future to the extinction of this species, thus, the majority of the risks for the species and the habitat are mainly of anthropogenic origin.

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