Research Article

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Romulea linaresii Parl. (Liliales: Iridaceae) in the maquis of Nea Peramos, North-Eastern Greece

Asen I. Asenov

Sofia University, Faculty of Bilology, Department of Botany, 8 "Dragan Tsankov" Blvd, 1164 Sofia, Bulgaria; asenasenov71@yahoo.com

Abstract: The maquis is a peculiar Mediteranean coastal evergreen bush vegetation. *Romulea linaresii* is a plant species that covers in a fast way the new opened sites and have a good reproduction there. The paper presents results from the study of the status of its clon-population and relations with the succession process in the "hosting" maquis situated in the vicinity of the village Nea Peramos (Greece). The threats for the development of *R. linaresii* in the region are also discussed.

Key word: coastal habitat, population, succession, threats.

Introduction

The *maquis* type of vegetation is strongly associated with the Mediterranean climate within the Mediterranean region. The maguis is associated with siliceous (acid) soils and is a dense schrubland, composed of numerous closely spaced shrubs. The dense plant cover serves as a barrier for the sunshine which is the reason for the poor grass cover situated below the shrubs. Nea Peramos is a village in North-Eastern Greece, situated 20 km west of the city of Kavala (Figs. 1, 2), where the maquis is the natural coastal vegetation. *Romulea linaresii* Parl. (Iridaceae) is a bulbous plant, Euro-Mediterranean element, distributed in Greece, Sicily, Malta, Turkey, East Aegean islands, Crete and Tunisia with the north border of its areal reaching barely warmest south part of Bulgaria (Tutin et al. 1977). *R. linaresii* is one of the typical elements of maquis coastal vegetation and according to our knowledge, its population in the region of Nea Paramos had not been studied till nowadays. Therefore, the aim of the present study is to describe and assess this coastal population with special attention to its threats.

Material and methods

The studied site occupies an area of 1 ha (40˚49'08"/ 24˚19'12") with silicate base rock (Figs. 1-4). For the description of climatic conditions in this study the Köppen climate classification (Köppen 1884), based on the empirical relationship between climate and vegetation, was chosen. The reason for this choice lies in the fact that this system was accepted as ecologically relevant and was widely used to map geographic distribution of long term climate and associated ecosystem conditions (Chen & Chen 2013). The climate of the studied region is Mediterranean with dry, hot summer and soft rainy winter, commonly abbreviated as *Csa* in Köppen's classification, which means that in the region the average temperature is above 0 °C, but below 18 °C in the coolest months, the precipitation is less than 30 mm in summer months and the average temperature in the warmest month is above 22 °C.

Field trips were realized during six years, from 2011 to 2017. The species determinations followed Elora Europaea (e.g. Tutin et al. 1963) and the recent plant names were checked in the Euro+Med PlantBase (http://ww2.bgbm.org/EuroPlusMed/publishedfamilies.asp).

Threat status of the species was identified after Peev (1981) and IUCN (2001). Below in a brief way the differences between both systems are outlined. According to the degree of threats, Peev (1981) divided the species into three groups: Conditionally

Endangered (high number of individuals, dense population and normal reproduction); Partially Endangered (species in small populations with different number of individuals, often with deviation in reproduction opportunities) and Critically Endangered (taxa in little mosaic or dispersible populations with small numbers individuals, spatially limited). The populations in the last category sometimes can degrade to a limited number of individuals. They often have decrease in reproduction and in some type of habitats are easily displaced by competitive species. Often the Critically Endangered taxa are relict endemic plants, locally neoendemic plants or, residues from desuctive spots. The positive aspects of this classification are its simplicity and moderate need for data. The method is especially suitable for assessment of populations at local level, when general monitoring, evaluation and Red Lists are already done.

The IUCN Global Categories and Criteria (2001), the Global Criterion Guidelines (IUCN, 2003a, b) and the Global Categories and Criteria IUCN Guide (IUCN, 2005) are the modern contemporary methods for assessments of species on a larger scale, for example National and Continental Red Data books and Red Lists. In spite of being well-known and broadly used, for easier comparison with the system of Peev (1981), the IUCN categories are briefly enlisted below: Extinct (EX) – no known individuals remaining; Extinct in the wild (EW) – known only to survive in captivity, or as a naturalized population outside its historic range; Critically Endangered (CR) – extremely high risk of extinction in the wild; Endangered (EN) – high risk of extinction in the wild; Vulnerable (VU) – high risk of endangerment in the wild; Near Threatened (NT) – likely to become endangered in the near future; Least Concern (LC) – lowest risk. The last one recently is not qualified as a risk category since widespread and abundant taxa are included in this category; Data Deficient (DD) – not enough data to make an assessment of its risk of extinction; Not Evaluated (NE) – has not yet been evaluated against the criteria. When discussing the IUCN Red List, the official term "threatened" is a grouping of only three categories: Critically Endangered, Endangered and Vulnerable.

Results

According to our observations the maquis of Nea Peramos (Fig. 4) is composed of bushes and small trees. Depending on the exposure, several species are dominating there: *Quercus coccifera* L., *Calicotome villosa* (Poir.) Link; *Calluna vulgaris* (L.) Hull, *Phylirea latifolia* L, *Cistus creticus* L. and *Pistacia lentiscus* L. Other species occur sparsely: *Olea europea* L., *Erica arborea* L; *Sarcopoterium spinosum* (L.) Spach and *Cistus salvifolius* L. The

Figs. 1-4. 1. Location of the studied area: Nea Peramos is marked with a red point (source: Google earth, prepared by A. Asenov); **2.** Location of the studied maguis (marked with a red point) (Source: Google earth, prepared by A. Asenov); **3.** Silicate base rock of the studied coastal habitat (photo A. Asenov); **4.** The maquis of Nea Peromos in winter (photo A. Asenov).

species, which were represented by single individuals in the studied area were *Juniperus oxycedrus* L. and *Paliurus spina-christi* Mill. *Romulea linaresii* was found to grow on sandy, stony and grassy open places between the shrubs in the maquis and had a flowering period in February (Figs. 5-8).

New open terrains in any maquis can arise by natural and athropogenic way. The natural way is the succession process in the habitat and it is related mainly with one of the maquis dominant species – *Calicotome villosa* (Poir.) Link. (Family *Fabaceae,* Tribe *Genisteae,* Order *Fabales*) – Figs. 9-10. It is a thorny shrub, 3-4 m height. This is the most important species for the population of *R. linaresii,* because of its morphology and short life cycle. *C. villosa* is the only deciduous shrub amongst the maquis of Nea Peramos with small fresh and loosely situated small leaves, which cannot make a dense shadow. Therefore the area around the species provides the most light spots in the dense maquis, proper for a grass vegetation. The existence of *R. linaresii* in the maquis depends on these light spots. Foliage and flowering of *C. villosa* is during the winter time, usually in February. The small and fragile leaves get dry and drop off in the summer period. The life cycle of *C. villosa* is shorter than the cycle of other shrubs and lasts only several years. The ragged remnants of the shrub do not form a serious barrier for the sunshine to reach the soil. This succession process is the most important natural way for appearing of new open spaces, which are necessary for the existence of *R. linaresii*. In this way the population of *R. linaresii* is directly connected with *C. villosa.* Without the last one, the population of *R. linaresii* would be smaller and critically endangered in the maques of Nea Reramos. The process described is well balanced – when old shrubs perish, the new individuals rise and when the maquis gets more dense and the available insolation decreases, *R. linaresii* disappears from this place, but quickly covers new open sites, thus changing its location.

The anthropogenic way for the appearance of *R. linaresii* on new open sites is related with farmers and tourists, who make new roads and paths in order to reach the olive gardens and the coast, thus providing new open sites for the plant. During this study, a new road and a new path were made and it was observed that they were fast covered by *R. linaresii*.

The clone-population of *Romulea linaresii* in the studied area is fragmented, has a mosaic structure (Figs. 5, 8) and very good vegetative and seed reproduction (Fig. 7). Therefore the species cover in a fast way all newly opened terrains and its population increases. The maximum density of the fragments observed by the author was 8 individuals/m². It has to be outlined also that at the time of flowering (February) tourists are not a threat to the small, gentle plants.

Since the population of *R. linaresii* is dependent on the existence of its natural coastal habitat – the maquis, their main threats are common. In case of the Nea Peramos maquis there are two main threats. First of them is the transformation of the maquis in olive gardens by the terrain owners. The stimulus for this activity is based on the Agricultural European programs. According to our knowledge, in the last years, an owner of the part of the maquis cut shrubs and planted olive trees and in this way a part of the habitat was already changed. Yet, because of lack of strong interest of the same owner, the olive garden is not fully shaped.

The second threat is the invasion of tourists, which want to buy parcels with the idea to make gardens with bungalows. This threat comes mainly from the Bulgarian people because the local Greek people are not so interested in these terrains. An additional reason for the "land apetites" of Bulgarian people is the accidental coincidence of the political territorial border between Bulgaria and Greece with the climatic border between Mediterranean climate of Greece and Temperate Continental climate of Bulgaria. In front of our eyes, in the summer of 2016, part of the maquis nearby Nea Paramos was destroyed by such activities.

Discussion

During the study the connection between the succession process in the maquis and dynamics of *Romulea linaresii* population was recorded. The short life cycle of the maguis dominant species *Calicotome villosa* and loose structure of its stems were recognized as the most important factors for the development of the population of *R. linaresii*.

The population of *R. linersii* in this coastal habitat was assessed as steady with the trend for increase of the individuals due to the cleaning of some shrubs by the owner of the terrain, and making a new paths and roads by the tourists and farmers. In this condition, the plants have good seed and vegetative reproduction, good reproductive potential, and cover in a fast way the newly opened light sites, where it reaches the maximum density of 8 individuals/m². These facts allow to classify the studied population of *R. linaresii* Conditionally Endangered (Peev 1981) or as population of a Least Concern (IUCN 2001).

Nevertheless, that due to the good reproductive potential the short-term perspectives for the survival of *R. linaresii* in te vicinity of Nea Peramos are positive, it has to be noted that in case of the

Figs 5-10. 5-8. *Romulea linaresii*, where on 5 and 8 are visible fragments of the population and on 7 – fruits and seeds of the species (photos A. Asenov); **9.** *Calicotome villosa* in spring (photo A. Asenov); **10.** *Calicotome villosa* in summer (photo A. Asenov).

maquis destroyment, the species will disappear from this place.

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