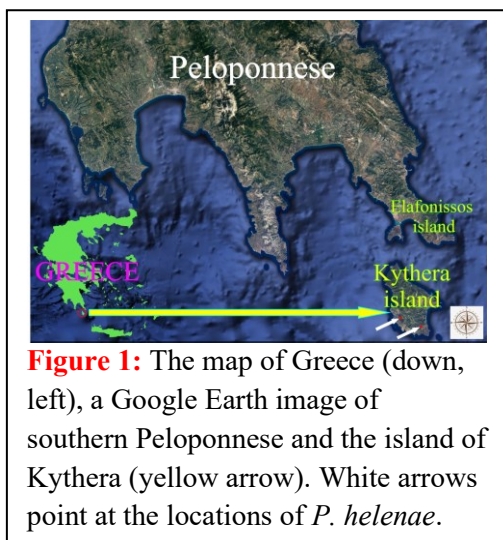


## Unraveling the story of *Polygala helenae* Greuter

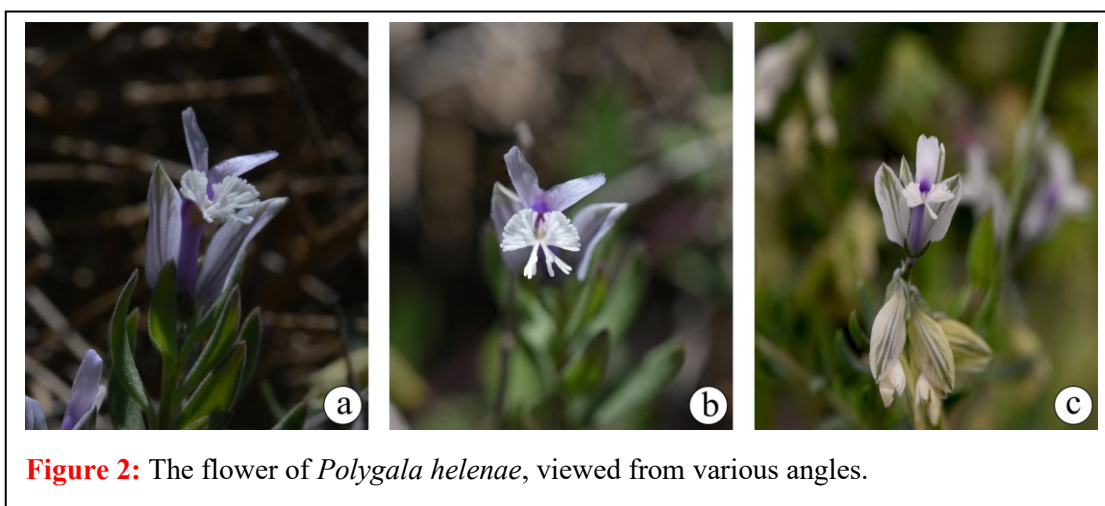
Aikaterina L. Stefi, Stavroula Fatsea and Costas A. Thanos

Kythera, the island of Aphrodite (Venus), stands south-eastern of Peloponnese and probably owes its beauty to the goddess herself (Fig 1).



The beauty of the island and its rich flora can only enchant you. A visit to Kythera, during the spring, is unique and adventurous and at the same time a big challenge especially when trying to track the beautiful and Critically Endangered (CR) *Polygala helenae*, the Milkwort of Kythera, a small perennial herb (Fig 2), narrow endemic of Kythera, classified among the TOP-50 IUCN Mediterranean Island Plants [1] and threatened by habitat loss,.

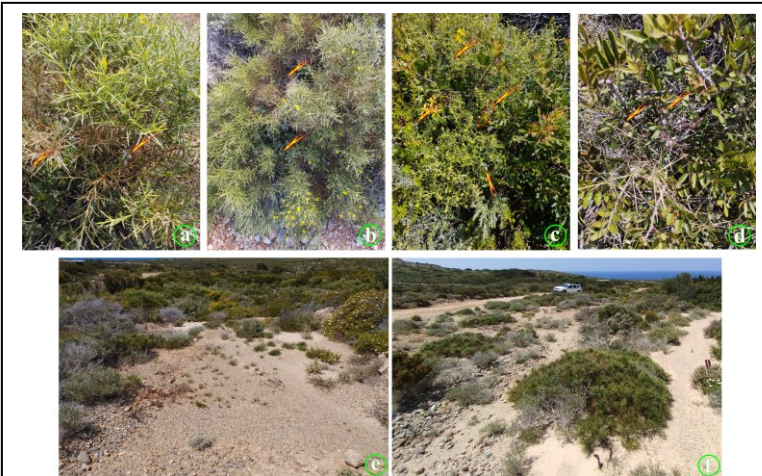
The genus name “*Polygala*” comes from the ancient Greek “πολύ” (much) – “γάλα” (milk) that is why Dioscorides’ πολύγαλον refers to the improved lactation in cattle fed on milkworts [2]. The species name “*helenae*” is probably connected to a



myth according to which when Paris kidnapped the beautiful Helen (Helen of Troy) from Sparta and while traveling to Troy, they stopped at Kythera to make libations in honour of the goddess Aphrodite who protected them and spent some time in Melidoni beach (from the ancient Greek words “meli” (honey) and “hedone” (pleasure)). On the island of Kythera, with a surface area of 278 km<sup>2</sup>, *P. helenae* is found only in a few small areas. The team started the expedition on Friday, April 28, late afternoon and we visited the area of Myrtidia, on the southwest of the island, close to the church of Virgin Mary “Panagia Myrtidiotissa” (Fig 3).



**Figure 3:** The habitat in Myrtidia, on the southwest of the island. (a) Phryganean formation; (b) Unpaved road.



**Figure 4:** The plant grows in dense shrubland along with *Genista acanthoclada*, *Sarcopoterium spinosum*, *Erica* sp., *Thymus brevifolius*, *Pistacia lentiscus* and *Cistus* sp. (a, b, c, d).

In places where *Genista* individuals are sporadically distributed, not a single individual of *P. helenae* was spotted (Fig 4 e, f). In the area of Myrtidia, our data indicate a population between 116 and 200 individuals (as it is impossible to exactly



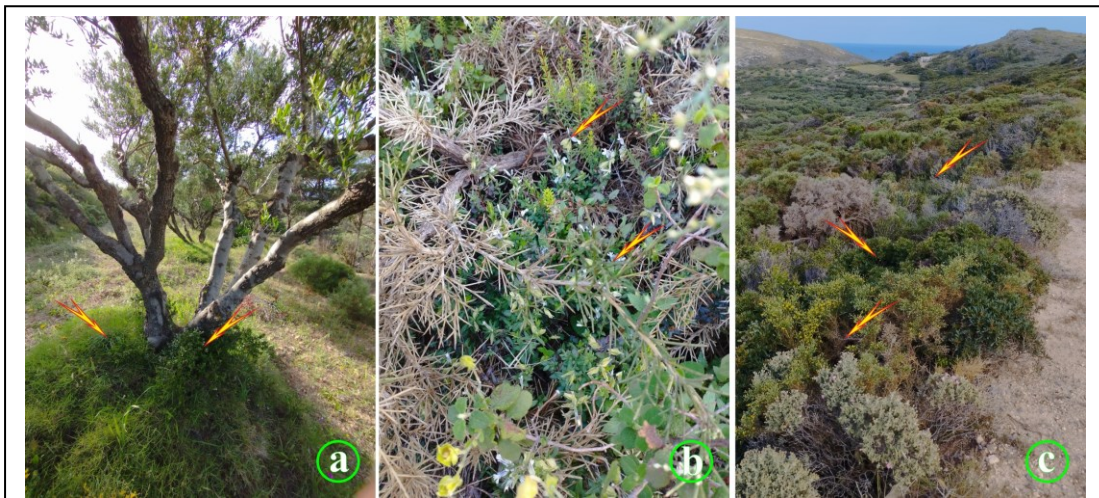
**Figure 5:** In the wider area of Kalamos, the plants grow on both sides of the road along with *Genista acanthoclada*, *Phlomis fruticosa* and *Pistacia lentiscus*.

We found a large population, at the end of the flowering phase, which, luckily, our partner Stavroula had already tracked down at the initiation of the flowering period. The day after, we started recording and mapping the population. The plant, which miraculously escaped the 2017 fire due to a sudden change of the wind direction, is difficult enough to discern as it is growing within larger thorny or compact shrubs, such as *Genista acanthoclada*, *Sarcopoterium spinosum*, *Erica* sp., *Thymus brevifolius*, *Pistacia lentiscus* and *Cistus* sp. (Fig 4a, b, c). It is characteristic that the plant grows in areas with such dense vegetation.

identify the individuals among the “nursing” plants). We also must point out that our measurements were restricted in the area near the unpaved road, as it is difficult to penetrate on foot into the dense vegetation of *Genista* and *Sarcopoterium*.

In the afternoon of the same day, our team headed south, towards the area of Kalamos where the second population of the species was previously spotted. As we carefully crossed the rough, scraggy road, we came upon a second subpopulation of the plant, about one kilometer further north. Here, the plants grow on both sides of the road, along with *Genista*, *Erica*, *Pistacia* and *Phlomis* (Fig 5).

As we climbed the hill, we traced *Polygala helenae* under some olive trees (Fig 6). It was evident that the ground under the olive trees was recently plowed. This means that, sooner or later, the area will be the subject of severe human intervention. We started mapping each *P. helenae* plant and we were thrilled to measure more than 200 individuals! The measurements ended at sunset and continued the next day.



**Figure 6:** Individuals of *Polygala helenae*, growing under *Olea europaea* trees (a) and near the unpaved road (b, c).

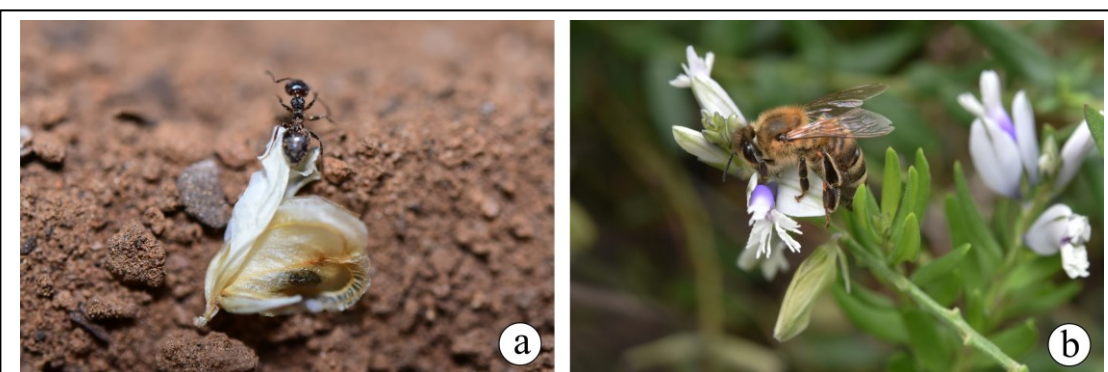
The team arrived at the already mapped population of 86 individuals (last year's measurements). Unfortunately, we detected a decrease in the population down to a maximum of 50 individuals, due to the significant degradation of the area. We noted a



**Figure 7:** Individuals of *Polygala helenae*, growing among dry shoots of *Genista*, *Erica*, *Pinus* and *Thymus*, in a quite degraded habitat.

dried vegetation throughout the area; dry shoots of *Genista*, *Erica*, *Pinus*, *Thymus* compose a degraded landscape, but despite the adverse conditions, cachectic shoots of *Polygala* were spotted struggling to survive (Fig 7). A major problem for the

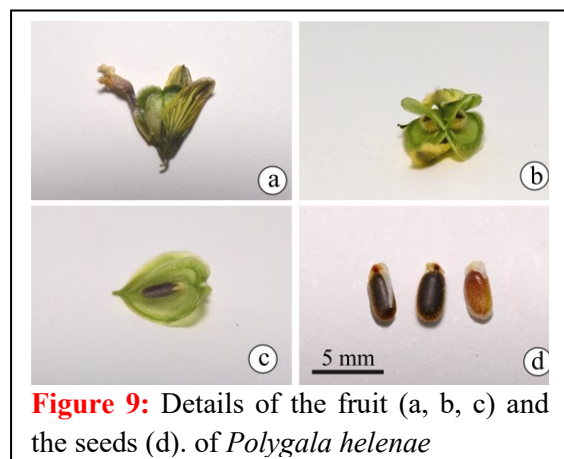
distribution range of the species is that it is growing on the existing unpaved road. It is rumoured that the widening of the road and its cement-paving is about to happen in the near future. In addition, this area has not been affected by wildfires for over a hundred years which means it might be easily burned in the future. On the other hand, despite the landscape of degradation and population decline, the sight of many ants carrying ripe seeds of *Polygala* (Fig 8a), which had fallen on the dirt road, gives hope for the future of the plant; Seed dispersal by ants (myrmecochory) in *Polygala* species [3] is already known due to the well-developed seed elaiosomes. Furthermore, the



**Figure 8:** Seed dispersal by ants and the presence of *Apis* sp., nectaring on *Polygala helenae*, shed some optimism on the future of this hallmark plant of the island.

presence of *Apis* sp., nectaring on *Polygala helenae*, sheds optimism on the future of this hallmark plant of the island (Fig 8b).

During our visit at the two distinct populations of the plant, about 600 mature and immature seeds (Fig 9) were collected for our *ex situ* conservation goals (i.e. scientific research and long-term storage in our Seed Banks - NKUA and MSB Kew)



**Figure 9:** Details of the fruit (a, b, c) and the seeds (d). of *Polygala helenae*

within the framework of a satellite assignment to the “Conserving the Flora of the Balkans: Native Plants of Greece” Project”.

A very interesting observation is that both locations of the *P. helenae* habitat, which are about 20 km apart from each other, share the same geotectonic substrate, the unit of Pliocene marine sediments [4], one of the 4 units documented on the island.

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