



Saponaria jagelii:

Population status, threats and conservation efforts

Oikonomidis S., Koutsovoulou K., Katsikis N., Thanos C.A.

NKUA Seed Bank, Section of Botany, Department of Biology, National and Kapodistrian University of Athens, Panepistimiopolis, 15784 Athens, Greece

Introduction

Saponaria jagelii (Fig. 1) is a member of the Caryophyllaceae family, which is widespread across the world with approximately 2,600 taxa and 81 genera (Christenhusz et al., 2017). Most taxa in this family grow as annual or perennial herbs. The genus *Saponaria* comprises approximately 40 taxa native to Asia and Europe, with 10 taxa represented in Greece, of which two, *Saponaria jagelii* and *Saponaria aenesia*, are endemic to the country (Dimopoulos et al., 2013).

This annual plant grows between 3 and 10 cm tall. Its stems are erect to ascending, sturdy, dichotomously branched, and have a reddish hue. The lower part of the stem is nearly glabrous, while the upper part is covered with glandular hairs. The leaves are thick, lanceolate to oblanceolate in shape. The lower and middle leaves are glabrous, sometimes ciliate along the margins, and gradually narrow into a broad petiole. They measure 1–4.5 cm in length and 0.5–1 cm in width, displaying a greenish-reddish coloration. The upper leaves are sessile and may be sparsely glandular-hairy. The pedicels are shorter than the calyx and are erect or spreading when in fruit. The calyx is cylindrical, reddish, covered in glandular hairs, and measures 7–10 mm in length, with short, ovate, and obtuse teeth. The petals are pink with a white base, entire, and obovate-spatulate in shape, gradually narrowing toward the base. Each petal bears two oblong appendages. The fruit is a subcylindrical capsule containing small, globose, finely tuberculate seeds measuring 1.0–1.2 mm in diameter. This species is closely related to *Saponaria calabrica* but is distinguished by its thicker, larger lanceolate or oblanceolate leaves, obovate-spatulate petal shape, and smaller, finely tuberculate seeds (Phitos & Greuter, 1993).

Saponaria jagelii rarely grows in groups of up to eight individuals, with most plants developing separately but usually in close proximity to others of the same species. The

species produces 1–96 flowers per plant, with a mean of 24.9 ± 3.1 flowers. Each fruit produces 7–14 seeds with a mean mass of 0.85 mg, and the seeds measure 0.92 ± 0.008 mm in length and 0.92 ± 0.010 mm in width (Katsikis, 2023).

Distribution and Life Cycle

Saponaria jagelii was initially recorded in two localities on the west coast of Elafonisos Island, along with a third locality at Pounta Beach (Phitos & Greuter, 1993). In 2024, the species was also reported on the island of Lemnos (Bergmeier et al., 2024), but this report requires verification. The species grows almost exclusively on mobile sand dunes, with fewer individuals occasionally found in more stabilized coastal sandy areas. As an annual herb, *Saponaria jagelii* has a short life cycle of approximately two months, from germination to seed dispersal. Based on laboratory and field observations (Katsikis, 2023; Stefi & Thanos, 2023), germination begins around late February to early March, with plants reaching the flowering stage after 3–4 weeks. The peak flowering period occurs in mid- to late March, and by the end of April, most seeds have dispersed.

Population Status

In 2019, during a recent evaluation under the SoBEx project, funded by the Hellenic Foundation for Research and Innovation (H.F.R.I.), no individuals of *Saponaria jagelii* were recorded at Pounta Beach. Monitoring of the two localities on Elafonisos Island during the SoBEx project recorded approximately 1,400 individuals at locality 1 and 250 individuals at locality 2, with the larger population located in the southwestern, more secluded area of the island (Fig. 3). Over the course of the current project (2022–2025), which included a four-year monitoring period, no individuals were recorded at locality 2, while the population persists at locality 1, occupying an area of approximately 1,800 m² (Table 1) with a range of 1,400–1,950 mature individuals. Based on the most recent evaluation under the IUCN Red List criteria, *Saponaria jagelii* is classified as Critically Endangered (CR) due to its restricted range and ongoing pressures from human activities (Iatrou & Aplada, 2023). The Area of Occupancy (AOO) for the species, based on the single known locality on Elafonisos, is 4 km² within a 2×2 km grid. As the species is known from only one locality, the Extent of Occurrence (EOO) cannot be calculated.

Threats

Based on field observations during the project period (2022–2025), human activity

emerges as the primary threat to *Saponaria jagelii*. The population at Pounta Beach was likely extirpated due to visitor activity during the summer, though no direct evidence currently confirms this. Similarly, the second population on Elafonisos Island, based on coordinates reported in the SoBEx project, was destroyed due to the development of a parking lot. Regarding the third and largest population, located in the southwestern part of the island, Kougioumoutzis (2019) reported that approximately 5% of the total individuals (~70–100 individuals, based on a population of 1,400–1,950) were within a fenced area near a house. During our monitoring (2022–2025), fewer than 30 individuals were recorded in this fenced area. The majority of the population, occupying approximately 1,800 m² outside the fenced area, is heavily impacted by its proximity to a residential area near the coast. The local flora is affected by escaped cultivated plants from nearby house gardens, with species such as *Carpobrotus edulis* posing a significant



Figure 1. *Saponaria jagelii* in flowering and fruiting stage.

threat to the survival of *S. jagelii* and the native flora in general. Additionally, other species, including native and alien members of the Poaceae family and a *Rumex* sp. (Fig. 5), are gradually stabilizing the substrate, which may threaten *S. jagelii* in the future, as the species is adapted to mobile sand dunes. Signs of grazing and the presence of goats were recorded, but no immediate impact on *S. jagelii* was observed during the monitoring period.

Table 1. Population size of *Saponaria jagelii* by monitoring year.

Year	Number of Individuals
2022	1440
2023	1520
2024	130
2025	1954



Figure 2. Habitat of *Saponaria jagelii* in Elafonisos island.

Seed collections and ex situ propagation of *S. jagelii*

The NKUA Seed Bank has collected and stored seeds from the *Saponaria jagelii* population in 2022, 2023, and 2024, with the three seed lots totaling approximately 2,000 seeds. The 2022 collection was duplicated and also stored at the Millennium Seed Bank (RBG, Kew). As part of a Diploma (BSc) Thesis within the NKUA-MSB collaboration, the germination ecophysiology of the species was thoroughly investigated. Germination of *S. jagelii* seeds is inhibited by light, occurring only in complete darkness (Katsikis, 2023). Additionally, the species requires relatively low temperatures for germination, with 10 °C identified as optimal for complete germination. Seedlings produced were planted in the Ioulia and Alexandros Diomides Botanical Garden, and some were provided to an external collaborator for further development. In the latter case, a few plants successfully reached the flowering stage.

In situ conservation of *S. jagelii*

During the project “Management Actions for the Sand Dune Ecosystems in Elafonisos and Laconic Gulf” (2019–2022), implemented by OIKOM, invasive species were targeted for removal to restore the sand dune ecosystems of Elafonisos Island, including the habitat of *Saponaria jagelii*. Recent monitoring expeditions indicate the need for continued management actions to reduce the spread of both invasive species and native species from adjacent habitats encroaching on the sand dunes.

Future perspectives

Based on the results of the four-year study (2022–2025), the NKUA Seed Bank has acquired the necessary expertise to propagate *Saponaria jagelii* from seeds and, if deemed necessary, establish an ex situ nursery for future conservation efforts. Additionally, developing a restoration plan for the species’ habitat is critical. This plan should prioritize the eradication of invasive alien species in the surviving population at locality 1 and focus on reintroducing a viable population at locality 2, leveraging knowledge gained from the project *Conserving the Flora of the Balkans: Native Plants of Greece*.

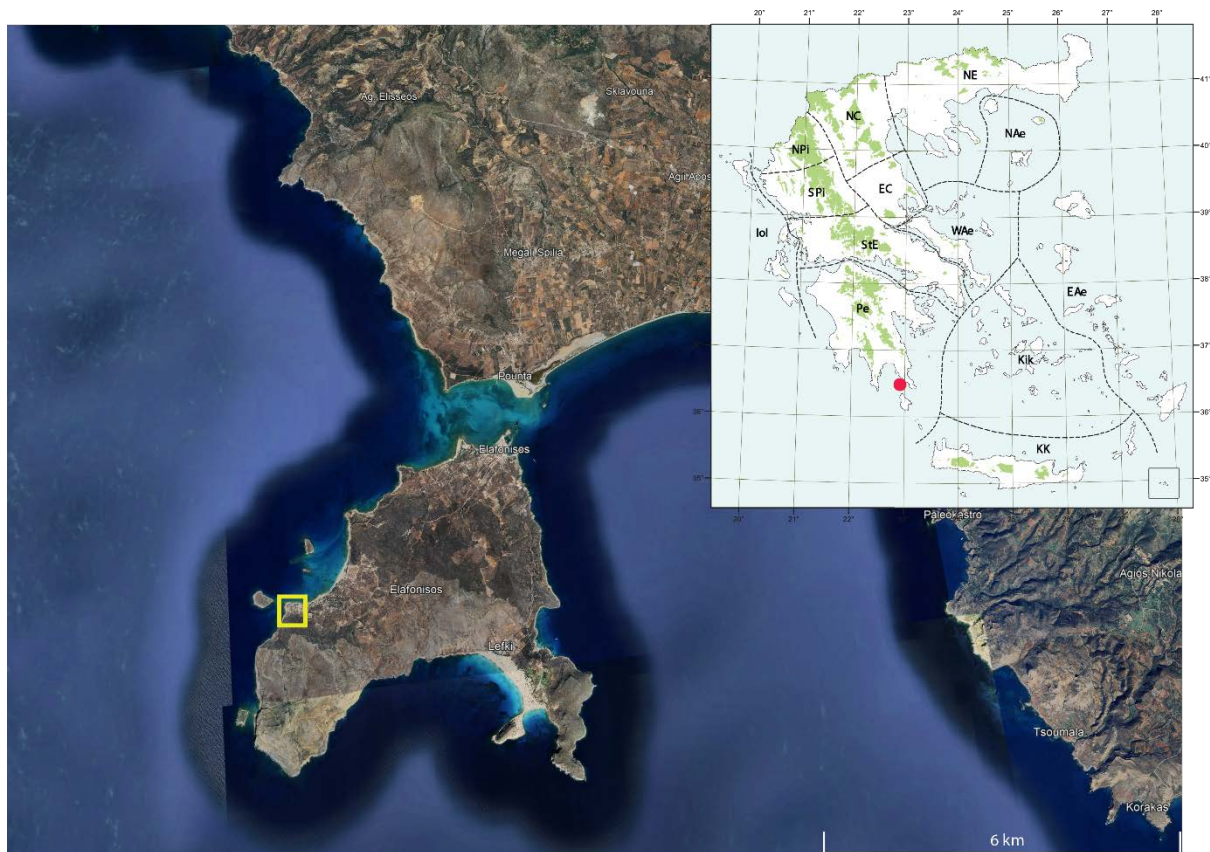


Figure 3. Map of Elafonisos island (Google Earth) with habitat of *S. jagelii* marked in yellow: On the inset map of Greece, Elafonisos is marked with a red dot.



Figure 4. *S. jagelii* area of presence in Elafonisos.

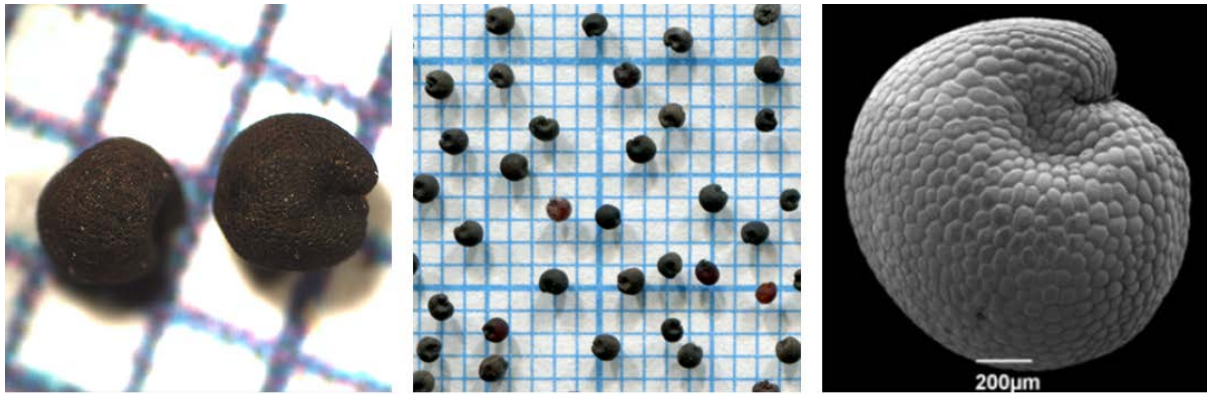


Figure 5. *S. jagelii* seeds as observed under a stereomicroscope (left), scanned on millimetre paper (centre) and under a SEM (right).



Figure 6. Disturbances in the habitat of *S. jagelii*: Escaped plants from nearby house gardens (1, 2), grazing by goats in the area (3, 4), invasion of species from adjacent non-coastal habitats (5) and residential development within a few meters of the population (6). Numbering from left to right and top to bottom.

References

Bergmeier E., Meyer S., Rinne L., Auer E., Bernhardt F., Braun FS., Ebenslander M., Honer

J., Joch J., Kuczka T., Malkow M., Muller-Kiefer J., Pahl J., Pfeiffelmann A., Philippi J., Schauder FM., Simorangkir J., Terracina N., Thieke N., Sakellarakis FN. 2024. *Saponaria jagelii* (Caryophyllaceae) on the island of Lemnos: New data for one of the rarest plants of the Mediterranean Basin. 18th Scientific Conference of the Hellenic Botanical Society, 2-5 October, Thessaloniki, Greece.

Christenhusz M.J.M., Fay M.F., Chase M.W. 2017. Plants of the world. Kew Publishing, Royal Botanical Gardens Kew.

Dimopoulos P., Raus T., Bergmeier E., Constantinidis T., Iatrou G., Kokkini S., Strid A., Tzanoudakis D. 2013. Vascular plants of Greece: An annotated checklist. Berlin: Botanic Garden and Botanical Museum Berlin-Dahlem; Athens: Hellenic Botanical Society.

Iatrou G. 2006. *Saponaria jagelii* (errata version published in 2016). The IUCN Red List of Threatened Species 2006. Accessed on 05 July 2025.

Iatrou G. 2016. *Saponaria jagelii* (errata version published in 2016). The IUCN Red List of Threatened Species 2013. <https://dx.doi.org/10.2305/IUCN.UK.2013-2.RLTS.T61639A50017799.en>. Accessed on 05 July 2025.

Iatrou G., Aplada E. 2025. *Saponaria jagelii*. The IUCN Red List of Threatened Species 2025. <https://dx.doi.org/10.2305/IUCN.UK.2025-1.RLTS.T61639A102929979.en>. Accessed on 05 July 2025.

Katsikis N. 2023. Conservation biology and germination ecophysiology of threatened plants of Greece with an emphasis on *Saponaria jagelii*. BSc Thesis, Section of Botany, Department of Biology, National and Kapodistrian University of Athens,

Kougioumoutzis K., Papadaki X., Alexiou I., Kelaidi G., Proios G., Triantis K., Parmakelis A. 2019. Species on the brink of extinction: Integrated approach and initial assessment. 16th Panhellenic Scientific Conference of the Hellenic Botanical Society, 10-13 October, Athens, Greece.

Kougioumoutzis K. 2019. Species on the brink of extinction. Research Report of the first year of the Project SoBEx. Athens (Greece).

OIKOM 2022. Management actions for the sand dune ecosystems in Elafonisos and Laconic Gulf.

Phitos D., Greuter W. 1993. *Saponaria jagelii*, a new species from the island of Elafonisos (Peloponnisos, Greece). Flora Mediterranean 3: 277-278.

Stefi A., Thanos C.A. 2023. There's still hope for *Saponaria jagelii*. NKUA Seed Bank.

Stefi A., Katsikis N., Thanos C.A. 2023. An investigation on the population, ecophysiology and morphology of *Saponaria jagelii*, a critically endangered species. HELECOS 11, 4-7 October, Patra, Greece.