



LIFE Project LETSGO GIGLIO: Results of flora and vegetation monitoring 2020-2024

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Conferenza finale
Isola del Giglio 23,24 Ottobre 2024



Progetto realizzato con
il cofinanziamento della
Commissione Europea



Project implemented with
co-funding from the
European Commission



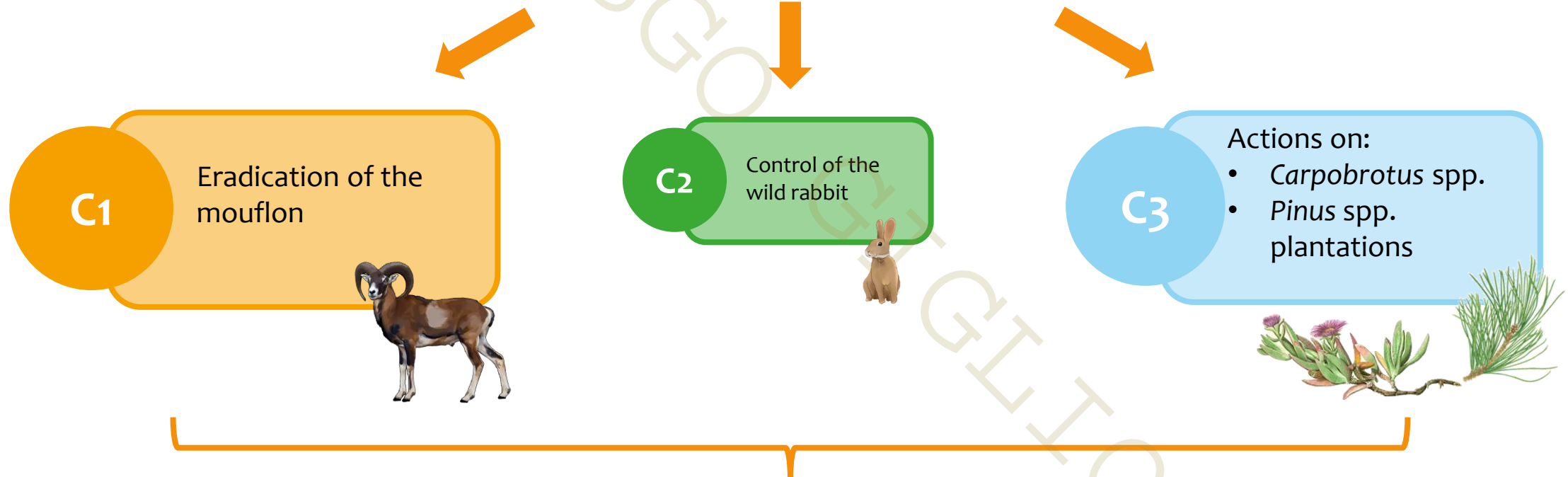
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Action D1: Scientific monitoring of flora and fauna

Monitoring of flora and fauna affected by the interventions



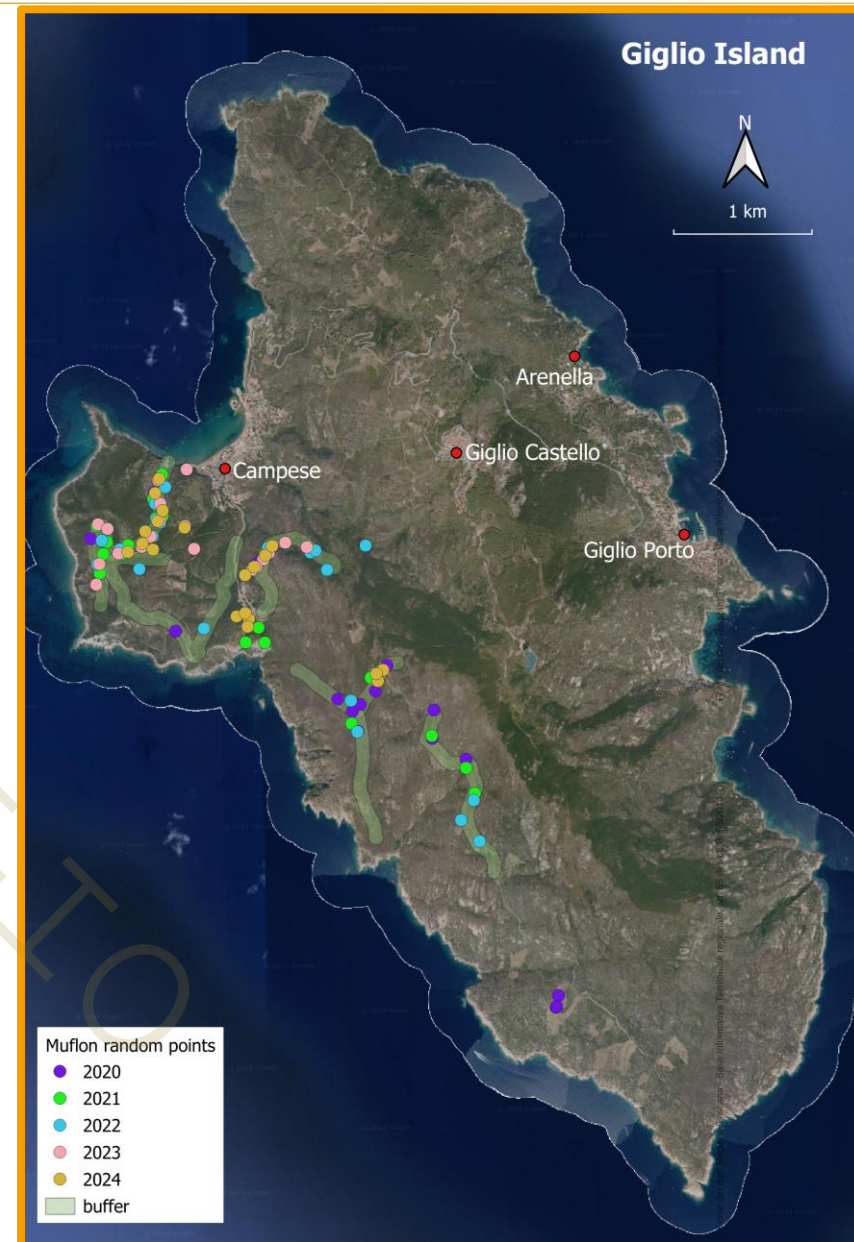
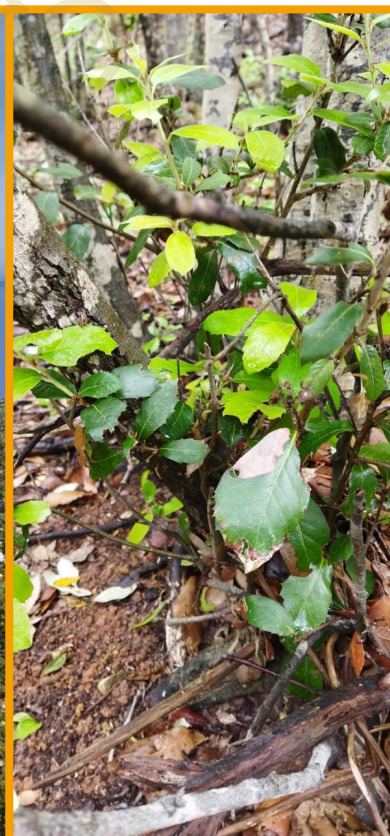
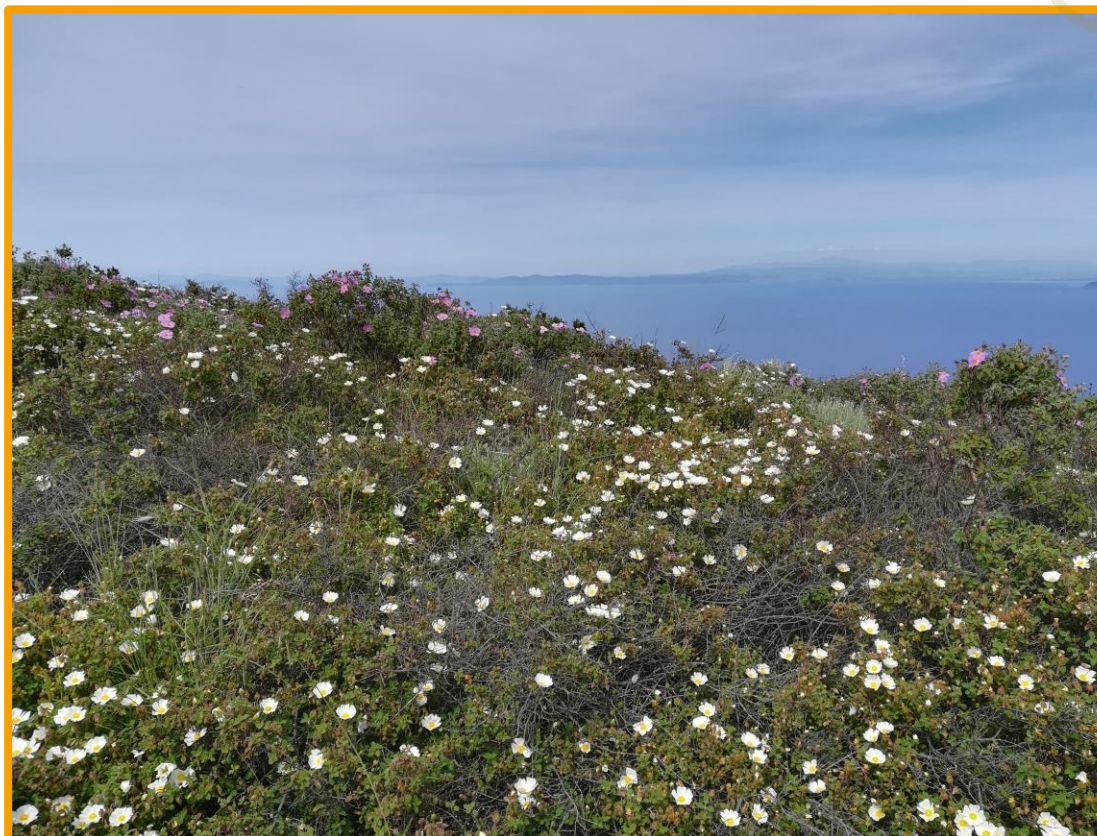
To evaluate the success of interventions and estimate their real effects



C1 Monitoring of flora impacted by mouflons

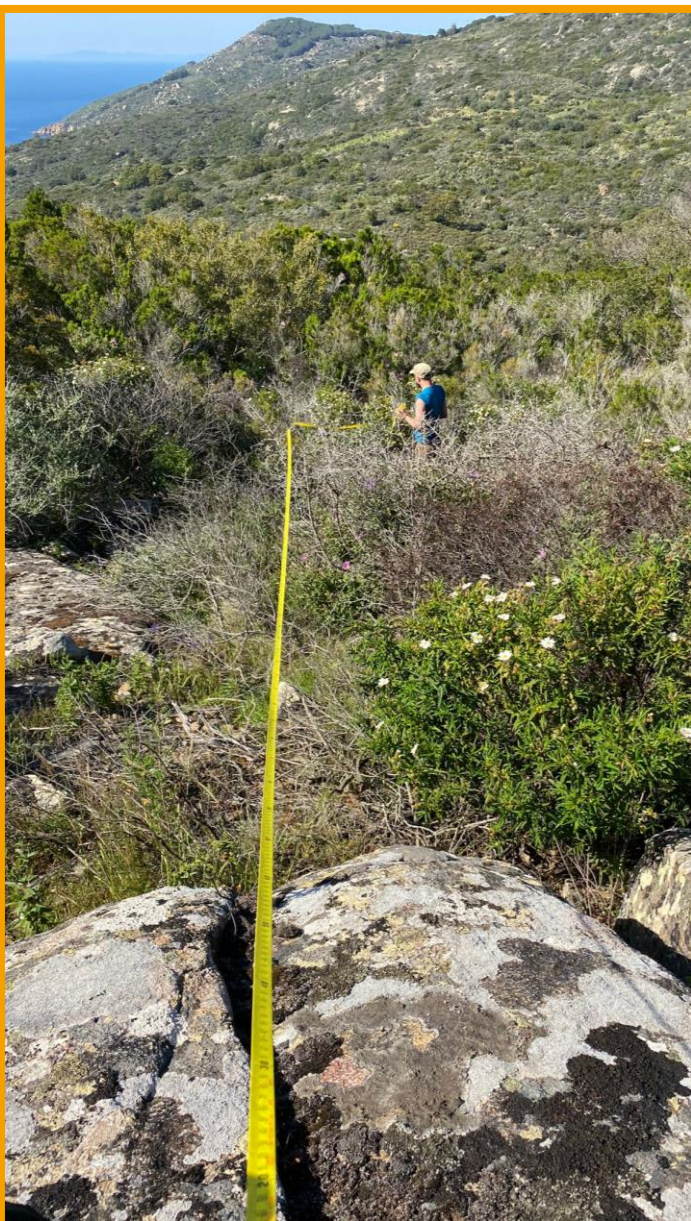
Habitats explored:

- oak woodland habitats (code 9340)
- high and low scrubland
- buffer distance 50 m from the main paths
- 20** randomly placed, non-permanent **10 m x 2 m** transects in the W sector of the island



What did we record?

- Cover of tree, shrub and herbaceous layer
- Count all individuals of the woody species (trees and shrubs) along the transect, indicating the species and detecting shoots and seedlings
- The extent of the impacts





Impact classes

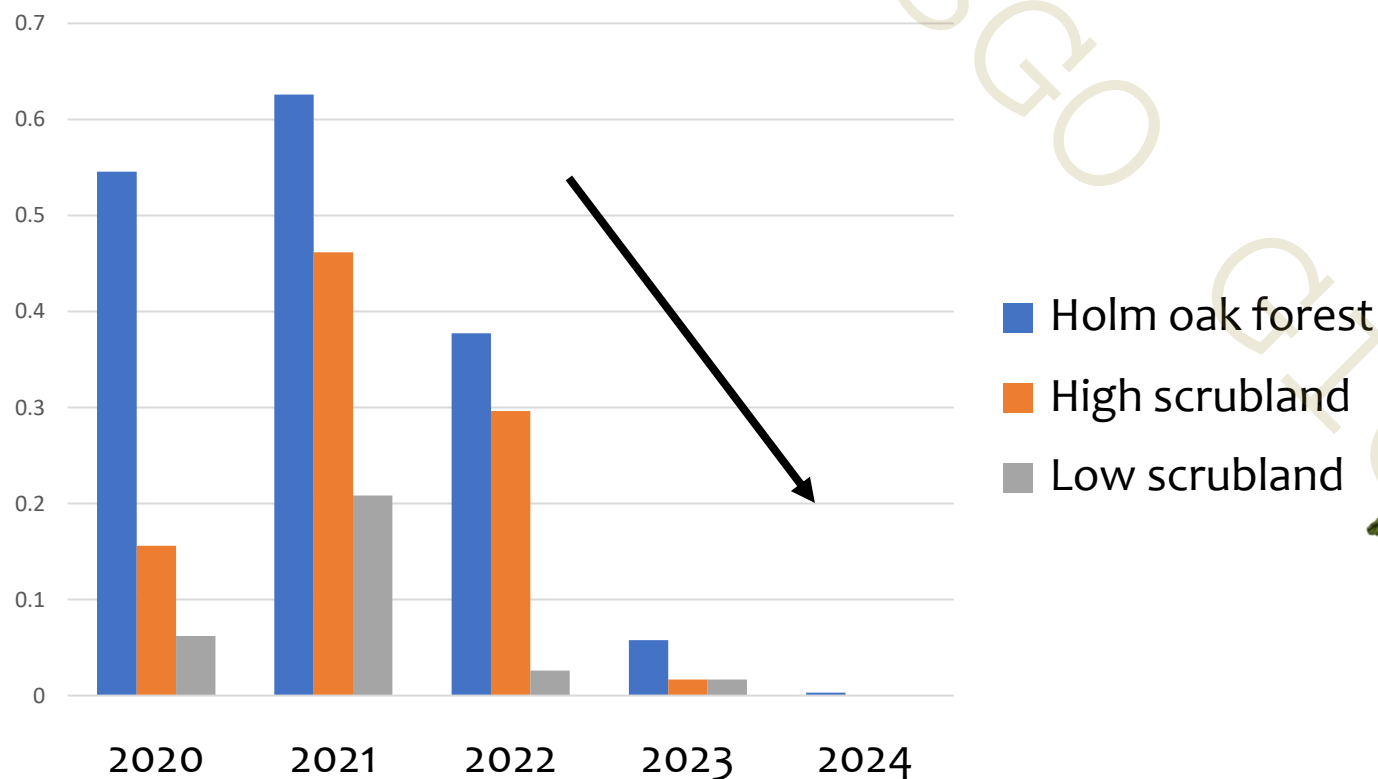
- 0 (no impact)
- 1 (low impact)
- 2 (medium impact)
- 3 (high impact)



C1

Results of the monitoring of mouflon-impacted flora

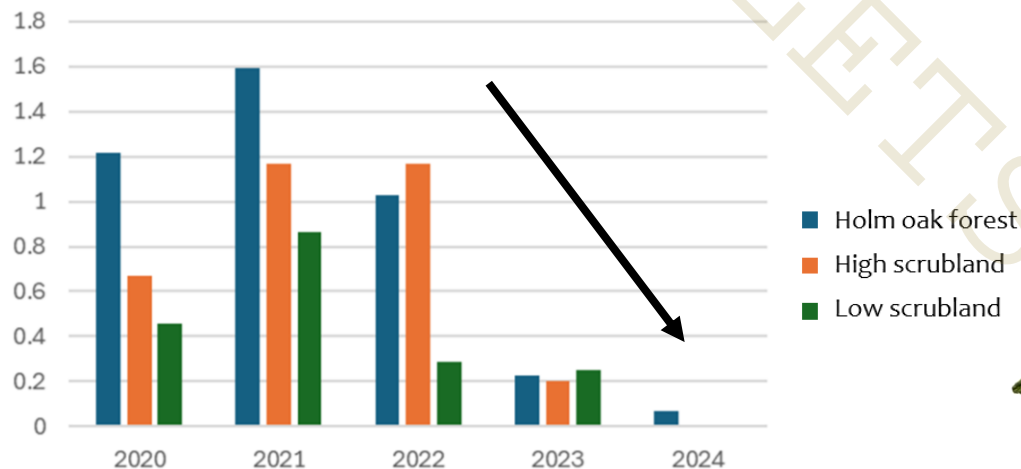
Proportion of individuals grazed



- > individuals grazed in holm oak forest
- Effective interventions → decline in the proportion of grazed individuals over time

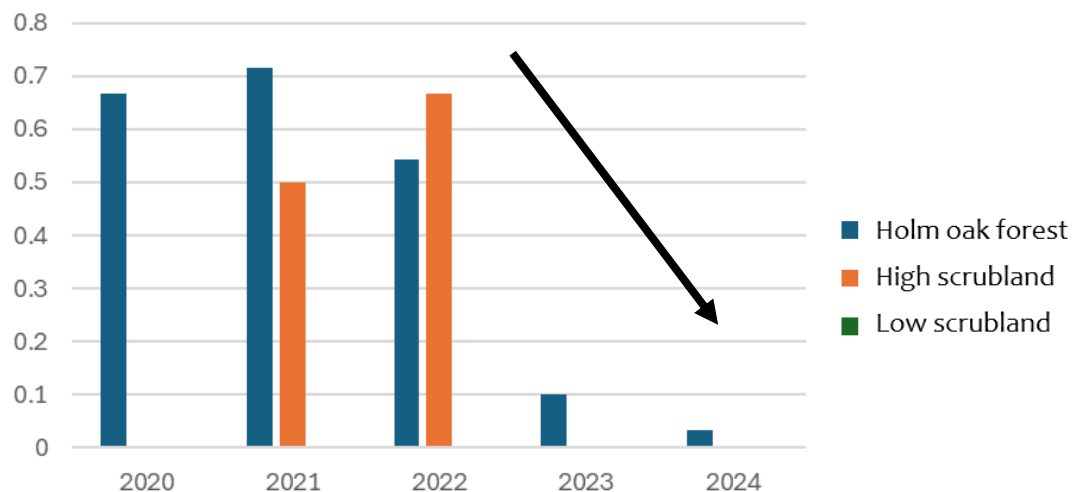


Mean impact

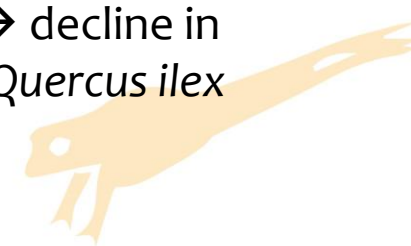


- Mean impact almost always higher in holm oak forest
- Effective interventions → decline in mean impact over time

Proportion of damaged *Quercus ilex* individuals



- Proportion of damaged *Quercus ilex* individuals higher in the holm oak forests, also very present in the high scrubland the second and third year
- Effective interventions → decline in proportion of damaged *Quercus ilex* individuals over time

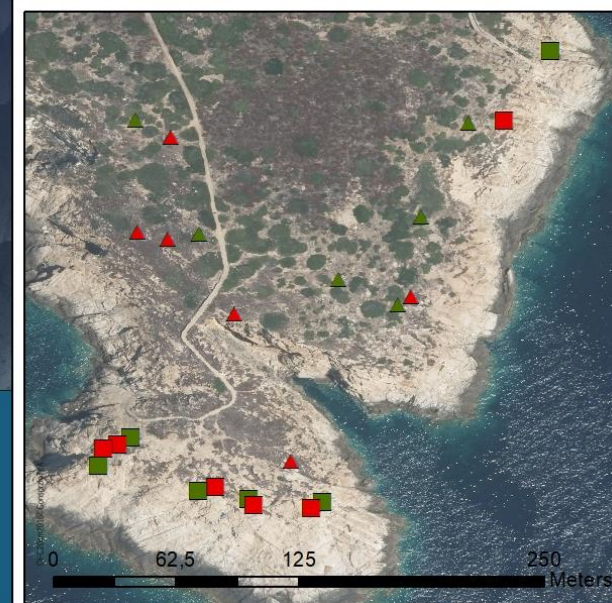
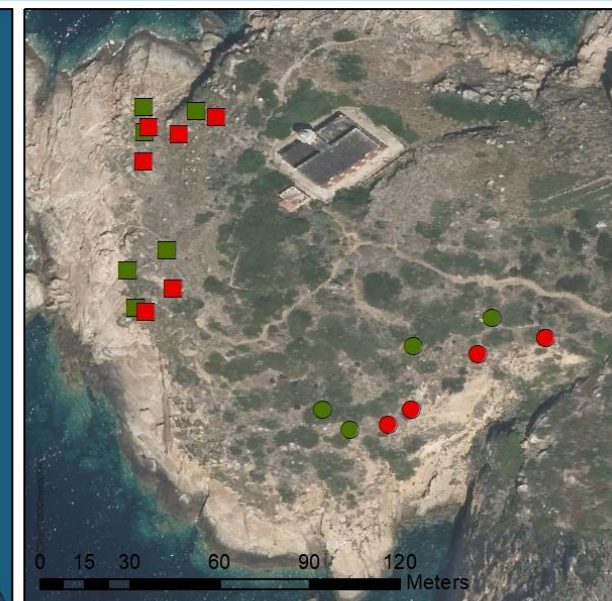
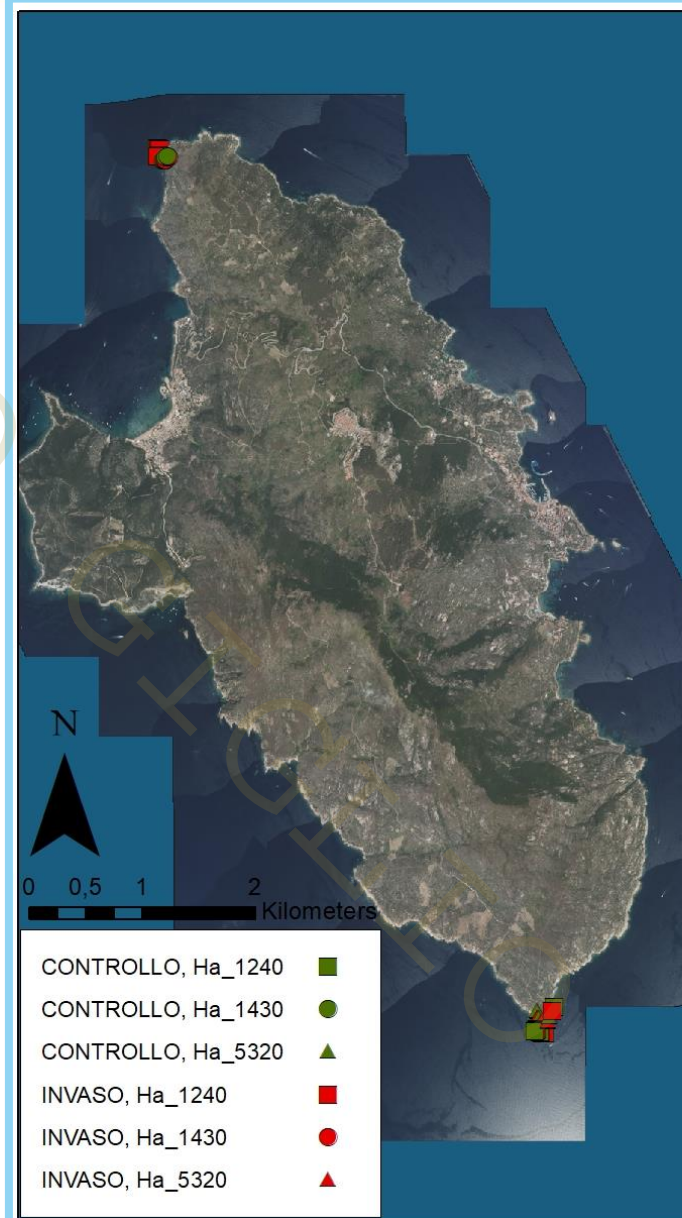


C3

Monitoring of flora impacted by *Carpobrotus* spp.

Impacted habitat:

- Vegetated sea cliffs (code 1240)
- Halo-nitrophilous scrubs (code 1430)
- Coastal garrigues (code 5320)





Sampling design:

- 2 m x 2 m plots in invaded and control areas
- Total of 44 permanent plots
- Stratified random sampling:
 - Habitat 1240
 - Habitat 5320
 - Habitat 1430

Before



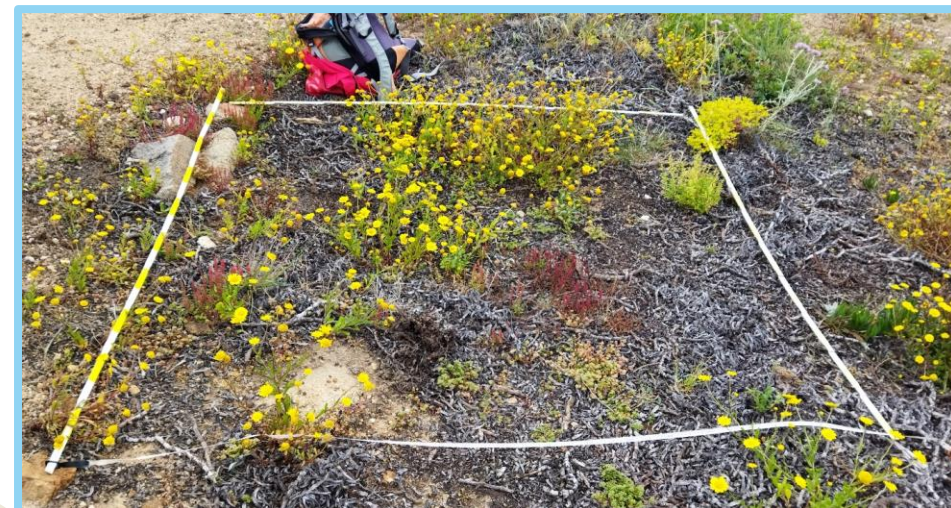
What did we record?



A
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- Species identification
- Species cover (percentage scale)
- *Carpobrotus* litter cover (percentage scale)





plants



Article

Impacts of the Invasive Alien *Carpobrotus* spp. on Coastal Habitats on a Mediterranean Island (Giglio Island, Central Italy)

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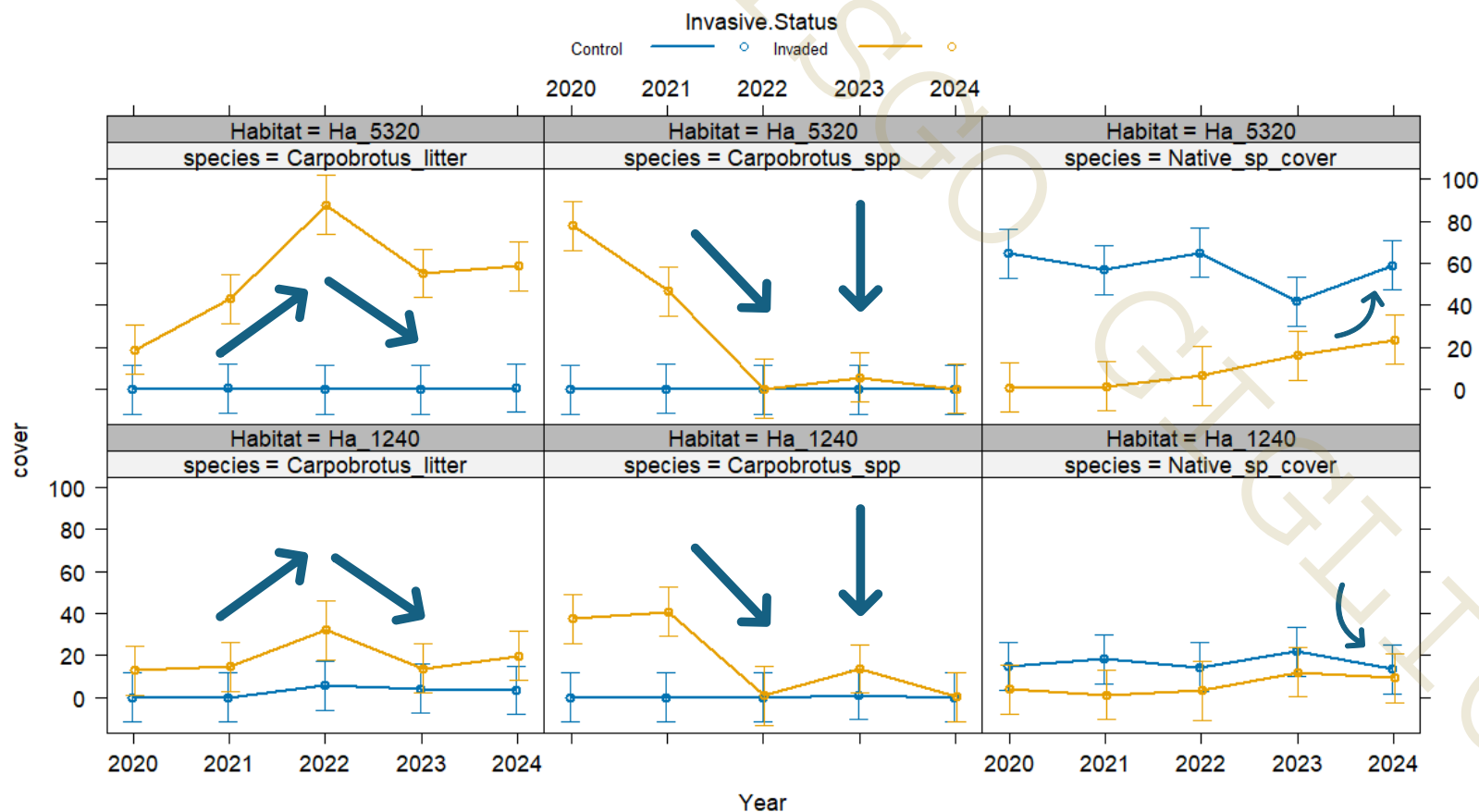


Citation: Mugnai, M.; Benesperi, R.; Viciani, D.; Ferretti, G.; Giunti, M.; Giannini, F.; Lazzaro, L. Impacts of the Invasive Alien *Carpobrotus* spp. on Coastal Habitats on a Mediterranean Island (Giglio Island, Central Italy). *Plants* **2022**, *11*, 2802. <https://doi.org/10.3390/plants11202802>

Abstract: *Carpobrotus acinaciformis* and *C. edulis* are well-known invasive alien plants native to South Africa, whose detrimental effects on native communities are widely documented in the Mediterranean basin and thus largely managed in coastal ecosystems. Most of the literature on these species focuses on their impacts on habitats of sandy coastal dunes, while the effects of *Carpobrotus* spp. invasion on other habitats such as rocky cliffs and coastal scrubs and garrigues are almost neglected. We present a study case conducted on a small Mediterranean island where *Carpobrotus* spp. invaded three different natural habitats listed within the Habitat Directive 92/43/CEE (Natura 2000 codes 1240, 1430, and 5320). We surveyed the presence and abundance of native species and *Carpobrotus* spp. on 44 permanent square plots of 4 m² in invaded and uninvaded areas in each of the three habitats. We found impacts on plant alpha diversity (intended as the species diversity within each sampled plot) in all the habitats investigated in terms of a decrease in species richness, Shannon index, and abundance. Invaded communities also showed a severe change in species composition with a strong homogenization of the floras of the three habitats. Finally, the negative effect of invasion emerged even through the analyses of beta diversity (expressing the species diversity among sampled plots of the same habitat type), with *Carpobrotus* spp. replacing a large set of native species.

C3

Results of monitoring the flora impacted by *Carpobrotus* spp.



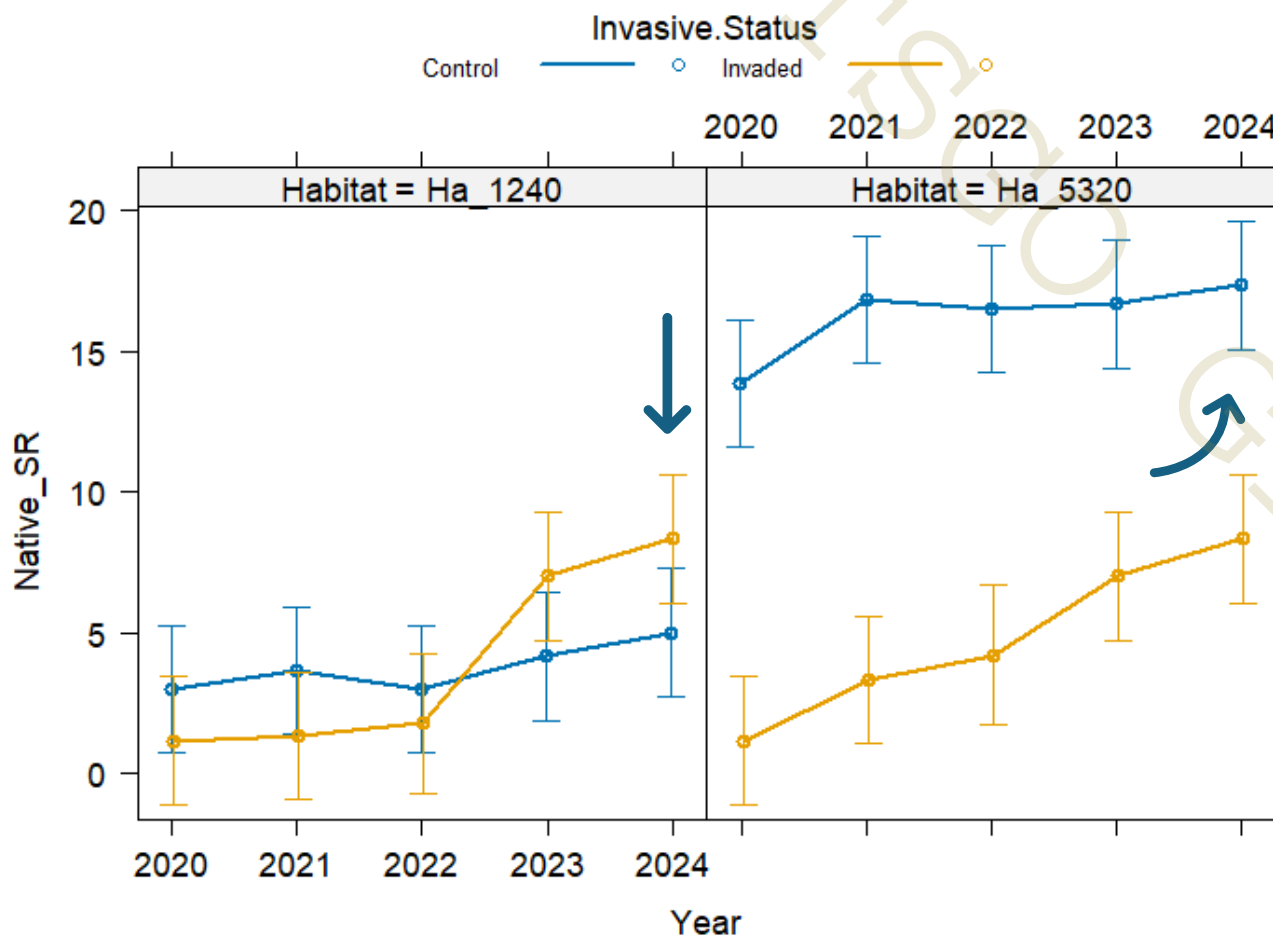
After the intervention (2020-2021):

- In the invaded plots *Carpobrotus* litter increased in both habitats and then declined
- Decrease in *Carpobrotus* cover
- Particularly in 2023, we recorded a reappearance of *Carpobrotus* seedlings
- For both the habitats, native species cover is higher in control plots than in the invaded
- Over the time, native specie cover of invaded areas tend to approach those of control



C3

Results of monitoring the flora impacted by *Carpobrotus* spp.



After the intervention (2020-2021):

- For Habitat 1240, native species richness is higher in invaded plots than control ones
- For Habitat 5320, native species richness is higher in control plots than in the invaded ones
- For Habitat 5320, native species richness of the invaded plots tend to approach that of control plots



Effects on species richness and habitats composition



For Habitat Coastal Vegetation 1240:

- Native species richness is higher in the invaded plots than in control

Accumulation of
Carpobrutus litter

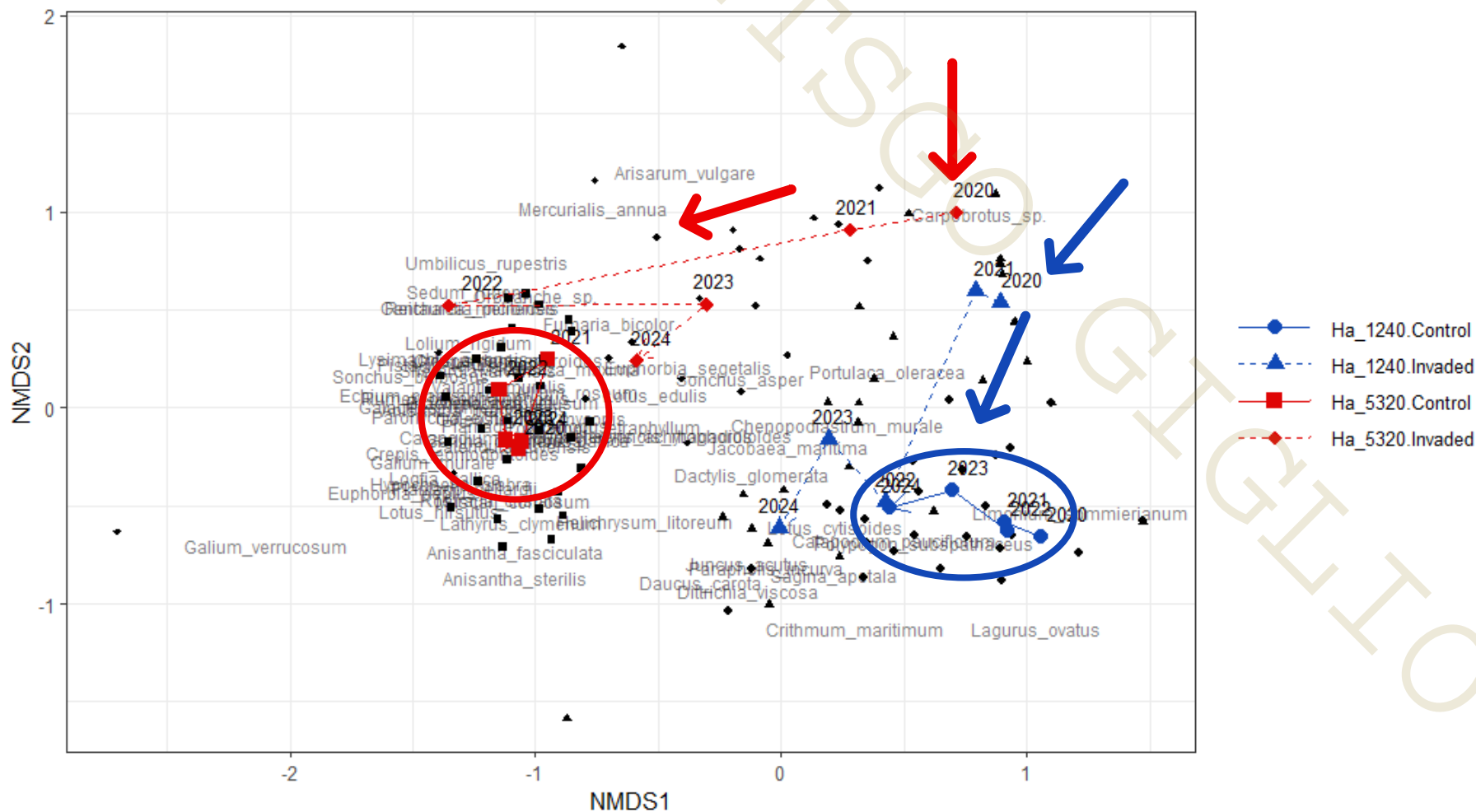
Specialised flora

Expansion of some
non-characteristic
species,
nitrophilous
species




C3

Results of monitoring the flora impacted by *Carpobrotus* spp.



- Well-defined differentiation of control plots of the two habitats across the time
- **Before** the intervention, the invaded plots of both habitats are in proximity
- **After** the intervention, differentiation begins among invaded communities approaching their respective controls

A peer-reviewed open access journal

 NeoBiota

Advancing research on alien species and biological invasions

NeoBiota 94: 127–143 (2024)

DOI: 10.3897/neobiota.94.120644

Research Article

Evidence of short-term response of rocky cliffs vegetation after removal of invasive alien *Carpobrotus* spp.

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Abstract

Invasive alien plant species are among the major drivers of change in natural ecosystems; therefore, their eradication or control is a common and effective conservation tool to reverse biodiversity loss. The LIFE LETSGO GIGLIO project was implemented with the objective of controlling the invasion of *Carpobrotus* spp., among the most threatening invasive alien species in Mediterranean ecosystems, on the Island of Giglio (Tuscan Archipelago, Italy). The management of *Carpobrotus* spp. was conducted across an area of approximately 33,000 m² of coastal habitats. The main intervention was conducted during the winter of 2021–2022, primarily through manual removal, with a limited use of mulching sheets. Subsequent years saw the continued removal of seedlings.

We monitored the habitats of vegetated sea cliffs and coastal garrigues (both protected under Directive 92/43/EEC), as these were the two habitats most affected by the control actions. A total of 24 permanent plots were sampled annually from 2020 to 2023 in a Before-After-Control-Impact (BACI) design. We analysed the variation pre- and post-removal of *Carpobrotus* spp. cover and litter and of native plant cover and diversity, as well as the changes in the composition of native plant communities.

Our results show that already two years after the main intervention of removal, thus in the short term, the community's composition shifted considerably towards the pre-invasion set of species. This recovery was also evident in terms of diversity indices, although the impact of *Carpobrotus* spp. on ecological parameters (mainly soil) favoured nitrophilous species. Furthermore, we highlight the need for yearly removal of *Carpobrotus* spp. seedlings for the next 5–10 years, in order to continue promoting the recovery of native communities.



Academic editor: Joana Vicente

Received: 29 February 2024

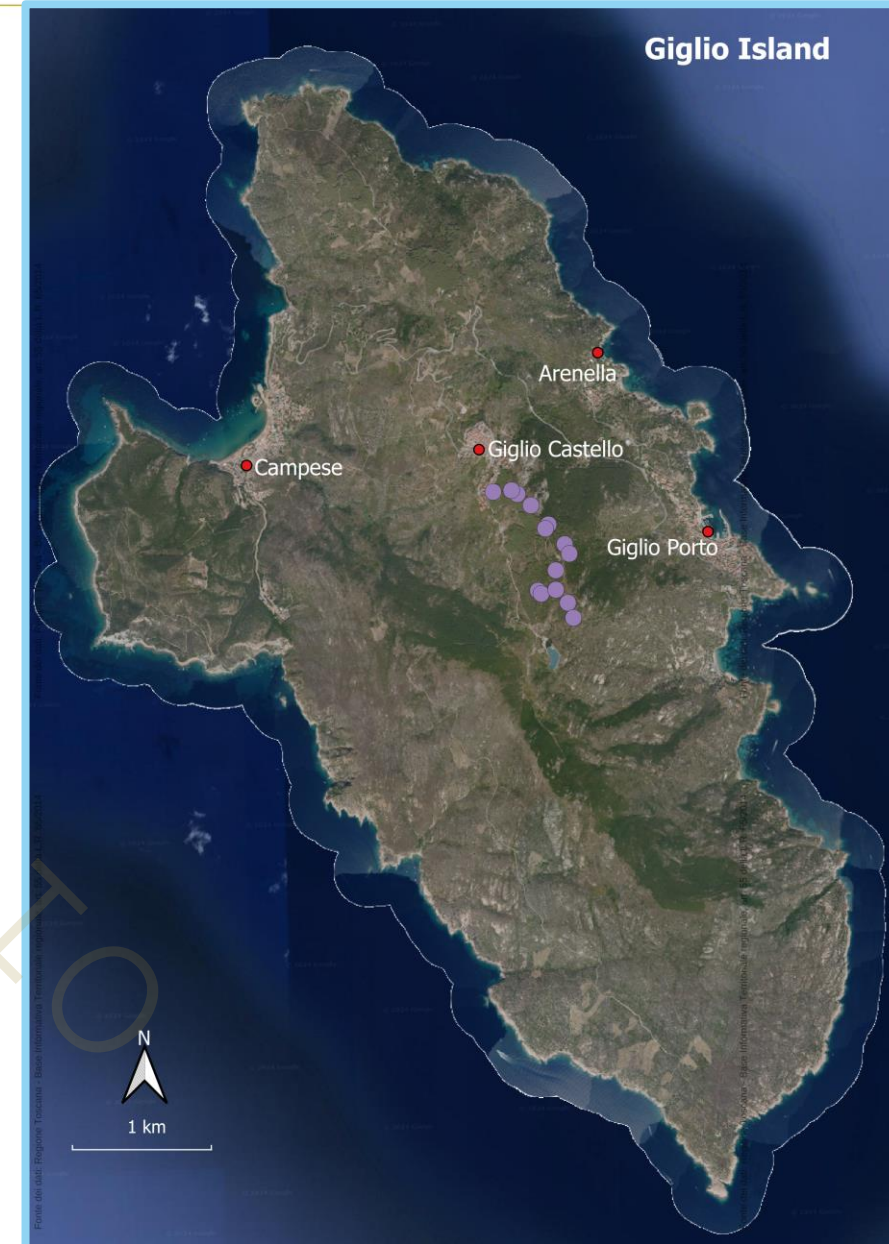
Accepted: 1 July 2024

Published: 26 July 2024

C3 Monitoring of flora after the thinning intervention on *Pinus* spp. plantation



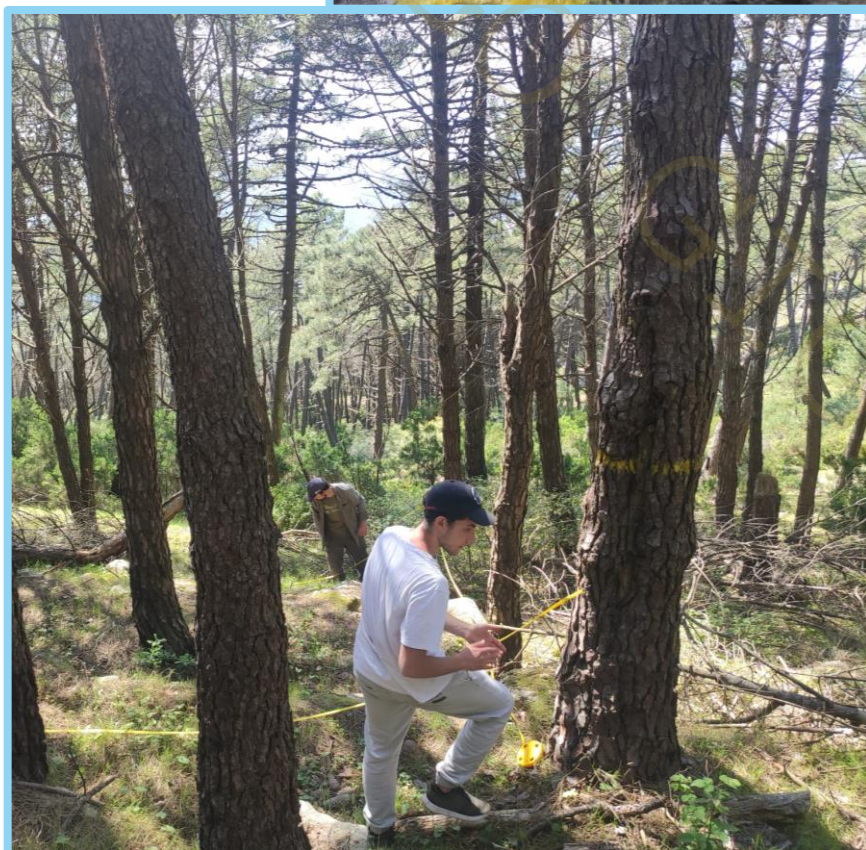
- 12 permanent square plots 5 m x 5 m
- Between Giglio Castello and Poggio delle Serre



What did we record?

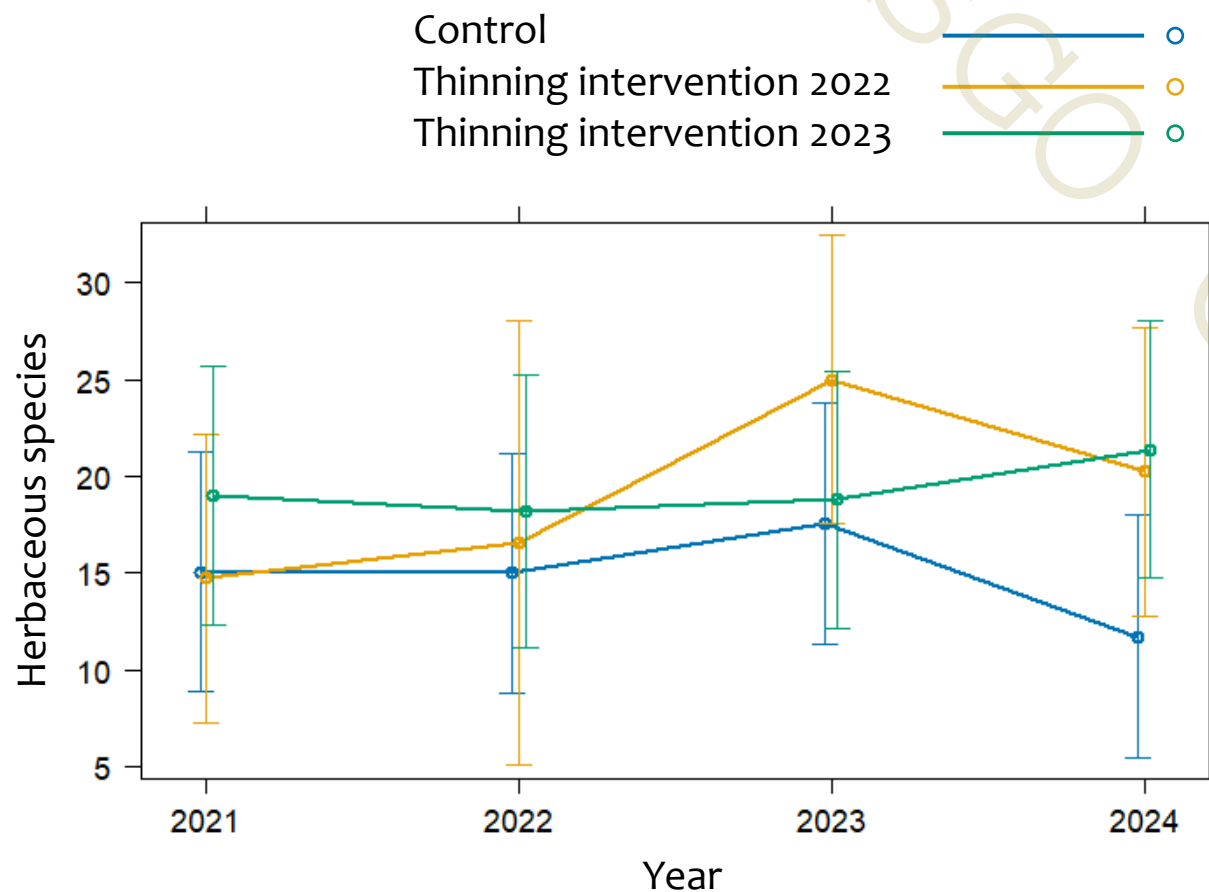


- Tree, shrub and herbaceous layer cover
- Species cover (percentage scale)
- Identification of the species



C3

Results of flora monitoring after the thinning intervention on *Pinus spp.* plantation



- Increase in herbaceous species after thinning in 2022
- Increase in herbaceous species after thinning in 2023



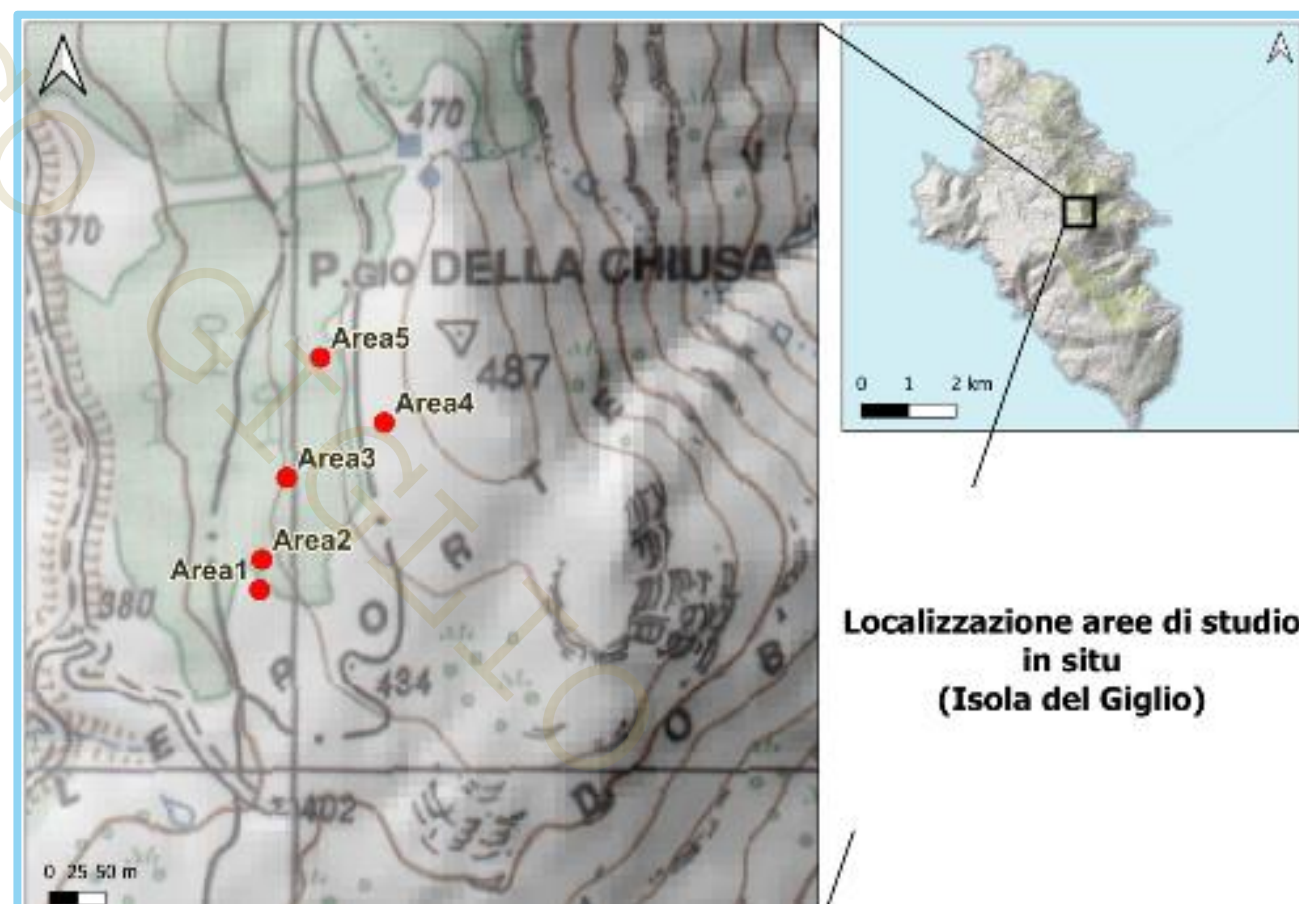


Effect of substrate and predation on the emergence of *Quercus ilex* L. seedlings in a renaturalization intervention of pine plantations on the Giglio Island (Tuscany)

Ex situ



In situ





Ex situ – experimental design

- Type of soil (Giglio pinewood soil/neutral soil) and p/a pinewood litter
- 96 acorns in total
- 4 basins (60x40 cm) filled with different types of soil
- Germination monitored twice a week



Giglio pinewood soil

Neutral soil



Results of the Master thesis experiment

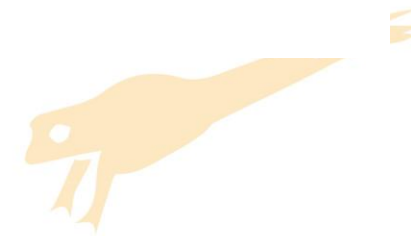


Proportion of germinated seedlings



- The germination of *Quercus ilex* seedlings is favoured in Giglio pinewood soil

Type of soil





In situ

- Acorn collection
- Tree types of cage: closed, open and control
- Each subplot contains 20 acorns
- Survey once a month for 4 months

closed cage
(excludes lagomorphs and rodents)



open cage
(excludes lagomorphs but not rodents)



control



What did we record?



- The number of emerged holm oak seedlings
- The presence of predator tracks
- % of loose soil



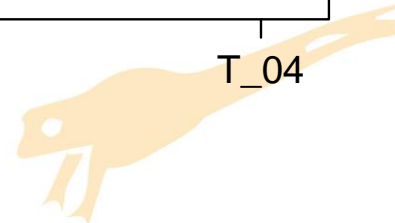
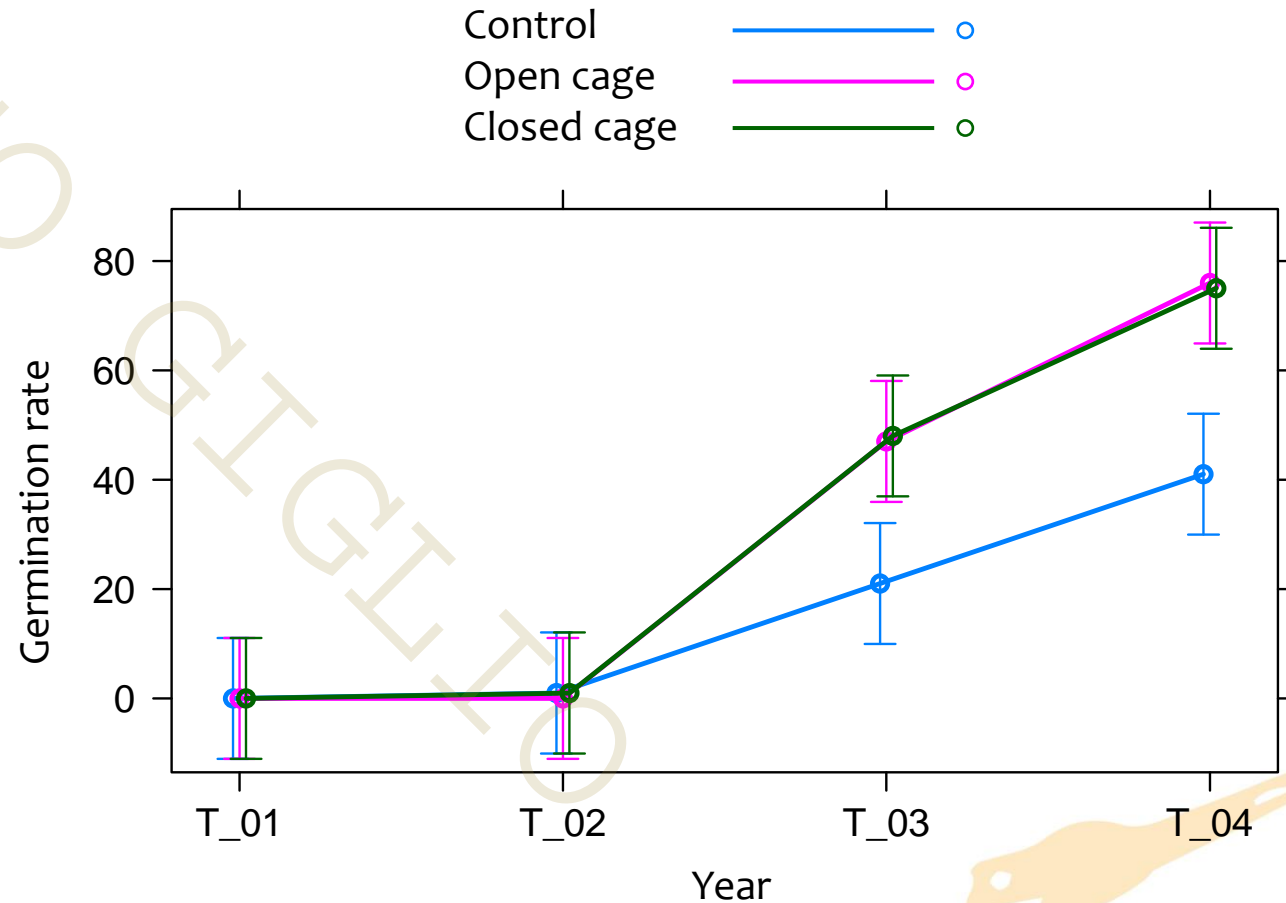


Results of the Master thesis experiment

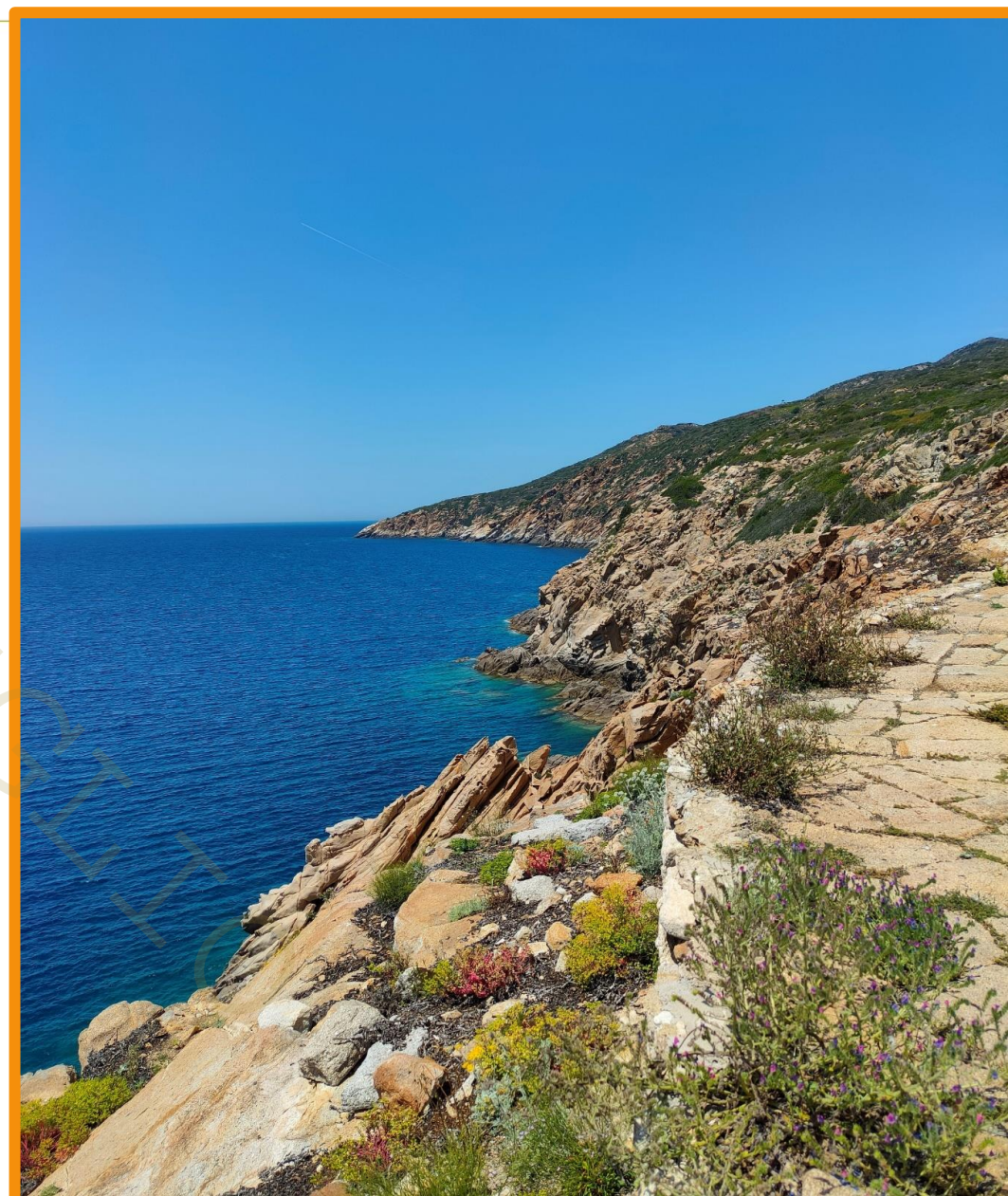
- Significantly higher germination rate in both open and closed cages than in the control
- Evident damage caused by lagomorphs and rodents in control plot



In situ



- Reduction of grazing impacts after mouflon eradication intervention
- Native vegetation recovery after *Carpobrotus* removal → vegetation monitoring in the **long term**
- First vegetation changes after the thinning intervention on *Pinus* spp. plantation → vegetation monitoring in the **long term**





**Thank you for your
attention!**