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The contribution of citizens to threatened plant conservation

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Abstract

There is growing recognition of the importance of citizens in biodiversity conservation, particularly in the Mediterranean Basin—a global biodiversity hotspot and cradle of several civilizations—where human actions have influenced the introduction, extinction, and relocation of plant species, determining their current distribution. This research aimed to understand the role of citizens in conserving flora of conservation interest in Sardinia. We used questionnaires administered to individual citizens to investigate whether their activities included intentional movements of endemic and threatened plants for conservation purposes (namely translocations). We documented 68 translocations; 69.5% of these were directly confirmed in the field, involving 22 plants, mainly woody and endemic to the island. Most of them were introductions and were successful, with 73.53% having live individuals surviving and 67.65% also having reproductive plants. Although our analysis covers a limited period of time and probably provides only a small snapshot of the total, these data reveal an important contribution of citizens to the practical conservation actions for threatened plants. To our knowledge, this constitutes the first attempt to quantify such contributions and suggests that the undocumented, spontaneous initiatives of citizens may far outnumber institutional efforts in both quantity and effectiveness. The contribution of citizens may represent a crucial component of regional biodiversity strategies if integrated and valued in more inclusive conservation strategies.

KEYWORDS

conservation translocations, endemic plants, Mediterranean Basin, plant conservation, plant introduction, plant reintroduction, population reinforcement, Sardinia

1 | INTRODUCTION

In recent years, particular emphasis has been given by the scientific community to citizen engagement in research activities. Citizen science involves the active participation of the general public in research activities across various disciplines (Callaghan et al., 2019; Vohland et al., 2021). This growing interest in public participation in science emerged partly as a response to a widening gap in scientific capacity, particularly in underfunded fields such as botany (Finch et al., 2022). In fact, currently, citizen science is an invaluable source of ecological and biodiversity data (e.g., Aavik et al., 2025; Callaghan et al., 2021; Dibner & Pandya, 2018; Irwin, 2018; McKinley et al., 2017). These data, often recorded by non-experts, are among the most abundant available for many taxonomic groups (Groom et al., 2017; Kelling et al., 2019) and they support critical functions such as tracking the distribution and population trends (e.g., Dennis et al., 2017; Finch et al., 2022; Horns et al., 2018; Mesaglio et al., 2025; Stewart et al., in press), monitoring the spread of invasive species (e.g., Gallo & Waitt, 2011; Johnson et al., 2020), and biodiversity assessments (e.g., Chandler et al., 2017; Gallagher et al., 2025; McKinley et al., 2017).

At the same time, there is increasing recognition of the importance of citizen and local indigenous communities in biodiversity monitoring and conservation (e.g., Aavik et al., 2025; Callaghan et al., 2019; Dibner & Pandya, 2018; Hochachka et al., 2012; Irwin, 2018; Sheppard et al., 2024; Stewart et al., in press). These communities often possess deep ecological knowledge (sometimes called "Traditional Ecological Knowledge-TEK"), developed through generations of close interaction with their environments (Berkes et al., 2000; da Silva et al., 2025; Sheppard et al., 2024). Such knowledge can provide essential information on plant distribution, phenology, seasonal cycles, and responses to environmental change, particularly where scientific data are scarce or difficult to obtain (e.g., Bessesen & Gonzalez-Suarez, 2021; de Wyllie Echeverria & Thornton, 2019; Turvey et al., 2018). Local communities can not only observe but also actively manage biodiversity through long-standing sustainable practices, often rooted in place-based knowledge (Ellis et al., 2021; Ridwan et al., 2023; Sousa et al., 2024). However, despite the growing recognition of the importance of traditional communities in biodiversity conservation, the role of these communities is often neglected or underestimated (e.g., da Silva et al., 2025; Levis et al., 2024; Robinson et al., 2021; Sousa et al., 2024; Urbano et al., 2024), and the effective involvement of individuals or local communities in practical conservation actions, especially in relation to plant species, remains underexplored. Organizing and analyzing these experiences to identify patterns and gaps is essential for fully understanding how these communities contribute to biodiversity conservation since, without a comprehensive assessment, it is difficult to direct conservation strategies that effectively integrate traditional and scientific knowledge. In fact, conservation strategies should recognize and incorporate the knowledge and practices of these communities to strengthen biodiversity preservation.

The Mediterranean Basin, one of the biodiversity hotspots identified around the world (Myers et al., 2000), has been the cradle over the last four millennia of several of the world's greatest civilizations (Fenu et al., 2020). The Mediterranean Basin is a priority center of plant diversity: despite representing 1.6% of the Earth's surface, approximately 7% of the whole world's plants can be found in this region (Fenu et al., 2020; Thompson, 2020). Nevertheless, this plant richness is irregularly distributed (Cañadas et al., 2014; Médail, 2022; Thompson, 2020) and, in particular, islands and archipelagos represent a significant component of the Mediterranean plant diversity, notably with an exceptional endemism rate of more than 40% and the presence of range-restricted flora, with numerous narrow endemic species present only in small populations, and peculiar vegetation types (Fenu et al., 2020; Médail, 2022; Thompson, 2020; Vogiatzakis et al., 2016).

Plant richness in the Mediterranean islands is correlated with many anthropogenic activities that have an effect on plant distributions and dynamics (Cañadas et al., 2014; Fenu et al., 2020; Thompson, 2020). In fact, the highly diversified insular flora and their endemicity rate are the result of their different geographical features inducing diverse biogeographical influences and bioclimatological characteristics, the varied consequences of paleogeographic events, and the geological and geomorphological features (Fenu et al., 2020; Médail, 2022; Thompson, 2020). On the other hand, this diversity and uniqueness is also explained by the long-lasting influence of humans, who act as a major "designer" of landscapes and vegetation dynamics through burning, cutting, grazing, and plowing (Blondel, 2006, 2008) and the conversion of natural habitats into agricultural landscapes (Fenu et al., 2020; Vogiatzakis et al., 2016). The heritage of human activities has had profound consequences on the distribution and dynamics of insular flora and vegetation (Médail, 2022). It is also widely accepted that such plant diversity is threatened due to numerous factors (physical, biological, and anthropogenic) and, therefore, many plants on these islands need pressing conservation measures (Fenu et al., 2020).

At the same time, it is widely accepted that, over the centuries, humans and human-mediated activities have contributed both intentionally and accidentally to introducing, extirpating, or moving plant species, determining the current distribution of numerous species (Hodkinson & Thompson, 1997; Niggemann et al., 2009). Humans have great potential as long-distance dispersal vectors for plant species (Hodkinson & Thompson, 1997); however, human-mediated dispersal also acts more frequently at much smaller spatial scales with large impacts on species' distributions (Niggemann et al., 2009). Some of these small-scale, human-mediated actions could also have had an implicit or explicit conservationist purpose and therefore can be configured as conservation translocations as currently defined. According to IUCN (IUCN/SSC, 2013), conservation translocations are intentional movements of plant and animal individuals for conservation purposes; translocation can be used to reinforce existing populations (*reinforcement/augmentation*), restore previously lost populations (*reintroduction*), establish new populations within known ranges (*introduction*), or create new populations outside existing ranges (*assisted colonization/assisted migration/ecological replacement*) (Brodie et al., 2021; Commander et al., 2018; Diallo et al., 2021; Seddon, 2010).

In recent years, conservation translocations have been adopted as a response to the impacts of climate change and habitat fragmentation, to restore lost ecological functions and enhance ecosystem resilience. These interventions are embedded within a framework of active conservation, where the approach is no longer exclusively defensive but includes targeted actions to anticipate or compensate for environmental transformations (e.g., Diallo et al., 2021; Fenu et al., 2023; Godefroid et al., 2025). Although translocations remain a complex and expensive undertaking that requires long-term commitment (e.g., Albrecht et al., 2019; Fenu et al., 2016; Godefroid et al., 2011; Silcock et al., 2019; Zimmer et al., 2019), their importance in conservation science is rapidly increasing, and thousands of plant translocations have been documented worldwide, allowing insights into management trends and the factors that drive project outcomes (Bellis et al., 2024, 2025; D'Agostino et al., 2024; Fenu et al., 2023; Godefroid et al., 2025; Liu et al., 2015; Silcock et al., 2019). Despite these important syntheses, a large amount of information still remains inaccessible to the scientific community; however, to improve the practice of translocation for conservation purposes, there is a clear need to learn from past successes and failures, allowing conservation managers to use proven approaches to maximize the success of future programs (Albrecht et al., 2019; Fenu et al., 2023; Godefroid et al., 2025; Maschinski et al., 2023).

The idea for this research arises from the observation matured over the last 15 years of floristic explorations in Sardinia aimed at studying and monitoring the endemic flora. These long-term field investigations have revealed a clear discrepancy between the data available in literature on the distribution and conservation status of many plant species and the results of field analyses—particularly for some plant species listed in the Annex II of the Habitat Directive (e.g., Fenu et al., 2011, 2024; Ruggero, 2022). The discovery of some translocations carried out by members of the general public has led to the hypothesis that such discrepancy could be attributed not only to an incomplete knowledge of the territory but also to the human-mediated activities of moving plant propagules (Fenu et al., 2023).

The main aim was to document as many plant translocations as possible carried out by individuals or groups of private citizens with a conservation purpose. In particular, the specific objectives were: (1) to record and organize in a Database as many translocations as possible carried out in Sardinia in the last 50 years; (2) to verify the effectiveness of these actions; and (3) to estimate the contribution of these interventions for the conservation of threatened species of the Sardinian flora.

2 | METHODOLOGY

2.1 | Study area

Sardinia, located in the Western Mediterranean Basin, covers an area of 24,090 km^2 and is the second largest island in the Mediterranean Sea. The island features a complex orography with plain, hilly, and mountainous landscapes developed on different geological substrates. The climate is typically Mediterranean, with dry and hot summers and relatively rainy and mild winters, while a temperate bioclimate occurs only at higher elevations. These environmental conditions, combined with the island's prolonged geographic isolation, are the main factors that promoted the speciation of endemic plants, especially on mountain peaks (Cañadas et al., 2014). The Sardinian endemic flora consists of 341 taxa (e.g., narrow endemics, Sardinian endemics, Corso-Sardinian endemics, and Corso-Sardinian-Balearic endemics), of which 195 are exclusive to Sardinia (Fenu et al., 2014; Fois et al., 2022), where they are often present only in small populations, a common feature of the islands of the Mediterranean Basin (Fenu et al., 2020). An additional component of conservation interest is represented by the "policy" species, defined as legally protected plants at the EU and national levels based on their supposed rarity, threatened status, and/or socioeconomic importance (see Rossi et al., 2016). Currently this component consists of 24 taxa, 17 of which are also endemic to the island (Fenu et al., 2017).

Although Sardinia is sparsely populated compared to other European regions, human presence, dating back to at least the Mesolithic, around 10,000 years ago, has played a crucial role in shaping Sardinia's landscape, the distribution of plant diversity and natural vegetation (Blondel, 2006, 2008).

2.2 | Data collection and validation

Data collection was carried out following several successive steps that saw the direct involvement of citizens engaged in plant conservation and people who live and work closely with the land (e.g., farmers, breeders, forestry workers, etc.). In order to obtain as much information as possible on any plant translocations carried out at a local level, a strategy based on questionnaires was adopted as recently done in other studies (e.g., Albani Rocchetti et al., 2022; Corli et al., 2023; Godefroid et al., 2025; Julien et al., 2022; Kelling et al., 2019); in our specific case, considering the target of our requests and the social context of the different island territories, our approach was based on interviews based on key questions. The surveys were first administered to a list of personal contacts of the authors/collaborators, who were asked to complete the survey and to forward it to their additional potentially interested contacts; for this reason, the exact number of people contacted is unknown, which makes it difficult to calculate the percentage of survey responders.

In the first phase of our research, generic information on all potential plant translocations was collected by interviewing potential local stakeholders and, in turn, their contacts; subsequently, two restrictive exclusion criteria for the cases surveyed were adopted:

- All potential cases not explicitly motivated by a clear conservation purpose (e.g., movements for ornamental, medicinal, ethnobotanical, or similar motivations).
- All actions involving species with no recognized conservation interest; specifically, only endemic and "policy" species were selected as target taxa.

For the actions considered useful for research purposes, after a preliminary validation by viewing the photos of the species subject to the conservation action, a second detailed interview was carried out for the translocations involving species included in the list of target species.

Thirty-three people provided answers that were potentially useful for this research and were then subjected to a more detailed interview. This second interview was based on six key questions: (1) the species involved; (2) the site where and the type of the material collected; (3) where and how the material was propagated; (4) the site and year where the transplants were planted; (5) the number of individuals transplanted; and (6) the management measures of the site (pre- and post-actions) carried out.

Respondents were assured that personal identity data and the exact location of the translocation sites would not be disclosed.

2.3 | Data analysis

The information orally collected was subsequently organized into a database and subjected to direct validation by the authors or collaborators in the field. During this detailed monitoring, the effectiveness of each translocation was assessed by verifying the correct identification of the reported plant species and recording the number of total and reproductive individuals that survived. These inspections allowed for the classification of each translocation into one of three categories (i.e., reintroduction, reinforcement, or introduction), clarifying the term "repopulation" generically used by respondents. All cases deemed doubtful or not directly confirmed in the field were excluded from further analysis.

Based on available data, the performance of each individual translocation was analyzed and evaluated; to do this, it was decided to adopt a practical operational criterion for conservation decision-making rather than a strategic vision such as "achieving self-sustaining populations" (see Canessa et al., 2025). Accordingly, in our analysis, it was decided a priori to use the term "success" for translocations in which live individuals are present, while translocations in which no individuals survived are considered "failures."

To compare average survivorship and reproductive rates among different types of translocations, the nonparametric Kruskal–Wallis tests and Dunn's post hoc comparisons were performed. A Bonferroni correction was applied to the post hoc comparisons to obtain more conservative *p*-values.

To test the effects of the origin material (seeds or cuttings), the type of transplants used (seeds, seedlings, juvenile, or reproductive plants), and the implemented management actions (pre- and post-plantation) on the average survivorship and reproductive rates, GLMs were implemented. The analyses were performed in JASP version 0.19.1 (JASP Team, 2025).

2.4 | Ethics statement

This study followed personal data protection and national and European privacy legislation. All respondents were informed in advance that participation in the scientific survey was entirely voluntary and fully anonymous, that all information obtained would be used only in an aggregated and impersonal form, and that no data would be shared with others without explicit permission.

3 | RESULTS

Overall, excluding all cases for which insufficient information was collected (16 cases), 68 conservation translocations carried out in Sardinia in the last 50 years on plants of conservation interest were documented. Of these, 69.5% were

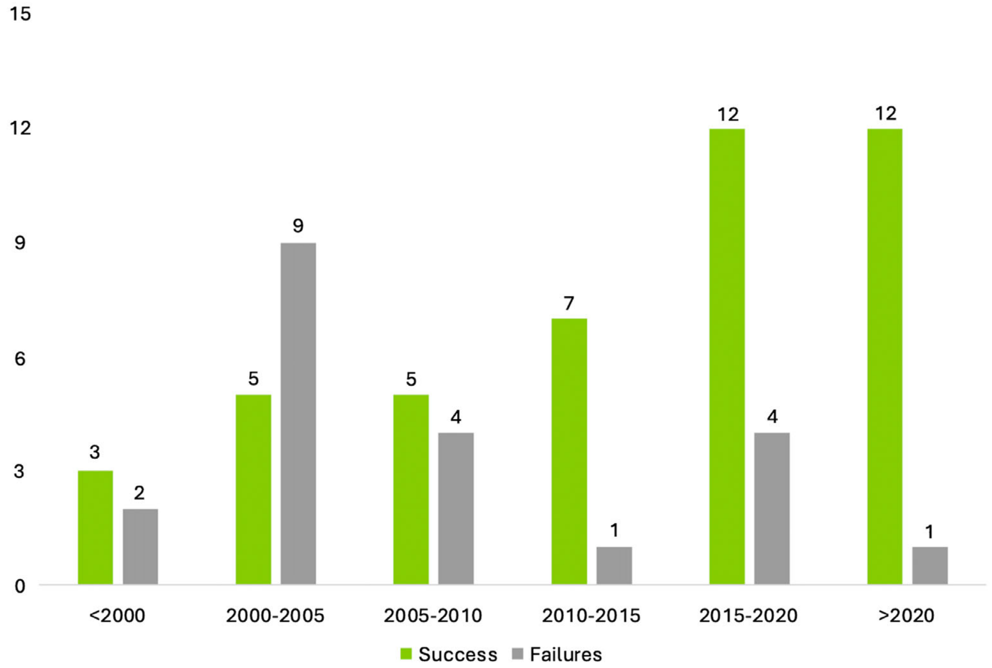

FIGURE 1 Temporal distribution of the plant translocations recorded in this study; for each 5-year period considered, the actions that failed are reported separately.

validated directly in the field by the authors and local collaborators, while the remaining were validated by consulting specific photographic material.

Confirmed conservation translocations involved a total of 22 plant species (see Data S1, Supporting Information for details), mainly represented by woody species (Chamaephytes 10 taxa and Nano-Phanerophytes 8 taxa), followed by Geophytes (4 taxa). Corologically, 91% of which were endemic or narrow endemic; policy species account for 27.3% of the total, but these are, except for two species, endemic. The largest number of translocations were made for *Rhamnus persicifolia* Moris, *Ribes multiflorum* Kit. ex Roem. & Schult. subsp. *sandalioticum* Arrigoni, and *Ribes sardoum* Martelli (7 actions), followed by *Aquilegia barbaricina* Arrigoni et E.Nardi and *Gentiana lutea* L. (6 cases).

The data collected highlights an increasing trend over the years in the number of translocations, particularly in the number of successful actions (Figure 1). More than half of the translocations were carried out after 2010 (54.4%), 35% of these in the last 5 years; documented actions prior to 2000 constitute only 7.35% of the total translocations.

Of the 68 total cases, 73.53% had live individuals (mean 19.3 ± 13.3 plants per translocation) and 67.65% also had reproductive plants (mean 14.5 ± 11.8 plants per translocation); therefore, adopting our approximation can be considered successful. In addition, recruitment was observed in 38.9% of the successful translocations. The most effective translocations in terms of surviving plants have been carried out for *Gentiana lutea* and *Paeonia corsica* Sieber ex Tausch (100%), followed by *Ribes multiflorum* subsp. *sandalioticum* and *Rhamnus persicifolia* (>80%); while considering also the presence of reproductive plants and recruitment, the percentages drop significantly, reaching values close to or equal to zero (e.g., for *Ribes sardoum* and *Rhamnus persicifolia*).

Conversely, 23.5% of the total cases have no living individuals and can be considered failures, while for two cases it was not possible to verify these data. The highest number of failures was recorded for *Ribes sardoum* and *Aquilegia nugorensis* Arrigoni et E.Nardi (3 cases), followed by *Aquilegia barbaricina*, *Nepeta foliosa* Moris, and *Rhamnus persicifolia* (2 cases).

The analysis of the translocation sites in comparison with the historical distribution areas and the ecological requirements of the plant species involved highlights how most of the conservation actions can be classified as introduction (50%), followed by population reinforcement and reintroduction (33.8% and 16.2%, respectively). No actions that can be identified as assisted colonization or assisted migration and ecological replacement have been recorded.

The size of each translocation is highly variable, with reported initial numbers of individuals ranging between 5 and 87 plants. The initial plant material used, of which it was not possible to know whether they came from one or more populations, was found to be in similar percentages of cuttings (51.5%) and seeds (45.6%); only in two cases was it not possible to recover these data. Then the translocations were performed mainly using juvenile plants (79.4%); in few cases (13.2%) seedlings were used, and only sporadically reproductive plants have been transplanted (4.4%).

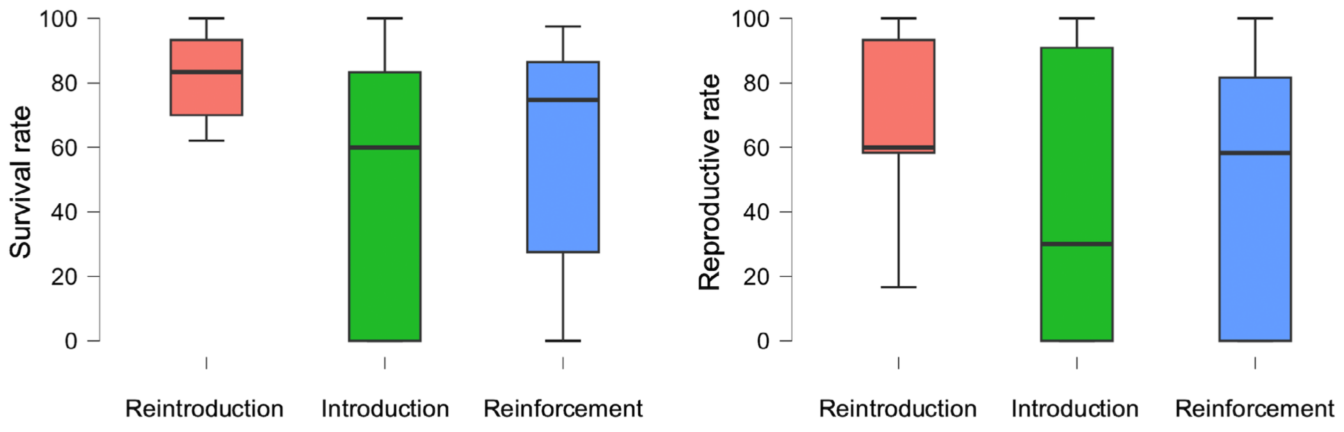

FIGURE 2 Survival (left) and reproductive (right) rates by type of plant translocation.

TABLE 1 Generalized linear model (GLM) results examining the effect of origin of material, type of transplants, and presence/absence of management action on the survivorship and reproductive rates. In bold are reported values statistically significant.

	Estimate	Standard error	*t* value	*p* value
Survivorship rate				
Intercept	80.230	7.587	10.575	**<.001**
Origin cuttings	−9.465	9.043	−1.047	.299
Material seedling	−50.879	11.940	−4.261	**<.001**
Material adult	43.442	30.932	1.404	.165
Management	−14.207	8.434	−1.684	.097
Reproductive rate				
Intercept	75.073	9.499	7.903	**<.001**
Origin cuttings	−17.768	11.323	−1.569	.122
Material seedling	−38.070	14.951	−2.546	**<.05**
Material adult	−24.112	38.730	−0.623	.536
Management	−16.524	10.561	−1.565	.123

Management actions pre-plantation were implemented in only 36.8% of cases and mainly consisted of site preparation actions and removal of the natural vegetation. Aftercare measures involved 41.2% of the translocations and mainly included the use of protective cages or fences (78.6% of the total), followed by water supply (21.4%).

The survivorship rate (Figure 2a), calculated as a ratio between the number of plants monitored and the initial number of individuals declared, and the reproductive rate (Figure 2b), calculated as a ratio between the number of reproductive plants counted during the last monitored time and the initial number of individuals, are higher in the reintroduction programs (range), while no differences exist between Introductions and Reinforcements; however, the Kruskal–Wallis test and the Dunn's post hoc comparisons indicated no statistically significant differences ($p > .05$) among translocation types for both survivorship and reproductive rates.

The use of seedlings as transplants has a significant negative effect on both the survivorship and reproductive rates, while the other parameters considered were not significant (Table 1). No effect of management actions (pre- and post-plantation) on survivorship and reproductive rates was found (Figure 3 and Table 1).

4 | DISCUSSION

The main objective of this research was to understand the role of citizens, volunteers and local communities in the active conservation of local flora of conservation interest. So far, this contribution has not been formally quantified in plant translocations (Doyle et al., 2024).

Our results demonstrate that, although local conservation efforts are often informal and rarely documented and small scale, they may play a strategic and underestimated role in preserving plant diversity, especially in biodiverse regions such as Mediterranean islands. The data

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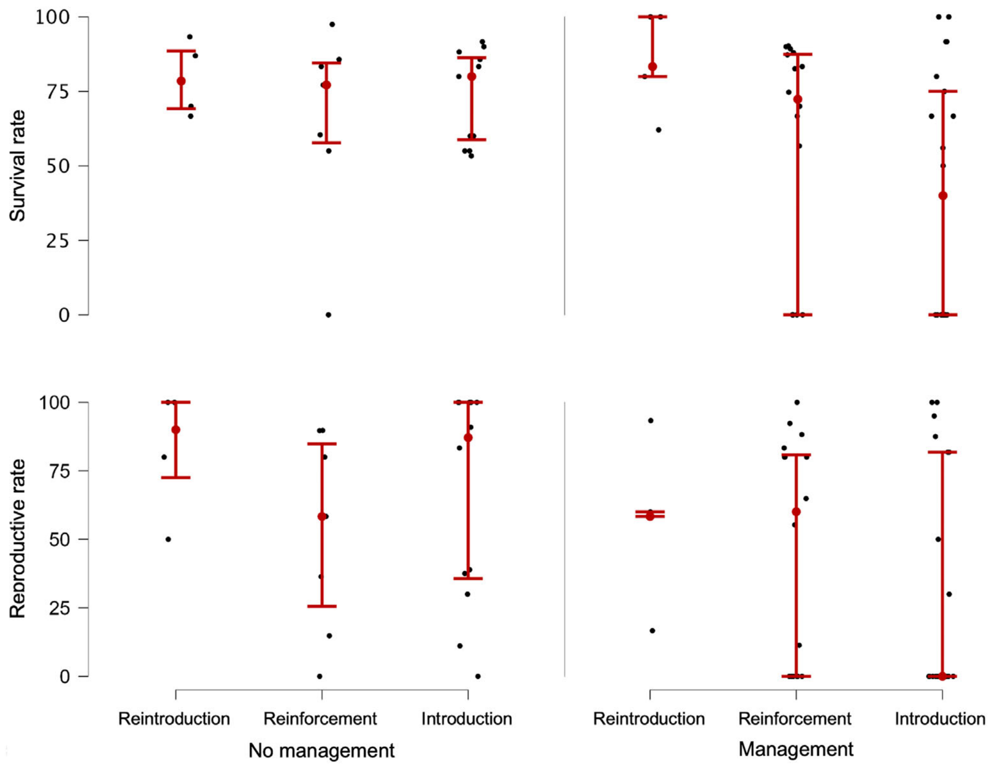

FIGURE 3 Effect of the cumulative management actions (pre- and post-plantation) on the survival and reproductive rates by type of plant translocation.

collected, although partial and related only to a limited period of time (about 50 years), highlight an important contribution in terms of practical conservation actions for some plants of interest, confirming the initial hypothesis of this research and, as far as we know, constitute the first attempt to quantify this contribution based on direct field evidence and interviews with local people.

From a numerical standpoint, the 68 translocations recorded in this study constitute a substantial total when compared with those recorded so far at the National or European level (187 and 3211, respectively; Abeli et al., 2021; Godefroid et al., 2025) or at the regional level in Sardinia, which count a total of 13 officially known plant translocations (Abeli et al., 2021), 46.5% of which were unsuccessful. Moreover, it is important to highlight that this number is certainly underestimated if we consider the difficulty of obtaining information across the whole island and the unavailability of information from particularly reserved people. So, such "hidden" conservation actions may therefore represent a crucial, though overlooked, component of regional biodiversity strategies.

Our research highlights several key findings that deserve attention. A first relevant aspect concerns the type of translocation carried out: in 50% of the cases it involves the introduction of species into sites where in the past (at least in historical times) the species was not present. This trend differs from what has been reported in the literature so far, namely the clear dominance of reintroductions and reinforcements (e.g., 72% at the European level; Godefroid et al., 2025). The good knowledge of the territory and the operator's ability to select an ecologically suitable recipient microsite could have played a significant role. This fact highlights the importance of experiential knowledge and long-term familiarity with local landscapes, which often allows community members to identify suitable microsites with precision currently unmatched by common ecological modeling.

Moreover, these findings highlight how local populations, in addition to knowing the flora of their territories, are also capable of evaluating its extinction risk or threatened status. In fact, most translocated taxa (63.6%) were nationally threatened (Critically endangered, Endangered, or Vulnerable) according to the New Italian National Red List (Orsenigo et al., 2018, 2021); surprisingly, this percentage is higher than those reported at the continental level for Europe (57%; Godefroid et al., 2025).

Unfortunately, it is not possible to derive a temporal trend considering the type of survey conducted and the difficulty of recovering information relating to decades of past years. However, when focusing on the last 25 years, a trend of progressive increase in the number of translocations emerges, similar to what has already been obtained in other research (Fenu et al., 2023; Godefroid et al., 2025). This implies that local actors may actively prioritize conservation targets and can integrate and, in some cases, anticipate institutional conservation priorities (Hagerman et al., 2021).

Analyzing in detail the plant translocations recorded in this study, it is not surprising that the vast majority of the target plants are woody (Ch and NP); this pattern is different from what emerged from previous analyses (Godefroid et al., 2025) but it is easily explained considering that woody plants are generally easier and less costly to propagate without particular structures and technologies. In general, survival performance was not related to some intrinsic characteristics of the target species, such as life form and distribution, indicating that the techniques adopted to perform a translocation are more crucial than the intrinsic species characteristics, as reported in a previous study (D'Agostino et al., 2024).

The size of each translocation, in terms of individuals planted into the recipient site, is comparable with that known at the national and European levels (D'Agostino et al., 2024; Godefroid et al., 2025). Contrary to what was reported in previous studies (e.g., Dalrymple et al., 2012; Godefroid et al., 2011), no significant correlation was observed between translocation success (in terms of survival and recruitment performance) and the plantation of a high number of young or adult individuals from mixed-origin populations with stable demographic trends.

An interesting result is that the use of juvenile plants was preferred and that this choice had a positive impact on both the survival and the reproduction performance of the transplanted individuals. Similar result was reported for translocations carried out on the major Mediterranean islands (Fenu et al., 2019) further supporting this approach as a valuable practical guideline for future actions.

Similarly, it deserves particular attention that concerns the (pre- and post-)plantation management actions that have been considered both indispensable to ensure the success of a translocation (Dillon et al., 2018; Fenu et al., 2016; Godefroid et al., 2011; Monks et al., 2023; Whitehead et al., 2023) and limiting factors, as it is generally expensive and sometimes difficult to implement and maintain in the long term (Dillon et al., 2018; Fenu et al., 2016; Monks et al., 2023). Our results seem to be inconsistent with these indications. In fact, the analyses highlight that management actions per se do not have a significant effect on the effectiveness of the translocation (in terms of survival and reproduction rates); the selection of a suitable microsite due to an excellent knowledge of the territory could be the key to success even in the absence of management actions.

With regard to costs, if specific actions were needed (often to limit grazing, as indicated by this study), they could be carried out at low cost using simple or non-natural materials, especially when performed by individual citizens who do not have significant economic resources to devote to these activities. These results align with those obtained in another research, which highlights that specific management interventions did not affect population size and recruitment in a consistent way (Whitehead et al., 2023). Although the evaluation of the effectiveness of management interventions is complicated because a specific action may promote plant survival but may have no effect on recruitment and vice versa, our findings suggest that conservation actions rooted in local communities can be both ecologically effective and economically sustainable.

In this study, the most frequent management actions are protection through fences and protective cages (against herbivores), which are expected to have a positive effect on the initial survival of the translocated plants (Corli et al., 2023; Fenu et al., 2016; Whitehead et al., 2023). Although some studies indicated the aftercare measures as a best practice in several plant translocation guidelines (e.g., Commander et al., 2018; Fenu et al., 2016), further evidence is needed to assess the importance and effect of aftercare techniques (Corli et al., 2023; D'Agostino et al., 2024). Indeed, our results do not highlight a significant role of such measures, also because fences require constant maintenance to be always effective, which is not always easy to do economically.

Generally, no difficulties have been highlighted, except for the transplanted mortality attributed to climatic stochasticity, but this may be due to the reluctance in declaring problems or failures. This reluctance is not surprising if we consider that the same phenomenon is also widespread among researchers (e.g., Fenu et al., 2023; Maschinski et al., 2023; Silcock et al., 2019).

Finally, the relevant data that emerges from this study, if compared with those available at a regional level, is the high percentage of successful plant translocations in terms of survival and recruitment rates. Although for some species (e.g., *Ribes sardoum* and *Rhamnus persicifolia*) the time elapsed from the transplant is limited compared to the time needed to reach reproduction, the high survival rate observed can be considered a good indicator of success. In general, these conservation actions have been found to be effective in the medium or long term. These data highlight the ability to cultivate and multiply threatened plants, to select suitable recipient sites (often outside the historical range of the species), and to complete a conservation action with relatively accessible costs for a passionate citizen. These aspects can define the key role that non-professionals can play in plant diversity conservation, highlighting that the integration of local knowledge systems with formal conservation planning is not only advantageous but also necessary. These considerations naturally lead to a broader reflection on the potential role of citizens in plant diversity conservation; citizens can contribute significantly not only to monitoring and reporting species distributions, but also to active conservation measures such as plant translocations. Furthermore, the successful engagement of local communities in conservation actions could enhance the long-term success of ecological restoration as demonstrated (Groom et al., 2019; Pocock et al., 2017). In particular, community-based conservation efforts tend to be more sustainable over time, as they rely on local knowledge, stewardship, and long-term presence in the territory. Such efforts may be especially relevant in regions like Sardinia, where conservation resources are severely limited and the botanical heritage is rich and often endemic.

At present there is not enough information to estimate the overall number of translocations at a national level or at a Mediterranean biogeographical region level, but it is not unrealistic to estimate a significantly higher number than is currently known. It would be useful to collect and share this invaluable source of information on methods used, practical experiences, and possible causes of success or failure and integrate them into the syntheses that are multiplying worldwide (Bellis et al., 2024; D'Agostino et al., 2024; Fenu et al., 2023; Godefroid et al., 2025; Liu et al., 2015; Ren et al., 2020; Silcock et al., 2019; Whitehead et al., 2023). Before all this knowledge is lost, it is essential to promote initiatives aimed at reversing this "extinction of experience" (Soga & Gaston, 2016). However, the flip side of the coin, the risks that such actions, even if done with the best intentions, may entail, must also be highlighted. These may include the release of plants in unsuitable ecological contexts, the establishment of new populations outside their natural distribution range, genetic contamination processes, and sometimes the illicit and unregulated species movement, among others.

For all these reasons, it is essential to integrate citizen-led or informal actions into well-structured, science-based conservation programs that include careful planning, systematic monitoring, and compliance with legal and ecological standards. Strengthening collaboration among specialists, managers, and environmental authorities is equally important to improve species conservation, while ensuring that local communities are actively engaged in the development and implementation of inclusive strategies, as hoped in the global policy frameworks (e.g., CBD, 2022; IPBES, 2024).

AUTHOR CONTRIBUTIONS

Conceptualization: Giuseppe Fenu. *Methods and data collection*: Giuseppe Fenu. *Data management, fieldwork, and analyses*: Giuseppe Fenu, Giulia Calderisi, and Donatella Cogoni. *Writing – original draft*: Giuseppe Fenu. *Writing – editing, reviewing, and final draft*: Giuseppe Fenu, Giulia Calderisi, and Donatella Cogoni.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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DATA AVAILABILITY STATEMENT

The data presented in this study are available on reasonable request from the corresponding author.

ETHICS STATEMENT

This study followed the personal data protection and national and European privacy legislation. All respondents were informed in advance that participation in the scientific survey was entirely voluntary and fully anonymous, that all information obtained would be used only in an aggregated and impersonal form, and that no data will be shared with others without an explicit permission.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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