

Collaboration between public administrations and research centers: a key element for guarantee the success of translocation actions

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Introduction

To prevent the extinction risk of known threatened species and to improve their conservation status, **translocation actions** became increasingly important in management worldwide.



Limits in the implementation of translocations:

- high economic and time costs;
- availability of the optimal sites and their implementation on private areas;
- high uncertainty of success.



- It is necessary to involve the skills of several institutions in the translocation actions;
- **collaborations between public administrations and research centers** represents an optimal solution to solve several criticisms related to the translocation actions;
- ***Dianthus morisianus* translocation program**: in collaboration between the **University of Cagliari** and **Fo.Re.S.T.A.S Agency**.



Dianthus morisianus translocation



Dianthus morisianus Vals. (Caryophyllaceae), the only psammophilous species of the genus in the Mediterranean basin and with only one population, is a **narrow endemic** plant and one of the most threatened plants in Sardinia (**Portixeddu** coastal dune system in Buggerru, South-West Sardinia).

D. morisianus is a perennial herb characterized by numerous woody stocks, erect stems and a basal rosette with thin and linear leaves.

The stems bear terminal multiflowered heads; the calyx is characterized by lanceolate teeth and the colour of the corolla is pink.

The flowering season is from early May to late June, and ripe fruits can be found during June–July.



Dianthus morisianus translocation

D. morisianus grows on stabilized dunes at the edge of *Juniperus* spp. micro-forests and scrub dominated by *Cistus* spp.



The natural habitat of *D. morisianus* has been strongly modified by human activities, causing habitat loss and fragmentation: there are several settlements in the species' habitat and since 1950 much of the dune system has been afforested to stabilize the dunes and halt the movement of sand inland.

Dianthus morisianus translocation

Preliminary researches (taxonomic studies, distributive studies etc.)

Seed germination

Seeds germinate easily

No limitations

Reproductive biology
(*ex situ* research)

No inbreeding depression

No limitations

Seedling recruitment

Extremely low recruitment

Severe limitations

Ecological requirements

Sand substrate

Specific requirements

Plant community (habitat)

Plants grows preferentially
in open area

Specific requirements

Ecological context

Nurse effect

Specific requirements

Main threats

Grazing/Trampling

Protective measures

Dianthus morisianus translocation

To reduce the extinction risk, the translocation program of the *D. morisianus* was realized in collaboration between University of Cagliari and Fo.Re.S.T.A.S Agency (formerly called Ente Foreste agency).

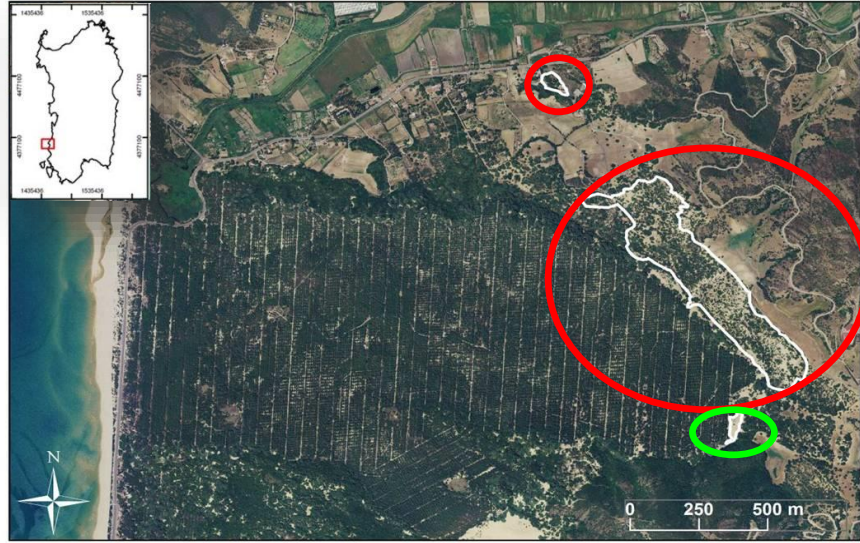


Previous conservation actions jointly carried out:

- in 2008, Ente Foreste agency funded a conservation project aimed at the safeguard of the ten most threatened endemic plants species of the island comprising *in situ* and *ex situ* researches.
- in 2009, Ente Foreste agency, in collaboration with the Biodiversity Conservation Center (CCB; University of Cagliari), carried out a conservation project for *D. morisianus*, including the construction of protective fences and the translocation; the population and all reproductive plants were monitored every year.



Dianthus morisianus translocation



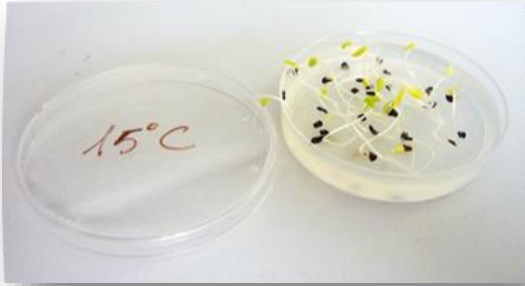
From 2010 to today, **3 different translocation** actions for the *D. morisianus* population were performed in different sites near to the wild population, managed by **Agency Fo.Re.S.T.A.S.**, and followed by the erection of protective fences.

- First intervention involved construction of protective fences and reintroduction of juvenile plants (November 2010);
- the second one was carried out in an open and unprotected site (February 2012);
- the third translocation action has been carried out in order to strengthen the population by boosting the number of mature individuals (March 2018).

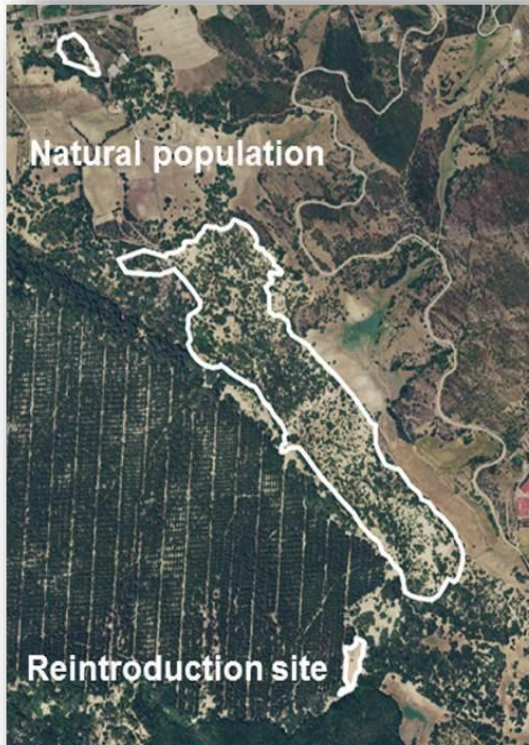


Dianthus morisianus translocation

First translocation



- In laboratory 200 seeds were sown and incubated at the optimal temperature;
- seedlings were cultivated at the Botanic Gardens of Cagliari University for 1 year.



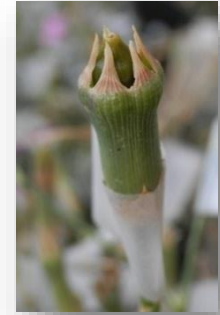
- A suitable area was selected in a protected, fenced site, managed by **Agency Fo.Re.S.T.A.S.**;
- **Agency Fo.Re.S.T.A.S** collaborated for free allowing cost cutting.



- In November 2010, all survived plant (113 in 9 groups) were reintroduced then monthly monitored.

Dianthus morisianus translocation

First translocation



Group	No. plant reintroduced	First year							Second year				
		No. dead plant	Mortality rate	Flowered plant (%)	Fruited plant (%)	Mean fruits per plant	NS	No. dead plant	Mortality rate	Flowered plant (%)	Fruited plant (%)	Mean fruits per plant	ES
1	12	1	0.083	33.33	25.00	2.33±2.31	3	0	0	63.64	63.64	7.43±3.26	0
2	10	0	0	40.00	40.00	4.00±2.45	7	0	0	40.00	40.00	4.75±4.35	8
3	9	0	0	66.66	66.66	4.50±1.52	9	0	0	88.88	88.88	15.25±13.17	12
4	15	0	0	46.66	46.66	3.14±1.95	25	0	0	86.66	73.33	10.18±6.15	22
5	15	0	0	40.00	33.33	3.60±2.07	1	0	0	80.00	66.66	7.60±6.33	0
6	6	0	0	33.33	33.33	1.50±0.71	0	0	0	83.33	66.66	4.00±3.46	3
7	20	2	0.100	25.00	25.00	3.20±2.77	0	0	0	55.55	50.00	4.44±3.09	1
8	16	0	0	56.25	56.25	5.78±3.27	47	0	0	56.25	62.50	7.80±6.09	41
9	10	1	0.100	40.00	30.00	2.67±1.15	0	0	0	70.00	33.33	3.67±2.52	0
Total	113	4	0.035	41.59	38.94	3.84±2.48	92	0	0	68.80	60.55	7.97±7.11	87

After two years:

- survival rates: > 96% (first year); 100% (second year);
- flowering and fruiting rates: > 40 % (first year); > 60 % (second year);
- high number of new seedlings after two years.

Dianthus morisianus translocation

First translocation

	2012	2013	2014	2015
Seedlings	92	236	349	516
Established plants		27	82	473
Reproductive plants			16	137



Long-term monitoring of the entire new population

- The number of seedlings produced by the reintroduced plants increased every year, after 5 years the total number of reproductive plants had doubled;
- the population size is grown over time, it is self-sustaining through the development of successive generations;

Agency Fo.Re.S.T.A.S collaborated providing staff for monitoring activities.



Dianthus morisianus translocation

Second translocation

	2012	2013	2014	2015
<i>Fenced site</i>				
Seedlings	92	236	349	516
Established plants		27	82	473
Reproductive plants			16	137
<i>Unprotected site</i>				
Seedlings		0	6	6
Established plants			0	0
Reproductive plants				0

Fenced site:

- higher cumulative number of seedlings were produced;
- 137 new plants became reproductive after 4 years.

Unprotected site:

- very low cumulative number of seedlings;
- no reproductive plants were recruited.

The management actions post-transplantation are important in terms of plant outcome that increases with time.



Dianthus morisianus translocation

Third translocation



- Plants were propagated from seeds under controlled conditions, at the greenhouse of the BG-SAR;
- in March 2018, 38 adult plants were reintroduced in a new site, near the natural population, fenced to reduce human and animal disturbance and managed by the public administration (Agency Fo.Re.S.T.A.S).



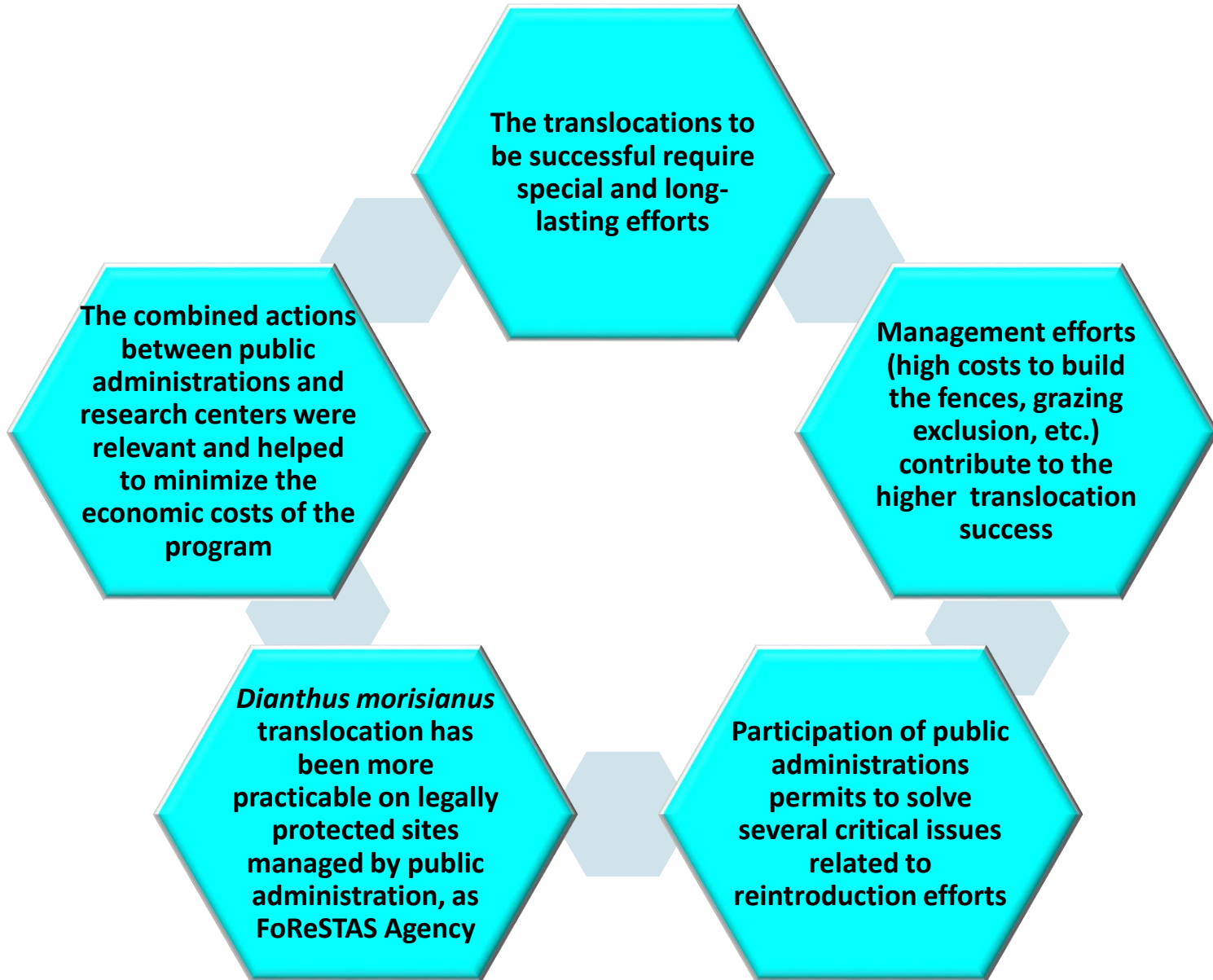
A monitoring plan was started in spring 2018:

- monthly (March-September);
- survival, the reproductive traits (number of reproductive stems, number of damaged stems by grazing and/or trampling, and fruits per plant), the number of seedling and the effectiveness of the management action.

Preliminary results: high survival, flowering and fruiting.

Fences positively enhanced the plant's long-term survival and reproductive success.

Conclusions





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Thanks for your attention!



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