



LIFE III



LIFE and endangered plants

Conserving Europe's threatened flora



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LIFE ("The Financial Instrument for the Environment") is a programme launched by the European Commission and coordinated by the Environment Directorate-General (LIFE Unit - E.4).

The contents of the publication "LIFE and endangered plants: Conserving Europe's threatened flora" do not necessarily reflect the opinions of the institutions of the European Union.

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Luxembourg: Office for Official Publications of the European Communities, 2007

ISBN 978-92-79-08815-5

ISSN 1725-5619

doi: 10.2779/99297

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Printed in Belgium



Ecolabel Flower

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Greece: Conservation of endangered Cretan flora

On the island of Crete, home to one of the richest floras of all the Mediterranean islands, a LIFE-funded project has established plant micro-reserves (PMRs) as a conservation measure for seven rare plant species. Modelled on PMRs in Spain, the success of the project demonstrates how this methodology can be transferred to other plant-rich Natura 2000 sites in Europe.

The Mediterranean bio-geographical region is the most bio-diverse in the European Union, with a high endemic floristic diversity concentrated on the islands and mountains of the Mediterranean Sea. Crete in particular, is considered to have one of the richest diversities of plants in Europe, with an especially high concentration of endemic plant species. The main threats to these plants stem from human activities, such as tourism, farming and the grazing of farm animals, as well as uncontrolled access to important habitats, fires, and habitat modification through deforestation, drainage and climate change.



Androcymbium rechingeri: a very rare Cretan endemic flower

Crete has 14 plant species included in Annex II of the Habitats Directive, with eight of these having priority conservation status, and the Greek authorities have proposed 38 Natura 2000

sites that include populations of these plant species. Within the framework of the LIFE project, the University of Athens, in collaboration with the Mediterranean Agronomic Institute of Chania

Table 1- Priority plant species targeted by the LIFE project in western Crete

Plant name	Description and location
<i>Androcymbium rechingeri</i>	This plant species grows on the west coast of Crete, in Falassarna and the islets of Imeri Gramvousa and Elafonisi (only known world locations). It is a small bulbous plant that flowers from December to February.
<i>Anthemis glaberrima</i>	This small annual plant, similar to chamomile, grows among calcareous coastal rocks on the islets of Imeri and Agria Gramvousa and is found nowhere else in the world. It is particularly threatened by tourism activities.
<i>Bupleurum kakiskalae</i>	This plant was first described in 1967 by the Swiss botanist Greuner. It grows on a single steep limestone cliff at Linoseli, in the Lefka Ori mountains (recently, a second population was discovered). It has the peculiarity of flowering once, after about 12 years of producing leaves, and then it dies.
<i>Cephalanthera cucullata</i>	This orchid only grows in the mountainous forest areas of Crete and is threatened by overgrazing.
<i>Hypericum aciferum</i>	This short, creeping shrub grows only on the coastal cliffs of Sphakia (between Sougia and Agia Roumeli), in the southwestern part of Crete.
<i>Nepeta sphaciotica</i>	This small shrub only grows on a mountainous slope, at an altitude of 2,300 metres on the northern side of the Svorichti summit of Lefka Ori. The small population of this unique plant species is susceptible to various threats, especially climate change.
<i>Phoenix theophrasti</i>	This palm tree is found only in Crete and southwest Turkey, mostly in moist sandy valleys or rocky areas in close proximity to the sea. It is known by the common names Phinikas or Vagi, and the largest known population is located in Vai, eastern Crete, an area already targeted by another LIFE project (LIFE98 NAT/GR/005264). This plant is included in Annex I and Annex II of the Habitats Directive as part of the priority habitat palm groves of Phoenix (habitat number 9370 of the Habitats Directive).

(MAICH) and the Region of Crete-For-est Directorate of Chania, proposed the establishment of a pilot network of PMRs in western Crete (the prefecture of Chania) to support the conservation of seven endemic priority plant species found in three of these Natura 2000 sites.

PMRs for seven endangered species

The main objective of this LIFE project was to promote the conservation of seven threatened plant species that are endemic to the island of Crete (see table 1). As the distribution range of the targeted species was so narrow, the PMR was considered to be the most appropriate conservation and management tool. This approach was first tested in 1994, in Valencia, Spain, and had already been successfully applied in other LIFE projects (see pp. 17-19). The project proposed establishing a network of PMRs in small land parcels (less than 20 ha), as defined by the original methodology.

This network of small protected areas constitutes a management tool that complements the management plans for larger areas, such as those for Natura 2000 sites, which require conservation actions and strategies at a wider landscape level.

This was the first experience of PMRs in Greece, but it was also recognised that, if successful, it could be more widely applied in other parts of Crete or the Greek mainland.

The first step was to gather all available information in order to establish the location and estimate the population size of the seven targeted species. It was then possible to define the number of PMRs required and to decide on their location and the area to be covered. The information collected showed that the plant species were restricted to very small areas, and were generally found in low-to-medium densities. The project pre-selected 14

potential PMR areas and from these it was decided to establish seven PMRs, one for each of the target species.

A detailed inventory and mapping was carried out for each PMR, including the location and densities of each species. This information was then used to develop a management plan for each PMR. Unlike other LIFE projects concerned with PMRs, this project did not foresee the purchase of land: The PMR areas were already in public ownership. "This was very important," stresses the project manager, Professor Costas Thanos, "as the owner of the land is the State (represented by the Chania Forestry Service, which was also a project partner)." This fact simplified both the bureaucratic processes of acquiring permits and the implementation of the subsequent actions.

All the PMRs were delimited and marked with signs and posts to discourage trespassing and to raise awareness of the presence of the threatened species. The *B. kakiskalae* and *C. cucullata* PMRs were also fenced off in order to avoid damage from grazing. A vehicle barrier was erected at the *P. theophrasti* PMR, since the area was being used to park vehicles.



Fences protect against grazing, note the difference between the right side (grazed) and left side (ungrazed)

Along with these actions, long term monitoring plans were prepared for each species in order to determine the factors that affect their conservation. Some of the parameters monitored included: climate conditions; soil characteristics; interaction with other plants; the presence of animals; and human activities. The project established permanent monitoring plots, with meteorological and environmental sensors (with dataloggers) and, in collaboration with the Chania Forestry Service, also hired a warden to guard each PMR.

To complement the *in-situ* actions, the project also implemented

*A lobster pot protects the highly endangered *C. cucullata* against grazing*





Endangered plants in general

certain *ex-situ* ones, including the collection and study of the germination of seeds from the target species in the University of Athens, in order to evaluate their viability. The seeds were also stored in the MAICH seed bank and seedling plantations were established in the MAICH botanical garden, in the Alpine Botanical Garden at Omalos (mountains of Lefka Ori) and in the Information Centre of the Forest Directorate of Chania. These *ex-situ* conservation measures acted as a backup, as the seeds and plants could be used in future to restore or reinforce the natural populations of the target species.

The project also developed an information campaign (local events, post-

Bupleurum kakiskalae

Species	PMR locations and area covered
<i>Androcymbium rechingeri</i>	Elafonisi islet (2 ha)
<i>Anthemis glaberrima</i>	Agria Gramvousa islet (4.5 ha)
<i>Bupleurum kakiskalae</i>	Linosei (1 ha)*
<i>Cephalanthera cucullata</i>	Koustogerako – Mountain range of Lefka Ori (12 ha)
<i>Hypericum aciferum</i>	Fournoti (6.5 ha)
<i>Nepeta sphaciatica</i>	Svourichti summit at Lefka Ori mountain (4.8 ha)*
<i>Phoenix theophrasti</i>	Chrisoskalitissa (2.2 ha)

* The only known worldwide populations

ers, leaflets and t-shirts) targeting the general public, in particular children, and local authorities. The campaign focused on the PMRs, highlighting their importance in conserving the flora of Crete. Key actions included the LIFE-funded Visitor Centre at the Botanical Garden of MAICH and the Alpine Botanical Garden created at Omalos.

Observed population growth

Although, the conservation procedures implemented by the project were based on 'mild' actions (fencing, wardening, installing signs and boards) and did not involve heavy restoration measures, the project achieved good results in terms of guaranteeing the long term conservation of the target species. Along with the implementation of management plans and continuous monitoring of the plant populations, the project defined the legal status of PMRs in Greek law, along with the Natura 2000 sites. The proclamation of the PMRs as "wildlife refuges" is currently being approved by the Regional authority of Crete.

Two species: *B. kakiskalae* and *C. cucullata*, which were particularly threatened by grazing, benefited significantly from the fencing actions. In 2006, the entire population amounted to 69 *B. kakiskalae* individuals while in 2007, within the fenced area, an additional 100 seedlings were recorded. In relation to *P. theophrasti*, the population increased from 49 to 55 individuals thanks to the planting of offshoots and the barrier that now

blocks vehicle access to the PMR and reduces the risk of fire.

Life after LIFE

Since the completion of the LIFE project, the beneficiary and partners have continued to monitor and survey the PMRs. The increased knowledge of the ecology of the target species, combined with the *ex-situ* actions allows for a better and quicker response to the different threats. The definition of a legal status and the implementation of the management plans by the Chania Forestry Service (Region of Crete) will also guarantee the conservation of these species in the future.

In summary, LIFE funding was crucial for the conservation of seven unique and rare plant species on the verge of extinction. Without the support of LIFE, the application of a new plant conservation methodology – PMRs – would not have been tested or transferred as an effective conservation tool in Europe.

Project Number:
LIFE04 NAT/GR/000104

Title: A pilot network of plant micro-reserves in western Crete

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Period: Sep-2004 to Dec-2007

Total Budget: € 932,000

LIFE Contribution: € 699,000

