

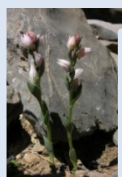
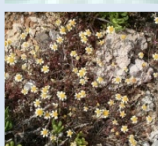


**LIFE NATURE 2004 Project
(LIFE04NAT_GR_000104)**

A Pilot Network of Plant Micro-Reserves in Western Crete

Layman's Report

Beneficiary: National & Kapodistrian University of Athens (NKUA)
Partners: Mediterranean Agronomic Institute of Chania (MAICH)
Forest Directorate of Chania (FDC)
Regional Development Fund of Crete (RDFC)
Duration: 1.9.2004 – 31.12.2007



Athens, March 2008

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THE CRETAPLANT PROJECT

Greece is gifted with an extremely rich flora of about **6500 plant taxa (species and subspecies)**, of which 1341 are endemic (ie they grow in Greece but nowhere else in the world, endemism 20,6%) In absolute numbers, the Greek flora is the 2nd largest of Europe (after Spain) but 1st relatively to country surface, In **Crete**, about **2250 plant taxa** have been recorded, 240 (10,7%) of which are Cretan endemics.

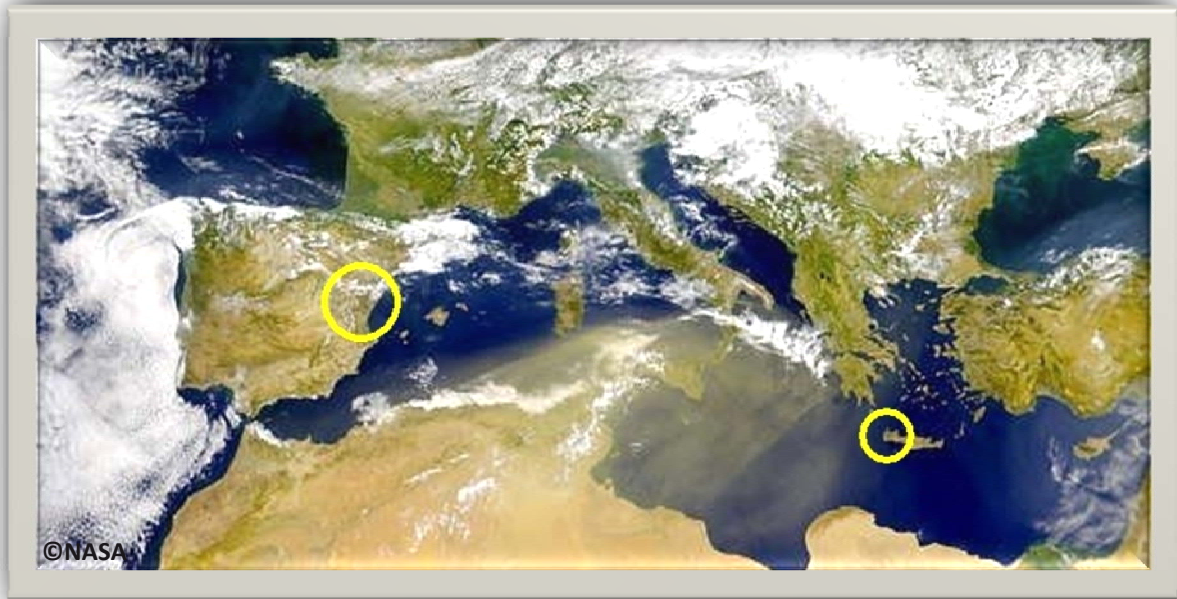
The **Habitat and Species Directive 92/43/EEC** includes 28 plant species of Community priority for Greece: 8 of them grow in Crete, 6 in the Chania Prefecture (of which 5 ONLY in Chania and nowhere else in the planet). Additionally, 4 habitat types of Community priority are found in Chania as well as 13 (out of a total of 239 for Greece) designated SITES OF COMMUNITY IMPORTANCE (SCI) within the framework of the European Network NATURA 2000 (with a total area corresponding to around 40% of the total land surface of the Chania Prefecture). It is therefore obvious that **Chania** is privileged to host a **significant biodiversity treasure** of the Greek and European nature.

The project **CRETAPLANT: A Pilot Network of Plant Micro-Reserves in Western Crete (LIFE04NAT_GR_000104)** constitutes the first attempt to apply the innovative concept of Plant Micro-Reserves (PMR) in Greece, with the aim to **protect all 6 plants of Community priority and 1 priority habitat** (9370, *Palm groves of *Phoenix*) of the Chania Prefecture. The European Union contributed 75% to the total budget while the remainder 25% was covered by national resources; the project was implemented in the period of **1.9.2004 - 31.12.2007** by the National and Kapodistrian University of Athens (**NKUA**, Beneficiary), the Mediterranean Agronomic Institute of Chania (**MAICh**), the Forest Directorate of Chania (**FDC**) and the Regional Development Fund of Crete (**RDFC**).

WHAT IS A PLANT MICRO RESERVE?

Plant Micro Reserves, PMR, have been recently conceived as a novel suggestion for the *in situ* conservation and management of threatened and rare plants. The PMR concept (**Microreserva de Flora**) was proposed and developed in the early 1990s by Emilio Laguna of the Region of Valencia (Spain); it was put into practice in 1994 within the context of a relevant European LIFE project.

Plant Micro Reserves encompass **areas of small surface (less than 20 ha)**, have a defined legal status and, ideally in a network form, aim (1) to protect a selected sample of each of the main populations of the rarest, endemic or most threatened species and at the same time (2) establish a permanent monitoring system to record and evaluate long-term population fluctuations and tendencies as well as provide germplasm (for *ex situ* conservation) to the regional, wild plant Seed Banks and, eventually, uplift PMRs to focal sites for a multitude of plant conservation and environmental awareness activities (reintroductions of species, plant population reinforcements and translocations, *in situ* management, environmental education).



Such a patchy network of small protected areas (and the PMR concept in general) should be viewed as a **management tool complementary** to the generally adopted 'large site' strategy that has recently been applied within the framework of the European Network of nature conservation, NATURA 2000. During the past decade, the PMR concept has received a wide recognition and appreciation throughout the European continent; however, apart from the extended network currently deployed in Valencia (about 250 PMRs), plant micro reserves are only scarcely implemented in other, floristically rich areas.

THE PROTECTED PLANTS



***Androcymbium rechingeri* (Liliaceae)**

A perennial bulbous plant, of small size (up to 10 cm high) with leaves up to 15 cm long. Each plant usually produces more than 4 impressive, white flowers with purple stripes. It flowers from December to February and the aboveground parts of the plant dry out in summer. It occurs in small areas on the beaches of Western Crete (Imeri Gramvousa islet, Falassarna, Elafonisi).



***Anthemis glaberrima* (Compositae)**

A small, annual aromatic plant with stems 2-30 cm high and many small flowers. It germinates in late autumn, flowers in spring (April - May) and dries out in summer. It occurs usually in shallow pans of coastal calcareous rocks, on the islets Imeri and Agria Gramvousa in W. Crete.



***Bupleurum kakiskalae* (Umbelliferae)**

A perennial monocarpic plant (i.e. it produces flowers and fruits only once in its lifetime and then dies). It flowers from July to August and forms an impressive inflorescence up to 1 m high with numerous, small yellow flowers. Seeds mature from October to November. It occurs only in 2 localities (Linoseli & Poria) of Lefka Ori, in almost perpendicular calcareous cliffs.



***Cephalanthera cucullata* (Orchidaceae)**

A perennial herbaceous orchid, with entangled rhizomes. Aboveground emergence and growth take place erratically, in spring (not all plants flower every year). It can reach 20 cm in height and produces up to 24 white-purple flowers, from May to June. The fruits mature by the end of June and the aboveground parts dry out. It occurs in forest areas on the 3 large mountain massifs of Crete, at altitudes 700-1500 m.



***Hypericum aciferum* (Guttiferae)**

A perennial, short and creeping chasmophyte, 20-30 cm high and up to 130 cm long. It has an extended flowering period (producing numerous small yellow flowers), from June to October; the seeds mature from November to December. It occurs mainly on coastal rocks only in the area of Sfakia (in a narrow belt between Sougia and Agia Roumeli).



***Nepeta sphaciotica* (Labiatae)**

A perennial aromatic shrub, with numerous flowering stems up to 20 cm high. It blossoms in August and its flowers are white with purple spots. Seeds mature in September and the plants remain covered with snow for about 6 months. It occurs only on a bare rocky slope, at an altitude of 2300 m, on the northern side of the summit Svourichti of Lefka Ori.



***Phoenix theophrasti* (Palmae)**

A dioecious plant (i.e. each individual develops either male or female flowers). It can grow up to 10 m high and produces numerous offshoots; it has often more than one trunk. It flowers from April to May and seeds mature in October. It is the only indigenous palm of Europe. It occurs in Crete and SW Turkey in about 20 coastal localities (usually on sandy and soaked soils).

Five out of the 7 target plants of the Project are endemic species of the Chania Prefecture, the 6th (*Cephalanthera cucullata*) is a Cretan endemic and the 7th (*Phoenix theophrasti*) is subendemic of Greece (Crete) and Turkey (coasts of Asia Minor). All 7 species are included in the **Red Data Book of Threatened Plants of Greece (1995)**, 6 of them ranked as 'endangered' and *Phoenix theophrasti* as 'vulnerable'. Moreover, *Anthemis glaberrima* and *Bupleurum kakiskalae* have been selected as members of the compilation of the 50 most threatened plants of the Mediterranean islands (The Top 50 Mediterranean Island Plants, 2005).

ACTIONS AND ACTIVITIES OF THE CRETAPLANT PROJECT

The Micro Reserves of Western Crete (Chania Prefecture)

Following a **detailed inventorying of over 20 localities for the species/habitat targets**, the size of the populations, the threats and the general ecotypic characteristics were estimated and identified and the precise sites of the Plant Micro-Reserves were proposed and adopted. All 7 PMRs are established on public land and, moreover, they fall within the boundaries of 4 SCIs (NATURA 2000 Network), Table 1.

Table 1 – Sites of Community Importance hosting the 7 PMRs

CODE	SCI NAME	SF (ha)
GR4340001	IMERI KAI AGRIA GRAMVOUSA — TIGANI KAI FALASARNA — PONTIKONISI, ORMOS LIVADIA-VIGLIA	5.781,30
GR4340002	NISOS ELAFONISOS KAI PARAKTIA THALASSIA ZONI	271,79
GR4340008	LEFKA ORI KAI PARAKTIA ZONI	53.363,68
GR4340015	PARALIA APO CHRYSOSKALITISSA MECHRI AKROTIRIO KRIOS	2.202,49

Afterwards the **detailed maps** of the PMRs were drawn, in a GIS digital system, the **monitoring plans** were elaborated (plans that include baseline reference data for every PMR as well as the foreseen monitoring actions concerning the population size and its variation, the monitoring programmes and the exact localities for the permanent monitoring plots, the ecotypic and meteorological conditions and the evaluation of the conservation status of the species), and the **management plans** for every PMR were scrutinised and finalised, comprising the management measures and timing, for each case.

Later on **the Plant Micro Reserves were established in the field** by placing discreet, borderline identification signs; fencing took place only in the PMRs *Cephalanthera* and *Bupleurum* as well as direction boards and information panels (for example see the photo at the bottom right). The information panels are bilingual (greek – english) and they were set at the PMR ‘entrance’ and in several other frequented spots (villages, beaches, junctions etc). At the same time, PMR wardens (from the local population) were hired and sent on duty..



Table 2 – The Plant Micro Reserves of Western Crete

(SF: surface, AL: altitude, NI: number of individuals of the plant-target, FL: number of plant taxa, EN: number of endemic taxa, HAB: number of habitat types, CS: Conservation Status of PMR, FV: Favourable, U2: Unfavourable – bad)

PMR	SCI	SF (ha)	AL (m)	NI	FL	EP	HAB	CS
<i>Androcymbium rechingeri</i>	GR 4340002	2,2	8-20	~ 350.000	110	3	3	FV
<i>Anthemis glaberrima</i>	GR 4340001	4,4	0-40	~ 100.000	116	3	4	FV
<i>Bupleurum kakiskalae</i>	GR 4340008	1,0	1450-1550	~ 100	48	16	4	FV
<i>Cephalanthera cucullata</i>	GR 4340008	12,1	1200-1380	~ 150	141	8	3	FV
<i>Hypericum aciferum</i>	GR 4340008	6,5	0-300	~ 300	134	8	5	FV
<i>Nepeta sphaciotica</i>	GR 4340008	5,2	2230-2350	~ 30.000	63	32	2	FV
<i>Phoenix theophrasti</i>	GR 4340015	7,9	0-20	48	195	9	6	U2

Table 2 shows important data for each PMR as well as the evaluation of their **Conservation Status**. CS for 6 of the plant species is favourable despite the threats faced (see next section). The only exception is the PMR *Phoenix theophrasti*; the population of this latter species is particularly small and excessively stressed as well; moreover, no production of fertile fruits and seeds has been observed so far and neither any sign of natural regeneration.

Population size for each of the 7 PMR plants clearly falls into two groups: (A) *Androcymbium rechingeri*, *Anthemis glaberrima* and *Nepeta sphaciotica* with considerably high numbers (and densities) of individuals and (B) *Bupleurum kakiskalae*, *Cephalanthera cucullata*, *Hypericum aciferum* και *Phoenix theophrasti* with quite low numbers. Concerning the latter group, the extinction danger for these species is immediate while the high-numbered plants do face difficulties, as well: *Anthemis glaberrima*, being an annual, is expected (and found indeed) to exhibit large fluctuations of its yearly seed production; *Nepeta sphaciotica* grows in adverse climatic conditions and, even worse, confronts a strong grazing pressure.

In regard to the **PMR legal status** (and despite the protection offered by their inclusion in a SCI), a study for the legal conservation tools and the protection of nature in Greece was undertaken and resulted in the proposal of utilizing the legal entity of the **Wildlife Refuge**. At the present stage there is an ongoing procedure that will end, hopefully soon, with the proclamation of the PMRs as Wildlife Refuges.

Despite the limited surface area covered by the 7 PMRs of Western Crete, their significance as **small biodiversity treasures** is further justified by the considerable floristic wealth and the presence of many other endemic plants and several Directive 92/43 habitat types.

Threats, monitoring and *in situ* management

Threats faced by the target plants and their PMRs are compiled and evaluated in Table 3: grazing (or not unusually overgrazing), tourist development and the accompanying land use change (and loss of habitats), other human activities (trampling, plant overcollection, vandalism etc), wildfires and climatic change.

These threats and pressures are considerably enhanced when combined either with the small size of certain populations, that potentially may lead to genetic erosion and species extinction (e.g. the cases of *Bupleurum kakiskalae*, *Cephalanthera cucullata* and *Phoenix theophrasti*) or with the biological characteristics of the target plants. As far as the latter issue is concerned, the annual *Anthemis glaberrima* has an expected (and recorded as well) interannual fluctuation of population size; the monocarpic perennial *Bupleurum kakiskalae* flowers and sets seeds only once during its lifetime (and then dies), thus a certain degree of natural regeneration (production of new seedlings) is of paramount importance for the survival of the species; the orchid *Cephalanthera cucullata* flowers only erratically (i.e. not yearly) and its regeneration is similarly problematical; finally, *Phoenix theophrasti*, at the Chrysoskalitissa area, has not been observed to produce sound seeds or seedlings.

Table 3 – Threats faced by the PMRs of Western Crete

PMR	GRAZING	TOURISM	HUM. ACT.	FIRE	GEN. EROS.	CLIM. CH.
<i>Androcymbium</i>						
<i>Anthemis</i>						
<i>Bupleurum</i>						
<i>Cephalanthera</i>						
<i>Hypericum</i>						
<i>Nepeta</i>						
<i>Phoenix</i>						

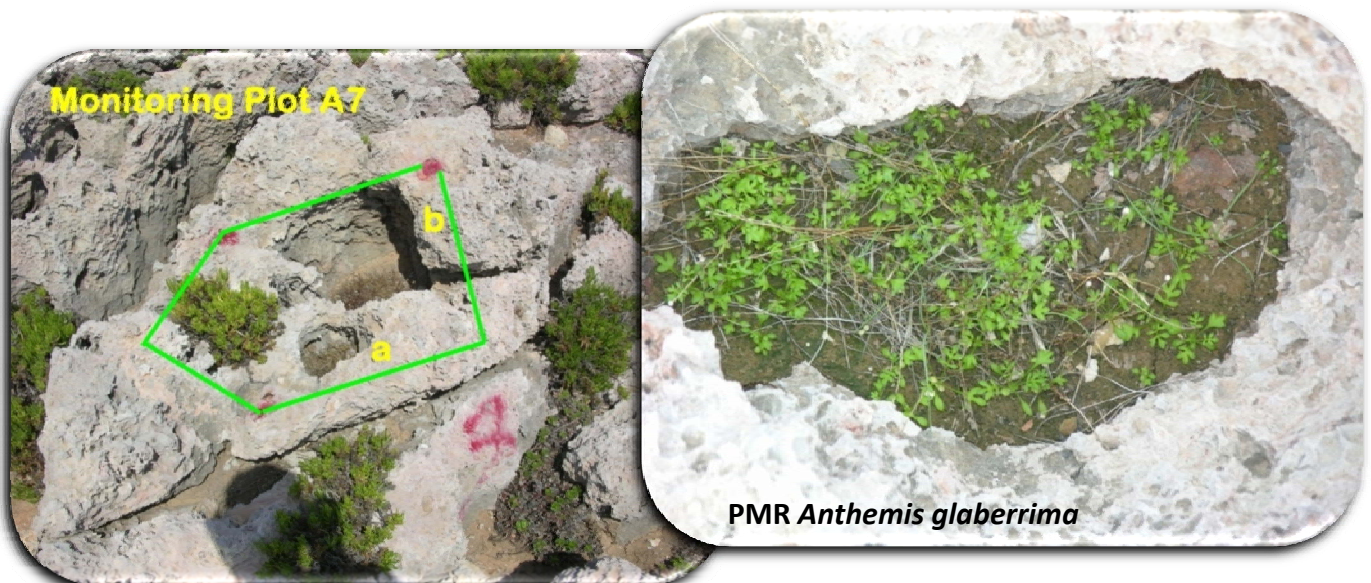
	SEVERE
	MODERATE
	SLIGHT
	MINIMAL

The most serious threat of all is grazing that affects almost all target plants. Unfortunately, in the case of *Nepeta sphaciatica* it cannot be eliminated due to the exceptionally difficult access to the PMR area and both the adverse climatic conditions (snow cover and strong winds) and soil morphology that do not permit any long-lasting fencing construction works.

On the other hand however, in the cases of *Bupleurum kakiskalae* and *Cephalanthera cucullata*, **fencing yielded spectacular results**. In the former species, 83 young plants were recorded within a 2-year old enclosure, which means a nearly doubling of its population. In the latter species, the vegetation recovery was impressive (even only 1 year after the fencing, left photograph below) while a dramatic increase (almost triple) was recorded in the flowering (and fruiting) orchids. Thus, fencing stabilises the actual population and ensures a mid- and long-term enhancement of natural regeneration.

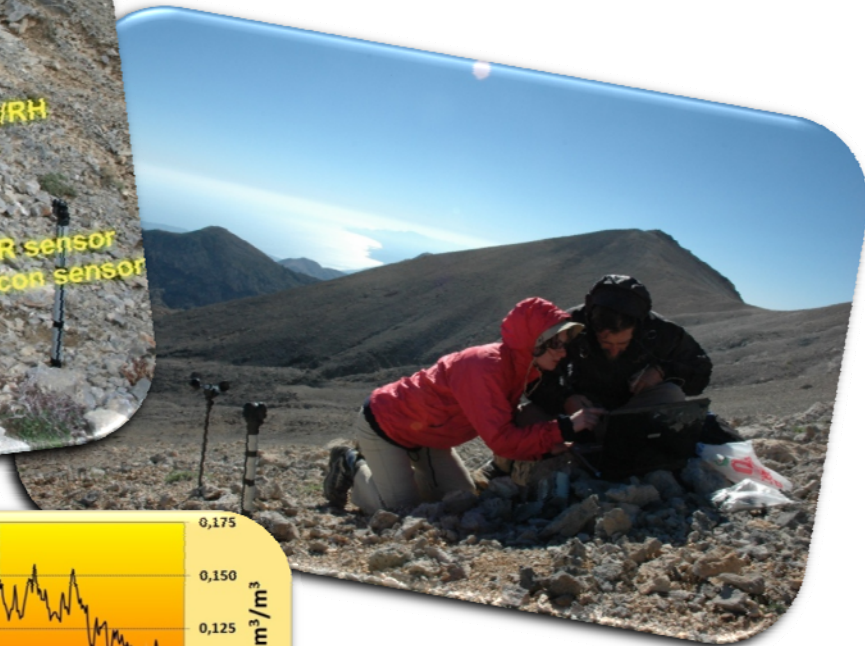
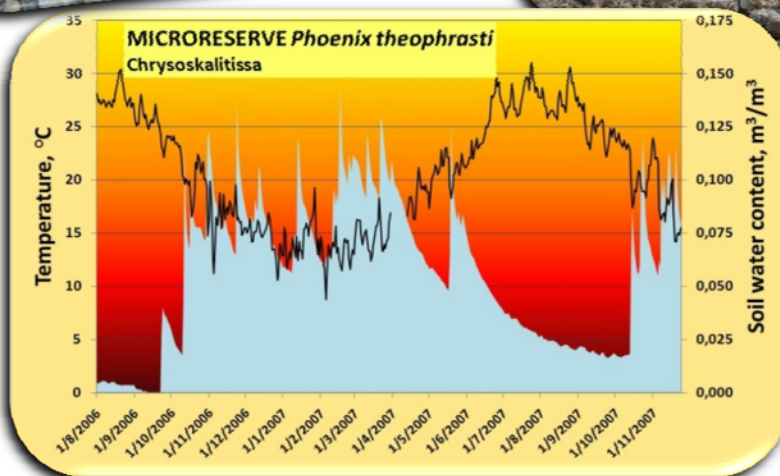
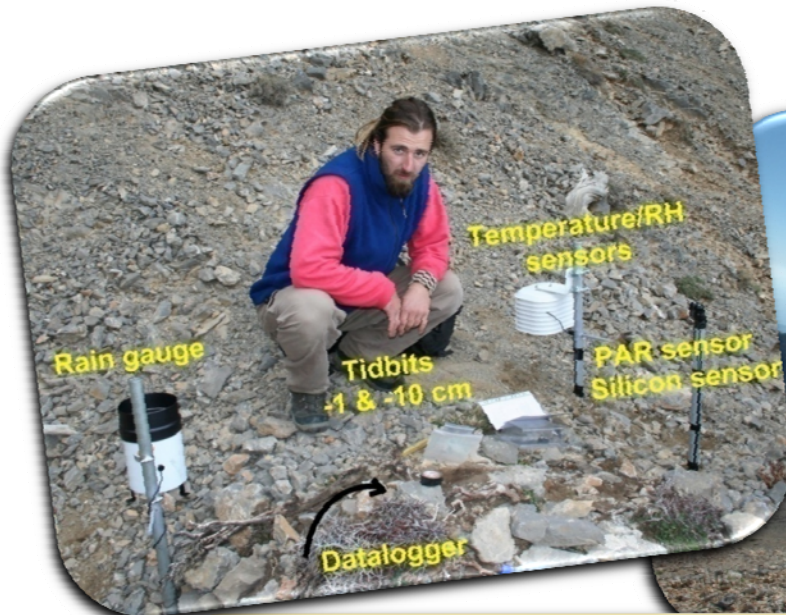


Permanent monitoring plots have been established in each PMR for the long-term recording of population trends and other ecological variables (left photograph below: a 'virtual' monitoring plot; right: seedling emergence). Furthermore, 9 digital microstations – dataloggers were installed together with 53 sensors of selected meteorological parameters, with the aim to closely record and monitor the plant microclimate (and, at mid-term, the climate change).





Telescopic monitoring of
'virtual' monitoring plots
at the PMR
Bupleurum kakiskalae



Meteorological
microstation at the PMR
Bupleurum kakiskalae
(upper left).
Data downloading at the
PMR *Nepeta sphaciotica*
(upper right).

Ex situ management

Several complementary actions towards safeguarding the genetic material (*ex situ* conservation and management) of the target plants were undertaken, namely **collection of seeds and their storage in the Gene Bank of MAICH** as well as **elaboration of protocols for seed germination and seedling production**. The propagation material obtained is currently cultivated at the Botanical Garden of MAICH and the 2 Alpine Botanical Gardens in Lefka Ori (Omalos and Poria).



Seeds of *Phoenix theophrasti* (left).

The Botanical Garden at MAICH (below).



The Alpine Botanical Garden in Lefka Ori.



Dissemination and awareness

The PMR network is supported by an information campaign based at the Visitors Centre of MAICH (hosting the permanent Project Exhibition) and in the Alpine Botanical Gardens, in Lefka Ori). The aims of the information campaign are: the dissemination of the Project results and the promotion of awareness and appreciation of nature conservation to the general public and, particularly, to the younger generations, the local authorities (Municipalities, Prefecture, Region of Crete), local communities, ecological clubs and specific target groups such as ecoguides, tourist agents, teachers and shepherds.

Seminar for tutors of
Environmental Education.



CRETAPLANT movie projection
for pupils at the Visitors Centre
of MAICH.

An information campaign was carried out in 8 schools (in the vicinity of PMRs) and 2 Student Weeks were organised at MAICH (May 2006 and 2007, with a participation of over 1300 students, in total), 7000 popularised, 20-page booklets (in Greek and English) and 500 large posters were distributed to students, schools and guests of the Visitors Center. Similarly, 4000 T-shirts were produced, decorated with original coloured drawings of the 7 target plants of the Project. Other events included 3 dissemination meetings for local authorities, 2 seminars for environmental education tutors and 1 seminar for ecotourism operators. An Experts Workshop took place in Chania in November 2005, with the significant participation of 20 experts on nature conservation and management from Greece and 6 European countries. A Project movie on DVD (in Greek with English subtitles) was produced for the general public, illustrating nature conservation and Plant Micro-Reserves. A bilingual (Greek and English) website, was launched in 2005 (<http://cretaplant.biol.uoa.gr>), hosting all CRETAPLANT activities and additional relevant information. Scientific papers with Project related activities were presented in international conferences and 4-page, coloured leaflets (with technical/scientific and layman's information) have been produced for each of the 7 Plant Micro-Reserves (both in Greek and English) for future reproduction and distribution.



The people

More than **50 scientists and technicians** (of numerous and diverse backgrounds) took active part in the implementation of the Project. Many others also contributed in several ways and instances. Special



mention should be made to the Scientific Committee of the Project (photo above) and the Advisory Board (comprised by the Mayors from the PMR localities and representatives of the Ministries of the



Environment and Agriculture, photo in the middle). Last but not least, several foreign experts contributed significantly (lower photo).

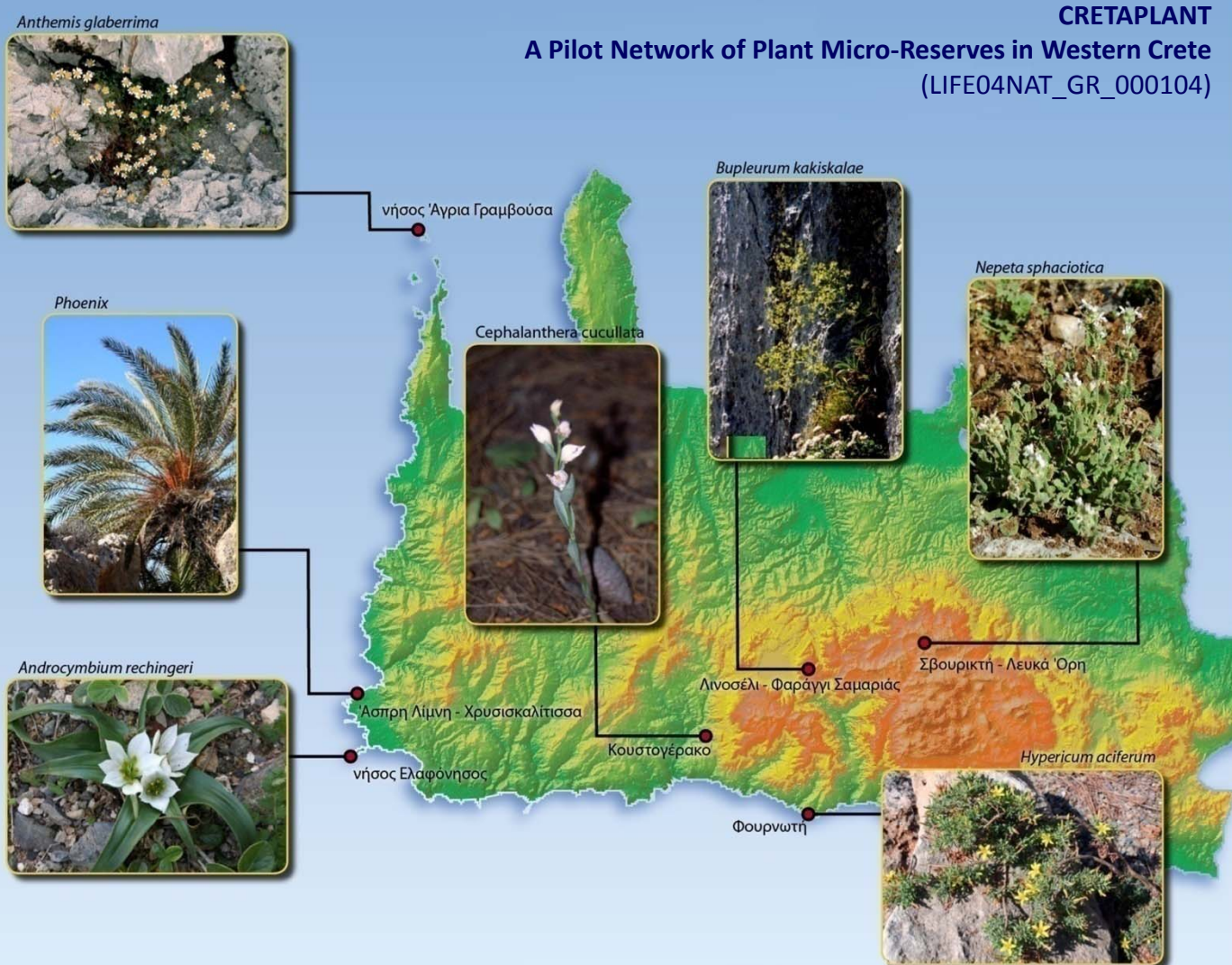
A big thank you to everyone! The CRETAPLANT experience has taught us all that apart from the hard work, the secret of success lies in the widest possible, interdisciplinary collaboration as well as in social consensus and synergy.



Plant Micro-Reserves In Western Crete (Chania)

CRETAPLANT

A Pilot Network of Plant Micro-Reserves in Western Crete
(LIFE04NAT_GR_000104)



Knowledge Protection Conservation

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