

## The Establishment, Monitoring and Management of a Pilot Network of Micro-Reserves in Western Crete for the Conservation of European Threatened Plants (CRETAPLANT Project, EU-LIFE)

Costas A. Thanos,<sup>1,5</sup> Fournaraki Chistini,<sup>2</sup> Georghiou Kyriacos<sup>1</sup>, Dimopoulos Panayotis,<sup>3</sup> and Bergmeier Erwin<sup>4</sup>

<sup>1</sup> Department of Botany, National & Kapodistrian University of Athens, Athens, Greece

<sup>2</sup> Mediterranean Plant Conservation Unit, Mediterranean Agronomic Institute of Chania, Crete, Greece

<sup>3</sup> Lab. of Ecology and Biodiversity Conservation, Dept. of Environmental and Natural Resources Management, University of Ioannina, Agrinio, Greece

<sup>4</sup> Dept. Vegetation & Phytodiversity Analysis, Albrecht-von-Haller Institute for Plant Sciences, University of Goettingen, Goettingen, Germany

<sup>5</sup> Contact should be made to C.A. Thanos, email [cthanos@biol.uoa.gr](mailto:cthanos@biol.uoa.gr)

### Keywords

Micro-reserves, threatened plants, monitoring

### Aim/s and Introduction

Within the framework of the EU-funded, LIFE-NATURE-2004 'CRETAPLANT' project (LIFE04NAT\_GR\_000104, 1.9.2004 – 31.12.2007), a Pilot Plant Micro-Reserves Network has been established in Western Crete, Greece (Chania Prefecture). The network is comprised of 7 reserves in 3 Natura 2000 sites: Gramvousa (GR4340001), Elafoisios (GR4340002) and Lefka Ori (GR4340008). Each of the reserves refers to each of 6 plant species of Community priority (Directive 92/43/EEC): *\*Androcymbium rechingeri*, *\*Anthemis glaberrima*, *\*Bupleurum kakiskalae*, *\*Cephalanthera cucullata*, *\*Hypericum aciferum*, *\*Nepeta sphaciatica* and priority habitat type 9370, *\*Palm groves of Phoenix*. Five of these target plants are local endemics of very restricted distribution, the last one – *C. cucullata* – is a Cretan endemic orchid and the grove of *Phoenix theophrasti* (a subendemic palm of Crete and western coast of Asia Minor) is the most stressed population, at the westernmost edge of the species distribution (Figure 1). Apart from the in situ conservation of the target species, the micro-reserves protect a significant number of other important plants (endemic, rare and threatened species).

The Plant Micro-Reserves constitute a relatively recent concept and a novel approach for the conservation and management of plant populations of threatened and rare species (Laguna 2001). The PMR concept was first developed around 1990, in the Region of Valencia (Spain) and was originally put into practice in 1994 within the framework of an EU-funded LIFE project. PMRs are legally defined areas of a small surface (less than 20 ha) which, ideally in the form of a network, 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 continuously monitored network in order: to achieve a representation of plant biodiversity richness, to facilitate understanding of the long-term changes of endemic-rich or relict plant communities, to provide germplasm to the regional, wild plant seedbanks, and to develop into focal points for the ongoing, plant conservation activities (re-introductions, reinforcements, translocations, in situ management etc.).

An integrated conservation strategy is being applied towards managing, monitoring and publicising the Micro-Reserves Network (Thanos et al. 2005). Management is implemented by wardening, delimitation signs, informative boards, a few enclosures to exclude grazing and additional, on-site mild measures. Long-term monitoring (aiming to elucidate the diverse biological features of the target plants and their population trends in response to various threats) is being implemented at permanent, observation and experimental plots established in each reserve; similarly, digital, meteorological microstations are continuously recording several, important climatic parameters. Conservation is complemented by ex situ management: seed banking and cultivation of target species in local botanical gardens. Last but not least, an information campaign is currently deployed, encompassing a centrally placed Visitors Center, dissemination and awareness events in the municipalities involved, seminars for target population groups and stakeholders, as well as the production of printed information material and a web site (<http://cretaplant.biol.uoa.gr>).

### Materials and Methods

The stages of the elaboration of the monitoring plans (Thanos et al. 2006) have been: a) collection of existing information on the species' biology, taxonomy, distribution and habitats; b) preparatory field work aiming to improve knowledge on species life cycle, phenology, population size, distribution pattern, habitat and threats; and c) compilation of plan. The monitoring plans include: a) summary of each species' biology, detailed population, growth and reproduction data, description of habitat and threats and assessment of its conservation status (new IUCN categories); b) establishment of monitoring rationale, methods and parameters; c) guidelines for the establishment of permanent plots and meteorological dataloggers, in each micro-reserve, for long-term monitoring and d) instructions for parameter estimation and analysis of results.

The 7 protected species form an heterogeneous mixture with distinct, individual biological and ecological characteristics, respectively: (1) a winter-growing geophyte, (2) a small-sized annual with short spring growth season, (3) a monocarpic perennial of chasmophytic habit, (4) an orchid with erratic above-ground growth, (5) a maritime chasmophyte with very extended (summertime) reproductive, (6) an alpine subshrub with short, summer growing season and (7) the westernmost and extremely stressed population

of the dioecious palm *Phoenix theophrasti*. The present work contains data gathered and conclusions drawn during the initial implementation phase of the Monitoring Plans (Thanos et al. 2007).

## Results/Discussion

1. The population trends of the winter-flowering geophyte *Androcymbium rechingeri* are being monitored within 5 permanent plots and 2 transects while meteo microstations with various sensors have been established in each of the 7 PMRs. An average density ( $\pm$ SE) of  $2.98\pm 0.26$  and  $2.22\pm 0.28$  flowering and vegetative plants, respectively, per  $0.04\text{ m}^2$  subplots, have been recorded ( $n=125$ ). 2. Twenty permanent plots (in 3 different microhabitat types) were established to monitor the density and regenerative capacity of the annual daisy *Anthemis glaberrima*. An average number ( $\pm$ SE) of  $13.6\pm 2.2$  plants per plot ( $n=20$ ) with  $4.0\pm 0.4$  flowering heads per plant ( $n=271$ ) have been recorded. 3. The seedling establishment of the monocarpic *Bupleurum kakiskalae*, an 'obligate', stenoendemic chasmophyte, is being monitored within a fenced enclosure (that excludes grazing by ruminants) at the base of its vertical habitat. 4. The total population of the erratically flowering orchid *Cephalanthera cuculata* was counted in the spring of 2006 within the respective PMR: a total of 92 flowering stems and 30 grazed ones were recorded. For the protection against grazing by goats 15 small enclosures (containing a total of 33 flowering stems) as well as an extended fence (0.8 ha) were established. Monitoring during spring 2007 yielded a total of over 300 flowering stems and no signs of grazing within the fenced area. 5. The population trends of the maritime chasmophyte *Hypericum aciferum* are being monitored within 15 permanent plots,  $1\text{ X }1\text{ m}$  on a total of 45 plants ( $3.0\pm 0.2$  plants per  $\text{m}^2$ ). 6. *Nepeta sphaciotica* is a stenoendemic labiate subshrub, growing in a single population on a scree area near the summit Svourichti of Lefka Ori (2230-2350 m asl). As implied by the temperature data collected, the snow cover period extends over 5-6 months annually; the growing season is restricted between May and November while seed germination and recruitment of new seedlings occurs early after snowmelt. 7. The PMR of the Palm grove of *Phoenix theophrasti* at Aspri Limni, near the Chryssoskalitissa Monastery, includes 48 mature palms (average height  $2.3\pm 0.1\text{ m}$ , range  $0.4\text{-}4.7\text{ m}$ ); only 4 individuals were found to bear female flowers and an artificial pollination venture has been launched.

## References

- Laguna E. 2001. The micro-reserves as a tool for conservation of threatened plants in Europe. Nature and Environment, No. 121. Council of Europe.
- Thanos, C.A., Dimopoulos, P., Bergmeier, E. and Georgiou, K. 2006. Elaboration of Monitoring Plans for Protected Plant Species of Western Crete, Greece. Book of Abstracts, p. 163, 1<sup>st</sup> European Congress of Conservation Biology 'Diversity for Europe', Eger, Hungary, 22-26 August 2006.
- Thanos C.A., Dimopoulos P., Bergmeier E., Georgiou K. and Fournaraki C. 2007 Monitoring of Plant Species of Community Priority in the Network of Plant Micro-Reserves in Western Crete (CRETAPLANT - LIFE04NAT\_GR\_000104). Pages 136-142 in Book of Proceedings 'Ecology and Biodiversity Conservation', Ioannina, Greece, 16-19 November 2006.
- Thanos C.A., Fournaraki C., Georgiou K., Dimopoulos P. and Bergmeier E. 2005. A Pilot Network of Plant Micro-Reserves in Western Crete. Book of Abstracts, P2288, p. 598, XVII International Botanical Congress, Vienna, Austria Center, 17-23 July 2005.

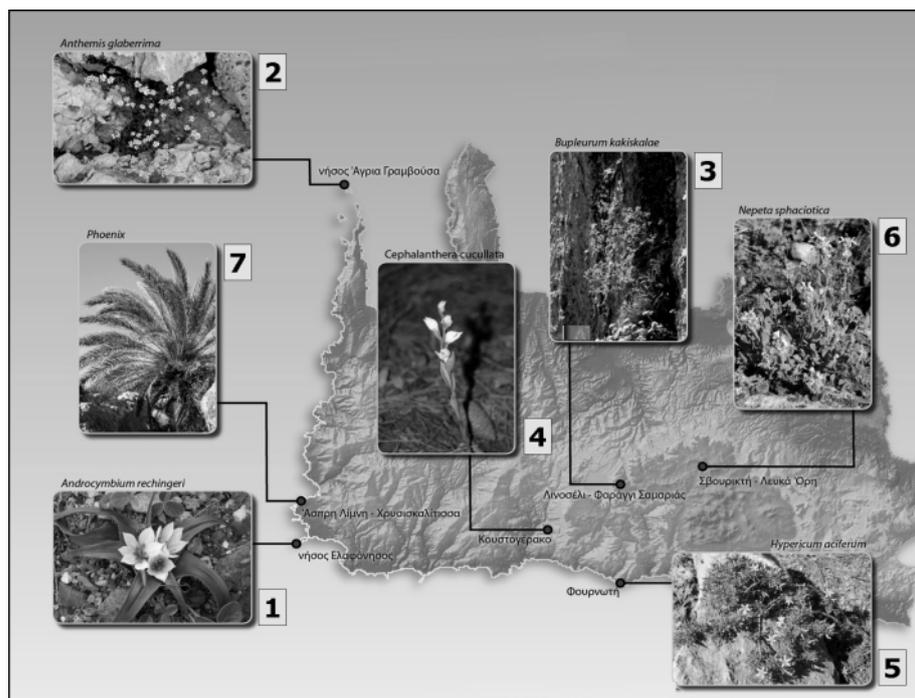


Figure 1 - The Pilot Plant Micro-Reserves Network in Western Crete (Chania Prefecture). (Map, photos and graphics: excerpt from the CRETAPLANT poster produced by MAIch, May 2006)