The *in situ* plant conservation actions of the Balkan Botanic Garden of Kroussia in Greece

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Greece has richer flora than any other European country with more than 5,700 taxa (species and subspecies, Strid & Tan 1997). About 15-20% are unique, found nowhere else in the world (Greek endemics). This figure is all the more striking considering the relatively small area and the topography of the country (Fig. 1). Much of the land is wild, rugged and mountainous, with more than 40% of the national area lying above 500m above sea level (including 314 mountains and 1674 individual peaks above 1000m, Strid & Tan 1997). The coastline of Greece stretches along more than 15,000km, the longest in Europe (Fig. 1). About 3,000 islands and islets dot the Aegean, the Ionian and the Cretan Seas, c. 19% of the land area of Greece's Mountain summits and islands host the most rare of wild plants. Four areas in Greece are considered as European Centers of Plant Diversity and Endemism (CPDEu14-17, Akeroyd & Heywood 1994).

Lacking an up to date and complete work on the flora of Greece, the floristic data are restricted to numerous scientific papers. The Flora Hellenica (Strid & Tan 1997, 2002) has produced only two volumes (out of at least 10 expected). Mountain flora of Greece (Strid 1986, Strid & Tan 1991) covers only mountain summits above 1000-1500m, Flora Europaea (Tutin & al. 1968-1980) lacks a significant amount of information concerning recently described taxa and updated distribution areas of plant species, while Flora of Turkey and the East Aegean Islands (Davis 1965-1985) covers only the flora of the East Aegean Islands.

Ironically, Greece lags behind many other European countries in the number of Botanic Gardens dedicated to the conservation of plants, education, public awareness and recreation.

The Balkan Botanic Garden of Kroussia, N Greece (BBGK) was founded in 2001 as an initiative of the National Agricultural Research Foundation of Greece (NAGREF). Today it covers an area of 31 ha, dedicated to *ex situ* and *in situ* conservation of plants native to Greece and/or the Balkans, incorporating the issue of biodiversity in environmental activities and raising of public awareness (Maloupa & al. 2006, Krigas & al. 2006). Every year BBGK organizes a series of botanical expeditions all over the country in order to obtain wild material from various plants endemic to Greece (Krigas & al. 2006). With a special permit provided by the Ministry of Agriculture, the scientific staff of the BBGK can collect wild plant material even from Natura 2000 sites and Nature Reserves of Greece. To date at least 1,000 taxa collected from the wild (more than 1,800 accession numbers) are cultivated and maintained in *ex situ* conservation, aiming at species-specific mass propagation and cultivation protocols. Yet, the rarity of the Greek flora demands more efforts as it is under threat from fire, land reclamation, over-grazing, urban and tourist development.

Figure 1. Location of in situ conservation actions of BBGK in different floristic regions of Greece. For explanation of the floristic regions of Greece see Strid & Tan (1997).

The Convention on Biological Diversity prioritizes the *in situ* conservation of plant species and the back up by *ex situ* conservation of wild plants (CBD, 1992). The Global Strategy for Plant Conservation (GSPC 2002) acknowledges 16 main targets in order to halt the biodiversity loss by 2010. If the steady decline of plant diversity is to be halted in Europe as well, a thorough understanding of the European flora is needed, including listing and assessment of wild plant species, their abundance, and monitoring of change in their distribution and status (Council of Europe 2002).

The *in situ* conservation activities of the Balkan Botanic Garden Kroussia, N Greece meet targets 1, 2, 3, 7 and 8 of the GSPC (2002), and include (for location of different areas of actions A, B and C, see Fig. 1):

A. Local scale actions (in the grounds of BBGK, Mt Kroussia, NE Greece):

- *Monitoring of wild plant populations*. In order to reveal distribution changes due to construction works in the garden, trampling from visitors and involuntarily introduced invasive species, population monitoring of at least 300 plant species is in process in the 15ha of BBGK's natural oak forest.

- *Labeling of plant species in the natural oak forest (Biodiversity Path).* Wild populations of 126 plant species have been labeled with c. 500 identity tags along the path of biodiversity of BBGK (Krigas & al. 2007).

- *Transplanting of plant individuals from trampled sites of BBGK into safer areas.* In order to avoid trampling impact from visitors resulting in plant biomass damage, at least 100 orchid bulbs of *Spiranthes spiralis, Dactylorhiza sambucina, Cephalanthera longifolia,* and *Orchis* spp. were transplanted in other areas of BBGK with no trampling. All orchid species growing very close or along the paths in the natural oak forest were collected and transplanted *in situ* during 2006 and a safe open-air native orchid display was created to host them within the grounds of BBGK (Garden of the Senses).

B. Regional scale actions (in other areas of Greece):

- *Monitoring of wild plant populations in Mt Athos, NE Greece.* For six rare plant species which are included in the Red Data Book of Rare and Threatened Plants of Greece (Phitos & al. 1995) and/or are protected by national and/or international legislation i.e. single-area endemics *Anthemis sibthorpii*, *Aubrieta erubescens, Helichrysum sibthorpii,* and *Silene orphanidis,* as well as *Fritillaria euboica* and *Galanthus nivalis,* a series of botanic expeditions have been made in order to (a) count and record *in situ* the size, the exact location and the local distribution of their populations and (b) obtain ecological data for their growing sites. Additionally, propagation material was collected for their back up *ex situ* conservation in BBGK.

- *Monitoring of wild plant populations in Mt Aenos National Park and in Cephalonia Island, Ionian Islands, SW Greece*. In collaboration with the Cambridge University Botanic Gardens and Stanley Smith Horticultural Trust (Krigas & al. 2006), a series of botanic expeditions were organized in order to record *in situ* the exact locations and the local distribution of wild populations of two groups of plants: (a) rare local endemic plant species (e.g. *Viola cephalonica, Silene cephalenia* subsp. *cephalenia*, *Poa cephalonica, Campanula garganica* subsp. *cephalenia*), and (b) regional (Ionian area) and/or Greek endemic plant species (e.g. *Ajuga orientalis* subsp. *aenesia, Astragalus sempervirens* subsp. *cephalonicus, Cerastium candissimum, Crocus hadriaticus* subsp. *hadriaticus, C. boryi, Cymbalaria microcalyx* subsp. *minor*, *Dianthus fruticosus* subsp. *occidentalis*, *Geocaryum peloponnesiacum*¸ *Heptaptera colladonioides, Limonium arcuatum, L. cephalonicum, L. damboltianum, L. ithacense, Mentha pulegium* subsp. *cephalonia, Paeonia mascula* subsp. *russii, Scaligeria moreana, Stachys ionica, S. parolinii, Teucrium halacsyanum, Thymus holosericeus* etc). Wild populations of some of the above mentioned species were also recorded up till now in other Ionian Islands i.e. Corfu, Lefkada and/or Paxi (IoI, Fig. 1). Additionally, propagation material was collected for their back up *ex situ* conservation in BBGK.

- *Evaluation and labeling of the wild growing native flora in Cephalonia Botanica Garden, SW Greece*. In collaboration with the Cambridge University Botanic Gardens, Stanley Smith Horticultural Trust and Cephalonia Botanica Garden, an attempt has been made to record the wild plant species growing in phryganic and evergreen formations in the grounds of the garden. Up till now, more than 100 taxa have been recorded, including several populations of wild orchids, and a plan is being made in order to incorporate the *in situ* wild growing plants into the garden design and landscape architecture.

- *Tracing of the genetic variability of economically important cultivated and wild plants*. Through a multilateral collaboration and an EU funding (CROCUSBANK Project), we have organized a series of botanic expeditions during 2006 in order to locate and record *in situ* wild populations of native endemic species of *Crocus* (*C. cartwrithianus*, *C. hadriaticus* subsp. *hadriaticus*, *C. hadriaticus* subsp. *parnonius, C. hadriaticus* subsp. *parnassicus*). Up till now, 24 wild *Crocus* populations have been investigated in various sites of NW, SW, SC, S and SE Greece (SPi, IoI, StE, Pe, KK, KiK in Fig. 1) and the most distinctive plant individuals from each population have been identified *in situ*.

Additionally, propagation material was collected for their back up *ex situ* conservation and further research in BBGK. Combined with various collections of cultivated *Crocus sativus,* a research on saffron and its allies is in process, concerning the genetic variability among populations of each taxon (species and/or subspecies), as well as between different taxa.

C. (Inter-) National scale actions

BBGK, in collaboration with the Botanic Garden Conservation International (BGCI), participates in the coordination of the actions of botanic gardens towards the implementation of CBD (1992) and the GSPC (2002) in regional, national, European and global scales. BBGK leads the coordination for the establishment of a National Network of Botanic Gardens in Greece. This network is intended to include numerous small scale botanic gardens in different floristic regions of Greece (*sensu* Strid & Tan 1997). These botanic gardens will be focused on (a) the *in situ* conservation of local endemic plant species in delimited areas within the grounds of each garden, (b) the *ex situ* conservation of the rare, threatened and/or endemic plant species of their specific floristic region and/or Greece, and (c) the raising of public awareness regarding the conservation of the phytogenetic resources and the biodiversity in Greece, in the European context.

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