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***In situ* and *ex situ* plant conservation in Greece in the framework of the Global Strategy for Plant Conservation**

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SUMMARY

Despite recent, significant developments in our knowledge of the Greek flora, important gaps do exist. Moreover, an integrated and country-wide study of the conservation status of endemic, rare and threatened plant taxa is urgently needed, particularly towards mitigating the ever increasing, current threats imposed by urban development, tourism and climatic change. A complete list of the 63 Greek plants included in the Habitats Directive is presented and the geographical distribution of the 26 priority taxa is illustrated. Finally, progress recorded through various *in situ* and *ex situ* conservation initiatives is presented and discussed.

Key words: Greek Flora, Plant Conservation, Habitats Directive, Conservation Status Monitoring, Seed Banks

RIASSUNTO

Conservazione delle piante *in situ* ed *ex situ* in Grecia nella rete per la Strategia Globale per la Conservazione delle Piante

Le conoscenze sulla flora della Grecia, nonostante esse abbiano avuto da recente un significativo sviluppo, presentano ancora dei punti oscuri. Inoltre, uno studio integrato ed esteso a tutto il territorio della Grecia sullo stato di conservazione delle specie endemiche, rare e minacciate è urgente e necessario al fine di poter mitigare le sempre crescenti, continue minacce derivanti dallo sviluppo urbano, dal turismo e dai cambiamenti climatici. Viene presentata la lista completa delle 63 specie della flora greca incluse nella Direttiva Habitat e viene inoltre illustrata la distribuzione geografica dei 26 taxa prioritari. Viene discusso infine l'andamento delle iniziative volte alla conservazione *in situ* ed *ex situ*.

Parole chiave: Flora greca, Conservazione, Direttiva Habitat, Monitoraggio dello stato di Conservazione, Banche dei semi

Introduction

The Greek flora is among the richest in Europe and the Mediterranean Basin and comprises about 6300 taxa (or 5700 species; Strid & Tan, 1997) although a formally published list (at least) is still missing. Unfortunately (and unreasonably), Flora Europaea does not include the East Aegean Islands of Greece while the Flora Hellenica project (Strid & Tan 1997, 2002) is still far from being complete (2 volumes published out of the anticipated 10); in addition, two significant endeavours (Med Checklist and Euro+Med Database) are similarly unfinished.

Recently, in the framework of the world-wide activities to celebrate 2010 as the International Year of Biodiversity, the Hellenic Botanical Society has launched an initiative to compile the Checklist of the Vascular Plants of Greece.

The Habitats Directive

The implementation of the European Habitat and Species Directive 92/43/EEC (as it has been recently consolidated, EU 2007) and the, rather slowly developing, Ecological Network NATURA 2000 offers several funding possibilities for the study and protection of Greek plants and habitats (particularly through LIFE+ projects). Nevertheless, only 26 plant taxa growing in Greece (all of them angiosperms) have been included, as priority species, in Annex II of the Directive (Table 1), representing 16.5% of the total number of 158 embryophytes of European priority. The vast majority of these taxa are stenoendemics (with a single or a few subpopulations): 21 occur in a single floristic region (Fig. 1), *Centaurea niederi* grows in relatively adjacent sites of Peloponnese and Sterea Ellas, *Silene holzmannii* - an endemic of small islets of the Aegean Sea - is found in 5 regions, 2 taxa may be also growing in N. Africa (*Androcymbium rechingeri* - KK and *Linaria hellenica* - Pe, a synonym of *L. tenuis* L.) and finally *Carex panormitana* has a wider European distribution. An additional number of 36 vascular plants and 1 bryophyte growing in Greece (15 endemics and 10 subendemics) are also included in Annexes II, IV and V of the Directive (Table 2) - thus amounting to a total number of 63 embryophytes (1 bryophyte, 3 pteridophytes and 59 angiosperms: 12.1% out of the total of 519 embryophytes of the Directive).

Table 1. List of the priority plants of Community interest, growing in Greece (included in the Habitats Directive 92/43/EEC, Annex II).

1	<i>Androcymbium rechingeri</i> Greuter	Colchicaceae
2	<i>Anthemis glaberrima</i> (Rech. fil.) Greuter	Asteraceae
3	<i>Bupleurum capillare</i> Boiss. & Heldr.	Apiaceae
4	<i>Bupleurum kakiskalae</i> Greuter	Apiaceae
5	<i>Carex panormitana</i> Guss.	Cyperaceae
6	<i>Centaurea alba</i> subsp. <i>heldreichii</i> (Halácsy) Dostál	Asteraceae
7	<i>Centaurea alba</i> subsp. <i>princeps</i> (Boiss. & Heldr.) Gugler	Asteraceae
8	<i>Centaurea attica</i> Nyman subsp. <i>megarensis</i> (Halácsy & Hayek) Dostál	Asteraceae
9	<i>Centaurea kalambakensis</i> Freyn & Sint.	Asteraceae
10	<i>Centaurea lactiflora</i> Halácsy	Asteraceae
11	<i>Centaurea niederi</i> Heldr.	Asteraceae
12	<i>Centaurea peucedanifolia</i> Boiss. & Orph.	Asteraceae
13	<i>Cephalanthera cucullata</i> Boiss. & Heldr.	Orchidaceae
14	<i>Consolida samia</i> P.H. Davis	Ranunculaceae
15	<i>Convolvulus argyrothamnos</i> Greuter	Convolvulaceae

16	<i>Globularia stygia</i> Orph. ex Boiss.	Plantaginaceae
17	<i>Hypericum aciferum</i> (Greuter) N.K.B. Robson	Hypericaceae
18	<i>Iberis runemarkii</i> Greuter & Burdet	Brassicaceae
19	<i>Linaria hellenica</i> Turrill	Plantaginaceae
20	<i>Micromeria taygetea</i> P.H. Davis	Lamiaceae
21	<i>Nepeta sphaciotica</i> P.H. Davis	Lamiaceae
22	<i>Phitosia crocifolia</i> (Boiss. & Heldr.) Kamari & Greuter	Asteraceae
23	<i>Silene holzmannii</i> Heldr. ex Boiss.	Caryophyllaceae
24	<i>Silene orphanidis</i> Boiss.	Caryophyllaceae
25	<i>Symphytum cycladense</i> Pawl.	Boraginaceae
26	<i>Veronica oetaea</i> Gustavsson	Plantaginaceae

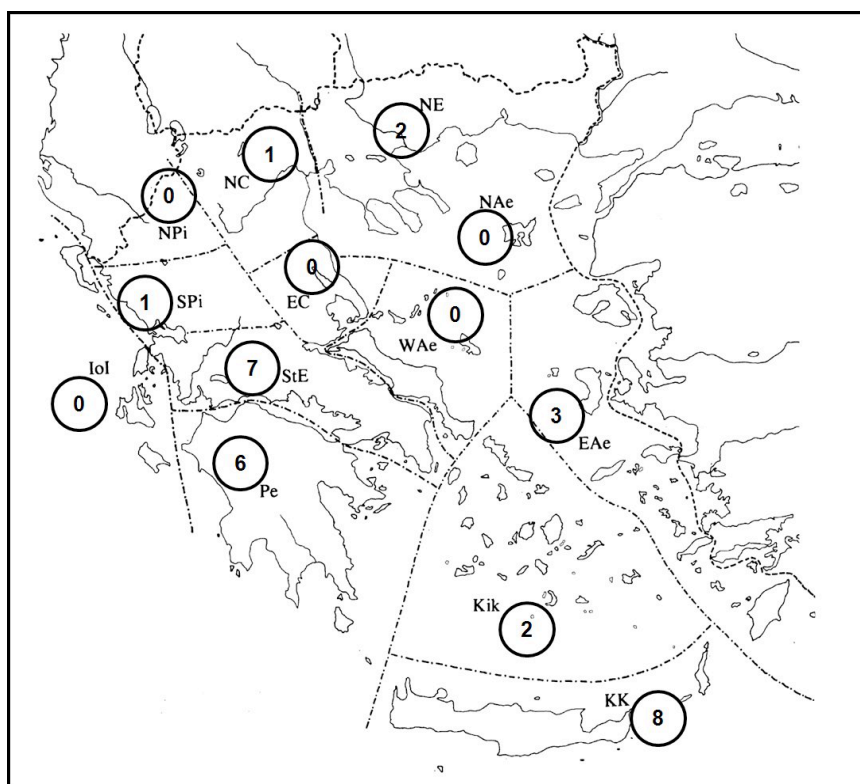


Fig. 1. The 13 floristic regions of Greece and the corresponding numbers of priority plants (of Community interest) that grow in each one of them. *Carex panormitana* has not been taken into account due to the fact that its detailed geographical distribution in Greece is unknown (although it seems to grow in almost all floristic regions of mainland Greece as well as in the Ionian Islands).

The Global Strategy for Plant Conservation

Among the 16 global targets set for the year 2010 (CBD 2002), target ii commands ‘a preliminary assessment of the conservation status of all known plant species, at national, regional and international levels’. It is now evident that most countries world-wide have failed bitterly to fulfill this goal. In regard to the rare and threatened plants of Greece that need to be conserved, 263 and 300 plant taxa have been included, respectively, in the 1995 and 2009 Red Data Books of Greece (Phitos et al. 1995, 2009) with an overlap roughly about 50%. Thus the overall number of taxa already assessed is ca 450 although rough estimations of the number of plants in-need-of-protection indicate a range between 700 and 1000 plants, which compares well with a recent compilation of the endemic plants of Greece: 1224-1442 taxa and overall endemism at the country level: 15.6-18.1% (Georghiou & Delipetrou 2010).

Moreover, Article 17 of the Habitats Directive requires EU Member States to report every six years on the conservation status of habitats and species (Greece submitted reports for 60 taxa). According to the Composite Report for the monitoring period 2001-2006 (Commission of the European Communities 2009): the quality of data was rather poor and the number of ‘unknown’ classifications was particularly high for species found in the countries of southern Europe, with Cyprus, Greece, Spain and Portugal all indicating ‘unknown’ for more than 50% of the species reported in their territories. Therefore, it is evident again that global target vii ‘60 per cent of the world’s threatened species conserved *in situ*’ has not been met as well (for most European countries) despite the efforts implemented through numerous projects in the context of the well established LIFE programme (e.g. for Greece: Thanos 2008).

Table 2. List of the non-priority vascular plants of Community interest, growing in Greece (included in the Habitats Directive 92/43/EEC, Annex II, IV, V, respectively for each separate group below).

1 <i>Buxbaumia viridis</i> (Moug.) Moug. & Nestl.	Buxbaumiaceae
2 <i>Botrychium simplex</i> Hitchc.	Ophioglossaceae
3 <i>Marsilea quadrifolia</i> L.	Marsileaceae
4 <i>Woodwardia radicans</i> (L.) Sm.	Blechnaceae
5 <i>Anacamptis urvilleana</i> Sommier et Caruana Gatto	Orchidaceae
6 <i>Asyneuma giganteum</i> (Boiss.) Bornm.	Campanulaceae
7 <i>Centaurea immanuelis-loewii</i> Degen	Asteraceae
8 <i>Crepis pusilla</i> (Sommier) Merxmüller	Asteraceae
9 <i>Cypripedium calceolus</i> L.	Orchidaceae
10 <i>Dactylorhiza kalopissii</i> E. Nelson	Orchidaceae
11 <i>Nepeta dirphyia</i> (Boiss.) Heldr. ex Halacsy	Lamiaceae
12 <i>Origanum dictamnus</i> L.	Lamiaceae
13 <i>Paeonia clusii</i> F.C. Stern subsp. <i>rhodia</i> (Stearn) Tzanoudakis	Paeoniaceae
14 <i>Paeonia parnassica</i> Tzanoudakis	Paeoniaceae
15 <i>Phoenix theophrasti</i> Greuter	Arecaceae
16 <i>Polygonum praelongum</i> Coode & Cullen	Polygonaceae
17 <i>Rhododendron luteum</i> Sweet	Ericaceae
18 <i>Solenanthus albanicus</i> (Degen & al.) Degen & Baldacci	Boraginaceae
19 <i>Viola delphinantha</i> Boiss.	Violaceae
20 <i>Zelkova abelicea</i> (Lam.) Boiss.	Ulmaceae
1 <i>Colchicum cousturieri</i> Greuter	Colchicaceae
2 <i>Fritillaria conica</i> Boiss.	Liliaceae

3 <i>Fritillaria drenovskii</i> Degen & Stoy.	Liliaceae
4 <i>Fritillaria gussichiae</i> (Degen & Doerfler) Rix.	Liliaceae
5 <i>Fritillaria obliqua</i> Ker-Gawl.	Liliaceae
6 <i>Fritillaria rhodocanakis</i> Orph. ex Baker	Liliaceae
7 <i>Helichrysum sibthorpii</i> Rouy	Asteraceae
8 <i>Jankaea heldreichii</i> (Boiss.) Boiss.	Gesneriaceae
9 <i>Ophrys argolica</i> Fleischm.	Orchidaceae
10 <i>Ramonda serbica</i> Pancic	Gesneriaceae
11 <i>Spiranthes aestivalis</i> (Poiret) L. C. M. Richard	Orchidaceae
12 <i>Viola athis</i> W. Becker	Violaceae
13 <i>Wagenitzia lancifolia</i> (Sieber ex Sprengel) Dostál	Asteraceae
1 <i>Artemisia eriantha</i> Ten.	Asteraceae
2 <i>Gentiana lutea</i> L.	Gentianaceae
3 <i>Mandragora officinarum</i> L.	Solanaceae
4 <i>Ruscus aculeatus</i> L.	Asparagaceae

Finally, the Global (and European) Conservation Strategies and the Countdown 2010 initiative have put forth important recommendations towards *ex situ* conservation: target viii recommends ‘60 per cent of threatened plant species in accessible *ex situ* collections, preferably in the country of origin, and 10 per cent of them included in recovery and restoration programmes’. Through national funds and mainly with the help of European projects, such as ENSCONET and SEMCLIMED (ENSCONET 2009, SEMCLIMED 2008) on a continental and regional (Mediterranean) level, respectively, significant progress has been made. An online database of the seedlots hosted in all major European Seed Banks (ENSCONET 2009) encompasses 9242 taxa, ie more than 70% of the entire European native flora. Moreover, along with an additional number of smaller, regional Greek Seed Banks, the two major banks for native plants of Greece (NKUA, Athens and MAICH, Crete) host seedlot accessions of more than 500 taxa (representing in majority rare and threatened species).

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