Fl. Medit. 23: 183-194
doi: 10.7320/FlMedit23.183
Version of Record published online on 30 December 2013

Georgia Kamari

The present and future of the flora of Greece and its conservation assessment

Abstract

Kamari, G.: The present and future of the flora of Greece and its conservation assessment. — Fl. Medit. 23: 183-194. 2013. — ISSN: 1120-4052 printed, 2240-4538 online.

A brief review on the Greek botany and flora study in, approximately, the past 50 years, is presented. The current status of the Greek flora is illustrated through the relevant work conducted in Greek University Institutes and Museums, but also in significant foreign centres, devoted to its study. Species conservation and habitat management are outlined, as well as future priorities that need the support of floristic and phytogeographical work. In the two Red Data Books (1995 & 2009) of the Greek flora, about half of the endemic, rare and threatened taxa are described and discussed.

Key words: Flora Hellenica, Red Data Book, endemic, threatened taxa.

Introduction

The present review on the Greek botany and flora study in, approximately, the past fifty years, practically starts after Rechinger's era with the famous works on *Flora Aegaea* (1943a), *Neue Beiträge zur Flora von Kreta* (1943b) and to *Phytogeographia Aegaea* (1951), which even today remain the main sources of sceintific information, especially for the Aegean islands.

The Greek flora is illustrated through the relevant work conducted in the three oldest Greek University Botanical Institutes (Athens, Thessaloniki and Patras) and Botanical Museums, but also in significant foreign research centres (Lund, Berlin and now Palermo), devoted to its study.

Discussion

Regarding the present status of the knowledge on the Greek flora two events were fundamental milestones. The 1st OPTIMA Meeting in 1975 in Hiraclion - Kriti (Fig. 1) and the 1st Meeting of the Hellenic Botanical Society (E.B.E.) in 1981 in Patras (Fig. 2).

Fig.1. Photo from the 1st OPTIMA Meeting in 1975 in Hiraclion – Kriti.

Fig. 2. Photo from the 1st Meeting of the Hellenic Botanical Society (E.B.E.) in 1981 in Patras.

The main research centres which have contributed to the knowledge of the Greek Flora are:

University of Lund with Prof. H. Runemark and his students, with several PhD studies on genera distributed in Greece, using mainly new karyological techniques.

Botanical Garden and Botanical Museum, Berlin with Prof. W. Greuter and his collaborators, with several PhD studies on genera or floristic and phytogeographical investigations in Greece.

The Botanical Institutes of the three main Universities (Athens, Thessaloniki and Patras with several PhD Theses and studies on genera or floristic and phytogeographical investigations in Greece.

Specifically:

In the University of Athens, the studies concentrate on alien plants, aquatic and wetland flora and vegetation, plants of insular ecosystems of the Aegean Sea in particular. They also focus on the biology (especially seed germination and *ex situ* conservation) and recently the taxonomy of the threatened and endemic species of Greece is being studied.

At the University of Thessaloniki, the relevant scientific work covers various research areas, associated mainly with the Greek flora and vegetation and emphasizing on chemotaxonomy of Greek members of the family *Labiatae,* vegetation mapping, and the inventorying of urban flora.

At the University of Patras, Prof. D. Phitos and his students deal with the taxonomy, biosystematics and karyosystematics of several genera, such as *Allium* L., *Anthemis* L., *Aubrieta* Adans., *Campanula* L., *Centaurea* L., *Crepis* L., *Galanthus* L., *Fritillaria* L., *Limonium* Mill., *Paeonia* L., *Sternbergia* Waldst. & Kit., *Viola* L., etc and also with biodiversity assessment, focusing mainly on the investigation and monitoring of endemic and threatened plant species. Additionally, many PhD Theses are being published on floristic inventory of mountains, islands, wetlands, urban areas and on vegetation mapping. The Patras Botanical Institute was one of the eleven national nodes of the important international project, 'Euro+Med PlantBase', which was coordinated by the University of Reading. This institute also maintains a database of cytological information relating to higher plant taxa growing in Greece and the other Euro+Mediterranean countries.

A particular contribution to the knowledge of the Greek flora is the journal *Botanika Chronika*, which is entirely devoted to plant taxonomy, floristic studies and phytogeography. It is being published by the Botanical Institute, University of Patras and was initially edited by D. Phitos from 1981 to 2000, followed by D. Phitos & G. Kamari (2001-2010). Unfortunately, the last volume was published on 2010, because of financial difficulties, but we hope to be able to resume publication soon.

Chronicle of the main works on the Flora of Greece

Modern floristic information on the East Aegean islands, also found in Davis' (1965-1988) *Flora of Turkey and the East Aegean Islands* was published almost at the end of the above work's publication time in the form of a reference work, i.e. the *Mountain flora of Greece*, which, as the title indicates, covers the flora of the high mountains of Greece. This

project was implemented under the editorship of Strid (1986) and Strid & Tan (1991) and covers the accounts of nearly one third of the Greek vascular flora.

Around the same time (1985), the ground for the first, complete Flora of Greece, *Flora Hellenica*, was set through the joint initiative of D. Phitos, W. Greuter, A. Strid and S. Snogerup. The first volume of this work, that will eventually cover all vascular plant taxa of Greece, together with their current taxonomy and distribution, was published in 1997 (after twelve years), edited by A. Strid & K. Tan, under the supervision of D. Phitos, A. Strid and S. Snogerup. It includes the *Gymnospermae* to *Caryophyllaceae*, the latter being a very important family with its high number of endemic taxa.

The second volume of *Flora Hellenica* was published in 2002, i.e. fifteen years after the first, and it includes the families *Nymphaeaceae* to *Platanaceae*, including the important family of *Cruciferae* with its high number of endemic taxa. The third volume still remains unpublished!

During the same period, several important books regarding specific genera or geographical regions are getting published, such as for Kriti & Karpathos, entitled *Flora of the Cretan area – annotated checklist & atlas*, edited by Turland & al. (1993), with 1738 distribution maps or only for Kriti by Fielding & al. (2005), entitled the *Flowers of Crete*, an attractive book with many spectacular color photographs etc.

Other notable works include also the book *Endemic plants of Greece –the Peloponnese* (Tan & Iatrou 2001) with the very attractive colour plates by Bent Johnsen and recently a special volume of *Bocconea* – vol. 25 – which includes the *Results of the Seventh 'Iter Mediterraneum' in Peloponnese, in 1995* (Greuter 2012). It handles 1078 taxa (from 2708 specimens(?)), 9 (7 sp. + 2 subsp.) of which are described and named as new to science. Also a lot of important information is provided for 53 numbered localities, which had only been poorly explored before.

Moreover, there are some interesting books, concerning the flora of individual mountains, like the flora of the famous Mt. Olymbos, by Strid (1980) or significant and attractive genera, like *Paeonia*, by Stern & Davis (1984) and even a few, concerning the attractive family *Orchidaceae*, covering Greece (Petrou & al. 2009 and others), Kriti by Alibertis & Alibertis (1998) or Rodopi Mountain-Range National Park (Tsiftsis & al. 2012).

There is also an important a two-volume book, presenting the shrubs and trees of Greece, through beautiful photographs and a wealth of information (Arabatzis 1998, 2001).

In 1999 we have the first book on *The Flora Graeca Story* (Lack & Mabberley 1999) and recently (Strid & Strid 2009, 2010) four volumes, organized into two books, concerning *An annotated re-issue of the Flora Graeca-Sibthorpiana.*

Finally, we must mention the publication of a book, which lists a total of 13,276 Bibliographical References (Strid 2006) for the Greek flora.

Understandably, it is not within the scope of this review to refer to the thousands of papers on taxonomic, phytogeographical or floristic investigations by Greek or foreign scientists, which, without doubt, have added immensely to the knowledge of the Greek Flora.

Recently, a book entitled '*Vascular plants of Greece: An annotated checklist*' (Dimopoulos & al. 2013) was publish. It will be an edition by Greek scientists, derived from the Universities of Athens, Thessaloniki and Patras, with the collaboration of some foreign scientists and is a separate volume of the monographic series *Englera*, (vol. 31). The book is issued by the Hellenic Botanical Society (HBS) and the Botanic Garden and Botanical

Museum Berlin-Dahlem (BGBM). It will consist of ca. 500 pages, with a coloured hardcover and will also include a photo appendix of 24 pages, i.e. ca. 220 colour photos.

The Greek flora and its conservation assessment

Concerning the conservation assessment of the Greek flora two Red Data Books, which include about half of the endemic, rare and threatened taxa have been already published.

The first '*Red Data Book of Rare and Threatened Plants of Greece*' includes 263 taxa in 527 pages + a 47-page introduction and the authors of the contributions were 33 (19 Greek + 14 foreign) scientists. The book was printed only in English and was edited by D. Phitos, A. Strid, S. Snogerup and W. Greuter (Phitos & al. 1995).

The second book was presented in March 1st, 2010, but was published in December 2009 in two volumes, the first presenting the taxa in alphabetical order from A to D and the second from E to Z. The book was edited by D. Phitos, Th. Constantinidis & G. Kamari, assisted by P. Bareka (Phitos & al. 2009).

The new R.D.B. includes 300 taxa, in 880 pages into 2 volumes and the authors of the contributions were 89 (74 Greek + 15 foreign) scientists. The taxa were evaluated according to IUCN 2001, 2003, 2006 criteria and statistical information on the work's coverage is presented in Fig. 3. The study taxa belong to several families, the most notable being *Compositae* (47 taxa), *Labiatae* (23 taxa), *Caryophyllaceae* (20 taxa), *Cruciferae* (15 taxa) etc. (Fig. 4).

By consequence, when using both books side by side, one finds information on 465 (202 + 263 = 465) different Greek plants, or almost 8% of the country's total flora. This means that less than the half of the endemic, rare and threatened taxa of the Greek flora have been evaluated and discussed until now.

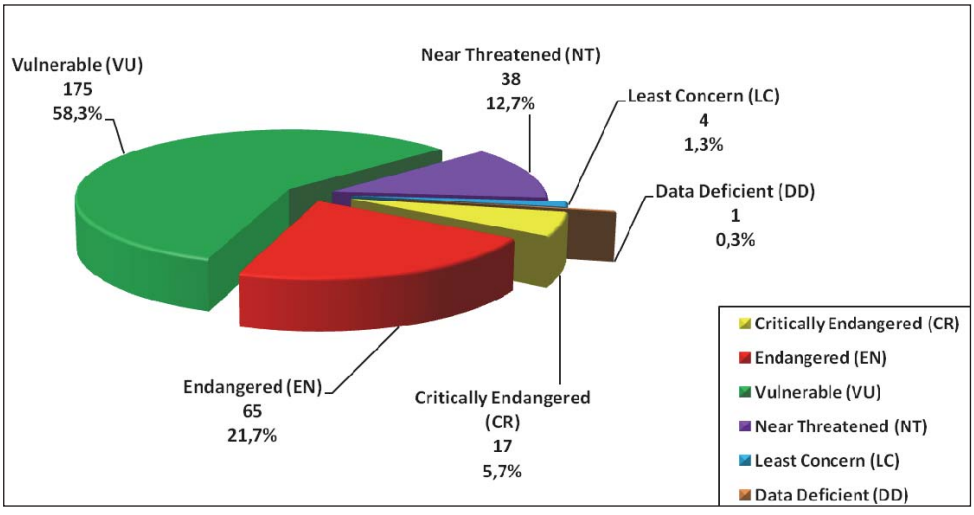

Fig. 3. Conservation status of the 300 studied taxa included in the *Red Data Book of Rare and Threatened Plants of Greece*, edited by Phitos & al. 2009.

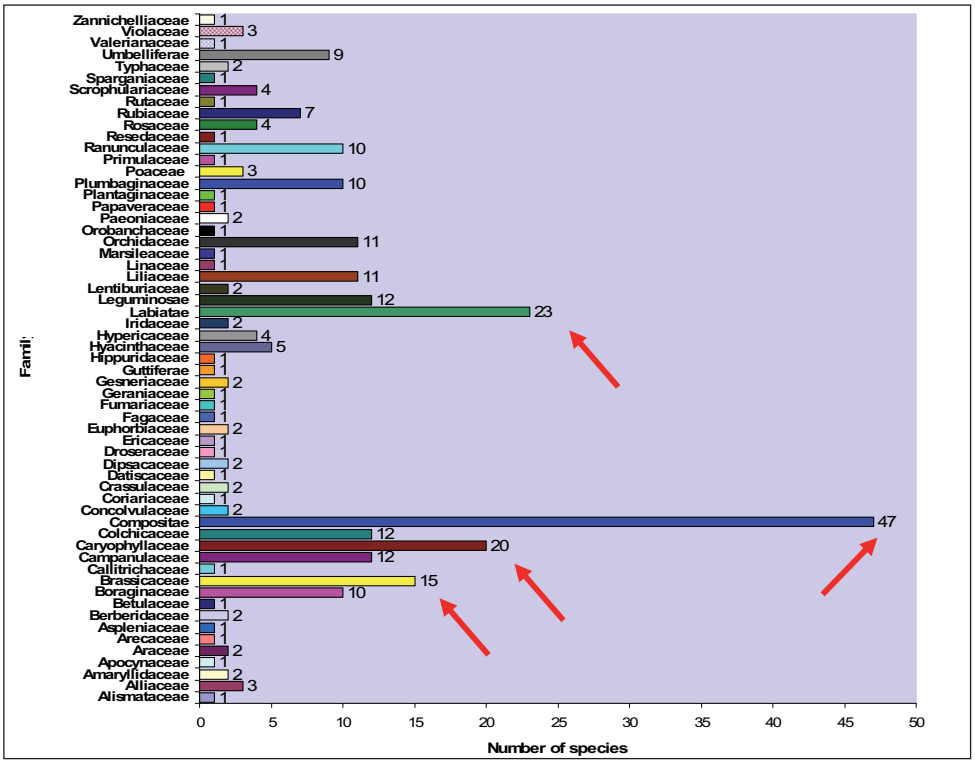

Fig. 4. Family allocation of the 300 studied taxa included in the *Red Data Book of Rare and Threatened Plants of Greece*, edited by Phitos & al. 2009.

Categories of taxa included in the new R.D.B.

Taxa with new taxonomic status.
Example: *Phitosia crocifolia* Kamari & Greuter (Kamari & Greuter 2000), which in the first R.D.B. was referred as '*Crepis crocifolia*', a stenoendemic, rare taxon, occuring only on the summit area of Mt. Taygetos (Kamari 1995). Now it has been evaluated as an Endangered, endemic genus of the Greek flora, which was recently discovered also on Mt. Parnon in SE Peloponnisos (Kamari & al. 2009, 2010).

Taxa with new distributions and new conservation categories.
Example: *Campanula reiseri* Halácsy (Fig. 5), which in the first R.D.B. was referred as Rare and only occurring on some Sporades islands (Phitos 1995b). In the new R.D.B. it has been assessed as Vulnerable (VU), with new distribution localities on Kiklades islands (Phitos & Kamari 2009).

Taxa which were not included at all in the first R.D.B. even though they are now considered Critically Endangered (CR).

Fig. 5. *Campanula reiseri* s.l. from Kithnos island, Kiklades.

Example: *Viola cephalonica* Bornm. (Katsouni & al. 2009), half the biotope of which is on the summit of Mt. Aenos, Kephalonia, having suffered considerable destruction, due to the establishment of TV and mobile telephony antennae infrastructure! Fortunately, what remained, was fenced and is now protected.

Taxa which were not included in the first R.D.B. and are not endemics of Greece.
These taxa, amounting to almost 1/3 of the evaluated taxa, are sometimes threatened: for example the Cyrenaic species, *Cynara cyrenaica* Maire & Weiller (Fig. 6), is an Endangered species for Greece, which was recently rediscovered in east Kriti in two small subpopulations, both of them, however, including no more than 32 mature individuals (Turland 2009).

One more book, concerning the threatened taxa at the brink of extinction and what is needed to save them is the publication of '*The Top 50 Mediterranean island plants*' of IUCN. Ten of the included taxa are distributed in Greek islands! Among them is *Allium calamarophilon* Phitos & Tzanoud. (Phitos & Tzanoudakis 1981, Phitos 1995a), which has not been rediscovered since then, probably because it is very difficult to reach its biotope, which can only be reached by sea!

Fig. 6. Close up photo of the inflorescence of *Cynara cyrenaica* in east Kriti.

The Greek legislature includes several laws for the protection of nature and biodiversity (2742/99, 3937/11 etc). For the protection and management of the most important areas that belong to the Natura 2000 Network (National Parks, Ramsar regions etc) 29 Management Bodies of Protected Areas have been established from 1999 onwards.

One of these is the Management Body of the National Park of Mt. Ainos(Fig. 8), which is situated on Kephalonia island, Ionian Sea. Similar to other Management Bodies, it coordinates and conducts with its own personnel, recording and monitoring studies for the local flora, focusing mainly on threatened or endemic taxa. In particular, it monitors the Greek endemic *Abies cephalonica* Loudon, for which the National Park constitutes the *locus classicus*, as well as the other endemic taxa, such as *Saponaria aenesia* Heldr. (Fig. 7), *Campanula garganica* subsp. *cephallenia* (Feer) Hayek, *Scutellaria rupestris* Boiss. & Heldr. subsp. *cephalonica* (Bornm.) Greuter & Burdet, *Viola cephalonica* Bornm and many

Fig. 7. *Saponaria aenesia* in the National Park of Mt. Ainos on Kephalonia island.

other threatened species, like *Paeonia mascula* subsp. *russoi* (Biv.) Cullen & Heywood. The same work is actually taking place for such plant taxa distributed all over Kephalonia island.

The richness of the flora of Greece increases with every day, as new taxa and new distributions are being discovered. Searching *IPNI* for names published since 01.01.2010 with "*Greece*" mentioned in the distribution notes, more than 50 taxa are found to be referred! (One should not forget that almost 10 new ones have been described in the last volume of '*Bocconea*'). This could mean that further floristic investigations in the future may increase the number of taxa to more than 6000.

Greece and Greek botanists have much to offer. Good contacts and friendly co-operation with colleagues in other Balkan countries and from throughout the world are an obvious and necessary way to improve the knowledge of our local flora, of the Balkan flora, and of that of Mediterranean countries in general.

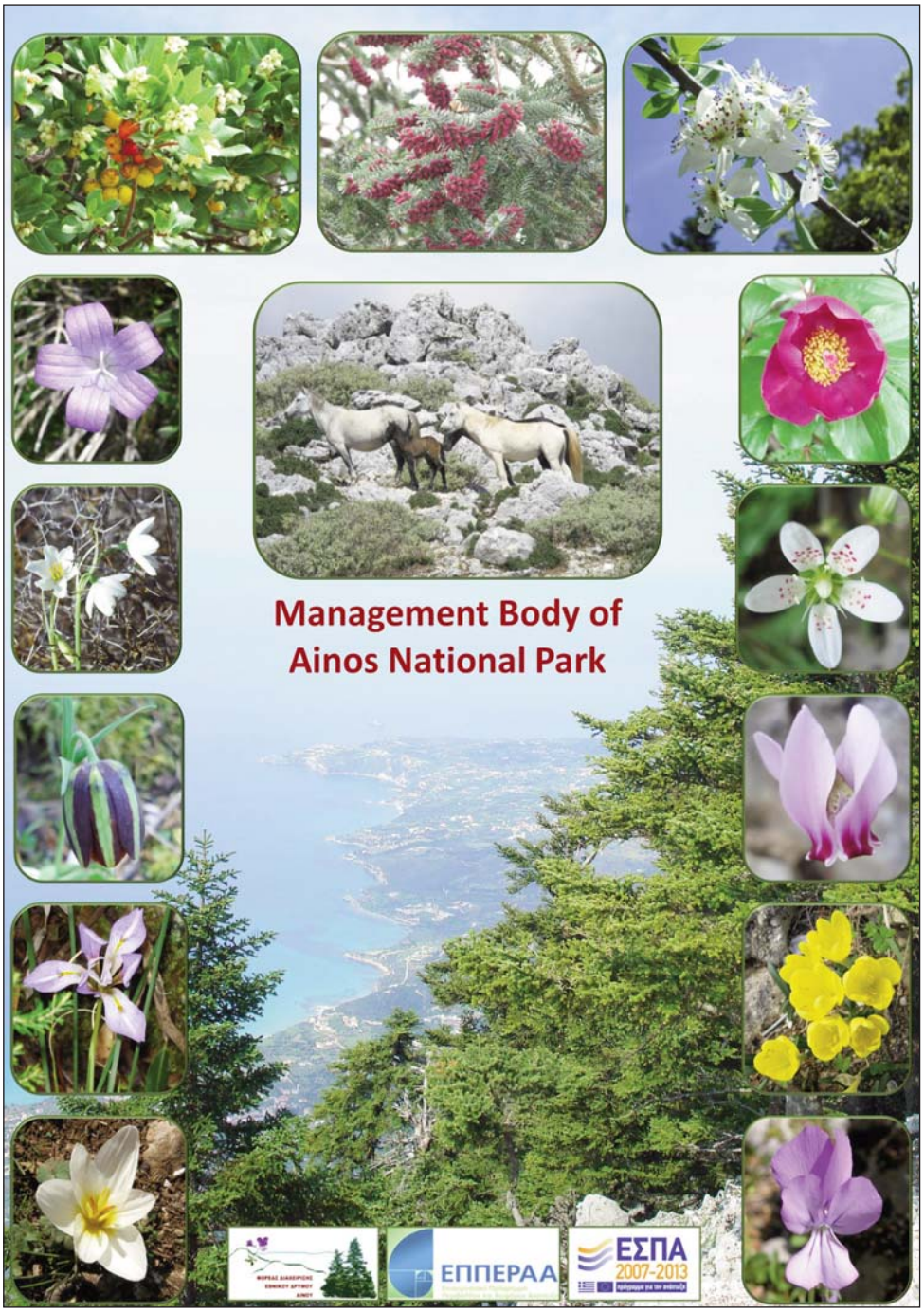

Fig. 8. Poster from the Management Body of Ainos National Park, presenting some of the beautiful, threatened or endemic taxa of the protected area.

Unfortunately, the financial crisis in Greece functions as an inhibitory factor on the thorough study of the flora of Greece, since young scientists are no longer getting appointed in the Universities and no funds become available for such purposes. Nevertheless, despite the above difficulties, new contributions are published and new taxa for the Greek flora still keep getting discovered.

References

Alibertis, Ch. & Alibertis, A. 1998: Orchidees of Crete. – Hiraklion, Kritis (in Greek).

Arabatzis, Th. 1998 & 2001: Scrubs and trees in Greece, **1-2.** – Drama.

Davis, P.H. (ed.) 1965-1988: Flora of Turkey and the East Aegean Islands, **1-10.** – Edinburgh.

Dimopoulos, P., Raus, T., Bergmeier, E., Constantinidis, Th., Iatrou, G., Kokkini, S., Strid, A. & Tzanoudakis, D. (eds) 2013: Vascular plants of Greece: An annotated checklist. – Englera **31.**

Euro+Med PlantBase – The information resource for Euro-Mediterranean plant diversity. Published on the Internet. – http://www.emplantbase.org/home.html

Fielding, J. & Turland, N. 2005 (reprinted 2008): Flowers of Crete (ed. by Mathew, B.). – Kew.

Greuter, W. 2012: Results of the Seventh 'Iter Mediterraneum' in Peloponnese, Greece, May to June 1995. – Bocconea **25:** 1-127. doi: 10.7320/Bocc25.005

IPNI -The International Plant Names Index 2013: Published on the Internet. – http://www.ipni.org [accessed 6 September 2013].

IUCN 2001: IUCN Red List Categories and Criteria: version 3.1. – Gland & Cambridge.

— 2003: Guidelines for Application of IUCN Red List Criteria at Regional Levels: version 3.0. – Gland and Cambridge.

— 2006: Guidelines for using the IUCN Red List Categories and Criteria: version 6.1. – IUCN SSC Biodiversity Assessments Sub-Committee, Standards and Petitions Working Group.

Kamari, G. 1991: *Crepis* L. – Pp. 576-595 in: Strid, A. & Tan, K. (eds), Mountain Flora of Greece, **2.** − Edinburgh.

— 1995: *Crepis crocifolia* Boiss. & Heldr. – Pp. 210-211 in: Phitos, D., Strid, A., Snogerup, S. & Greuter, W. (eds), The Red Data Book of Rare and Threatened Plants of Greece. – Athens.

— & Greuter, W. 2000: *Phitosia*, a new genus for *Crepis crocifolia* (Compositae, Cichorieae), a local endemic of Mount Taigetos (Greece). – Bot. Chron. **13:** 11-36.

— , — & Kyriakopoulos Ch.. 2009: *Phitosia crocifolia* Kamari & Greuter. – Pp. 253-255 in: Phitos, D., Constantinidis Th. & Kamari, G. (eds), The Red Data Book of Rare and Threatened Plants of Greece, **2(E-Z)**. – Patra (in Greek).

—, Kyriakopoulos Ch. & Kofinas G. 2010: New finding of *Phitosia crocifolia* (*Compositae*) in E Peloponnisos. – Fl. Medit. **20:** 235-238.

Katsouni, N., Karagianni, V. & Kamari, G. 2009: *Viola cephalonica* Bornm. – Pp. 385-387 in: Phitos, D., Constantinidis Th. & Kamari, G. (eds), The Red Data Book of Rare and Threatened Plants of Greece, **2(E-Z)**. – Patra (in Greek).

Lack, H. W. & Mabberley, D. J. 1999: The Flora Graeca story. Sibthorp, Bauer, and Hawkins in the Levant. – Oxford.

Montmollin, B. de & Strahm, W. (eds) 2005: The Top 50 Mediterranean Island Plants: Wild plants at the brink of extinction, and what is needed to save them. – Gland & Cambridge.

Natura 2000: The Greek Habitat Project: An Overview. – Pp. 917 in: Dafis, S., Papastergiadou, E., Georghiou, K., Babalonas, D., Georgiadis, Th., Papageorgiou, M., Lazaridou, E. & Tsiaoussi, B. (eds), Commission of the European Communities. – Thessaloniki.

Petrou, N., Petrou, M. & Giannakoulias, M. 2009: Orchidees of Greece. – Athens (in Greek).

Phitos, D. (ed.) 1981-2000: Botanika Chronika, **1-13.** – Patra.

— 1995a: *Allium calamarophilon* Phitos & Tzanoud. – Pp. 16-17 in: Phitos, D., Strid, A., Snogerup, S. & Greuter, W. (eds), Red Data Book of Rare and Threatened Plants of Greece. – Athens.
— 1995b: *Campanula reiseri* Halácsy. – Pp. 128-129 in: Phitos, D., Strid, A., Snogerup, S. & Greuter, W. (eds), Red Data Book of Rare and Threatened Plants of Greece. – Athens.
— & Kamari, G. (eds) 2001-2010: Botanika Chronika, **14-20.** – Patra.
— & — 2009: *Campanula reiseri* Halácsy. – Pp.192-194 in: Phitos, D., Constantinidis, Th. & Kamari, G. (eds), The Red Data Book of Rare and Threatened Plants of Greece, **1(A-D)**. – Patra (in Greek).
— & Tzanoudakis, D. 1981: Anew species of *Allium* from Euboea (Greece). – Bot. Chron. **1:** 11-13.
—, Constantinidis, T. & Kamari, G. (eds) 2009: The Red Data Book of Rare and Threatened Plants of Greece, **1(A-D):** & Τόμος **2(E-Z):** . – Patras (in Greek).
—, Strid, A., Snogerup, S. & Greuter W. (eds) 1995: The Red Data Book of Rare and Threatened Plants of Greece. – Athens.
Rechinger, K. H. 1943a: Flora Aegaea. Flora der Inseln und Halbinseln des ägäischen Meeres. – Denksch. Acad. Wiss. Wien, Math.-Naturwiss. Kl. **105(1).**
— 1943b: Neue Beiträge zur Flora von Kreta. – Denksch. Acad. Wiss. Wien. Math.-Naturwiss. Kl. **105(2).**
— 1944: Bericht über eine botanische Forschungsreise nach Kreta. – Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. **25(12):** 9 pp.
— & Rechinger-Moser, F. 1951: Phytogeographia Aegaea. – Akad. Wiss. Wien, Math.-Naturwiss. Kl., Denkschr. **105/2:** 1-208.
Stearn, W. T. & Davis, P. H. 1984: *Paeonies* of Greece. – Kifissia.
Strid, A. 1980: Wild flowers of Mount Olympus. – Kifissia.
— (ed.) 1986: Mountain flora of Greece, **1.** – Cambridge.
— (ed.) 2006: Flora Hellenica Bibliography. – W. Szafer Inst. of Bot, Polish Acad. Sci. Kraków.
— & Strid, B. 2009, 2010: Flora Graeca Sibthorpiana - An annotated re-issue, **1-2** & **2-4**. – Ruggell.
— & Tan, K. (eds) 1991: Mountain flora of Greece, **2.** – Edinburgh.
— & — (eds) 1997: Flora Hellenica, **1.** – Königstein.
— & — (eds) 2002: Flora Hellenica, **2.** – Ruggell.
Tan, K. & Iatroú, G. 2001: Endemic plants of Greece. – København.
Tsiftsis, S., Tsiripidis, J. & Vidakis, K. 2012: Orchids of Rodopi Mountain-Range National Park. – Paranesti.
Turland, N. J. 2009: *Cynara cyrenaica* Maire & Weiller – Pp. 345-347 in: Phitos, D., Constantinidis, Th. & Kamari, G. (eds), The Red Data Book of Rare and Threatened Plants of Greece, **1(A-D)**. – Patra (in Greek).
—, Chilton, L. & Press, J. P. 1993: Flora of the Cretan area: An annotated checklist & atlas. – London.

Address of the author:
Georgia Kamari,
Botanical Institute, Section of Plant Biology, Department of Biology, University of Patras, GR-265 00 Patras, Greece. E-mail: kamari@upatras.gr