



THE INTERNATIONAL MEDITERRANEAN ECOSYSTEMS CONFERENCE  
PERTH, WESTERN AUSTRALIA, AUSTRALIA  
SUNDAY 2 - WEDNESDAY 5 SEPTEMBER

2007

# CONFERENCE PROCEEDINGS

D. Rokich, G. Wardell-Johnson, C. Yates, J. Stevens,  
K. Dixon, R. McLellan & G. Moss (Eds).

Life history traits and habitat preferences of the alien plants in Greece

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**Keywords**

invasions, Greece, Mediterranean, habitats, plant traits

**Introduction**

Although the phenomenon of biological invasions has been noted for some time [Elton 1958], it is only during the last two decades that the biological consequences of exotic invasions have extensively been researched. This is due to the significant losses of the biological diversity and function of the ecosystems invaded in addition to the impact of invasives in terms of economic impacts (Mooney and Hobbs 2000, Mack et al. 2000). Vascular plants are among the most ubiquitous invasive organisms. The majority of the plants have been introduced for agricultural, silvicultural, ornamental or medicinal purposes (Williamson 1996), while many have been accidental introductions (Newsome and Noble 1986).

Two basic questions have fascinated ecologists since biological invasions have become a focal issue of the global change (Pyek and Richardson 2006). The first question articulated was 'which species invade and under which conditions?'. This question has stimulated the search for traits that make plant species potential successful invaders (Lloret et al. 2004). The second question was 'what features of ecosystems make them either prone to or resistant to invasions?'. This has led to studies on community characteristics and environmental conditions under which an invasive event is realised (Davis et al. 2000). It is only recently that these two questions have been considered in concert (Richardson and Pyek 2006).

Despite the fact that there are several independent research efforts in the field of invasion ecology in Europe, it is only recently that a systematic and syncretical approach has been adopted on investigations into alien species in Europe. The European Commission funded the project DAISIE ([www.europe-alien.org](http://www.europe-alien.org)) with a view to delivering an alien invasive species inventory for Europe. The project aims at producing a Pan European Data Base on the alien species in Europe, covering all known taxa of terrestrial and aquatic plants, animals and fungi as well as lichens. The outcome will be a web portal from which scientists will have access to the data-base (e.g. species lists, taxonomy, origin, status, habitats, distribution maps) as well as to a registry of experts. The current work, mostly carried out under this project, is a preliminary analysis of the data concerning alien plants in Greece aiming at tracing possible relationships between plant traits and habitat preferences.

**Materials and Methods**

In this study, data were collected based on extensive surveys of the existing literature in terms of taxonomy, distribution, chorology, habitat, introduction pathway, as well as life history traits of the alien plant taxa (e.g. life and growth form, fruit type, reproduction and dispersal mode etc.). A relational data base has been created with fields corresponding to the above mentioned topics of information. Data are analysed for their trends and discussed within the context of the Mediterranean character of the country.

**Results**

The updated list of alien plants in Greece includes 321 taxa (species and subspecies), corresponding to 5% of the native flora of the country. A high percentage of alien plants (approx. 40%) are recorded as naturalized. The majority of alien plants in Greece (187 taxa) are of American and Asiatic origin at 39% and 17% respectively. Families having the highest number of both overall alien and naturalized taxa are Poaceae, Asteraceae and Fabaceae. Most invasive plants are herbs (over 75%), while shrubs and trees account for 14% and 9% respectively. Regarding life history characteristics, perennials and annual-biennials are equally represented. Most of the herbaceous plants are annuals and biennials (64%), while only 33% are perennials. In terms of life forms, therophytes are the most prominent group, equalling 45% of the overall alien flora, followed by the phanerophytes (20%) and the hemicytrophytes (15%). Among the naturalized plants, annual herbs are the dominant life form (over 60%). The dispersal capacity of more than 60% of alien plants ensures active long-distance dispersal. Most of alien plants possess either zoochorous or anemochorous mode of dispersal while almost 60% utilise more than one dispersal mechanism.

The majority of the alien plant taxa are found in artificial 'habitats' and more specifically in transport networks, in cultivated areas and highly disturbed urban or rural areas. Habitats hosting naturalized species are mainly artificial, although many of the taxa occur in natural habitats as well. Coastal zones and inland surface waters host a significant number of alien plants. Most of the plants (~ 45%) occur only in one habitat type, approximately 30% are able to grow in 2 or 3 habitat types, while only one (*Oxalis pes-caprae*) is omnipresent (18 out of 21). Of the 39 invasive plants recorded only from natural habitat types, 12 are naturalized. Within this group of plants only 20 taxa are known to occur in Mediterranean habitats so far.

## Discussion

It has been suggested (Holmgren et al. 2000) that where a life history trait is poorly represented in the native flora e.g. herbs with an annual life cycle, available sites are more susceptible to exotic plants that possess this life trait. However, this hypothesis has been rejected following broader, comparative studies (Arroyo et al 2000). It seems that a high representation of a plant character on a broad geographical scale is related to the availability of species having this character in the pool of species entering this region, rather than to an advantage of these species over the rest. This seems to be true for most of the traits studied in the current work. The representation of phanerophytes and hemicryptophytes in the alien flora is 20% and 15% respectively, while in the native Mediterranean flora of Greece a reverse situation is observed, with 10% phanerophytes and 20% hemicryptophytes. This observation may indicate the specific introduction pathway for the taxa. The over-representation of therophytes and phanerophytes in the alien flora in Greece seems to be due to the fact that the majority of deliberately introduced taxa also belong to these two groups. Therefore it can not be assumed that these taxa are more advantageous compared to those of the native flora. The number of naturalized taxa encountered so far may be related either to the time since their introduction and/or to their adaptability to the different environments they enter, both in terms of their habitat requirements and in their ecological tolerances. The fact that most of either the total or the naturalized alien plants are anemochorous or zoochorous relates to their telechorous (of specific energetic mechanism) mode of dispersal, which may equip these species with an aggressive potential of expansion. Although the number of invasive plant taxa found in various artificial habitats represent the most frequent taxa, there are significant numbers of taxa in natural systems. Naturalization rate of alien plants in coastal habitats and inland surface waters exceeds all other systems reaching over 70%. This may reveal either their stronger water dependence or the higher susceptibility of these habitats. Grazed systems also appear to have high naturalization rates either to the fact that livestock feed mainly on native plants, minimizing interspecific competition [this has been proved for the mediterranean type ecosystems of Chile (see overview by Figueroa et al. 2004)] or may be related to differing nutrient and light requirements. Finally, the relatively lower naturalization rate observed in Mediterranean habitats compared to those of other natural habitats, multiplied by the representation of these ecosystems over the terrestrial area of Greece (over 40%) may reveal the resistance of the Mediterranean ecosystems to such perturbations. Nevertheless, further research is needed in order to fully understand the risks and ecological resilience of Mediterranean systems to invasive plants.

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