The challenge of *in situ* plant conservation in the Mediterranean

University of Reading

Vernon Heywood
School of Biological Sciences
University of Reading, UK
v.h.heywood@reading.ac.uk

IUCN

CARE MEDIFLORA

Global Diversity Foundation
A world of difference

L-Università ta' Malta

1

Outline

- The background
- The scale of the problem
- Various forms of *in situ* conservation
- Species recovery
- Role of Protected areas
- Beyond protected areas
- Key issues in species recovery
- Global change and future prospects

The background

The Mediterranean region has unique characteristics:

- Its semi-enclosed sea, elongated shape, large topographic contrasts and climate gradients and its great sensitivity to climate change.

- It has suffered impacts from anthropogenic change over thousands of years, notably deforestation, the expansion of agriculture, introduction of new crops, movement away from the land, increase in area under irrigation, agricultural intensification, intensive cultivation of horticultural crops under glass or plastic, abandonment of terraces, urbanization and industrial development, and tourism which have depleted resources and led to major alterations to the landscapes.

- This environmental degradation has important implications for biodiversity conservation, especially in the east and the south of the region.

3

Terracing, Morella, Spain

Photo VHHeywood

Deforested landscapes, mid-Atlas Morocco   Photo VHHeywood

Tobacco cultivation nr Ioannina, Greece   Photo VHHeywood

Special circumstances of the south and east Mediterranean

- Compared with the countries on the northern shores, the political and socio-economic conditions and the patterns of land use, and ownership, and food production and diets, notably a switch to more animal-based food production, are different.

- Food production from agriculture and fisheries across the Mediterranean region is also changing due to the social, economic and environmental changes.
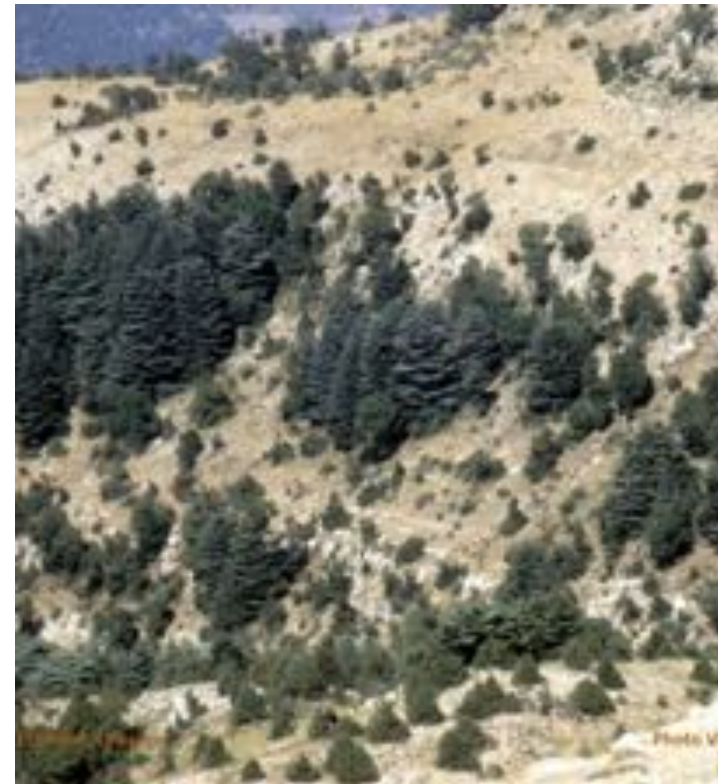
The challenge

In situ conservation of species is a complex multidisciplinary process and involves a wide range of conservation techniques and expertise.

It is perhaps the most challenging task facing conservation today.

But it is poorly understood and little implemented.

1. **Conservation of natural or semi-natural ecosystems in various types of Protected Area or other effective area-based conservation measures**

The various forms of *in situ* conservation

Quercus suber sylvo-pastoral forêt de La Mamora, Moyen-Atlas, Morocco Photo VHHeywood

Arganeraie Biosphere Reserve, Morocco
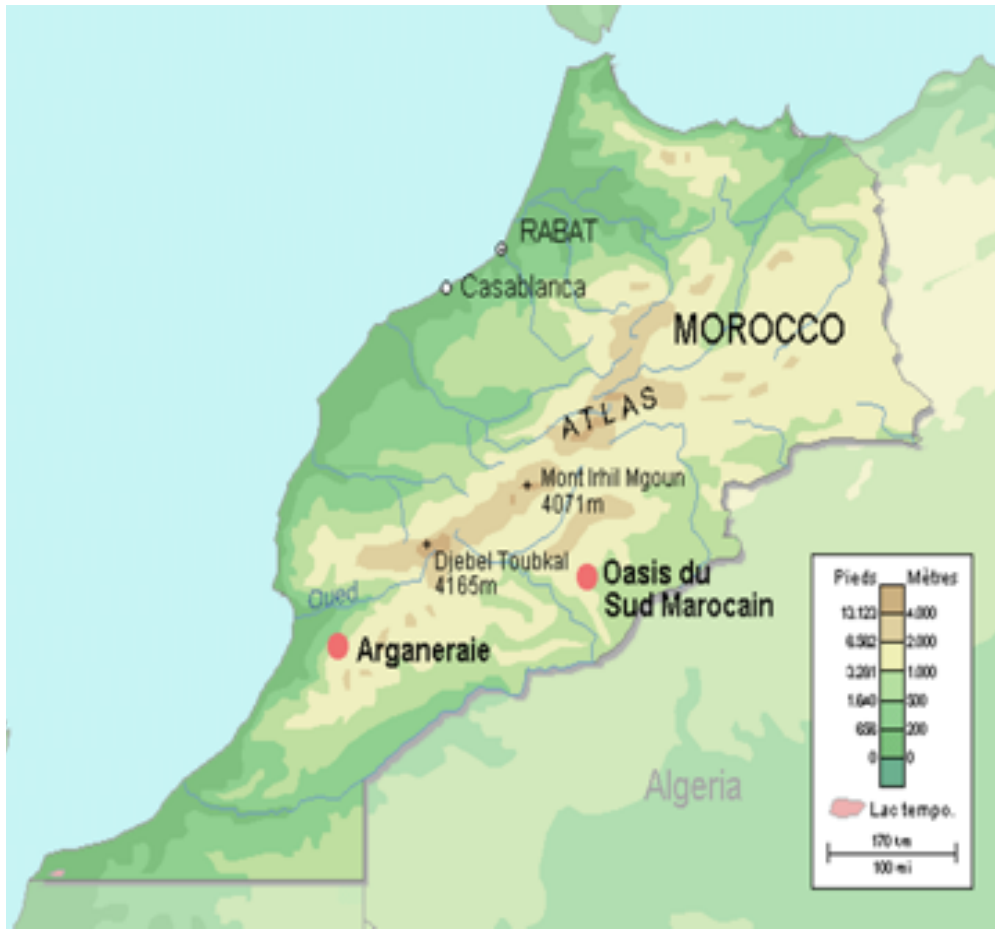
Mangrove, Nabq Protected Area, Sinai, Egypt   Photo vhheywood

The various forms of *in situ* conservation

1. Conservation of natural or semi-natural ecosystems in various types of Protected Area

2. **Conservation of agricultural biodiversity, including entire agroecosystems and the maintenance of domesticates**

Landscape of olive groves, Baeza, Jaén, Spain

Wild olives in Morocco

Photo VHHeywood

The various forms of *in situ* conservation

1. Conservation of natural or semi-natural ecosystems in various types of Protected Area

2. Conservation of agricultural biodiversity, including entire agroecosystems and the maintenance of domesticates

3. **Conservation and maintenance of target species in their natural or semi-natural habitats**

Phoenix theophrasti at Preveli beach, Crete, Greece   Photo VHHeywood

Argyrocytisus battandieri, mid-Atlas, Morocco Photo vhh

The various forms of *in situ* conservation

1. Conservation of natural or semi-natural ecosystems in various types of Protected Area

2. Conservation of agricultural biodiversity, including entire agroecosystems and the maintenance of domesticates

3. Conservation and maintenance of target species in their natural or semi-natural habitats

4. **Species recovery programmes**

Conservation of medicinal plants in St Catherine's Protectorate, Sinai

St Katherine's Protectorate, in situ enclosure

Ex situ native bulb collection, Nezahat Gökyiğit Botanik Bahçesi, Istanbul   Photo VHHeywood

The various forms of *in situ* conservation

1. Conservation of natural or semi-natural ecosystems in various types of Protected Area

2. Conservation of agricultural biodiversity, including entire agroecosystems and the maintenance of domesticates

3. Conservation and maintenance of target species in their natural or semi-natural habitats

4. Species recovery programmes

5. **Habitat restoration**

The scale of the problem

- The number of threatened plant species in the Mediterranean is not known and the threat status of only c. 7% of the 25,000 or so species have been assessed so far. Of these some 572 are threatened to some degree.

- The total number of threatened species in the Mediterranean region is probably 2–3000, **of which fewer than 10% have conservation or recovery plans.**

- The recorded number threatened plant species in the east and south Mediterranean is c.200 (or 312 if Turkey is included). **Very few have conservation or recovery plans.**

Clear mandate, weak implementation on the ground

- Despite the clear mandate under the CBD, targeted *in situ* conservation of species through recovery programmes remains a poorly understood process and has been practised on a substantial scale in only a few countries and scarcely at all in the tropics. Consequently, it has been undertaken for only a small percentage of threatened plant species.

- Species recovery can be complex and multidisciplinary and involves a series of procedures and actions which ideally should be undertaken in a logical sequence as part of an action plan.

- It often involves both *in situ* and *ex situ* actions and may be directed at a single species or at a group of species in the same area.

The role of Protected Areas

PAs are regarded as the primary defence against biodiversity loss, provided they are well maintained and managed. The growth of protected areas in number in the past 25 years to 202,000 at the present day, covering 14.7% of the world's terrestrial area, is rightly acknowledged as an outstanding achievement in global conservation.

There are, however, serious caveats to this apparent success story.

- For one thing, most biodiversity occurs outside PAs and it is now widely accepted that the present coverage of PAs is inadequate in terms of their extent, ecological representation and key areas of biodiversity.

- About half of them are inadequately managed and as a consequence, their ability to provide a safe and secure haven for the species of biodiversity concern that they contain is compromised unless actions to prevent or mitigate other harmful or threatening factors are taken. Extensive human activity within their boundaries can undermine their role and one-third of global protected land is under intense human pressure.

- The effectiveness of protected areas in conserving biodiversity is poorly known and the available evidence is at best equivocal, especially for plants.

- Many countries still depend on Protected Areas as their primary strategy to meet their commitments to conserve species *in situ*.

Global change and Protected Areas

- Today, potentially the greatest threat to protected areas is Global Change and in particular accelerated Climate Change.

- How far protected areas will continue to be effective in protecting biodiversity under projected climate change scenarios is still uncertain.

Defining species recovery

- The term **species recovery** (derived from the US Endangered Species Act) applies to the procedures whereby species as a whole, or targeted populations of species which have become threatened, for example through loss of habitat, decrease in population size, or loss of genetic variability, are recovered to a state where they are able to maintain themselves without further human intervention.

Whose responsibility is it?

The preparation and implementation of recovery plans may be carried out under the auspices of a wide diversity of bodies such as:

- various government departments,

- national or regional environment agencies,

- other government services,

- forestry institutes,

- university departments,

- botanic gardens,

- national or local environment or conservation associations,

- intergovernmental agencies,

- nongovernmental organizations (NGOs),

- the armed forces, and

- civilian society.

No global compilation of recovery efforts has been made and little information is available about success rates.

Senecio varicosus   Photo: VHH

Key elements of species recovery

- Inventory and assessment
- Initial protection and monitoring
- Establishing which species are of priority for conservation or recovery
- Preparing a recovery action plan
- Monitoring strategy and plan
- Consultation and review
- Implementation
- Aftercare

Saxifraga florulenta
Alpes Maritimes

Some of the key issues in species recovery

Species recovery and species reintroduction are often conflated in the literature and so as to avoid confusion it is recommended that they be distinguished as follows:

- **Species recovery** is the process whereby native species or populations within their indigenous range that have become endangered as a result of habitat loss, decrease in population size, or loss of genetic variability, are recovered to a state where they are able to maintain themselves without further human intervention.

- **Species reintroduction** is the deliberate translocation of individuals of a species to parts of its natural range from which it has been lost with the aim of establishing a new viable population.

- To provide clear guidance on how to plan and implement species conservation *in situ*, a manual of good practice on plant species recovery has been produced by BGCI and IABG (Heywood et al., 2018) which it is hoped will facilitate appropriate action.

Species recovery manual

Key messages

- Species recovery is multidisciplinary and requires teamwork

- Without a detailed understanding of the nature of the threats affecting threatened species and how to manage them, recovery efforts may be ineffective and valuable resources wasted

- The better prepared recovery actions are, the greater is the chance of success

- Rapid interventions may be tempting but usually only provide a short-term solution, and sooner or later will need a proper effective recovery programme

- Genetic knowledge is critical

- Recovery may be undertaken under a variety of land management regimes

- Wide range of management interventions

- The state of the translocation habitat is critical

- Monitoring is essential at all stages of recovery
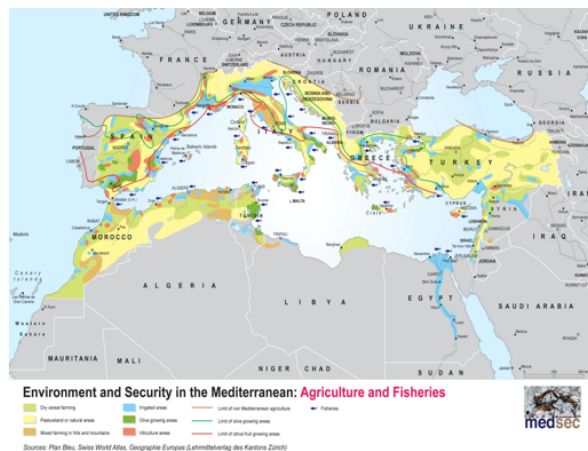
Climate change – the sword of Damocles

Climate change, interacting with other aspects of Global Change such demographic increase and population movements, alterations to disturbance regimes such as continuing deforestation and fire events, changes in agricultural patterns, and increased urbanization is predicted to have serious impacts on the flora and vegetation of the Mediterranean region.

34

A report[1] by an international network of scientists synthesizes the effects of climate change and environmental problems in the Mediterranean region. The key messages are:

➢ Future warming in the Mediterranean region is expected to exceed global rates by 25%, notably with summer warming at a pace 40% larger than the global mean.

➢ Even for a 'Paris-compliant' global warming of 1.5 °C, a 2.2 °C increase in regional daytime maxima is likely.

➢ This increase is expected to be associated with more frequent high-temperature events and heatwaves.

➢ In the eastern Mediterranean, heatwave return periods may change from once every two years to multiple occurrences per year.

➢ A global atmospheric temperature increase of 2 °C will probably be accompanied by a reduction in summer precipitation of around 10–15% in southern France, northwestern Spain and the Balkans, and up to 30% in Turkey and Portugal.

➢ Scenarios with 2–4 °C temperature increases in the 2080s for southern Europe would imply widespread decreases in precipitation of up to 30% (especially in spring and summer months).

Climate change – the unique situation of the Mediterranean region

Environment and Security in the Mediterranean: Agriculture and Fisheries

Sources: Plan Bleu, Swiss World Atlas, Geographie Europas (Lehrmittelverlag des Kantons Zürich)

The Mediterranean region plays a unique role in the context of climate change and its effects on biodiversity because it acts as a barrier to the migration of many plant species from south to north during the timescale of concern.

Because of the lack of a hinterland (arrière-pays, traspaís) that characterizes the climatic zone of the comparable Saharan hinterland, a new climate will develop in Mediterranean Europe as the consequence of climate change.

It is difficult to imagine what type of vegetation will occupy this space without extensive migration of species from North Africa although some species will probably arrive through long-distance dispersal. The vegetation will be vulnerable to invasive and weedy species and its is probable that those which already occur there will persist or extend their ranges while new species will become established.

Reactions of species to climate change

Faced with a changing climate and changing environmental conditions, plant species will react in different ways:

➢ they may persist *in situ* and keep their current range or in the case of short-lived species they may adapt to the new conditions over time through selection of suitable genotypes

➢ their distribution area may contract or shift

➢ they may respond with range expansions through migration

Species movements

- Some species will be able to migrate out of the current Mediterranean climate zone and track their climatic envelope northwards or altitudinally

- Some species will be able to adapt *in situ* to the changing climate

- Some species will migrate from the southern to the northern shores of the Mediterranean by long-distance dispersal

- Some species will not be able to adapt *in situ* or to migrate and therefore will become locally, or in the case of range-restricted species, totally extinct.

- Some existing invasive species will colonize niches left vacant and spread

- Some new alien invasive species will successfully occupy vacant niches and spread

Conclusions

- The maintenance and recovery of viable populations of species *in situ* is regarded by the CBD as one of the fundamental requirements of biodiversity conservation.

- A national species recovery strategy is desirable

- Many countries still depend on Protected Areas as their primary strategy to meet their commitments to conserve species *in situ*.

- But while Protected Areas have an important role to play, the presence of threatened species within a Protected Area is no guarantee of their successful conservation without further targeted action to remove threats to species within them.

- As a consequence, many threatened species in Protected Areas continue on a trajectory to extinction.

- All countries need to recognize the need for targeted *in situ* species conservation and invest much greater effort and resources in the recovery of threatened or other important species.

- We need to cooperate closely with area managers and plan for conservation, persistence, resilience and adaptation and try to minimize the risk of species extinctions from existing protected areas.

- In planning species recovery programmes, when reliable information is available about climate change and species' reactions to it, appropriate actions should be included to facilitate either the adaptation of species or their migratory capacity