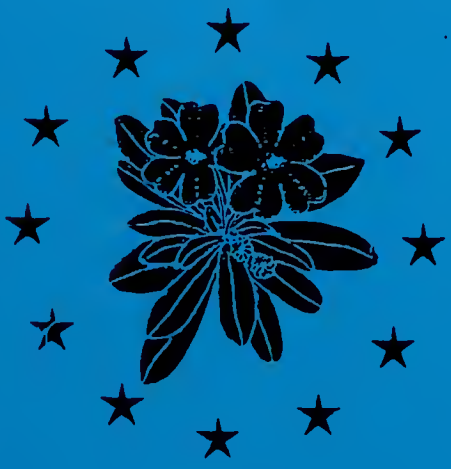
EUROPEAN PLANTS IN PERIL

A Review of Threatened Plants in the
EUROPEAN COMMUNITY



Compiled by the
WORLD CONSERVATION MONITORING CENTRE

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WORLD CONSERVATION MONITORING CENTRE

The World Conservation Monitoring Centre (WCMC) was formerly the Conservation Monitoring Centre of the International Union for Conservation of Nature (IUCN). Today, it is a joint venture between the three partners in the World Conservation Strategy: IUCN –The World Conservation Union, WWF – the World Wide Fund for Nature, and UNEP – the United Nations Environment Programme. Its mission is to support conservation and sustainable development through the provision of information on the world's biological diversity. Major IUCN publications prepared in close collaboration with WCMC include the IUCN Red Data Books and IUCN Protected Areas Directories.

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Cover *illustration* *Primula allionii*, a threatened plant found only in Italy and France

CONTENTS

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THE AUTHORS

Sue Everett has been deeply involved in plant conservation projects for many years. She served as Chairperson of the British Association of Nature Conservationists between 1985 and 1987 and most recently helped to develop and launch *Plantlife*, a new voluntary body devoted to plant conservation. She is currently a Director of the Nature Conservation Bureau.

Christine Leon has been managing the Threatened Plants Unit of WCMC since January 1988 and has almost ten years experience with IUCN promoting plant conservation in Europe and developing a data base of Europe's threatened plants. She has prepared the Council of Europe's *List of Rare, Threatened and Endemic Plants in Europe* published in 1983 and is a joint author of a recent reference work entitled *Plants in Danger: What Do We Know?* published by IUCN.

John Akeroyd is a freelance botanist who was formerly revising Volume I of *Flora Europaea*. He has travelled widely in the Mediterranean region and has published over fifty papers on its flora.

FOREWORD

*Professor Vernon H Heywood**

The European Community is rich in plant life. Within its frontiers it houses some of the world's most spectacular habitats and rich assemblages of plant species. Unfortunately many of these habitats have been encroached upon by the unrelenting march of human activity over the centuries. Indeed, many of the landscapes in the European Community are an artificial consequence of deforestation, agriculture (both small and large scale) and other changing kinds of land use. In recent years, reafforestation by exotic species not only changes the traditional landscape but diminishes the plant diversity.

This booklet draws attention to the problems of habitat loss or degradation within the territory of the European Community and presents a selection of those plant species which are, as a consequence, under threat. It explains in uncomplicated language the nature of the different kinds of threat and gives an outline of the measures that are needed to ensure the conservation of the plant species that are at risk.

Although only a small sample of the European Community's approximately 2,000 threatened plants are covered by this booklet, it will, I believe, serve its purpose in focusing the attention of the responsible authorities and decision-makers on the urgent need to conserve habitats and with them plant species threatened throughout the Community. If we are not to suffer further losses of our natural heritage, powerful instruments like the proposed 'Habitats Directive' will be needed.

All those who have been involved in the compilation of this booklet are to be congratulated on producing such an urgent and persuasive publication.

*Chief Scientist, Plant Conservation
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INTRODUCTION

This booklet covers a small, though representative, sample of the 343 plant species which have been proposed for listing on Annex 1b of the proposed 'Habitats Directive'. Even these 343 species are themselves only a fraction of the total of at least 2,000 threatened higher plants found in the European Community. Unfortunately, the information available for the far more numerous lower plants was not sufficient to prepare a similar range of species accounts as has been done for 50 or so higher plants included in this booklet. Nevertheless, a short section on lower plants has been included to draw attention to their particular needs which are no less urgent than those of higher plants.

Each species account in the booklet aims to provide the reader with a 'flavour' of the types of species which are threatened, the range of threats posed by damage and destruction of their habitats, and an indication of broad conservation measures which are needed to protect them. Maps showing the general distribution of each species are also shown. These, unless otherwise stated, do not show individual localities or their surface area, more the general location of one or more sites.

Most of the plants described herein are globally Endangered or Vulnerable as well as being threatened within the Community's own territory. The Community therefore has as much a special responsibility to ensure their conservation as have the countries supporting tropical rain forests to conserve their diminishing plant resources. As threats mount from every quarter, as ranges decline and numbers grow fewer, the future flora of Europe looks increasingly forlorn.

Plants of the European Community

The European Community is estimated to contain between 9,000 and 10,000 species of 'higher' plants. These are plants with vascular systems, and include herbaceous plants, grasses, ferns, sedges, rushes and trees. Today, in north-west Europe, it is an unusual event for a new species to be discovered - the floras of countries such as the Netherlands, Britain and Denmark are very well known and not particularly high in species (Figure 1). In contrast, the floras of the southern states, particularly Spain and Greece, are less well known, are much richer in species, and new species continue to be discovered. The Community contains about 4% of the world's 250,000 higher plants. Some of these species have tiny populations, often confined to only one or two Member States (Figure 2).

The conservation needs of lower plants are often forgotten. The lower plants include algae, fungi, lichens, mosses and liverworts. Relatively few scientists are interested in them compared to the higher plants, yet they play a very important role within natural and seminatural ecosystems and many are important to humans. For example, seaweeds and fungi are still eaten throughout the Community and lichens are of increasing interest due to their relative sensitivity to air pollution: some are important indicators of atmospheric quality. There are far more lower plants in Europe than higher plants - perhaps as many as 50,000 species! Though Red Data Books and Red Lists are being drafted for some groups of lower plants, at present there is practically no information for many groups and it is not yet possible to assign conservation priorities or develop conservation strategies for them.

Threats to Plants of the European Community

The main threat to European plants is the loss or degradation of their habitat. In northern Europe, there has been a dramatic decline of most natural and seminatural habitats over the past 40 years or so. Much of this damage and destruction has occurred in recent years as an indirect consequence of Community policies, notably the financial encour-

Figure 1: Numbers of native plant species in Member States and islands of the European Community.

Sources: Davis *et al.* 1986 *Plants in Danger: What do We Know?* IUCN, Cambridge.
Webb, D A 1978 Flora Euopaea: a retrospect. *Taxon*: 27(1): 3-14.

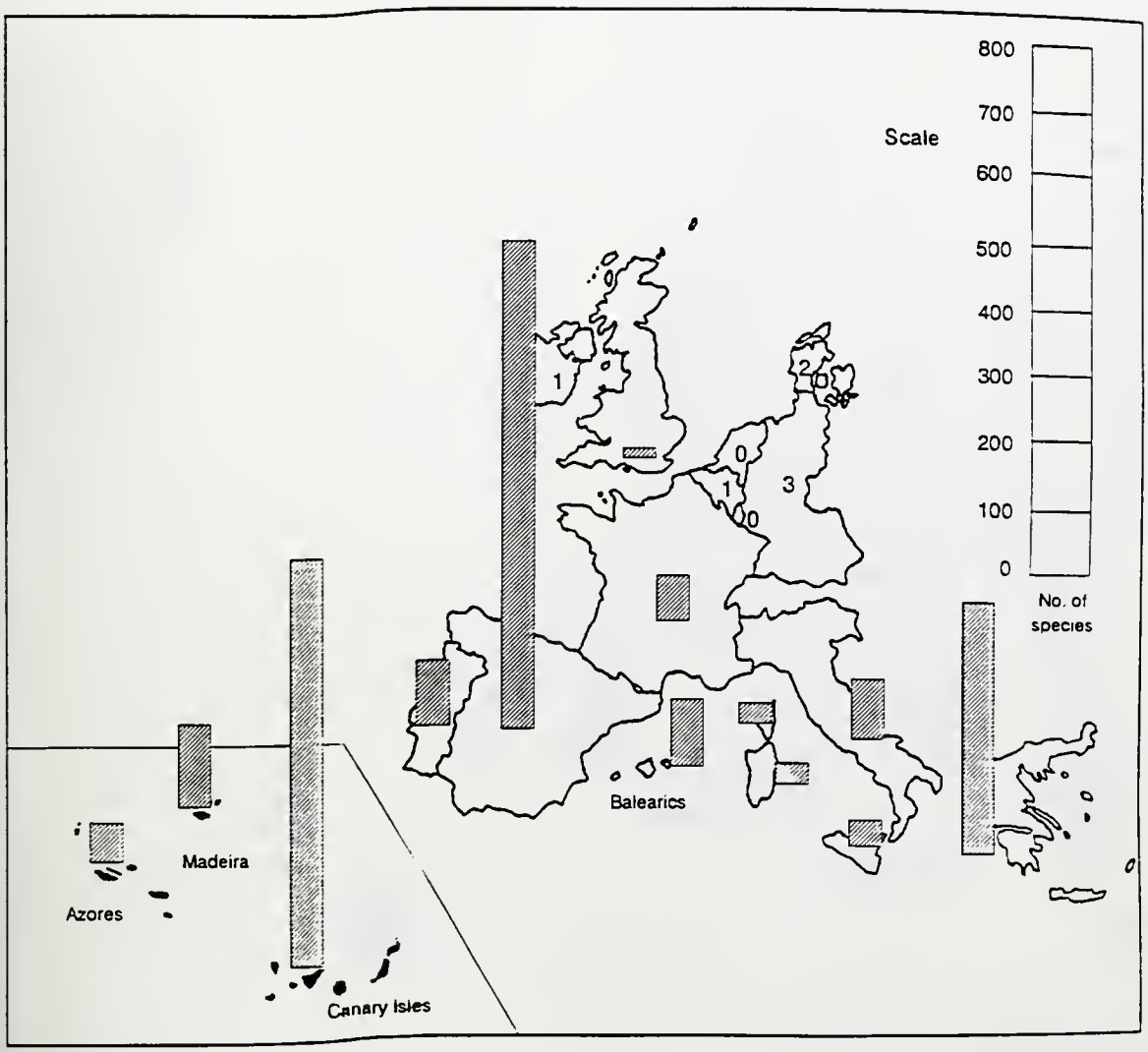


Figure 2: Numbers of endemic plants in Members States and islands of the European Community. Source: WCMC, 1989.

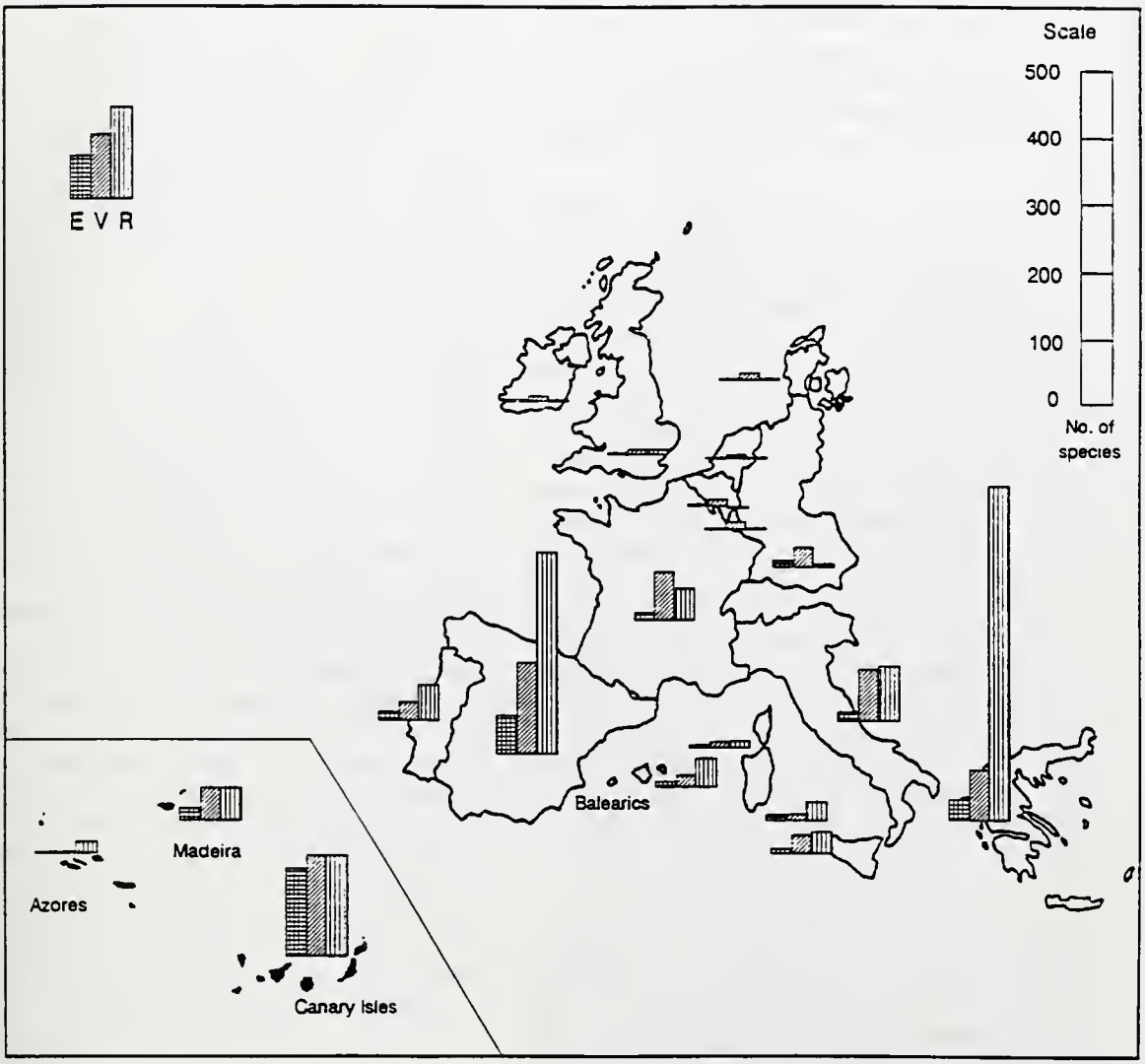


Figure 3: Numbers of Endangered (E), Vulnerable (V) and Rare (R) plants (on a European scale) in Member States and islands of the European Community.

Note: Only plant species threatened throughout their entire European distribution are represented.

Source: WCMC, 1989.

agement provided to farmers for increasing the area under crop production through the Common Agricultural Policy. Community funding for commercial forestry projects, such as the planting of conifers on Irish peat bogs and the planting of *Eucalyptus* on a massive scale in the Mediterranean region and Portugal, are more recent problems which are causing losses of important plant habitats in parts of Europe.

Many of the Community's threatened plant species (Figure 3) are found in coastal areas in the Mediterranean or in attractive mountain regions. Such areas are under immense pressure from tourist developments. The construction of holiday flats, hotels and chalets, sometimes supported with funds from the Community's Integrated Mediterranean Programme, destroys important plant habitats. Plants and their habitats also suffer due to the increased accessibility of formerly remote areas following tourism developments: fragile sand dune areas are trampled and sensitive mountain slopes are cleared of vegetation for ski-pistes. This booklet gives several examples of plants which are threatened by tourism including Curled Alkanet (*Anchusa crispa*), Savona Harebell (*Campanula sabatia*) and Sardinian Knapweed (*Centaurea horrida*).

The widespread problem of pollution has degraded many freshwaters in the Community with the result that formerly common water plants have disappeared from many rivers and lakes. The Pillwort Fern (*Pilularia globulifera*) and Floating Water-plantain (*Luronium nutans*) have both significantly declined owing to eutrophication (nutrient enrichment) of pools and lakes. The Pillwort, which has its most important strongholds in Britain, is now considered a Vulnerable plant in the European Community.

The European Community's Threatened Plants

Over the last 10 years, the Threatened Plants Unit of WCMC has developed a data base containing no less than 2,000 plant species under threat throughout the European Community. However, criteria for Annex Ib of the 'Habitats Directive' specify that, for higher plants, only those in the IUCN categories 'Endangered' or 'Vulnerable' (see below) at a European level may qualify for listing on it. With the help of botanists and conservationists from Member States, those of the 2,000 threatened species meet [illegible] criteria have now been identified and proc[illegible] listing in Annex Ib of the 'Habitats Directive'.

The definitions for all IUCN Red Data ca[illegible] are available from the Threatened Plan[illegible] WCMC, 53 The Green, Kew, Middx, TW9 3A[illegible]

Endangered species

According to IUCN, *Endangered* species are [illegible] which are "in danger of extinction and whose s[illegible] vival is unlikely if the causal factors continue op[illegible] ing. Included are taxa whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction."

Many Endangered plants have probably never been very common and they tend to be restricted to tiny areas of land. Many rare endemic species of the Mediterranean countries like Greece and Italy come into this category, including the Mount Killin[illegible] ant's-eye (*Adonis cyllenea*) and the Sardinian Gooseberry (*Ribes sardoum*). Because they are geographically restricted, the pressures on their habitat mean that there is a very real possibility of their becoming Extinct in the near future. Conserving their habitat, therefore, is essential. The management of these tiny sites through Special Protection Areas is very likely to be quite straightforward. Thus many Endangered plants could be protected fairly simply and for relatively small cost.

A number of Endangered plants were once more numerous, but never widespread. These have suffered declines almost to the point of extinction owing to the deterioration and destruction of their habitats. The Brittany Eryngo (*Eryngium viviparum*), for instance, has declined because of drainage of damp pastures and, in some localities, cessation of grazing. The Brittany Eryngo is a good example of a species which requires active management to ensure its survival, as it has become associated with traditional grazing and stock-keeping practices and cannot survive under modern land use systems.

Vulnerable species

IUCN has defined *Vulnerable* species as those which are "believed likely to move into the 'Endangered'

category in the near future if the causal factors continue operating. Included are taxa of which most or all of the populations are decreasing because of over-exploitation, extensive destruction of habitat or other environmental disturbance, taxa with populations that have been seriously depleted and whose ultimate security is not yet assured, and taxa with populations that are still abundant but under threat from serious adverse factors throughout their range."

Vulnerable plants are chiefly found in threatened semi-natural and natural habitats like sand dunes, wetlands and ancient forests. Examples include the Bristle Fern (*Trichomanes speciosum*) and Bog Orchid (*Hammarbya paludosa*). In general, Vulnerable plants would enjoy the greatest benefits from measures to protect, restore and enhance habitats.

Endemic Plants in the European Community

A significant feature of the European flora is the large number of endemic species which have always been recognised as a priority for conservation action. In particular, so-called 'point endemics' (species confined to a single locality or several adjacent sites), are characteristic of the mountain ranges of central and southern Europe (e.g. the Sierra Nevada of Spain), stretches of the Mediterranean coast (e.g. Greece) and some islands (e.g. Crete). Where many endemic plants grow together, for example in north-west Sardinia and in the Gennargentu mountains of east-central Sardinia, they form a 'centre of endemism'. These centres are obvious first targets for designation as Special Protection Areas under the proposed 'Habitats Directive'.

The Atlantic Islands

Due to their remote situation and ancient volcanic origin, the Atlantic islands (Canary Isles, Azores and Madeira) support a flora so distinct from that of continental Europe that they comprise their own botanical region. Indeed, there are so many endemic species in the islands that they provide one of the world's best demonstrations of evolutionary processes. Of special importance are the remaining upland laurel 'cloud' forests ('laurisilva') that harbour many threatened endemic plants.

Measures Needed to Protect Threatened Plants

Conserving the Habitats of Threatened Species

There are a number of relatively simple measures that individual Member States can take in order to secure the future of threatened plants.

For species restricted to a few small localities, it should be possible to establish suitable protected areas with full protection against any potentially damaging impacts. In coastal areas, for instance, public access may have to be restricted or carefully guided to reduce the effects of trampling. Elsewhere, the continuation of traditional land use practices such as grazing, burning and low-yield rotational crop production may be necessary. Enforcement of special protection and management measures like these demands trained staff who will be responsible for organising effective site management, liaising with local people, monitoring the threatened plants and carrying out other essential conservation work.

In some areas, habitat restoration could be undertaken. For example, some former French localities for Shore Dock (*Rumex rupestris*) have become invaded by the alien Hottentot Fig (*Carpobrotus edulis*) whose clearance from coastal areas could result in the restoration of suitable habitat for the dock - a plant that has declined over much of its European range.

Of course, for those species that may still be relatively widespread even if in continuous decline, it will not be feasible for Member States to designate all localities for such species as protected areas. Nevertheless, complementary measures relating to operation of general land use policy and practices in selected areas (perhaps designated as Environmentally Sensitive Areas under the Agricultural Structures Directive) can be instituted. Thus, potentially damaging projects proposed in or near localities for a listed species, including agricultural intensification, tourist development or commercial forestry would be diverted.

Proposal for an EC Council 'Habitats Directive'

It is the loss of plant habitats rather than picking or uprooting that poses the major threat to most plant

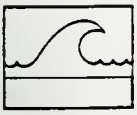
species. Sadly, few Member States have laws to conserve the habitats or sites of threatened species, although most have passed unenforceable laws or decrees listing them as 'protected' from collection, picking or uprooting. Measures to protect habitats and sites for threatened species would be far more effective, and the existence of a European Council Directive on habitat protection would serve to encourage the development of and bolster national legislation in this regard.

This is where the *"Proposal for a Council Directive on the protection of natural and semi-natural habitats of wild flora and fauna"* of 21 September 1988 breaks new ground: Annex 1b of this proposed Directive would oblige Member States of the Community to protect the habitats of listed plants by designating appropriate Special Protection Areas so as *"to ensure the maintenance of the species specified ... at a satisfactory level in all regions where they occur"*.

The protection afforded to threatened plants through the implementation of Annex 1b of the proposed Directive would provide a much-needed boost and encouragement to Member States to pursue the protection of threatened plant habitats. It is also hoped that practical help in the form of funds to help protect specific threatened plant localities will be made available, thus making resources possible to those Member States which have particular responsibilities for plant conservation according to Annex 1b. The implications of this Directive for promoting rural employment, whether directly for site management, or indirectly from low intensity countryside recreation, and maintaining rural cultures should not be underestimated.

Quick reference key

1: Habitats of Threatened European Plants



COASTLAND: Sand dunes, shorelines and intertidal areas, other habitats near the sea.

GRASSLAND and PASTURE

CLIFFS, ROCKY AREAS, SCREES

SCRUB, including MAQUIS and GARRIQUE (spiny shrubland characteristic to the Mediterranean Region)

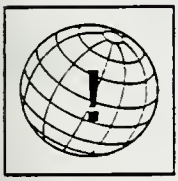
MOUNTAINS

WETLAND: Bogs, marshes, floodlands, saltmarshes.,

RIVER BANKS, RIVERS, STREAMS.

NATIVE FOREST AND WOODLAND

2: Threat status of plants in the European Community



Threatened at World level (and consequently also threatened in the European Community)

Threatened in the European Community (not threatened at World Level)

E

IUCN Category: ENDANGERED

Endangered species are those in danger of extinction i.e. whose survival is unlikely if the causal threat factors continue operating.

V

IUCN Category: VULNERABLE

Vulnerable species are those believed likely to move into the 'Endangered' category in the near future if the causal factors continue operating.

3: Threats to plants of the European Community

TOURISM: Development of tourist complexes, trampling of vegetation by tourists and other tourist-related disturbances

BUILDING CONSTRUCTION: Associated with urban, industrial and tourism development

FIRE: Usually associated with tourist pressures or 'management' of vegetation for grazing purposes.

OVERGRAZING: High stocking levels, causing destruction of vegetation, and in extreme cases, erosion

LAND DRAINAGE: Usually associated with reclamation of land for intensive agriculture

INTENSIVE AGRICULTURE: Including cultivation, land reclamation, and use of fertilisers

USE OF HERBICIDES (weedkillers)

INTENSIVE FORESTRY, including AFFORESTATION, the planting of non-native trees and various methods of intensive forest management

PICKING, collecting, cutting or uprooting of plants.

SKIING and disturbances associated with skiing, including bulldozing of vegetation for piste construction and erection of ski-lifts

RECREATION, TRAMPLING and similar human disturbance

QUARRYING, MINING

DEFORESTATION

INDUSTRIAL DEVELOPMENT

REGULATION OF RIVERS: including straightening banks, clearance of bank-side vegetation and dredging

AIR POLLUTION. including ACID RAIN

WATER POLLUTION: from sewage, agricultural fertilisers, industry

CONSERVATION SUMMARIES

1: HIGHER PLANTS

A selection of threatened species from Annex I(b) of the "Proposal for a Council Directive on the protection of natural and semi-natural habitats and of wild fauna and flora"

O Mount Killini: Probably extinct

● Mount Oligartos: Extant

Mount Killini Pheasant's-eye

Adonis cyllenea

[Ranunculaceae: Buttercup family]

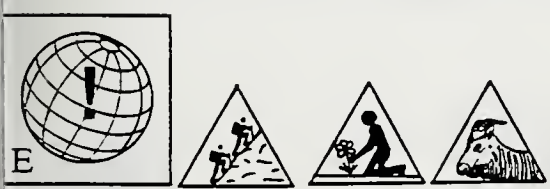
Mount Killini Pheasant's-eye is a perennial plant with handsome bright yellow flowers 2-3 cm across.

Discovered in 1948 on Mount Killini in the north-east Peloponnese, Greece, it was feared extinct for most of this century but in 1977 a small colony was found on Mount Parnias in the Oligartos massif south of Killini. Another botanist found a few plants in the same area in 1984, growing in a damp meadow surrounded by forest of Greek Fir at 1,340 metres.

Today the Mount Killini Pheasant's-eye is known from four small sites on Mount Oligartos, each consisting of less than 25 plants. Here it grows in damp pasture between 1,200 and 1,800 metres altitude. Its preferred habitat is thought to be in semi-shade at the base of limestone rocks which remain moist throughout the summer. The species appears always to have been rare and its future survival is threatened by the over-grazing of its habitat by sheep and goats. Killini is also subject to growing pressure from tourists who visit the mountain in increasing numbers for skiing, walking and mountaineering.

Conservation measures needed for the Pheasant's-eye will require at least partial exclusion of grazing animals from its fragile habitat. Such an attractive species also needs protection from plant collectors.

Fortunately the survival of the species in cultivation is secure because plants have been successfuly grown and propagated in botanic gardens. The priority is therefore to protect the natural habitat of the species and the surrounding area with a view to conserving the remaining wild plants, encouraging their increase and possibly introducing some artificially propagated plants in order to augment the tiny wild populations.



Apennine Adonis

Adonis distorta

[Ranunculaceae: Buttercup family]

This small plant with white, occasionally yellow, flowers, grows in high mountain areas of the Apennine Mountains in central Italy, where it is endemic. It is a 'pioneer' of lime-rich soils, being able to colonise coarse gravel and other unstable rock even when there is almost no soil, providing there is a constant source of moisture. Its habitat is therefore mostly breccias and coarse gravels on northern mountain slopes near snowfields.

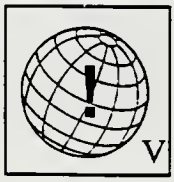
The Apennine Adonis is a very useful plant, being of medicinal value. The whole plant is poisonous and is used as a substitute for foxglove (*Digitalis*) as a heart-regulator, and also as a diuretic and for inducing hypertension. The flowers are also much sought after by casual visitors. For these reasons, its harvest and trade are regulated by a Royal Decree of 1932 and subsequent Regional Laws.

However, the main threat to the species is loss of its habitat. In recent times, it has declined because of road construction, the use of four-wheel drive vehicles and the development of ski resorts. The creation of ski slopes has seriously altered its habitat, due to clearance of the natural vegetation and levelling of screes and mountain slopes.

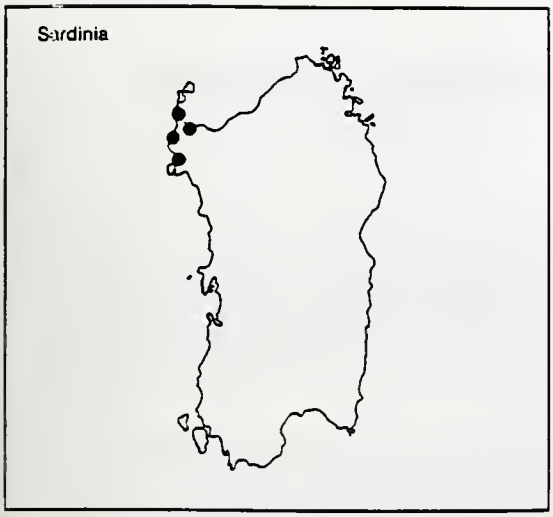
Some populations of this species are included in the Mount Sirente protected area but no protection has been specifically granted to the flora within this reserve.

So far, insufficient action has been taken to protect this threatened plant. Priorities for its conservation must include a full assessment of remaining populations with prompt action taken to protect and manage key areas of habitat where the Apennine Adonis grows.

Part of the Apennine Mountain range where Apennine Adonis occurs



restrictions placed on public access.



Curled Alkanet

Anchusa crispa

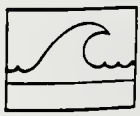
[Boraginaceae: Borage family]

This very rare plant grows in sand dunes near the sea and occasionally inland at altitudes between sea-level and 700 metres. It usually grows amongst Marram Grass (*Ammophila arenaria*) and Cotton-weed (*Otanthus maritimus*). It is endemic to Corsica and Sardinia. The few remaining localities in Corsica number ten at the most and are restricted to the southern end of the island at Favone, Bonifacio, Porto Vecchio and at the mouth of the River Rizzanese. It is now extinct at Santa Severa, Cap Corse and the beach at Portigliolo. The only known sites in Sardinia are on the north-west coast at Golfo Palma, Capo Argentiera on La Nurra and Capo del Falcone, and on the north coast near Porto Torrés, Stagno di Pilo and La Pelosa.

On both islands, Curled Alkanet is greatly threatened by trampling of its vulnerable sand dune habitat and by other activities associated with tourism, including seasonal beach cleaning. Sand-quarrying also threatens the plant at one Sardinian locality. The growth of coastal towns (largely associated with tourism) is posing an increasing threat to this plant throughout its range.

Urgent consideration must be given to designating the remaining localities as nature reserves, with some restrictions placed on public access.

Approximate area of distribution on Corsica



Atlantic Angelica

Angelica heterocarpa

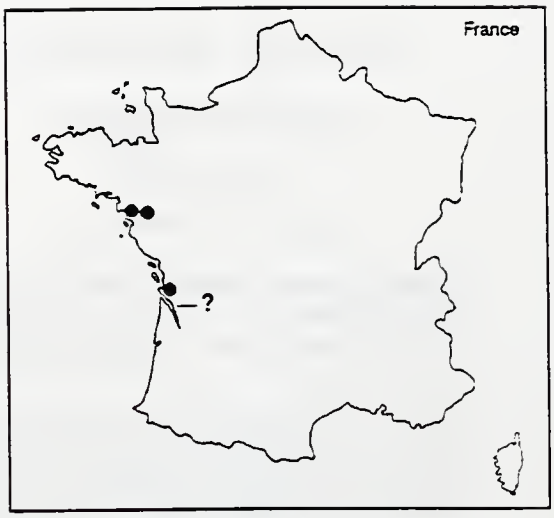
[Umbelliferae:Carrot family]

This plant is endemic to France, where it is restricted to scattered localities in the regions Loire-Atlantique, Charente-Maritime and Gironde-Dordogne. It grows in muddy areas along the banks of three tidal rivers and estuaries on the Atlantic coast, often in beds of reed (*Phragmites*).

Its habitats are particularly under threat in the estuary of the river Loire and in the Gironde-Dordogne region as a result of watercourse management and regulation. Such activities are reducing the amount of suitable habitat for the Angelica through the destruction of reedbeds and other areas of marginal vegetation.

One locality for the Angelica is located in a nature reserve which was established in 1983 over the Bruges Marshes near Bordeaux. This is one of the region's last remaining wetlands, and was originally protected for its migratory birds.

French botanists have recommended that all areas where this rare and endangered plant grow should be protected, and that conservation of the plants and wildlife which inhabit these wetlands must take priority over development projects, financial and sporting interests.



? Current distribution in this estuary uncertain. In 1961 known from the banks of the rivers Gironde, Garonne and Dordogne and along banks of the canal in the region of Hure, Fontet, Castets, Barie.

● *Astragalus aquilanus*
○ *Astragalus maritimus*
❑ *Astragalus verrucosus*

Astragalus verrucosus

Endemic Italian milk-vetches

Astragalus spp.

[Leguminosae: Pea family]

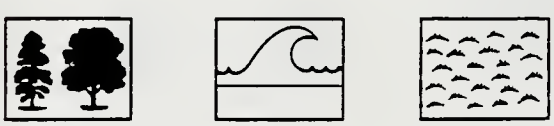
Three milk-vetches which are endemic to Italy are Endangered both at European and world level. As yet, no localities for these species are subject to habitat protection measures.

Astragalus aquilanus: This milk-vetch grows in grassy glades and in the edges of upland pine forest (altitude 800-1,000 metres) at four localities within 2-3 square kilometres of each other at Pineta di Roio near the town of L'Aquila (Abruzzo, central Italy). The area where the milk-vetch grows is easily accessible due to the proximity of a good road and it is also close to the town. Consequently, the pine forest habitat of the Pineta di Roio suffers from heavy recreational use. Many sections of the forest undergrowth have disappeared as a result, and the area is subject to dumping of rubbish.

Although the Pineta di Roio is municipal land, it is insufficiently protected. Action is particularly required to control visitor access.

Astragalus maritimus: Known from only one locality on the Isola di San Pietro, an islet off southwest Sardinia, *A. maritimus* grows on maritime sands and in coastal vegetation over an area of only 200 x 60 metres. Building construction for the tourist industry is considered a threat.

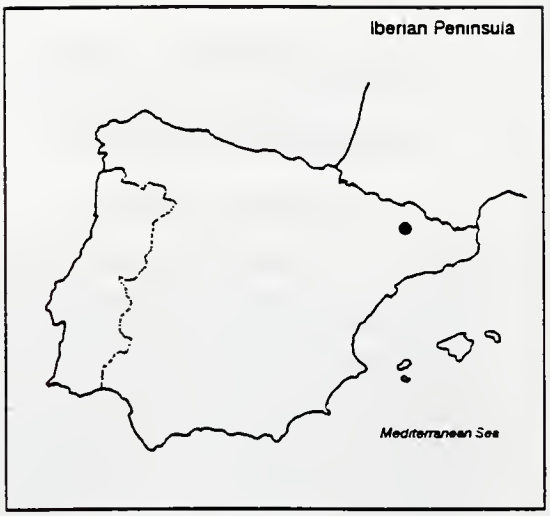
Astragalus verrucosus: Found only at one locality in southwest Sardinia in the coastal area of Arbus and south of Capo Frasca. It, grows in dry scrubby calcareous grassland near to the coast where it may be threatened by cultivation and other agricultural operations.



Chouard's Flowering Yam

Borderea chouardii

[Dioscoreaceae: Yam family]

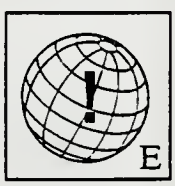


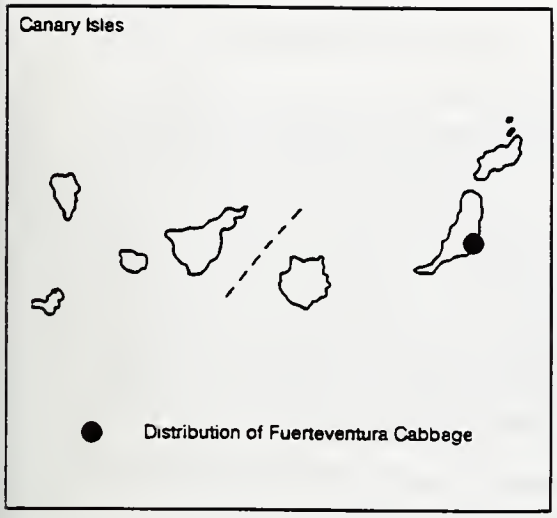
This is a plant which is on the way to extinction, with a total population of between 300 and 500 individuals. The sole population consists of three tiny colonies, in a tongue of land surrounded by a dam and road. In recent years, one of the colonies was almost totally obliterated due to widening of the road. Stones and other debris still threaten those that remain. Plant collectors pose an additional threat.

The *Borderea* is endemic to a small area in the north of the Province of Huesca, north-east Spain, where it grows between 800 and 840 metres. It is dependent on shade and cool summer temperatures and is therefore found growing in rock fissues with a north or north-easterly aspect.

Apart from the ever-present threat of collection, the construction of a dam in recent years has adversely affected the microclimate of its fragile habitat and it is believed that this has directly caused the local extinction of several colonies.

No conservation measures have been instigated to safeguard the remaining colonies of this species. Attempts have been made to propagate it in cultivation, but these have not been very successful. There is a need, therefore, to continue attempts at artificial propagation. More important is the pressing need to protect the habitat of the species, by declaring the remaining colonies and their surrounding environment as small nature reserves and ensuring that any future developments do not cause further damage to the plant's habitat. Collection and picking should be prohibited, with the exception of properly regulated taking of bulbils and seed for an approved conservation programme involving artificial propagation.





Some threatened wild cabbages

[Cruciferae Cabbage family]

The wild relatives are ancestors of our domestic cabbages (including cabbages, broccoli, kale, kohl-rabi and cauliflower) are centred in the Mediterranean region. An important group of these plants occurs on coastal cliffs and rocks, especially in the islands of the western Mediterranean region and on Crete. Coastal plant communities in the European Community are increasingly threatened by development of even quite remote areas for tourism. As a result, several wild cabbages are threatened, including the following species:

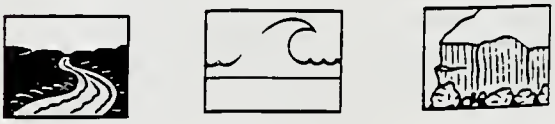
Egadi Cabbage: *Brassica macrocarpa*

This rather shrubby plant has leafy stems up to 60 cm, yellow flowers and thick, woody boat-shaped seed pods. It occurs only on the Egadi Islands of Favignana and Marettimo off the coast of western Sicily. These islands are rapidly being developed for tourism, resulting in the destruction of coastal rocks and low cliffs where the Egadi Cabbage and other endemic plants grow. Areas of cliff should be protected from building and safeguarded from the effects of adjacent tourist developments.

Sardinian Cabbage: *Brassica insularis*

This is another rather shrubby plant, with lobed basal leaves and stems 30–80 cm tall, fragrant white or pale yellow flowers, and slender seed-pods up to 8 cm long. It is found at scattered localities on the coasts of Sardinia and Corsica and on the small island of Pantelleria off Sicily. It also occurs in Tunisia, although Europe is its main centre, and the Corsican plants are regarded as a distinct, unique variety. The plant is not in immediate danger, but is very vulnerable to coastal development.

Fuerteventura Cabbage



Hairless Cabbage: *Brassica glabrescens*

This cabbage has a somewhat different habitat to those described opposite, being found along gravelly and stony banks of the rivers Meduna and Cellina, north of Pordenone in north-east Italy. It is a small plant up to 25 cm tall, woody at the base, with rather narrow leaves and a few yellow flowers. Hairless Cabbage is related to a group of dwarf cabbages of mountains and open ground in the lowlands from south Spain to the western Alps and was first described in 1973. Its restricted habitat is unusual for a cabbage, and the plant is vulnerable to gravel extraction and other human interference with the river banks.

Fuerteventura Cabbage: *Crambe sventenii*

This wild cabbage is a peculiar white-flowered endemic plant confined to the island of Fuerteventura (Canary Isles) where it grows in mountain peaks and ridges of the south-central region at an altitude of between 200 and 400 metres.

Five colonies are known, each with no more than 5-20 individuals. The plant is confined to cliff crevices and fissures away from the reach of predatory goats. Originally the plant formed part of an olive woodland community which has virtually disappeared on Fuerteventura and which has been replaced by semi-desert scrubland leaving many of the islands rare endemic plants in a very precarious state.

Two of the five populations are included in protected areas according to the "Ley de Espacios Naturales" approved by the Canarian Parliament, Parques naturales de Pozo Negro and Montaña Cardones.

● Egadi Cabbage
○ Trapani Cabbage
□ Sardinian Cabbage
■ Hairless Cabbage

Legal protection should be given to the sites outside the natural parks. Additionally, seeds should be propagated and a programme of reintroducing plants to the wild should be funded. Because of the potential economic value of the species, seed needs to be bulked up for conserving in a local gene bank. More generally, the problem of goat-grazing on Fuerteventura needs to be seriously tackled. Should goats be excluded from sensitive zones it is possible that some degraded natural areas may recover and some of the rare endemic species could naturally extend their range and so reduce their current vulnerability.

These cabbages represent an important genetic resource as relatives of cultivated crops. For example, another species: Cretan Cabbage (*Brassica cretica*) is thought to have given rise to the cauliflower of commerce. The Cretan Cabbage is a plant of coastal cliffs and gorges by the sea in Crete and southern Greece. The Domestic Cabbage also grows on cliffs in the western Mediterranean, from where it was taken centuries ago to many countries around the world. The rare wild cabbages of the western Mediterranean have characters such as longevity and perhaps resistance to diseases that may be of value in any future plant breeding programmes. The seeds of the genus *Crambe* yield a commercially important vegetable oil and *Crambe sventenii* may be of value as it has the largest seeds of any species in the genus, but its oil content and other potentially useful properties have not yet been studied.

Protecting the habitats of the Endangered and potentially useful species should be a priority with restrictions placed on activities such as building development and tourism at sensitive localities. In the case of *Brassica glabrescens* controls over gravel extraction are necessary so as to ensure future protection of its habitat. It is also important that seeds are held in gene banks with a view to future phytochemical studies and artificial propagation.

Savona Harebell

Campanula sabatia

[Campanulaceae: Bellflower family]

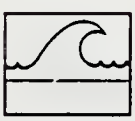
Savona Harebell is an attractive small blue-flowered plant which grows in bare places. Its usual habitats are limestone rock crevices and coarse gravels associated with maquis vegetation. This habitat is often shared with other endemic Italian plant species.

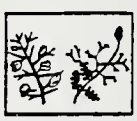
This plant is unique to north-west Italy and is known only from a few coastal localities south-west of Savona. This includes the islets of Gallinara and Bereggi, the headland of Capo Noli and some additional localities up to 12 kilometres inland. The species may also occur in northern Bordighera.

Savona Harebell is threatened due to fire, building construction, road building and collecting. Increasing pressure from tourism is of concern at Capo Noli.

There have been long standing proposals to establish a number of regional parks and reserves on the island of Gallinara and at Capo Noli but so far no sites have been adequately protected.

The localities at Capo Noli, Rocca di Perti and on Gallinara island are considered top priority for habitat protection and would benefit from Special Protection Area (SPA) status.

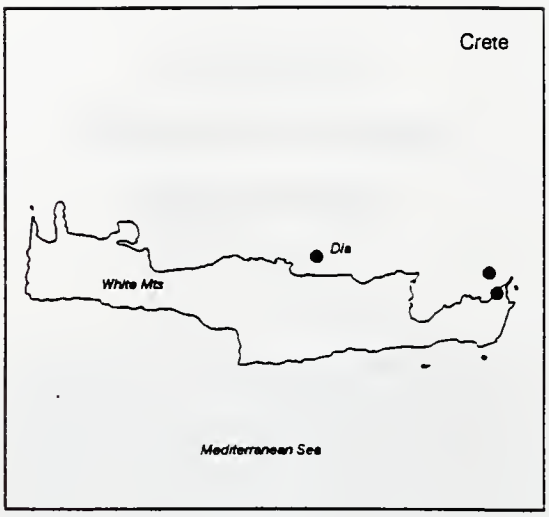




Dia Carline Thistle

Carlina diae

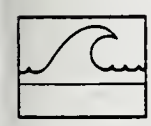
[Compositae: Daisy family]

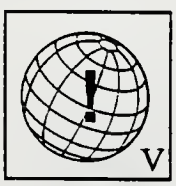


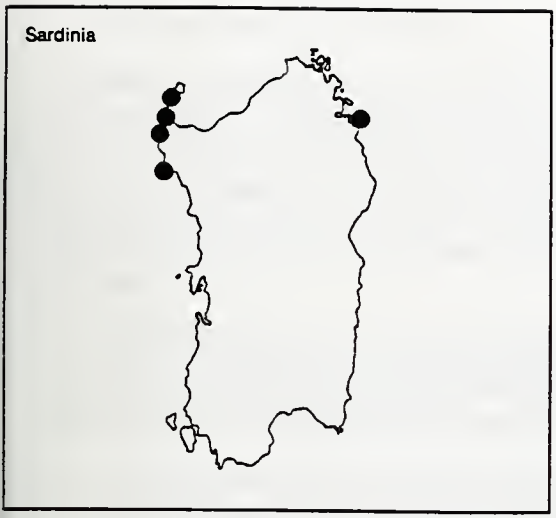
This hairy, spineless, dwarf shrub grows up to 60 cm high and has flat-topped clusters of yellow flower-heads, each 1.5-3.5 cm across. It is found only in a few coastal localities in northern Crete. It was first discovered on the island of Dia off the northern coast near Iráklion, and later at two coastal localities on the Sidheros peninsula and on two islets, Dragonada and Yionisádhos, on the coast of Sitia province in north-eastern Crete. The Sitia populations are not immediately endangered, but are vulnerable due to the small numbers of plants present. Goats that have been introduced to the islands threaten the plant's survival.

The situation with the plants on Dia is more serious. Since 1958 this island has been a refuge for the Cretan Ibex or Cri-Cri, the famous wild goat of the White Mountains. These were threatened in their native habitat and were introduced to Dia to protect them. However, they have caused considerable damage by grazing the island's plants and only three plants of the Dia Carline Thistle could be found in 1973, although others may have survived on inaccessible ledges and cliffs. Since the goats are now surviving well in the White Mountains, it should be possible to move at least some of them back to their native range.

Domestic goats should also be removed from the islands off Sitia to preserve those populations of the thistle. The Dian and Sitian plants are genetically different, and it is therefore important to protect plants in both areas in order to conserve the genetic diversity of this species, which is handsome enough to have a future as an ornamental plant.







● *Centaurea horrida*

Endemic Mediterranean knapweeds

Centaurea spp.

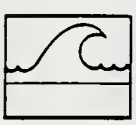
[Compositae: Daisy family]

Knapweeds have flowers that are similar in appearance to thistles, but their foliage is less spiny. The flowers are attractive - usually purple, pink, yellow or white. They are an important element of the flora and vegetation in the Mediterranean region, where some 180 species, and many subspecies, occur in the European part alone. Knapweeds are a significant component of dry grasslands and are a characteristic feature of old meadows. Some species are plants of rocks, cliffs, stony ground and other disturbed or open habitats.

At present we know rather little about many of the rare knapweeds of the Mediterranean. They are of great scientific interest for understanding evolution and plant geography, and their distribution is often associated with that of other endemic species. The knapweeds are genetically interesting and appear to have undergone considerable evolutionary radiation in the Mediterranean, particularly in Greece and the Balkans. Many of them are widespread and common in the region but nine of those endemic to single Member States are Endangered at country, European and World level.

The populations of these Endangered species are small, confined to a few localities and mostly occupy only tiny areas (in some cases a few square metres). Despite this, no habitat protection measures have been comprehensively undertaken at any of their sites, although a number are severely threatened and some may have already been lost.

Centaurea horrida

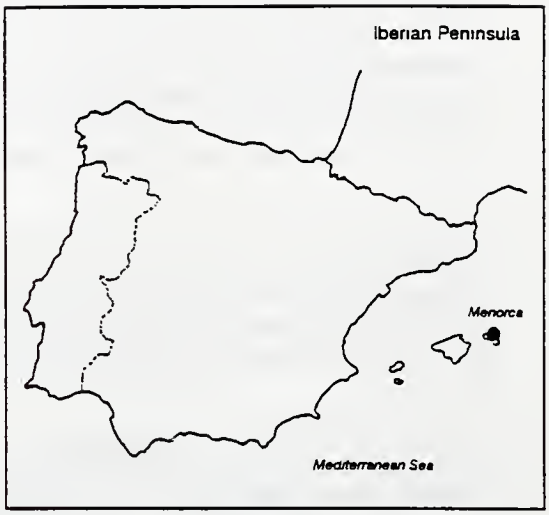


The nine Endangered endemic species are:

Centaurea balearica: Endemic to the north coast of Menorca (Balearic Islands, Spain) where it grows in sandy areas near the sea. Only five populations are known and all contain a small number of individuals. One of the populations has been reduced (cut in half) by the construction of a road to the beach. Uprooting of mature plants has occurred in at least one other population.

This knapweed grows up to 1.5 m tall and up to 2 m in diameter. The survival rate of young plants is poor, so the presence of mature plants is very important to maintain a source of seed for future regeneration.

The remaining sites for this rare species need official protection by designating their habitats and surroundings as small nature reserves. In these localities, competition from other species needs to be reduced. Where appropriate, the remaining wild populations could also be reinforced by introducing plants propagated in cultivation.



● *Centaurea balearica*

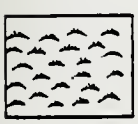
Centaurea heldreichii: Known only from one coastal locality on calcareous rocks in western Greece, east of Mesolongion, between the mountains Varrasova and Klokova. The population is small: part of it is threatened by quarrying and urgently requires protection.

Centaurea horrida: This species is endemic to rocky coastal areas in northern Sardinia where it occurs in two sites on the mainland and on three islets off the north-west coast. The maquis and garrigue habitats in which *C. horrida* grows are of great biological importance - they also hold populations of other plants unique to the region and therefore merit special protection for the purposes of both habitat and species conservation.

Tourist developments are a major threat. For example, at Capo del Falcone tourism complexes and new roads were being built in the 1970s, which resulted in the dissection of one *C. horrida* locality.

On the islet of Tavolara, tourism and military constructions threaten another site. Tourist developments also threaten the localities at Capo Caccia and Punta del Giglio. On one occasion, vegetation was irreparably damaged when the area was used to make a film – part of the requirements of the script involved destroying a good deal of the vegetation. In addition, after the film was shot, the area was set on fire to destroy remnants of the scenery.

The designation of key *C. horrida* localities has been called for by the Inchiesta del Gruppo Conservazione Natura della Società Italica, who have recommended that nature reserves be established on Isola Asinara, Isola di Tavolara, Capo del Falcone, Capo Caccia and Punta del Giglio.






H *Centaurea heldreichii*
K *Centaurea kalambakensis*
L *Centaurea lactiflora*
M *Centaurea megarensis*
N *Centaurea niederi*
Pe *Centaurea peucidanifolia*
P *Centaurea princeps*

Centaurea kalambakensis: Endemic to two localities in Greece, on the rocks of the Meteora near Kalambaka in central Greece (near the famous monasteries), and at one locality in Pella province (Macedonia) where only 30-40 plants have been found. The Macedonian population is apparently under threat from the use of herbicides and requires urgent protection.

Centaurea lactiflora: Endemic to a small area near the village of Koniskos, 15 kilometres east of Kalabaka in central Greece. Its habitat is dry roadsides and field margins. Some time ago it was considered to be under threat from a road-widening scheme and may, in fact, already be Extinct.

Centaurea megarensis: Endemic to the summit of Mount Gerania in western Attica, to the east of the isthmus of Corinth where it grows in small and scattered populations and is under considerable pressure from overgrazing by sheep and goats.

Centaurea niederi: Endemic to western Greece this plant is known from calcareous rocks and cliffs on roadsides near Mount Arakinthos above Mesolongion and in the north-west Peloponnese (Achaia province). In total, less than 80 plants are known from these two localities.

Centaurea peucedanifolia: Endemic to Mount Athos in northern Greece where it is restricted to two sites, one an area of 200 metres of roadside near the port of Daphni, the other in the vicinity of the monastery of Agios Pavlos, where it grows on rocks and walls. The roadside locality is vulnerable to road improvements.

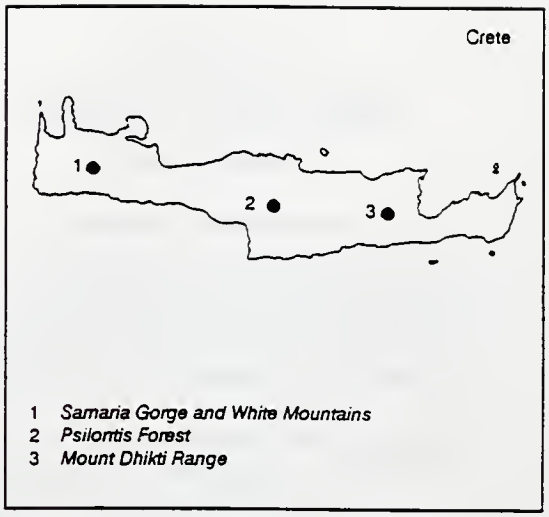
Centaurea princeps: Endemic to Mount Timfristos above Karpenision in central Greece where only a few plants are known, growing close to a quarry.

Cretan Helleborine

Cephalanthera cucullata

[Orchidaceae: Orchid family]

This small orchid with slender stems 15-30 cm tall bearing a loose cluster of up to 20 creamy-white to pink flowers is restricted to about six localities on Crete. The localities are situated in the south-west (Samaria Gorge National Park and White Mountains), central Crete (Psiloritis forest) and eastern Crete (Mount Dhikti range). The orchid grows at altitudes of between 700 and 1,500 metres in montane forest and scrub of native cypress, Calabrian Pine and Kermes Oak.

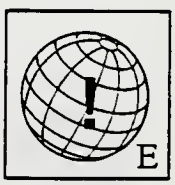


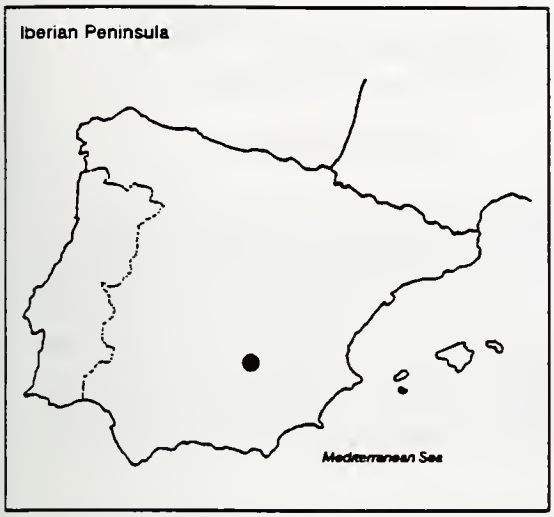
1 *Samaria Gorge and White Mountains*
2 *Psiloritis Forest*
3 *Mount Dhikti Range*

Detailed studies of three localities during the 1970s showed a decline from about 150 plants to perhaps less than 30 over seven years. Recently, three additional localities for this rare species were discovered, in 1985 and 1986, one with a population of about 150 plants. In total there are probably less than 250 plants of this Endangered species.

Like several Greek and Cretan endemic plants, the Cretan Helleborine has probably always been rare and could easily become Extinct. Overgrazing by sheep and goats is the principal threat, and urgent action is required to fence off plots to protect the surviving plants. This would allow the vegetation to recover and give the orchids a chance to flower and set seed.

Although many of Crete's endemic plants are widespread and under no threat, those that have only small populations, such as Cretan Helleborine and Cretan Catmint (*Nepeta sphaciotica*) are particularly susceptible to the heavy grazing pressure in the island's mountains. Small nature reserves to protect the habitats of such species should be established, with partial or total exclusion of grazing animals.





Coincy's Rock Cabbage

Coincya rupestris

[Cruciferae: Cabbage family]

This biennial herb with yellow, violet-veined flowers, lives in north-facing crevices of vertical karstic limestone rocks in the Sierra de Alcaraz in the province of Albacete, Spain. It is restricted to an area of about 0.4 square kilometres at an altitude of 1,100 metres.

A site survey in 1979 estimated there to be as few as 500-1,000 flowering plants plus perhaps twice as many non-flowering individuals.

Present threats are from building construction coupled with collecting. There is also a possible threat from another plant species (*Sisymbrium arundonum*) which occupies the same ecological niche and may compete for space with the Endangered *Coincya*. Careful monitoring is therefore essential to ensure that the *Coincya* does not become displaced by the *Sisymbrium*.

The seeds of Coincy's Rock Cabbage were once used locally as a kind of mustard but this use has now ceased. It is of considerable scientific interest and belongs to a small group of related endemic Spanish species.

No conservation measures have yet been taken for this plant but the creation of a small reserve has been recommended. Strict vigilance will be needed to ensure that building does not encroach on the area. Its habitat and setting are attractive and very vulnerable to development.

Brittany Eryngo

Eryngium viviparum

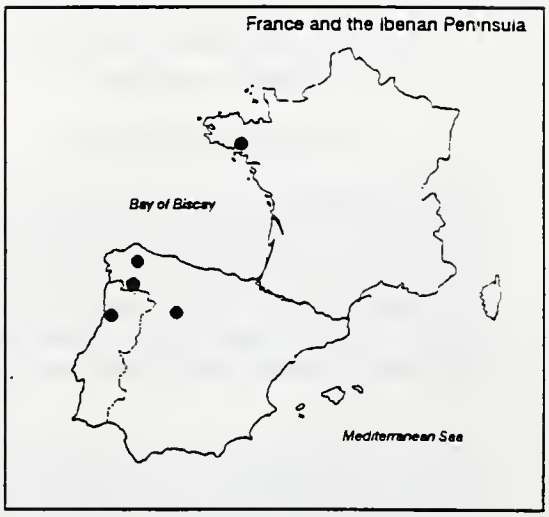
[Umbelliferae: Carrot family]

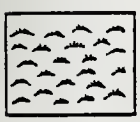
The eryngos are a group of distinctive plants with sharply spined leaves. The Brittany Eryngo is known from Brittany (France), around Porto (northern Portugal) and Spain (north-west, Galicia and Léon). In both Portugal and Spain the plant is severely Endangered and is threatened with extinction. In France, the plant probably survives at few more than ten localities distributed over a small part of Brittany. The plant is confined to these three Member States of the European Community.

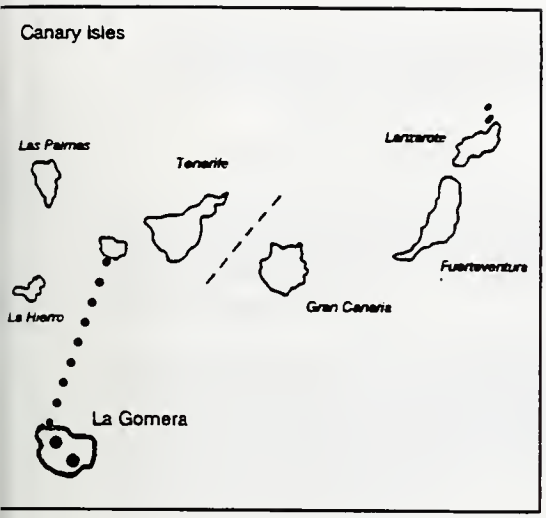
The Brittany Eryngo grows in damp pastures, in depressions which are subject to winter flooding. Many populations have disappeared due to the abandonment of pastures and the removal of grazing stock. As a consequence. such areas have become invaded by tall vegetation in which the eryngo has been unable to survive.

Other localities where the eryngo used to grow have disappeared due to urban and industrial development, afforestation by pines and land drainage. Trampling is an additional problem to populations around the French town of Carnac.

The creation of nature reserves for the protection of this species and its habitat is urgent. In such reserves control over the water regime will be necessary to ensure the maintenance of winter flooding. In addition, the grassland must be grazed to prevent invasion by tall vegetation.







Gomeran Spurge

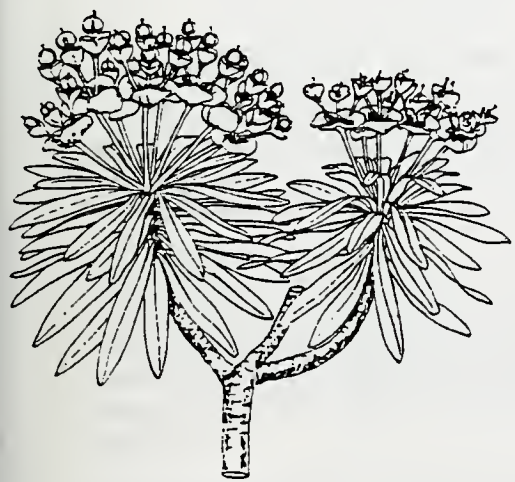
Euphorbia lambii

[Euphorbiaceae: Spurge family]

Only three small populations of this local endemic of the Canary Isles are known. As its name suggests, the Gomeran Spurge is confined to the island of La Gomera, where it lives in damp crevices or at the foot of cliffs at the lower edges of the laurel forest zone between 600 and 1,000 metres. It grows in damp shallow soils, usually in small groups of three or four plants.

Over-grazing is one of its main threats throughout most of its small area of distribution, and in some places its habitat has been reduced due to the clearance of native laurel forest and its replacement with inappropriate forestry species. Furthermore, the immature fruits tend to suffer insect damage and many capsules develop without seeds.

Populations on the north-west side of La Gomera are protected in the Lomo de Carreton park but an important population at Benchijugua is without formal protection. This situation could be rectified by extending the boundaries of the Los Roques park down to 700 metres. In addition, to prevent genetic erosion, it may be appropriate to bulk up the wild population using material of wild origin that has been propagated locally.



Sicilian Bedstraw

Galium litorale

[Rubiaceae: Madder family]

Endemic to western Sicily, this plant is restricted to coastal sands. Its habitat is much threatened by agricultural developments and by building construction for the tourist industry.

Sicilian Bedstraw is known from near Marsala, Mazara, Selinunte and Campobello at a total of four localities within about 30 km of one another. Protection of a large area of coastal sand is essential to arrest the continuing decline of this species.

● Downy Gypsophila
○ Sicilian Bedstraw

Downy Gypsophila

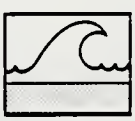
Gypsophila papillosa

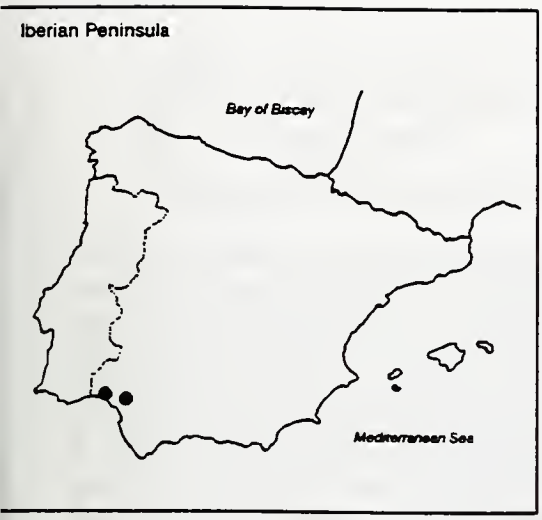
[Caryophyllaceae: Carnation family]

This species is only known from one locality in northern Italy, above the eastern shore of Lake Garda, where it grows on dry stony soils in hills between 50 and 200 metres above sea level.

Field observations in 1970 indicated that the entire population of the plant was confined to an area less than 0.25 hectares but since then it has apparently declined even further. The species is considered to be in great danger of extinction due to building developments as well as from collection (mostly by foreign botanists).

The whole belt of hills around Lake Garda are being irreparably damaged by building construction associated with the tourist industry. Despite this, the critical habitat where Downy Gypsophila continues to survive so precariously remains unprotected.





Spanish Gaudinia

Gaudinia hispanica

[Gramineae: Grass family]

This grass species occupies a very limited and disjunct area; the two known localities on the Huelva Coast in south-west Spain are 70 kilometres apart.

The natural habitat of the *Gaudinia* is sandy acid soils with a low water table, where it forms part of the ground vegetation normally found under stands of Stone Pine (*Pinus pinea*).

In the past two decades one of its localities was subject to disturbance and afforestation with *Eucalyptus*, an activity which has affected wild species and habitats throughout the region in recent years. Fortunately, the *Gaudinia* has so far survived below the planted *Eucalyptus*. However, it is feared that in future years accumulating litter from the planted trees will alter nutrient levels in the soil and prevent the plant's survival at this locality.

The second locality is situated inside the Doñana National Park and therefore there is some regulation over development of its habitat.

It is possible that further populations occur between the two existing disjunct ones so the surrounding area ought to be explored. In any case, the most westerly locality which has been subject to *Eucalyptus* afforestation, should be given some protection and the population monitored regularly. If the species begins to decline as a result of the effects of litter accumulation from the *Eucalyptus*, then measures will need to be taken to restore the original habitat. This will involve clearance of the *Eucalyptus* and restoration of the semi-natural Stone Pine woodland.

Styx Globularia

Globularia stygia

[Selaginaceae: Globularia family]

The Styx Globularia is a prostrate, woody, perennial with slender branches, small almost circular leaves, and compact heads of tiny violet to bluish flowers. It grows in small numbers on rocks and screes above 2000 metres on a few mountains in the northern Peloponnese in Greece, principally Mounts Chelmos and Killini. The summit areas and higher ground of these two mountains are excessively grazed by sheep and goats and despite their rich floras there is no protection for rare species such as this Globularia.

The area in which the plant grows on Chelmos is the steep northern slopes of the mountain in the Styx valley, a region which together with the adjacent Zarouchla forest to the east is rich in narrowly endemic plants and other rare plants that are otherwise found only in northern Greece or Anatolia. The steep cliffs of the Styx valley provide some protection against grazing, but increasing tourism threatens the Styx Globularia and other rarities through collecting.

The Styx valley requires national park status, as it is an area of outstanding botanical importance. It also has considerable cultural interest, as the cave from which the waters of the river Styx emerge was to the ancient Greeks the entrance to Hades, the river being the River of the Underworld.

Bog Orchid

Hammarbya paludosa

[Orchidaceae: Orchid family]

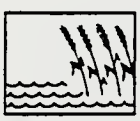
Indicates present in these States (scale too small to map accurate distribution)

This small and inconspicuous green-flowered orchid grows in acid bogs in north-west Europe, with a range extending circumpolar to temperate north-east Asia and North America. In Europe it extends from Ireland eastwards to European Russia.

Bog Orchid grows in one of Europe's most threatened habitats: peatland, where it is usually found growing with *Sphagnum* moss and other typical peatland plants.

Everywhere in Europe this wetland habitat is greatly threatened by land drainage, peat-digging, reclamation for agriculture or other developments, and by afforestation. As a result, this orchid is threatened over three-quarters of its European range, including Belgium (declined by 80%), Czechozlovakia, Denmark (declined by 90%), the Faeroe Isles, Finland, France, the Federal Republic of Germany, Ireland (declined by 90%), the Netherlands (declined by 75%), Romania, Switzerland and Russia. In some of the other European countries in which it occurs it is experiencing serious decline as a result of habitat destruction. For example, although the Bog Orchid is not officially considered as threatened in Britain, it has been lost from at least 50% of its former localities since 1930. In particular, many of its Scottish strongholds are inadequately protected and have been lost or are threatened by afforestation.

Conservation priorities for this species must include the special protection of all major localities of European importance, and the prevention of further declines by ensuring that damaging activities such as forestry and peat-digging are directed away from places where the Bog Orchid grows. In those Member States where the Bog Orchid has declined by 90%, all remaining localities ought to be protected.



Detailed distributional information

The following information has been obtained from various plant atlases which have mapped the distribution of rare and threatened plants in certain Member States. However, figures on very recent declines are difficult to compile. Many of the plant atlases use 1950 or earlier as a base-line for recording the presence of absence of a species. For example, data from the Federal Republic of Germany records that Bog Orchid has been recorded from 53 'hour-squares' since 1945. It is likely that significant land use changes since then have led to the disappearance of Bog Orchid at many localities within these squares. The scale of decline is therefore considerably greater than might therefore be assumed from the data provided below.

Belgium

Formerly known from 25 localities but since 1940 it has only been seen in four of these.

Denmark

Before 1950, there were 112 areas of suitable habitat for Bog Orchid in Denmark. Since 1950, 93 of these areas have been destroyed, usually as a result of land drainage for agriculture. Of the 19 localities (probably less now) that were thought to remain, most were situated in lowland mires along the west coast, with a few very scattered and ecologically separated localities on islands to the east.

Federal Republic of Germany

Before 1945, Bog Orchid had been recorded from more than 190 'hour-squares', with many localities in the extreme north: Schleswig-Holstein, Lüneberg, Hanover and Weser-Ems districts, and in the south along the Austrian border. Since 1945, it has only been recorded from 17 'hour-squares' in the north of the country and 37 in the south. Bog Orchid is considered as Endangered in the Federal Republic of Germany.

France

A rapid decline in the species has been recorded throughout France to the extent that it is now Extinct in a number of regions such as the Paris Basin and Lévezon. Bog Orchid is considered as Vulnerable in France.

Ireland

Formerly known from more than 50 sites but has only recently been seen at six sites, although it is possible that it has been overlooked in others. However, many peatland sites in Ireland have been destroyed or damaged over the past 30 years as a result of peat-digging, drainage and afforestation.

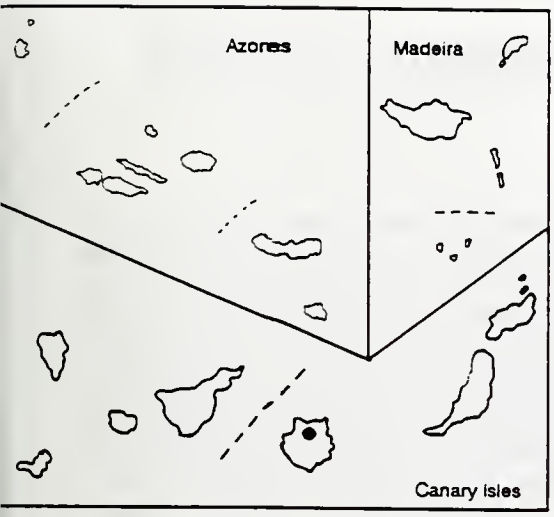
Netherlands

Before 1950, the Bog Orchid was known from 122 hour-squares scattered throughout the Netherlands. Since 1950, it has been observed in only 33 of these. This decline has been caused by land reclamation and particularly by drainage and the use of agricultural chemicals, especially fertilisers.

United Kingdom

Bog Orchid still occurs in over 150 localities in England, Scotland and Wales but nevertheless, this figure masks a serious decline experienced over the past 50 years. Britain is considered to hold more than half of the total population of Bog Orchid in north-west Europe, with the main stronghold in western Scotland, where there are over 100 localities. Elsewhere in Britain, the species is confined to a few scattered localities with a notable population in the New Forest (a large area of lowland heath in southern England with associated lowland mires, maintained by traditional grazing and commoning practices).

As in many other countries of north-west Europe, Bog Orchid has declined in recent times as a result of land drainage and other land improvements for agricultural purposes and due to commercial afforestation of peatlands by conifer trees.



Cockscomb Foxglove

Isoplexis chalcantha

[Scrophulariaceae: Foxglove family]

Endemic to the island of Gran Canaria, Canary Isles, where only four populations with a small number of individuals (5-20) are known from the north slopes of the island between 600 and 800 metres above sea level. This foxglove is always associated with the scarce remains of laurel forest ('laurisilva') on Gran Canaria, particularly in ravines of the humid, shady mountainous part of the island, specifically Los Tiles de Moya and Barranco de la Virgen.

Of the Canary Isles archipelago, Gran Canaria is the island most affected by forest clearance, with only about one percent of its original laurisilva surviving.

Isoplexis species are used in local popular medicine as anaesthetics in the treatment of toothache, for treatment of diabetes and as a cardiotonic. In addition, chemical studies have revealed that this genus contains glucosides which are important as heart stimulants.

Populations of the Cockscomb Foxglove are included within the limits of the Monte Doramas Natural Park, recently established by the Canarian Parliament. Additional specific measures which need to be taken to ensure the future survival of this species include the development and implementation of a conservation management plan specific to the plant and its natural habitat. Studies of the species' reproductive biology and a programme of artificial propagation should also be adequately funded.

Watson's Lettuce

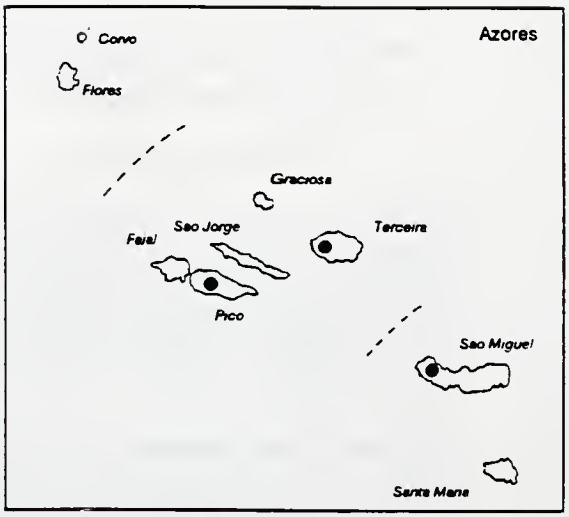
Lactuca watsoniana

[Compositae: Daisy family]

This large white-flowered perennial grows up to 2 metres tall. It is one of Europe's rarest plants, found only in a few small sites in the Azores Archipelago, on the islands of Sao Miguel, Terceira, Faial and Pico at 500-900 metres above sea level, in sheltered places on wet ground, in ravines and old volcanic craters. In these locations Watson's Lettuce is often found growing with other plant species which are endemic to the Atlantic Islands or are otherwise threatened in the European Community, including the ferns *Woodwardia radicans* and *Trichomanes speciosum*.

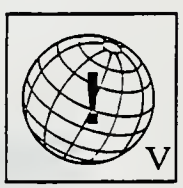
Watson's Lettuce prefers locations with a permanent water supply or permanently moist ground in combination with high relative humidity and is restricted to the native laurel cloud forests ('laurisilva') for which the Atlantic Islands are so famous. The laurisilva contains some of the rarest plants of the Azores as well as some endemic birds such as the Priôlo or Azores Bullfinch. In the Azores this habitat is severely threatened and very little now remains due to clearance of the forest for agriculture and for plantations of Japanese Larch (*Cryptomeria japonica*). For example, the forest of Caldeira da Santa Barbara on Terceira requires urgent protection - as recently as 1986, *Cryptomeria* was being planted at this important site, although this activity may now have stopped.

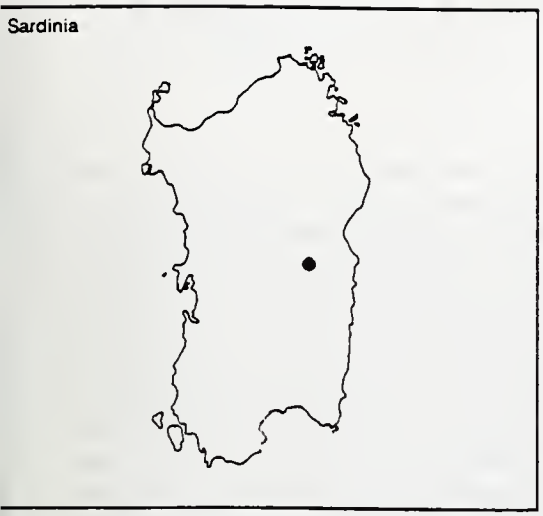
Even those areas of unexplored and relatively inaccessible laurisilva may hold populations of rare endemic plants, and it is therefore important that the remaining laurel cloud forests are given full protection. Two of the sites for Watson's Lettuce in the Caldeira da Santa Barbara (Terceira) and on north-east O'Pico (Pico) are very small. The population on O'Pico is in a small wooded gully only about 15 metres square and is completely surrounded by pasture. Urgent measures are therefore required to protect these fragile and vulnerable areas.



● Known extant localities for *Lactuca watsoniana*:
Caldeira da Santa Barbara (Terceira)
North-east O'Pico (Pico)
Lagoa do Canario (Sao Miguel)

A few other localities, not recently confirmed (not mapped) have been recorded for Pico, Terceira and Faial.





Sardinian Thistle

Lamyropsis microcephala

[Compositae: Daisy family]

The Sardinian Thistle is a very thorny thistle with whitish-pink flowers. It occurs over a small area on the western and southern slopes of Mt. Bruncu Spina in the Monte del Gennargentu. The thistle is a montane species and grows at altitudes of between 1,500 to 1,700 metres on rocky slopes vegetated with scattered shrubs (such as juniper), herbs and grasses.

Its habitat is badly degraded by intense grazing and grubbing by semi-feral pigs and is additionally threatened by the construction of winter ski facilities. These pressures together contribute to soil erosion, a general threat to the area. The thistle occurs over a restricted area totalling no more than one hectare, so far unprotected, and it is considered one of Sardinia's most threatened endemic plants.

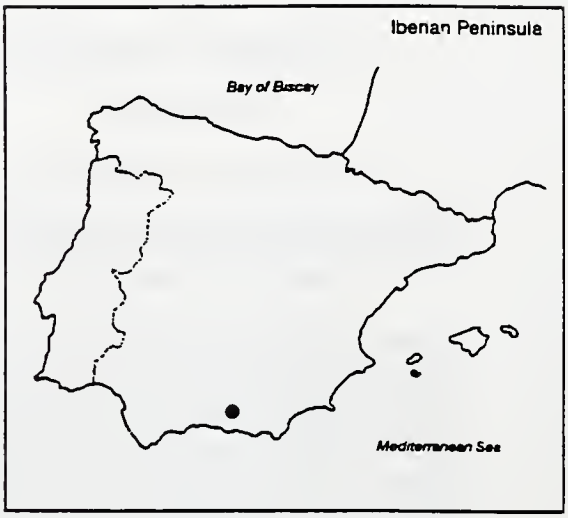
The Monte del Gennargentu supports an extremely rich and diverse flora with many endemic Sardinian plants in addition to the Sardinian Thistle, some of which are found nowhere else on the island. Locally important medicinal plants such as the Great Yellow Gentian (*Gentiana lutea*), Purple Foxglove (*Digitalis purpurea*), together with a variety of mints, thymes and junipers also grow in profusion.

However, the threats to the Sardinian Thistle are also responsible for the general degradation of the area as a whole. It is essential that the region is declared a protected area and that appropriate management is introduced to redress problems of erosion and vegetation destruction. Priority measures are the regulation of grazing and tourism to levels compatible with the conservation of the region's plant life.

Long-rayed Laser

Laserpitium longiradium

[Umbelliferae: Carrot family]



This species used to be abundant along the banks of the River Monachil in the Sierra Nevada mountain range of southern Spain. However, only one small population numbering a dozen individuals is currently known, growing at an altitude of between 1,200 and 1,500 metres. At the only known locality, the plant grows on very wet ground in almost total shade. It is thought that the former localities have become unsuitable for this wetland plant owing to pollution of the River Monachil and other damaging activities which have affected its headwaters. For example, for some years the river has been receiving all the effluent from a ski resort. The species' survival is further threatened due to overgrazing of its habitat by local goat herds.

The Sierra Nevada is recognised as one of the most important areas of plant diversity and endemism in the whole of Europe. More than 60 plant species are endemic to this mountain range and in 1988 the highest part of the mountain range was declared as a Natural Park. Despite this, the region continues to be subject to increasing tourism development and damage from mining. As a result, the specialised ecological requirements of rare plants such as *Laserpitium* are becoming increasingly scarce.

Measures are urgently needed to improve protection of the Sierra Nevada as a whole. These include extending the limits of the Natural Park and effective implementation of a conservation management plan. Such a plan will need to consider the placing of restrictions on future tourism and mining developments, control over grazing pressures and the installation of effluent treatment plants in existing tourist developments so as to reduce water pollution.

A programme of artificial propagation should also be undertaken for the *Laserpitium*, together with regular monitoring of the wild population and its habitat.

Maléa Toadflax

Linaria hellenica

[Scrophulariaceae: Foxglove family]

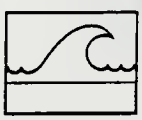
The Maléa Toadflax is an annual plant with branched stems up to half a metre tall, narrow fleshy leaves and showy yellow flowers about 1.5 cm long.

This rare and Endangered species is confined to a few coastal sites in the south-eastern extremity of the Peloponnese (Greece), within an area of about 20 square kilometres on the Maléa Peninsula around the town of Neapolis and on the nearby island of Elafonisos. Only discovered and described in 1955, the toadflax has probably always been rare due to the restricted area of its habitat of sandy beaches and other level sandy areas (both cultivated and uncultivated) near the sea. More recently, it has become critically threatened by the loss of this habitat through modern agricultural methods, especially the use of herbicides. The open, coastal habitat is naturally unstable, and is under threat from both tourism and industrial development.

By the late 1970s Maléa Toadflax was present in only four of its seven known stations. The remaining population are tiny, with the largest containing some 100 individuals, while three others support only a handful of plants each.

Suitable sandy areas in and around the localities of this Endangered plant require urgent protection. In particular, damaging activities such as herbicidal weed control and building construction for tourism and industry must be prohibited in these areas.

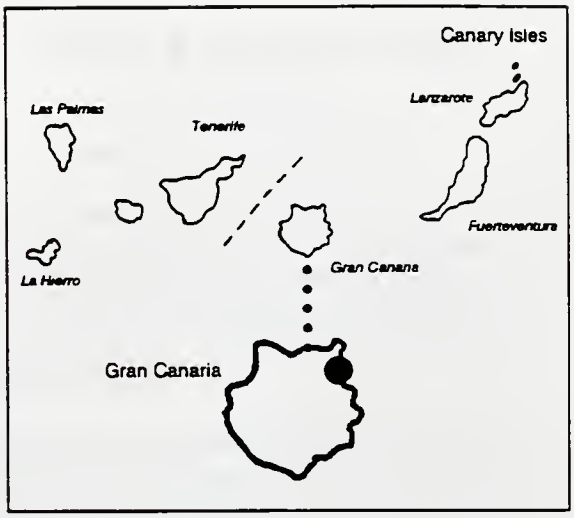
A specis of *Linaria*



Succulent Birdsfoot-trefoil

Lotus kunkelii

[Leguminosae: Pea family]

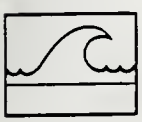


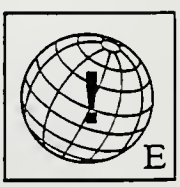
Endemic to Gran Canaria, the Succulent Birdsfoot-trefoil is known only from a single very threatened locality at the mouth of the Barranco de Jinamar. It is a prostrate, woody-based plant with succulent leaves bearing long silky hairs. It grows in the littoral sands on the coast between 15 and 20 metres above sea level.

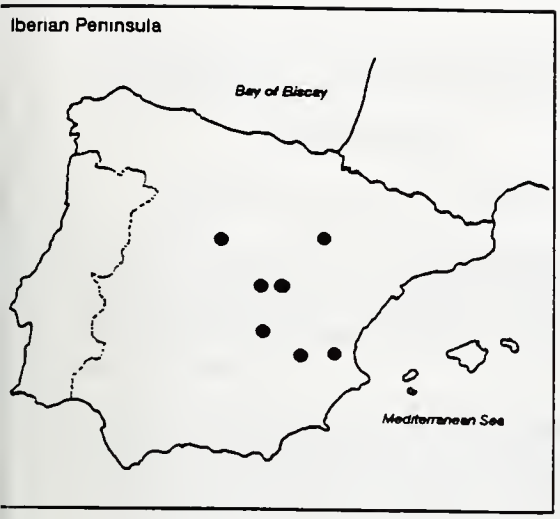
Until the early 1960s several populations of this species occurred along the sandy areas of the coast of Gran Canaria but extraction of sand for construction, and disturbance from roadbuilding, urban development and other activities have had an enormous impact on the habitat of the plant, reducing its distribution spectacularly.

The only surviving locality is extremely small (approximately two hectares) and is situated between the coast and the main Las Palmas Airport road and alongside industrial sites containing seawater distillation and electricity generating stations.

Although the site where the trefoil grows has been declared a protected area by the Canarian Parliament no specific or effective habitat conservation measures have yet been taken and protection against all negative activities, particularly mineral extraction, is required. Artificial propagation of the species in a botanic garden is likely to be successful if funding can be secured and this could, in turn, lead to a programme of reintroducing the species to suitably protected habitats in the wild.







Wavy Loosestrife

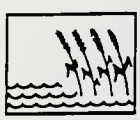
Lythrum flexuosum

[Lythraceae: Loosestrife family]

Wavy Loosestrife is a small annual plant, 3-10 cm tall, with pinkish-purple flowers. It is a wetland species, preferring seasonally inundated depressions, and is found in sites scattered throughout central Spain in the provinces of Toledo, Ciudad Real and Cuenca y Guadalajara. It may also occur in the provinces of Albacete and Teruel.

This loosestrife grows on the edges of brackish pools and depressions on subsaline and mineral-rich soils which are flooded in the winter and which usually dry out at the beginning of the spring. Like so many other wetland habitats, this habitat has been severely reduced throughout Spain due to widespread land drainage and pollution. As a result the scattered populations of Wavy Loosestrife have declined dramatically.

To protect this threatened plant, it is necessary to establish small reserves to ensure the protection of the main populations. These reserves should be protected from further drainage operations. Consideration should also be given to controlling the use of agricultural fertilisers and other sources of pollution in the vicinity of sites where the Wavy Loosestrife grows.



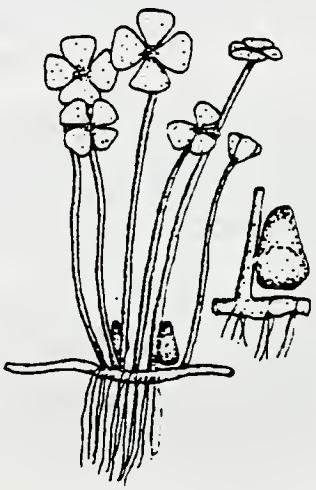
Hairy Clover Fern

Marsilea strigosa

[Marsileaceae: Clover Fern family]

The Hairy Clover Fern, as its name suggests, has long-stalked leaves of four wedge-shaped hairy leaflets arising from a short creeping stem. Also on the stem are lentil-sized pods containing reproductive bodies (spores).

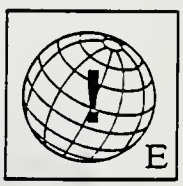
This highly Endangered plant is found in seasonally wet hollows in *maquis* and in similar rock depressions on basalt and other metamorphic rocks such as schistose gneiss. It withstands the long dry summers of the Mediterranean climate, by losing its leaves, and protecting its vulnerable spores in a thick horny pod. This splits open during winter rains and the sticky spore mass is believed to be dispersed on birds' feet.

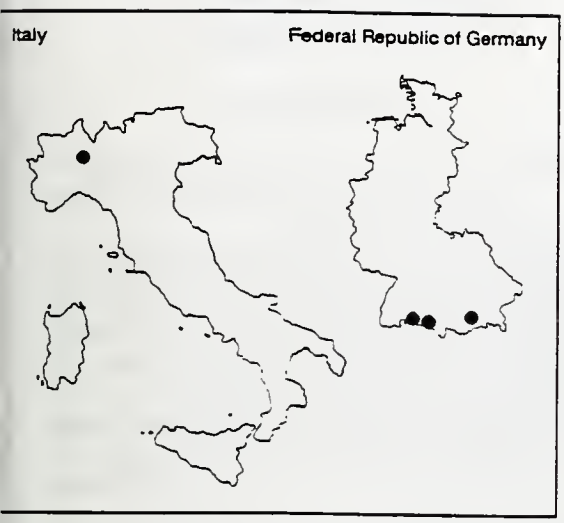


In total, it is estimated that less than 50 plants of the Hairy Clover Fern survive today. Its few localities are situated in south-east Italy and Sardinia, Menorca (Balearic Isles) with another possible site in south France (Herault). In Menorca, the locality is under threat from tourism development. At the French site, although the fern is protected in a nature reserve, it is in danger of becoming overgrown by encroaching vegetation due to lack of suitable management.

Outside the European Community, the fern is found only at two coastal localities in Algeria and Morocco, where it is also rare and threatened.

A closely related species *Marsilea batardae* is also Endangered, and its total world population is confined to Portugal and western Spain.





The Lake Constance Forget-me-not

Myosotis rehsteineri

[Boraginaceae: Borage family]

In the European Community, this species occurs in restricted areas in the Federal Republic of Germany and Italy where it grows along the shores of Lake Constance near Langenargen, Kressbronn, Constance and Bodman, and on the banks of the river Rhine down to Basle. It is also known from the shores of Lake Starnberg and from along the banks of the river Ticino. This species is endemic to the Alps. Outside EC states, it occurs in Austria, Liechtenstein and Switzerland where it is considered Endangered.

Along the shores of Lake Constance, the Forget-me-not grows on sand and shingle associated with other wetland plants characteristic of shallow water and periodic submergence.

The species has experienced a rapid decline due to tourist pressure (especially camping and boating), pollution and consequent eutrophication. Water pollution is thought to have caused the extinction of the Lake Constance Forget-me-not in the Lake Lugano area.

Some of the localities around Lake Constance are protected, but eutrophication remains a problem. A combination of habitat protection, improved pollution control, habitat management and restocking measures is required if the continuing decline of this species is to be prevented.





Cretan Mint

Nepeta sphaciotica

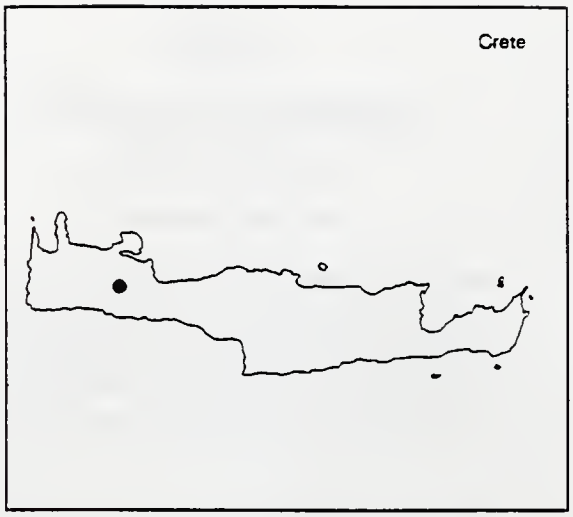
[Labiatae: Mint family]

The Cretan Mint is a perennial herb with white flowers, which grows to a height of about 10-20 cm.

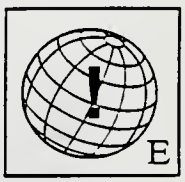
This Endangered plant is one of many species which are endemic to the island of Crete, where it grows on the northern side of Mount Svourichti in the Lèvka Ori (White Mountains) at an altitude of about 2,300 metres. The plant is confined to calcareous rocks and screes on a north-facing slope. Like many of the rare endemic plants of Crete, this species has always had a restricted distribution and inhabits a relatively inaccessible location.

However, there is concern that overgrazing in the Cretan mountains may be threatening the survival of the Cretan Mint because sheep eat the flowers and prevent the production of seed. In the late 1960s less than 50 plants were found to be surviving and the species is now considered to be in great danger of extinction unless a combination of habitat protection and other conservation measures can be immediately taken.

The main priorities are to protect the habitat from overgrazing, with parallel measures to take the species into cultivation with the aim of reintroducing nursery-grown plants back into the wild. Without these measures, the Cretan Mint may well become extinct in the near future.



A species of *Nepeta*



Distribution of Elb Water Dropwort in the Federal Republic of Germany. Belgian localities not shown (data not available).

Elb Water Dropwort

Oenanthe conioides

[Umbelliferae: Carrot family]

This plant is known only from the valley of the Lower Elbe and tributaries between Zollenspieker/Howe near Hamburg and Gluckstadt in Schleswig-Holstein, Federal Republic of Germany, and two localities in Belgium. It grows with other tall wetland plants in riverside wetlands dependent upon a special flooding regime.

The Elb Water Dropwort has declined in all its locations. In the FRG it is primarily threatened by dyking and deepening of the River Elbe. This activity has eliminated the seasonal flooding necessary for the survival of this Endangered plant. Embankment of many tidal rivers with resulting disturbance and fragmentation of remaining populations has caused further declines.

Four nature reserves have been established but the largest remaining population of 200 plants at Moorburg is threatened by works to extend the harbour.

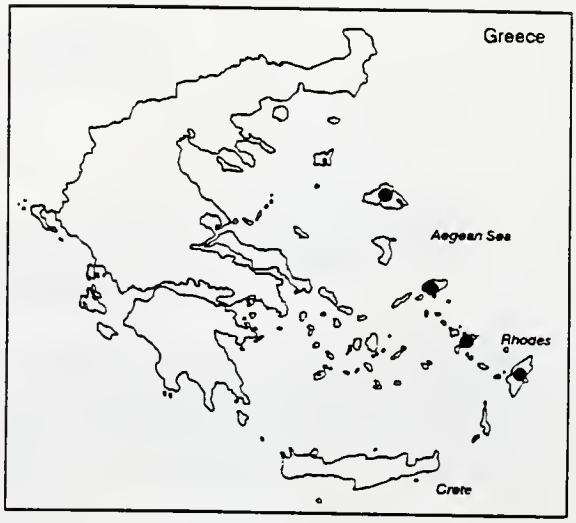





Rhodes Peony

Paeonia rhodia

[Paeoniaceae: Peony family]



The Rhodes Peony grows up to 40 cm tall and has large dark green leaves cut into oval segments and white flowers 7-10 cm across with orange-yellow stamens and a strong and fragrant smell of cloves. This most handsome plant, related to the Cretan peony (*Paeonia clusii*) of Crete and Karpathos, is virtually restricted to the island of Rhodes, although scatteered populations are found on the islands of Kos, Lesbos and Samos in the eastern Aegean.

It is known from nine localities in total, five of which are on the slopes of Mount Profitas Elias in the centre of Rhodes, where the peony is still locally frequent. However, the habitat is not extensive and has suffered from severe forest fires, especially during the summer of 1987 when huge areas of the island's woodland and scrub were devastated.

On Profitas Elias, the Rhodes Peony grows between 400-800 metres in small stands of a few square metres within open woodland dominated by Calabrian Pine and cypress. It provides a magnificent spectacle in April, flowering alongside several species of wild orchid including the spectacular Komper's Orchid (*Comperia comperiana*) at one of its few European stations. These woods are of considerable importance, not only for their rich flora but also because they contain stands of native cypress on the steep and rocky ground.

The Rhodes Peony is threatened by the destruction. of its habitat, notably through fire, the risk of which grows with the increasing numbers of tourists. The summit ridge of Profitas Elias is easily accessible by road, and the plants are therefore vulnerable to picking and trampling by both tourists and villagers, especially at Easter when peonies and other striking flowers are used to decorate churches. Profitas Elias should be established as a nature reserve, and full protection given to its forests and diverse flora.

Cretan Date Palm

Phoenix theophrasti

[Palmae: Palm family]

Main area of distribution (Crete)

Outlying locality on Nisiros

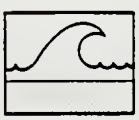
The Cretan Date Palm is one of only two species of palm native to Europe. This, together with its classical appearance and its tendency to form palm groves at isolated localities behind sandy bays along stretches of Cretan coastline, have attracted increasing interest from tourists and film-makers alike.

Within the European Community, the palm is confined to Crete, although one outlying locality is believed to occur on the Aegean Island of Nisiros. Until about two years ago, the Cretan Date Palm was believed to be endemic to Greece, but new palm-groves have now been located on the Datca Peninsula of south-west Turkey.

A slender tree, up to 12 metres high, the Cretan Date Palm often has several trunks and a crown of leaves 2-5 metres long. Its typical habitat consists of damp gullies and valleys leading down to the sea which have high water tables and are subject to seasonal flooding.

On Crete, five main populations are known, the largest being at Vai in the north-east extremity of the island, where it extends over an area of around one square kilometre and supports some 700 trees. Due to tourist and other human pressures in the past, this site has now been declared a nature reserve and access to the grove is by permit only. Elsewhere on the island, however, the remaining populations are small, scattered and receive no protection. At Preveli, on the south coast, the palm grove is located in a small riverine valley and is threatened by campers who cause major damage by cutting the basal fronds for use as shelters. As the palm regenerates from the base of the main trunk, this activity is very harmful and unless it is prohibited, the palm grove will become mature and eventually die out from the lack of young trees. The site at Preveli has also suffered from fires started by campers and because protective *Pistacia* scrub has been cleared to make access easier.

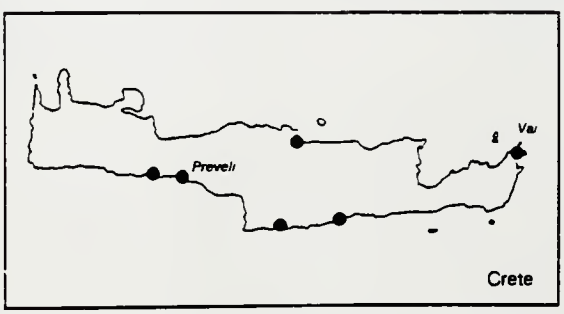
Even though the palm grove at Vai is protected, it is still the target of thousands of tourists who visit each year to see the palms and picnic. Potential danger from fire is therefore high.



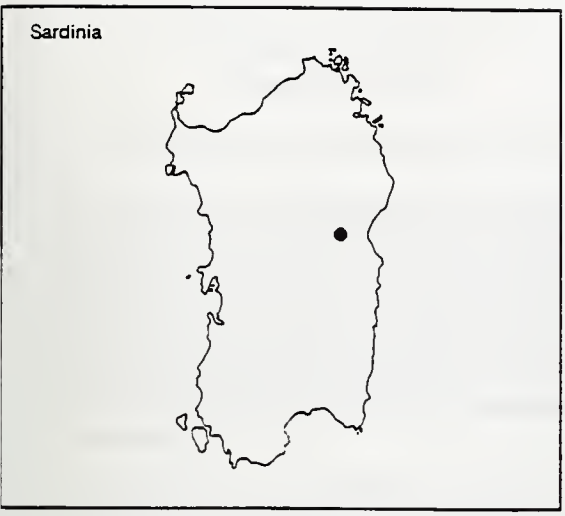
The place name 'Finiki', meaning palm, is not uncommon in the Aegean region and this suggests that the palms remaining today may represent the fragments of a formerly much larger and more widespread population. This beautiful tree has a strong place in local culture and has now become a tourist attraction on Crete, featuring on postcards throughout the island and as a theme for café names. This suggests widespread support for the palm's protection. Any conservation measures taken must therefore take into account, not only the palm's special ecological requirements, but the needs and demands of the local community and the tourists that flock to see it each year.

Of the Cretan localities, only the one at Vai is adequately protected. Additional conservation measures are needed at its other localities, particularly at Preveli, the second largest population on Crete.

The Cretan Date Palm is related to the Cultivated Date Palm (*Phoenix dactylifera*) and could prove important in the future for breeding new hybrid cultivars, possibly with improved disease resistance, which may prove to be economically valuable.



- Distribution of the main localities of Cretan Date-palm on Crete (other localities consisting of scattered trees are not mapped)



Sardinian Gooseberry

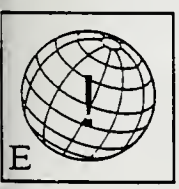
Ribes sardoum

[Grossulariaceae: Gooseberry family]

The Sardinian Gooseberry is known from only one locality on Sardinia, where it grows at Monte di Oliena in Su Prada. It is a small spineless shrub, reaching a height of 1.5 metres, which grows on calcareous rocks at an altitude of 1,200 metres in a small damp valley. There are only 30 or so gooseberry shrubs in the sole population which extends over approximately 200 square metres in a habitat of scrub and upland garrigue. Many other of Sardinia's rare or endemic plants also grow in this area.

Monte di Oliena is included in the area of the proposed National Park of Gennargentu but is not yet protected. The main threat to the Sardinian Gooseberry is fire and its poor regenerative capacity. Italian botanists consider that this species may be heading for extinction in the wild.

Full protection of its habitat is required, together with suitable management *in situ* to produce better conditions for its survival. Such management should include reducing grazing pressure, creating fire breaks and consideration to a programme of artificial propagation with subsequent reintroduction of plants to the wild. A study of its population biology may also shed light on why it does not reproduce well in the wild.



Shore Dock

Rumex rupestris

[Polygonaceae: Dock and knotweed family]

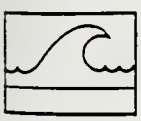
The Shore Dock is undistinguished in appearance and might be thought to be just another wayside dock. However, it is one of the world's rarest docks, restricted to the Atlantic coasts of Europe from north Spain to Wales. It has erect, branched stems 30-100 cm tall, oblong to narrowly oval, rather bluish-green leaves, and clusters of small flowers - the fruits of which bear 3 corky floats by which they are dispersed in sea-water.

This dock is known from Galicia in north-west Spain, Britanny and Normandy in north-west France, the Channel Isles, south-west England and from Anglesey in Wales. The localities are scattered and the plant is nowhere common. For example, although widespread in Britain at the beginning of this century, 1989 figures indicated that only about 13 sites remain, eight of which contain a total of less than 250 plants.

The habitat of the Shore Dock is the upper part of seashores, especially where a stony beach lies adjacent to a cliff that is damp with fresh water seepage, but sometimes in damp places in sand dunes. The plant is Vulnerable and has declined dramatically due to pressures of tourism, including both seaside building development and trampling of its unstable habitat by large numbers of visitors. Afforestation of sand dunes has also destroyed suitable habitat for it at one Welsh locality. In Finistère (France) the Shore Dock has become Extinct at many former localities due to the invasion of its habitat by Hottentot Fig (*Carpobrotus edulis*), an introduced daisy-like plant originally from South Africa.

It is very important that the remaining localities be protected from unrestricted public access and other pressures. Consideration should also be given to the restoration of former habitats that have become degraded by, for instance, invasion of *Carpobrotus*.

Distribution of Shore Dock in the European Community

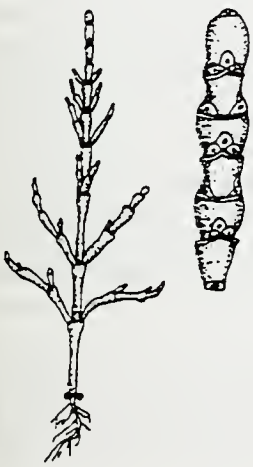


Venetian Glasswort

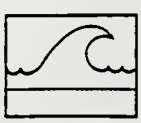
Salicornia veneta

[Chenopodiaceae: Goosefoot family]

The Venetian Glasswort, like all members of the genus *Salicornia*, is confined to shallow saline waters and has fleshy, cylindrical stems that 'crackle underfoot'. Many species of *Salicornia* are considered a delicacy and are popular in local cuisine. The Venetian Glasswort is confined to the tidal shores of the Venice Lagoon, which is a fragile coastal environment, threatened by infilling for the construction of industry and other developments. Pollution has also altered the water quality and plant life of the lagoon. In particular, pollution from sewage and agricultural fertilisers has caused a plague of seaweed, large quantities of which have to be dredged from the lagoon each day. The ecology of the shoreline and intertidal areas is particularly threatened by accumulating piles of rotting seaweed which are stranded at high tides and by mechanical beach-cleaning operations which become necessary to clear them.



The Venetian Glasswort is an example of a species where a combination of measures are required to ensure its protection. As a priority, the fragile shoreline habitat must be safeguarded, by prohibiting land reclamation and other damaging developments. In addition, there is an urgent need to curb the use of agricultural fertilisers, so that pollution of rivers entering the lagoon and the consequent effects of the seaweed plague are reduced.



Holzmann's Catchfly

Silene holzmannii

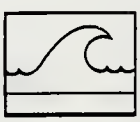
[Caryophyllaceae: Carnation family]

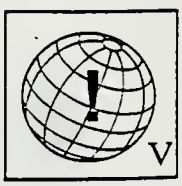
This small catchfly is an erect, unbranched annual plant up to 20 cm tall, with paired lance-shaped leaves and small pinkish flowers. It is a rare plant of scattered distribution through the European part of the southern Aegean Sea, where it is mostly restricted to very small islands. Some of these islands are remote, but many are adjacent to larger islands or mainland coasts which are becoming increasingly susceptible either to severe disturbance from repeated visits by tourists or, more seriously, by the use of these islands for short term grazing by goats.

Holzmann's Catchfly is thought to occur at 13 localities but further investigation is needed to establish whether the plant still survives at all these sites. It is part of a unique community of small plants that has evolved on islands; its fine adaptation to this habitat is shown by its fruits which are able to float and survive in sea water and this is its major method of dispersal from one island coast to another.

The often tiny islands where the catchfly grows could be granted strong protection if grazing were prohibited. (Apparently, even a few goats left on these islands can cause total destruction to the vegetation in a very short time.)

Furthermore, careful diversion of tourists away from sensitive zones on some of the more accessible islands, especially in Attica and eastern Crete, would benefit greatly the chances of this species' survival.





Note: Bristle Fern is also scattered throughout the Atlantic Islands (distribution not mapped here)

Bristle Fern

Trichomanes speciosum

[Hymenophyllaceae: Filmy Fern family]

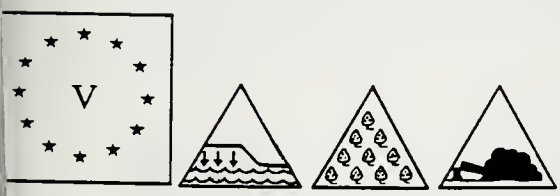
A fern with thin, membranous and highly dissected leaves some 10-40 cm long which arise from a creeping stem usually embedded in fissures of sandstone or similar porous rock close to streams and waterfalls.

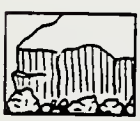
The Bristle Fern grows in situations with constant flowing water, and because of its very thin texture, is confined to highly moist, often dark, crevices and gullies in deep narrow wooded valleys in areas of high rainfall. Throughout its range it is threatened by deforestation and the drying out of small watercourses. It has also become established in isolated man-made wells or mine-shafts in France and Ireland.

This Vulnerable fern is a representative of a fast diminishing ancient subtropical flora and is of high scientific interest.

The Bristle Fern is scattered throughout the Atlantic Islands where it is often associated with the native laurel cloud forest, a habitat which is critically threatened. In northern Spain it is present in a number of localities where it is particularly threatened by encroaching *Eucalyptus* plantations. The few populations in the French Pyrenees are Endangered and the single Portuguese population may be Extinct. In both Britain and Ireland it is legally protected and one of the British sites is located within a National Nature Reserve. One population is known in the Apuane Alps of northern Italy where it requires protection.

In the past this attractive fern was highly sought after for decorating the sitting rooms of Victorian England and elsewhere in Europe, and many wild populations were completely removed as a result.





Threatened tulips of Greece

Tulipa spp.

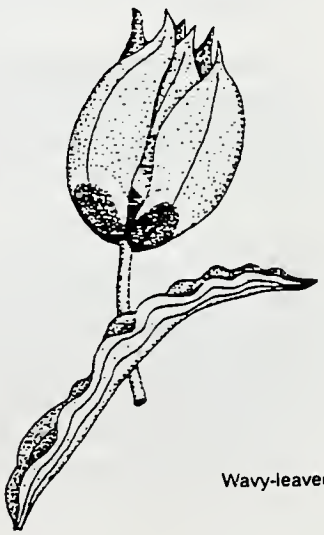
[Liliaceae: Lily family]

Goulimy's Tulip (*Tulipa goulimyi*) is a beautiful tulip which grows to about 10-25 cm tall and has brilliant orange-red flowers 4-5 cm across. It occurs only in the most south-eastern part of the Peloponnese, the adjacent islands of Elafonisos and Kithira, and at one station on the most westerly extremity of Crete. Altogether this tulip is known from 18 localities, but at almost all of them only a few individuals are present. Of these, even fewer actually flower each year and these are frequently picked by villagers. Reproduction is principally by offsets from the bulbs, but this is threatened by the gathering of the sweet-tasting bulbs for food. Furthermore, the plant's habitat of sandy fields and stony or gravelly places amongst low scrub, often near the sea, is being eroded by the expansion of arable cultivation and glasshouse construction and by the development of the coast for tourism. Bulbous plants, such as the Goulimy's Tulip, are vulnerable not only to the use of herbicides for weed control, but also to modern deep ploughing which precludes their survival even on the margins of arable fields.

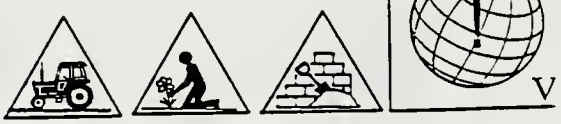
In order to conserve this threatened plant, areas of suitable habitat should be protected against agricultural and building development, especially on Kithira where Goulimy's Tulip is still locally frequent. Digging up the bulbs, mostly done by children, should be strongly discouraged, perhaps as part of a general educational campaign about the value of wild flowers.

Another species, Wavy-leaved Tulip, (*Tulipa undulatifolia*), which grows in cultivated fields, may be even more critically threatened as a result of deep ploughing. 50 years ago it was sold by the bucket in the Athens flower market but the main reason for its decline is changing agricultural methods rather than picking.

Total known distribution of Goulimy's Tulip



Wavy-leaved Tulip



Mount Iti Speedwell

Veronica oetaea

[Scrophulariaceae: Foxglove family]

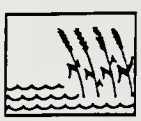
Mount Iti speedwell is a rather hairy annual plant not more than 5 cm tall, with tiny, narrow leaves and inconspicuous flowers. Despite its diminutive stature, it is one of the most interesting plants of the Greek mountains, being restricted to the upper slopes of Mount Iti, south-west of Lamia in central Greece, where it occurs in just two temporary pools formed from snow melt in the spring. Its nearest relatives occur in western Asia.

The habitat of Mount Iti Speedwell is a very specialised one which is vulnerable and very localised throughout Europe. Not long after the discovery of the species in 1976, its only known site became threatened due to bauxite mining nearby. This brought considerable disturbance to the general area. Ancilliary developments such as the construction of mine and forestry roads placed further pressures on the area.

A site survey is now needed to determine whether the species has survived this interference as the pools themselves are very fragile, being shallow and only a few metres in diameter – they are therefore very sensitive to even quite small changes in the local environment.

It is imperative that any further mining of bauxite or construction of roads be directed away from these pools and their catchment area. Indeed, the whole area of Mount Iti is of major scientific interest and has a rich flora that includes a number of species rare or endemic to Europe. It is therefore clear that Mount Iti merits special protection, and any activity likely to damage the flora (and fauna) should be prohibited.

A species of *Veronica*



Viviparous Chain Fern

Woodwardia radicans

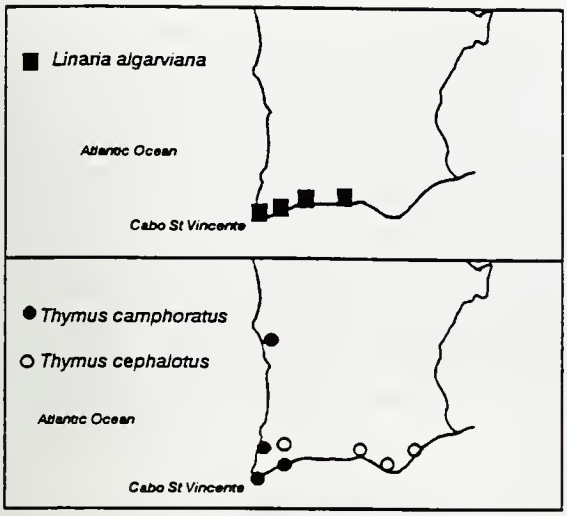
[Blechnaceae: Chain fern family]

A robust fern, with leaves up to 2.5 metres long arising from a short thick stem that remains close to the ground. The blade of the leaf comprises deeply toothed leaflets and bears near the tip a young plantlet which eventually establishes itself independently. The reproductive bodies (clusters of spore-cases) are in chain-like groups on the underside of the leaf.

Woodwardia radicans, like all chain ferns must have its roots in water or moist soil and are found associated with rocky streams in steep-sided valleys or in scrubby more open valley floors where natural underground drainage channels provide the right environment. The species is therefore Vulnerable and threatened by schemes to remodel watercourses and other activities involving the management and canalisation of drainage channels.

The main centre for the Viviparous Chain Fern is the Atlantic Islands: the Canary Isles, Madeira and Azores, where the fern is characteristically found in gullies and ravines associated with remnant laurel forest, a critically threatened habitat which has been subject to much recent clearance and replacement with forestry plantations of Japanese Larch (*Cryptomeria japonica*). Remnant populations of the Viviparous Chain Fern in north Portugal and northern Spain are threatened by re-afforestation and the making of extraction roads which is changing water-courses. There are only three sites in Italy, where the species is protected by provincial laws, and one in Sicily, but active management is needed if it is to survive. The sole French site is in north Corsica and is unprotected. The single population in western Crete is threatened by agricultural development.

Note: Also present throughout the Atlantic Islands



Distribution of some rare and threatened endemic plants of the Algarve, Southern Portugal

Some threatened plants of Portugal

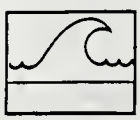
Wild plants of the Algarve

Thymus camphoratus and *Thymus cephalotos*
[Labiatae: Mint family]

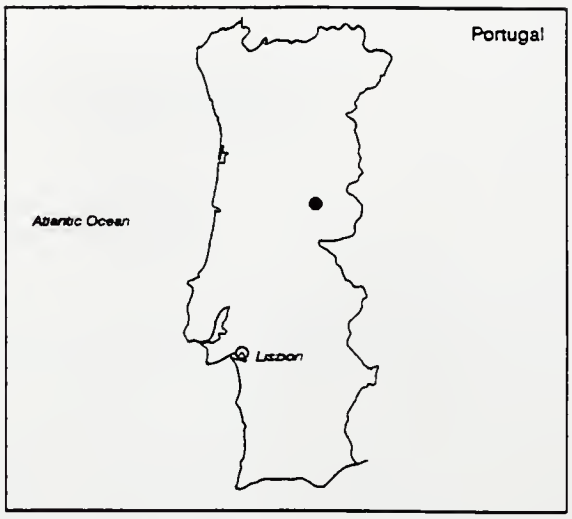
Linaria algarviana
[Scrophulariaceae: Foxglove family]

The Portuguese Algarve remains a wonderful place for its wealth of wild flowers, although pressure for tourism developments is constantly reducing the extent and distribution of natural and semi-natural vegetation. One of the richest areas for plant life in Portugal is the 'Berrocal' region of the Algarve - a zone of limestone which begins at Cabo St Vincente (the south-west corner of Portugal), extending to Tavira to the east. Many interesting and colourful plants are found in this area, including a number of species which are endemic to Portugal, such as the Berrocal Thyme "Tomilho Cabeçudo" (*Thymus cephalotos*), a distinctive aromatic dwarf shrub which grows in open stony areas.

Two other plants endemic to the Algarve and of world Endangered status also grow nearby, along a short windswept stretch of coast to the east of Cabo St Vincente, between Odeceixe and Sagres. This area of spectacular limestone coast is known as the 'Barlavento'. Its grazed headlands support a rich flora of herbs and aromatic dwarf shrubs including the Camphor Thyme (*Thymus camphoratus*) and Algarvian Toadflax (*Linaria algarviana*). The latter species has attractive violet-coloured flowers measuring up to 2.5 cm in length, which are spotted with white or yellow.



The south-west coast of the Algarve, and the 'Berrocal' limestone zone are both very important floristically and many foreign 'botanical tourists' visit the area every year. It is to the credit of the Portuguese government that illegal building has recently been stopped in some parts of the sensitive coastal zone near Cabo St Vincente, but pressure for tourism development everywhere in the Algarve remains significant and there are further threats from quarrying. Action to protect remaining areas of natural and semi-natural vegetation, including the zones where the two endemic thymes grow, is urgently required. Such areas are undoubtedly worthy of special designation, such as a Special Protection Area.



● Abrotea: area of distribution

Abrotea

Asphodelus bento-rainhae

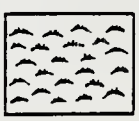
[Liliaceae: Lily family)

This elegant white-flowered asphodel is a herbaceous perennial which grows up to one metre tall. It is endemic to Portugal and is known from east-central Portugal where it grows in clearings and glades in native forests of Pyrenean oak (*Quercus pyrenaica*) and along the edges of roads. The Abrotea has a restricted distribution, usually on slopes with a north-easterly aspect and is confined to the mountain area of Guardunha, around Fundao.

It is permanently threatened from fire, mostly started deliberately and further threatened because of unregulated and increasing expansion of cherry orchards on the mountain slopes.

The exact population and distribution of this rare plant is not precisely known. However, the creation of nature reserves at Guardunha is urgently required in order give protection to the Abrotea and the remaining native oak forests in which it grows.







CONSERVATION SUMMARIES

2: LOWER PLANTS

A selection of threatened species from Annex I(b) of the "Proposal for a Council Directive on the protection of natural and semi-natural habitats and of wild fauna and flora"

Distribution: All Member States of the EC

* Member States where Large Crimson Wax Cap is threatened (declining in all others)

Large Crimson Wax Cap

Hygrocybe punicea

[Hygrophoraceae: Wax Cap Family]

Large Crimson Wax Cap is a large, bright red toadstool which is a species of old, agriculturally unimproved grassland. It prefers calcareous soils, usually of clay or loam which are poor in humus.

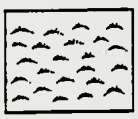
This fungus has declined over its entire range, particularly in the north-west European lowlands.

Large Crimson Wax Cap is threatened for a variety of reasons including abandonment of pastures and their afforestation, the use of artificial fertilisers and liquid manure, and the ploughing up of old grassland.

In view of the intensification of agricultural practices throughout Europe, this species is regarded as extremely Vulnerable, even in areas where it is still relatively frequent.

Many other species of fungi which are characteristic of old pastures are similarly threatened, including those belonging to the genera *Hygrocybe, Camarophyllopsis, Entoloma, Dermoloma, Clavaria, Clavulinopsis* and *Geopglossum.*

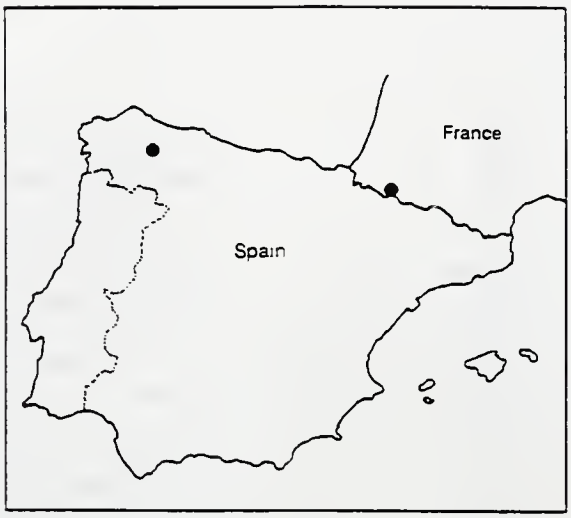
The Large Crimson Wax Cap is listed as threatened in the Netherlands, Federal Republic of Germany, Poland and Sweden. The most pressing conservation requirement for this species is to ensure that tracts of old grassland are maintained by traditional grazing practices without the use of modern fertilisers and liquid manures. In addition, abandoned ancient pasturelands need to be identified and appropriate grazing management reinstated on them. This should also benefit many other declining wild flowers and lower plants characteristic to this threatened habitat type.



Pendulous Lichen

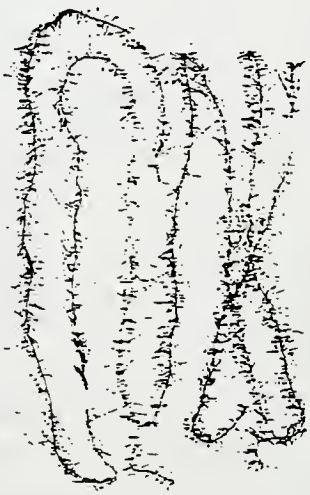
Usnea longissima

[Usneaceae]



This is the longest pendulous lichen known in the northern hemisphere. reaching a length of 1-2 metres in favourable conditions. It can form impressive festoons hanging from tree branches and swaying with the wind.

The lichen grows on trees in virgin undisturbed forests, mainly in primitive stands of spruce. Neither can it survive any disturbance of its habitat and disappears as soon as the air is contaminated by pollution, even at extremely low and undetectable quantities. It cannot colonise tree plantations, even in apparently suitable conditions. Lichenologists regard this species as the symbol of the vanishing lichens -- unable to survive modern forest management (such as removal of old and dead trees, drainage and clearance of the understorey) and the formidable disaster of acid rain.



Fifty years ago, Pendulous Lichen was quite common in Scandinavia and the mountains of central Europe including the Alps and the Carpathian Mountains. It has already disappeared from all its localities in the Federal Republic of Germany, the French Alps and Italy. It is on the verge of extinction in Switzerland, Austria and southern Scandinavia. The only healthy populations now remaining are in north-west Spain and in two sheltered valleys in the central Pyrenees in France.

The future of the species can only be secured by absolute protection to the undisturbed forests in which it survives and by implementation of strict measures to control all forms of air pollution throughout Europe.

INDEX OF PLANT NAMES