

# ENSCONET European Collecting Plan Report

*Produced by Ruth Eastwood, October 2009 – Version 1*

## Introduction

The European Native Seed Conservation Network (ENSCONET) is funded by the European Community's Sixth Framework Programme as an Integrated Activity implemented as a Co-ordination Action. 31 institutions from 19 countries worked together in four activity areas: Collecting, Curation, Data Management and Dissemination. The Collecting activity involved preparation of a detailed, co-ordinated and prioritised seed collection programme for the European spermatophyte flora which aims to contribute to the time bound targets identified in the Global Strategy for Plant Conservation, together with the objectives of The Sixth Environment Action Programme of the European Community 2002-2012 and the EU Action Plan 2010. ENSCONET has produced seed collecting plans at the following scales:

- 1) Europe
- 2) Biogeographic region
- 3) Country
- 4) Member

Fulfilled, these plans would significantly contribute to the *ex situ* (off site) conservation of Europe's threatened native species. Case studies ([Appendix 1](#)) of species from the Bioregional lists are given to illustrate the results of this activity.

## European Collecting Plan

ENSCONET has taken a new approach to seed bank collection planning by considering population distribution across biogeographic regions (bioregions). Biogeographic regions are defined by habitat and climate. Country boundaries are, for ease of work and politics, often the focus of biological sampling. Working at a bioregional scale is more species-orientated because species distributions are influenced by habitat conditions and often span multiple political borders. For example, focusing on the Alpine bioregion will allow the planning of seed collections from the Alps to be considered as a whole, not individually by a number of countries. This will avoid unnecessary duplication of collections. Additionally, the approach is designed to maximise capture of genetic diversity of a species in *ex situ* conservation.

The European Environment Agency divides Europe into 11 biogeographical regions (EEA, 2005; <http://dataservice.eea.europa.eu/atlas/viewdata/viewpub.asp?id=2671>). In ENSCONET seed collection planning has focused on nine bioregions<sup>1</sup>. The

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<sup>1</sup> The Anatolian bioregion is not considered under ENSCONET as it is geographically outside of Europe.

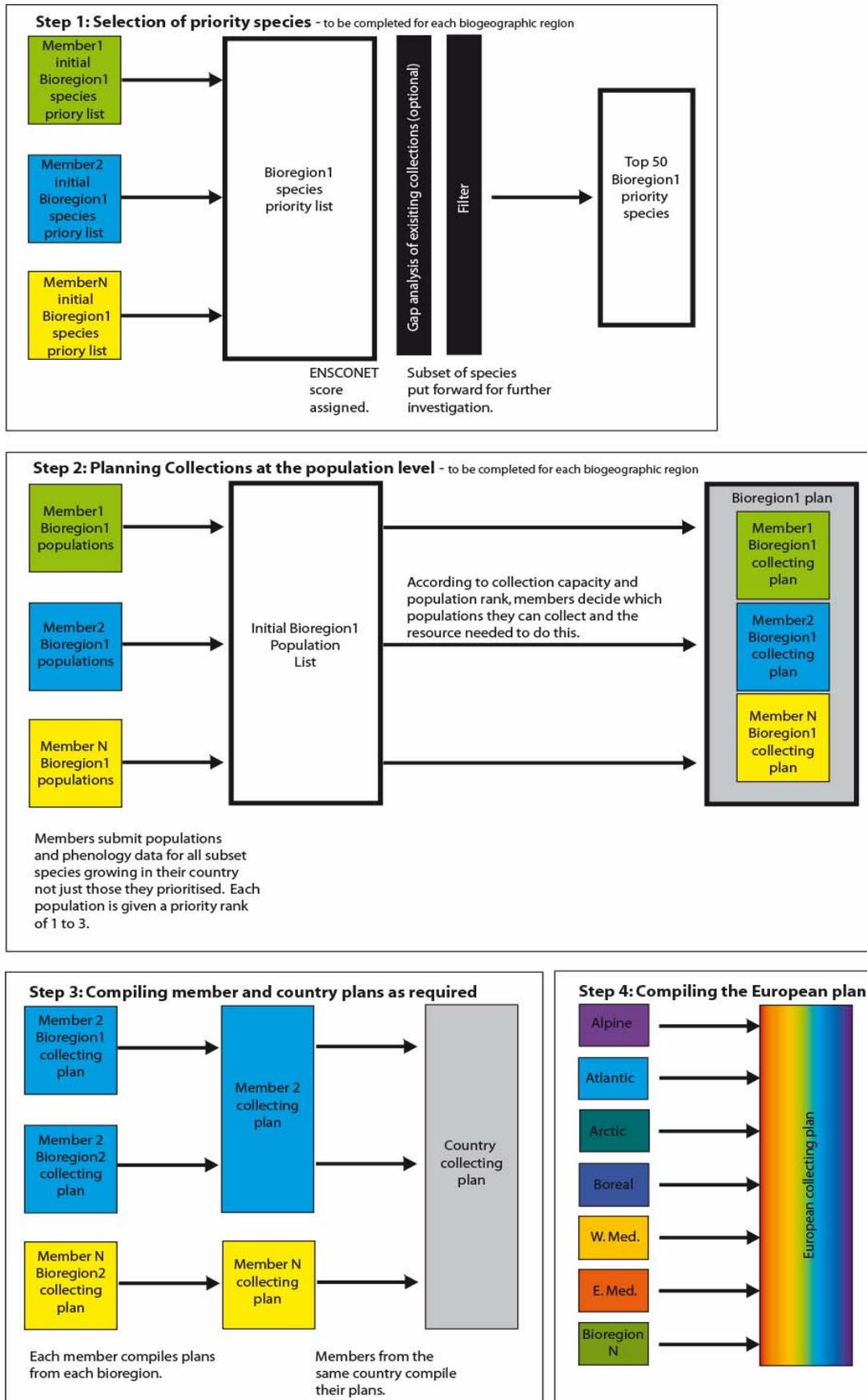
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Steppic bioregion has not been considered to date. The Mediterranean bioregion was, for logistic purposes, split into two parts, East and West. Bioregions are composed of 1 to 10 ENSCONET countries ([See Table 1](#)).

Bioregional groups planned collecting at the bioregional level. Planning was a multi-step process ([Figure 1](#) and [Appendix 2](#) - ENSCONET workflow). In step 1 priority species were selected. As part of this work a novel plant conservation status, the ENSCONET score, was developed ([Box 1](#)). The ENSCONET score was used as a filter to select the 50 priority species. In step 2 collection of the priority species is planned at the population level to ensure good geographical coverage, maximise genetic representation and to avoid making collections with no added value. Additionally, at step 2 research to identify flowering and fruiting times was included to facilitate collecting trip planning.

<b>Table 1: Composition of Bioregional groups</b>		
<b>Bioregion</b>	<b>ENSCONET Countries<sup>2</sup></b>	<b>ENSCONET Partners</b> (Abbreviations listed in <a href="#">Appendix 3</a> )
Atlantic	Belgium, France, Germany, Ireland, Norway, Portugal, Spain, UK	RBGK, JB Cordoba, TCD, UPM, NBGB, MNHN (leader), FUB-BGBM, FUL, NHMOSLO
Alpine	Austria, Bulgaria, Finland, France, Germany, Italy, Poland, Norway, Slovakia, Spain,	IB SAS, UPM, MNHN, PAV-UNI-CFA (co-leader), MTSN (co-leader), HBV, BG-CBDC-PAS, FUB-BGBM, HUBG, NHMOSLO, IB-BAS
Arctic	Norway	NHMOSLO
Black Sea	Bulgaria	IB-BAS (leader)
Boreal	Finland, Norway	HUBG (leader), NHMOSLO
Continental	Austria, Belgium, Bulgaria, France, Germany, Hungary, Italy, Poland, Slovakia	IB SAS, BZBG, NBGB, MNHN, PAV-UNI-CFA, HBV, BG-CBDC-PAS, FUB-BGBM (leader), IB-BAS
East Mediterranean	Cyprus, Greece	NKUA, MAICh (leader), CYARI
Macaronesian	Portugal, Spain	Jardin Canario (leader), FUL
Pannonian	Austria, Hungary, Slovakia	IB SAS, BZBG (leader), HBV
West Mediterranean	France, Italy, Portugal, Spain	MNHN, Pisa Botanic Garden (co-leader) JB Cordoba, UPM (co-leader), JB Soller, UVEG, FUL

<sup>2</sup> Associate members participated in some bioregions but their data is excluded from this report.



**Figure 1: Process of collection planning at the Bioregional scale.**  
 This example illustrates a few members for each step. In practice the process is applied by all members.

**Box 1: ENSCONET score**

ENSCONET members agreed that as stated by IUCN (2001) *“the category of threat is not necessarily sufficient to determine priorities for conservation action. The category of threat simply provides an assessment of the extinction risk under current circumstances, whereas a system for assessing priorities for action will include numerous other factors concerning conservation action. (...) However, assessment of taxa using Red List Criteria represents a critical first step in setting priorities for conservation action.”* and thus developed the ENSCONET score which represents "Threat status" and "Endemicity" assessed at a Bioregional level. Threat and Endemicity were assessed independently (see [Tables 2](#) and [3](#) for criteria and values). The sum of these two values represents the ENSCONET score.

**Table 2: Transformation of endemism category to numerical score**

Category	Description	Value
Narrow endemic	Species with an extremely localised distribution typically occurring in one or few locations not too far apart e.g. a mountain top in the Dolomites, a small Mediterranean island.	4
Endemic	Species distributed over a wider area with respect to the previous one, typically occurring on part of any homogeneous and continuous geographical unit e.g. The western Alps, Crete.	3
Subendemic	Species distributed over an even wider area with respect to the previous one, typically covering a whole - or nearly so - homogeneous and continuous geographical unit e.g. Alps, Pyrenees	2
Not endemic		0

**Table 3: Transformation of threat status to numerical score**

Category	Score
CR (including EW)	4
EN	3
VU	2
Other (R, DD, NT, LR, etc...)	1
Not threatened (LC)	0

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In total ENSCONET members plan to collect seed from at least 2873 plant populations ([Table 4](#)) from nine bioregions ([Table 5](#)) over four years. 22 % of species would be collected from more than one country.

<b>Families</b>	78
<b>Genera</b>	309
<b>Species</b>	339
<b>Populations</b>	2873

<b>Bioregion</b>	<b>No. of planned Collections</b>		<b>Country</b>	<b>No. of planned Collections</b>
Alpine	557		Austria	78
Arctic	6		Belgium	55
Atlantic	1029		Bulgaria	73
Black Sea	30		Cyprus	52
Boreal	101		Germany	376
Continental	432		Spain	222
East Med.	149		Finland	103
Pannonian	158		France	693
West Med.	411		Great Britain	164
			Greece	97
			Hungary	80
			Ireland	38
			Italy	275
			Norway	82
			Poland	163
			Portugal	160
			Slovakia	162

Comparison of the initial Bioregional priority species lists with the Seed Information Database (SID – Liu *et al*, 2008) identified 30 intermediate/recalcitrant species. These are listed in [Appendix 4](#).

### Discussion

The complete European, bioregional, member and country lists are not given in this document. ENSCONET feels that if publicly available these documents may be misinterpreted and used in purposes for which they were not designed. Resources and legislation limit the number of collections planned and which species can be collected. The plans aim to be practical and take these factors into consideration. Species not included on the list may also be worthy of conservation effort.

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22 % of species in the European Collection Plan are scheduled to be collected in more than one country. This figure may sound small but the prioritisation of threatened and endemic species, which by their definition tend to have small ranges, will always limit this figure.

Seed banks across Europe hold at least 44 % of Habitats Directive Species (Gymnosperms and Angiosperms) and 27 % of BGCI threatened European plants list (Gymnosperms and Angiosperms). If all the planned collections were made these figures would rise to 56 % and 33 %, respectively, making a significant impact on *ex situ* conservation in Europe.

A particularly useful result of planning at the bioregional level was the identification of species which are rare and protected in some countries but relatively common in others. Examples from the Pannonian region are: *Schoenus nigricans* L. (Hungary: Not Endangered, Austria: Endangered, Slovakia: Critically Endangered), *Achillea asplenifolia* Vent. (Hungary: not threatened, Austria: Endangered, Slovakia: Critically Endangered) and *Ononis pusilla* L. (Austria: Vulnerable, Slovakia: Critically Endangered). Collecting the non-endangered populations will often be easier and may bring a wider range of genetic variety into *ex situ* conservation.

The development of member's collections plans has allowed institutes to prepare for the future and have a basis for developing/planning scenarios for different resource futures. Additionally, these detailed plans are impressive to funders and can be used as a tool to secure additional financial support.

Comparison of the species prioritised for conservation with the Seed Information Database show that a small number may need alternative storage strategies. ENSCONET recognises this and such strategies will be investigated in the future.

This European model is applicable to any "shared/overlapping region" at different scales and could be implemented to co-ordinate shared governance/conservation of waterways, nature reserves or marine areas. To succeed it needs advance planning and meticulous organisation. Although work can be divided between bioregional leaders there needs to be an overall co-ordinator or institute.

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Advantages to this model over planning at the local or national level include:

- Avoidance of unfruitful duplication (making collections with no added value).
- Increased communication between partners and means to build and strengthen working relationships.
- Ease of adding or amending data following large initial input.
- Improved geographic and genetic representation

### Outlook

Further work could fruitfully expand the system to consider an additional planning step for species which span more than one biogeographic region. To identify these it might be useful to carry out a gap analysis of planned collecting ranges against GBIF distributions maps to observe whether there are obvious gaps in the collection plans at the species level. An additional useful tool would be an online system to automatically collate and present data in a standard form.

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### References

European Environmental Agency (2005) Biogeographical regions, Europe 2005  
<http://www.eea.europa.eu/>

IUCN (2001) *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. ii + 30 pp.

Liu, K., Eastwood, R.J., Flynn, S., Turner, R.M., and Stuppy, W.H. (2008) Seed Information Database (release 7.1, May 2008) <http://www.kew.org/data/sid>

Appendix 1: Case studies in alphabetical order of bioregions

***Callianthemum kernerianum* Freyn. ex Kern. (RANUNCULACEAE)**

ALPINE



Photo: C. Bonomi

**Reason this species is prioritised for collection:** Kerner White Buttercup is a heavily threatened narrow endemic alpine species. Its successful conservation is dependant on a good understanding of its reproductive biology which is currently being investigated jointly by Trento and Pavia.

**IUCN score:** Italian Red list 1992 V; tentative new assessment according to IUCN 2001 criteria: CR at global level.

**ENSCONET threat score:** 8

**Conservation concerns:**

- It has a very restricted distribution, occurring only at the summit of an isolated mountain.
- The seed set is extremely low, its fruits are heavily predated and the longevity of its seeds in ex situ conservation is expected to be very low.
- Changes in land use and tourism development are currently heavily impacting on its population.
- Climate change might have a devastating potential impact on its populations considering their isolation and poor dispersal ability.

**Habitat and Distribution:** Kerner White Buttercup only occurs in the rocky meadows on the summit of Mt. Baldo east of Lake Garda in NE Italy. Its extent of occurrence according to 2001 IUCN criteria only scores 1.78 square kilometres

**Collecting Institute(s):** Trento Natural History Museum and Pavia University - Italy

***Oenanthe conioides* Lange** (APIACEAE)

ATLANTIC



Photo: Rami Arafah

**Reason this species is prioritised for collection:** This highly endangered umbellifer (Red list 1) is endemic to Northwestern Germany. Even if the species is in *ex-situ* cultivation in the Botanical Garden in Hamburg, and the seeds of the species are probably quite persistent in the soil seed bank, we know nothing about the longevity of the seeds in a seed bank. Research is necessary to learn more about the possibilities to ensure the species in a seed bank.

**IUCN score:** 4 (highly endangered) for Germany

**ENSCONET threat score:** 8

The species is included in the Bern Convention Annex 1 and is a priority species of the Habitat Directive.

**Conservation concerns:**

This special habitat of the Water Hemlock *Oenanthe conioides* is mainly endangered due to river regulation, dyke constructions and other building construction activities and is reduced today to a very few locations.

**Habitat and Distribution:** *Oenanthe conioides* is native in the freshwater intertidal zone of the Elbe river in the federal states Schleswig-Holstein, Hamburg and Niedersachsen. The freshwater intertidal zone of the Elbe is a rare and very special habitat which is influenced by ebb and flow of the North Sea.

**Collecting Institute(s):** Botanical Garden and Botanic Museum Berlin-Dahlem (BGBM) - Germany

***Cypripedium calceolus* L.** (ORCHIDACEAE)

BOREAL



Photo: Ritva Hiltunen

**Reason this species is prioritised for collection:** The largest populations of *Cypripedium calceolus* in Europe remain in Finland, Sweden, Norway, and the Baltic States. However, plenty of the habitats have deteriorated in the last decades due to draining and logging. Restoration projects have recently been initiated, and collected seeds could facilitate these efforts.

**IUCN score:** VU for Finland, NT for Norway

**ENSCONET threat score:** 3

Included in the Bern Convention and Habitats Directive

**Conservation concerns:**

- restricted to lime-rich habitats rare in the Boreal bioregion
- slow development: it takes over ten years for a plantlet to start flowering
- transplanting to private gardens has also diminished populations

**Habitat and distribution:** *Cypripedium calceolus* grows on lime-rich woodlands and meadows, and in nutrient-rich mires.

**Collecting Institute(s):** Finnish Museum of Natural History, Botanic Garden and Herbarium - Finland and the Natural History Museums and Botanical Garden - Norway

***Thesium ebracteatum* Hayne** (SANTALACEAE)

CONTINENTAL



**Reason this species is prioritised for collection:** *Thesium ebracteatum* is an endangered hemiparasitic species which needs a host plant to get nutrients for growing. *Ex-situ* cultivation and the establishment of seedlings of this species are like the cultivation of other hemiparasitic or parasitic species difficult and therefore more research is necessary.

**IUCN score:** Critically endangered in Austria and Germany, vulnerable in Poland, extinct in Slovakia

**ENSCONET threat score:** 6

The species is included in the Bern Convention Annex 1 and is a priority species of the Habitat Directive.

**Conservation concerns:**

Main reasons for the remarkable decrease of the inconspicuous species are the reforestation of meadows, succession and particularly the eutrophication of the habitats. Most of the remaining populations are small and decrease since the last fifty years continuously; at a lot of location the species is extinct now.

**Habitat and Distribution:** The Toadflax *Thesium ebracteatum* is a European species. Its main distribution is in Eastern Europe and the Eastern part of Middle Europe where it occurs mainly in dry meadows on sandy and acid soil or in heathlands. The western distribution edge is in Niedersachsen / Germany, where it is nearly extinct.

**Collecting Institute(s):** Botanical Garden and Botanic Museum Berlin-Dahlem (BGBM) – Germany, Botanical Garden of Vienna University - Austria, Botanical Garden – Center for Biological Diversity Conservation of the Polish Academy of Sciences, Warsaw – Poland

***Onosma stridii* Teppner** (BORAGINACEAE)

EAST MEDITERRANEAN



Photo: E. Kalogeropoulos

**Reason this species is prioritised for collection:** This plant is officially Vulnerable according to the Red Data Book of the Greek Flora (1995). However, due to habitat destruction in the last fifteen years, its conservation status needs to be reassessed. If any conservation schemes are to be implemented for this species it must be better understood. A key factor will be knowledge of the reproductive biology and requirements for growth. Collecting seeds from this species will facilitate this research.

**IUCN score:** VU for Greece

**ENSCONET threat score:** 6

Included in the BGCI European threatened plant list

**Conservation concerns:**

- it has a small population and a small area of occupancy
- it has a very restricted distribution

An actual threat is brought about by construction works - a large part of its population was recently destroyed due to road opening.

**Habitat and distribution:** It grows exclusively on serpentine substrate, being one of the few serpentine endemics of the Greek flora. It is the unique white flowered *Onosma* of the Greek mountains and is located in Mt. Kallidromon, Central Greece (Region of Sterea Ellada).

**Collecting Institute(s):** National and Kapodistrian University of Athens (NKUA) - Greece

***Gladiolus palustris* Gaudin.** (IRIDACEAE)

PANNONIAN



Photo: Jaromír Kučera

**Reasons for Prioritisation:** This attractive species was once quite common in Pannonian wetland areas, especially in unfertilized, species-rich meadows which were cut once or twice a year for hay production. Nowadays the land is mostly abandoned inducing succession. Lots of areas have been lost due to amelioration actions like drainage and fertilisation, which is not tolerated by this species. Most populations have already been lost and only a few viable ones remain. Luckily these are now under protection.

**IUCN score:** critically endangered in Austria, Slovakia; endangered in Hungary

**ENSCONET threat score: 11**

In Hungary and in Slovakia this species was proposed for monitoring in the Natura2000 network program because of its "importance to the community". It was also suggested for inclusion in the Bern Convention list. In Slovakia *G. palustris* has been monitored for several years, population details and maps of distribution are available now.

**Conservation concerns:**

- Most populations lost, only a few big ones remaining
- Sensitive to changes in water regime
- Recent populations in small protected areas surrounded by intensely used agricultural land (input of nutrients and herbicides)
- Threatened by succession after landuse changes

**Habitat and distribution:** *Gladiolus palustris* is a widespread species growing in different bioregions in Mid and Eastern Europe, but is threatened and declining everywhere. It grows on humid to wet meadows and open forests and suffers quickly from too much competition, thus, it favours poor situations.

**Collecting Institute(s):** Botanical Garden of Vienna University – Austria, Budapest Zoo & Botanical Garden – Hungary, Inst. of Botany of Slovak Academy of Sciences, Bratislava – Slovakia

***Erodium paularense* Fern. Gonz. & Izco** (GERANIACEAE)  
WEST MEDITERRANEAN



Photo: David Draper

**Reason this species is prioritised for collection:** This plant is endemic to central mountain range of Spain. It is confined to the Lozoya Valley (Madrid) but new populations recently discovered in the province of Guadalajara have been ascribed to this species. In addition to its narrow distribution and the small size of the populations, plants have very low reproductive success. Even populations from the *locus classicus* are currently preserved in BGV-UPM, collecting seeds from the discovered populations will contribute to enlarge the genetic diversity preserved *ex situ* of this species.

**IUCN score:** EN B2ab(v) for Worldwide (endemic of Spain)

**ENSCONET threat score:** 7

Included in the Bern Convention, Habitats Directive (Annex II) and BGCI European threatened plant list

**Conservation concerns:**

- Narrow population in inland edaphic islands
- High pressure by cattle herbivory
- Impacts by recreational activities and plant collecting

**Habitat and distribution:** It grows in the Central Range in Spain. This species occupies two different microhabitats: crevices and cavities of rocks and shallow soils (lithosols) of nearby grassy communities, where it is the dominant species. Both microhabitats are surrounded by large meadows growing on siliceous substrate.

**Collecting Institute(s):** Plant Germplasm Bank of the Universidad Politécnica de Madrid (BGV-UPM) - Spain

**Reference:** Bañares Á., Blacnca G., Güemes J., Moreno J.C. & Ortiz S., eds. 2004. *Atlas y Libro Rojo de la Flora Vasculare Amenazada de España*. Dirección General de Conservación de la Naturaleza. Madrid, 1.069 pp.

***Anchusa crispa* Viv.** (BORAGINACEAE)

WEST MEDITERRANEAN



Photo: Giovanni Gestri

**Reason this species is prioritised for collection:** It is an endemic of Sardinia and Corsica. Even if 20 subpopulations are still known to exist, these are all very small. Fragmentation of the population makes the species particularly vulnerable. At least four subpopulations in Corsica are in strong decline, and one site at Campitellu disappeared in 1999. The growing sites are affected by human activities, like intense trampling, camping, construction of tracks and roads, mechanical beach cleaning, threatening the species to various extent. *In situ* conservation measures do not seem to have effectively stopped the decline.

**IUCN score:** CR [B1ab(iv)c(iv)+2ab(iv)c(iv)]

**ENSCONET threat score:** 4

Included as a priority species in Annexes II and IV of the EU Habitats Directive and in Appendix I of the Bern Convention.

**Conservation concerns:**

- the area of occupancy is very small
- the population is severely fragmented and declining
- the number of mature individuals fluctuates extremely
- currently this species is badly affected by human activities and natural events (strong storms)

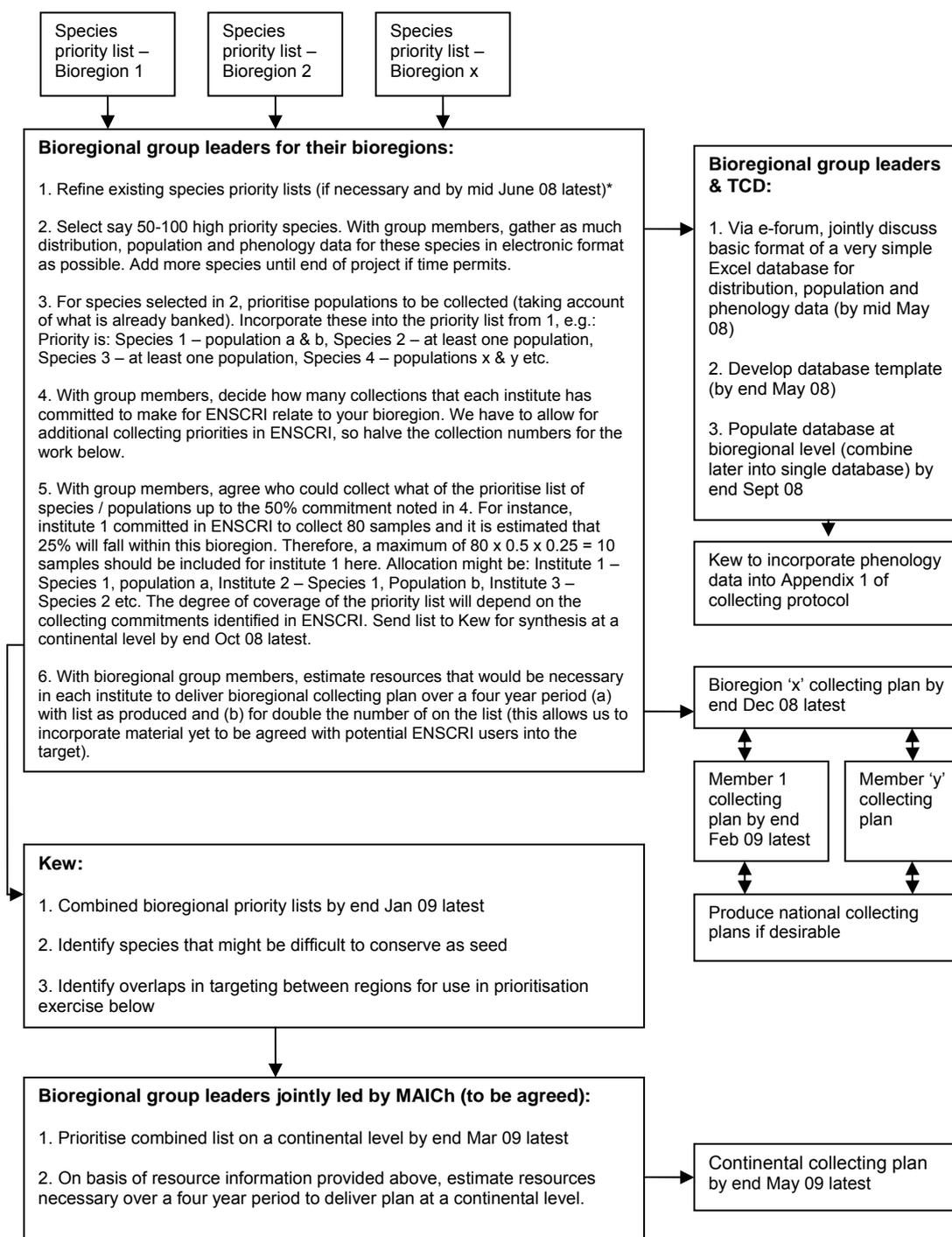
**Habitat and Distribution:** It is known for 20 small subpopulations in northern Sardinia and southern Corsica. It is found growing on fairly firm sandy substrates at the upper edge of the beach. Although *A. crispa* tolerates occasional trampling, it will disappear if the pressure becomes too severe.

**Collecting Institute(s):** Botanic Garden of Pisa, University of Pisa - Italy

## Appendix 2: ENSCONET workflow for Bioregional Collection Planning

### N2 Producing the collecting plans – tasks 2 & 3

17 April 2008



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<b>Appendix 3: Institute Abbreviations</b>	
<b>Abbreviation</b>	<b>Institute</b>
RBGK	Royal Botanic Gardens, Kew, UK
NKUA	National and Kapodistrian University, Athens, Greece
IB-SAS	Institute of Botany, Slovak Academy of Sciences, Slovak Republic
BZBG	Budapest Zoo & Botanical Garden, Hungary
MAICh	Mediterranean Agronomic Institute Chania (Crete), Greece
JB Cordoba	IMGEMA-Jardín Botánico de Córdoba, Spain
TCD	Trinity College Dublin, Ireland
Jardin Canario	Jardín Botánico Gran Canaria, Spain
CYARI	Agricultural Research Institute Cyprus
UPM	Universidad Politecnica de Madrid, Spain
NBGB	National Botanic Garden Belgium
MNHN	Museum National d'Histoire Naturelle Paris, France
PAV-UNI-CFA	Università di Pavia / Centro Flora Autoctona della Lombardia, Italy
Pisa Botanic Garden	Università di Pisa, Orto Botanico, Italy
JB Soller	Jardi Botanic de Soller (Mallorca), Spain
MTSN	Museo Tridentino di Scienze Naturali Trento, Italy
UVEG	Universitat de València, Spain
HBV	Faculty Centre of Biodiversity, Department of Biogeography and Botanical Garden, Austria
BG-CBDC- PAS	Botanical Garden Polish Academy of Sciences Warsaw, Poland
FUB-BGBM	Botanischer Garten und Botanisches Museum Berlin-Dahlem, FU Berlin, Germany
HUBG	University of Helsinki Botanic Garden, Finland
FUL	Jardim Botânico - Fundação da Universidade de Lisboa, Portugal
NHMOSLO	Botanical Garden, Natural History Museum, University of Oslo, Norway
IB-BAS	Institute of Botany, Bulgarian Academy of Sciences, Bulgaria

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<b>Appendix 4: European species identified with non-orthodox seeds</b>		
<b>Species</b>	<b>Bioregion where listed as priority</b>	<b>Storage Behaviour</b>
<i>Acer pseudoplatanus</i>	Black Sea	Recalcitrant
<i>Aesculus hippocastanum</i>	Black Sea / East-Med	Recalcitrant
<i>Castanea sativa</i>	Atlantic	Recalcitrant
<i>Corylus avellana</i>	Atlantic / Black Sea	Intermediate?
<i>Dactylorhiza maculata</i>	Alpine / Atlantic / Boreal / Continental / Pannonian	Intermediate
<i>Euonymus europaeus</i>	Alpine / Atlantic	Intermediate?
<i>Euonymus verrucosus</i>	Alpine	Intermediate?
<i>Najas flexilis</i>	Alpine / Atlantic / Boreal	Intermediate?
<i>Najas marina</i>	Alpine / Atlantic / Boreal / East-Med / West-Med / Continental	Intermediate
<i>Nuphar lutea</i>	Alpine / Atlantic / Black Sea / Continental / Pannonian	Recalcitrant
<i>Nuphar pumila</i>	Alpine / Atlantic / Continental	Recalcitrant
<i>Nymphaea alba</i>	Alpine / Atlantic / Black Sea / West-Med / Continental / Pannonian	Recalcitrant
<i>Populus canescens</i>	Black Sea	Recalcitrant
<i>Populus tremula</i>	Atlantic / Black Sea	Recalcitrant
<i>Quercus cerris</i>	Alpine / Black Sea	Recalcitrant?
<i>Quercus ilex</i>	Atlantic	Recalcitrant
<i>Quercus petraea</i>	Alpine / Atlantic	Recalcitrant?
<i>Quercus pubescens</i>	Alpine / Black Sea / Continental / West-Med	Recalcitrant?
<i>Quercus robur</i>	Alpine / Atlantic / Black Sea	Recalcitrant
<i>Salix alba</i>	Alpine / Atlantic / Black Sea / Boreal	Recalcitrant
<i>Salix aurita</i>	Alpine / Atlantic / Pannonian	Recalcitrant
<i>Salix caprea</i>	Atlantic / Black Sea / West-Med	Recalcitrant
<i>Salix cinerea</i>	Atlantic / Black Sea	Recalcitrant
<i>Salix fragilis</i>	Alpine / Atlantic / Black Sea / Pannonian	Recalcitrant
<i>Salix pentandra</i>	Alpine / Atlantic / Continental / Pannonian	Recalcitrant
<i>Salix purpurea</i>	Atlantic / Black Sea / East-Med	Recalcitrant
<i>Salix triandra</i>	Alpine / Atlantic / Black Sea / Boreal / Pannonian	Recalcitrant
<i>Salix viminalis</i>	Alpine / Atlantic / Continental / Pannonian	Recalcitrant
<i>Spartina anglica</i>	Atlantic	Recalcitrant
<i>Zostera marina</i>	Atlantic / Black Sea / Continental / West-Med	Recalcitrant