

## ***Ex situ* Conservation at the Conservatoire Botanique National Alpin Gap-Charance**

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SUMMARY - *Ex situ Conservation at the Conservatoire Botanique National Alpin Gap-Charance* - The “Conservatoire Botanique National Alpin” (CBNA) is a French national organism whose major objective is the conservation of the native flora. To reach this goal, the CBNA follows two directions:

- study and conservation of endangered flora;
- information and education to the knowledge and preservation of the native flora.

The Conservation department is the base of technical and scientific projects considering 122 priority species in terms of threat or scarcity. *In situ* and *ex situ* conservation are needed to ensure the realization of such projects. In terms of the *ex situ* part of the conservation, the department works on the constitution of a seed bank as well as the gardening of the conserved species. This means a total understanding of many technical processes like seed collection and conservation, germination, and multiplication and cultivation. All these processes need a deep knowledge of the biology of species as well as of the geographic repartition and structure of genetic diversity. This diversity is observed at the intra-specific, intra- population and intra-site scales.

RIASSUNTO - *Conservazione ex situ al Conservatoire Botanique National Alpin* - Il *Conservatoire Botanique National Alpin* (CBNA) è un organismo nazionale francese il cui principale obiettivo è la conservazione della flora spontanea. Per raggiungere questo traguardo, il CBNA segue due direzioni:

- lo studio e la conservazione della flora minacciata;
- informare ed educare alla conoscenza e alla conservazione della flora spontanea.

Il Dipartimento di conservazione è la base di progetti tecnici e scientifici aventi come oggetto 122 specie prioritarie in termini di minaccia o rarità. La conservazione *in situ* ed *ex situ* sono necessarie per assicurare la realizzazione di tale progetto. Per quanto riguarda la conservazione *ex situ*, il Dipartimento si è adoperato per la costituzione di una banca del germoplasma nonché della coltivazione delle specie conservate. Ciò implica una totale comprensione di molti processi tecnici come la raccolta e la conservazione del seme, la germinazione, la moltiplicazione e la coltivazione. Tutti questi processi richiedono una profonda conoscenza della biologia delle specie, della distribuzione geografica nonché della struttura della diversità genetica. Tale diversità viene studiata a livello intra-specifico, intra-popolazionistico e intra-sito.

*Key words:* France, Conservatoire Botanique National, Conservatoire Botanique National Alpin, *in situ* and *ex situ* conservation, seedbank  
*Parole chiave:* Francia, Conservatoire Botanique National, Conservatoire Botanique National Alpin, conservazione *in situ* e *ex situ*, seedbak

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### 1. THE FRENCH NETWORK OF THE «CONSERVATOIRES BOTANIQUES NATIONAUX»

In France, the origin of the “*Conservatoires botaniques*” stands in the 70s, at approximately the same period as the environment Ministry. At that time, some botanists became aware of a dangerously growing disappearance of vegetal species all over the world while some of them could easily be saved by a multiplication realized in botanical gardens. Following their advices, the Ministry gave birth to the first 3 “*Conservatoires Botaniques*” of Brest, Porquerolles and Nancy in 1977 and 1980 (Galland 1996).

In 1998, the Ministry defined by law what will definitely be a “*Conservatoire Botanique National*”. Since and for being approved by the Ministry they have to comply a very strict book of specifications that describes the 3 missions to lead (Code rural 1994; Ministère de l’Environnement 1990):

- Knowledge and constitution of observatories on the endangered flora in their region;
- Biodiversity preservation by ensuring monitoring and using *in situ* and *ex situ* conservation as needed by the endangered *taxa* or classified as so;
- Information and education to the knowledge and preservation of wild plants inheritance of local authorities as well as concerned populations.

Each CBN works on its own biogeographic area. To become a Conservatoire Botanique National, institutions have to apply for it. Candidatures are examined by a commission for the Ministry, composed by representatives of different national scientific institutions (INRA, CNRS and so on). It is this commission that decides of the book of specifications and missions of the Conservatoire (Ministère de l’Environnement 1990).

Currently, there are 6 others CBNs in France in

Bailleul (Nord), Chavaniac la Fayette (Massif Central), Gap (Hautes-Alpes), Paris (Bassin Parisien), Bagnères de Bigorre (Pyrénées), Mascarin (Réunion). Nancy has lost its CBN title and Besançon is applying to obtain it for the Franche-Comté region. Two others CBN project are in preparation to cover the South-west and the East of France.

The first CBN mission is to assemble the existing data on scarce species in their own biogeographic region. Such data are obtained either from bibliography and herbarium or from direct field observations. Older data are verified and actualized on field if needed before being integrated. That's how CBNs constitute their flora database that they're using to establish priorities among the needed interventions (Ministère de l'Environnement 1990).

In 2000, the CBN network created a federation that represents the CBNs for the Ministry, makes coordination and harmonization of work easier, initiates national projects and tempts to increase the number of administrative departments cover (CBN, 2000). In 2004, a new directive enlarges the CBN missions to the whole flora and natural and sub-natural habitats of their study area and specified the expertise function of the CBN relatively to the local authorities (AA.VV. 2004).

## 2. THE CONSERVATOIRE BOTANIQUE NATIONAL ALPIN (CBNA), PRESENTATION AND ACTIVITIES

In 1992, the «*Conservatoire Botanique Alpin de Gap-Charance*» was created by an assembly composed by representatives of the National Park “*les Ecrins*”, the city of Gap, the “*Conservatoire Botanique National de Porquerolles*” and of the local authorities assembly.

In 1993 this new institutions became the “*Conservatoire Botanique National Alpin de Gap-Charance*” through the approval given by the Ministry. As this approval has been renewed in 1999, the institution changed its name for the “*Conservatoire Botanique National Alpin*” and covers the administrative departments of Ain, Alpes de Hautes-Provence, Hautes-Alpes, Drôme, Savoie, Haute Savoie and Isère (AA.VV. 1999).

The CBNA organizes the making of alpine flora inventory and more particularly thus of rare and endangered species. It gathered data and build a databank currently made of 2.500,000 data. Such a tool is useful to know which of the vegetal populations are more scarce or endangered and so in the need of conservation programs that could ensure their long-term preservation (Collectif CBNA 2000a).

A other important role is the technical and scientific support as well as a scientific expertise and a decisional help to States, local authorities or associations.

The CBNA can also give advices for the local economic development by helping the new agricultural channels by producing seeds for greening or cultivation of wild species as *Artemisia umbelliformis*, *Eryngium alpinum* (Vinciguerra 2000).

## 3. CONSERVATION EX SITU IN THE CBNA

Conservation of rare and endangered wild flora is composed by actions on a group of priority species. Con-

servation strategies are defined for each species and integrate *in-situ* and *ex-situ* conservations, two complementary methods (Olivier 1997).

For bettering conditions of conservation, the CBNA need at first to identify all the existing information (chorology, ecology, biology, state of *in situ* populations, threats, etc.) Sometimes a look over some particular aspects of taxonomy or biology is needed like ways of pollinization, genetic structuration of populations, pathologies, etc. in order to reach a better understanding of their threats (Olivier 1997; Collectif CBNA 2000b).

*Ex situ* conservation of endangered vegetal species is a group of operations that may preserve species outside their natural habitats. This appear to be a necessary complement to protection actions of species in their natural sites (*in situ* conservation). International recommendations advice the use of this double conservatory method for it is rare to be assured of the future use and evolutions of habitats.

Priority is given to *in situ* conservation that preserves all the interactions existing in the natural sites and is considered as the only valuable method at long term.

*Ex situ* conservation is used for species:

- whose natural habitats have disappeared
- whose natural habitats are unstable or threatened, particularly by anthropic activities
- whose number of individual, on the field, are weak and/or in decrease.

Moreover it seems more advisable to take precautions for some species and use *ex-situ* conservation as precaution principle (Collectif CBNA 2000a).

At the CBNA, *ex-situ* conservation is composed by a seed bank and a cultural bank. This means that the entire technical processes have to be controlled: collect and seed conservation, germination and multiplication and cultivation procedures. Usually, an investigation on species biology knowledge (flora biology, reproduction biology, life-cycle) is made at the same time.

The conservatory seed collect aims to get samples that are the most representatives of the entire population and its intra specific diversity.

Once the collect realized, seeds are sorted and cleaned in the seed room and then progressively dehydrated in a place called “dryer room” (15 °C and 20% of humidity). The conditioning in three-hermetic-layer bags is made in this room too, bags being then heat-welded. Each seed accession is finally conserved in a cold storage room (4 °C) and a freezer at -18 °C (Collectif CBNA 2000b).

In 1998, an observers and collectors network has been created around the CBNA local units, that allow a collect in the entire biogeographical area of the “*conservatoire*”.

Knowledge and seating of adapted conservation processes (dehydration, conservation temperatures) leads to a better longevity of the seeds conserved in bank. The investigation of germination processes knowledge precises the germination characters of species. This knowledge allows the “*conservatoire*” to:

- get an effective tool on the evolution of seed viability that are mid or long-term conserved
- produce plants through effective processes
- improve *in situ* reintroduction processes and mana-

gement of natural populations (germination ecology, soil seedbank).

Cultivation of *taxa* in the conservatory garden allows us to:

- regenerate seed lots and increase the number of available seeds
- increase threatened population strengths
- prepare introduction, reintroduction and reinforcement operations
- study and evaluate the conserved material as well as contribute to the species study
- communicate about endangered vegetal species (actions with local human population, institutions of natural habitats management, etc.)

The cultural bank is a stable solution for species:

- whose seed conservation in seed bank is not effective
- whose germination processes are not controlled
- whose reproductive isolation is not sure enough
- that produce low number of viable seeds

This sort of bank means that endangered species multiplication and cultivation processes are known and needs some adapted infrastructures like frames, shadow making place or glass-house (Collectif CBNA 2000b).

The final object of *ex-situ* conservation is to preserve as possible the genetic viability of threatened species. There is an important fight against the involuntary selection during the sampling or sorting. At the same time, the isolation of diverse population of a same species is needed to avoid hybridization. Finally losses of genetic allele through the genetic derive is avoided by using the most important quantity of vegetal material during the different part of the *ex situ* conservation (Olivier 1997).

#### 4. CONSERVATION *EX SITU*, A MEAN FOR THE WILD FLORA PRESERVATION

*Ex situ* conservation in CBNA is mostly oriented to conservation programs of 122 priority species defined by their scarcity and vulnerability characteristic through the Alps also integrating *in situ* actions (Collectif CBNA 2000a).

This tool is used to preserve populations that are threatened by installation projects. The CBNA is actually working on train installations and highway construction and more particularly on restoration of swamps and rescue of particular species (Vinciguerra 1998a; 1998b).

*Ex situ* operations are a way of safeguarding vegetal diversity. Species that are so conserved constitutes biological resources for restoration of natural habitats and scientific works.

Sometimes, if the strengths of a species reaches a

very critical low level, the reinforcement of the population is useful to maintain the *in situ* population. Sometimes, the reintroduction of a species in a site where its presence has once been observed can be operated. All these operations are under strict scientific and deontological obligations that are defined by the Ministry. These actions need a close collaboration among *in situ* and *ex situ* conservation departments and are directly linked with the knowledge on seeds, germination and wild flora cultivation accumulated during the *ex situ* activities (Collectif CBNA 2000a).

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