ARTICLES

Mediterranean Botany
ISSNe 2603-9109

EDICIONES COMPLUTENSE

http://dx.doi.org/10.5209/MBOT.60780

Threat and protection status analysis of the alpine flora of the Pyrenees

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Received: 13 October 2017 / Accepted: 31 May 2018 / Published online: 29 june 2018

Abstract. Threat and protection statuses have been analyzed for the Alpine vascular flora of the Pyrenees, i.e., species that live mainly 2,300 masl (Alpine and Subnival levels). They have been cataloged as 387 different taxa (onwards: Alpine Flora Catalogue, AFC), many of them of conservationist interest, especially in the Iberian context, due to the abundance of endemisms and relict populations.
This analysis presents an added difficulty derived from this territory's administrative situation. The region extends over three countries: Spain, France and Andorra. The first two are divided into four autonomous communities and three regions, respectively.
Threat and protection statuses have been assessed according to the presence of AFC species in Red Lists (Spain: RL 2010, Andorra: RL 2008 and France: RL 2012) and catalogues of protected species. In the latter case, it has been analyzed at national level (Spain: LWSSPR-SCTS and France: LPPSNT) and regional level: Spanish autonomous communities and French regions. Andorra lacks catalogue of protected flora.
Results demonstrate that, of the 387 AFC species, 46 (12%) are included in some of the national red lists: 8 Spain, 30 Andorra and 13 France. None of the 8 Spanish threatened species appears in the LWSSPR, and in France only 3 of the 13 threatened are protected. In Andorra, none. With respect to threat status: 11 are CR (2 Spain + 9 Andorra +1 France); 11 EN (1 Spain + 8 Andorra + 2 France) and 27 VU (5 Spain + 13 Andorra + 10 France).
At national level, there are 14 protected taxa: 3 Spain, and 13 France. Atregional level, there are 52 protected taxa in some of the lists from Spain and 47 from France, The Basque Country and Midi-Pyrenees are the AACC with more number of protected species.
Keywords: Threatened flora; protected flora; Conservation flora; Pyrenees.

Análisis del estatus de amenaza y protección de la flora alpina de los Pirineos

Resumen. Se han analizado los estados de amenaza y protección de la flora vascular alpina de los Pirineos, es decir, de las especies que fundamentalmente viven a partir de 2.300 msnm (niveles alpino y subnival). Se ha elaborado un catálogo con los 387 taxones que cumplen este requisito (en adelante: Catálogo de Flora Alpina, CFA), muchos de ellos de interés conservacionista, especialmente en el contexto ibérico, debido a la abundancia de endemismos y poblaciones relictas.
El estado de amenaza se ha evaluado en función de la presencia de las especies del CFA en alguna de las Listas Rojas publicadas (España 2010, Andorra 2008 y Francia 2012). Y el grado de protección mediante la presencia o no de las especies del CFA en los respectivos catálogos de especies protegidas. Como el área de estudio abarca tres países: España, Francia y Andorra, y los dos primeros se dividen en cuatro comunidades autónomas y tres departamentos, respectivamente, los análisis se han hecho a diferentes escalas: i. a nivel nacional (España: LESPRE-CEEA y Francia: LEVPE) y iii. a nivel regional: comunidades autónomas españolas y departamentos franceses. Andorra carece de catálogo de flora protegida.
Los resultados muestran que de las 387 especies del CFA, 46 (12 %) están incluidas en alguna/s de las Lista/s Rojas nacionales: 8 España, 30 Andorra y 13 Francia. Con respecto al grado de amenaza: 11 están en la categoría CR (2 España + 9 Andorra +1 Francia); 11 en EN (1 España + 8 Andorra + 2 Francia) y 27 en VU (5 España + 13 Andorra + 10 Francia).
A nivel nacional, hay 14 taxones protegidos: 3 en España y 13 en Francia. A nivel regional, hay 52 protegidos en alguna de las listas autonómicas de España y 47 en Francia. País Vasco y Midi-Pyrenees son las entidades administrativas regionales con más especies protegidas. Ninguna de las 8 especies españolas amenazadas aparece en el LESPRE, y en Francia sólo 3 de las 13 amenazadas están protegidas. En Andorra, ninguna.
Palabras clave: Flora amenazada; Flora Protegida; Conservación de Flora; Pirineos.

Introduction

The Pyrenees (Figure 1) extends along approximately 50,000 km^2 (Daniel & *al*., 2017). The main part is 2/3 of the southern part, the Spanish zone, the remaining 1/3 the northern slope, is French territory and about 468 km^2 correspond to Andorra (Sesé & *al*., 1999). Administratively the territory is distributed in three countries: Spain, France and Andorra. In turn, the Spanish Pyrenees form part of 4 autonomous communities: Basque Country, Navarre, Aragon and Catalonia; and the Pyrenean-French zone is divided into 3 regions: Great Aquitaine, Midi-Pyrenees and Languedoc-Roussillon.

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The object of study is the alpine flora of the Pyrenees due to its interest from a scientific, biogeographic and conservationist point of view (Körner, 1999; Sáinz Ollero & Moreno Saiz, 2002). It is understood as alpine flora (Braun-Blanquet, 1948; Vigo, 1976; Sesé & *al*., 1999) those found above the 2,300 masl (Daniel & *al*., 2017), i.e., above the treeline econote or Crioro-Mediterranean life zone, at the alpine and subnival levels (Figure 2).

Figure 1. Map showing the delimitation of the Pyrenees.

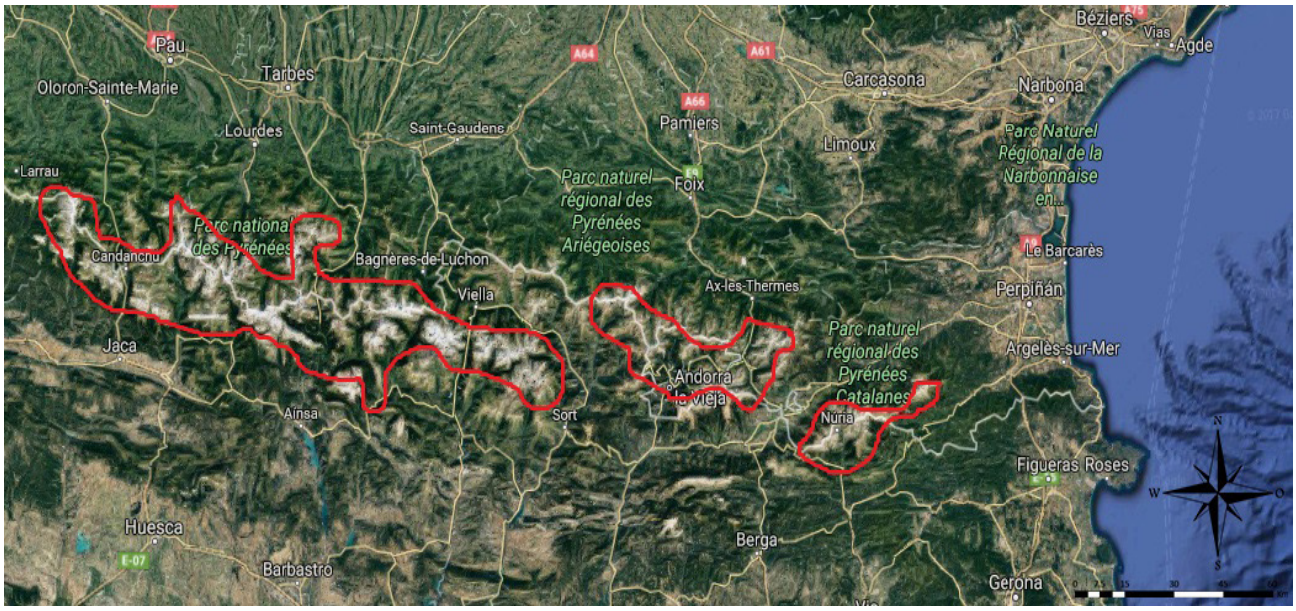


Figure 2. Delimitation of the alpine or supraforest or Crioro-Mediterranean life zone.

These groups include taxa that live exclusively from 2300 m asl, that is, the *sensu stricto* of the alpine bioclimatic [2300-2600 (2800) m asl] and subnival levels [> 2800 m asl], and also, species that live on the alpine and subnival levels, but also, inhabit lower altitudinal levels.

As is known, not always endangered species are legally protected, therefore the main objective of this study has been to analyze the degree of threat and legal protection of the vascular alpine flora of this territory. To do so, it has been necessary first to elaborate the Alpine Flora Catalogue (AFC) (Appendix 1), which has analyzed the degree of coherence between the lists of threatened and protected species. As the study area covers three countries: Spain, France and Andorra, and the first two are divided into four autonomous communities and three departments, respectively, the analysis have been done at different scales: i) at national level (Spain and France) and ii) at regional level: Spanish autonomous communities and French departments. Andorra lacks a catalogueof protected flora.

Materials and Methods

In order to achieve the main objective, a catalogue of species whose distribution area is located above the alpine treeline ecotone, but also, those species that although live in lower levels also reach the 2300 m asl, has been elaborated. To include a species in this catalogue it has been stabilished that atleast 40% of its citations must be above 2300 m asl, in all databases. The reason why this very restrictive criterion has been chosen in the development of the AFC has been to achieve greater reliability in the results.

The AFC has been elaborated using information extracted from different databases; Gómez (2016); Villar (2001) and Anon. (2012-2015). The criterion adopted in terms of taxonomy and nomenclature, is the one used by Anon. (2005b), which mainly follows the terminology proposed by Tutin & *al*. (1964-1980), being the general and complete work of reference that covered the territory of study, and Castroviejo (1986-2016). The terminology used for the vegetation levels has been established according to Rivas-Martínez's (1987) classification. Subsequently information of each of these taxa has been collected: their degree of threat and their protection status.

Threatened species

The information on the degree of threat of each of the taxa has been extracted from the Red Lists (RL). These RL are catalogues scientifically developed according to the categories and criteria established by IUCN elaborated by the IUCN National Plant Committees. Thus, this study has been developed considering three red lists: Red List of Spanish Vascular Flora (Moreno, 2010); Check-List and Red List of Andorran Flora (Carrillo, 2008) and Red List of Threatened Species in France (Anon., 2012). We have considered that a taxon is threatened when it is included in any of the categories CR, EN or VU in any of the RL published to date. A database has been developed with the gathered information; analizing which AFC taxa are threatened in each country and if there are any resemblances between them.

Protected species

To evaluate the degree of legal protection of each taxon, catalogues of protected species have been revised. These catalogues have been reviewed throughout the whole territory, both at state level: France and Spain, as well as a regional level: Spanish autonomous communities and French regions. For each of the taxa, the protection category has been recorded.

At national level, Spain boast the List of wild species in special protection regime (LWSSPR; LESRPE in Spanish) in which, the Spanish catalogue of threatened species (SCTS; CEEA in Spanish) (Anon., 2011b), is located. The species included in this listing have a generic degree of protection common to all, and those that are also threatened are included in the SCTS. These threatened species are classified as in Endangered (EN) or Vulnerable (VU).

France has the List of protected plant species throughout the national territory (LPPSNT; LEVP in French) (Anon., 2013). These species are in both the Appendix 1: Strictly protected species (SPS) and Appendix 2: Protected species (PS), collection or harvest subject to authorization by the Government, the first one presenting a greater degree of protection. Andorra lacks any kind of list.

At regional level, the Spainsh Pyreness are represented byfour autonomous communities, each of them with their own catalogue: The Basque Catalogue of Endangered Species (Anon., 2014), the Navarre Catalogue of Endangered Species (Anon., 1997a), the Aragonese Catalogue of Endangered Species (Anon., 2005) and the Catalan Catalogue of Endangered Species (Anon., 2015). As for France, the Pyrenean territory is divided in three departments with the following catalogues; List of protected plant species in the Aquitaine region (Anon., 2002), List of protected plant species in the Midi-Pyrenees region (Anon., 2004) and List of protected plant species in the Languedoc-Roussillon region (Anon., 1997b).

The analysis of the degree of legal protection of each taxon has been carried out both at national and regional level for both countries, attempting to notice any possible resemblances between them.

Comparison between threatened and protected species

Given the information and databases created for protected and threatened species, the next step of this proyect was to contrast this information and examine de coherence between the IUCN catalogues of threatened species and the legally protected species, at regional and national level, for both France and Spain.

Results and Discussion

Alpine Pyrenean vascular flora includes almost 9% of the total number of species that live in this territory, thus, the AFC accounts with 387 species out of a total of 4334 (Appendix 1). Using this criterion some species have been left out of the study due to their presence has been considered accidental (Tejero & *al*., 2017) or lack of data.

The taxonomic analysis of the AFC shows that the families with the highest number of taxa are distributed as follows: there are a total of 56 families, of which the family with the highest number of taxa is the Poaceae, with 36, close of 9%. It is followed by the Composite with 33 species (8.5%), the Cruciferae with 27 species (7%), and the Cyperaceae with 26 species on the total, that is, almost 7% as well. The predominant functional groups of AFC are hemicriptophytes and camefitas with 317 species (82%). This flora is also closely linked to its habitat not only from the ecological point of view but also for its conservation. We can find a greater taxonomic

abundance in grasslands, meadows, mountain scree slopes, rocky and grassy habitats.

The taxa that inhabit exclusively from 2300 m, constitute 7% (28) of the AFC. About 5% (21) are exclusive to the Alpine zone and almost 2% (7) of the Subnival zone. These results show that 92.6% (359) of the AFC can also be found in lower altitudinal levels.

Threatened Species

The list of AFC species included in the RL of the three countries adds up to 46, 12% of the total (Appendix 2). By country, Andorra stands out with 30 species, followed by France with 13 and Spain with 8 (Table 1; Figure 3). The sum of these taxa amounts to 51, which is due to the fact that the species listed in Table 2 appear at the same time in more than one RL. In Spain and France there is a low number of CR and EN taxa with respect to VU, while in Andorra, although the largest number of species are categorized as VU, there is a higher percentage of species labeled as CR and EN. An inducing factor of this situation may be the type of land use, since winter sports in this country cause great pressure on alpine species (Pladevall, 2016).

Table 1. Total number of AFC species of the three RL for each category.

IUCN Categories	Spain	France	Andorra
CR	2	1	9
EN	1	2	8
VU	5	10	13
Number of species	8	13	30

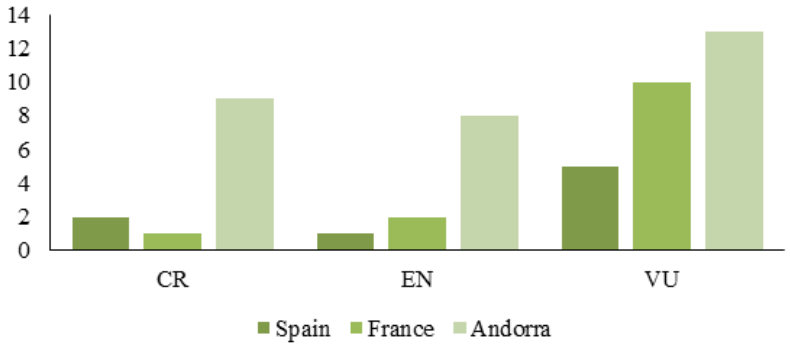


Figure 3. Total number of AFC species of the three RL for each category.

A remarkable fact is that none of the species are found in the three RL at the same time. The vast majority, 41 taxa, are found in only one list and five in two of them at the same time (Table 2). *Vicia argentea* is considered VU (Villar & *al*., 2001) in both countries: Spain and France, and *Brassica repanda* subsp. *turbonis* in CR in Andorra and France. The rest of the taxa do not match in regards to category. Highlighted in the Spanish RL are *Aquilegia pyrenaica* as it is the only EN species and *Carex bicolor* and *Carex lachenalii* subsp. *lachenalii* labeled as CR, against the remaining five classified as VU.

Table 2. Matching AFC species in the three RL and their categories.

Taxa	Spain	France	Andorra
Aquilegia pyrenaica	EN		CR
Brassica repanda subsp. *turbonis*		CR	CR
Subularia aquatica		EN	CR
Vicia argentea	VU	VU	
Xatardia scabra		VU	CR

Among the red lists of the study, the Andorra RL has the highest number of threatened species. In the CR category there are 9 taxa and some are in the process of degrowth and restricted in the Pyrenees, such as *Xatardia scabra* or *Aquilegia pyrenaica* (Carrillo, 2008). With the category of EN there are 8 and the remaining 13 are VU. In the french list, *Brassica repanda* subsp. *turbonis*, considered as a Pyrenean endemic subspecies (Gruber, 2014), stands out as the only species CR; while, *Phyllodoce caerulea* and *Subularia aquatica* (Penin & *al*., 2003) are classified as EN; the 10 remaining species are VU.

Protected Species

Of the 387 species studied, 81 (21%) are considered to be protected under a protection law in some of the lists and catalogues of protected species of the countries and regions belonging to the Pyrenees (Appendix 3) and 30 of them are protected at the same time in both countries. With the exception of Andorra that, despite the high number of taxa threatened (Carrillo, 2008), it lacks an official catalogue of protected flora among its legislation.

1. Analysis at national level

At national level, 14 species are protected (4% of the catalogue): In Spain there are few protected taxa, only 3 being listed in the LWSSPR; Two of them *Androcase cylindrica* and *Ranunculus parnassiifolius* are laveled with the highest category, EN, and only one of them, *Androsace*

pyrenaica (Goñi & *al*., 2006) is cataloged as VU according to the SCTS, that is, the lowest protection category established in this catalogue. In contrast, in France 13 taxa are protected under the maximum category of SPS according to the LPPSNT and there are no species under the PS category. Whereas only two species are found in both catalogues at the same time; *Androsace pyrenaica* and *A. cylindrica* (Table 3).

Table 3. Species protected at national level in the lists and catalogues of protected species of Spain and France.

Taxa	Spain (LWSSPR-SCTS)	France (LPPSNT)
Adonis pyrenaica		SPS
Androsace cylindrica	EN	SPS
Androsace helvetica		SPS
Androsace pyrenaica	VU	SPS
Androsace vandellii		SPS
Borderea pyrenaica		SPS
Carex bicolor		SPS
Carex ornithopoda		SPS
Diphasiastrum alpinum		SPS
Isoetes echinosporum		SPS
Isoetes lacustris		SPS
Jurinea humilis		SPS
Ranunculus parnassiifolius	EN	
Vicia argentea		SPS
Number of species	3	13

2. Analysis at regional level

Spain

The 52 Spanish protected taxa are listed (Appendix 3), as different categories depending on each autonomous community (AACC), in the four autonomic catalogues: the Basque Country has the highest number of protected species: 26, followed by Aragon and Catalonia with 15 and, Navarre with 3. (Table 4; Figure 4). Moreover, 9 are protected in several catalogues at once (*Adonis pyrenaica*, *Androsace pyrenaica*, *A.cylindrica*, *Diphasiastrum alpinum*, *Draba fladnizensis*, *Leontopodium alpinum*, *Minuartia cerastiifolia*, *Saxifraga clussi* and *Subularia aquatica*). *Ranunculus parnassiifolius* stands out as it does not appear in any of the regional catalogues but nevertheless it is protected nationally in the LWSSPR.

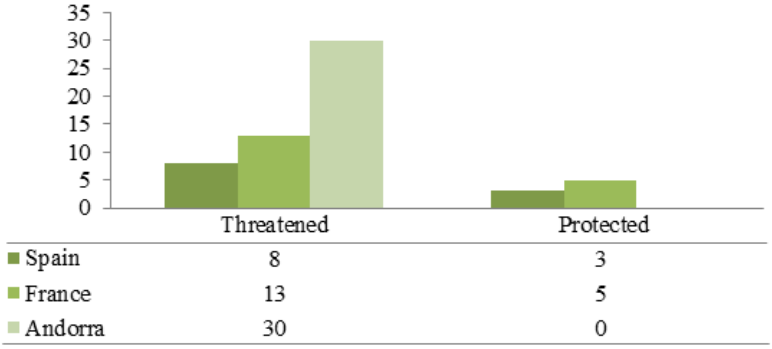
Only *Diphasiastrum alpinum*, in Navarre, has the maximum category (EN) in contrast to the majority, which are found as VU in all of the regional catalogues. This fact correlates with the low number of protected taxa at national level.

The Basque Country stands out because it is precisely the autonomous community with the highest number of protected alpine taxa and it is surprising since its mountains do not reach the altitudes defined in this paper. This is due to the fact that they are species with tolerant ecological amplitude, which is to say that, eventhough they are alpine species, they are able to reach lower altitudinal levels (Aizpuru & *al*., 2001; Garmendia & *al*., 2014).

Table 4. Protected species at regional level in Spain.

Catalogues	Basque Country	Navarre	Aragón	Catalonia	Spain (LWSSPR-SCTS)
Number of species	26	3	15	15	3

Figure 4. Number of protected species in Spain and France



France

In regard to the French Pyrenees, there are 47 protected species (Appendix 3), of which, 32 are included in one of the lists of protected species of the three French departments, LPPSNT. Therefore, the list of protected species in the Great Aquitaine (Table 5; Figure 4) has 9 protected species (*Arabis alpina*, *Asplenium septentrionale*, *Carex humilis*, *Daphne cneorum*, *Saussurea alpina*, *Sempervivum arachnoideum*, *Streptopus amplexifolius*, *Vaccinium myrtillus* and *Woodsia alpina*), Languedoc-Roussillon, 3 (*Brassica repanda* subsp. *repanda*, *Matthiola fruticulosa* subsp. *valesiaca* and *Phyteuma rupicola*) and in the Midi-Pyrenees, 22 *(Alyssum cuneifolium*, *Androsace ciliata*, *Asplenium viride*, *Eriophorum vaginatum*, *Festuca borderei*, *Gymnadenia austriaca*, *Huperzia selago*, *Kobresia simpliciuscula*, *Minuartia cerastiifolia*, *Papaver aurantiacum*, *Papaver lapeyrousianum* subsp. *endressii*, *Pedicularis rosea* subsp. *allionii*, *Petrocallis pyrenaica*,

Pinguicula vulgaris, *Plantago monosperma*, *Saxifraga clussi*, *Saxifraga media*, *Saxifraga stellaris*, *Subularia aquatica*, *Thymus praecox, Vaccinium uliginosum* and *Vaccinium vitis-idaea*).

None of the alpine taxa present in the French regional lists of protected species coincide with each other or with the national list. In addition, they are not classified in different categories which make it difficult to know the status of each of them, as well as the comparison of a species with its equivalent in the Spanish slope.

Table 5. Protected species at regional level in France.

Catalogues	Great Aquitaine	Languedoc-Roussillon	Midi-Pyrenees	France (LPPSNT)	Spain (LWSSPR-SCTS)
Number of species	9	3	22	13	3

Comparison between threatened and protected species and their analysis of consistency between catalogues

Having analyzed the situation of threat and protection of the alpine flora of the Pyrenees, it has been calculated how many of the threatened species are protected and which ones are not. Of the 8 threatened species present in the Spanish RL only 3 are protected in some catalogue, and of the 13 present in the French RL, 5 are protected (Moreno, 2010; Anon., 2012), reflecting a low degree of coherence between the RL and protection catalogues. The nonexistence of the Andorran list is even more incoherent than the lacking number of protected species in the two adjacent countries (Figure 5).

As can be seen in Table 6, the degree of coherence between threat and protection catalogues in the Pyrenees is scarce. The list of AFC species included in any of the RL of the three countries adds up to 46, while only 7 (2%) are nationally protected. Excluding Andorra from the analysis, as it lacks a protection catalog, the degree of coherence increases, although it is still insufficient since, of the 20 species that are threatened in Spain and France, only 7 are protected in a catalog. *Vicia argentea* is striking because it is the only taxon that is simultaneously threatened under the same category (VU) in Spain and France, but it is also protected in both countries. Reasonable fact given its high degree of endemicity and, therefore, its great conservationist interest (García & *al*., 1994).

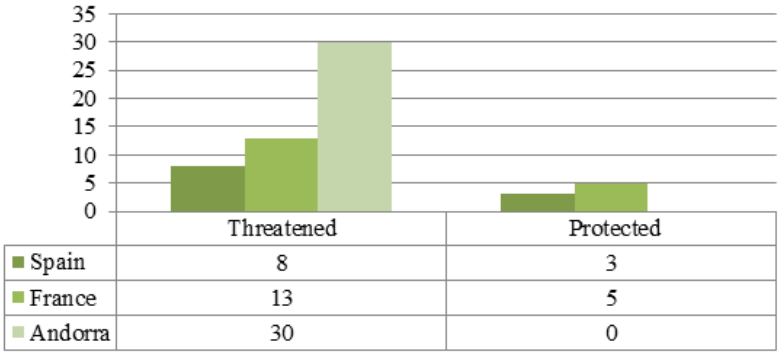


Figure 5. Number of threatened vs. protected species in any catalogue

Table 6. Threatened and protected species in some catalogue in Spain and France.

Taxa	Threatened species	Protected species
Adonis pyrenaica	VU	X
Alyssum cuneifolium	VU	X
Androsace halleri	VU	
Androsace helvetica	VU	X
Aquilegia pyrenaica	EN	
Brassica repanda subsp. *turbonis*	CR	
Campanula jaubertiana	VU	
Carex bicolor	CR	X
Carex foetida	VU	
Carex lachenalii subsp. *lachenalii*	CR	
Draba subnivalis	VU	
Juncus arcticus subsp. *arcticus*	VU	
Oreochloa disticha	VU	
Oxytropis foucaudii	VU	
Phyllodoce caerulea	EN	
Silene borderei	VU	
Subularia aquatica	EN	X
Thymus praecox	VU	X
Vicia argentea	VU + VU	X + X
Xatardia scabra	VU	
Total	20	7

National level in Spain and France

None of the threatened species are protected in Spain according to the LWSSPR, and only two are protected in France according to the LPPSNT (Table 7).

At national level, the degree of coherence between the catalogues is also low and *Vicia argentea*, again, is the only species that brings some coherence to the catalogues of endangered and protected species. In both countries, the VU category has the highest number of threatened plants, although none are protected in Spain, and in France only *Vicia argentea* and *Adonis pyrenaica*, the latter with a certain degree of rarity, which is consistent with the degree of protection (Carreras & *al*., 1996).

Regional level in Spain and France

Establishing the same parallelism in the regional analyses for the threatened vascular plants in each country against their degree of protection, it should be

noted that the 3 threatened species in Spain (Appendix 4) are protected in Aragon (*Androsace helvetica, Carex bicolor* and *Vicia argentea*), and their protection categories are VU, CR and VU, respectively. It is interesting to note that, although these plants are present in the four AACC, they lack protection in the rest of the AACC as well as at national level. At regional level in France (Appendix 4), the situation is similar to Spain, as only three of the threatened species, present in the French regions, are only recorded on the list of protected species of the Midi-Pyrénées (*Subularia aquatica* (EN), *Thymus praecox* (VU) and *Alyssum cuneifolium* (VU)). These two countries correctly protect only 3 species according to their degree of presence and, again, the predominant category of protection is VU. These results denote a great inconsistency between catalogues and possibly a lack of effort by these governments to ensure the survival of alpine plant species.

Table 7. Threatened species in Spain and France according to the red lists, and their degree of protection at national level.

Taxa	Threatened		Protected in LWSSPR, SCTS and LPPSNT	
	Spain	France	Spain	France
Adonis pyrenaica	.	VU	.	SPS
Alyssum cuneifolium	.	VU	.	.
Androsace halleri	VU	.	.	.
Androsace helvetica	VU	.	.	.
Aquilegia pyrenaica	EN		.	.
Brassica repanda subsp. *turbonis*	.	CR	.	.
Campanula jaubertiana	.	VU	.	.
Carex bicolor	CR	.	.	.
Carex foetida	VU	.	.	.
Carex lachenalii subsp. *lachenalii*	CR	.	.	.
Draba subnivalis	.	VU	.	.
Juncus arcticus subsp. *arcticus*	VU	.	.	.
Oreochloa disticha	.	VU	.	.
Oxytropis foucaudii	.	VU	.	.
Phyllodoce caerulea	.	EN	.	.
Silene borderei	.	VU	.	.
Subularia aquatica	.	EN	.	.
Thymus praecox	.	VU	.	.
Vicia argentea	VU	VU	.	SPS
Xatardia scabra	.	VU	.	.
Total	8	13	0	2

Threatened taxa that must be protected

Given this situation, a list of species that are not protected but should be legally protected due to the degree of threat established by IUCN is proposed. All species that, according to the IUCN, are cataloged in the three main categories of threat (CR, EN and VU) should be protected.

The inclusion of these threatened species -not protected-, will be carried out according to their order of priority, that is, in first place, those labeled as CR, and then those as EN and VU, respectively, following the inclusion criteria established in Law 42/2007 (Anon., 2007). For each country, the geographical distribution of each threatened species will be analyzed, reviewing its conservation status (CS) and establishing its corresponding scale of protection; at national, regional or other level (Anon., 2011). Under these criteria, the list shown in Table 9 is proposed, with 42 species, of which, *Brassica repanda* subsp. *turbonis*, *Carex bicolor*, *Silene borderei* and Vicia *argentea* should be mentioned.These 4 species, as a consequence of being contempleted in Aragon under the category 'Special Interest' (S.I.), deserve additional protection and surveillance. Similarly, the evaluation and monitoring will be carried out not only of the proposed species, but also of all the AFC taxa, in view of a possible modification of their CS.

Table 9. Threatened species that should be protected

Agrostis agrostiflora	*Juncus arcticus* subsp. *arcticus*
Alyssum alpestre subsp. *alpestre*	*Lonicera pyrenaica*
Alyssum cuneifolium	*Myosotis alpina*
Androsace halleri	*Oreochloa disticha*
Androsace helvetica	*Oxytropis foucaudii*
Aquilegia pyrenaica	*Pinguicula alpina*
Artemisia eriantha	*Poa minor*
Artemisia umbelliformis	*Potentilla frigida*
Brassica repanda subsp. *turbonis*	*Ranunculus glacialis*
Campanula jaubertiana	*Reseda glauca*
Carex bicolor	*Saxifraga androsacea*
Carex foetida	*Saxifraga aspera*
Carex lachenalii subsp. *lachenalii*	*Saxifraga intricata*
Carex rupestris	*Saxifraga umbrosa*
Draba tomentosa subsp. *ciliigera*	*Silene borderei*
Draba subnivalis	*Subularia aquatica*
Festuca alpina	*Thalictrum alpinum*
Festuca niphobia	*Thymus praecox*
Gnaphalium hoppeanum	*Veronica nummularia*
Gnaphalium norvegicum	*Vicia argentea*
Iberis spathulata	*Xatardia scabra*

Conclusions

The Alpine Flora Catalogue (AFC) is constituted by 387 species, of which 46 (12%) are threatened in some of the national red lists of the Pyrenees: 8 Spain, 30 Andorra and 13 France. In regards to threat status: 11 are CR (2 Spain + 9 Andorra +1 France); 11 EN (1 Spain + 8 Andorra + 2 France) and 27 VU (5 Spain + 13 Andorra + 10 France), this last category having the most number of taxa. Of the AFC, 81 (21%) are legally protected in at least one of the Spanish (52) and French (47) catalogues, 30 of them protected at the same time in both countries, meanwhile Andorra lacks an official catalogue of protected flora. At national level there are 14 taxa (3 LWSSPR, 1 SCTS + 13 LPPSNT), of which, *Androsace pyrenaica* and *A. cylindrica* coincide in the two catalogues.

At regional level there are 51 in Spain and 34 in France. In Spain, the Basque Country stands out as the autonomous community with the highest number of protected flora: 26, "*in most cases, Basque populations are located at much lower altitudes compared to Pyrenean*

populations, which suggests that they are isolated and relict populations" (Garmendia & *al*., 2014). In France, the Midi -Pyrenees should be highlighted as the region with the most number of protected species: 22.

Regarding coherence between threatened and protected species catalogues, of the 8 present in RL2010, 3 are legally protected, but not at national level in the LWSSPR, in France only 5 of the 13 RL2012 threatened are protected (2 LPPSNT + 3 regional level), and in Andorra, due to the absence of an official list, the species are unprotected. Excluding Andorra from the analysis, the degree of coherence increases, although it is still insufficient since, of the 20 species that are threatened in both Spain and France, only 7 are protected in a catalogue at the same time.

The protection of this flora is complex due to the administrative situation of the territory. Given this reality, it would be adequate to develop the list of protection, proposed in this paper, common and cross-border covering the territories of the Pyrenees. To accomplish this, it will be necessary to periodically review the AFC, keep it updated and be able to continue with the investigation of this variety of flora, as well as the evaluation and periodic monitoring of its conservation status.

Acknowledgements

To Daniel Gómez (IPE-CSIC) who provided the bibliographical information of the alpine flora of the Pyrenees and anonymous reviewers of the manuscript whose suggestions have helped to improve the article.

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Appendix 1. Pyrenees alpine flora catalogue (AFC).

Taxon	Family
Achillea millefolium	Asteraceae (Compositae)
Achillea odorata	Asteraceae (Compositae)
Achillea pyrenaica	Asteraceae (Compositae)
Acinos alpinus subsp. *alpinus*	Lamiaceae (Labiatae)
Adonis pyrenaica	Ranunculaceae
Agrostis agrostiflora	Poaceae (Gramineae)
Agrostis alpina	Poaceae (Gramineae)
Agrostis rupestris	Poaceae (Gramineae)
Agrostis schleicheri	Poaceae (Gramineae)
Ajuga pyramidalis	Lamiaceae (Labiatae)
Alopecurus gerardii	Poaceae (Gramineae)
Alyssum alpestre subsp. *alpestre*	Brassicaceae (Cruciferae)
Alyssum cuneifolium	Brassicaceae (Cruciferae)
Androsace carnea subsp. *laggeri*	Primulaceae
Androsace ciliata	Primulaceae
Androsace cylindrica	Primulaceae
Androsace halleri	Primulaceae
Androsace helvetica	Primulaceae
Androsace pyrenaica	Primulaceae
Androsace vandellii	Primulaceae
Androsace villosa	Primulaceae
Anemone narcissiflora	Ranunculaceae
Antennaria carpatica	Asteraceae (Compositae)
Antennaria dioica	Asteraceae (Compositae)
Anthemis cretica	Asteraceae (Compositae)
Anthyllis montana	Fabaceae (Leguminosae)
Anthyllis vulneraria subsp. *vulnerarioides*	Fabaceae (Leguminosae)
Antirrhinum sempervirens	Scrophulariaceae
Aquilegia pyrenaica	Ranunculaceae
Arabis alpina	Brassicaceae (Cruciferae)
Arabis ciliata	Brassicaceae (Cruciferae)
Arabis serpillifolia	Brassicaceae (Cruciferae)
Arctostaphylos alpinus	Ericaceae
Arenaria biflora	Caryophyllaceae
Arenaria ciliata	Caryophyllaceae
Arenaria marschlinsii	Caryophyllaceae
Arenaria purpurascens	Caryophyllaceae
Arenaria tetraquetra	Caryophyllaceae
Armeria alpina	Plumbaginaceae
Armeria bubanii	Plumbaginaceae
Artemisia eriantha	Asteraceae (Compositae)
Artemisia umbelliformis	Asteraceae (Compositae)
Asperula cynanchica subsp. *pyrenaica*	Rubiaceae
Asperula hirta	Rubiaceae
Asplenium ruta-muraria subsp.*ruta-muraria*	Aspleniaceae
Asplenium septentrionale	Aspleniaceae
Asplenium viride	Aspleniaceae

Aster alpinus	Asteraceae (Compositae)
Astragalus alpinus	Fabaceae (Leguminosae)
Astragalus australis	Fabaceae (Leguminosae)
Astrantia minor	Apiaceae (Umbelliferae)
Athyrium distentifolium	Woodsiaceae
Avenula versicolor	Poaceae (Gramineae)
Bartsia alpina	Scrophulariaceae
Bellardiochloa variegata	Poaceae (Gramineae)
Biscutella brevifolia	Brassicaceae (Cruciferae)
Biscutella intermedia	Brassicaceae (Cruciferae)
Borderea pyrenaica	Dioscoreaceae
Botrychium lunaria	Ophioglossaceae
Brassica repanda subsp. *repanda*	Brassicaceae (Cruciferae)
Brassica repanda subsp. *turbonis*	Brassicaceae (Cruciferae)
Bupleurum ranunculoides	Apiaceae (Umbelliferae)
Campanula cochlearifolia	Campanulaceae
Campanula scheuchzeri	Campanulaceae
Campanula jaubertiana	Campanulaceae
Cardamine alpina	Brassicaceae (Cruciferae)
Cardamine resedifolia	Brassicaceae (Cruciferae)
Carduus carlinoides subsp. *carlinoides*	Asteraceae (Compositae)
Carex atrata	Cyperaceae
Carex bicolor	Cyperaceae
Carex canescens	Cyperaceae
Carex capillaris subsp. *capillaris*	Cyperaceae
Carex caryophyllea	Cyperaceae
Carex curvula	Cyperaceae
Carex echinata	Cyperaceae
Carex ericetorum	Cyperaceae
Carex foetida	Cyperaceae
Carex frigida	Cyperaceae
Carex humilis	Cyperaceae
Carex lachenalii subsp. *lachenalii*	Cyperaceae
Carex macrostyla	Cyperaceae
Carex nigra	Cyperaceae
Carex ornithopoda	Cyperaceae
Carex parviflora	Cyperaceae
Carex pyrenaica	Cyperaceae
Carex rostrata	Cyperaceae
Carex rupestris	Cyperaceae
Carex sempervirens	Cyperaceae
Cerastium alpinum	Caryophyllaceae
Cerastium cerastoides	Caryophyllaceae
Cerastium pyrenaicum	Caryophyllaceae
Chaenorhinum origanifolium	Scrophulariaceae
Chenopodium bonus-henricus	Chenopodiaceae
Coincya monensis	Brassicaceae (Cruciferae)
Comastoma tenellum	Gentianaceae
Crepis pygmaea	Asteraceae (Compositae)

Crepis pyrenaica	Asteraceae (Compositae)
Crocus vernus	Iridaceae
Cryptogramma crispa	Adiantaceae
Cystopteris alpina	Woodsiaceae
Cystopteris fragilis	Woodsiaceae
Daphne cneorum	Thymelaeaceae
Daphne mezereum	Thymelaeaceae
Deschampsia flexuosa	Poaceae (Gramineae)
Dianthus deltoides subsp. *deltoides*	Caryophyllaceae
Diphasiastrum alpinum	Lycopodiaceae
Doronicum grandiflorum	Asteraceae (Compositae)
Draba aizoides	Brassicaceae (Cruciferae)
Draba dubia	Brassicaceae (Cruciferae)
Draba fladnizensis	Brassicaceae (Cruciferae)
Draba siliquosa	Brassicaceae (Cruciferae)
Draba subnivalis	Brassicaceae (Cruciferae)
Draba tomentosa subsp. *ciliigera*	Brassicaceae (Cruciferae)
Dryas octopetala	Rosaceae
Dryopteris dilatata	Dryopteridaceae (Aspidiaceae)
Dryopteris expansa	Dryopteridaceae (Aspidiaceae)
Eleocharis quinqueflora	Cyperaceae
Empetrum hermaphroditum	Empetraceae
Epilobium alsinifolium	Onagraceae (Circaeaceae, Epilobiaceae)
Epilobium anagallidifolium	Onagraceae (Circaeaceae, Epilobiaceae)
Erigeron alpinus	Asteraceae (Compositae)
Erigeron cabelloi	Asteraceae (Compositae)
Erigeron glabratus subsp. *occidentalis*	Asteraceae (Compositae)
Erigeron uniflorus	Asteraceae (Compositae)
Erinus alpinus	Scrophulariaceae
Eriophorum angustifolium	Cyperaceae
Eriophorum scheuchzeri	Cyperaceae
Eriophorum vaginatum	Cyperaceae
Eryngium bourgatii	Apiaceae (Umbelliferae)
Erysimum duriaei subsp. *pyrenaicum*	Brassicaceae (Cruciferae)
Euphorbia pyrenaica	Euphorbiaceae
Euphrasia alpina	Scrophulariaceae
Euphrasia minima	Scrophulariaceae
Euphrasia salisburgensis	Scrophulariaceae
Festuca airoides	Poaceae (Gramineae)
Festuca alpina	Poaceae (Gramineae)
Festuca borderei	Poaceae (Gramineae)
Festuca eskia	Poaceae (Gramineae)
Festuca gautieri	Poaceae (Gramineae)
Festuca glacialis	Poaceae (Gramineae)
Festuca laevigata	Poaceae (Gramineae)
Festuca nigrescens	Poaceae (Gramineae)
Festuca niphobia	Poaceae (Gramineae)
Festuca prudhommei	Poaceae (Gramineae)
Festuca pyrenaica	Poaceae (Gramineae)

Festuca quadriflora	Poaceae (Gramineae)
Gagea liotardii	Liliaceae
Galeopsis pyrenaica	Lamiaceae (Labiatae)
Galium cespitosum	Rubiaceae
Galium cometerhizon	Rubiaceae
Galium pyrenaicum	Rubiaceae
Gentiana acaulis	Gentianaceae
Gentiana alpina	Gentianaceae
Gentiana nivalis	Gentianaceae
Gentiana schleicheri	Gentianaceae
Gentiana verna	Gentianaceae
Gentianella campestris	Gentianaceae
Geum montanum	Rosaceae
Globularia repens	Globulariaceae
Gnaphalium hoppeanum	Asteraceae (Compositae)
Gnaphalium norvegicum	Asteraceae (Compositae)
Gnaphalium supinum	Asteraceae (Compositae)
Gymnadenia austriaca	Orchidaceae
Gymnadenia gabasiana	Orchidaceae
Gypsophila repens	Caryophyllaceae
Helianthemum alpestre	Cistaceae
Helianthemum nummularium	Cistaceae
Helictotrichon sedenense	Poaceae (Gramineae)
Helictotrichon versicolor	Poaceae (Gramineae)
Herniaria alpina	Caryophyllaceae
Hieracium piliferum	Asteraceae (Compositae)
Hippocrepis comosa	Fabaceae (Leguminosae)
Huperzia selago	Lycopodiaceae
Hypericum nummularium	Clusiaceae (Guttiferae)
Iberis sempervirens	Brassicaceae (Cruciferae)
Iberis spathulata	Brassicaceae (Cruciferae)
Iris latifolia	Iridaceae
Isoetes echinosporum	Isoetaceae
Isoetes lacustris	Isoetaceae
Jacobaea leucophylla	Asteraceae (Compositae)
Jasione crispa	Campanulaceae
Jasione laevis	Campanulaceae
Juncus alpinoarticulatus subsp. *alpinoarticulatus*	Juncaceae
Juncus arcticus subsp. *arcticus*	Juncaceae
Juncus balticus subsp. *pyrenaeus*	Juncaceae
Juncus filiformis	Juncaceae
Juncus trifidus	Juncaceae
Juncus triglumis subsp. *triglumis*	Juncaceae
Juniperus nana	Cupressaceae
Jurinea humilis	Asteraceae (Compositae)
Kernera saxatilis subsp. *saxatilis*	Brassicaceae (Cruciferae)
Kobresia myosuroides	Cyperaceae
Kobresia simpliciuscula	Cyperaceae
Koeleria vallesiana	Poaceae (Gramineae)

Leontodon pyrenaicus subsp.*pyrenaicus*	Asteraceae (Compositae)
Leontopodium alpinum	Asteraceae (Compositae)
Leucanthemopsis alpina	Asteraceae (Compositae)
Leucanthemum gaudinii	Asteraceae (Compositae)
Linaria alpina	Scrophulariaceae
Loiseleuria procumbens	Ericaceae
Lonicera pyrenaica	Caprifoliaceae
Lotus corniculatus subsp. *alpinus*	Fabaceae (Leguminosae)
Luzula alpina	Juncaceae
Luzula alpino-pilosa subsp. *alpino-pilosa*	Juncaceae
Luzula desvauxii	Juncaceae
Luzula lutea	Juncaceae
Luzula nutans	Juncaceae
Luzula spicata	Juncaceae
Lychnis alpina	Caryophyllaceae
Matthiola fruticulosa subsp. *valesiaca*	Brassicaceae (Cruciferae)
Meum athamanticum	Apiaceae (Umbelliferae)
Minuartia cerastiifolia	Caryophyllaceae
Minuartia laricifolia	Caryophyllaceae
Minuartia recurva	Caryophyllaceae
Minuartia sedoides	Caryophyllaceae
Minuartia verna	Caryophyllaceae
Mucizonia sedoides	Crassulaceae
Murbeckiella pinnatifida	Brassicaceae (Cruciferae)
Myosotis alpestris	Boraginaceae
Myosotis alpina	Boraginaceae
Nardus stricta	Poaceae (Gramineae)
Ononis cristata	Fabaceae (Leguminosae)
Oreochloa disticha	Poaceae (Gramineae)
Oxyria digyna	Polygonaceae
Oxytropis amethystea	Fabaceae (Leguminosae)
Oxytropis campestris	Fabaceae (Leguminosae)
Oxytropis foucaudii	Fabaceae (Leguminosae)
Oxytropis halleri	Fabaceae (Leguminosae)
Oxytropis lapponica	Fabaceae (Leguminosae)
Oxytropis pyrenaica	Fabaceae (Leguminosae)
Papaver aurantiacum	Papaveraceae
Papaver lapeyrousianum subsp. *endressii*	Papaveraceae
Papaver lapeyrousianum subsp. *lapeyrousianum*	Papaveraceae
Paronychia kapela subsp. *serpyllifolia*	Caryophyllaceae
Paronychia polygonifolia	Caryophyllaceae
Pedicularis kerneri	Scrophulariaceae
Pedicularis mixta	Scrophulariaceae
Pedicularis pyrenaica	Scrophulariaceae
Pedicularis rosea subsp. *allionii*	Scrophulariaceae
Petrocallis pyrenaica	Brassicaceae (Cruciferae)
Phleum alpinum	Poaceae (Gramineae)
Phyllodoce caerulea	Ericaceae
Phyteuma globularifolium	Campanulaceae

Phyteuma hemisphaericum	Campanulaceae
Phyteuma orbiculare	Campanulaceae
Phyteuma rupicola	Campanulaceae
Pilosella lactucella	Asteraceae (Compositae)
Pinguicula alpina	Lentibulariaceae
Pinguicula grandiflora	Lentibulariaceae
Pinguicula vulgaris	Lentibulariaceae
Pinus uncinata	Pinaceae
Plantago alpina	Plantaginaceae
Plantago monosperma	Plantaginaceae
Poa alpina	Poaceae (Gramineae)
Poa cenisia	Poaceae (Gramineae)
Poa chaixii	Poaceae (Gramineae)
Poa glauca	Poaceae (Gramineae)
Poa laxa	Poaceae (Gramineae)
Poa minor	Poaceae (Gramineae)
Poa nemoralis	Poaceae (Gramineae)
Poa supina	Poaceae (Gramineae)
Polygala alpestris	Polygalaceae
Polygala alpina	Polygalaceae
Polygonum viviparum	Polygonaceae
Polystichum lonchitis	Dryopteridaceae (Aspidiaceae)
Potentilla alchimilloides	Rosaceae
Potentilla aurea subsp. *aurea*	Rosaceae
Potentilla brauneana	Rosaceae
Potentilla crantzii	Rosaceae
Potentilla frigida	Rosaceae
Potentilla nivalis	Rosaceae
Potentilla pyrenaica	Rosaceae
Primula elatior subsp. *intricata*	Primulaceae
Primula farinosa	Primulaceae
Primula hirsuta	Primulaceae
Primula integrifolia	Primulaceae
Primula latifolia	Primulaceae
Pritzelago alpina	Brassicaceae (Cruciferae)
Pseudorchis albida	Orchidaceae
Pulsatilla alpina subsp. *alpina*	Ranunculaceae
Pulsatilla vernalis	Ranunculaceae
Ranunculus alpestris subsp. *alpestris*	Ranunculaceae
Ranunculus carinthiacus	Ranunculaceae
Ranunculus glacialis	Ranunculaceae
Ranunculus gouanii	Ranunculaceae
Ranunculus parnassiifolius	Ranunculaceae
Ranunculus pyrenaeus	Ranunculaceae
Ranunculus ruscinonensis	Ranunculaceae
Ranunculus trichophyllus subsp. *trichophyllus*	Ranunculaceae
Reseda glauca	Resedaceae
Rhamnus pumilus	Rhamnaceae
Rhinanthus pumilus	Scrophulariaceae

Rhododendron ferrugineum	Ericaceae
Rumex scutatus	Polygonaceae
Sagina saginoides	Caryophyllaceae
Salix ceretana	Salicaceae
Salix herbacea	Salicaceae
Salix pyrenaica	Salicaceae
Salix reticulata	Salicaceae
Salix retusa	Salicaceae
Saussurea alpina	Asteraceae (Compositae)
Saxifraga adscendens	Saxifragaceae
Saxifraga aizoides	Saxifragaceae
Saxifraga androsacea	Saxifragaceae
Saxifraga aspera	Saxifragaceae
Saxifraga bryoides	Saxifragaceae
Saxifraga caesia	Saxifragaceae
Saxifraga clussi	Saxifragaceae
Saxifraga geranioides	Saxifragaceae
Saxifraga hirsuta subsp.*hirsuta*	Saxifragaceae
Saxifraga intricata	Saxifragaceae
Saxifraga longifolia	Saxifragaceae
Saxifraga media	Saxifragaceae
Saxifraga moschata	Saxifragaceae
Saxifraga oppositifolia	Saxifragaceae
Saxifraga paniculata	Saxifragaceae
Saxifraga pentadactylis	Saxifragaceae
Saxifraga praetermissa	Saxifragaceae
Saxifraga pubescens	Saxifragaceae
Saxifraga retusa	Saxifragaceae
Saxifraga stellaris	Saxifragaceae
Saxifraga umbrosa	Saxifragaceae
Scutellaria alpina subsp. *alpina*	Lamiaceae (Labiatae)
Sedum album	Crassulaceae
Sedum alpestre	Crassulaceae
Sedum anacampseros	Crassulaceae
Sedum annuum	Crassulaceae
Sedum atratum	Crassulaceae
Sedum brevifolium	Crassulaceae
Sedum rosea	Crassulaceae
Selaginella selaginoides	Selaginellaceae
Selinum pyrenaeum	Apiaceae (Umbelliferae)
Sempervivum arachnoideum	Crassulaceae
Sempervivum montanum	Crassulaceae
Sempervivum tectorum	Crassulaceae
Senecio boissieri	Asteraceae (Compositae)
Senecio doronicum	Asteraceae (Compositae)
Senecio pyrenaicus subsp. *pyrenaicus*	Asteraceae (Compositae)
Sesamoides interrupta	Resedaceae
Sesleria coerulea	Poaceae (Gramineae)
Sibbaldia procumbens	Rosaceae

Sideritis hyssopifolia	Lamiaceae (Labiatae)
Silene acaulis	Caryophyllaceae
Silene borderei	Caryophyllaceae
Silene ciliana	Caryophyllaceae
Silene rupestris	Caryophyllaceae
Silene vulgaris	Caryophyllaceae
Soldanella alpina	Primulaceae
Sparganium angustifolium	Sparganiaceae
Streptopus amplexifolius	Liliaceae
Subularia aquatica	Brassicaceae (Cruciferae)
Taraxacum pyrenaicum	Asteraceae (Compositae)
Teucrium pyrenaicum	Lamiaceae (Labiatae)
Thlaspi brachypetalum	Ranunculaceae
Thalictrum alpinum	Ranunculaceae
Thalictrum minus	Ranunculaceae
Thesium alpinum	Santalaceae
Thesium pyrenaicum subsp. *pyrenaicum*	Santalaceae
Thymus praecox	Lamiaceae (Labiatae)
Thymelaea calycina	Thymelaeaceae
Thymelaea tinctoria subsp. *nivalis*	Thymelaeaceae
Trifolium alpinum	Fabaceae (Leguminosae)
Trifolium thalii	Fabaceae (Leguminosae)
Trisetum spicatum	Poaceae (Gramineae)
Vaccinium myrtillus	Ericaceae
Vaccinium uliginosum	Ericaceae
Vaccinium vitis-idaea	Ericaceae
Valeriana apula	Valerianaceae
Valeriana saliunca	Valerianaceae
Veratrum album	Liliaceae
Veronica alpina	Scrophulariaceae
Veronica aphylla	Scrophulariaceae
Veronica aragonensis	Scrophulariaceae
Veronica bellidioides	Scrophulariaceae
Veronica fruticans	Scrophulariaceae
Veronica nummularia	Scrophulariaceae
Veronica ponae	Scrophulariaceae
Veronica serpyllifolia subsp. *humifusa*	Scrophulariaceae
Vicia argentea	Fabaceae (Leguminosae)
Vicia pyrenaica	Fabaceae (Leguminosae)
Viola biflora	Violaceae
Viola diversifolia	Violaceae
Viola pyrenaica	Violaceae
Viola rupestris subsp. *rupestris*	Violaceae
Vitaliana primuliflora	Primulaceae
Woodsia alpina	Woodsiaceae
Xatardia scabra	Apiaceae (Umbelliferae)

Appendix 2. Threatened species in the pyrenees according to the red lists of Spain, France and Andorra.

Taxa	Spain	France	Andorra
Adonis pyrenaica	.	VU	.
Agrostis agrostiflora	.	.	VU
Alyssum alpestre subsp. *alpestre*	.	.	VU
Alyssum cuneifolium	.	VU	.
Androsace halleri	VU	.	.
Androsace helvetica	VU	.	.
Aquilegia pyrenaica	EN	.	CR
Artemisia eriantha	.	.	VU
Artemisia umbelliformis	.	.	VU
Brassica repanda subsp. *turbonis*	.	CR	CR
Campanula jaubertiana	.	VU	.
Carex bicolor	CR	.	.
Carex foetida	VU	.	.
Carex lachenalii subsp. *lachenalii*	CR	.	.
Carex rupestris	.	.	EN
Draba tomentosa subsp. *ciliigera*	.	.	VU
Draba subnivalis	.	VU	.
Festuca alpina	.	.	EN
Festuca niphobia	.	.	VU
Gnaphalium hoppeanum	.	.	CR
Gnaphalium norvegicum	.	.	VU
Iberis spathulata	.	.	VU
Juncus arcticus subsp. *arcticus*	VU	.	.
Lonicera pyrenaica	.	.	VU
Myosotis alpina	.	.	EN
Oreochloa disticha	.	VU	.
Oxytropis foucaudii	.	VU	.
Phyllodoce caerulea	.	EN	.
Pinguicula alpina	.	.	CR
Poa minor	.	.	EN
Potentilla brauneana	.	.	EN
Potentilla frigida	.	.	EN
Ranunculus glacialis	.	.	CR
Reseda glauca	.	.	VU
Saxifraga androsacea	.	.	EN
Saxifraga aspera	.	.	VU
Saxifraga intricata	.	.	VU
Saxifraga umbrosa	.	.	VU
Silene borderei	.	VU	.
Subularia aquatica	.	EN	CR
Thalictrum alpinum	.	.	CR
Thymus praecox	.	VU	.
Veronica nummularia	.	.	EN
Vicia argentea	VU	VU	.
Woodsia alpina	.	.	CR
Xatardia scabra	.	VU	CR

Appendix 3. Protected species throughout the whole Pyrenees.

Taxa	Spain (LWSSPR)	Spain (SCTS)	Basque Country	Navarre	Aragón	Catalonia	France (LPPSNT)	Great Aquitaine	Midi-Pyrenees	Languedoc-Roussillon
Adonis pyrenaica				V.		E.E.P.	ESP			
Alyssum cuneifolium									Protégée	
Androsace ciliata						E.E.P.			Protégée	
Androsace cylindrica	EN				I.E.		ESP			
Androsace helvetica					V.		ESP			
Androsace pyrenaica	VU	VU.			V.		ESP			
Androsace vandellii							ESP			
Arabis alpina								Protégée		
Arctostaphylos alpinus					E.P.E.					
Asperula hirta			R.							
Asplenium ruta-muraria subsp. *ruta-muraria*			VU.							
Asplenium septentrionale			VU.					Protégée		
Asplenium viride									Protégée	
Aster alpinus			R.							
Bartsia alpina			VU.							
Borderea pyrenaica					I.E.		ESP			
Botrychium lunaria			R.							
Brassica repanda subsp. *repanda*										Protégée
Brassica repanda subsp. *turbonis*					I.E.					
Carex bicolor					I.E.		ESP			
Carex humilis								Protégée		
Carex ornithopoda							ESP			
Carex rostrata			EN.							
Crepis pyrenaica			VU.							
Daphne cneorum			EN.					Protégée		
Diphasiastrum alpinum			EN.		E.P.E.	V.	ESP			
Draba fladnizensis					V.	V.				
Eriophorum vaginatum			EN.						Protégée	
Festuca borderei									Protégée	
Galium pyrenaicum			R.							
Gymnadenia austriaca									Protégée	

Taxa	Spain (LWSSPR)	Spain (SCTS)	Basque Country	Navarre	Aragón	Catalonia	France (LPPSNT)	Great Aquitaine	Midi-Pyrenees	Languedoc-Roussillon
Gypsophila repens			VU.							
Huperzia selago			R.						Protégée	
Iris latifolia			VU.							
Isoetes echinosporum							ESP			
Isoetes lacustris							ESP			
Juncus trifidus			EN.							
Jurinea humilis							ESP			
Kobresia simpliciuscula									Protégée	
Leontodon pyrenaicus subsp. *pyrenaicus*			VU.							
Leontopodium alpinum					I.E.	V.				
Luzula nutans			R.							
Matthiola fruticulosa subsp. *valesiaca*										Protégée
Meum athamanticum			EN.							
Minuartia cerastiifolia				V.	I.E.				Protégée	
Oxytropis amethystea						E.E.P.				
Oxytropis lapponica						E.E.P.				
Papaver aurantiacum									Protégée	
Papaver lapeyrousianum subsp. *endressii*									Protégée	
Pedicularis rosea subsp. *allionii*						E.E.P.			Protégée	
Petrocallis pyrenaica									Protégée	
Phyllodoce caerulea						E.P.E.				
Phyteuma globularifolium						E.E.P.				
Phyteuma rupicola										Protégée
Pinguicula vulgaris									Protégée	
Plantago monosperma									Protégée	
Potentilla brauneana						E.E.P.				
Primula farinosa			EN.							
Primula integrifolia			VU.							
Primula latifolia						E.E.P.				
Ranunculus parnassiifolius	EN.									
Rhododendron ferrugineum						E.E.P.				

Taxa	Spain (LWSSPR)	Spain (SCTS)	Basque Country	Navarre	Aragón	Catalonia	France (LPPSNT)	Great Aquitaine	Midi-Pyrenees	Languedoc-Roussillon
Saussurea alpina								Protégée		
Saxifraga clussi			VU.	V.					Protégée	
Saxifraga longifolia			EN.							
Saxifraga media									Protégée	
Saxifraga stellaris									Protégée	
Sempervivum arachnoideum								Protégée		
Silene borderei					I.E.					
Silene ciliata			VU.							
Streptopus amplexifolius								Protégée		
Subularia aquatica					I.E.	E.E.P.			Protégée	
Thymus praecox									Protégée	
Vaccinium myrtillus								Protégée		
Vaccinium uliginosum									Protégée	
Vaccinium vitis-idaea									Protégée	
Veratrum album			I.E.							
Veronica aragonensis					I.E.					
Vicia argentea					I.E.		ESP			
Viola biflora			VU.							
Woodsia alpina						V.		Protégée		

Appendix 4. Threatened species in Spain and France according to the RL, their presence in their regions and their degree of protection. Pres = presence; Prot: protected.

		Basque Country		Navarre		Aragon		Catalonia		Great Aquitaine		Languedoc-Roussillon		Midi-Pyrenées	
Taxa	IUCN	Pres	Prot	Pres	Prot	Pres	Prot	Pres	Prot	Pres	Prot	Pres	Prot	Pres	Prot
Adonis pyrenaica	VU	.	.	.	.	.	.	.	.	.	.	X	.	X	.
Alyssum cuneifolium	VU	.	.	.	.	.	.	.	.	X	.	X	.	X	X
Androsace halleri	VU	.	.	.	.	.	.	X	.	.	.	.	.	.	.
Androsace helvetica	VU	.	.	.	.	X	X	X	.	.	.	.	.	.	.
Aquilegia pyrenaica	EN	X	.	X	.	X	.	X	.	.	.	.	.	.	.
Brassica repanda subsp. *turbonis*	CR	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Campanula jaubertiana	VU	.	.	.	.	.	.	.	.	.	.	X	.	X	.
Carex bicolor	CR	.	.	.	.	X	X	.	.	.	.	.	.	.	.
Carex foetida	VU	.	.	.	.	X	.	.	.	.	.	.	.	.	.
Carex lachenalii subsp. *lachenalii*	CR	.	.	.	.	.	.	X	.	.	.	.	.	.	.
Draba subnivalis	VU	.	.	.	.	.	.	.	.	.	.	X	.	X	.
Juncus arcticus subsp. *arcticus*	VU	.	.	.	.	X	.	.	.	.	.	.	.	.	.
Oreochloa disticha	VU	.	.	.	.	.	.	.	.	.	.	X	.	X	.
Oxytropis foucaudii	VU	.	.	.	.	.	.	.	.	X	.	X	.	X	.
Phyllodoce caerulea	EN	.	.	.	.	.	.	.	.	.	.	X	.	X	.
Silene borderei	VU	.	.	.	.	.	.	.	.	.	.	X	.	X	.
Subularia aquatica	EN	.	.	.	.	.	.	.	.	.	.	X	.	X	X
Thymus praecox	VU	.	.	.	.	.	.	.	.	X	.	X	.	X	X
Vicia argentea	VU	.	.	.	.	X	X	X	.	.	.	.	.	.	.
Vicia argentea	VU	.	.	.	.	.	.	.	.	.	.	.	.	X	.
Xatardia scabra	VU	.	.	.	.	.	.	.	.	.	.	X	.	.	.