Drafting a prioritized checklist of Crop Wild Relatives and Wild Harvested Plants of Italy: problems and solutions

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CWR and WHP should be protected not only *per se*, as key elements of biodiversity, but also for their great and direct socioeconomic importance for humans.

CWR, some of which are also collected in the wild for different purposes including human consumption, are widely used in specific breeding programs aimed at improving crops for productivity, quality, and resistance to biotic and abiotic stress . The most relevant economic impact of wild relatives in crop improvement is related to the introgression of disease and pest resistance traits in several crops.

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ARTICLE

A new list and prioritization of wild plants of socioeconomic interest in Italy: toward a conservation strategy

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ABSTRACT
Wild harvested plants (WHP) and crop wild relatives (CWR), part of the segment of natural diversity that is collectively known as 'Plant Genetic Resources', have great socioeconomic importance for humans because they are used either directly or in crop breeding. In order to lay down a solid base for constructing conservation strategies for Italy, an updated annotated list of CWR and WHP was produced for the country including information on known uses. Taxa included in the list were then prioritized using a pragmatic approach based on their value, native status, and need of protection or monitoring.

KEYWORDS
Crop wild relatives; Italian CWR check list; CWR taxa conservation priority; biodiversity; ethnobotanical use

Introduction

It is commonly acknowledged that the inter- and intra-specific diversity, as well as the habitat diversity of wildlife, is under threat of irremediable loss (Cardinale et al. 2012; Ceballos et al. 2015; Chase et al. 2020; Leigh et al. 2019). The Mediterranean basin is an important biodiversity hotspot with about 25,000 plant species (Cuttelod et al. 2008), of which about 13,000 are endemic (Myers et al. 2000). In particular, after the Iberian Peninsula and Balearic Islands, the Italian Peninsula, and the main Italian Islands are the European areas where the highest number of endemic plant species can be found (Bartolucci et al. 2018; Bilz et al. 2011; Castroviejo 2010). Because of their distribution and the real and potential threats to the conservation of their populations (Bilz et al. 2011), many plant species of the Mediterranean area are considered in need of protection and/or monitoring by national and international conservation policies such as the Bern Convention (Council of Europe 1979) and the Habitats Directive 92/43/EEC (European Commission 1992). The crop wild relatives (CWR) (i.e., wild plant taxa that are relatively genetically close to cultivated plants) (Maxted et al. 2006) and the wild harvested plants (WHP) (i.e., non-cultivated species, which are collected from the wild

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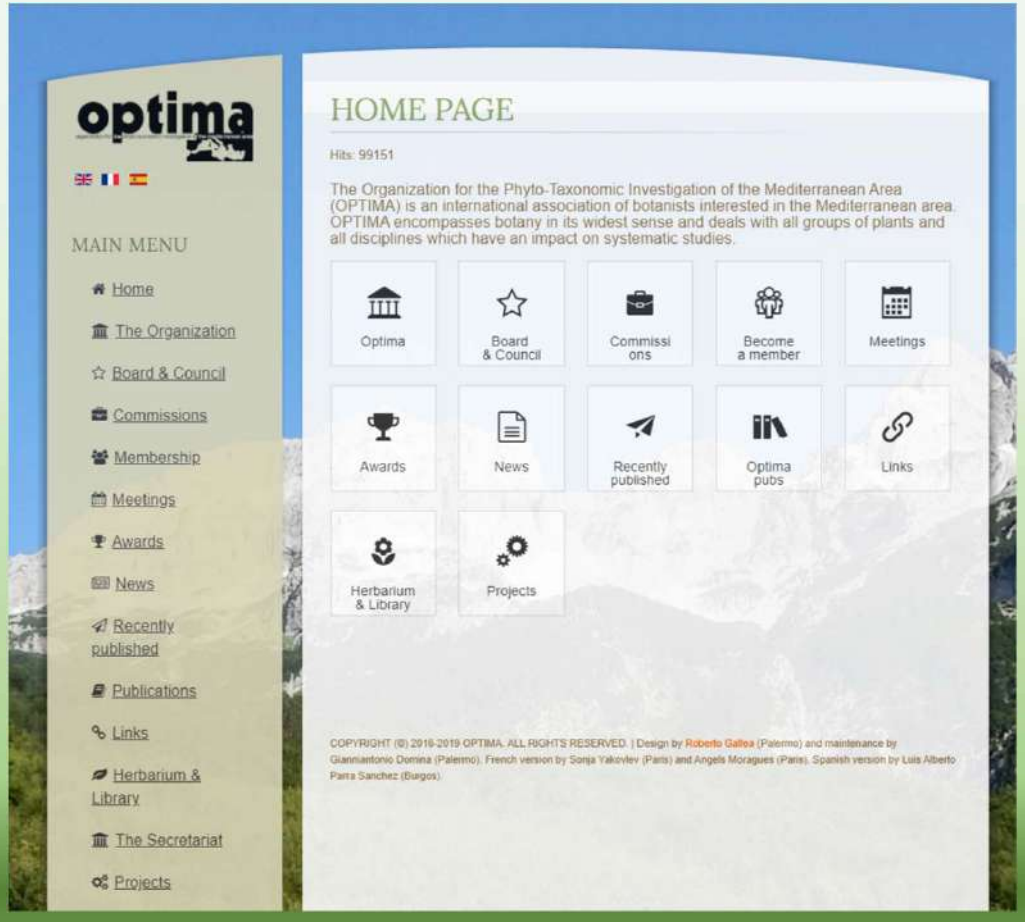

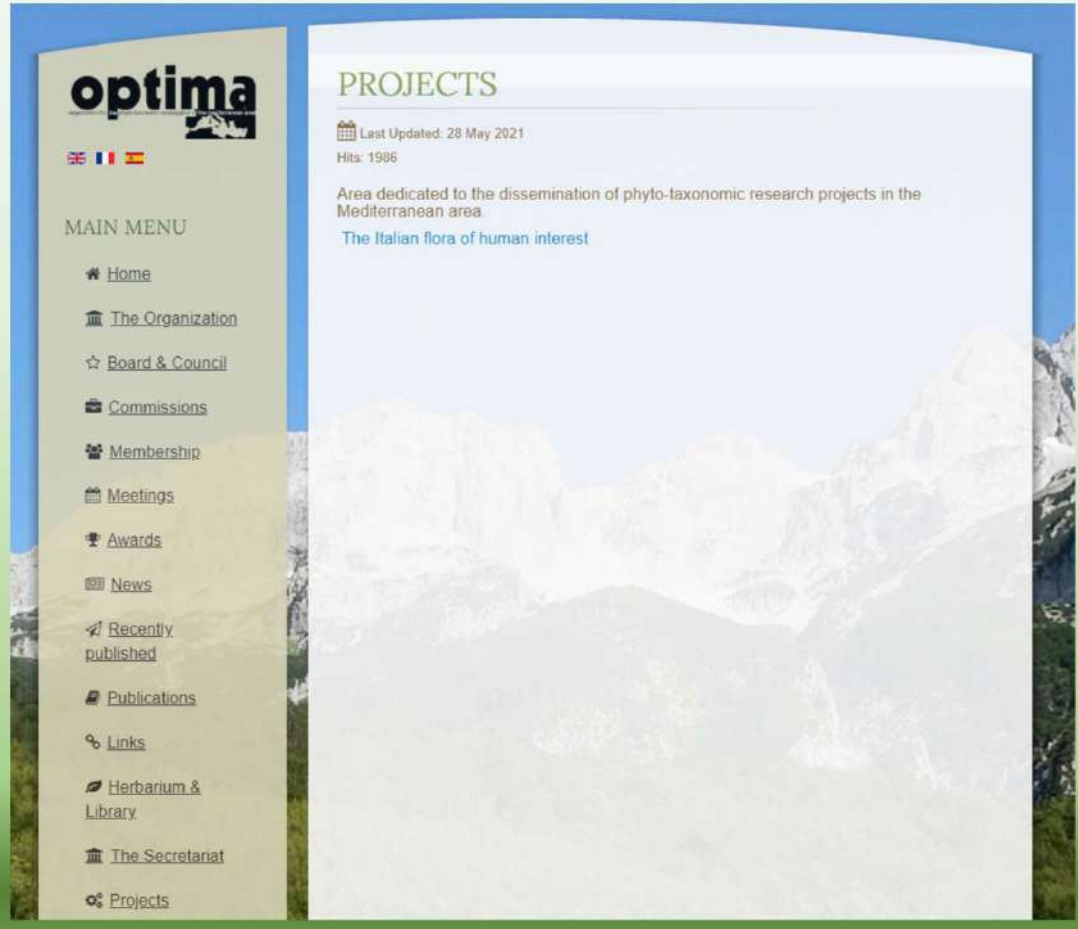

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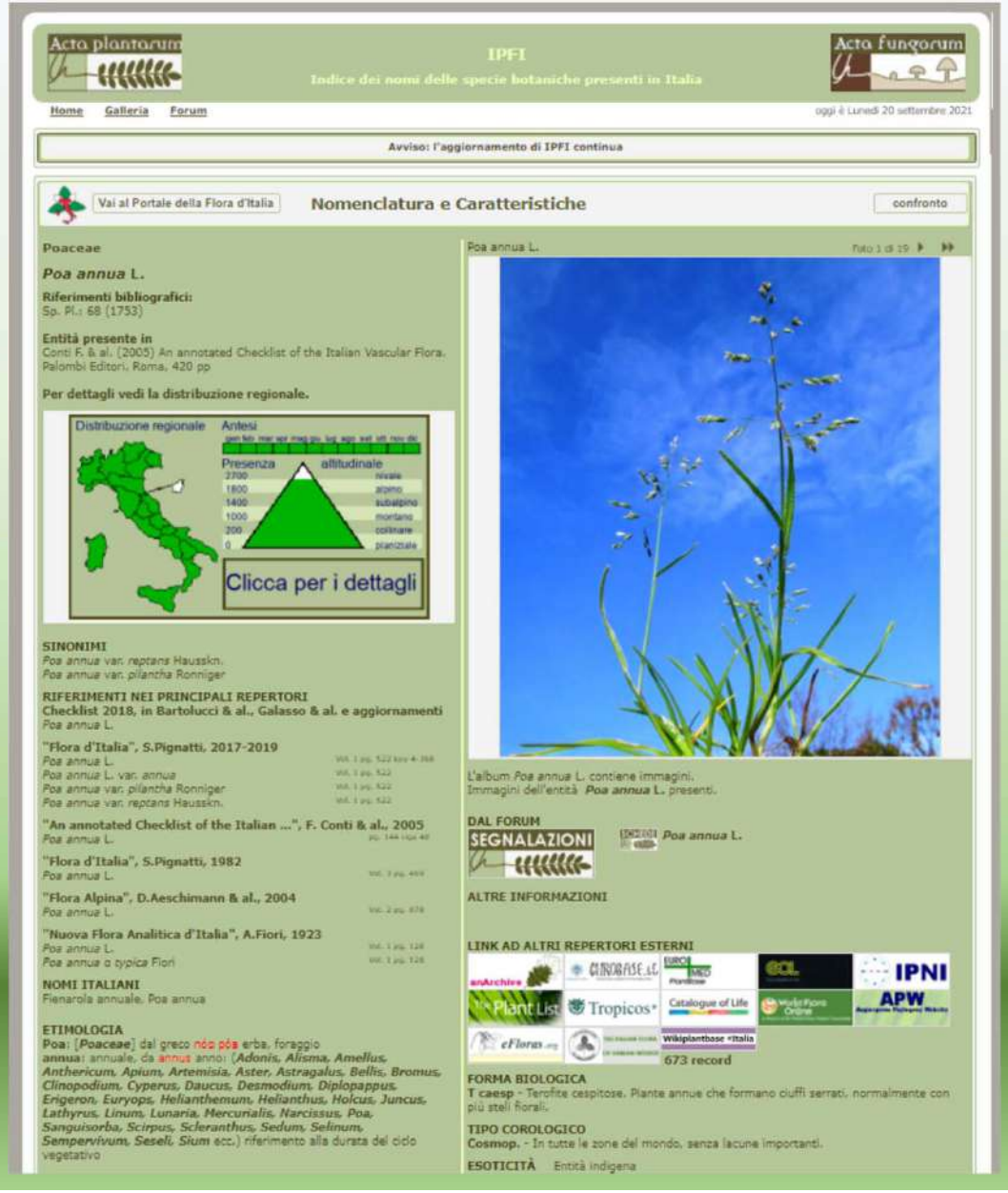

https://www.actaplantarum.org/flora/flora.php

The developed lists will be made available in one of the next updates of the 'Portal to the Flora of Italy' (http://dryades.units.it/floritaly/index.php).

- Any wild plant taxon related to a crop can be defined as a CWR, but it is its genetic relatedness with a certain cultivated taxon that conditions how easily it can be used in crop breeding. Following the concept of Harlan and De Wet (1971), only taxa at least partially fertile with the crop (i.e., included in Gene Pool 1 and 2) are commonly considered as CWR.

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TOWARD A RATIONAL CLASSIFICATION OF CULTIVATED PLANTS

J. R. Harlan and J. M. J. de Wet

Summary

The methods of formal taxonomy have not been very satisfactory for the classification of cultivated plants. As a result, the people who deal with cultivated plants the most have developed their own informal and intuitive classifications based on experience as to what constitutes useful groupings. An attempt is made to provide a framework in which both systems can operate with a minimum of confusion. The structure of the total available gene pool is characterized by assigning taxa to primary, secondary and tertiary gene pools. At the infraspecific level, cultivars are grouped into races and subraces in an informal way without rigid rules for the use of terms.

In the course of our work at the Crop Evolution Laboratory, we have, of necessity, dealt with cultivated plants and their relatives in a comparative way. The inconsistencies and lack of agreement among taxonomists dealing with the same materials are remarkable, to say the least, and are even more striking when the treatments of different crops are compared. Confusion and disagreement extend over the generic, specific and infraspecific levels.

In the wheats, Percival (1921) used two species, Bowden (1959) three, and Jakubziner (Jackubziner and Dorofeev 1968) 24, but all were classifying essentially the same materials. Snowden (1935) used 31 species of cultivated *Sorghum* alone, in addition to the wild and weedy ones that are fully compatible genetically with the domesticated sorts. Jakushevsky (1969) reduced these to nine and de Wet and Huckabay (1967) to one. Bukasov (1933, 1939) had well over 200 species in the Tuberarium section of *Solanum*; Hawkes (1963) reduced these to about half that many, yet retained 64 species in the series Tuberosa Rydb. in which the taxa can be intercrossed and in which there is very little genomic differentiation despite a fairly extensive polyploid series. Some taxonomists assign teocintle to the genus *Euchlaena*, some to *Zea*, and some to a race or subspecies of *Zea mays*. *Aegilops* is maintained as a genus by some and assigned to *Triticum* by others.

The number of examples of this kind can be multiplied many times. Faced with this sort of vacillation and indecision among taxonomists, the people who deal with cultivated plants the most — geneticists, agronomists, horticulturalists and foresters — have developed their own informal and intuitive classifications based on experience as to what constitutes useful groupings. They will continue to use their own systems no matter what the taxonomist does or does not do. But, there is more involved here than the usual differences in judgement between splitters and lumpers. In the first place, cultivated plants *are* different from wild ones and require special taxonomic treatment. In the second place, there have been no guidelines for consistent groupings of related taxa according

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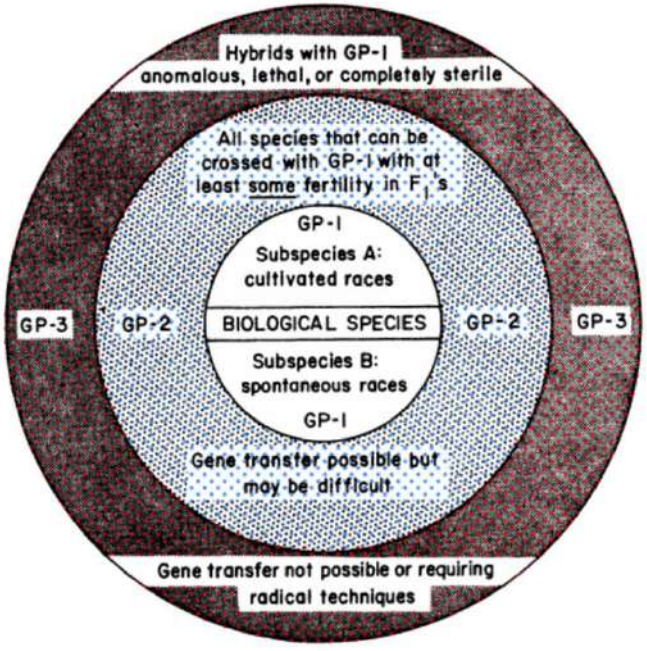

FIG. 1. Schematic diagram of primary gene pool (GP-1), secondary gene pool (GP-2) and tertiary gene pool (GP-3).

- However, it should be pointed out that not all the interbreeding relationships of wild plants with crops have been assessed yet. For this reason, Maxted et al. (2006) proposed the concept of taxon group (TG) where, broadly speaking, a CWR is considered any taxa belonging to the same genus as the crop, the genus being a proxy for relatedness.

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Towards a definition of a crop wild relative

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Key words: Crop wild relative, Definition, Gene pools, Plant genetic resources, Taxon groups

Abstract. Crop wild relatives are an important socio-economic resource that is currently being eroded or even extinguished through careless human activities. If the Conference of the Parties (COP) to the CBD 2010 Biodiversity Target of achieving a significant reduction in the current rate of loss is to be achieved, we must first define what crop wild relatives are and how their conservation might be prioritised. A definition of a crop wild relative is proposed and illustrated in the light of previous Gene Pool concept theory. Where crossing and genetic diversity information is unavailable, the Taxon Group concept is introduced to assist recognition of the degree of crop wild relative relatedness by using the existing taxonomic hierarchy.

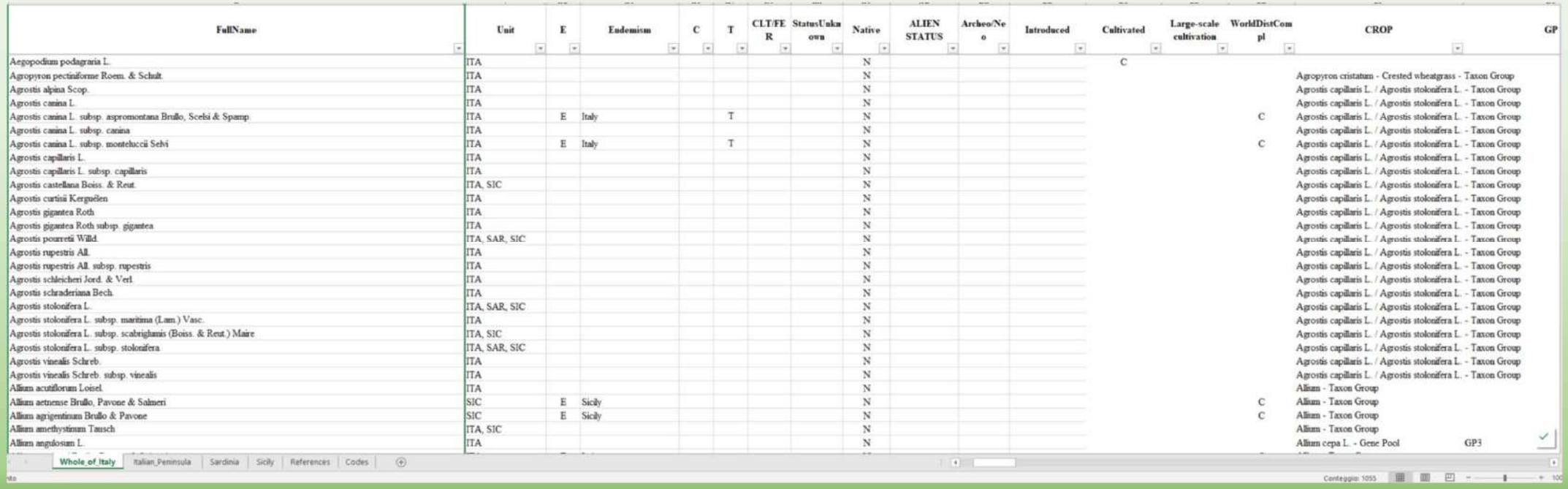
Abbreviations: CBD – Convention on Biological Diversity; COP – Conference of the Parties to the CBD; CWR – Crop wild relative; FAO – Food and Agriculture Organisation of the United Nations; GM – Genetic modification; GP – Gene pool; PGR – Plant genetic resources; TG – Taxon group

Introduction

The Convention on Biological Diversity (CBD 1992) and the subsequent International Treaty on Plant Genetic Resources for Food and Agriculture (FAO 2001) have proved a watershed in plant genetic resources (PGR) conservation in many ways, particularly by re-focusing conservation activities onto *in situ* conservation. *In situ* conservation, using the definition provided in the text of the CBD (Convention on Biological Diversity 1992), incorporates two distinct approaches: conservation of wild species in nature and on-farm conservation of domesticated varieties or breeds. Within the context of socio-economic plant diversity conservation, the change of emphasis away from further collecting of cultivated material for *ex situ* conservation in gene banks towards the *in situ* conservation of locally adapted land races and the wild relatives of crops within or outside existing protected areas, has necessitated the research and development of new conservation methods (Hawkes 1991; Maxted et al. 1997a).

Taxon Group 1a – crop
Taxon Group 1b – same species as crop
Taxon Group 2 – same series or section as crop
Taxon Group 3 – same subgenus as crop
Taxon Group 4 – same genus
Taxon Group 5 – same tribe but different genus to crop

- In order to generate national and international PGR conservation plans, the first step is to create and maintain updated dedicated inventories of taxa.



FullName	Unit	E	Endemism	C	T	CLT/FER	StatusUnknown	Native	ALIEN STATUS	Archeo/Neo	Introduced	Cultivated	Large-scale cultivation	WorldDistCompl	CROP	GP
Aegopodium podagraria L.	ITA							N				C				
Agropyron pectiniforme Roem. & Schult.	ITA							N							Agropyron cristatum - Crested wheatgrass - Taxon Group	
Agrostis alpina Scop.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis canina L.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis canina L. subsp. aspromontana Brullo, Scelsi & Spamp.	ITA	E	Italy		T			N						C	Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis canina L. subsp. canina	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis canina L. subsp. montelucciì Selvi	ITA	E	Italy		T			N						C	Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis capillaris L.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis capillaris L. subsp. capillaris	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis castellana Boiss. & Reut.	ITA, SIC							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis curtisii Kerguélen	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis gigantea Roth	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis gigantea Roth subsp. gigantea	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis pourretii Willd.	ITA, SAR, SIC							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis rupestris All.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis rupestris All. subsp. rupestris	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis schleicheri Jord. & Verl.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis schraderiana Bech.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis stolonifera L.	ITA, SAR, SIC							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis stolonifera L. subsp. maritima (Lam.) Vasc.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis stolonifera L. subsp. scabrighamis (Boiss. & Reut.) Maire	ITA, SIC							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis stolonifera L. subsp. stolonifera	ITA, SAR, SIC							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis vinealis Schreb.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Agrostis vinealis Schreb. subsp. vinealis	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	
Allium acutiflorum Loisel.	ITA							N							Allium - Taxon Group	
Allium aetnense Brullo, Pavone & Salmeri	SIC	E	Sicily					N						C	Allium - Taxon Group	
Allium agrigentinum Brullo & Pavone	SIC	E	Sicily					N						C	Allium - Taxon Group	
Allium amethystinum Tausch	ITA, SIC							N							Allium - Taxon Group	
Allium angulosum L.	ITA							N							Allium cepa L. - Gene Pool	GP3

Whole of Italy | Italian_Peninsula | Sardinia | Sicily | References | Codes

Conteggio: 1055

- Applying the CWR concept developed by Maxted et al. (2006), a comprehensive list of CWR for Europe and the Mediterranean area was produced, which includes 25,687 native and exotic CWR taxa (Kell et al. 2008); 5,712 taxa are cataloged for Italy in this inventory.

5 Crops and Wild Relatives of the Euro-Mediterranean Region: Making and Using a Conservation Catalogue

S.P. Kell, H. Knüpffer, S.L. Jury, B.V. Ford-Lloyd and N. Maxted

5.1 Why Catalogue the Crop Resources of Europe and the Mediterranean?

The combined European and Mediterranean region (the Euro-Mediterranean region) is an important centre for the diversity of crops and their wild relatives – a major socio-economic resource and the cornerstone of agrobiodiversity for the region. Major food crops, such as wheat (*Triticum aestivum* L.), barley (*Hordeum vulgare* L.), cabbage (*Brassica oleracea* L.) and olive (*Olea europaea* L.), originated in the Euro-Mediterranean and the wild relatives of these crops, along with several other major crops that have wild relatives in the region, are an important genetic resource for crop improvement and food security. Many minor crops have also been domesticated and developed in the region, such as chickpea (*Cicer arietinum* L.), lentil (*Lens culinaris* Medik.), sugarbeet (*Beta vulgaris* L.), almond (*Prunus dulcis* (Mill.) D.A. Webb) and apple (*Malus domestica* Borkh.). Other crops of socio-economic importance with wild relatives in the region are forestry species such as *Abies alba* Mill., *Populus nigra* L. and *Quercus ilex* L., ornamentals such as species of *Dianthus* L., *Euphorbia* L., *Gerantium* L. and *Primula* L. and medicinal and aromatic plants such as species of *Anemone* L., *Campanula* L., *Helianthemum* Mill., *Orchis* L. and *Verbascum* L. Although it is acknowledged that populations of crop wild relatives (CWR) are under threat in the Euro-Mediterranean region, their conservation has historically received relatively little systematic attention. Creating a CWR inventory is the first step in the conservation and effective use of these vital resources – to tackle CWR conservation, we need to know how many taxa there are, what they are and where they are.

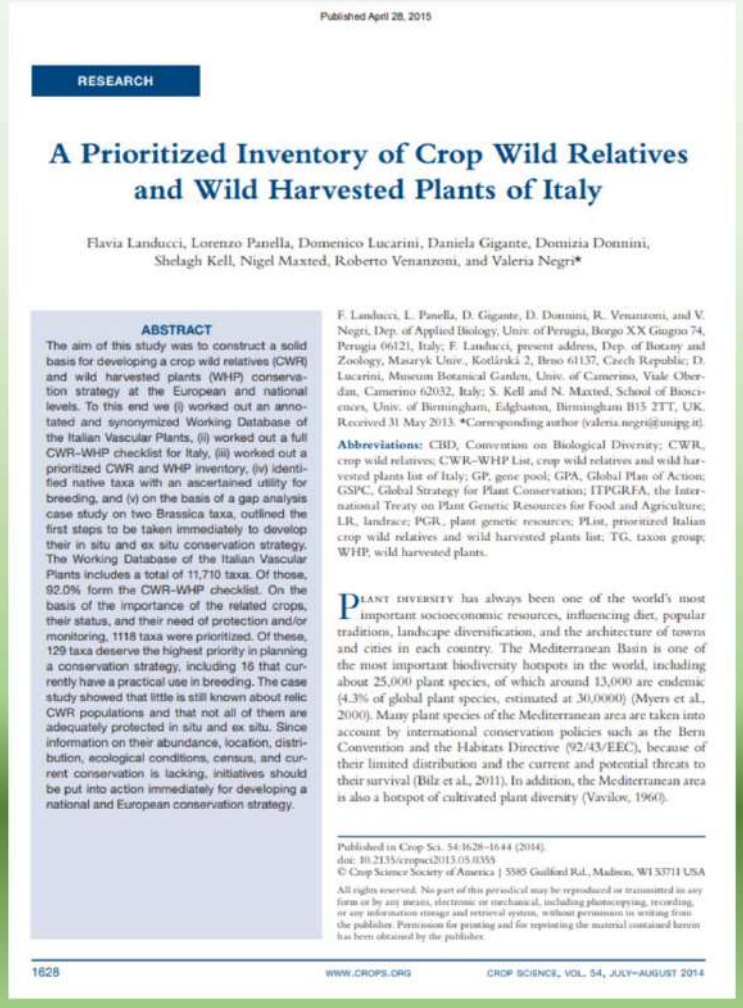
Taxon inventories provide the baseline data critical for biodiversity assessment and monitoring, as required by the Convention on Biological Diversity (CBD) (CBD, 1992), the Global Strategy for Plant Conservation (GSPC) (CBD, 2002), the European Plant Conservation Strategy (EPCS) (Council of Europe

Table 5.6. List of Euro-Mediterranean nations, showing the total number of crop and CWR species per nation in descending order. The right column shows the number of species as a percentage of the total number of crop and CWR species in the region.

Nation	No. of crop and CWR species	Percentage of Euro-Mediterranean crop and CWR species
Turkey	7235	28
Spain	6669	26
Italy	5712	22
France	5528	22
Greece	4818	19
Ukraine	4265	17
Russia	4259	17
Germany	4211	16
Slovakia	3873	15
Bulgaria	3619	14
Austria	3563	14
Czech Republic	3526	14
Romania	3484	14
Croatia	3436	13
Switzerland	3413	13
Morocco	3409	13
Portugal	3296	13
Albania	3030	12
Algeria	2911	11
Poland	2751	11
Hungary	2639	10
Lebanon	2577	10
Slovenia	2533	10
Syria	2421	9
Sweden	2362	9
Serbia	2359	9
Norway	2276	9
Armenia	2235	9
United Kingdom	2169	8
Israel	2084	8
Denmark	2056	8
Tunisia	1882	7
Georgia	1882	7
Moldova	1795	7
Finland	1771	7
Egypt	1745	7
Belgium	1730	7
The Netherlands	1723	7
Libya	1547	6
Estonia	1501	6
Lithuania	1477	6
Cyprus	1448	6
Latvia	1323	5
Ireland	1299	5
Azerbaijan	882	3

Continued

- The last updated Italian CWR/WHP list is that one proposed by Landucci et al. (2014), which also includes a prioritization method applied to Italian territory.



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RESEARCH

A Prioritized Inventory of Crop Wild Relatives and Wild Harvested Plants of Italy

Flavia Landucci, Lorenzo Panella, Domenico Lucarini, Daniela Gigante, Domizia Donnini, Shelagh Kell, Nigel Maxted, Roberto Venanzoni, and Valeria Negri*

ABSTRACT

The aim of this study was to construct a solid basis for developing a crop wild relatives (CWR) and wild harvested plants (WHP) conservation strategy at the European and national levels. To this end we (i) worked out an annotated and synonymized Working Database of the Italian Vascular Plants, (ii) worked out a full CWR-WHP checklist for Italy, (iii) worked out a prioritized CWR and WHP inventory, (iv) identified native taxa with an ascertained utility for breeding, and (v) on the basis of a gap analysis case study on two Brassica taxa, outlined the first steps to be taken immediately to develop their in situ and ex situ conservation strategy. The Working Database of the Italian Vascular Plants includes a total of 11,710 taxa. Of those, 92.0% form the CWR-WHP checklist. On the basis of the importance of the related crops, their status, and their need of protection and/or monitoring, 1118 taxa were prioritized. Of these, 129 taxa deserve the highest priority in planning a conservation strategy, including 16 that currently have a practical use in breeding. The case study showed that little is still known about relic CWR populations and that not all of them are adequately protected in situ and ex situ. Since information on their abundance, location, distribution, ecological conditions, census, and current conservation is lacking, initiatives should be put into action immediately for developing a national and European conservation strategy.

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Abbreviations: CBD, Convention on Biological Diversity; CWR, crop wild relatives; CWR–WHP List, crop wild relatives and wild harvested plants list of Italy; GP, gene pool; GPA, Global Plan of Action; GSPC, Global Strategy for Plant Conservation; ITPGRFA, the International Treaty on Plant Genetic Resources for Food and Agriculture; LR, landrace; PGR, plant genetic resources; PList, prioritized Italian crop wild relatives and wild harvested plants list; TG, taxon group; WHP, wild harvested plants.

Plant diversity has always been one of the world's most important socioeconomic resources, influencing diet, popular traditions, landscape diversification, and the architecture of towns and cities in each country. The Mediterranean Basin is one of the most important biodiversity hotspots in the world, including about 25,000 plant species, of which around 13,000 are endemic (4.3% of global plant species, estimated at 30,0000) (Myers et al., 2000). Many plant species of the Mediterranean area are taken into account by international conservation policies such as the Bern Convention and the Habitats Directive (92/43/EEC), because of their limited distribution and the current and potential threats to their survival (Bilz et al., 2011). In addition, the Mediterranean area is also a hotspot of cultivated plant diversity (Vavilov, 1960).

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available from http://vnr.unipg.it/PGRSecure

A Catalogue of the Wild Relatives of Cultivated Plants Native to Europe

An enumeration of the wild genetic resources of native European plants that are grown in Europe for food, forage, ornament, timber and other purposes

Prepared by

Vernon H. Heywood & Daniel Zohary

Introduction

Europe has a long history of plant domestication and a rich heritage of crops cultivated for a diversity of purposes. The number of plants involved is remarkably high yet much of this heritage has been surprisingly neglected. No systematic account of the crop plants developed in Europe and the genetic resources present in their wild relatives has been produced up to the present. This Catalogue aims to fill that gap.

Approximately 10% of the species of the European flora are regarded as being threatened to some degree. Amongst these are wild relatives of numerous cultivated plants, some of which are already facing serious genetic erosion, and in a few cases, a risk of their extinction. The development of new priorities for the conservation of threatened plants is urgently needed in Europe. In these priorities, some of the plants listed here should figure prominently if the continent is not to lose much of the wild genetic basis of economic plants which have had their origins here.

This Catalogue provides a survey of the wild genetic resources of cultivated plants in Europe as circumscribed by *Flora Europaea* (Tutin, Heywood et al. 1964-1980, Tutin et al. 1993). (See also Fig. 1). In addition, Cyprus and the Canary Islands are also included because they are member states (or part of a member state) of the Council of Europe. Although Turkey is a member state, it was decided not to include Anatolian Turkey in this survey, as its flora is almost as diverse as that of Europe as a whole; and it has such a large number of species (c. 8,000) that it deserves a separate treatment.

The Catalogue enumerates the various cultivated plants (grain crops, fruit trees, vegetables, oil and fibre crops, pot herbs and condiments, medicinal plants, fodder plants, timber trees, and ornamentals) grown in Europe which also have their close wild relatives growing on this continent. For each cultigen the Catalogue specifies, as far as can be ascertained, which are its close wild relatives (the primary wild gene pool); and where they occur in Europe. The survey of the food crops is more exhaustive than that of the other groups, and contains several minor or relict crops. The list of the other cultivated plants is less comprehensive: only the main timber trees, fodder crops, medicinals, and ornamentals have been included.

The total number of wild relatives of cultivated plants of economic importance in Europe is larger than one might suspect. Europe harbours rich wild gene pools of several

The occurrence of wild relatives of cultivated plants in Italian protected areas

Pietro Mazzola, Francesco M. Raimondo & Giovanni Scuderi

Abstract

Mazzola, P., Raimondo, F. M. & Scuderi, G.: The occurrence of wild relatives of cultivated plants in Italian protected areas. Bocconea 7: 241-248. 1997. — ISSN 1120-4060.

An evaluation of the role played by protected areas in the conservation of the wild relatives of cultivated plants in Italy and Sicily has been carried out, based mainly on bibliographic sources. Of the 163 species and subspecies represented in the whole Italian territory, 147 occur inside protected areas. The figures for Sicily are 113 and 104, respectively. These data are evaluated in relation to the present number and extension of protected areas and with their possible increase.

There is general agreement on the remarkable role that protected areas play in the conservation of our plant heritage, including the ancestors and other close wild relatives of cultivated plants. Indeed, general provisions for preserving the semi-natural and human-made habitats, where many relatives of cultivated plants occur and are at risk of genetic erosion, can be successfully applied in areas under controlled management, even if special provisions for single taxa are difficult to adopt.

We possess some very basic information on the pattern of distribution of crop plant ancestors occurring in protected areas in Italy and here we attempt to evaluate these data on the present and potential role of natural parks and reserves in Italy, with special reference to Sicily.

The list of the crop plant ancestors that occurs in Italy and Sicily were obtained from the *Catalogue of the wild relatives of cultivated plants native to Europe* compiled by Heywood & Zohary (1995) for the Council of Europe. While this list needs further development, it is suitable as a first survey for a general overview.

The occurrence of each taxon in any protected areas was examined, taking into consideration all Italian national parks and Sicilian regional parks and reserves.

Species present in the national parks were mostly obtained from literature data (see references) but in Sicily personal unpublished records have also been included.

- Ever since, a thorough taxonomic revision of the Italian flora has been carried out in Italy (Bartolucci et al. 2018; Galasso et al. 2018), with the serious consequence of a broad change of the geographic occurrence of taxa at the territorial level. Additionally, there has been a reassessment of their threat status as well (Rossi et al. 2016, Orsenigo et al. 2018; 2020;). As a consequence, the Italian CWR/WHP lists by Landucci et al. (2014) became obsolete and unusable.


An updated checklist of the vascular flora native to Italy


An updated checklist of the vascular flora alien to Italy


Is legal protection sufficient to ensure plant conservation? The Italian Red List of policy species as a case study


Red Listing plants under full national responsibility: Extinction risk and threats in the vascular flora endemic to Italy


Are Red Lists really useful for plant conservation? The New Red List of the Italian Flora in the perspective of national conservation policies

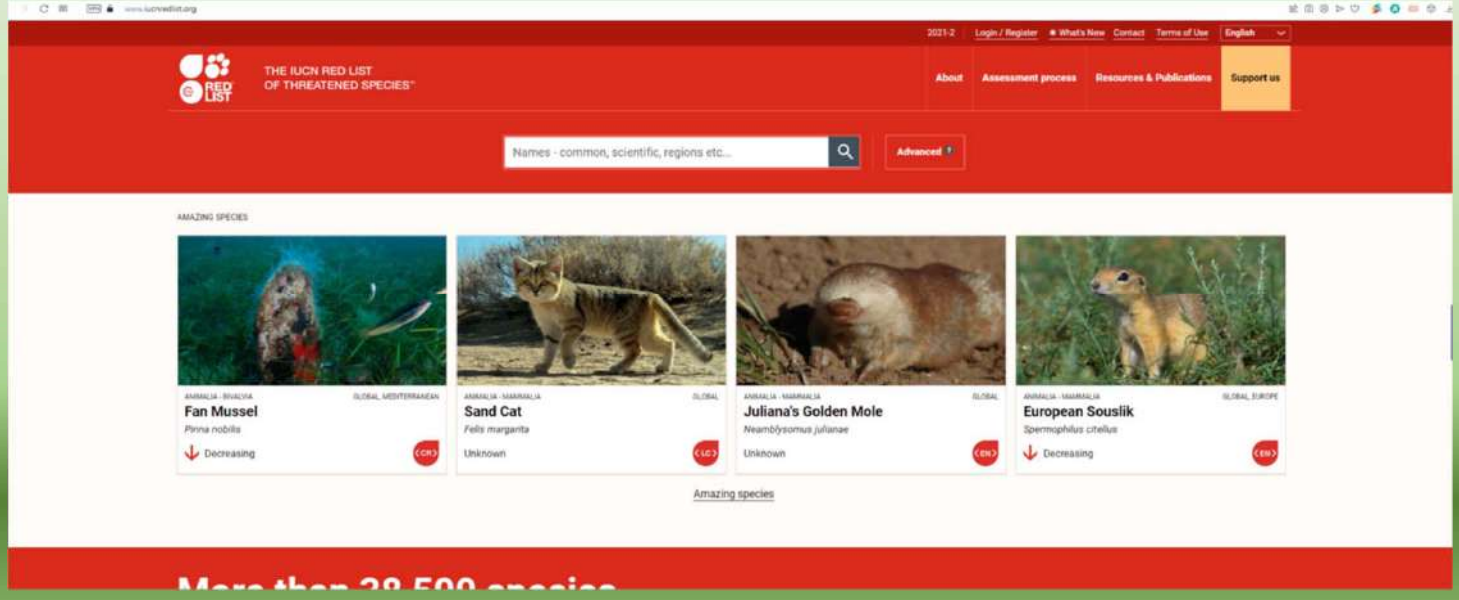
- The Working Database of the Italian Vascular Flora developed by Landucci et al. (2014) was used as starting
- point for the new one.


An updated checklist of the vascular flora native to Italy

An updated checklist of the vascular flora alien to Italy

The updated regional distribution was retrieved from Bartolucci et al. (2018), Galasso et al. (2018) and Pignatti, Guarino, and La Rosa (2017-2019).

- Additional information about origin (i.e., native or introduced, archaeophyte or neophyte status), the indication of endemic status (or not), cultivation, economic importance, uses, gene pool, and protection and/or monitoring need was provided for each taxon according an extensive reference literature and was supplemented with personal knowledge of the authors.
- Finally, the indication of the need of protection and/or monitoring at the national level was integrated following the most recent Italian Red lists (Rossi et al. 2016; Orsenigo et al.2018, 2020) or, when taxa were not included in these lists, the IUCN Red List of Threatened Species (IUCN 2020), database available online.



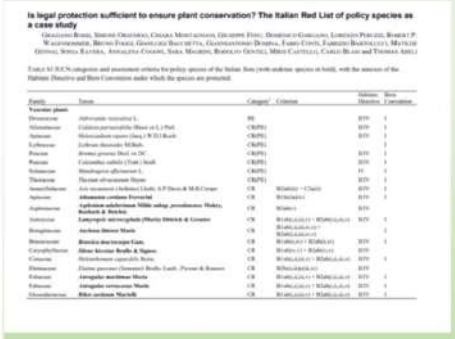
The wild relative taxa of the most socioeconomical important crops for food and agriculture for Italy and the entire European region were considered.

These were retrieved from the Annex I of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)(FAO 2001) and/or by the Italian Institute of Statistics for cultivated areas and yield in the last 5 years (ISTAT 2019).

Another solution that could have been adopted is to use the economic value of the related crop, derived from FAOSTAT (2012-2016) for the Italian agricultural gross production (FAO 2019), and organized according to the classifications of products used for the statistical purposes in FAOSTAT Commodity List

Then, in order to focus our attention on taxa in high need of protection, we considered the threatened taxa occurring in Red lists.


Is legal protection sufficient to ensure plant conservation? The Italian Red List of policy species as a case study


Is legal protection sufficient to ensure plant conservation? The Italian Red List of policy species as a case study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Biological Conservation

Red Listing plants under full national responsibility: Extinction risk and threats in the vascular flora endemic to Italy


Table A1. IUCN Red list status and assessment criteria for the Italian endemic vascular flora.

FullName	Unit	E	Endemism	C	T	CLTIVEP	StatusUnknown	Native	ALIEN STATUS	Archeo/Neo	Introduced	Cultivated	Large-scale cultivation	WorldDistComp	CROP	GP	TG	Uses	Orsenigo et al. (2020)	Orsenigo et al. (2018)	Rossi et al. (2019)	IUCN Red List of Threatened Species	CWR	WHP	ITPGRFA Annex I	ISTAT	PRIORITY
Aegopodium podagraria L.	ITA							N				C						food, medicine					x			x	C
Agropyron pectiniforme Roem. & Schult.	ITA							N							Agropyron cristatum - Crested wheatgrass - Taxon Group		TG4						x		x		C
Agrostis alpina Scop.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4						x		x		C
Agrostis canina L.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4						x		x		C
Agrostis canina L. subsp. aspromontana Brullo, Scelsi & Spamp.	ITA		E Italy			T		N						C	Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4			EN			x		x		A
Agrostis canina L. subsp. canina	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4						x		x		C
Agrostis canina L. subsp. monteluccii Selvi	ITA		E Italy			T		N						C	Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4			VU			x		x		A
Agrostis capillaris L.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG1B; TG4						x		x		C
Agrostis capillaris L. subsp. capillaris	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG1B; TG4						x		x		C
Agrostis castellana Boiss. & Reut.	ITA, SIC							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4		environmental				x	x	x		C
Agrostis curtisii Kerguélen	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4						x		x		C
Agrostis gigantea Roth	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4						x		x		C
Agrostis gigantea Roth subsp. gigantea	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4						x		x		C
Agrostis pourretii Willd.	ITA, SAR, SIC							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4		environmental				x		x		C
Agrostis rupestris All.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4		environmental				x	x	x		C
Agrostis rupestris All. subsp. rupestris	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4		environmental				x	x	x		C
Agrostis schleicheri Jord. & Verl.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4						x		x		C
Agrostis schraderiana Bech.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4						x		x		C
Agrostis stolonifera L.	ITA, SAR, SIC							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4; TG1B						x		x		C
Agrostis stolonifera L. subsp. maritima (Lam.) Vasc.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4; TG1B						x		x		C
Agrostis stolonifera L. subsp. scabriglumis (Boiss. & Reut.) Maire	ITA, SIC							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG1B			LC			x		x		C
Agrostis stolonifera L. subsp. stolonifera	ITA, SAR, SIC							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4; TG1B						x		x		C
Agrostis vinealis Schreb.	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4						x		x		C
Agrostis vinealis Schreb. subsp. vinealis	ITA							N							Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group		TG4						x		x		C
Allium acutiflorum Loisel.	ITA							N							Allium - Taxon Group		TG4			DD			x			x	C
Allium aennense Brullo, Pavone & Salmeri	SIC		E Sicily					N						C	Allium - Taxon Group		TG4				LC		x			x	B
Allium agrigentinum Brullo & Pavone	SIC		E Sicily					N						C	Allium - Taxon Group		TG4				EN		x			x	A
Allium amethystinum Tausch	ITA, SIC							N							Allium - Taxon Group		TG4						x			x	C
Allium angulosum L.	ITA							N							Allium sepa L. - Gene Pool	GP3		food					x	x		x	C
Allium anzalonei Brullo, Pavone & Salmeri	ITA		E Italy					N						C	Allium - Taxon Group		TG4				NT		x			x	A
Allium apulum Brullo, Guglielmo, Pavone & Salmeri	ITA		E Italy					N						C	Allium - Taxon Group		TG4				LC		x			x	B
Allium arcuvioliaceum Boiss.	ITA							N							Allium ampeloprasum - Leek - Gen-GP1B; GP3			gene source					x			x	C
Allium calabrum (N.Terracc.) Brullo, Pavone & Salmeri	ITA		E Italy					N						C	Allium - Taxon Group		TG4				NT		x			x	A
Allium carinatum L.	ITA							N							Allium - Taxon Group		TG4						x			x	C
Allium castellanense (Garbari, Miceli & Raimondo) Brullo, Guglielmo, Pavone & Salmeri	SIC		E Sicily					N						C	Allium - Taxon Group		TG4				EN		x			x	A
Allium chamaemoly L.	ITA, SAR, SIC							N							Allium - Taxon Group		TG4			LC			x			x	C
Allium chamaemoly L. subsp. chamaemoly	ITA, SAR, SIC							N							Allium - Taxon Group		TG4			LC			x			x	C
Allium chamaespathum Boiss.	ITA							N							Allium - Taxon Group		TG4			DD			x			x	C
Allium coloratum Spreng.	ITA							N							Allium - Taxon Group		TG4		ethnobotanical				x	x		x	C
Allium commutatum Guss.	ITA, SAR, SIC							N							Allium ampeloprasum - Leek - Gen-GP1B				gene source, food				x	x		x	C
Allium cupani Raf.	SIC		E Sicily					N						C	Allium - Taxon Group		TG4		food, medicine		LC		x	x		x	B
Allium cyrilli Ten.	ITA							N							Allium - Taxon Group		TG4				LC		x			x	C
Allium dicmedeum Brullo, Guglielmo, Pavone & Salmeri	ITA		E Italy					N						C	Allium - Taxon Group		TG4				NT		x			x	A
Allium eiceronum Thore	ITA							N							Allium - Taxon Group		TG4						x			x	C
Allium flavum L.	ITA, SIC							N				C			Allium - Taxon Group		TG4		ornamental, poison				x			x	C
Allium flavum L. subsp. flavum	ITA, SIC							N							Allium - Taxon Group		TG4						x			x	C
Allium francoae Brullo & Pavone	SIC		E Sicily					N						C	Allium - Taxon Group		TG4				NT		x			x	A
Allium garbarii Peruzzi	ITA		E Italy					N						C	Allium - Taxon Group		TG4				NT		x			x	A
Allium garganicum Brullo, Pavone, Salmeri & Terrasi	ITA		E Italy					N						C	Allium - Taxon Group		TG4				EN		x			x	A
Allium hemisphaericum (Sommier) Brullo	SIC		E Sicily					N						C	Allium - Taxon Group		TG4				VU		x			x	A
Allium horvatii Lovrić	ITA							N							Allium - Taxon Group		TG4						x			x	C
Allium insubricum Boiss. & Reut. ex Reut.	ITA		E Italy					N						C	Allium - Taxon Group		TG4				LC		x			x	B

Whole_of_Italy | Italian_Peninsula | Sardinia | Sicily | References | Codes

1054 su 11095 record trovati.

Conteggio: 1055

60%

- The ‘A’ category includes native and allochthonous taxa related to a crop of European and national importance for food and agriculture that need specific protection and/or monitoring measures; taxa in this category are present in at least one of the most recent National Red Lists (Orsenigo et al.2020; Orsenigo et al. 2018; Rossi et al. 2016) or in the IUCN Red List (IUCN 2020).
- The ‘B’ category includes endemic or subendemic taxa and, although they do not necessarily require specific protection measures, they require monitoring because of their restricted distribution.
- Finally, the ‘C’ category includes all the remaining native taxa, which, on the grounds of current knowledge, do not need any specific protection measure.

- The described procedure allowed to produce an updated version of the ‘annotated’ Italian CWR/WHP checklist. Distinct lists were then extracted for (i) the Italian Peninsula, (ii) Sardinia , and (iii) Sicily. Lists developed for Sardinia and Sicily were based on the actual occurrence of the taxa in the regions. The two main Italian Islands, both corresponding to administrative regions (Sicily and Sardinia) and Euro+Med territories (De Jong et al. 2015), were focused since they both include large and heterogeneous territories and are characterized by a remarkably high number of endemic species (Bartolucci et al. 2018), thus constituting an emblematic example of the strong spatial and biogeographical diversity typical of Italy.

Agrostis canina L. subsp. aspromontana Brullo, Scelsi & Spamp.	ITA	E	Italy		T			N			C	Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	TG4
Agrostis canina L. subsp. montelucciі Selvi	ITA	E	Italy		T			N			C	Agrostis capillaris L. / Agrostis stolonifera L. - Taxon Group	TG4
Allium agrigentinum Brullo & Pavone	SIC	E	Sicily					N			C	Allium - Taxon Group	TG4
Allium anzalonei Brullo, Pavone & Salmeri	ITA	E	Italy					N			C	Allium - Taxon Group	TG4
Allium calabrum (N.Terracc.) Brullo, Pavone & Salmeri	ITA	E	Italy					N			C	Allium - Taxon Group	TG4
Allium castellanense (Garbari, Miceli & Raimondo) Brullo, Guglielmo, Pavone & Salmeri	SIC	E	Sicily					N			C	Allium - Taxon Group	TG4
Allium diomedeum Brullo, Guglielmo, Pavone & Salmeri	ITA	E	Italy					N			C	Allium - Taxon Group	TG4
Allium franciniae Brullo & Pavone	SIC	E	Sicily					N			C	Allium - Taxon Group	TG4
Allium garbarii Peruzzi	ITA	E	Italy					N			C	Allium - Taxon Group	TG4
Allium garganicum Brullo, Pavone, Salmeri & Terrasi	ITA	E	Italy					N			C	Allium - Taxon Group	TG4
Allium hemisphaericum (Sommier) Brullo	SIC	E	Sicily					N			C	Allium - Taxon Group	TG4
Allium julianum Brullo, Gangale & Uzunov	ITA	E	Italy					N			C	Allium - Taxon Group	TG4
Allium lehmannii Lojac.	SIC	E	Sicily					N			C	Allium - Taxon Group	TG4
Allium lopadusanum Bartolo, Brullo & Pavone	SIC	E	Sicily					N			C	Allium - Taxon Group	TG4
Allium nebrodense Guss.	SIC	E	Sicily		T			N			C	Allium - Taxon Group	TG4
Allium obtusiflorum DC.	SIC	E	subendemic					N			C	Allium - Taxon Group	TG4
Allium pelagicum Brullo, Pavone & Salmeri	SIC	E	Sicily					N			C	Allium - Taxon Group	TG4
Allium pentadactyli Brullo, Pavone & Spamp.	ITA	E	Italy					N			C	Allium - Taxon Group	TG4
Allium permixtum Guss.	ITA							N			C	Allium - Taxon Group	TG4
Allium savii Parl.	ITA, SAR							N				Allium - Taxon Group	TG4
Allium trifoliatum Cirillo	ITA, SIC							N				Allium - Taxon Group	TG4
Allium vernale Tineo	SIC	E	Sicily					N			C	Allium - Taxon Group	TG4
Arrhenatherum elatius (L.) P.Beauv. ex J.Presl & C.Presl subsp. nebrodense (Brullo, Miniss. & Spamp	SIC	E	Sicily					N			C	Arrhenatherum elatius (L.) P.Beauv. ex J.Presl et C.Presl - Taxon Group	TG3
Asparagus pastorianus Webb & Berthel.	SIC							N				Asparagus officianalis – Asparagus – Gene Pool	TG4
Astragalus alopecurus Pall.	ITA							N					
Astragalus aquilanus Anzal.	ITA	E	Italy					N			C		
Astragalus gennarii Bacch. & Brullo	SAR	E	Sardinia					N			C		
Astragalus kamarinensis C.Brullo, Brullo, Giusso, Miniss. & Sciandr.	SAR	E	Sardinia					N			C		
Astragalus maritimus Moris	SAR	E	Sardinia					N			C		
Astragalus nebrodensis (Guss.) Strobl	SIC	E	Sicily					N			C		
Astragalus peregrinus Vahl	SIC							N					
Astragalus peregrinus Vahl subsp. warionis (Gand.) Maire	SIC							N					
Astragalus raphaelis G.Ferro	SIC	E	Sicily					N			C		
Astragalus siculus Biv.	SIC	E	Sicily					N			C		
Astragalus tegulensis Bacch. & Brullo	SAR	E	Sardinia					N			C		

Table 1. Synoptic table of CWR and WHP for the different defined categories and geographic areas: the number of specific and subspecific taxa is followed by the number of species in brackets.

Category	Italy	Italian Peninsula	Sardinia	Sicily
Total CWR and/or WHP	8,766 (7,334)	7,916 (6,641)	2,745 (2,600)	2,952 (2,738)
Native	7,117 (5,758)	6,367 (5,164)	2,180 (2,062)	2,431 (2,252)
Native in need of monitoring or protection (Priority A + B)	175 (148)	89 (81)	29 (27)	81 (63)
CWR	8,658 (7,222)	7,812 (6,536)	2,685 (2,544)	2,889 (2,673)
Native	7,015 (5,655)	6,268 (5,064)	2,120 (2,000)	2,380 (2,187)
Endemic	1,551 (1,155)	1,012 (733)	309 (261)	393 (314)
Non native	1,644 (1,571)	1,544 (1,472)	565 (544)	509 (486)
Neophytes	1,323 (1,295)	1,228 (1,201)	401 (394)	(1) 366 (359)
Archaeophytes	190 (148)	185 (143)	120 (107)	98 (84)
Not natives only cultivated	136 (133)	136 (133)	45 (44)	46 (44)
In need of monitoring/protection	159 (136)	79 (71)	28 (26)	72 (58)
WHP	1,927 (1,818)	1,855 (1,768)	944 (940)	1,003 (974)
Native	1,702 (1,600)	1,593 (1,519)	853 (852)	910 (884)
Endemic	163 (122)	92 (75)	43 (37)	62 (41)
Non native	225 (218)	215 (208)	91 (88)	93 (90)
Neophytes	193 (189)	184 (180)	68 (67)	74 (73)
Archaeophytes	26 (23)	25 (22)	22 (20)	18 (16)
Not natives only cultivated	7 (7)	7 (7)	2 (2)	2 (2)
In need of monitoring/protection	16 (12)	10 (10)	1 (1)	9 (5)

Simona

Domizia

Daniela

Giulio

Thanks for your attention

Lorenzo

Gianniantonio

Valeria