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When taxonomy matters for conservation priorities: some cases among the genus *Allium* L.

Errol Véla, Jean-Marc Tison

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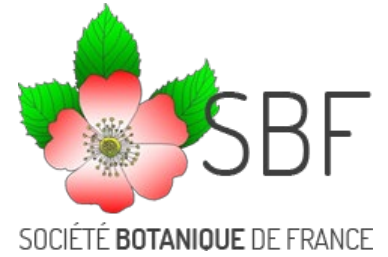
Submitted on 17 Nov 2023

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AMAP lab



When taxonomy matters for conservation priorities: some cases among the genus *Allium* L.

Errol Véla, University of Montpellier / AMAP lab, Montpellier
Jean-Marc Tison, Société Botanique de France, L'Isle d'Abeau



Abstract

1. The genus *Allium* is one of the most diverse in the world, with more than 1000 accepted species yet [POWO, 2023]. But a lot of new species are regularly described (several per year), including in the Euro-Mediterranean subgenus *Allium*. Within the sections *Allium*, *Codonoprasum*, *Cupanoscordum* and *Pseudoscorodon*, some old described species were recently rehabilitated and/or splitted into species complexes. This situation is not due to hazard, but to the difficult conservation of the main discriminant criteria when the plants collected were classically put in herbaria (A somewhat comparable situation is known for orchids and broomrapes for the same reasons). But the recent and prolific color photograph activities plus the more traditional comparative experimental cultivation have led several botanists to better understand the variability and therefore the taxonomy of the genus *Allium*.
2. During the last 10 years, redlisting activities supported by the IUCN-Med challenged us to choose a pragmatic taxonomy, not dependent to one or another backbone database but to conservation units identifiable on the field by botanists.
3. The parallel progress of both taxonomy and redlisting are commented in details for the Euro-Mediterranean *A. ampeloprasum* complex (sect. *Allium*). We can also enlarge the problematics to the Mediterranean *A. cupanii* / *hirtovaginatatum* complex (sect. *Cupanoscordum*), the western Mediterranean *A. rouyi* complex (sect. *Pseudoscorodon*), and some Maghrebian species of the *A. pallens* / *oleraceum* / *paniculatum* and the *A. flavum* / *stamineum* complexes (sect. *Codonoprasum*).
4. Keywords: Conservation units; Red listing; Species complex; Threatened species;
5. https://powo.science.kew.org/results?f=%2Caccepted_names%2Cspecies_f&page.size=24&q=Allium

1. *The genus Allium*



1.1. *Allium* L., one of the most diverse genus in the northern hemisphere

1066 "accepted" species names

Taxonomic rank 1 Accepted names only Has images

1 066 results

SPECIES	<i>Allium aaseae</i> Ownbey
SPECIES	<i>Allium abanticum</i> Brullo & Salmeri
SPECIES	<i>Allium abbasii</i> R.M.Fritsch
SPECIES	<i>Allium abramsii</i> (Ownbey & Aase ex Traub) McNeal
SPECIES	<i>Allium acidoides</i> Stearn
SPECIES	<i>Allium aciphyllum</i> J.M.Xu
SPECIES	<i>Allium acuminatum</i> Hook.

2001 species names (incl. "synonyms")

Taxonomic rank 1 Accepted names only Has images

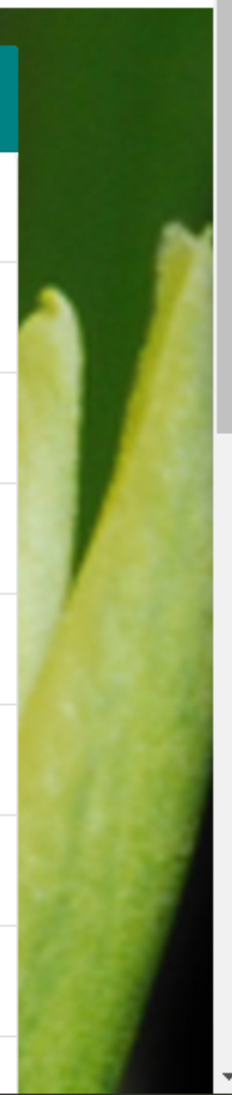
2 001 results

SPECIES	<i>Allium aaseae</i> Ownbey
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SPECIES	<i>Allium abbasii</i> R.M.Fritsch
SPECIES	<i>Allium abramsii</i> (Ownbey & Aase ex Traub) McNeal
SPECIES	<i>Allium acetabulum</i> (Raf.) Shinnery Synonym of: <i>Allium canadense</i> var. <i>canadense</i>
SPECIES	<i>Allium achainum</i> Boiss. & Orph. Synonym of: <i>Allium frigidum</i> Boiss. & Heldr.

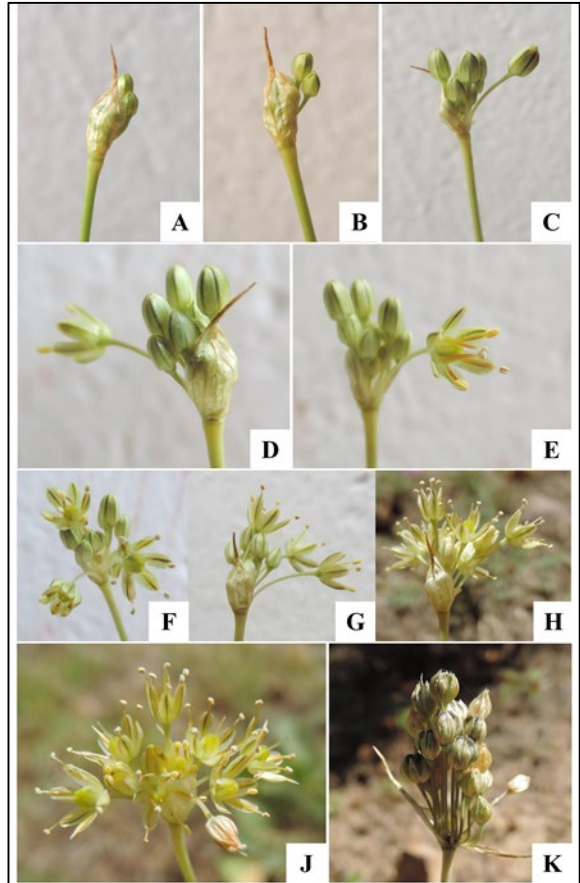


17 results Filter by: Familial Infrafamilial Generic Infrageneric Specific Infrspecific Sort by [dropdown] [refresh] [download]

<i>Allium ayhan-toprakii</i> Yıldırım, Ann. Bot. Fenn. 59: 233, f. 1-2 (2022).	WFO
<i>Allium deneliae</i> Balos, Ann. Bot. Fenn. 59(1): 213 (2022).	WFO POWO
<i>Allium ducissae</i> Bartolucci, Iocchi & F.Conti, Plants [Basel] 11(3)-426: 5 (2022).	WFO POWO
<i>Allium elaounii</i> El Mokni, Phytotaxa 533(4): 207 (2022).	WFO POWO
<i>Allium goumenissanum</i> Ioannidis & Tzanoud., Phytotaxa 554(1): 60 (2022).	WFO POWO
<i>Allium halfetiense</i> Balos, Ann. Bot. Fenn. 59(1): 274 (2022).	WFO POWO
<i>Allium heterophyllum</i> D.F.Xie & X.J.He, PhytoKeys 190: 56, figs. 1-3 (2022).	WFO POWO
<i>Allium incomptum</i> Kierstead & Lindstrand, Madroño 69(1): 95 (2022).	BHL WFO POWO
<i>Allium izmireense</i> Pirhan, Adansonia sér. 3, 44(13): 134 (2022).	WFO POWO



1.2. Alpha-taxonomy: old descriptions, resurrected species, new species, split, etc.



Allium elaeagnifolium El Mokni [sect. *Pseudoscorodon*],
first published in Phytotaxa 533: 207 (2022)

- » The Euro-Mediterranean sections of subgenus *Allium*
- » Sect. *Allium* (syn. *Porrum*) : 111+ species at present day...
- » Sect. *Codonoprasum* : 102+ species at present day...
- » Sect. *Cupanoscordum* :
 - » from 2 species (1810 & 1843, stable until Garbari et al. 1979)
 - » to 18 species (16 descriptions between 1983 and 2017)
- » Sect. *Pseudoscorodon* :
 - » Regularly increasing until 18 species (from 1805 to 2022)

1.3. Study methods for the genus *Allium* through the ages

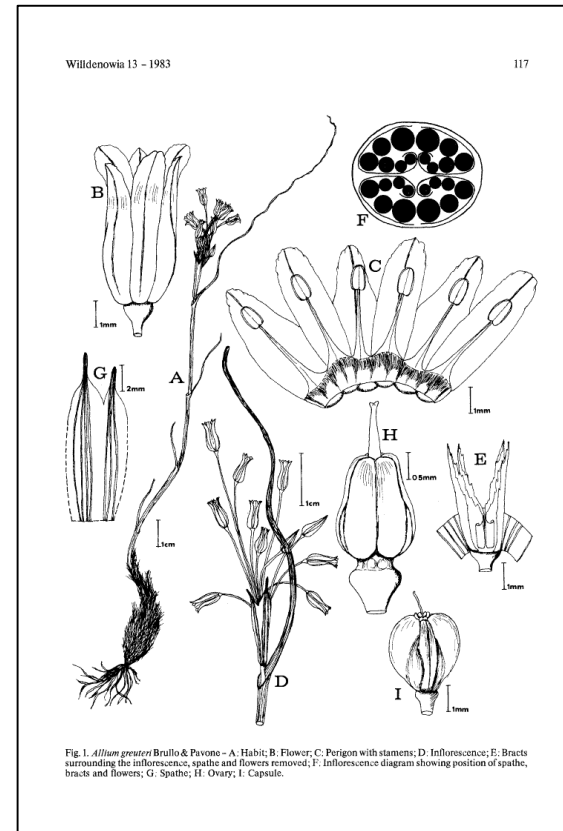
Collected specimen dried and pressed



Herbarium Linné (18th century)



Living specimen drawn or photographed



Brullo & Pavone 1983
(Willd., 13: 115-122)



Mifsud & Mifsud 2018
(Fl. Medit., 28: 27-51)

*2. The redlisting
process*



2.1. The Mediterranean biodiversity hotspot

CEPF delimitation:

The Mediterranean Basin
(and biogeographically
adjacent areas)

More than 20 countries
(from Portugal to Iraq and
from Cabo Verde to Jordan)

More than 30.000 vascular
plant species / subspecies (\approx
50 % endemic)

In 2021, **2426 vascular
plants** have been
assessed by IUCN (< 10 %)
+ 1855 Bryophytes.



<https://www.cepf.net/sites/default/files/mediterranean-basin-2017-ecosystem-profile-summary-english.pdf>

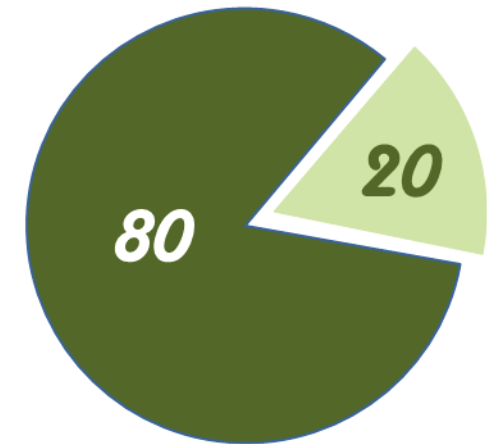
2.2. The Mediterranean Monocots project

First aim : around 20% of the Mediterranean flora are Monocots (around 6000?)

A previous funded project (2015-2017):
4 workshops, >70 experts, 4 project managers...

A provisional checklist of **1446 (near-)endemic** species was built:
Out of the 1446 species listed, only 602 have been evaluated in 2021 (41,6 %)
→ **844 drafts still needed assessment (58,4 %)**

Orchidaceae: 59 (assessed) / 141 (total endemics)
Allium: 97 (assessed) / 210 (total endemics)



2.3. Main problems and limitations

What taxonomic reference to follow?

The image shows two overlapping website screenshots. The top one is the Kew Science website, titled 'World Checklist of Selected Plant Families (WCSP)'. It features a search bar with the text 'Quick Search' and 'Find name', and a note: 'Enter family names in full and use the wildcard character (*) for partial matches on genus and species.' Below this is a link to 'WCSP is an international collaborative programme (view contributors) that provides the latest peer reviewed (view reviewers) and'. The bottom screenshot is from the 'CONSERVATOIRE ET JARDIN BOTANQUES VILLE DE GENEVE' website. It has a navigation menu with 'Accueil | Recherche | Contact' and a breadcrumb trail: 'CJB > Base de données > Africa > Recherche'. Below this is a section for 'Base de données des plantes d'Afrique' with a small 'Apd' logo and three buttons: 'Par nom', 'Par pays', and 'Récents'. A large green cross logo is overlaid on the right side of the screenshots, with the text 'EURO' on the top left, 'MED' on the top right, and 'PlantBase' in a large, italicized font at the bottom.

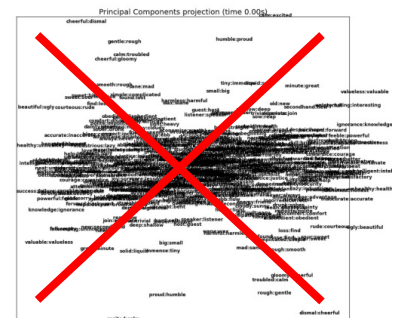
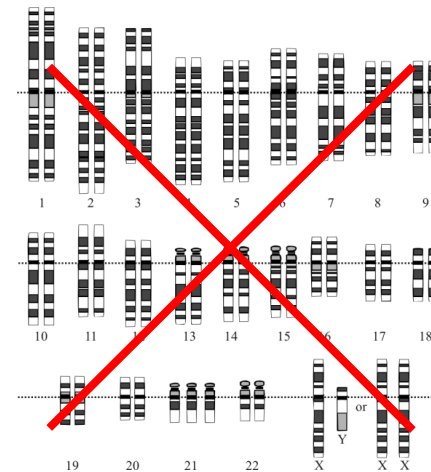
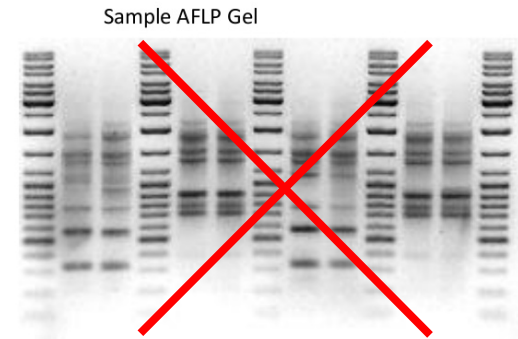
Unsolvable question... → Fluctuating taxonomy!

2.4. Species delimitation using fluctuating taxonomy (how and why)

1st property:

A taxon has to be **identifiable on the field**

→ no cryptic species (karyology, DNA, numerical data...)



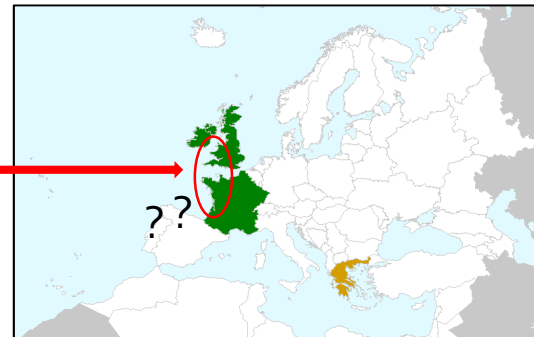
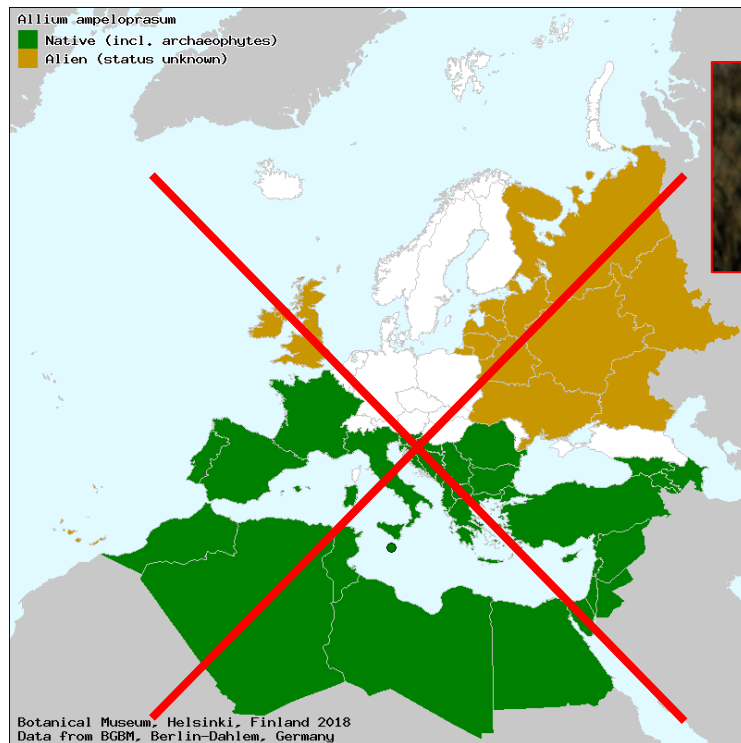
2.4. Species delimitation using fluctuating taxonomy (how and why)

2nd property:

Have to share **homogenous conservation issues**

→ No distinct eco-evolutionary heritages (allopolyploidy, etc.)

ex. *Allium* "*ampeloprasum*" s.s. versus s.l.



- A French-British atlantic endemic
- A possible anthropic origin (cultivated)
- An allo-hexaploid plant ($2n=6x$)
- A coastal sandy and semi-wet ecology
- A plant flowering in early summer (July)
- A lot of morphological criteria...
- A garlic taste (not leek) !

→ Around 10 species (described or not, typified or not, known in their locus classicus or not...)

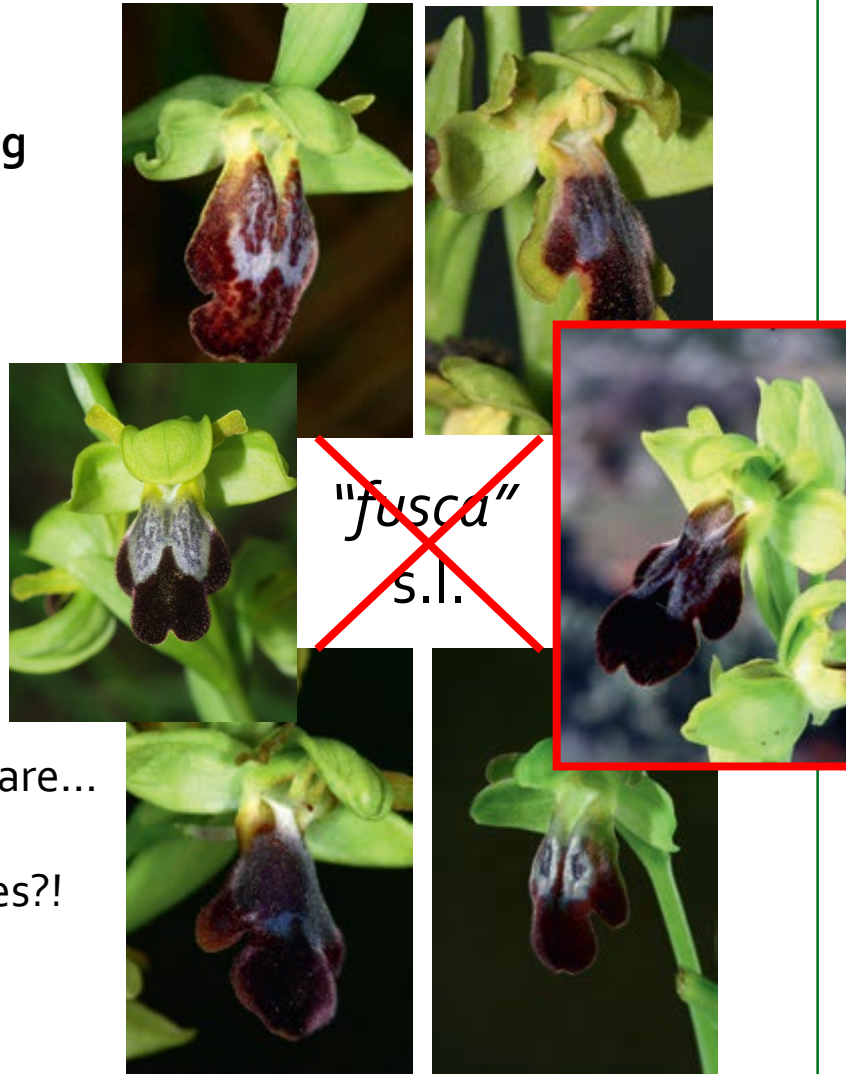


2.4. Species delimitation using fluctuating taxonomy (how and why)

3rd property:

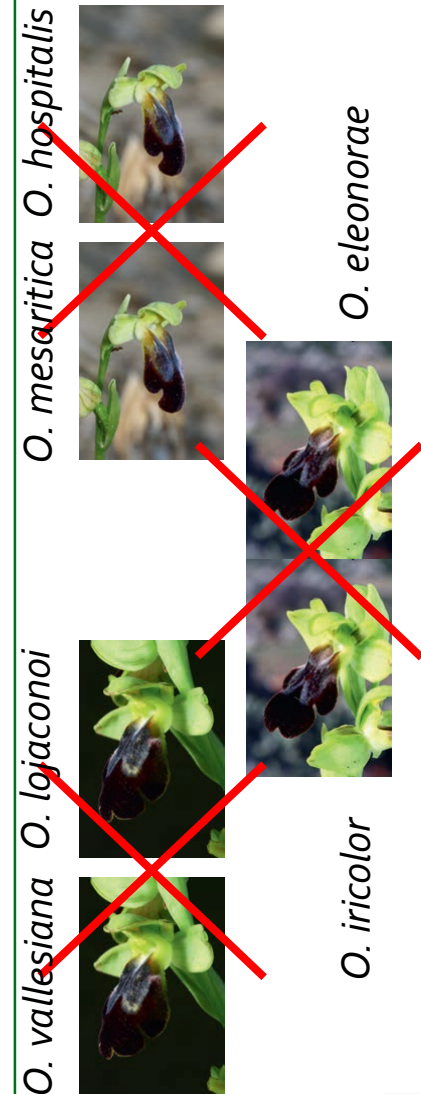
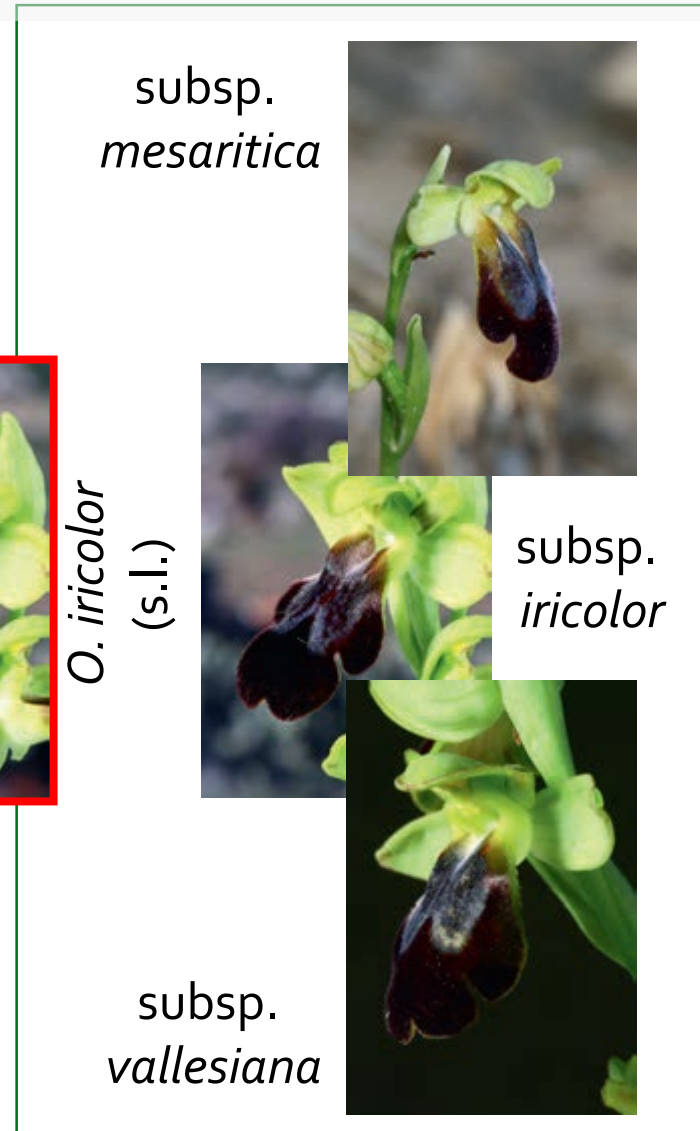
Avoid the **never-ending controversies...**

→ “not too splitter,
not too lumper”



ex. The *Ophrys* nightmare...
(*Orchidaceae*):

Q°: 10 // N // 400 species?!



very lumper position

→ our compromise ←

very splitter

2.5. Achieving the Mediterranean Red List... (2021's strategy)

"We first try to build a strategy for achieving some objectives in order to complete the Monocots RL before to start a Dicots one in the future..."

- Objective 1: complete and publish the draft assessment Monocots already done on SIS (64 taxa);
- Objective 2: transfer and update the data from European assessments of Mediterranean countries (576 taxa) into the global level;
- **Objective 3: complete all Alliums and Orchids species**
- Objective 4: try to complete the *Poaceae* family?

(...)"

[Véla & Numa, 3th MPCW at Chania, 2021]

- "Objective 3: complete all Alliums and Orchids species"
- **Objective 3a: clarify the confuse taxonomy when names exist but are lost into a false synonymy in order to assess/reassess the resurrected taxa;**
- **Objective 3b: describe the field detected but still unnamed taxa with potential conservational issues!**

3. *The Allium
ampeloprasum
species complex*



3.0. *Allium porrum* L., Sp. Pl.: 295 (1753), nom. rej. [only in case of synonymy]

(Not evaluated)



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➤ « Not Applicable »

- » Anthropogenic taxon, created for/by cultivation
- » No wild population, only casual escaped specimen...
- » Tetraploid (wild progenitors not fully resolved)



No Copyright (CCo)

3.1. *Allium ampeloprasum* L., Sp. Pl.: 294 (1753), nom. cons.

« Least Concern »
(Rhodes & Maxted , IUCN RLTS 2016)

<https://www.iucnredlist.org/species/172192/19391082>



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➤ Possibly « Near Threatened »?

- » « Wild » (indigenous?) populations in SW-Britain and W-France, casual elsewhere...
- » Mainly sandy coastal primary/secondary habitat
- » Also cultivated and then casually escaped or temporarily ruderal
- » To be confirmed as naturalised in Ireland, Spain, Portugal, Greece, etc.
- » Wild population severely fragmented?
- » AOO < 2.000 km²?
- » Number of mature individuals < 10.000?
- » Continuing decline of habitat quality?
- » Mainly hexaploid (wild progenitors not fully resolved)

3.2. *Allium multiflorum* Desf., Fl. Atlant. 1: 288 (1798)

« Least Concern »
(Lansdown & Véla, IUCN RLTS 2018)

<https://www.iucnredlist.org/species/13144620/18612715>



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✓ OK, but...

- » 3 forgotten names: are they really synonyms?
- » *Allium mogadorensis* Willd. ex Schult. & Schult.f., (...) Syst. Veg., ed. 15[bis]. 7: 1004 (1830)
- » *Allium getulum* Batt. & Trab. in Bull. Soc. Bot. France 39: 75 (1892)
- » *Allium tortifolium* Batt. & Trab. in Bull. Soc. Bot. France 39: 338 (1892)
- » Still need more field and lab data, but possibly both distinct endemic species (Morocco and/or Algeria).



A. tortifolium, Algeria

3.3. *Allium polyanthum* Schult. & Schult.f., J.J.Roemer & J.A.Schultes, Syst. Veg., ed. 15[bis]. 7: 1016 (1830)

« Least Concern » (Véla, IUCN RLTS 2019)

✓ OK

<https://www.iucnredlist.org/species/172193/129513554>



3.4. *Allium commutatum* Guss., Enum. Pl. Inarim.: 339 (1855)

« Least Concern »
(Véla & Kell, IUCN RLTS 2018)

<https://www.iucnredlist.org/species/172281/19174707>



✓ OK, but...

- » Delimitation not achieved / Synonymy not resolved :
- » Diploid vs auto-tetraploid cytotypes?
- » Hybridogenic swarm vs hybridogenic species *A. commutatum* x *polyanthum* (Mifsud & Mifsud 2018, Fl. Medit.)
- » Related to the *A. bourgeai* / *creticum* / *cyclacidum* complex ?

<https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:527708-1#children>



3.5. *Allium atroviolaceum* Boiss., Diagn. Pl. Orient. 7: 112 (1846)

« Data Deficient »
(Rhodes & Maxted, IUCN RLTS 2016)

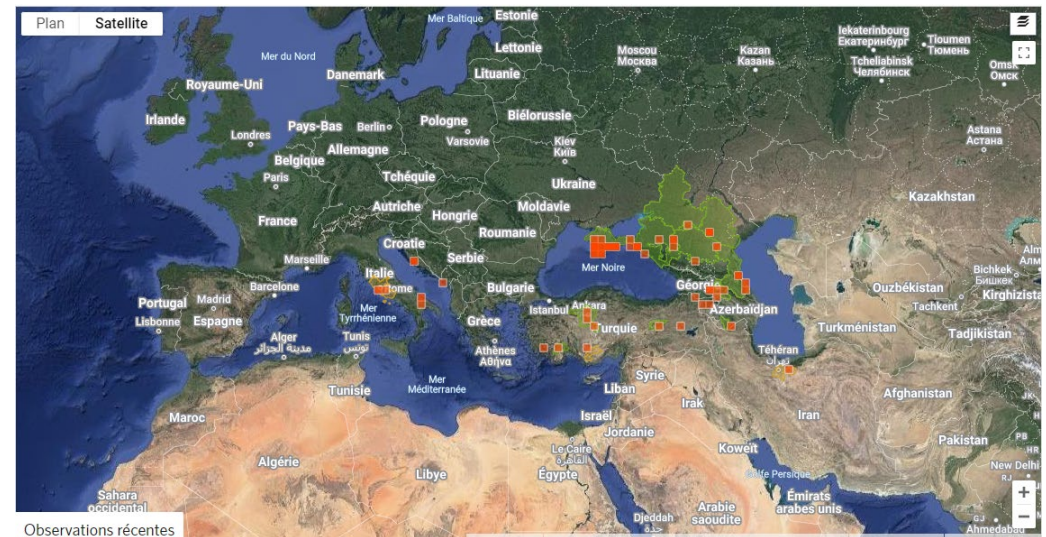
<https://www.iucnredlist.org/species/172241/19391362>



Allium atroviolaceum Boiss.,
LECTOTYPE, G00164986

✓ Not better...

- » Described near Chiraz (Iran)
- » Rudero-segetal ecology
- » Western distribution limit not known because of numerous confusions
- » Relationship with *A. scaberrimum* still not known...



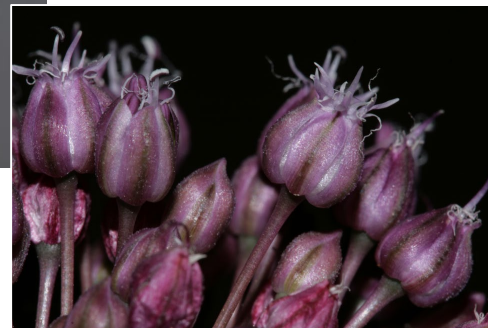
<https://www.inaturalist.org/taxa/738854-Allium-atroviolaceum>

3.6. *Allium leucanthum* K.Koch, Linnaea 22: 240 (1849)

(Not Evaluated)



Allium cf. leucanthum ?
(white form and purple form), Lebanon



➤ Probably « Data Deficient »?

- » Described from the Caucasus
- » Endemic of the Caucasus? (POWO's position)
- » Widespread through the Middle East?
- » The oldest name for the Eastern « ampeloprasum »? (both white and purple forms)



3.7. *Allium scaberrimum* J.Serres, Bull. Soc. Bot. France 4: 439 (1857)

« Vulnerable »
(Molina et al., IUCN RLTS 2018)

<https://www.iucnredlist.org/species/110805790/87775132>



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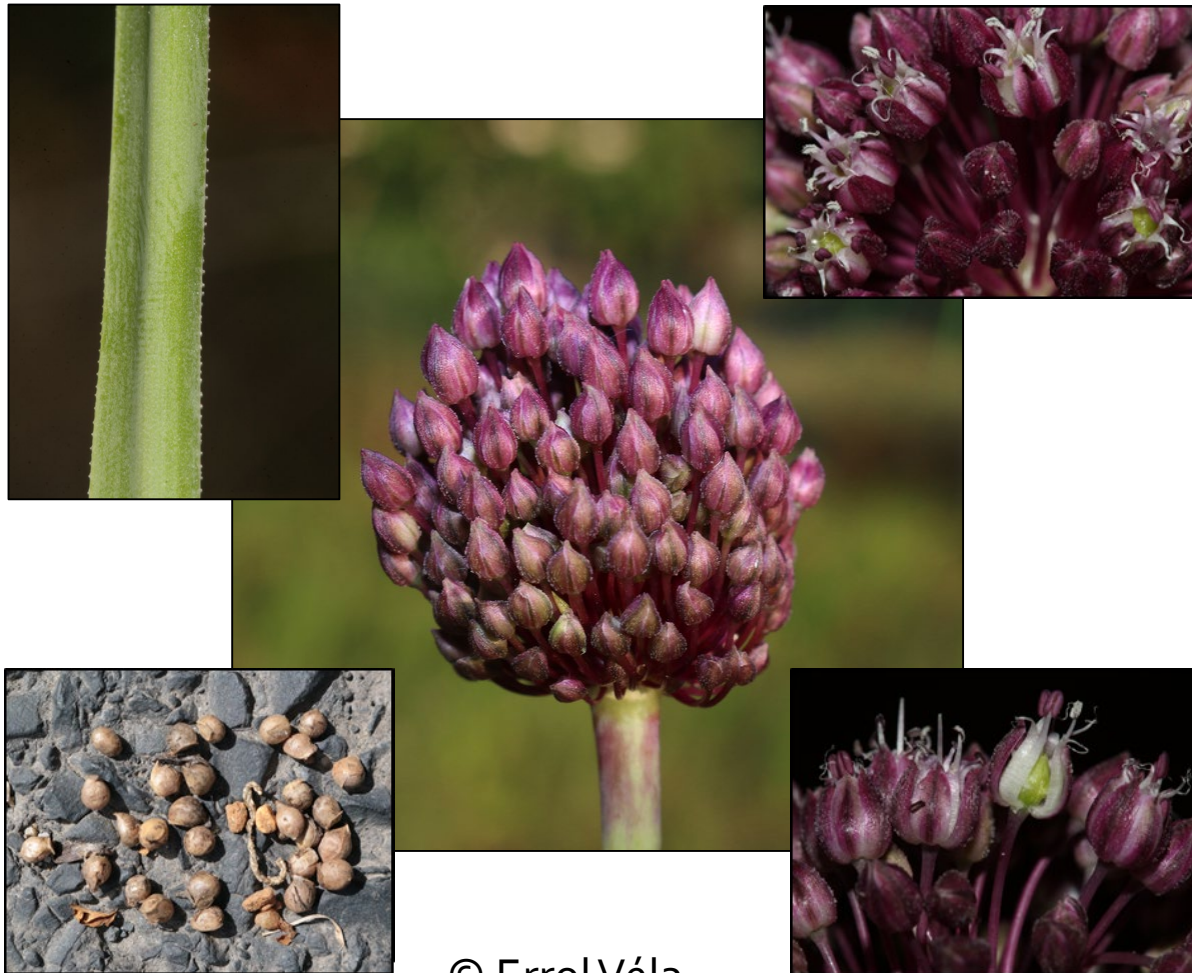
➤ « Vulnerable » or « Near Threatened »?

- » Synonymy *A. scaberrimum* = *A. pardoii* recently confirmed
- » Recent rediscovery of the 3 historical localities in Algeria (Rebbas et al. 2019, Bull. mens. Soc. Linn. Lyon)
- » Continuing decline not confirmed yet...
- » Still needs national surveys!
- » + Taxonomic relationship with the Eastern *A. atroviolaceum* s.s. to be re-assessed?



3.8. *Allium* "occitanicum" J.M.Tison & Véla, nom. provis.

Confused with *A. porrum* (NA)



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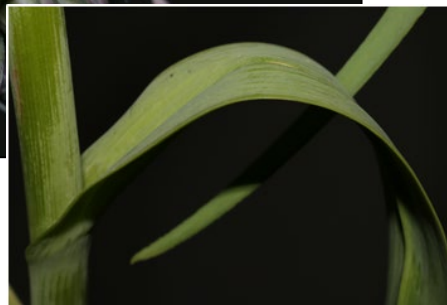
✓ « Least Concern » (unpubl. data)

- » Nb of mature individuals unknown but very high (obviously >> 10.000)
- » AOO not precisely known but > 2.000 km²
- » EOO unknown but > 20.000 km²
- » SE-France, NE-Spain?, Italy? Elsewhere?
- » Numerous confusions under *A. atrovioleaceum* auct. still to be checked...
- » The overlooked Caucasian *A. leucanthum* to deepen?
- » The unnamed Eastern *A. ampeloprasum* sensu Linné pro parte (excluded lectotypus) to check?

- » Allo-hexaploid (progenitors unknown)
- » Sandy coastal primary / secondary habitat (0-100m alt.)
- » No germplasm collection ? (or not labelled)

3.9. *Allium "algarvense"* J.M.Tison & Véla, nom. provis.

Confused with *A. ampeloprasum* (LC)



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➤ Possibly « Near Threatened »? (unpubl. data)

- » Nb of mature individuals unknown (but potentially thousands)
- » AOO \approx 84 km²
- » EOO \approx 40.000 km²
- » CW- & SW-Portugal, SW-Spain
- » To be searched in Morocco...
- » Forgotten name *A. modagorene* Willd. to be checked?

- » Allo-hexaploid (progenitors unknown)
- » Sandy coastal primary / secondary habitat (0-100m alt.)
- » No germplasm collection ? (or not labelled)

3.10. *Allium "debusscheorum"* J.M.Tison & Véla, nom. provis.

Confused with *A. ampeloprasum* (LC)
then *A. porrum* (NA)



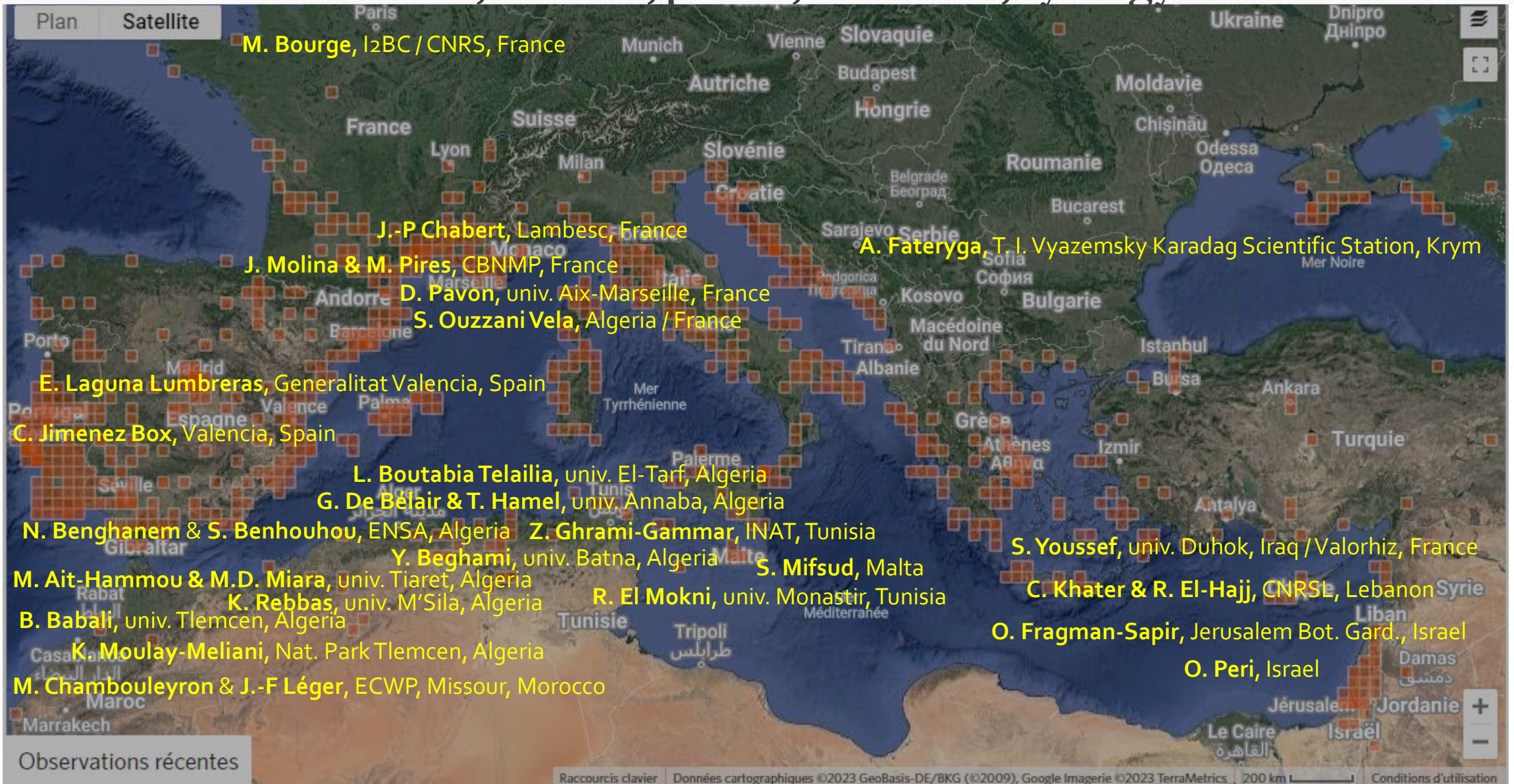
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➤ « Critically Endangered »!
(unpubl. data)

- » < 10 flowering individuals each year
- » < 50 mature individuals (potentially able to flower)
- » < 200 clonal juveniles (2021 survey)
- » AOO = 8 km²
- » 2 locations (sensu IUCN)
- » 1-site restricted

- » Allo-hexaploid (progenitors unknown)
- » Chasmophytic primary habitat
- » No germplasm collection until now (few ex situ private cultivation)

Thanks to all Mediterranean experts that helped us to better know the *Allium* sect. *Allium* taxa from the field, herbaria, photos, cultivation, cytology...





Errol Vela

errol.vela@cirad.fr

IUCN Mediterranean plant specialist group

[https://www.researchgate.net/profile/
Errol_Vela](https://www.researchgate.net/profile/Errol_Vela)



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