

5MPCW
CY-2025

The role of archaeological sites in plant conservation: a first look at the Mediterranean panorama

Giulia Albani Rocchetti*[1,2], Zohreh Hosseini[1,2], Thomas Abeli[3], Giulia Caneva[1,2]

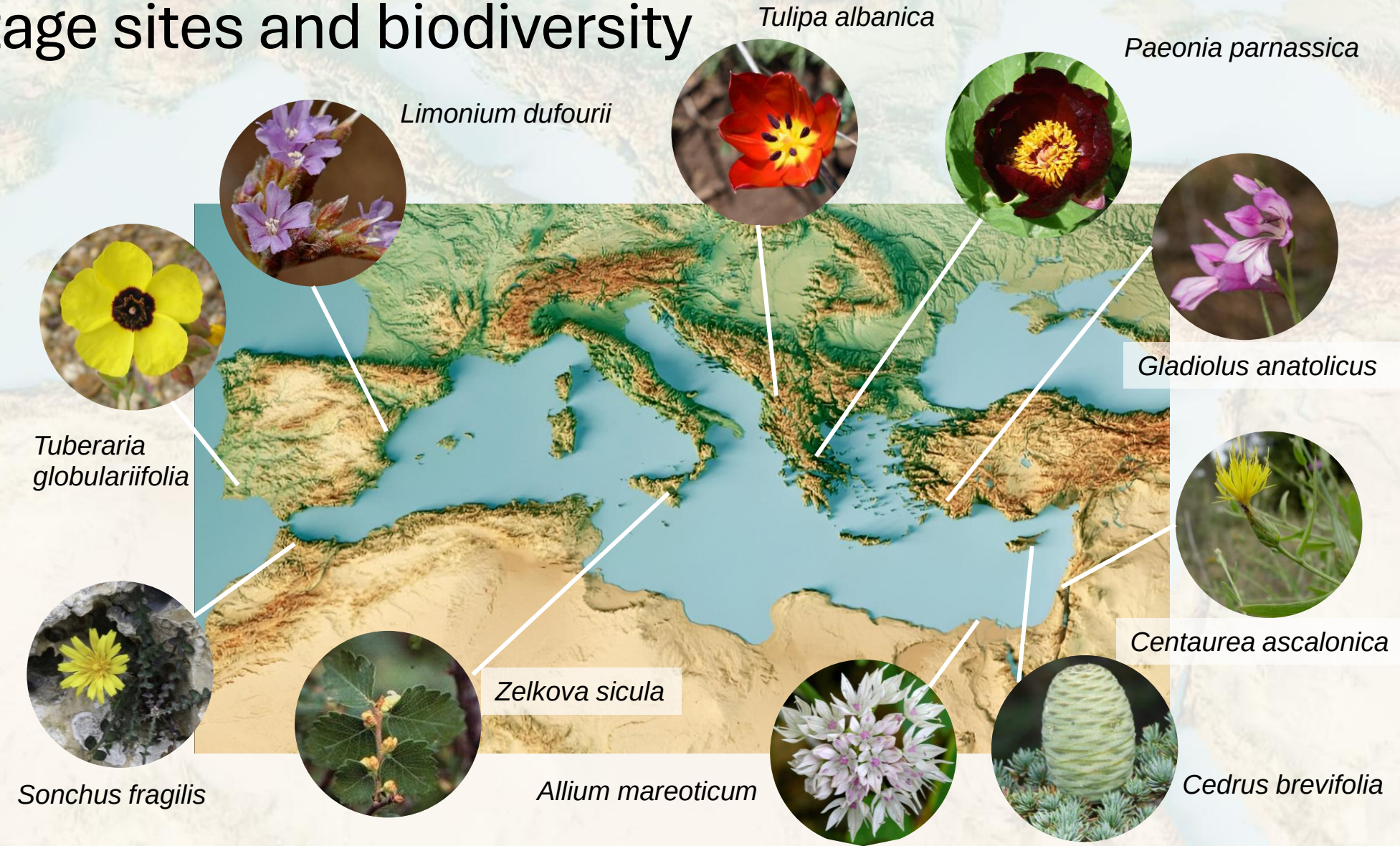
1 Roma Tre University, Rome, Italy. giulia.albanirocchetti@uniroma3.it

2 National Biodiversity Future Center (NBFC), Palermo, Italy

3 University of Pavia, Pavia, Italy

Cultural heritage sites and biodiversity

- The Mediterranean Basin is a **global biodiversity hotspot**.
- **~60% of all native taxa** occur only in the Mediterranean Biogeographical Region and **~37% of the native flora** correspond to narrow **endemic species.**



Cultural heritage sites and biodiversity

- Cradle of numerous **civilizations**
- Indelible mark on the **Mediterranean landscape**
- Millennia of **human-environment interactions** shaped biodiversity, landscape, culture, society

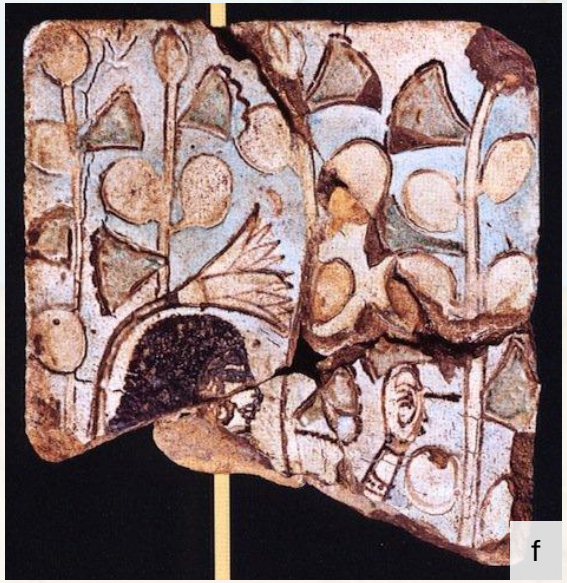

a


b


c


d


e


f

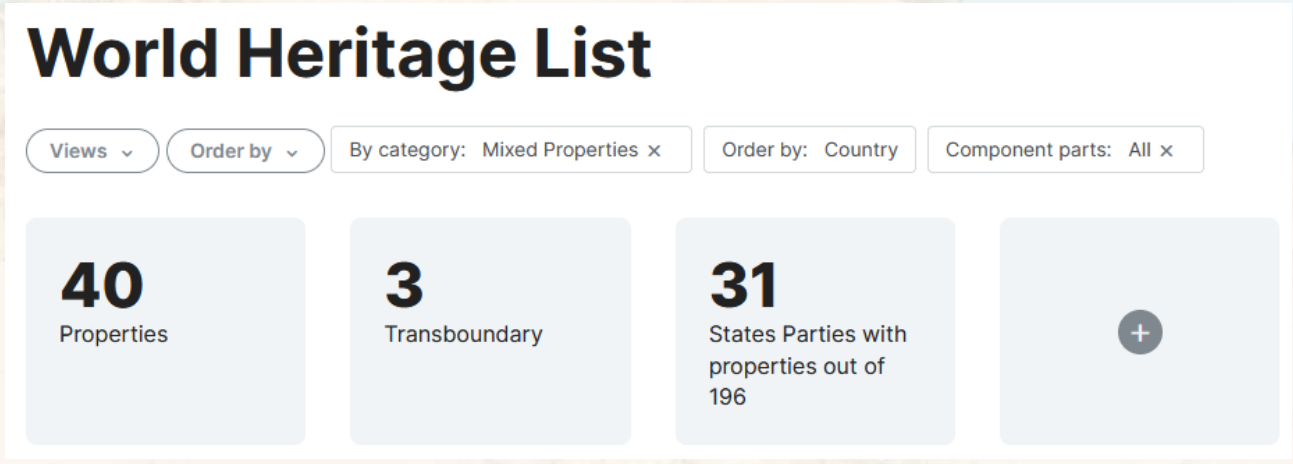

g

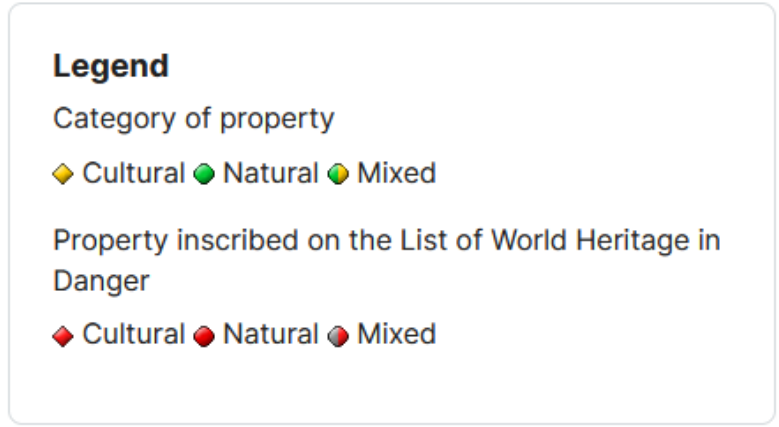
a. Mycenaean, 1250 BC, Archaeological Museum of Mycenae, Greece
b. Pyxis lid, 1250 BC, Louvre museum, France
c. Etruscan fresco, 5th century BC, Monterozzi necropolis, Tarquinia, Italy.
d. Roman terracotta relief, 1st century AD, Louvre museum, France
e. Greek vase of Archemoros, 4th century BC. Naples, National Archaeological Museum
f. Fragment of a faience plaque from Qantir. 1292-1189 BC. Cairo Museum, Egypt
g. Roman-byzantine mosaic, 450-550 AD, Great Palace Mosaics Museum, Fatih/İstanbul, Turkey

Cultural heritage sites and biodiversity

- **Archaeological sites** represent an unexploited resource for achieving conservation goals.
- Unique opportunity to **bridge the divide** between **cultural heritage preservation** and **biodiversity conservation**







Cultural heritage sites and biodiversity

- Numerous studies focusing on **plant deteriorative effects** on epigeal and hypogeal structures

CONSERVATION OF…

ARCHAEOLOGICAL HERITAGE

NATURAL HERITAGE



Pistacia atlantica growing on Ottoman Baths in Paphos, Cyprus

NORDIC JOURNAL OF BOTANY

AN INTERNATIONAL JOURNAL FOR BOTANY AND MYCOLOGY

Research Article

Deteriogenic flora of the Phlegraean Fields Archaeological Park: ecological analysis and management guidelines

Riccardo Motti, Giuliano Bonanomi, Adriano Stinca

Proceedings of the 9th International Congress on Deterioration and Conservation of Stone
Venice June 19–24, 2000
2000, Pages 433-443

- The temples of the archaeological area of Paestum (Italy): A case study on biodeterioration

Altieri Antonella *, Pietrini Anna Maria, Ricci Sandra, Roccardi Ada, Piervittori Rosanna

ELSEVIER
International Biodeterioration & Biodegradation 46 (2000) 335–341
INTERNATIONAL BIODETERIORATION & BIODEGRADATION
www.elsevier.com/locate/ibiod

Biodeterioration of Mayan archaeological sites in the Yucatan Peninsula, Mexico

H.A. Videla *,1 , P.S. Guiamet, S. Gomez de Saravia

plants
MDPI

Review

The Role of Lichens, Mosses, and Vascular Plants in the Biodeterioration of Historic Buildings: A Review

Alessia Cozzolino [1], Paola Adamo [1,2], Giuliano Bonanomi [1,3] and Riccardo Motti [1,*]

Contents lists available at ScienceDirect
International Biodeterioration & Biodegradation
journal homepage: www.elsevier.com/locate/ibiod

Evaluating hazard conditions of plant colonization in Pasargadae World Heritage Site (Iran) as a tool of biodeterioration assessment

Zohreh Hosseini *, Giulia Caneva

Aerobiologia (2020) 36:375–385
https://doi.org/10.1007/s10453-020-09639-7

ORIGINAL PAPER

Biodeterioration of archaeological monuments of Taxila, Pakistan

This article belongs to the special issue "Aerobiology for the Preservation of Human and Environmental Health" published in the Volume 36, Issue 1, March 2020

Muhammad Farooq · Syeda Durre Maknoon

Biodeterioration of Archaeological Monuments and Approach for Restoration

Preeti Bhatnagar[1*], Abdul Arif Khan[2], Sudhir K. Jain[3] and M.K. Rai[4]

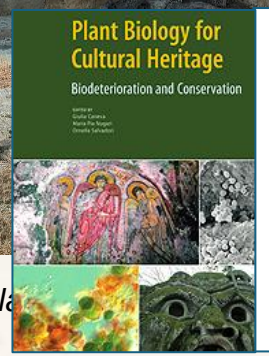
ARCH

Biomass Conversion and Biorefinery (2024) 14:12069–12083
https://doi.org/10.1007/s13399-022-03300-8

REVIEW ARTICLE

Assessment of the potential effects of plants with their secreted biochemicals on the biodeterioration of archaeological stones

Yomna M. Elgohary[1] · Maisa M. A. Mansour[1] · Mohamed Z. M. Salem[2]



Plant Biology for Cultural Heritage

Biodeterioration and Conservation

Edited by
Giulia Caneva, Maria Pia Nugari, and Ornella Salvadori

Pistacia atl

Cultural heritage sites and biodiversity

- Numerous studies focusing on **plant deteriorative effects** on epigeal and hypogeal structures
- Growing, but more limited studies on the **role of archaeological sites in plant conservation**, often examining single sites or localized networks



Astragalus berytheus in the UNESCO World Heritage Site at Tyre, Lebanon

Open Access Article

Archeological Sites and Relict Landscapes as Refuge for Biodiversity: Case Study of Alexandria City, Egypt

by Selim Z. Heneidy [1], Yassin M. Al-Sodany [2], Laila M. Bidak [1], Amal M. Fakhry [1], Sania K. Hamouda [1], Marwa W. A. Halmy [3], Sulaiman A. Alrumman [4], Dhafer A. Al-Bakre [5], Ebrahem M. Eid [2,4,*] and Soliman M. Toto [1]

Biodiversity Journal, 2017, 8 (1): 87–104

MONOGRAPH

The wild vascular flora of the Archaeological Park of Neapolis in Syracuse and surrounding areas (Sicily, Italy)

Pietro Minissale[1] & Saverio Sciandrello[2]

Open Access Article

Vegetation in Archaeological Areas: Risks, Opportunities, and Guidelines to Preserve or Remove: An Italian Case Study

by Kristian Fabbri *, Maria Catalano and Andrea Ugolini

epigeal and hypogeal structures

Articles

First floristic investigation in archaeological sites of Iran: features and plant richness of the Pasargadae World Heritage Site

Zohreh Hosseini, Flavia Bartoli, Emanuela Cicinelli & Fernando Lucchese

Pages 605-621 | Received 03 Jun 2022, A



70 ORCHIDEE SPONTANEE D'EUROPA – EUROPEAN NATIVE ORCHIDS

GIROS Orch. Spont. Eur. 62 (2019:1): 70-89

Archaeological sites as refugia and conservation areas of native orchids: a case study from Northern Campania

ANTONIO CROCE, MAURO BIAGIOLI, VALENTINA DELLA BELLA, CORRADO TOPI[1]

localized networks

Articles

A botanical approach to the planning of archaeological, parks in Italy

Giulia Caneva

Pages 127-134 | Published online: 18 Jul 2013

Articles

Plants and Vegetation in the Archaeological Park of Neapolis of Syracuse (Sicily, Italy): A Management Effort and also an Opportunity for Better Enjoyment of the Site

Pietro Minissale, Alessandra Trigilia, Filadelfo Brogna & Saverio Sciandrello

Pages 340-369 | Published online: 06 Sep 2016



diversity MDPI

Article

Archaeological Areas as Habitat Islands: Plant Diversity of Epidaurus UNESCO World Heritage Site (Greece)

Maria Panitsa *, Maria Tsakiri, Dimitra Kampiti and Maria Skotadi

Astragalus berytheus in the

Fl. Medit. 28: 377-383
doi: 10.7320/FlMedit28.377
Version of Record published online on 20 December 2018

Open Access Article

Plant Diversity in Archaeological Sites and Its Bioindication Values for Nature Conservation: Assessments in the UNESCO Site Etruscan Necropolis of Tarquinia (Italy)

by Giulio Zangari *, Flavia Bartoli, Fernando Lucchese and Giulia Caneva

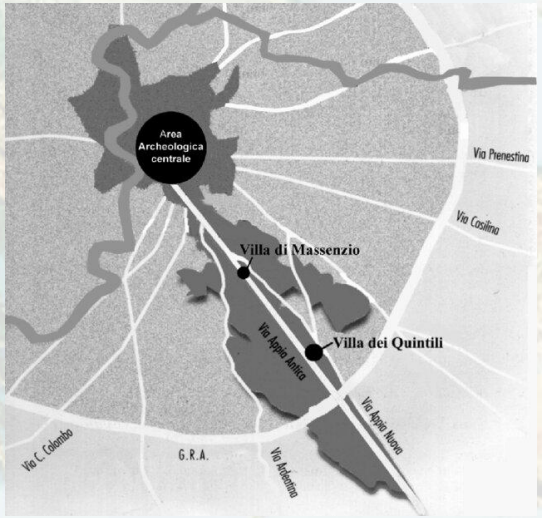
Gianniantonio Domina

The floristic research in Italian archaeological sites*

Cultural heritage sites and biodiversity

Cultural heritage sites (monuments, archaeological and sacred sites) can be:

- **refuge sites** for local flora and fauna
- **ecological corridors**
- **hot spots** and sites for biodiversity **conservation**



672 taxa in 11 archeological sites. (Ceschin, Caneva & Kumbaric, 2006, *Webbia*)



Hieracium australe Fr. subsp. *australe,* (Galasso et al., 2012, *Pagine Botaniche*)



Circum-situ conservation of *Astragalus beritheus* Boiss. & C.I.Blanche, in the Tyre World Heritage Site. (Samad et al., 2021, *Oryx*)

Cultural heritage sites and biodiversity

Need for a **large-scale analysis of flora in archaeological sites (AS)** to evaluate:

- Their **floristic richness, biodiversity** and its composition
- The presence of **threatened species**
- The presence of **alien species**



Aiming to:

- Creating the **first database** of biodiversity in AS
- Assess the **role of AS in plant conservation**
- Improving **AS conscious management** (cultural+natural heritage)
- Assessing how **current framework** contribute to Cult+Nat preservation

Geographic area and study case selection

A **research network** of expert conservationists and botanists was created to gather significant, sound data from each country.

Published and grey literature, and unpublished data focusing on the **wild flora and/or vegetation growing within archaeological and monumental sites** was searched.



Geographic area and study case selection

A premise

Disparity in the number of cultural sites and studies on flora in AS among countries.



Italian cultural heritage (ISTAT 2017):

- 293 archaeological areas and parks,
- 570 monuments and monumental complexes.

[>50,000 records from GNA geoportal]

Italian natural heritage (Bartolucci et al., 2024):

- 7,591 taxa, 1,702 endemics.



Greek cultural heritage (Archaeological Cadastre):

- 3,400 archaeological sites and historical sites,
- 17,000 monuments.

Greek natural heritage (Flora of Greece Version VI, 2024):

- 6,867 taxa, 1459 endemics

Geographic area and study case selection

A premise

Disparity in the number of cultural sites and studies on flora in AS among countries.



Fl. Medit. 28: 377-383
doi: 10.7320/FlMedit28.377
Version of Record published online on 20 December 2018

97 contributions (underestimated)

Gianniantonio Domina

The floristic research in Italian archaeological sites*



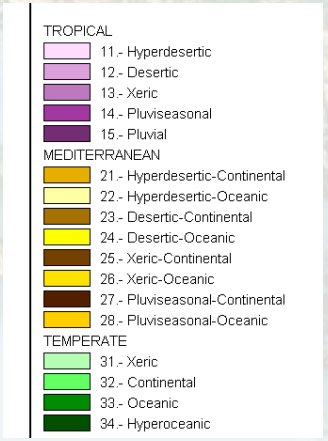
Criteria for data homogenization needed

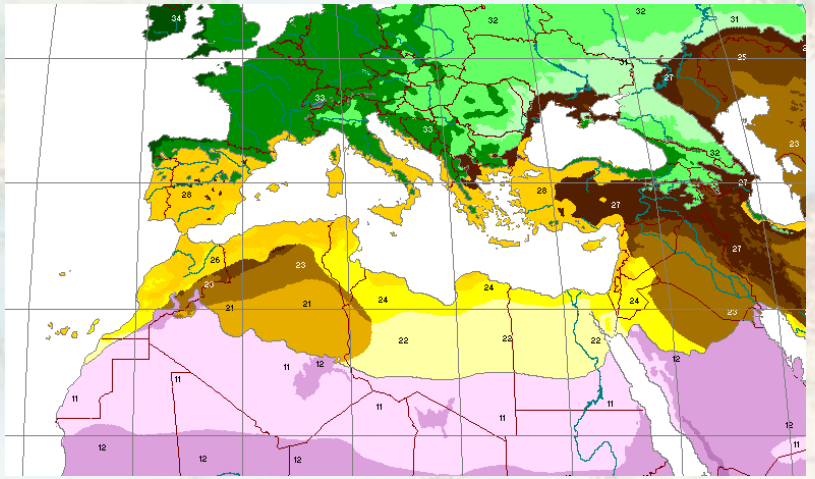


The **Programmatic Contract** between the Ministry of Culture, the Ministry of Environment, the National and Kapodistrian University of Athens and the Natural Environment and Climate Change Agency, with a total budget of 285,500 euros and a duration of 18 months, provides for the **recording of flora and fauna in a total of twenty archaeological sites**.

Geographic area and study case selection

Max 6 study per country, selection based on:
(1) **Bioclimate**: sites located in different bioclimatic areas, to have a potentially higher variability representation (Rivas-Martínez et al., 2011).
(2) **Surrounding land use**: homogeneous number of study cases located in different land use area contexts.
(3) **Size of the site**: in case of multiple sites from (1) and (2) category, select the sites with larger area.





urbanized or built-up areas	residential, commercial, industrial, transportation, mixed	
peri-urban areas	agricultural, pasture, horticultural	
natural areas	lands	rangelands, forests, wetlands
	barrens	beaches, deserts, quarries, bare exposed rocks

Data collection and homogenization

International **conservation status** has been reported according to:



- The European Red List of Threatened Species (2017)
- European red list of vascular plants (2011)
- Habitat Directive Annexes



- CITES
- Bern Convention
- The IUCN Top 50 Mediterranean Island Plants UPDATE 2017
- The IUCN Mediterranean aquatic threatened species

Data collection and homogenization

- **Endemicity** of listed species reported by experts per each country
- Current **global distribution** assessment ongoing using *expowo* R package

LV1	LV1
NON-MEDIT	MEDIT

LV2	LV2	LV2	LV2
W-MEDIT	E-MEDIT	N-AFRICA	N-MEDIT

LV3	LV3	LV3	LV3	LV3	LV3	LV3	LV3
IBERIAN	BALKAN	W-N-AFRICA	E-N-AFRICA	LEVANT	AEGEAN	MALTA PLATEAU	SARDO-CORSICAN

LV4
EXCEPTIONS

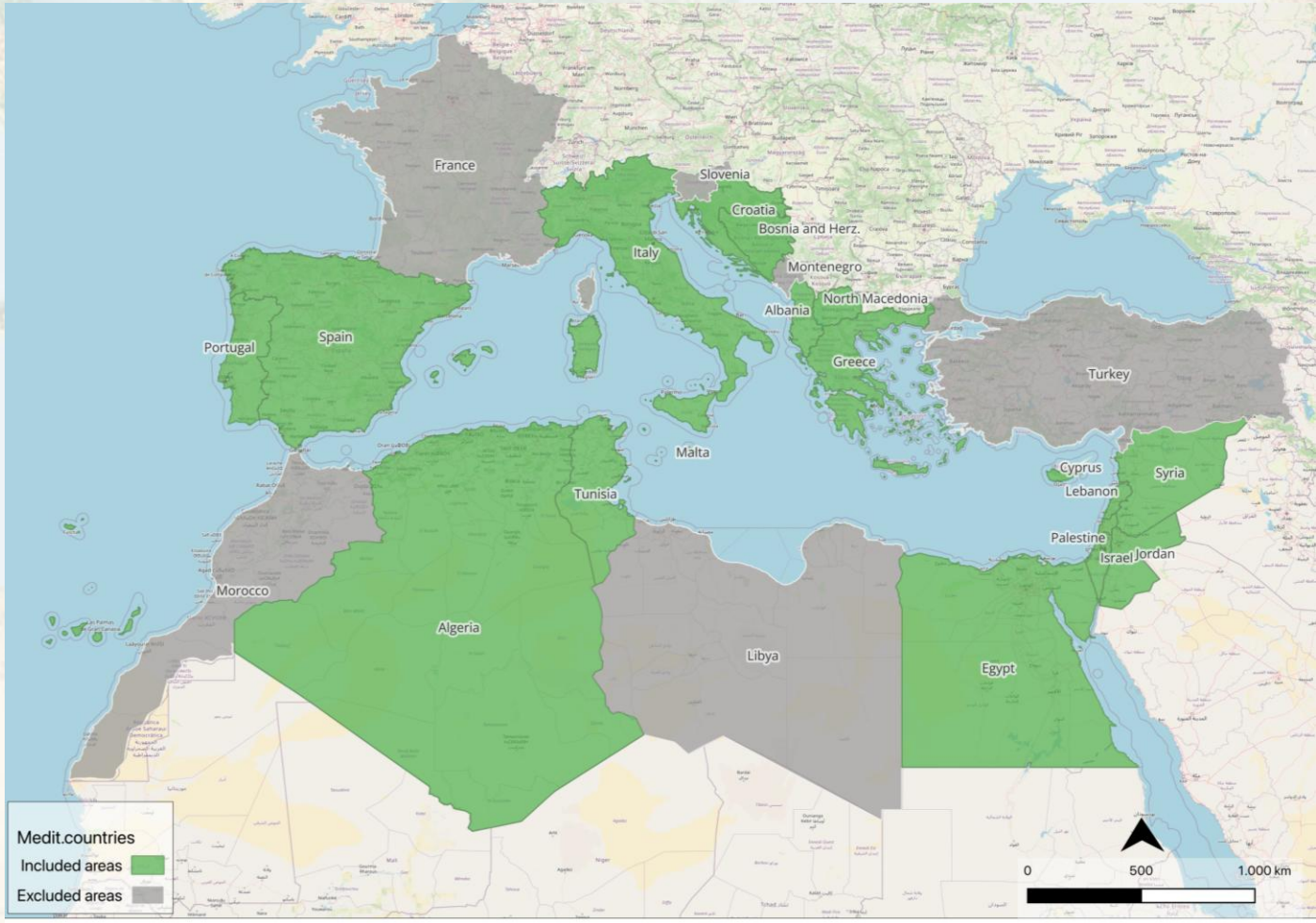
Species	ENDEMIC
Biarum rhopalospadix	GRC
Biarum sp. nova	ISR (new species not described yet)
Campanula andrewsii subsp. andrewsii	GRC
Campanula andrewsii subsp. hirsutula	GRC
Campanula drabifolia	GRC
Campanula topaliana subsp. topaliana	GRC
Carduus meonanthus	Iberian

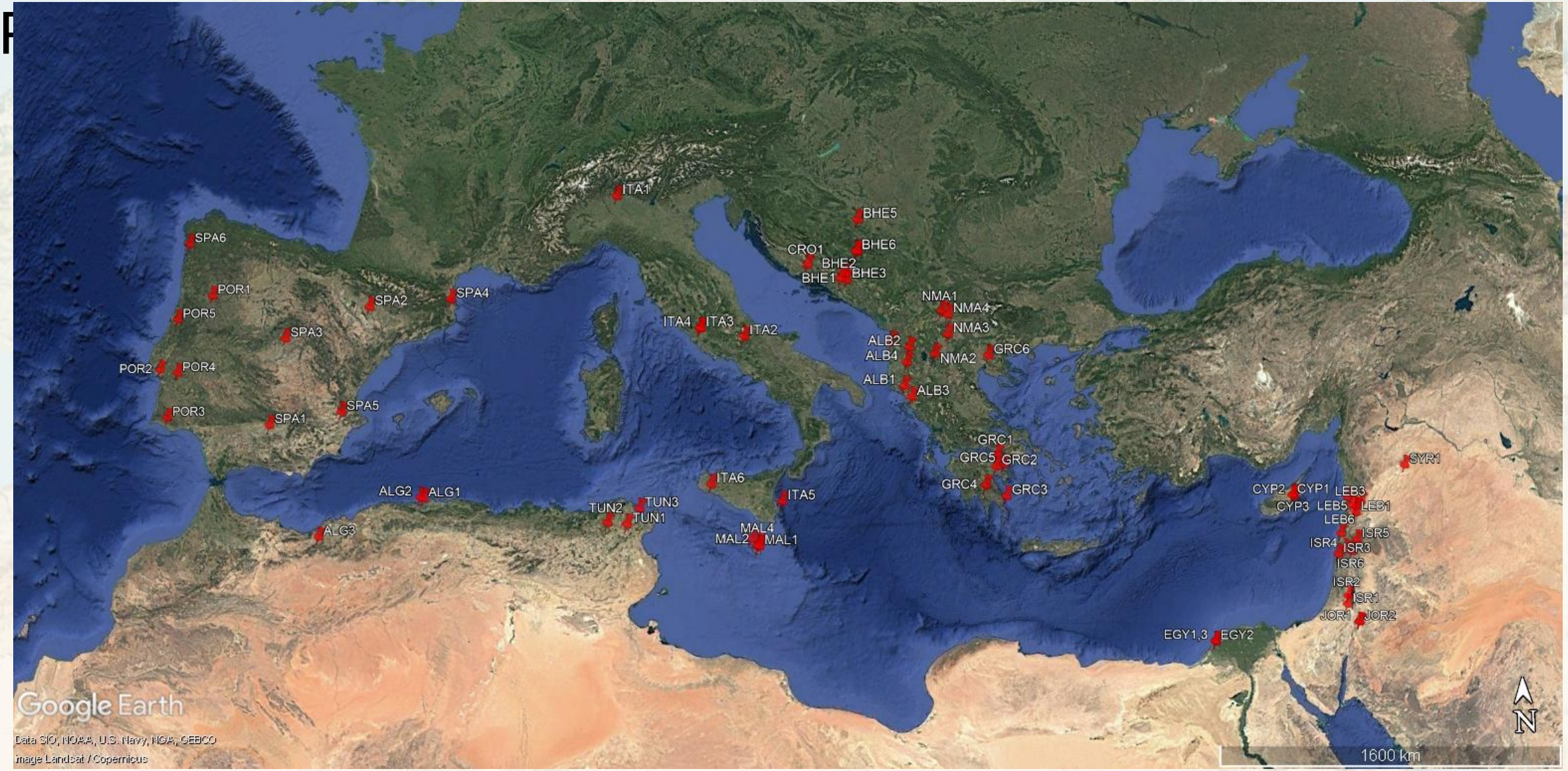
Preliminary results

Research team of >**30 experts** from **17 countries**

69 studies found/ selected

Country	N. AS
Albania	5
Algeria	3
Bosnia and Herzegovina	6
Croatia	1
Cyprus	3
Egypt	3
Greece	6
Israel	6
Italy	6
Jordan	2
Lebanon	6
Malta	3
Portugal	5
Republic of North Macedonia	4
Spain	6
Syria	1
Tunisia	3




ITA1
BHE5
BHE6
CRO1
BHE2
BHE1
BHE3
SPA6
POR1
SPA2
SPA4
POR5
SPA3
ITA4
ITA3
ITA2
NMA1
NMA4
NMA3
ALB2
ALB4
NMA2
GRC6
POR2
POR4
ALB1
ALB3
POR3
SPA1
SPA5
GRC1
GRC5
GRC2
SYR1
ITA6
GRC4
GRC3
CYP2
CYP1
LEB3
ALG2
ALG1
ITA5
CYP3
LEB5
LEB1
TUN2
TUN3
LEB6
TUN1
ISR5
ALG3
MAL4
ISR4
ISR3
MAL2
MAL1
ISR6
ISR2
ISR1
JOR1
JOR2
EGY1,3
EGY2
Google Earth
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
N
1600 km

Preliminary results



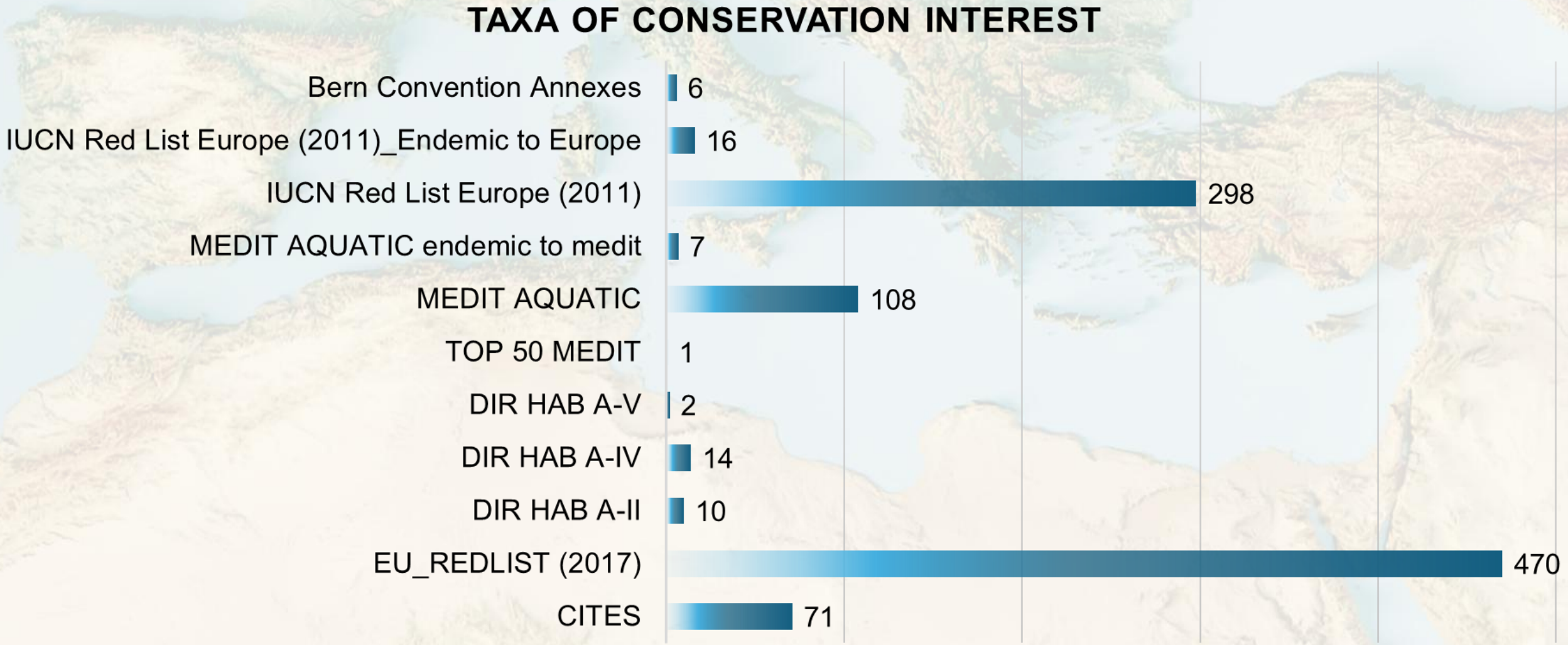
First list of 10,600ca taxa with duplicates

World Flora R package

1030 mismatches, 438 corrections for 215 taxa

3,380ca taxa

Preliminary results



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Preliminary results

~105 endemics



Astragalus cyprius Boiss. (CYP)



Allium gomphrenoides Boiss. & Heldr. (GRC)



Allium obtusiflorum Redouté (ITA-SICILY)



Scrophularia nabataeorum Eig (JOR)

Preliminary results

~105 endemics



Antirrhinum linkianum Boiss. & Reut. (POR)



Ferula loscosii (Lange) Willk. (SPA)



Limonium melitense Brullo (MAL)

Preliminary results

~145 narrowly distributed taxa



Crucianella graeca Boiss.
(Balkans)



Carthamus boissieri Halácsy
(Cyprus, Greece, Crete and East Aegean Islands)



Crocus aleppicus Baker
(W. Syria to Jordan)

Preliminary results

~145 narrowly distributed taxa



Euphorbia boetica Boiss.
(S. Portugal to SW. Spain - incl. Gibraltar)

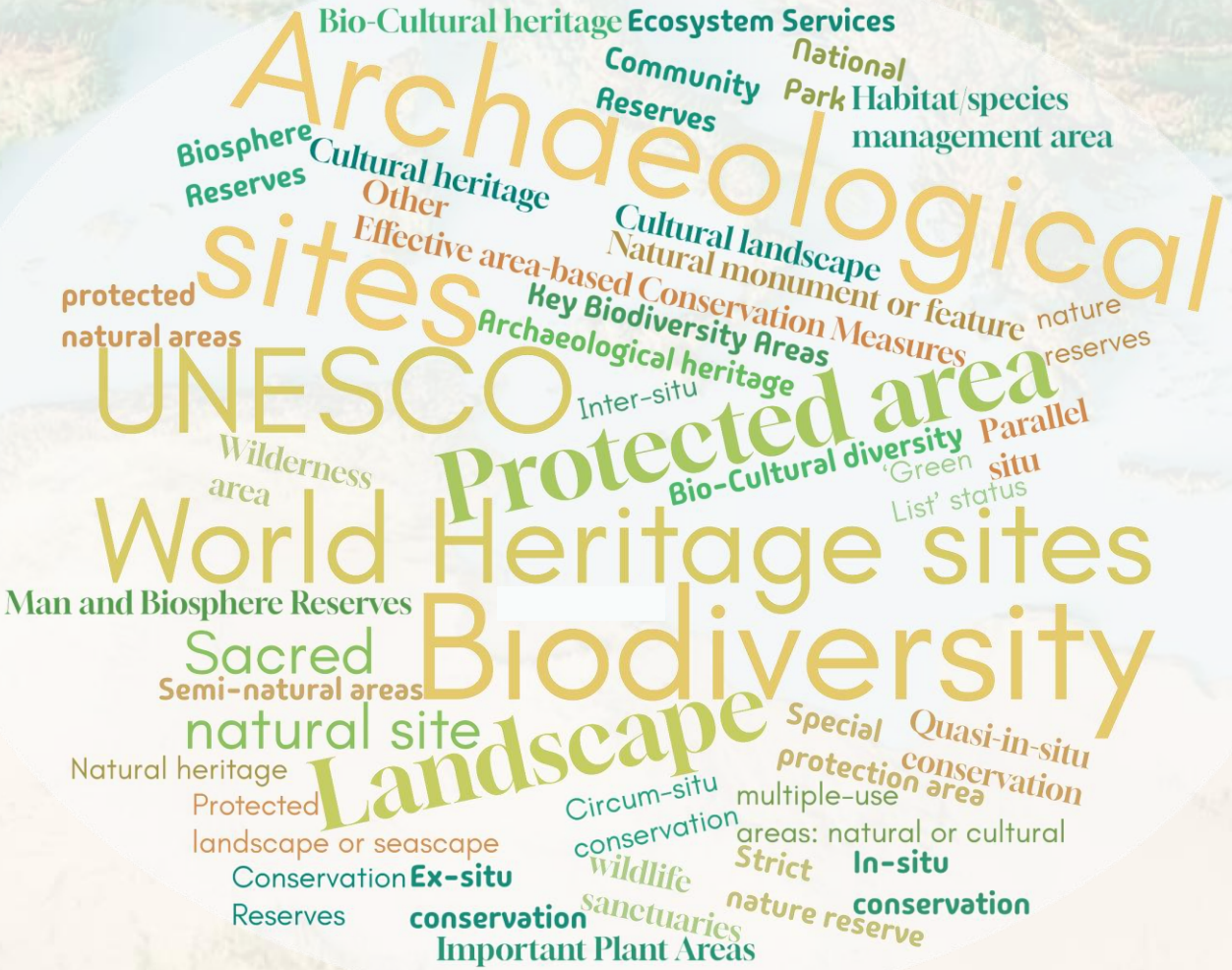


Stachys neurocalycina Boiss.
(Syria to Israel)

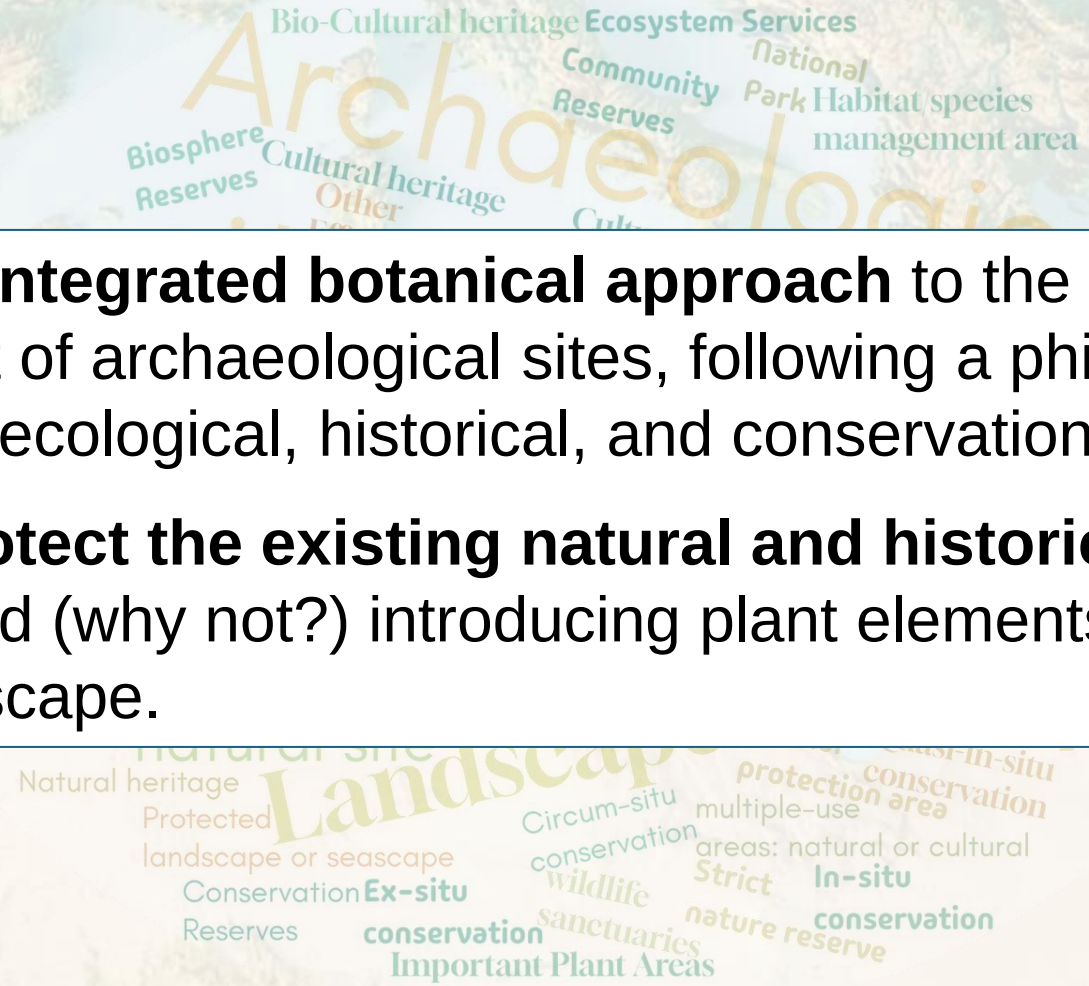


Ornithogalum prasinantherum Zahar.
(Albania to Greece)

Discussion and next steps



Discussion and next steps



Need for an **integrated botanical approach** to the planning and management of archaeological sites, following a philosophy that incorporates ecological, historical, and conservation parameters,

aiming **to protect the existing natural and historical features** while managing and (why not?) introducing plant elements coherent with the original landscape.

Discussion and next steps

land

MDPI

Article

Revaluating CUNA Places (CUltural Place of High Relevance for NAture): Rome as a Multifaced Example of Outstanding Values and Potentials

Giulia Caneva [1,2], Zohreh Hosseini [1,2,*], Flavia Bartoli [3], Giulia Capotorti [4], Fabio Attorre [2,4] and Carlo Blasi [2]

CUNA 1.1

Typology	Category	Definition
Type 1. Cultural places with Natural Value	**1.1 Archaeological sites, which are related to natural values**	Those archaeological sites which contain ancient gardens or their traces, or which have relevance as refugee sites for nature. Archaeological sites where protection of human settlements and monuments also significant and important biodiversity and/or geological features to be protected
Prevailing material cultural heritage and natural heritage (tangible and intangible)		

Discussion and next steps

- Evidence of the **role of archaeological site in plant conservation**
- Gap in **cultural AND natural heritage protection** in archaeological sites
- General **lack of awareness** (e.g., deterioration only, plant blindness)
- **Biodeterioration** must be considered (e.g., Hazard Index)



Journal of Cultural Heritage 62 (2023) 217–229

Risk, hazard, and vulnerability for stone biodeterioration due to higher plants: The methodological proposal of a multifactorial index (RHV)

Giulia Caneva[a,b,*], Zohreh Hosseini[a], Flavia Bartoli[a,c]

Opportunity to publish - link

Special Issue

Plant Conservation Science and Practice

Guest Editors

Dr. Giulia Albani Rocchetti
Dr. Marco Porceddu

Deadline

30 June 2025

plants

IMPACT FACTOR 4.0

Indexed in: PubMed

CITESCORE 6.5

Thanks for your attention

Prof. Giulia Caneva
Prof. Thomas Abeli
Dr. Giulia Albani Rocchetti
Dr. Zohreh Hosseini
Prof. Flavia Bartoli
Prof. Dietmar Brandes
Prof. Ferdinand Bego
Dr. Marjol Meco
Dr. Badia Siab-Farsi
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Prof. Renata Šoštarić
Dr. Vedran Šegota
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Prof. Soliman Mohammad Toto
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Prof. Pietro Minissale
Prof. Francesco M. Raimondo
Dr. Filippo Scafidi
& al.!



5MPCW
CY-2025

The role of archaeological sites in plant conservation: a first look at the Mediterranean panorama

Giulia Albani Rocchetti*[1,2], Zohreh Hosseini[1,2], Thomas Abeli[3], Giulia Caneva[1,2]

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2 National Biodiversity Future Center (NBFC), Palermo, Italy

3 University of Pavia, Pavia, Italy