Insights on the species-richness and on the biogeographic and conservation interest of the vascular flora of the circum-Sicilian islands

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Mediterranean Islands, Species-Richness and Endemism

Fig. 23.1. The ten regional species diversity hotspots of the Mediterranean basin based on plant endemism and richness (based on Médail and Quézel 1997, 1999 and Véla and Benhouhou 2007).
Main circum-Sicilian Islands and Archipelagos
Sicilian phytogeography

(Brullo & al., 1995)

http://www.dipbot.unict.it/fito_new/territori/territori.html
# High number of endemic plants

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<th>Territory</th>
<th>Nr of endemics</th>
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<td>Etna Mt.</td>
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<td>all Circumsicilian islands</td>
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<td>Pelagie Archipelago</td>
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The ‘PIM’ Project

International Project *Petites Iles de la Méditerranée* promoted by the French *Conservatoire National du Littoral* ([www.initiative-pim.org](http://www.initiative-pim.org)).

**Main goals:**

- update and homogenization of biological data on the small islands (<10 km²; distant >5 m from the nearest coast; separated by >0.5 m deep water)
- assessment of disturbances and threats
- assessment of best conservation & management practices
The ‘PIM’ Project: Sicilian ‘clusters’

12, mostly based on geographical and geological criteria
Beyond ‘PIM’ Project: many results...

• 90 out of 337 investigated islands, islets and stacks host vascular plants and some 40 (!) more islets could, too.

• 39 unpublished checklists issuing from recent field surveys ready. Mostly islets and stacks never investigated before (22 located in the Aeolian Archipelago)
Does the strong floristic (dis)similarity between Aeolian islets and stacks tell us a different history?

- Aeolian satellite islets host **144** taxa (c. 16% of the flora of the Archipelago)
- **84** taxa (i.e. 58.3% of the islets’ flora) live on **only one** islet
- **21** (14.6% of the islets’ flora) live on **only two** islets
- **only 8** taxa are present on more than 30% of the islets

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<th>Taxon</th>
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Beyond ‘PIM’ Project: many results...

- 9 updated (and huge) checklists (7 Aeolian Islands + Favignana + Ustica) are almost ready
- The best known island groups: Pelagie and Egadi (3 check-lists available for each main island, almost all satellite islets and stacks investigated)
…yet many challenges!

- 14 islets hosting vascular plants still wait to be studied and other 8 need complete updating

- The last (and often the only) complete botanical survey of many other islands (e.g. Pantelleria and Stagnone Islands) dates back to 30 years ago or even more
‘Isola’ (now Isole!) dei Porri
The ‘PIM’ Project: further research

Information on other topics such as geology, geography, human history, disturbance regime is being collected in order to identify the key factors affecting:

- native and alien plant diversity
- endemism rate values
- local turnover and extinction rates
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Geographical setting
Geological history: still looking for a convincing film
Marettimo: melting pot...

Thymelaea tartonraira

Erodium maritimum

Simethis mattiazi

< Daphne sericea
... or Noah’s Ark?

Bupleurum dianthifolium

Thymus nitidus

Pseudoscabiosa limonifolia
The central Mediterranean ‘enigma’: stepping stones or plate tectonics?

Maghreb, Sicily, S Tyrrhenian, Sardinia

- *Glandora rosmarinifolia*
- *Hyoseris taurina*
- *Iberis semperflorens*
- *Brassica insularis*
- *Ambrosina bassii*
Same feature above species level...

- *Genista gr. ephedroides*
- *Silene gr. mollissima*
... on very young islands

*Eokochia saxicola*

*Cytisus aeolicus*
Aeolian Islands and Tyrrhenian endemics

1. *Dianthus rupicola* subsp. *aeolicus*
2. *Centaurea aeolica* subsp. *aeolica*
3. *Helichrysum angustifolium*
4. *Seseli bocconeii*
Landscape heterogeneity: rocks & soils

The most common outcropping rocks of the circum-Sicilian islands and islets are:

- **sandy or compact limestones/dolomites** (most part of Lampedusa and Lampione, Egadi islands and islets, Stagnone islands, some S Sicilian islets + all NW and SE islets)

- **base-rich or acid volcanites** (Linosa, Pantelleria, Ustica, Aeolian islands and islets, Ciclopi islets, part of Capo Passero islet)

- **marls** (Lampedusa and satellite islets, many S Sicilian islets)

- **sandstones and acid metamorphic rocks** (most of the N and NE Sicilian stacks)
## Landscape heterogeneity: habitats

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Localized: 1 1 2 0 1 3 2 1 0 1 1 1 2 2 1 0 0 0
Destroyed: 2 0 1 1 0 1 1 0 1 2 3 3 3 3 2 0 2 0
Landscape heterogeneity:
resource-demanding and/or
stress-tolerant plant communities

- Temporary ponds
- Cliffs (N- vs S-facing)
- Karstic areas
- Hostile substrata: gypsum, dolomia, seabird colonies, etc.
Landscape heterogeneity: disturbance-driven plant communities

- Sand shore and dune systems
- Rocky coasts subject to salt-spray and waves
- Areas subject to lava flows
- Screes and volcanic ashes
- Areas subject to poisonous gases
Human history: Islands & Ecological catastrophes

Egadi Islands:
12,000 BC!
Human disturbance: Islands & Settlements

Ortigia, the centre of Syracuse

Mozia
Human disturbance: Islands & Private/Public Properties
Opposite trends in current human disturbance

- Traditional agriculture 🔻
- Grazing intensity 🔻
- Fire occurrence 🔻
- Afforestation 🔻
- Seasonal tourism 🔻
- Waste 🔻
- Urbanisation 🔻
- Alien introduction 🔻
Reduction (or fading) of traditional agriculture

During last 50-80 years once dominating land use underwent a strong decline
Terraced landscapes of Sicily

10% cultivated

90% abandoned

Palermo Mts.

Peloritani Mts.

Etna

Erei Mts.

Hyblaean Mts.

Pantelleria

Aeolian Islands

0 10 20 Kilometers

0 5 10 Kilometers

10% cultivated

90% abandoned

Pantelleria

Peloritani Mts.

Etna

Erei Mts.

Hyblaean Mts.
“It is very difficult to make an accurate prediction, especially about the future”

Niels Bohr (1885-1962)
Human pressure still rules
1. the fate of local flora...

Space per time substitution

Aerial photo interpretation in order to detect areas sharing the same year of abandonment

Stage 1: 1-2 yrs.
Stage 2: 3-6 yrs.
Stage 3: 7-15 yrs.
Stage 4: 16-30 yrs.
Stage 5: >30 yrs.

... 3. life form spectrum

Grazing intensity

Need to monitor the effect of grazing trends on plant assemblages, demography and aggregation
endemic or very rare, grazing-tolerant plants

Colymbada acaulis

Ophrys picta

Echinops spinosissimus subsp. spinosus

Thapsia pelagica
Seasonal tourism
(fast advantages, long-lasting damages)

Destruction of dune ecosystems at Vulcano
Limonium lopadusanum

Disturbance: ‘wild’ car tracks and parking places may represent a serious threat for the pollination of coastal plants

Anthemis lopadusana

Daucus lopadusanus
“self-protected”

Limoniastrum monopetalum

Suaeda pelagica
“self-condemned”

< Juncellus laevigatus

Bagno dell’Acqua (= Venus Lake), Pantelleria

Limonium secundirameum
Waste increase and yellow-legged seagull explosion
Ecological 'shifts' at community level

D = disturbance; S = stress

C = competitors prevail if $D \downarrow + S \downarrow$

R = ruderals prevail if $D \uparrow + S \downarrow$

S = stress-tolerant prevail if $D \downarrow + S \uparrow$

Primary Strategies (Grime)

Ellenberg Indicator Values

Afforestation: often unsuccessful

1. too dense final cover and no needle removal
2. excessive soil erosion due to wrong practices before planting
3. too severe edapho-climatic stress factors
impact of afforestation on local plant assemblages: Lampedusa study case

Alien introduction: just a a question of time?

Carpobrotus edulis vs. Anthemis aeolica at Lisca Bianca (Aeolian islands)

Mirabilis jalapa

Nicotiana glauca
Opuntia ficus-indica, an ‘iconic’ invader
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- Local extinction is a **common fact** on islets
- It may depend on natural turnover processes, but is very often enhanced by human activities (as clearly documented for Lampedusa, Linosa and Ustica)
- The higher is its biogeographic value the more it is fragile: this is the case of the vascular florulas of Lampedusa and Marettimo
The paramount conservation value of the circum-Sicilian islands’ flora

350 noteworthy taxa (c. 21% of the whole vascular flora of circum-Sicilian islands!) according to at least one of the following criteria:

• listed within 92/43 EU Directive Appendixes: 8 (18 in all Sicily!)

• protected by CITES: 40

• listed within regional red lists according to IUCN classification: 182 (660 in all Sicily!)

• biogeographical interest (endemic, stenochorous, rare at regional level, etc.): 130
Conservation: *memento* and best wishes for the future

**Aeolian Archipelago**
- UNESCO’s World Heritage List
- mainly within regional nature reserves and/or Natura 2000 network
- strict application of management plans *urgently* needed to protect many local habitats and plants

**Satellite islets and stacks of NW, N, NE, SE and S Sicily**
- only partially protected by regional and national laws
- currently out of regional nature reserves and/or Natura 2000 network
Acknowledgements

First of all thanks to many friends and colleagues who shared data and photos of “our” islands and islets during last twenty years:

**Pietro Lo Cascio**: Eolie, Pelagie and Stagnone  
**Leonardo Scuderi** and **Alfonso La Rosa**: Egadi, N & S Sicily and Stagnone  
**the whole staff of the Nature Reserve “Isola di Lampedusa”**: Pelagie  
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**Angelo Troìa**: S Sicily and Capo Passero

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**Luigi Bertini**: Egadi islets  
**Fabio Morreale**: SE Sicily islets  
**Carlo Di Leo**: digital maps

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Thank you for your attention!

PLEASE contact me:
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