Effectiveness of protected areas on Italian forest in the Mediterranean biogeographical region

Di Musciano M., Ricci L., Alessi N., Sabatini F.M., Frattaroli A.R, Chiarucci A., Di Martino, L., Di Cecco, V., Geldmann J.

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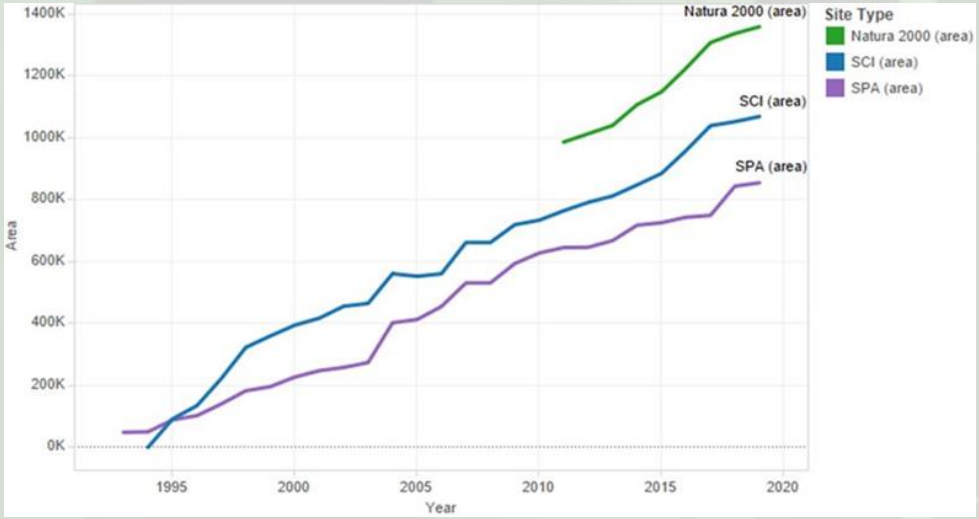
Introduction

Protected areas (PAs) have been established worldwide as a **key conservation tool** aimed at preserving natural habitats, biodiversity and natures contribution to people



Cumulative surface area of N2K neetwork in km^2, 1993-2019 (EEA)

Merely designating PAs does not ensure the **protection of biodiversity**

PLOS ONE

OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

High and Far: Biases in the Location of Protected Areas

Lucas N. Joppa, Alexander Pfaff

Published: December 14, 2009 • https://doi.org/10.1371/journal.pone.0008273

In the Mediterranean Basin, specifically **in Italy**, forests are considered one of the most **threatened** global biodiversity hotspots, due to the **high rate of endemism** and to the **high human impact**

Cardamine bulbifera L.

Limodorum abortivum L.

A little is known about the **effectiveness** of Italian forest-PAs in **conserving** plant diversity **across time**

Aims

Here, we used a **new** and **unique** published dataset to assess the **effectiveness** of Italian forest-PAs in conserving vascular plant diversity across time. We compared **changes** in plant species diversity between PAs and non-PAs after accounting for the main **confounding factors** of PA locations.

Specifically, we evaluated:

- Plant species diversity (alpha and gamma diversity)
- Ellenberg's Light index values

Saxifraga rotundifolia L.

Materials and Methods

Data collection and preparation

EUNIS2020 Broadleaved deciduous forest

More than 16000 preferential and 201 probabilistic plots containing plant cover values of **2948 species** in **PAs and non-PAs**, with a temporal range from 1890s to 2020

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Data collection and preparation

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More than 16000 preferential and 201 probabilistic plots containing plant cover values of **2948 species** in **PAs and non-PAs**, with a temporal range from 1890s to 2020

From the preferential dataset we selected forest plots located in the **mediterranean biogeographical** region, with **size > 100 m & < 400 m** only within the **broadleaf habitat type** and within a temporal range between **1980 and 2020**

These plots were separated in two categories

- **Pre-2000**
- **Post-2000**

Materials and Methods

Data collection and preparation

- **Altitude**

- **Annual Mean Temperature**
- **Annual Precipitation**

CHELSA

- **Distance from roads**

Minimum distance from small roads

- **Population density** → Global Human Settlement Layer

European Commission

Journal of Vegetation Science
Advances in plant community ecology
IAVS
RESEARCH ARTICLE | Open Access

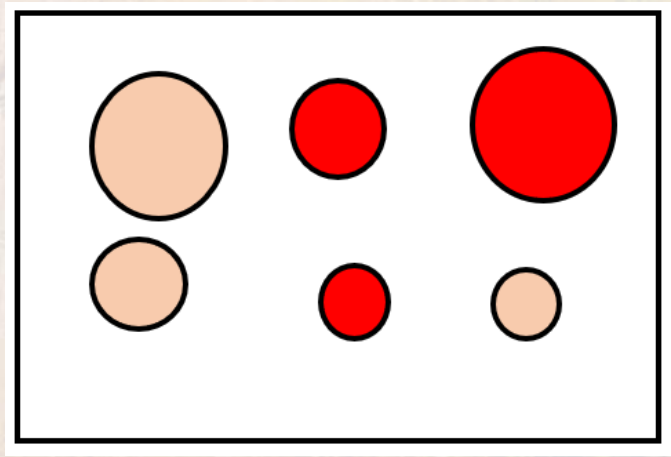
Probabilistic and preferential sampling approaches offer integrated perspectives of Italian forest diversity

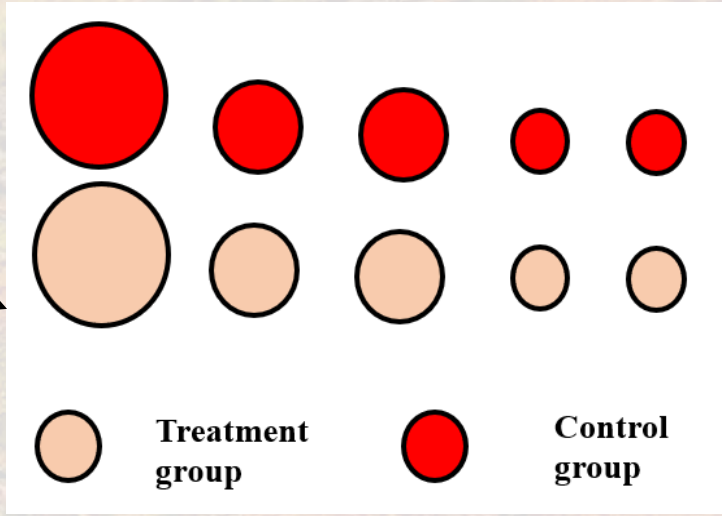
Nicola Alessi, Gianmaria Bonari, Piero Zannini, Borja Jiménez-Alfaro, Emiliano Agrillo, Fabio Attorre, Roberto Canullo, Laura Casella, Marco Cervellini, Stefano Chelli, Michele Di Musciano, Riccardo Guarino, Stefano Martellos, Marco Massimi, Roberto Venanzoni, Stefan Zerbe, Alessandro Chiarucci

Data analyses

Propensity Score Matching

PSM matches **comparable treatment** and **control groups** by accounting for **covariates** in both groups





MatchIt

Altitude, AMT, AP, plot sizes, minimum distance from roads, population density, time, type of habitat, and protection

Exact matching for **type of protection** and **type of eunis habitat category**

Data analyses

Alpha diversity → Total number of species for each plot

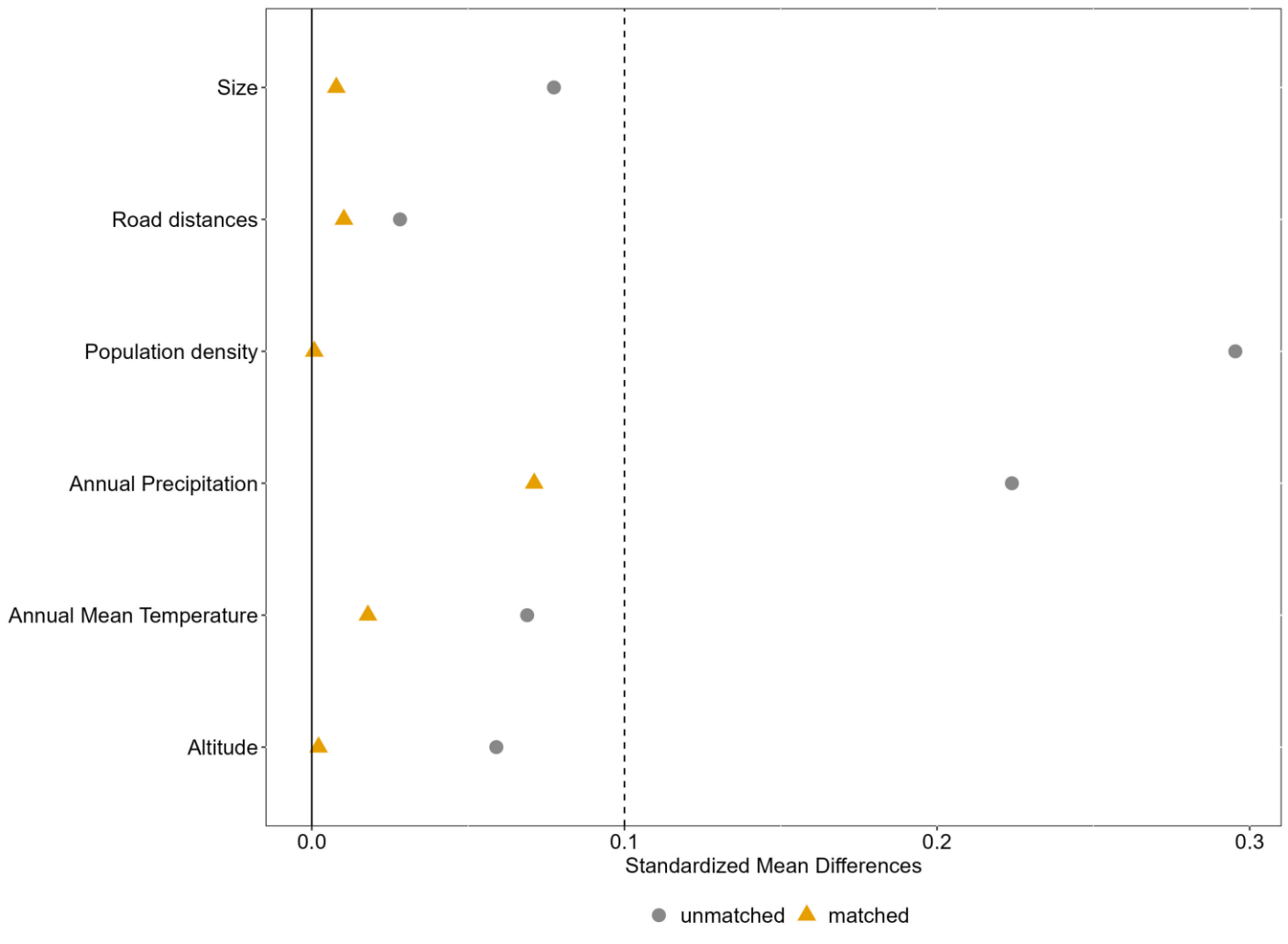
Light index → Community Mean of Light index

} GLMs - time * type of protection + all the covariates used in the matching

Gamma diversity → Total number of species in PAs and non-PAs pre-2000 and post-2000

Exclusive species → Number of species only found in PAs and non-PAs pre- and post-2000 for each light index value

Matching results

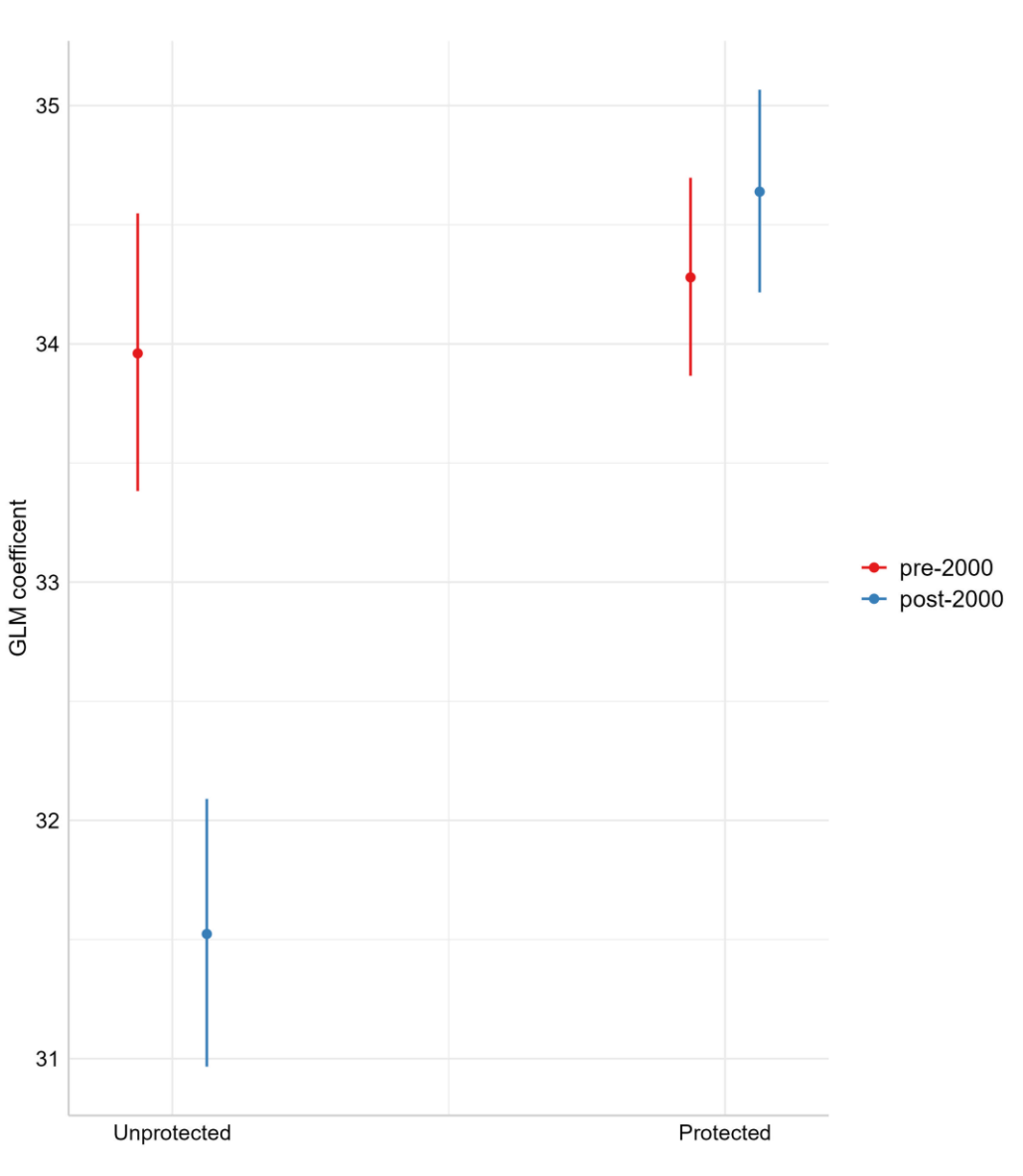


Pre-matching, few covariates indicated a large difference in means and standardized mean differences (i.e., population density and AP)

Post-matching, these differences were reduced substantially indicated that a good balance was achieved

Results and Discussion

Alpha diversity

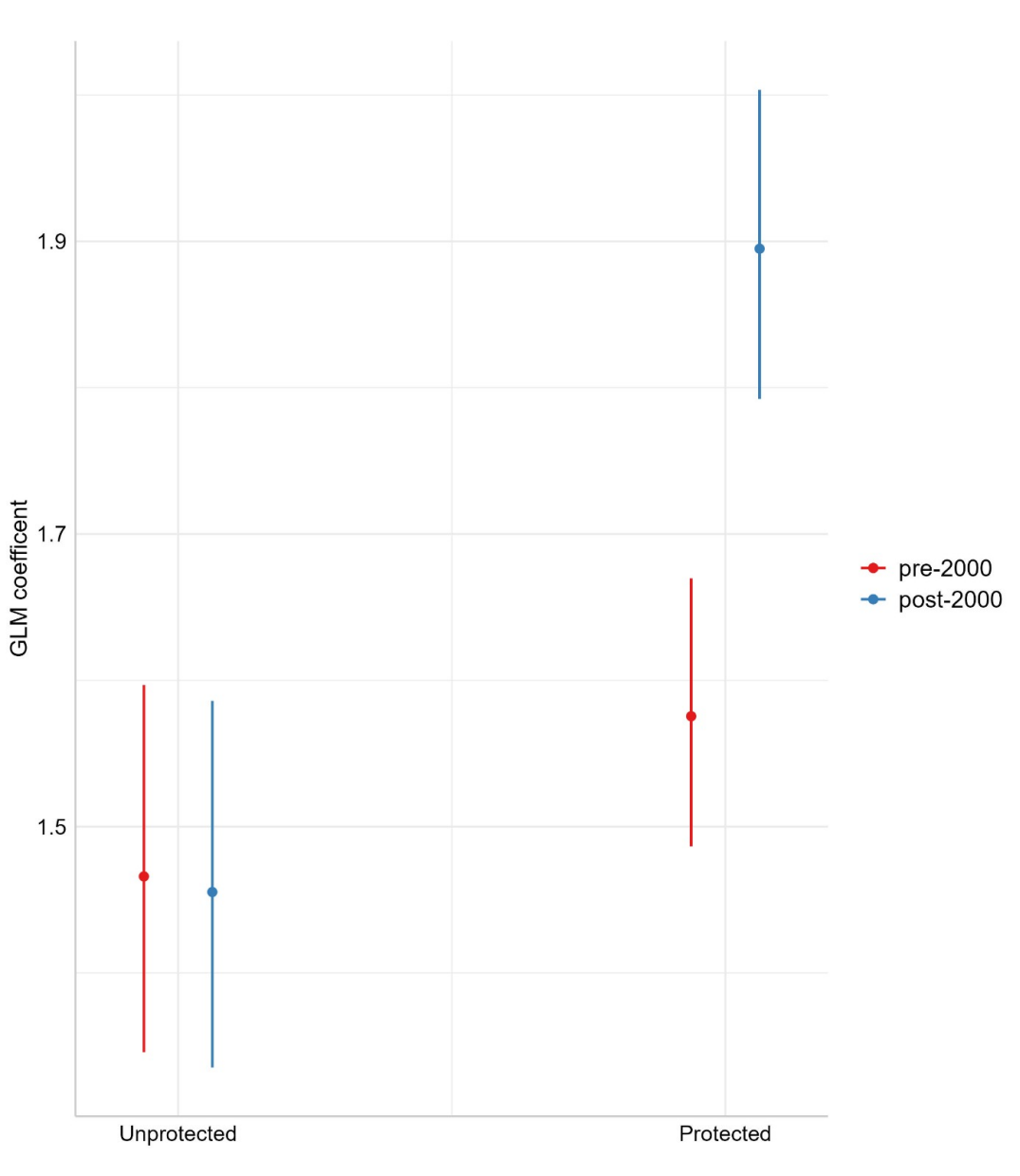


- **Higher number** of vascular plant species inside than outside PAs both pre- and post-2000

- In non-PAs, we found a **decrease** of species post-2000 as compared to pre-2000

Results and Discussion

Red list species



Increase of the red list species

pre- and post-2000 in Protected areas

Original Articles

Red list of threatened vascular plants in Italy

Simone Orsenigo, Giuseppe Fenu, **Domenico Gargano**, Chiara Montagnani, Thomas Abeli, Alessandro Alessandrini, ..

Pages 310-335 | Received 18 Oct 2019, Accepted 20 Feb 2020, Published online: 26 Mar 2020

Cite this article https://doi.org/10.1080/11263504.2020.1739165 Check for updates

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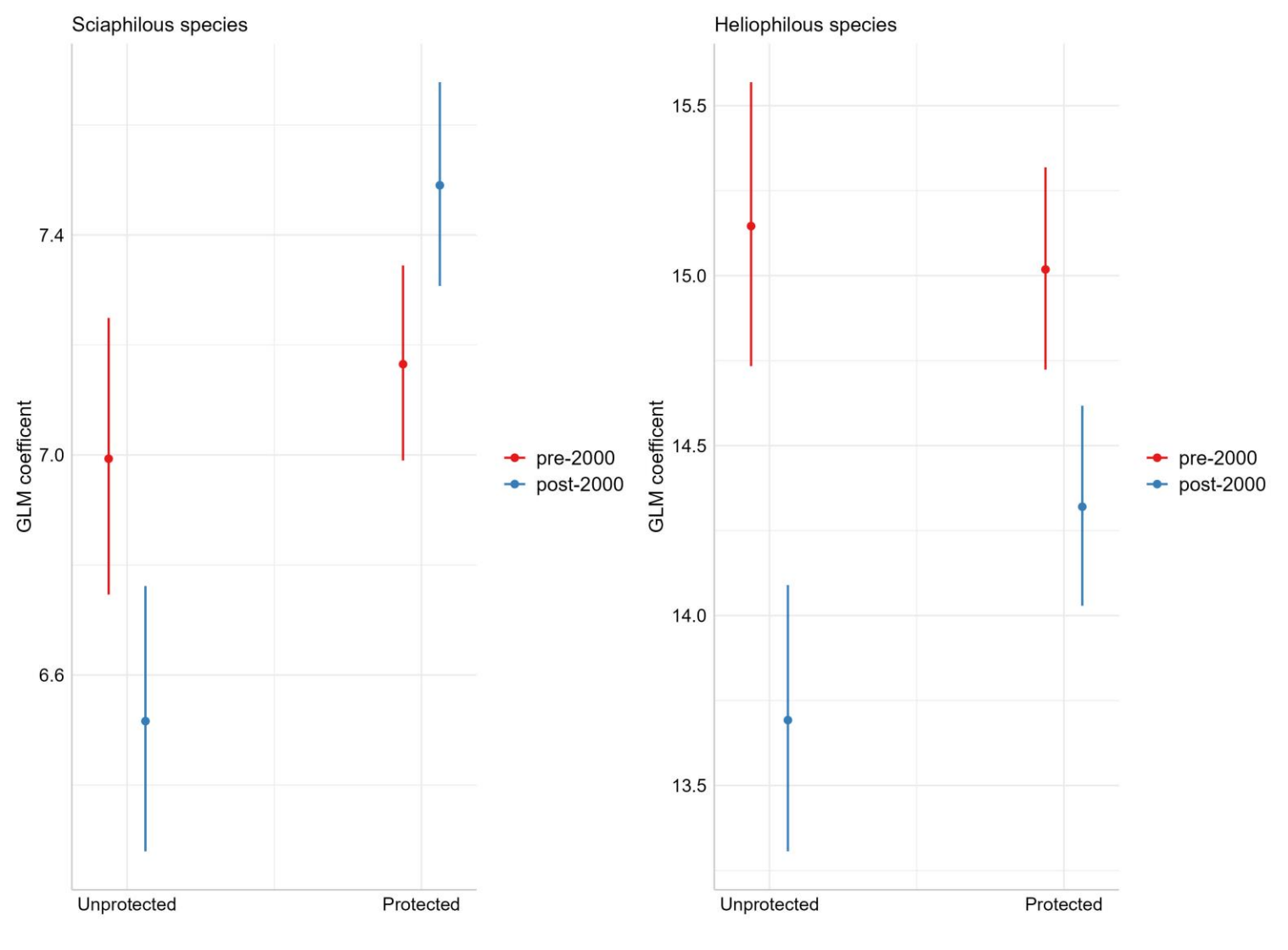
Abstract

Italy has a rich natural heritage, which is dangerously under pressure. In recent yea
awareness of the crucial role of plants in ecosystem functioning and in providing
Consequently, an updated Red List of the Italian vascular flora was compiled in
the Ministry for Environment, Land and Sea Protection, with the scientific suppo
Society. The IUCN Red List criteria were applied to 2,430 Italian native vascular p
current extinction risk and to highlight the major threats affecting the Italian flora.
54 taxa (2.2% of the assessed taxa) are extinct or possibly extinct at regional level, whi

IUCN RED LIST©

https://doi.org/10.1080/11263504.2020.1739165

Ellemberg ligth indicator values

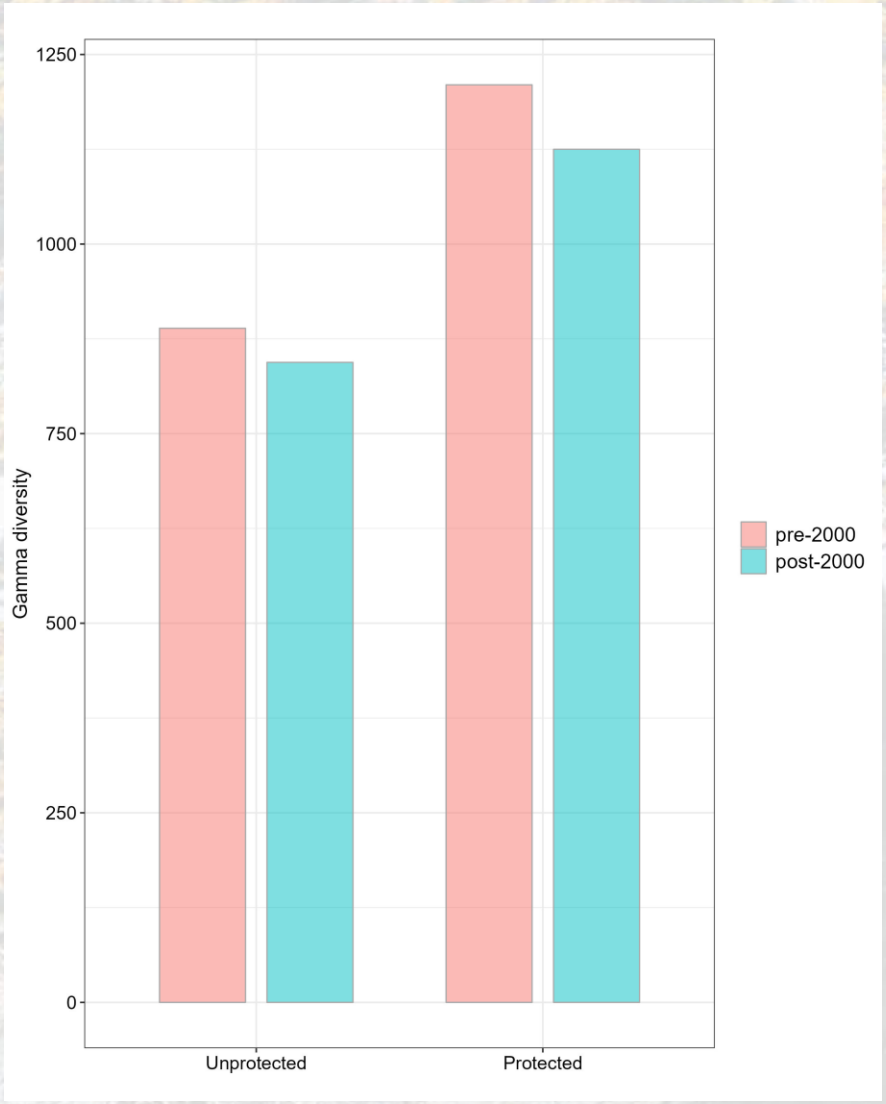


Increase of sciaphiluos species in **protected areas**

Decrease of sciaphiluos species in **non protected** areas

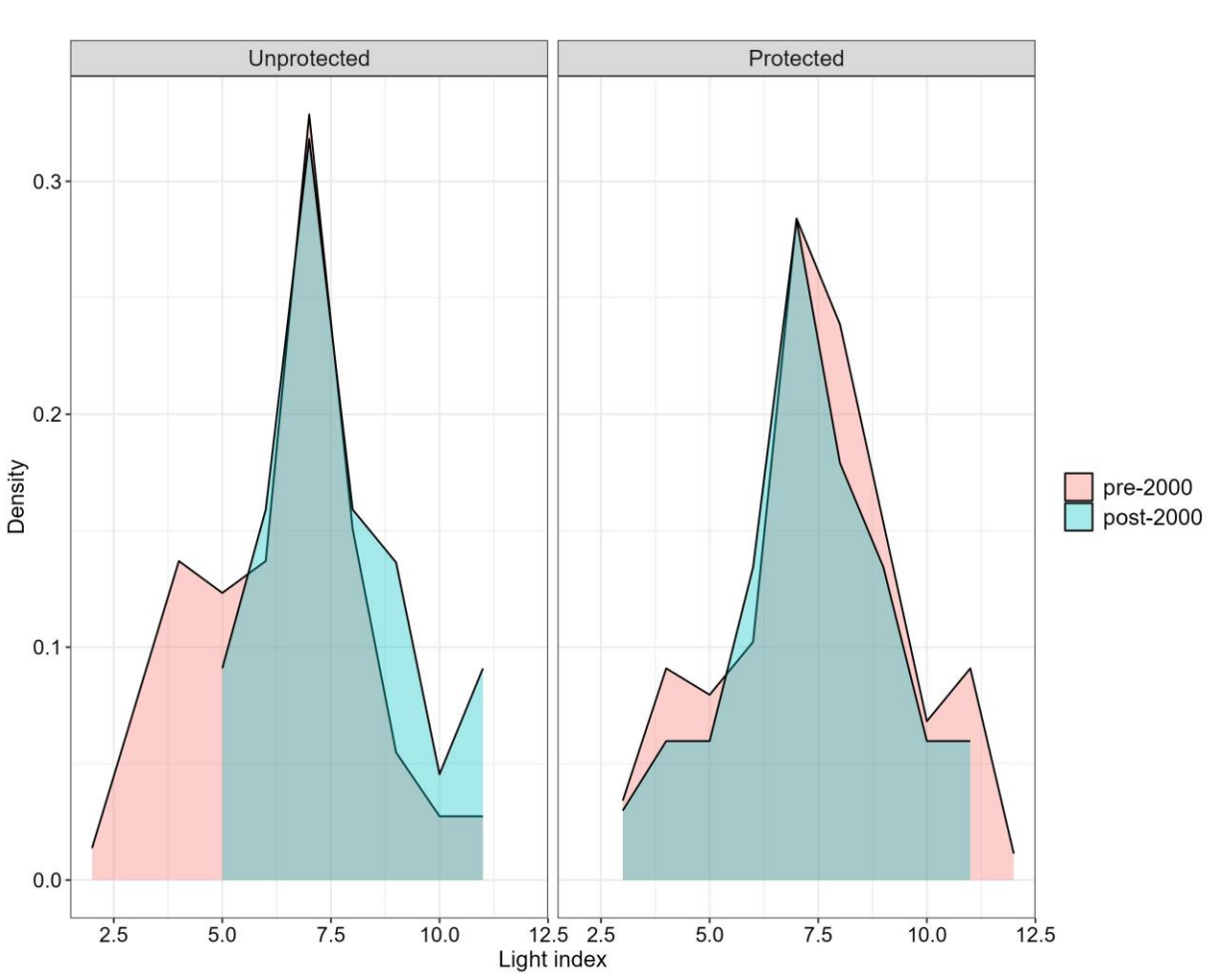
Results and Discussion

Gamma diversity



- **Higher** gamma diversity in PAs than non-PAs
- **Decrease** of gamma diversity in PAs pre- and post-2000
- **Slightly decrease** of gamma diversity in non-PAs pre- and post-2000

Results and Discussion



PAs → **Decrease** of **heliophilous species** across time

↓

Decrease in gamma diversity across time

non-PAs → **Turnover** of **heliophilous and sciaphilous** species across time

↓

Stability in gamma diversity across time

Conclusions

- PAs **have favoured biodiversity conservation** over time compared to non-PAs **increasing** the complexity of the forest communities

- A **decrease of heliophilous species** suggested a natural dynamic of forest with a **formation of shady environments**

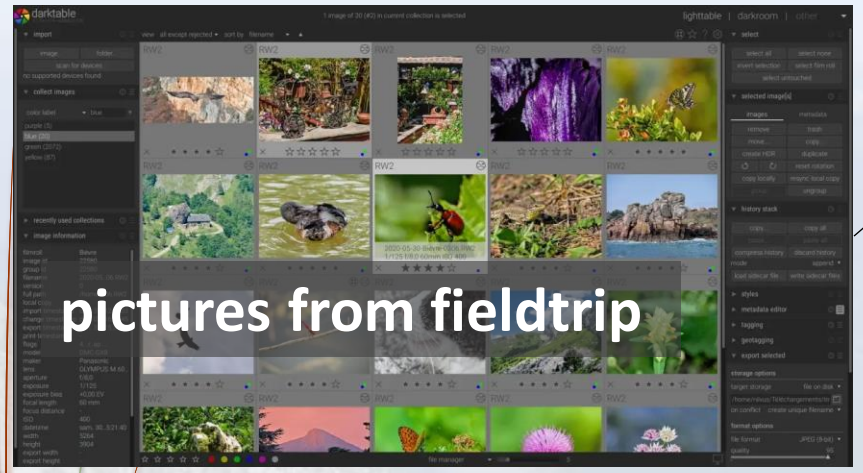
- **Disentangle the processes across time** in forest ecosystems **are difficult**, more efforts and studies are necessary to make them clear

- **Limitation** of the dataset ⟶ **Resurveys**

Sorry but this is not the last slide

not even the secon last

Generative florae (from pictures to map)

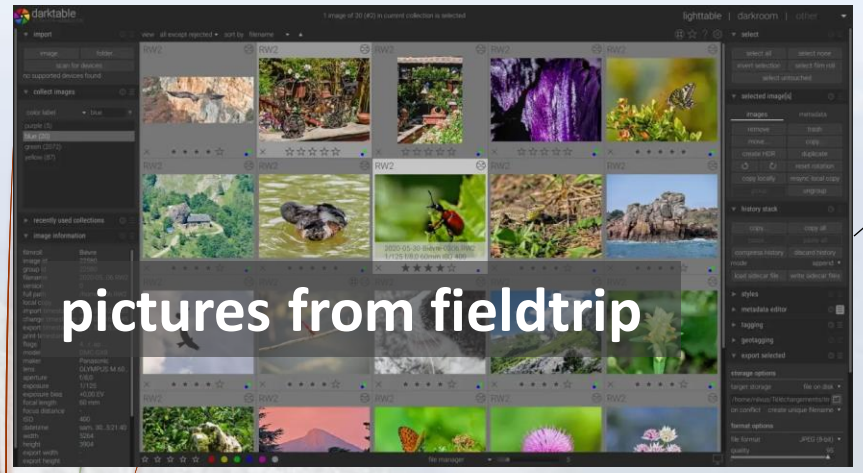


1) **Identify pictures that contains**: plant, leaf, flower, bark …

Google **Photos APIs**

Unfortunately this step is not free (possible solution are welcome)

Generative florae (from pictures to map)



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What species is it?

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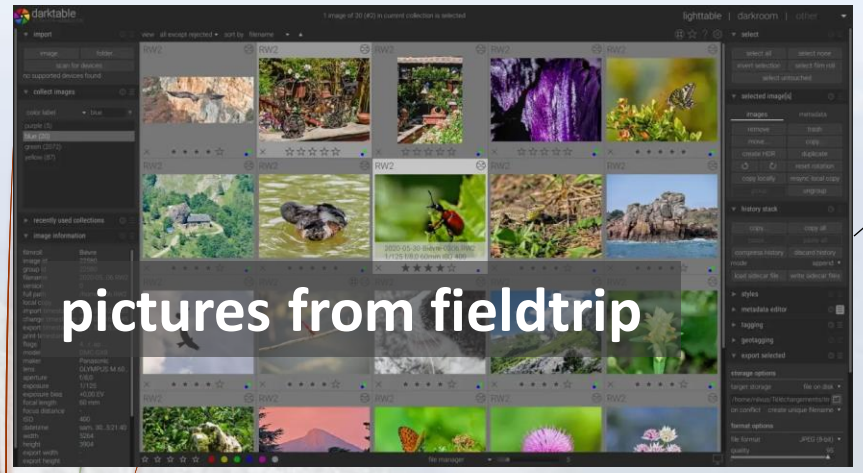

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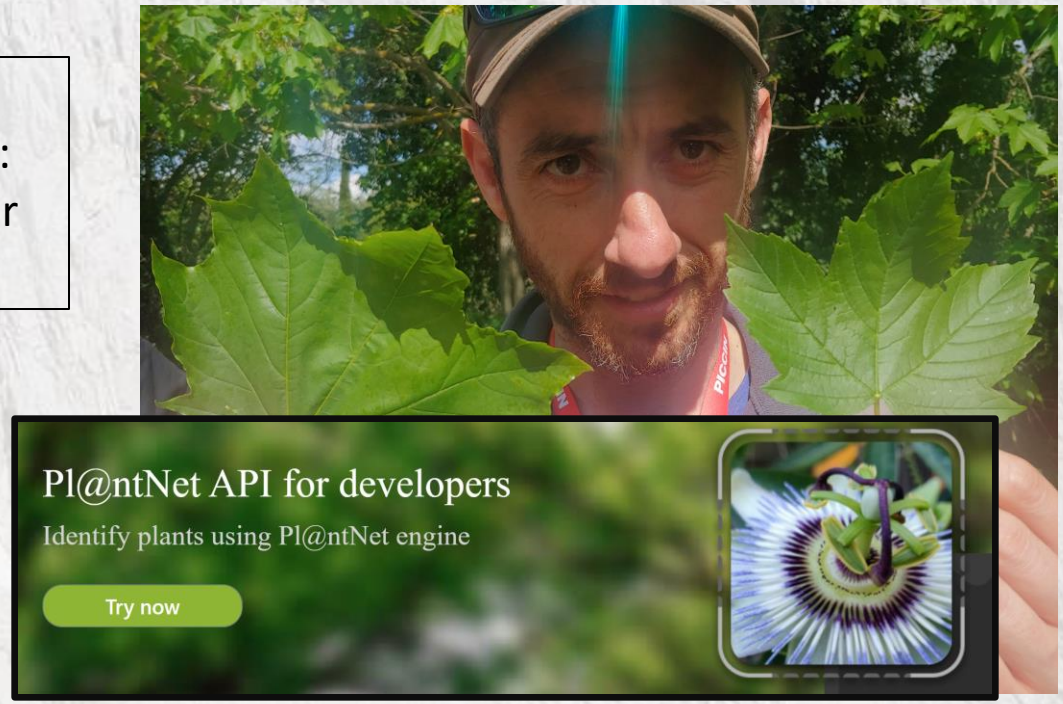
3) **Assosiate the most probable species names to the metadata**: *Acer Pseudoplatanus* (63%), Acer opalus (35%), …

4) **Extract pictures metadata:**
a. Gps coordinates
b. Data taken
c. species name/names
d. …



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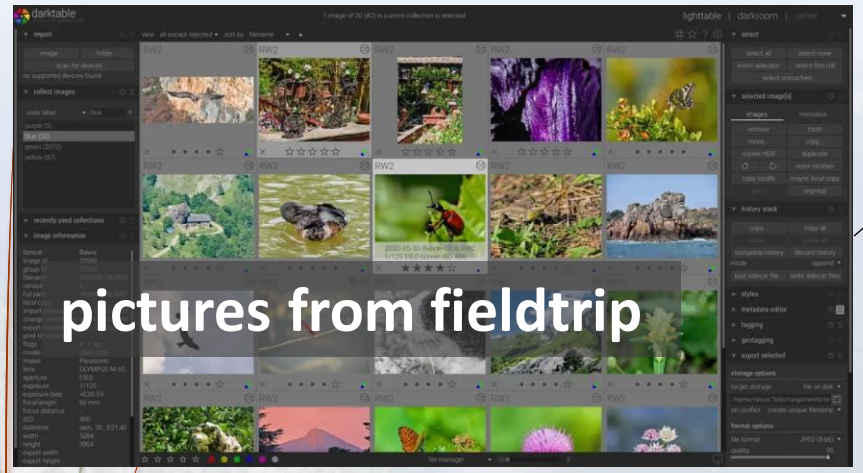

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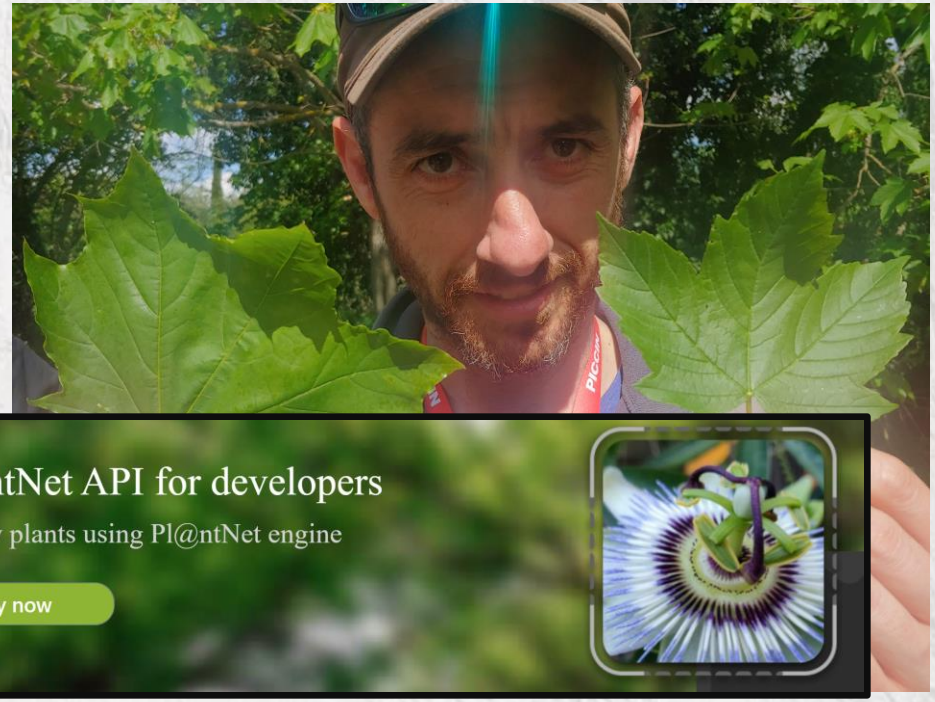
FloraGenerativa - RStudio Source Editor

pictures_database

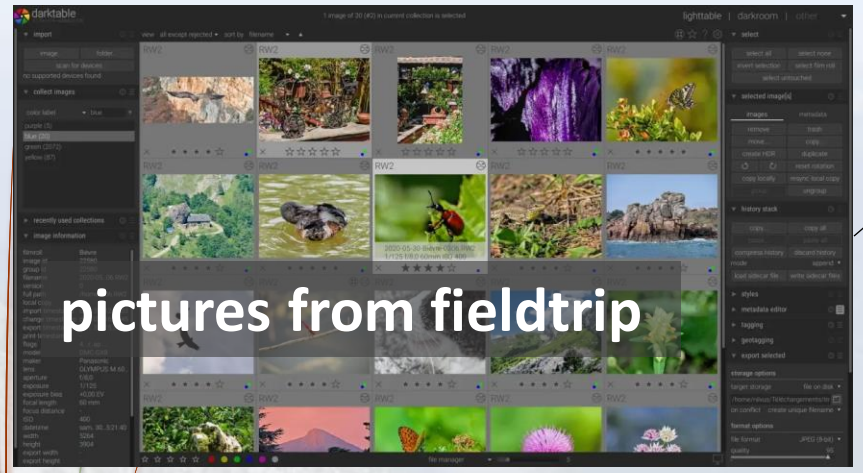
Filter

	FileName	Score	ScientificName	GPSLongitude	GPSLatitude	GPSDateTime	GPSAlti
1	2023-04-10-14h10m47-001.jpg	0.17208	Plantago webbii	-17.83768	28.57926	2023:04:10 13:10:48Z	
2	2023-04-10-14h10m47-001.jpg	0.08046	Plantago sempervirens	-17.83768	28.57926	2023:04:10 13:10:48Z	
3	2023-04-10-14h10m47-001.jpg	0.01321	Aeluropus lagopoides	-17.83768	28.57926	2023:04:10 13:10:48Z	
4	2023-04-10-14h10m47-001.jpg	0.01168	Plantago arborescens	-17.83768	28.57926	2023:04:10 13:10:48Z	
5	2023-04-10-14h10m47-001.jpg	0.01017	Aeluropus littoralis	-17.83768	28.57926	2023:04:10 13:10:48Z	
6	2023-04-10-14h10m47-001.jpg	0.00601	Bassia laniflora	-17.83768	28.57926	2023:04:10 13:10:48Z	
7	2023-04-10-14h10m47-001.jpg	0.00513	Spergula morisonii	-17.83768	28.57926	2023:04:10 13:10:48Z	
8	2023-04-10-14h10m47-001.jpg	0.00502	Gypsophila struthium	-17.83768	28.57926	2023:04:10 13:10:48Z	
9	2023-04-10-14h10m47-001.jpg	0.00413	Spergula arvensis	-17.83768	28.57926	2023:04:10 13:10:48Z	
10	2023-04-10-14h10m47-001.jpg	0.00364	Astragalus granatensis	-17.83768	28.57926	2023:04:10 13:10:48Z	
11	2023-04-10-14h10m47-001.jpg	0.00325	Santolina impressa	-17.83768	28.57926	2023:04:10 13:10:48Z	
12	2023-04-10-14h10m47-001.jpg	0.00257	Minuartia glomerata	-17.83768	28.57926	2023:04:10 13:10:48Z	

Showing 1 to 11 of 16 entries, 10 total columns



Generative florae (from pictures to map)



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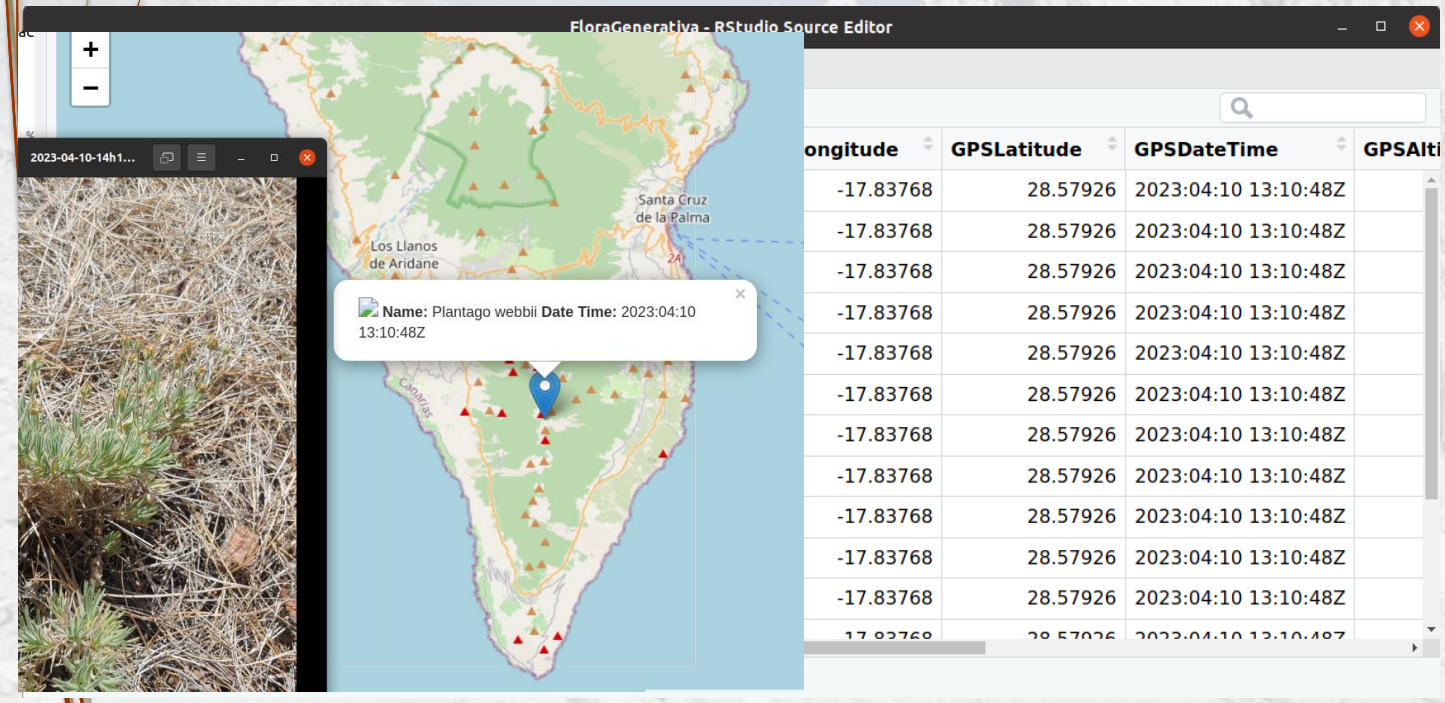

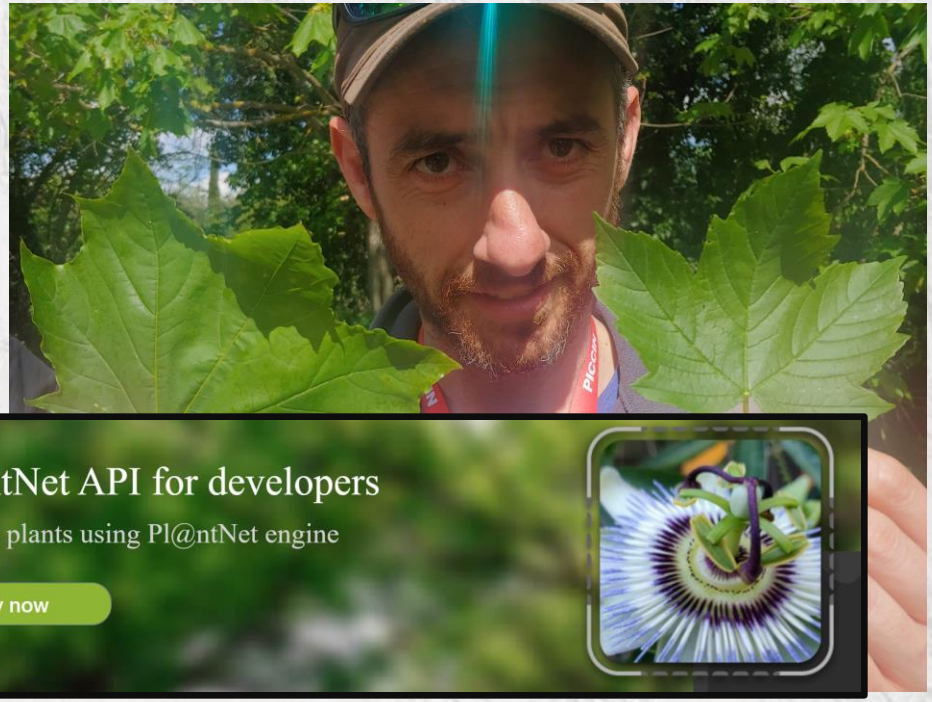

We are looking for potential **collaborators if you are interested**, contact be my email OR join the project on github

https://github.com/micdimu/GenerativeFlorae

-17.83768	28.57926	1933.07	0.01017	Aeluropus littoralis	(Gouan) Parl.	Aeluropus	Poaceae
-17.83768	28.57926	1933.07	0.00601	Bassia laniflora	(S.G.Gmel.) A.J.Scott	Bassia	Amaranthace
-17.83768	28.57926	1933.07	0.00513	Spergula morisonii	Boreau	Spergula	Caryophyllac
-17.83768	28.57926	1933.07	0.00502	Gypsophila struthium	L.	Gypsophila	Caryophyllac
-17.83768	28.57926	1933.07	0.00413	Spergula arvensis	L.	Spergula	Caryophyllac
-17.83768	28.57926	1933.07	0.00364	Astragalus granatensis	Lam.	Astragalus	Fabaceae
-17.83768	28.57926	1933.07	0.00325	Santolina impressa	Hoffmanns. & Link	Santolina	Asteraceae
-17.83768	28.57926	1933.07	0.00257	Minuartia glomerata	(M.Bieb.) Degen	Minuartia	Caryophyllac

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Thanks for your attention

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