

# ENDEMIC FLORA OF THE BALEARIC ISLANDS: A BIOGEOGRAPHIC AND BIOLOGICAL APPROACH

## ENDEMIC TAXA OF THE BALEARIC ISLANDS

### Introduction

The Mediterranean basin is considered one of the 25 most important biodiversity hotspots on the planet. Within the basin, the insular floras stand out for its high scientific interest and the high endemism rate. The Balearic archipelago is located in the centre of the Western Mediterranean basin. It includes 5 main islands: Mallorca, Menorca, and Cabrera, called **Gimnesies**; and Eivissa and Formentera, called **Pitiuses**. In addition to these, a hundred small islets are also part of it (Sa Dragonera is considered in this work).

Despite the typical Mediterranean climate, there is a certain latitudinal and altitudinal climatic gradient that, added to the diversity of substrates, favours the variety of environments in the different islands and the high endemism linked to it.

A quantitative study is presented below, in which the endemic flora of the Balearic Islands is characterized from a biogeographic and biological point of view.

### Main descriptive values

The number of taxa of endemic vascular plants of the Balearic Islands is 144, which represents 8.3% of the total number of 1729 native taxa (Table 1). Among the total of endemic taxa, 60 can be found on more than one island and 84 are exclusive to some of them.

In the **Gimnesies**, 123 of the Balearic endemic taxa occur, 108 of which (87.8%) are exclusive. In the **Pitiuses**, only 35 of the species are found, 20 of them (57.1%) are exclusive. Only 16 taxa are shared between Gimnesies and Pitiuses, representing 11.1% of the total endemic species

	Nº endemic taxa	% endemics to native flora	Nº exclusive taxa	% exclusives to native flora
Balearic Islands	144	8,3%	-	-
Mallorca	105	7,3%	53	3,7%
Menorca	54	4,7%	16	1,4%
Cabrera	23	4,7%	1	0,2%
Sa Dragonera	23	6,9%	0	0,0%
Eivissa	34	3,7%	12	1,3%
Formentera	18	3,0%	2	0,3%

Table 1. Summary of the main values that characterize the endemic flora of the Balearic Islands (Rita & Payeras, 2006; Sáez, 2017).

	Mallorca	Menorca	Cabrera	Sa Dragonera	Eivissa	Formentera
Mallorca	-	35%	19%	22%	14%	10%
Menorca	69%	-	31%	26%	15%	11%
Cabrera	87%	74%	-	52%	43%	26%
Sa Dragonera	100%	61%	52%	-	30%	17%
Eivissa	44%	24%	29%	21%	-	47%
Formentera	56%	33%	33%	22%	89%	-

Table 2. Asymmetric matrix with the percentages of species shared between the different islands. Each row expresses the percentage of species shared with the islands in each column.

Mallorca is the largest island and the one with the largest number of endemic taxa among the Balearic Islands. Most of the flora present on the other islands can be found in Mallorca; instead, a lower proportion of the taxa present in Mallorca can be found on the other islands (Table 2). Notice the case of Sa Dragonera where all the taxa that are present are also present in Mallorca. In fact, **Sa Dragonera is often considered an extension of the Serra de Tramuntana in Mallorca.**

## Families

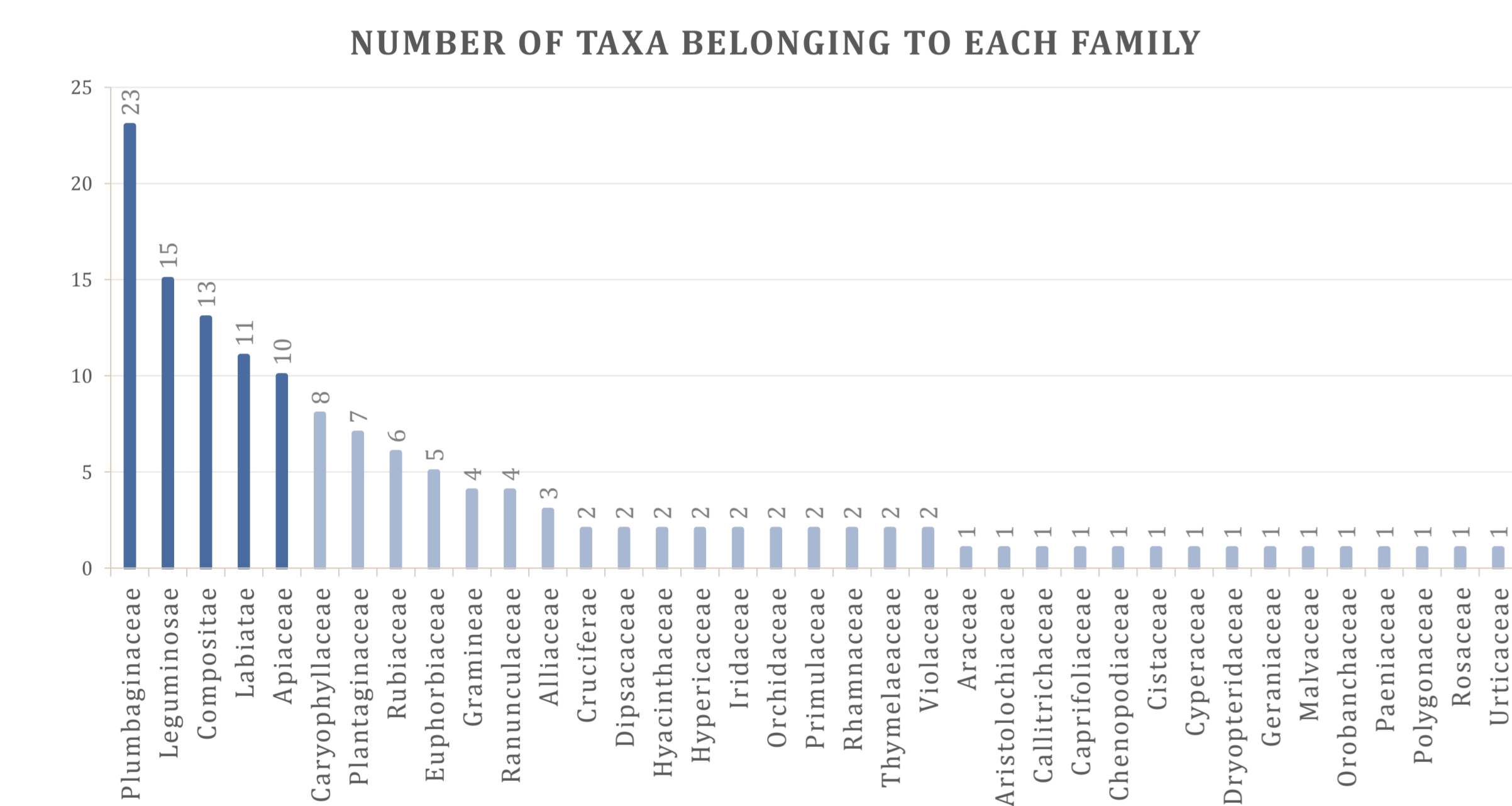


Fig. 2. Number of taxa belonging to each family.

The endemic Balearic species belong to 37 different families (Figure 2). Only 5 families group the half of all taxa: **Plumbaginaceae, Leguminosae, Compositae, Labiatae and Apiaceae.**

These, in contrast, do not coincide with the most important families of the native flora.

## Pollination and dispersal

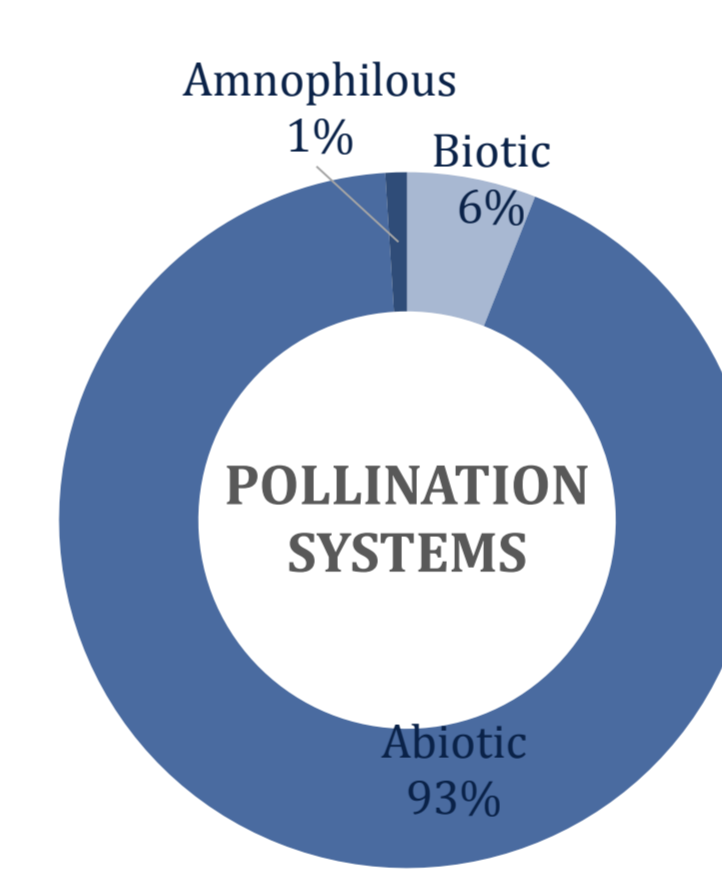


Fig. 5. Proportion of main pollination systems.

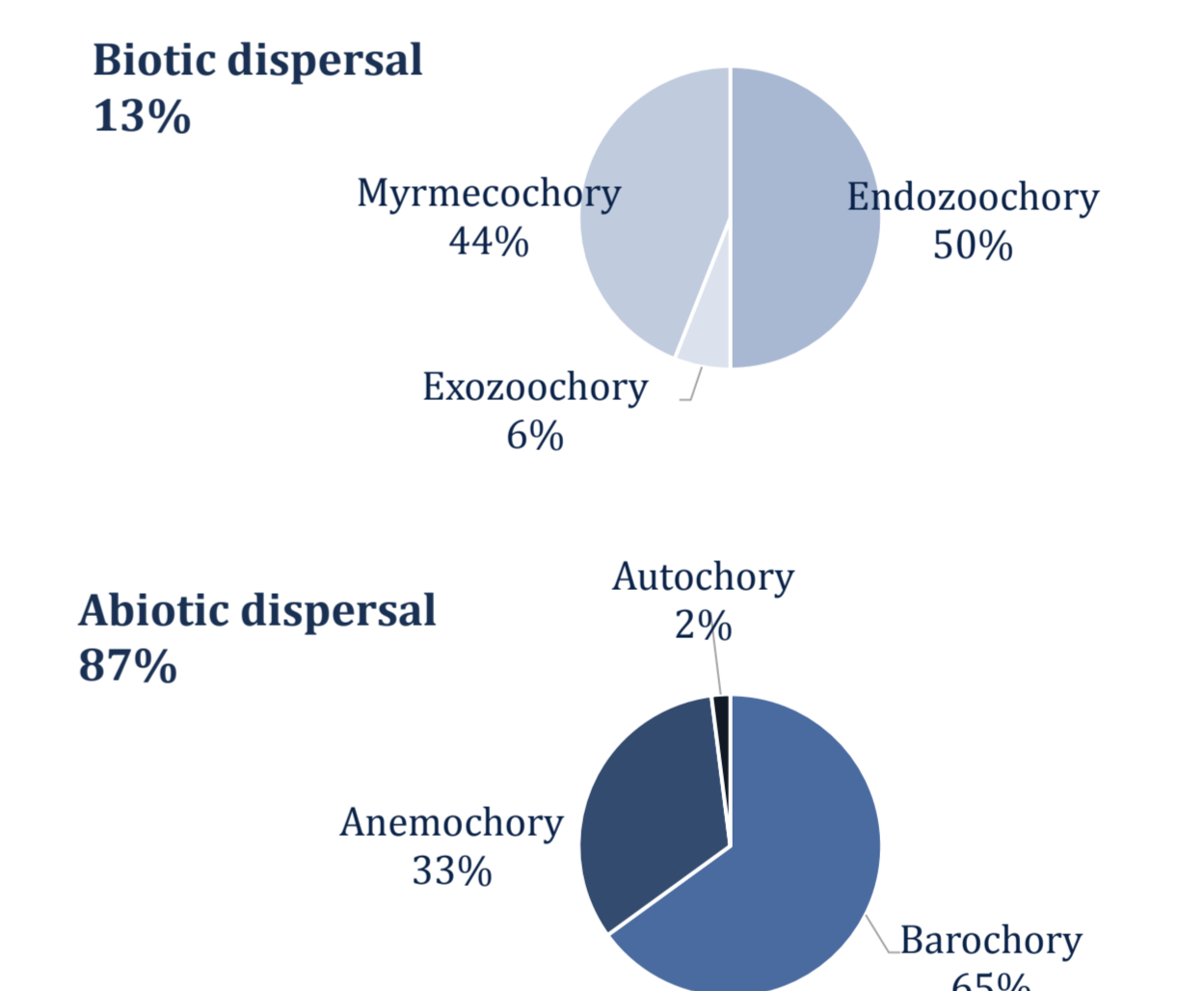


Fig. 6. Proportion of main seed dispersal systems.

It is not the lack of pollinators but the **type of habitat of endemic plant species that causes bias in pollination systems.**

Plants adapted to extreme fragmented habitats, prioritize the production of large seeds which fall near the parents, rather than seeking a longer dispersion. The extreme expression of this trend is autochory.

## Biogeography

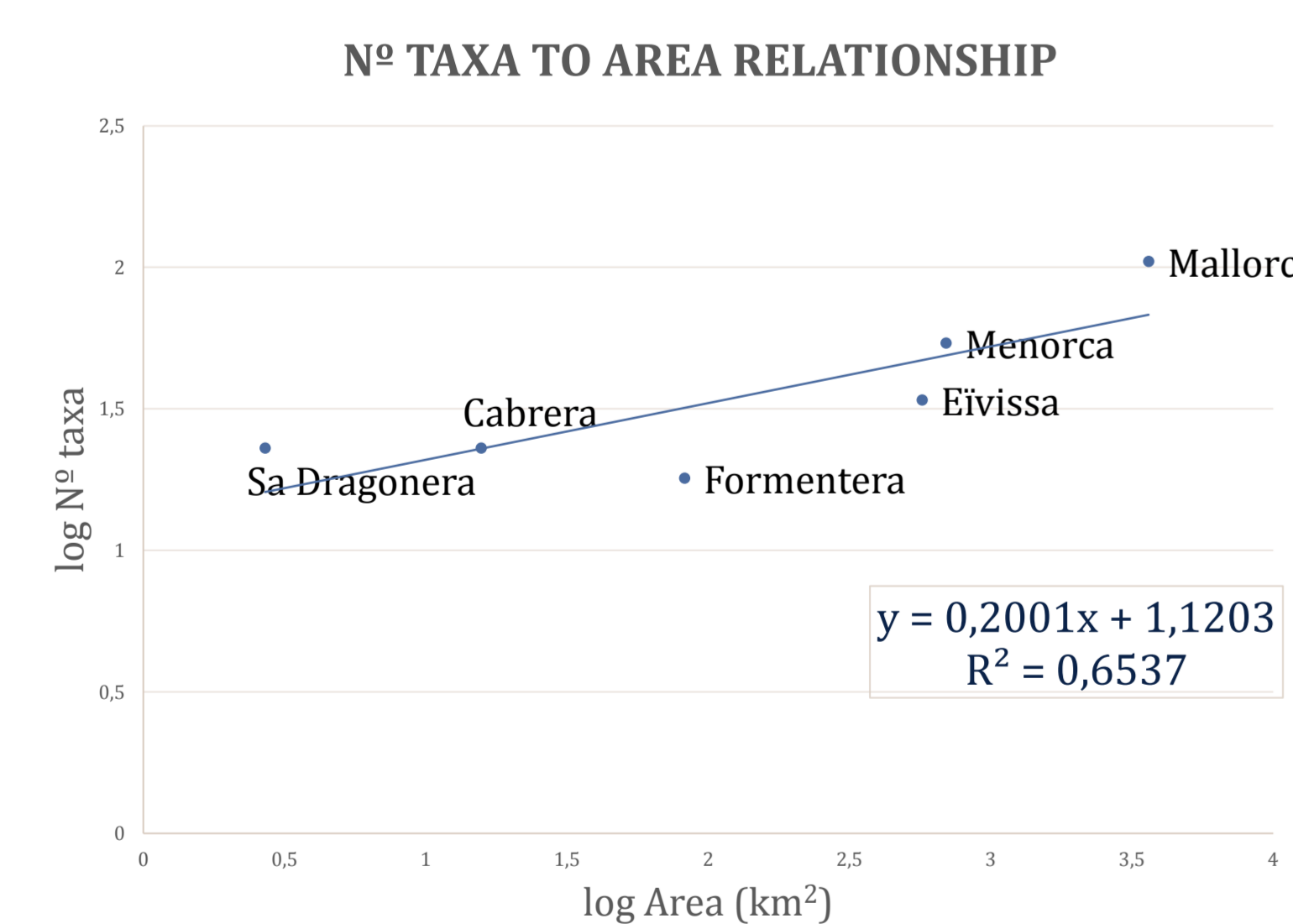


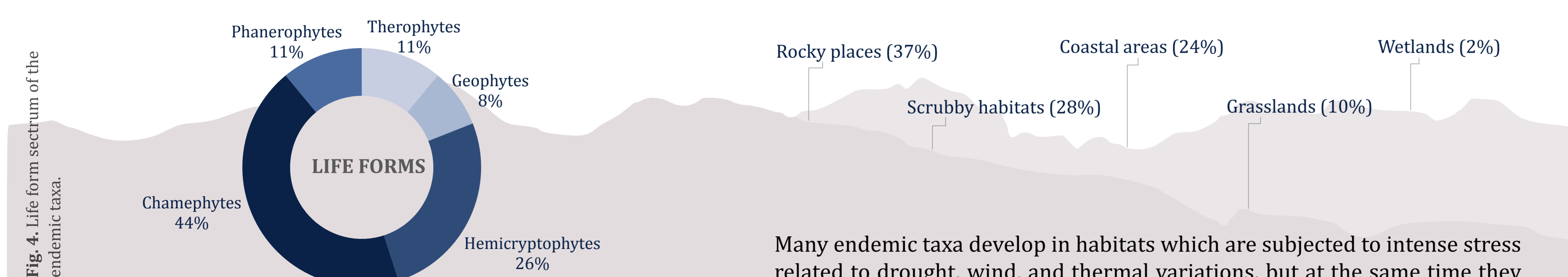
Fig. 3. Relationship between the logarithm of the number of taxa present on each island and the logarithm of its area.

A linear relationship exists between the islands' surface and their richness of endemic taxa. In any case, **although on the larger islands there are a greater number of endemic taxa, they do not necessarily occupy larger areas within the island.**

The origin of the Mediterranean islands is from the separation of these from the mainland. Thus, **the islands function as conservation systems:** The species are isolated from the climatic and evolutionary effects that prevail on the continent.

The relict role played by the islands explains the high percentage of endemism of the Balearic Islands and also the differences between them: The Gimnesies are related to the Tyrrhenian Islands, so their flora clearly differs from that of the Pitiuses, which are biogeographically related to the Iberian Peninsula and North Africa.

## Life forms and hábitat



The spectrum of life forms of Balearic endemic taxa is different from that of the native flora.

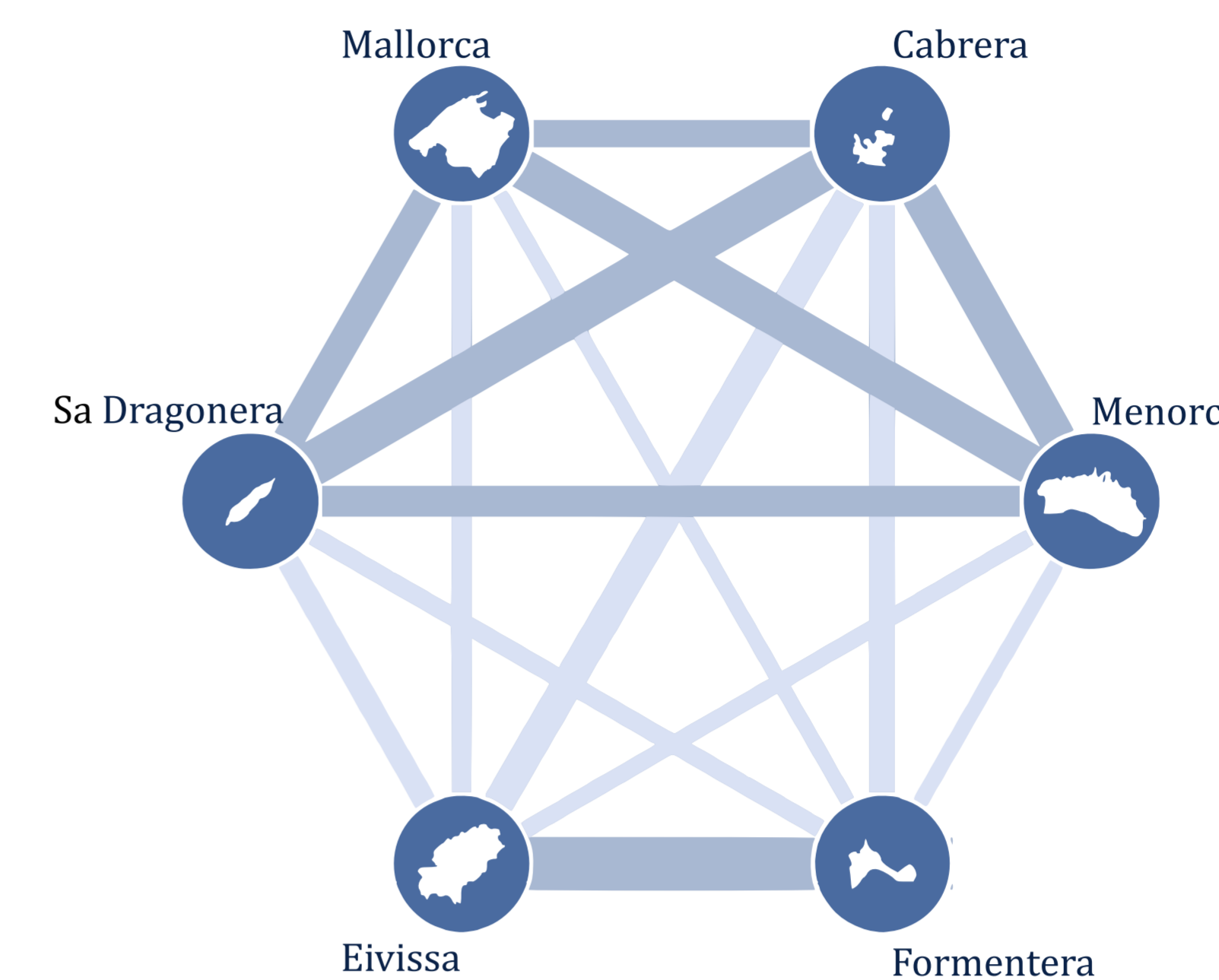
The higher proportion of chamephytes and hemicryptophytes and the low representation of annual species is related to the habitats where many of the endemisms occur:

Rocky places (37%), Coastal areas (24%), Wetlands (2%), Scrubby habitats (28%), Grasslands (10%).

Many endemic taxa develop in habitats which are subjected to intense stress related to drought, wind, and thermal variations, but at the same time they are free from competition and do not suffer drastic disturbances often. **The richest communities in endemics are made up of taxa that are found in cracks of rocky cliffs.**

44% of all endemic taxa are found in mountainous areas. The altitude and microenvironment gradient offered by the mountains enhances its effect as a refuge for species.

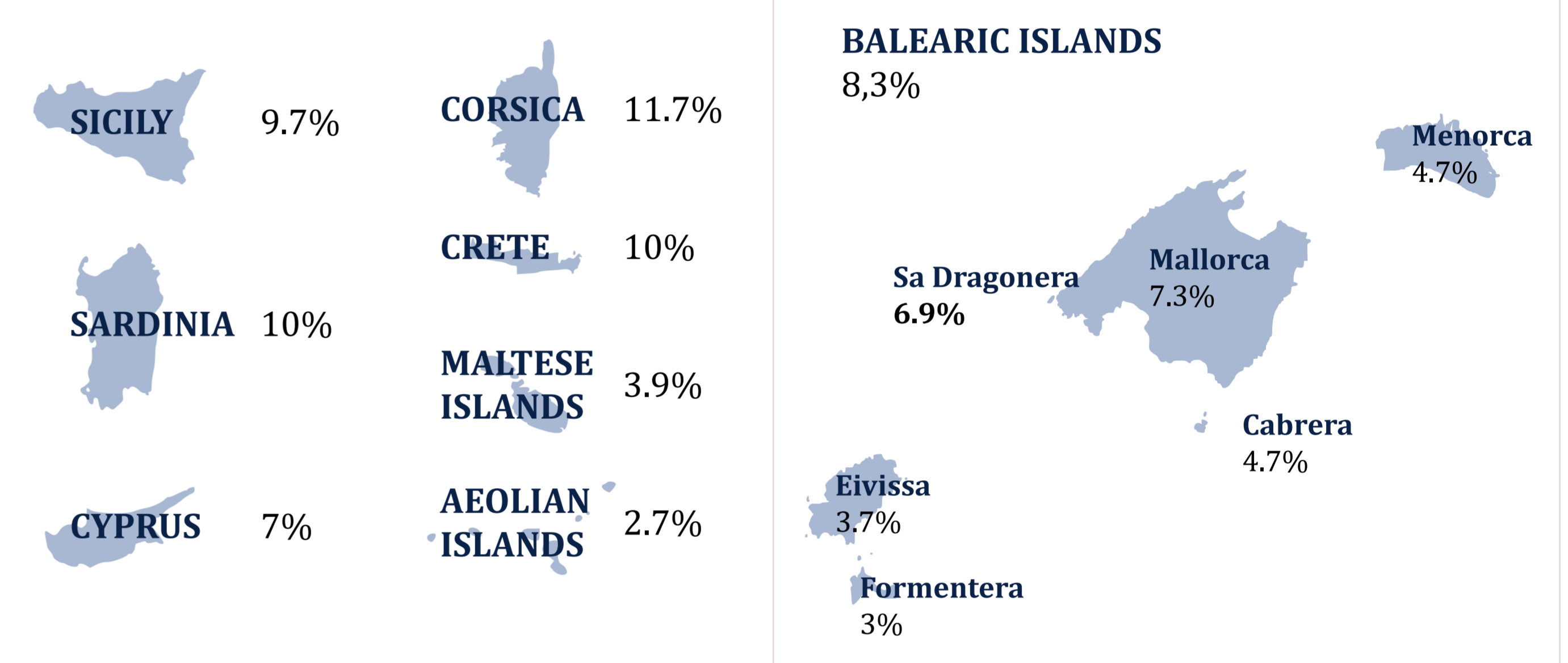
## Similarity



It should be noticed that **Eivissa and Formentera are the two most similar islands.** Most pairs of islands belonging to the Gimnesies which are also significantly similar to each other. **The similarity between islands belonging to Gimnesies and Pitiuses is much less significant.**

Fig. 1. Representation of the floristic similarity between the different islands (Sorensen Index). The thickness of the lines corresponds to a greater or lesser similarity between them.

## Other Mediterranean islands' endemism



## Reproductive systems

Island species tend to reproductive systems that allow them to reproduce by themselves.

Among the panmictic species, it should be studied what percentage of them are self-compatible.

Flower hermaphroditism may indicate that self-compatible systems can occur.

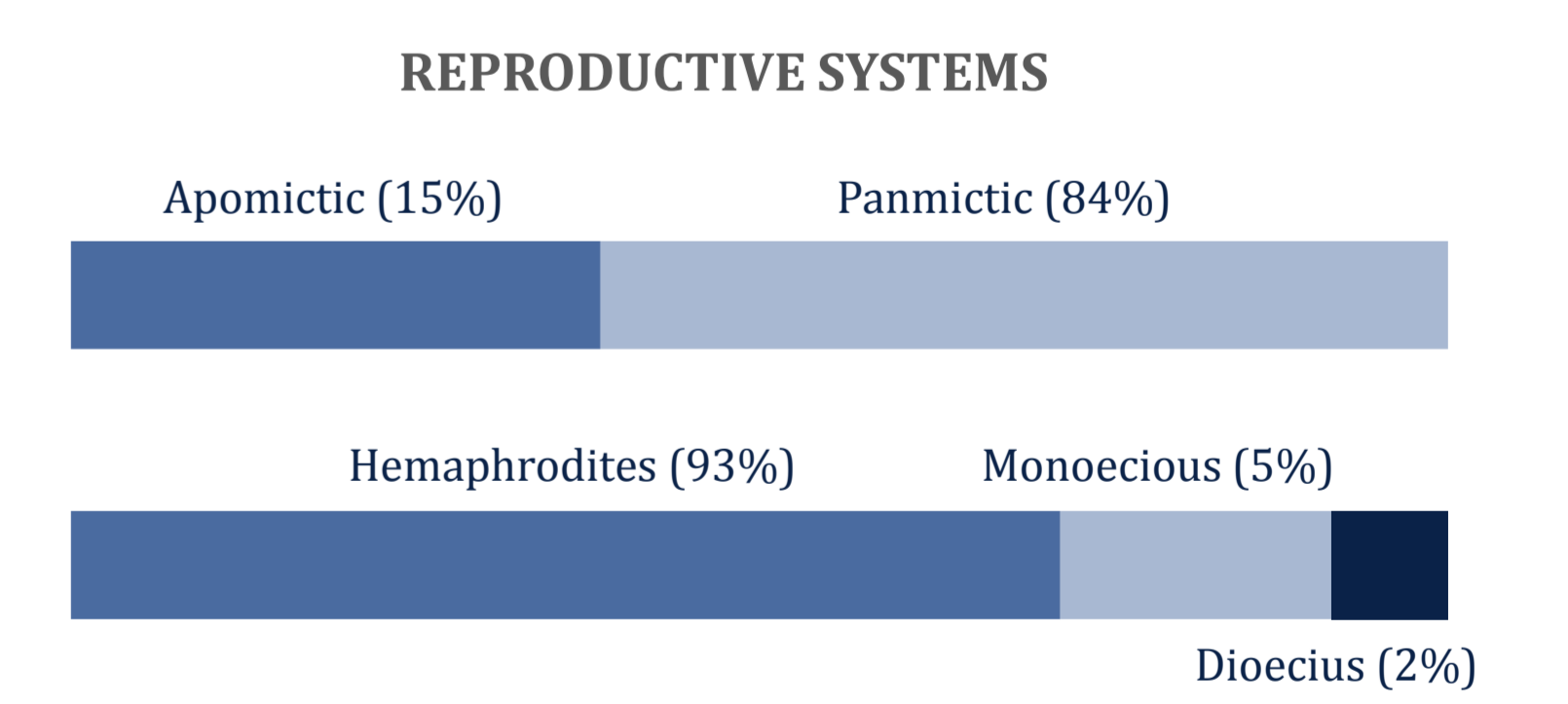


Fig. 7. Proportion of main reproductive systems.

## CONCLUSIONS

The endemic flora of the Balearic Islands is noticeably rich and is comparable to the rest of the islands in the Mediterranean. There is a very remarkable difference between Gimnesies and Pitiuses regarding the composition and the biogeographic and biological characteristics of their floras.

Some Balearic endemic taxa have a relictual character, which gives them greater conservation value. The numerous taxa with fragmented distributions, concentrated in mountainous and rocky areas with extreme conditions are of special interest because of their vulnerability. For this reason, efforts are required to protect mountain and coastal habitats. The protection of the most vulnerable populations are subjects of special urgency that require special attention if the exceptional value of the endemic flora of the Balearic Islands is to be maintained.

## MAIN REFERENCES

- For the delimitation of the endemic element we follow:  
Rita, J., & Payeras, T. (2006). Biodiversidad de las plantas vasculares de las Islas Baleares. *Orsis: Organismes i Sistemes*, 21, 41-58.  
Sáez, L., Roselló, J. A., & Fraga, P. (2017). *Llibre vermell de la flora vascular de les Illes Balears* (2nd ed.). Conselleria de Medi Ambient, Agricultura i Pesca.