A hopeful future

Foliar epiphytes as bioindicators of *Posidonia oceanica* state of preservation

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INTRODUCTION
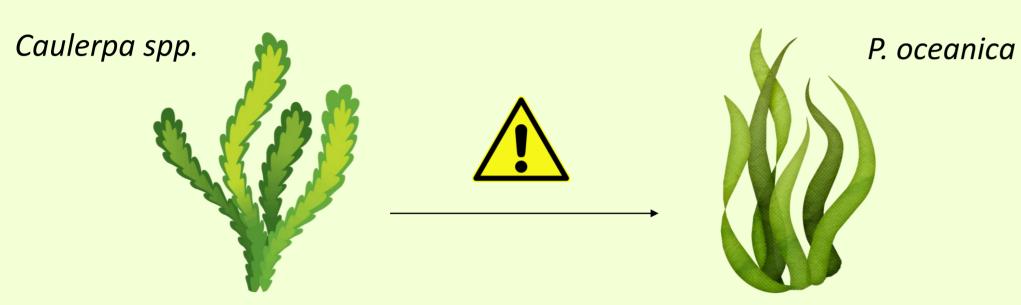
Out of the 5 marine phanerogams found in the Mediterranean Sea, *Posidonia oceanica* (L.) Delile, 1813 is the only one which is endemic.

It forms extensive seagrass meadows which are very important at:

- Ecological level → to act as a substrate, refuge or place of settlement for many species.
- Economical level → to provide a wide variety of ecosystem services.

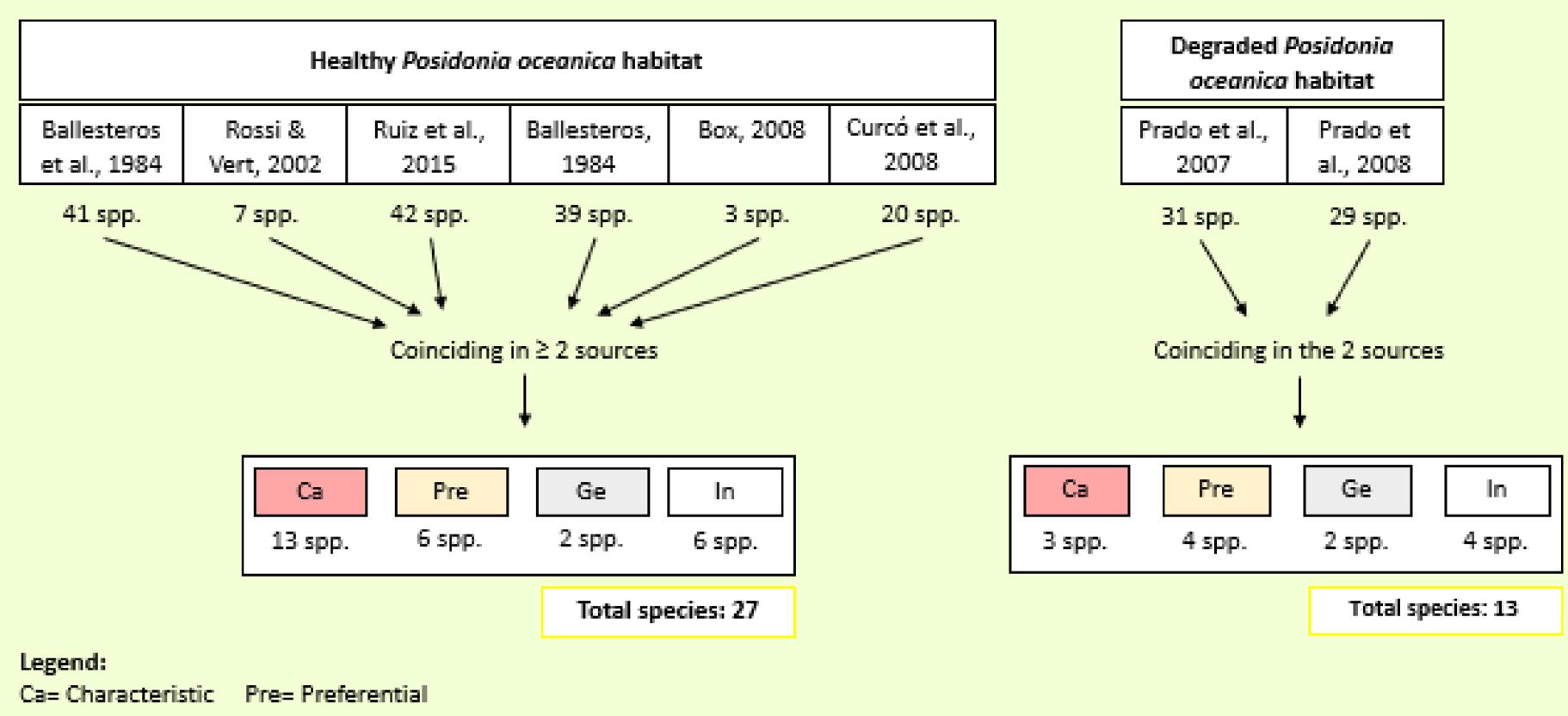Unfortunately, they are subjected to a list of threats which put at risk the diversity associated with them.

Caulerpa spp.   *P. oceanica*

AIMS OF THE STUDY

- To see if a *Caulerpa spp.* community has less biodiversity associated than a healthy *P. oceanica* community.
- To analyse the foliar epiphytes of *P. oceanica* in a good state of preservation vs. a degraded one.
- To understand the trend of *P. oceanica* meadows taking into account the current situation.

METHODOLOGY

Bibliographical information was searched and classified into 2 groups: those which described a typical or healthy meadow and those which referred to a degraded one.
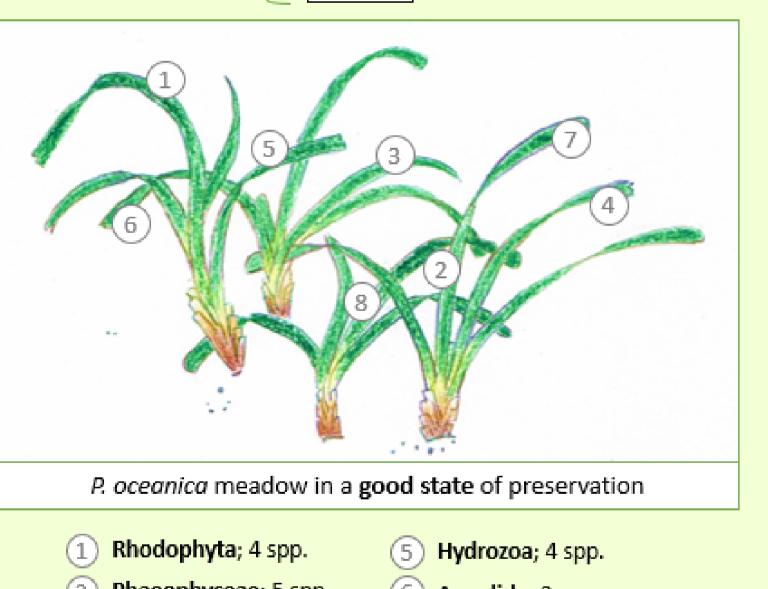
Healthy *Posidonia oceanica* habitat

Ballesteros et al., 1984	Rossi & Vert, 2002	Ruiz et al., 2015	Ballesteros, 1984	Box, 2008	Curcó et al., 2008
41 spp.	7 spp.	42 spp.	39 spp.	3 spp.	20 spp.

Coinciding in ≥ 2 sources

Ca	Pre	Ge	In
13 spp.	6 spp.	2 spp.	6 spp.

Total species: 27

Degraded *Posidonia oceanica* habitat

Prado et al., 2007	Prado et al., 2008
31 spp.	29 spp.

Coinciding in the 2 sources

Ca	Pre	Ge	In
3 spp.	4 spp.	2 spp.	4 spp.

Total species: 13

Legend:
Ca= Characteristic   Pre= Preferential
Ge= Generalist   In= Indeterminate

Figure 1. Methodology diagram used for the habitat characterisation and comparison.

Only foliar epiphytes species were selected and they were classified according to 2 established criteria. Finally, the two communities were characterised and the foliar epiphytes species of the two habitats compared.

RESULTS AND DISCUSSION

CHARACTERISATION

27 spp.

13 Ca	≈ 50 % ←
6 Pre	≈ 22 %
2 Ge	≈ 7 %
6 In	≈ 22 %

13 spp.

3 Ca	≈ 25 % ←
4 Pre	≈ 30 %
2 Ge	≈ 15 %
4 In	≈ 30 %

P. oceanica meadow in a **good state** of preservation

① Rhodophyta; 4 spp.   ⑤ Hydrozoa; 4 spp.
② Phaeophyceae; 5 spp.   ⑥ Annelida; 3 spp.
③ Bryozoa; 5 spp.   ⑦ Ascidiacea; 2 spp.
④ Anthozoa; 2 spp.   ⑧ Clorophyta; 1 sp.

P. oceanica meadow in a **degraded state** of preservation

① Rhodophyta; 5 spp.
② Phaeophyceae; 3 spp.
③ Bryozoa; 5 spp.

Figure 2. Results diagram with the taxonomic groups which characterise a **healthy (left)** and a **degraded (right)** *P. oceanica* meadow.
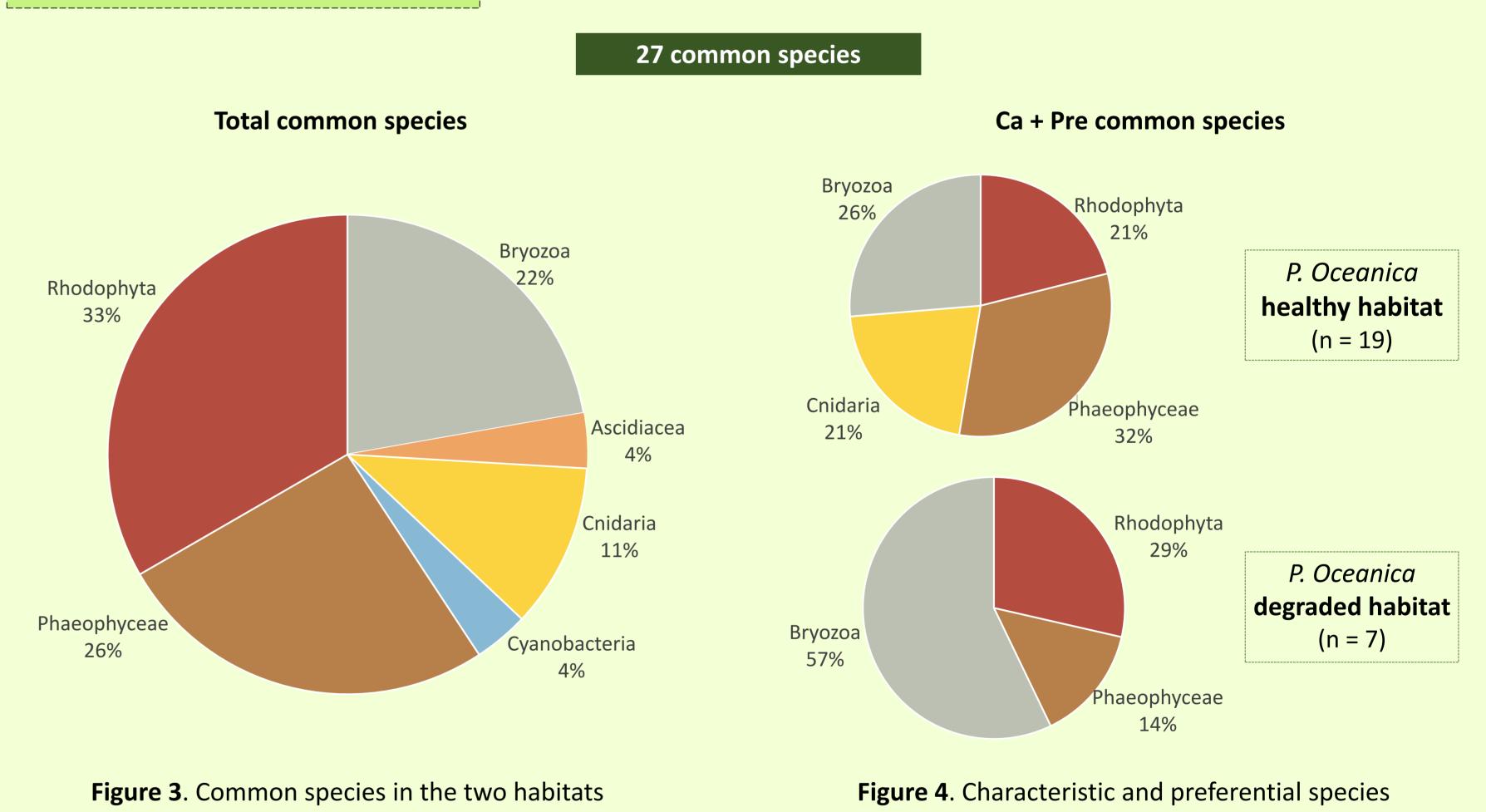
CURRENT SITUATION — **Least concern** at IUCN Red List

36 %	Declining
20 %	Increasing
44 %	Showing no change

- Water quality degraded, anchoring, trawling & coastal modification.
- Geological dynamics change.
- Non-native macroalgae invasions.
- Climate change (↑ temperature & ↑ extreme events).

THREATS

In Catalonia, *P. oceanica* meadows have different preservation states depending on the region.

However, in general, they are showing no change in trajectory due to the management measures taken.

COMPARISON

27 common species

Total common species

Rhodophyta 33%
Bryozoa 22%
Ascidiacea 4%
Cnidaria 11%
Cyanobacteria 4%
Phaeophyceae 26%

Figure 3. Common species in the two habitats classified by taxonomic groups.

Ca + Pre common species

Bryozoa 26%
Rhodophyta 21%
Cnidaria 21%
Phaeophyceae 32%

P. Oceanica **healthy habitat** (n = 19)

Bryozoa 57%
Rhodophyta 29%
Phaeophyceae 14%

P. Oceanica **degraded habitat** (n = 7)

Figure 4. Characteristic and preferential species classified by taxonomic groups in a healthy habitat and a degraded habitat.

CONCLUSIONS

- It can not be affirmed that *Caulerpa spp.* "meadows" have less biodiversity.
- As an habitat dominated by *P. oceanica* degrades, the composition of species changes: characteristic species decrease and generalist species increase.
- There is not a generalized trend of *P. oceanica* meadows to regression and the main degradation causes are the anthropogenic ones.

MANAGEMENT RECOMMENDATIONS

- More scientific research should be done and it would be convenient to standardise sampling methods.
- In order to preserve these habitats is extremely important to:
  - create networks of nature protection areas
  - keep local monitoring of the *P. oceanica* meadows
  - carry out environmental initiatives

SELECTED REFERENCES:
- Ballesteros, E., García, A., Lobo, A., & Romero, J. (1984). L'alguer de *Posidonia oceanica* de les Illes Medes. En I. Olivella (Ed.), *Els Sistemes naturals de les Illes Medes* (p. 739-759).
- Romero, J. (2004). *Posidònia: els prats del fons del mar* (Escola del Mar, Àmbit de Medi Ambient Sostenibilitat i Habitatge, & Ajuntament de Badalona (ed.); 1a ed.).
- De los Santos, *et al.* (2019). Recent trend reversal for declining European seagrass meadows. *Nat. Commun., 10*(1), 1-8.