Conservation insights from the endangered Mediterranean lichen *Seirophora villosa* (Ach.) Frödén

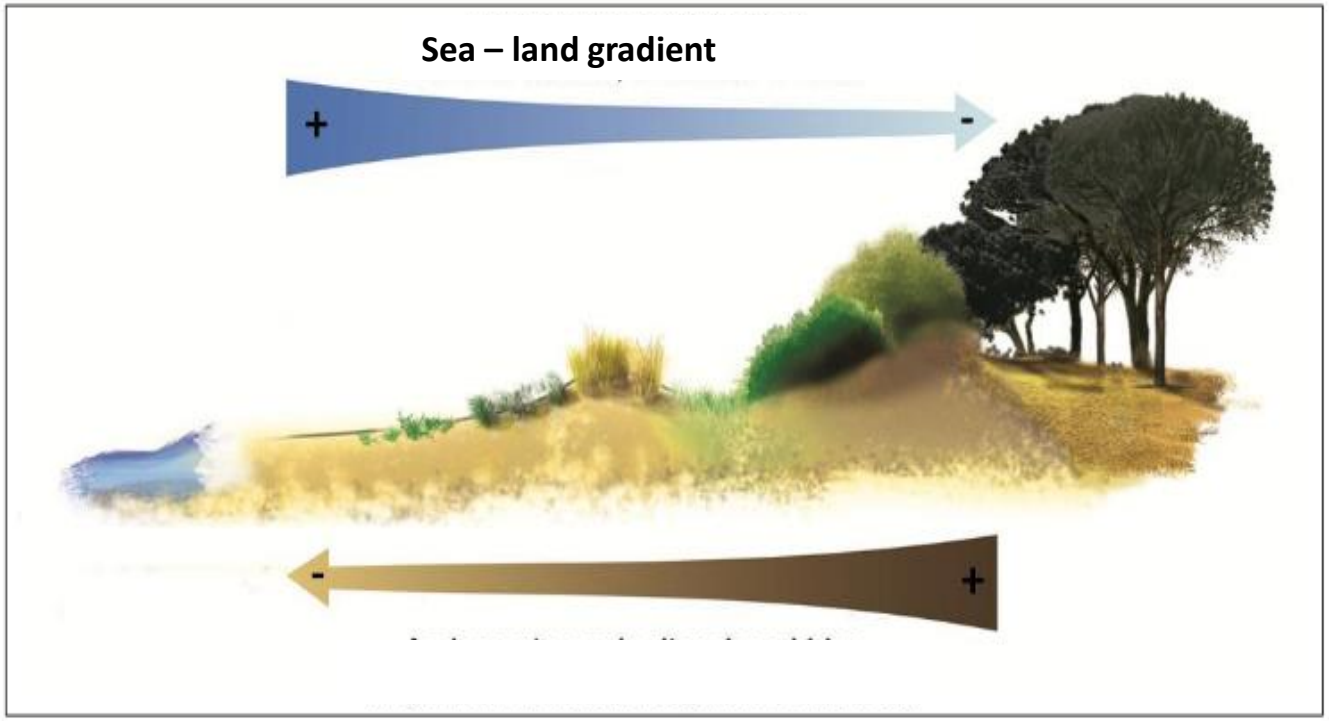
Bianchi, E.,[1*] Di Nuzzo L.,[2] Lazzaro L.,[2] Paoli L.,[3] & Benesperi R.[2]

4th Mediterranean Plant Conservation Week

VALÈNCIA | 23-27 OCTOBER | 2023

An extremely dynamic ecosystem:

Natural processes interact and modify the environment's characteristics



General introduction: coastal dunes with *Juniperus* spp.

The habitat is under strong threat from anthropogenic and natural **disturbances**:

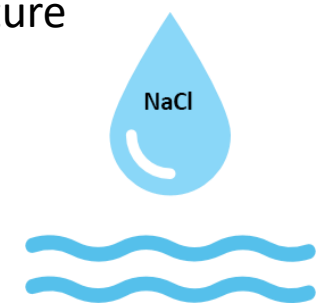
- Urban coastal development
- Tourism
- Habitat fragmentation
- Alien species introduction
- Coastal erosion
- Polluted sea spray
- Forest fires

(Natura 2000 priority habitat code 2250*)

General introduction: adaptations to environmental stresses

- Prolonged sun exposure

- Wind-dependent fluctuations in salinity and temperature



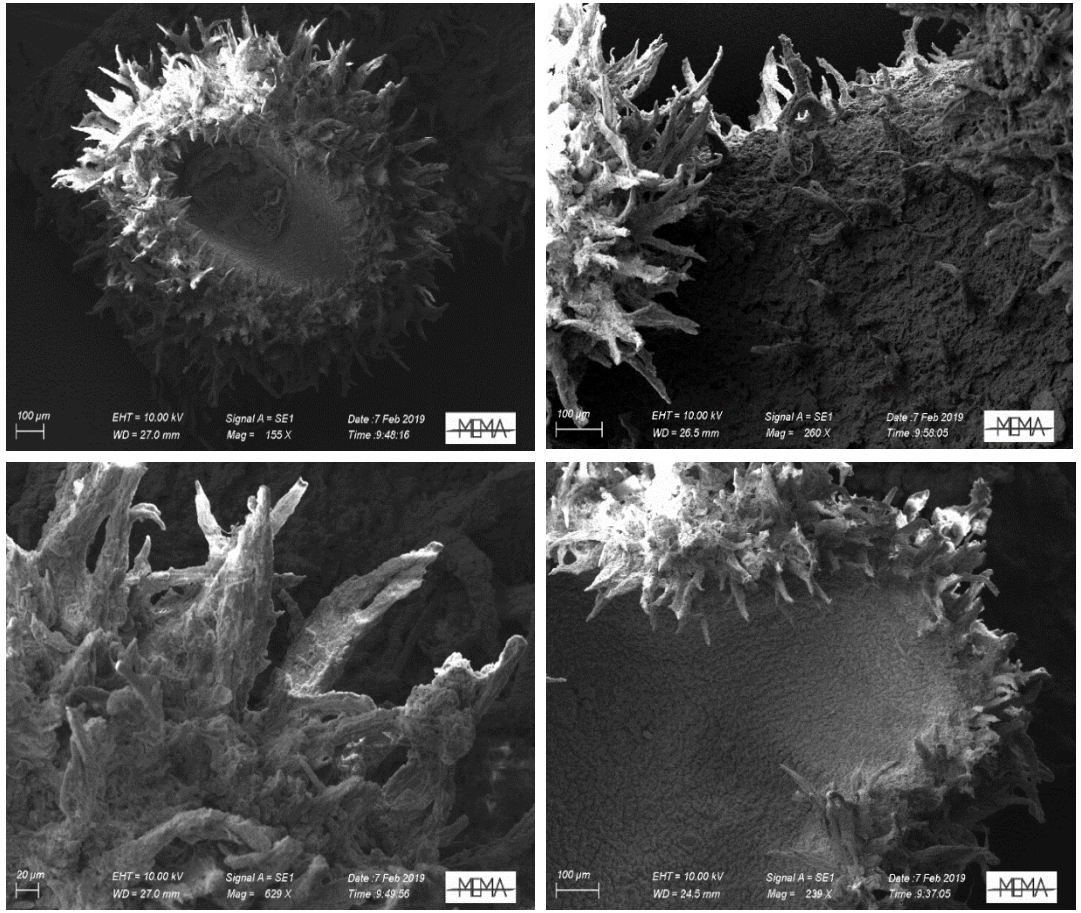
- Rapid change in water availability

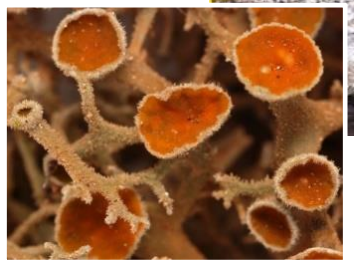
Ramalina menziesii Taylor

Cladonia spp.

General introduction: *Seirophora villosa* (Ach.) Fröden

Thallus: compressed canaliculated laciniae; hispid villose and cinereous surface; and whitish, naked, underneath





Sexual reproduction by apothecia

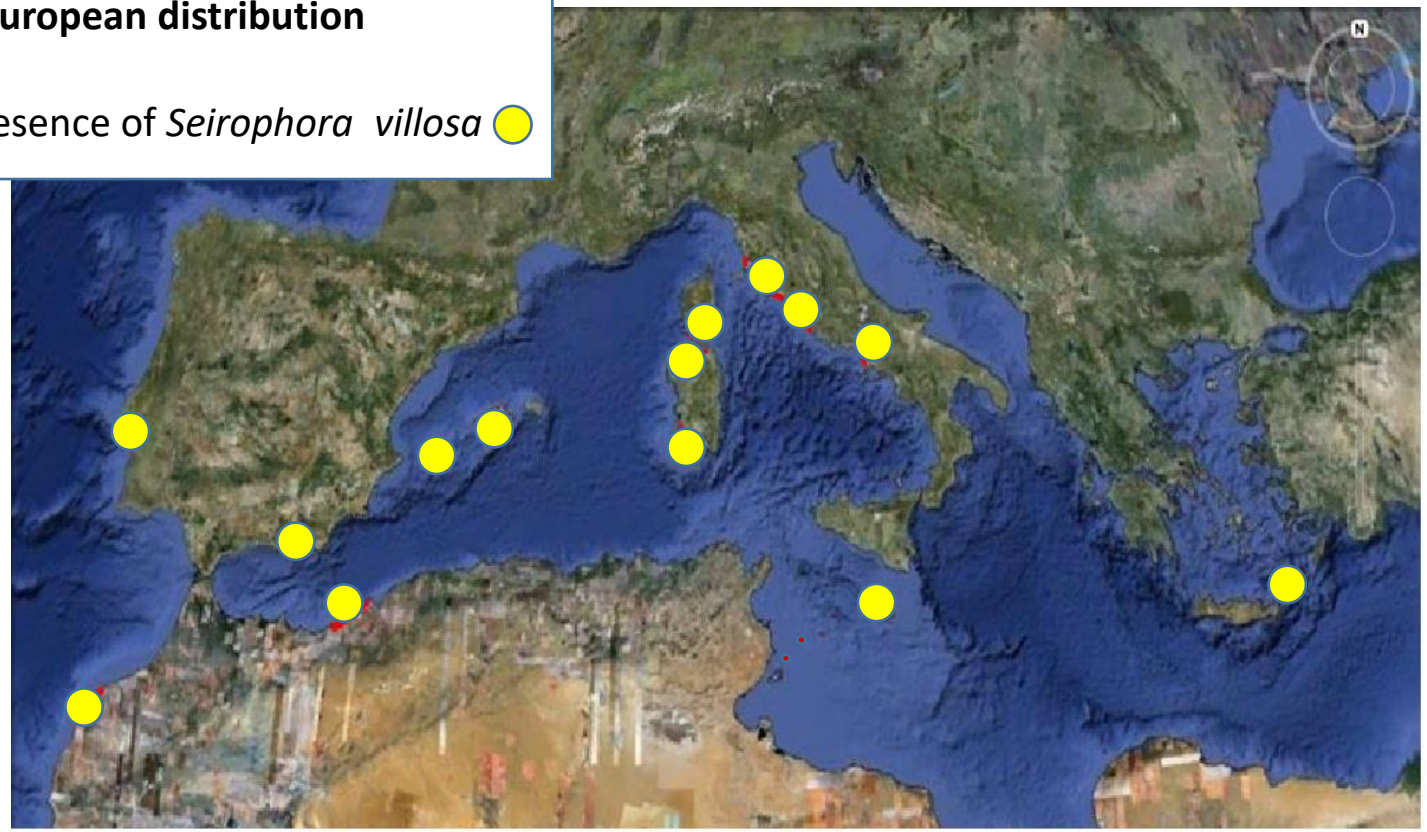
Apothecia (2-5 mm diam.) are usually present and abundant, sub-apical, concave, and with a red disk.

SEM analyses highlighted the presence of consistent multiseriate complex hair on the entire upper cortex, consisting of strongly conglutinated hyphae, approximately long 137.5 ± 10.7 (SE) µm

General introduction: chorology

European distribution

Presence of *Seirophora villosa*



In Italy the species is distributed along the western side of the peninsula, in Tuscany Lazio, Campania, Sicilia and Sardinia

S. villosa is widespread but not common along the coast of Spain, Portugal, **Italy**, Greece, Israel, Morocco, Tunisia, Egypt, and Lybia

General introduction: ecology

S.villosa is strictly associated with dune environments, such as coastal *Juniperus* shrub lands

Endangered

Environmental Management (2013) 52:939–945
DOI 10.1007/s00267-013-0081-1

Human Disturbance Threats the Red-Listed Macrolichen *Seirophora villosa* (Ach.) Frödén in Coastal *Juniperus* Habitats: Evidence From Western Peninsular Italy

Renato Benesperi · Lorenzo Lastrucci · Juri Nascimbene

FUNGAL ECOLOGY 13 (2015) 77–82

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Local dispersal dynamics determine the occupied niche of the red-listed lichen *Seirophora villosa* (Ach.) Frödén in a Mediterranean *Juniperus* shrubland

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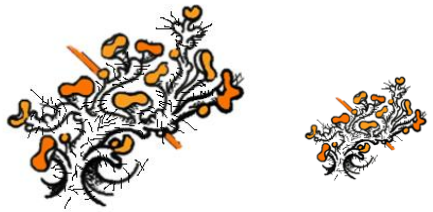
Our aims:

Evaluate the effects of main ecological variables on the eco-physiology of the species

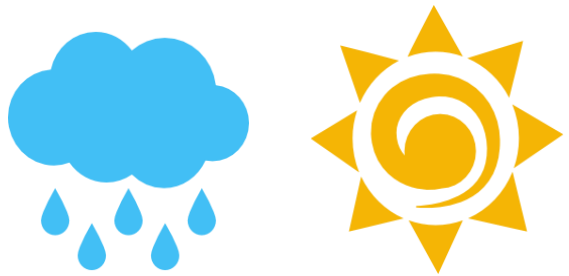
1. **Effect of size**

2. **Effect of hairiness**



Large thalli **Small thalli**

Hairy thalli **Hair-less thalli**



Abiotic stressors

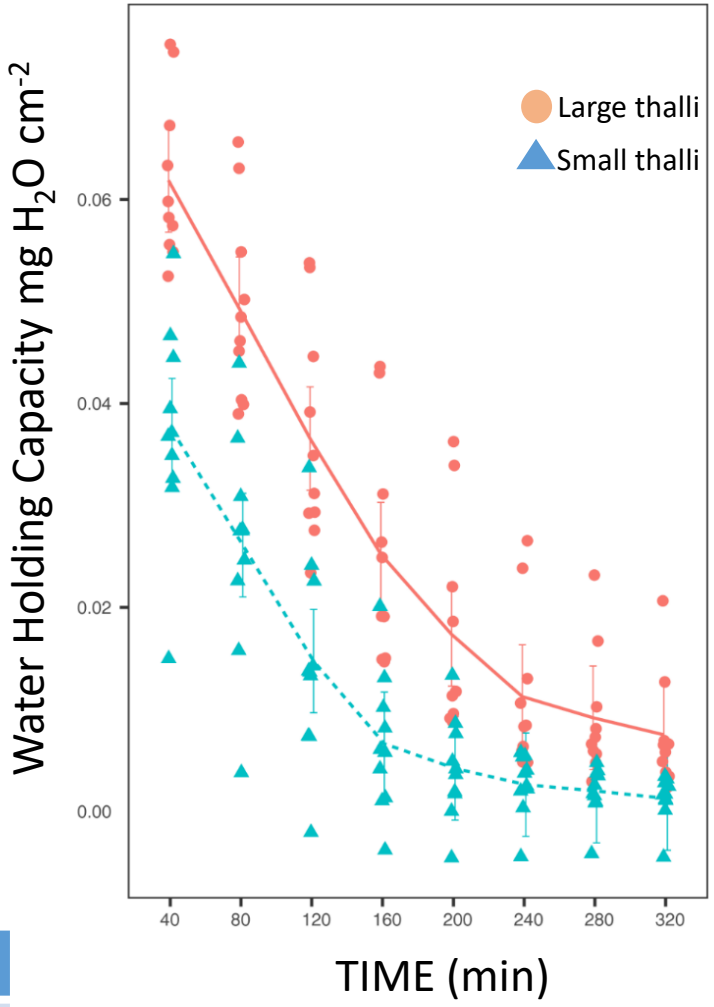
1. M&M and results: size +

Large thalli Small thalli

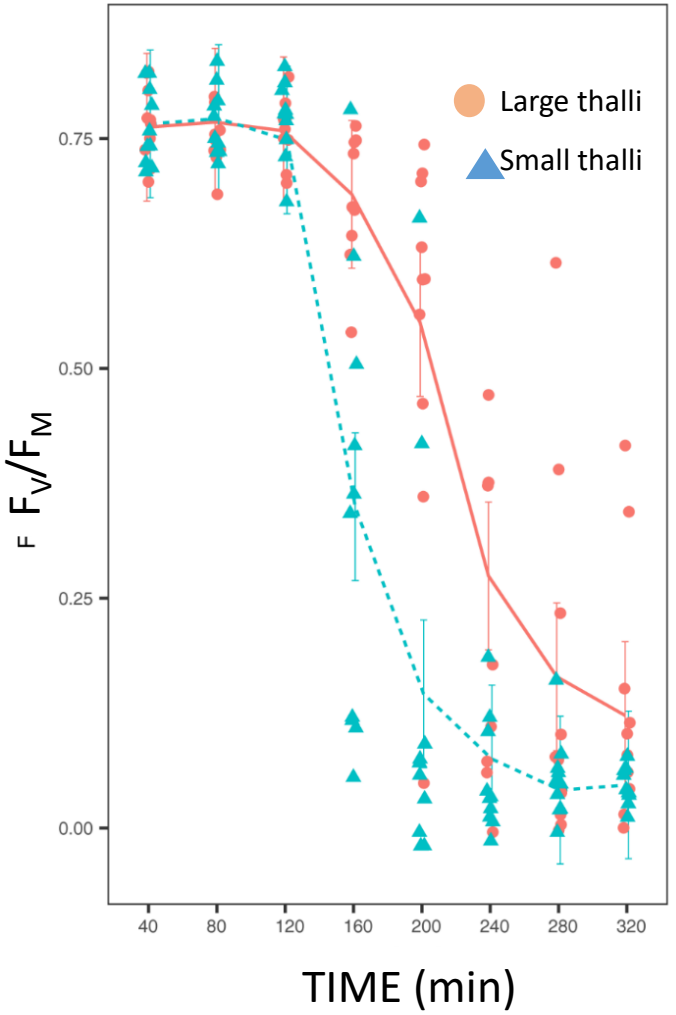
Fluorescence values
Rate of water every 40’

	Area (cm^2)	Dry weight (gr)	Laciniae thickness (mm)
Small	27.45 ± 1.28	0.36 ± 0.03	0.10 ± 0.02
Large	136.89 ± 19.6	3.31 ± 0.53	0.43 ± 0.38

Rate of water loss



Fluorescence values



2. M&M and results: size +

2000 µmol $m^{-2}s^{-1}$
8 hours

DRY

Large thalli

Small thalli

RECOVERY
hydrated
70 µmol $m^{-2}s^{-1}$

Fluorescence values

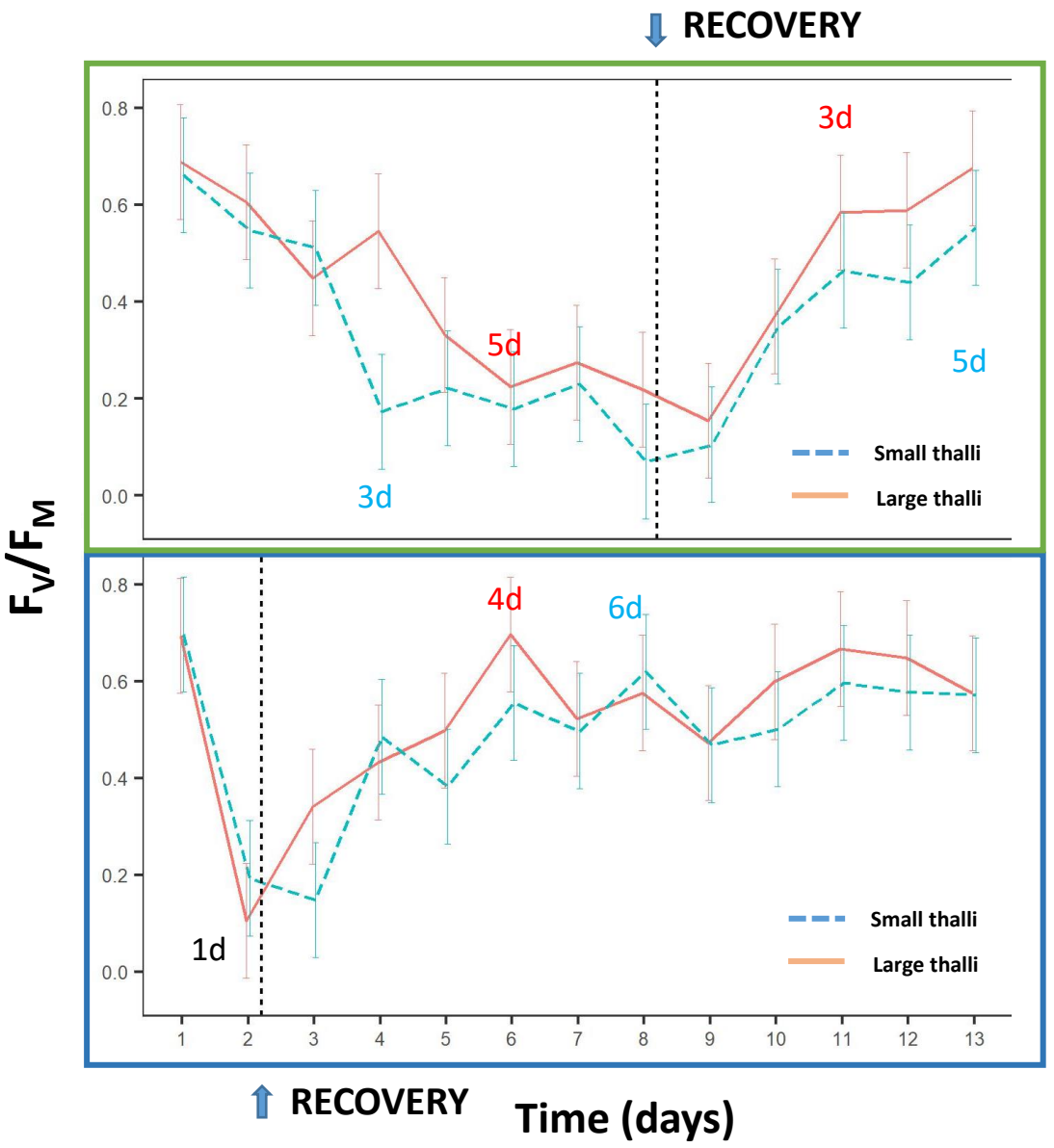
HYDRATED

Large thalli

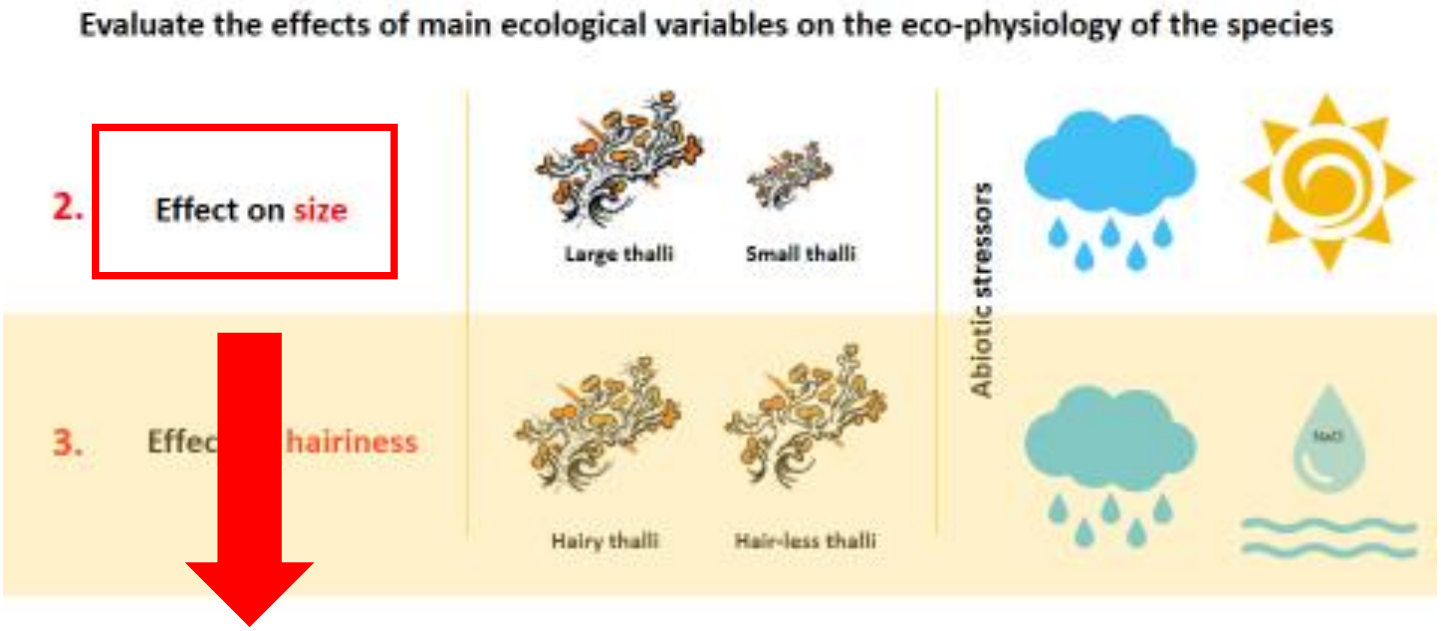
Small thalli

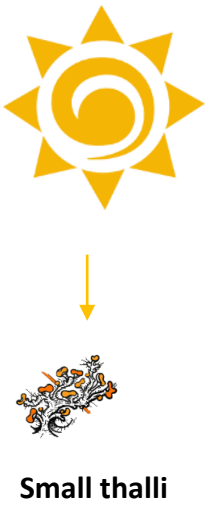
2000 µmol $m^{-2}s^{-1}$
8 hours

RECOVERY
hydrated
70 µmol $m^{-2}s^{-1}$



1. Conclusions *S. villosa* and size





- **Size influence the water retention** capacity of this species and consequently influence responses to strong exposure to light

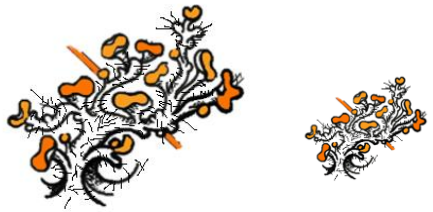
- *S.villosa* **thalli are susceptible to sudden increases in PAR**, especially in the case of **smaller specimens**, which after photoinhibition exhibited reduced ability to recover

Outline of this thesis

Evaluate the effects of main ecological variables on the eco-physiology of the species

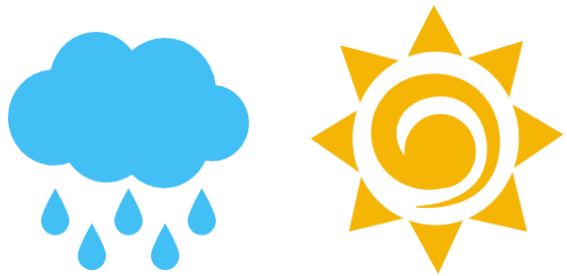
1. Effect of size

2. Effect of hairiness



Large thalli Small thalli

Hairy thalli Hair-less thalli



Abiotic stressors

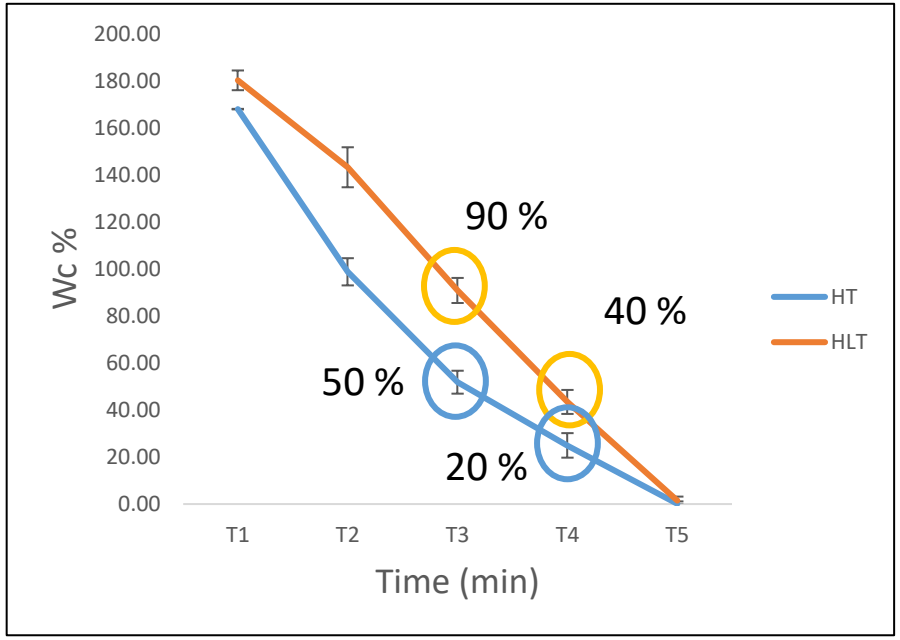
2. M&M and results: hairiness +

Hairy thalli

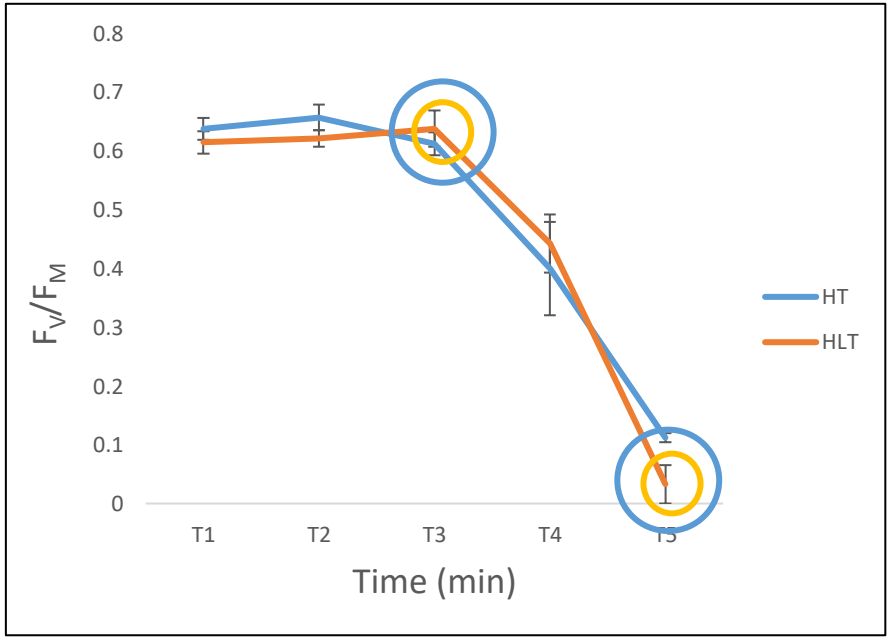
Hair-less thalli

Fluorescence values
Rate of water loss
every 40’

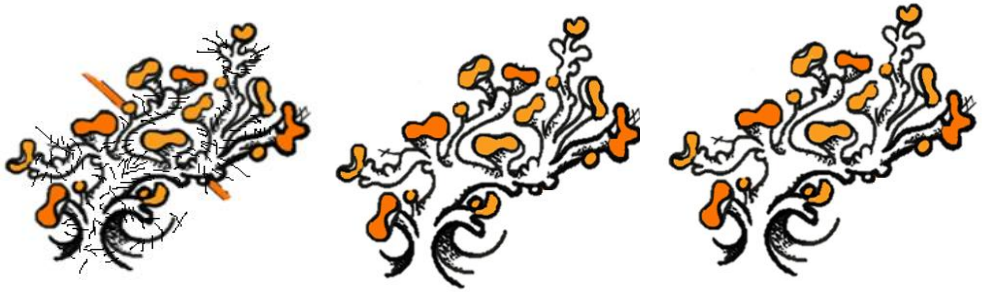
Rate of water loss



Fluorescence values



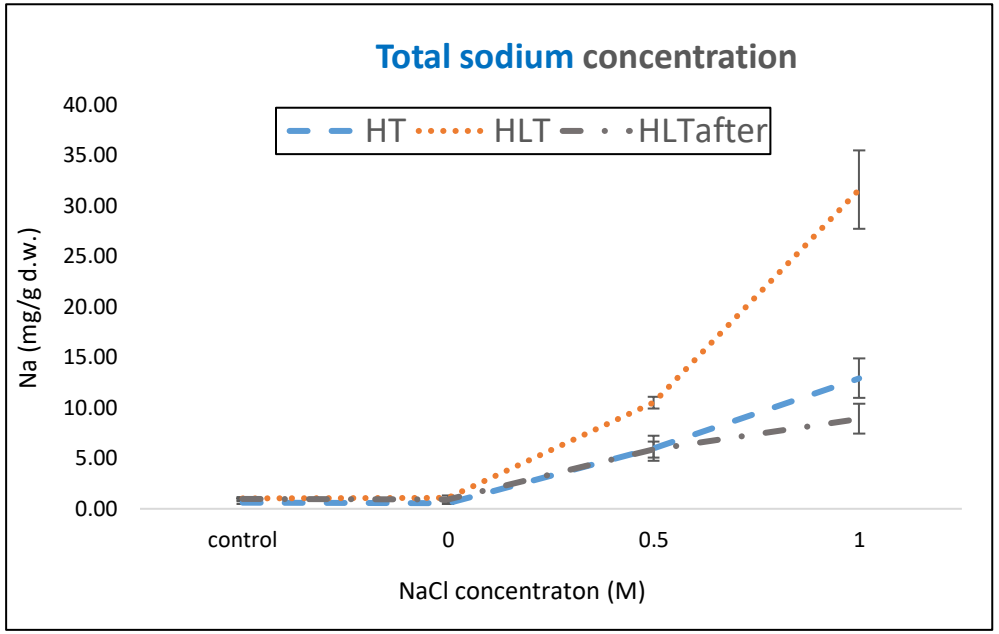
2. M&M and results: hairiness +

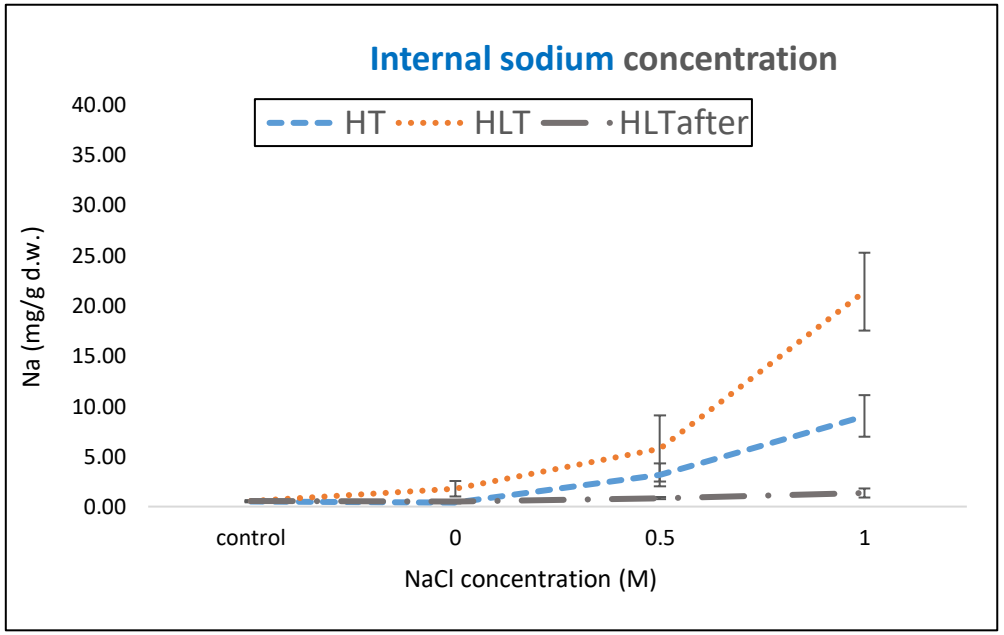


Hairy thalli (HT) **Hair-less thalli** (HLT) **Hair-less thalli after salt treatment** (HLTafter)

Control
0,5 M NaCl
1 M NaCl

To obtain cell wall concentrations, half of the samples were stirred in de-ionized water for 20 min and the other half in 5 mL of $NiCl_2$ (20 mM) for 20 min



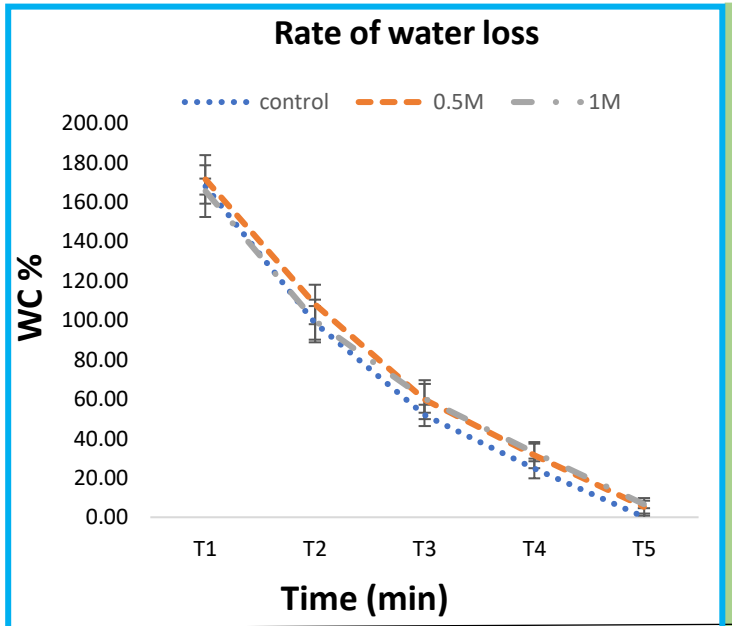


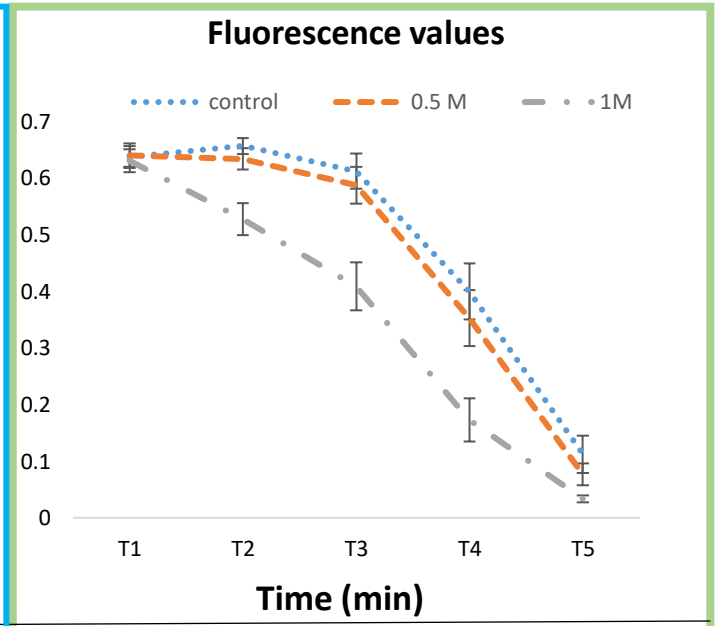
2. M&M and results: hairiness +

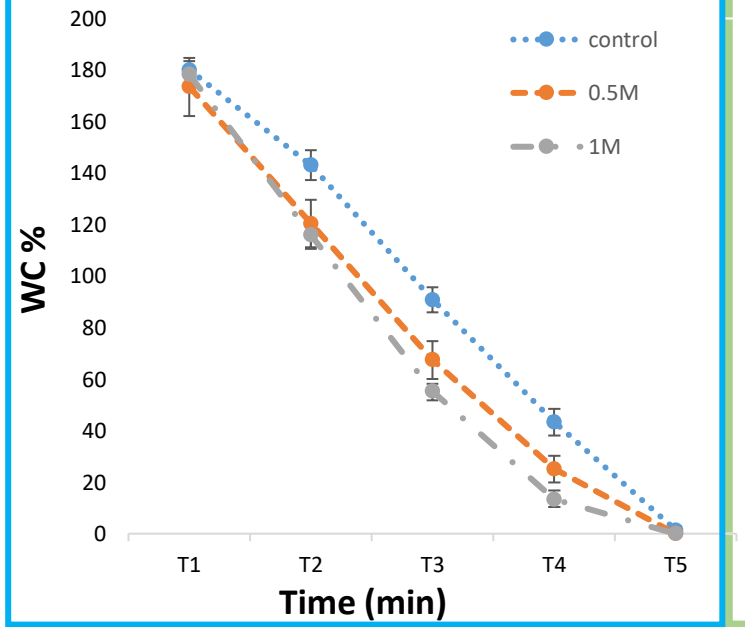
Control
0.5 M NaCl
1 M NaCl

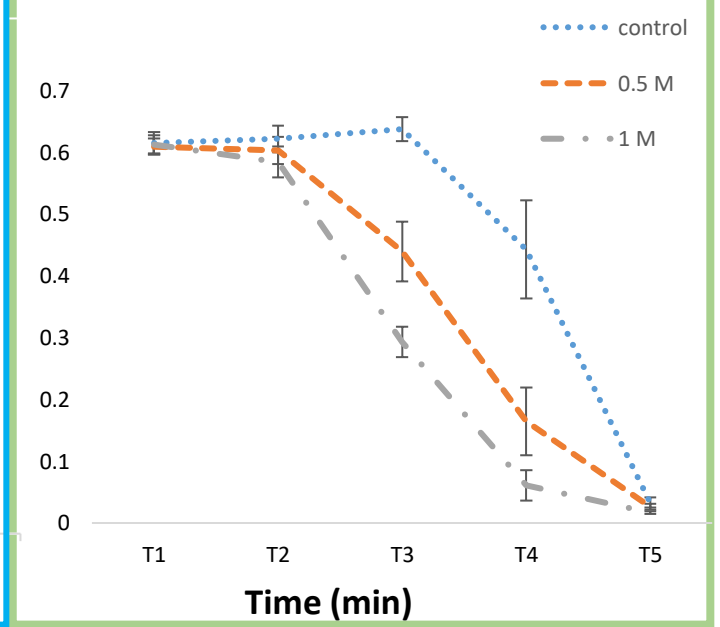
Hairy thalli

Hair-less thalli

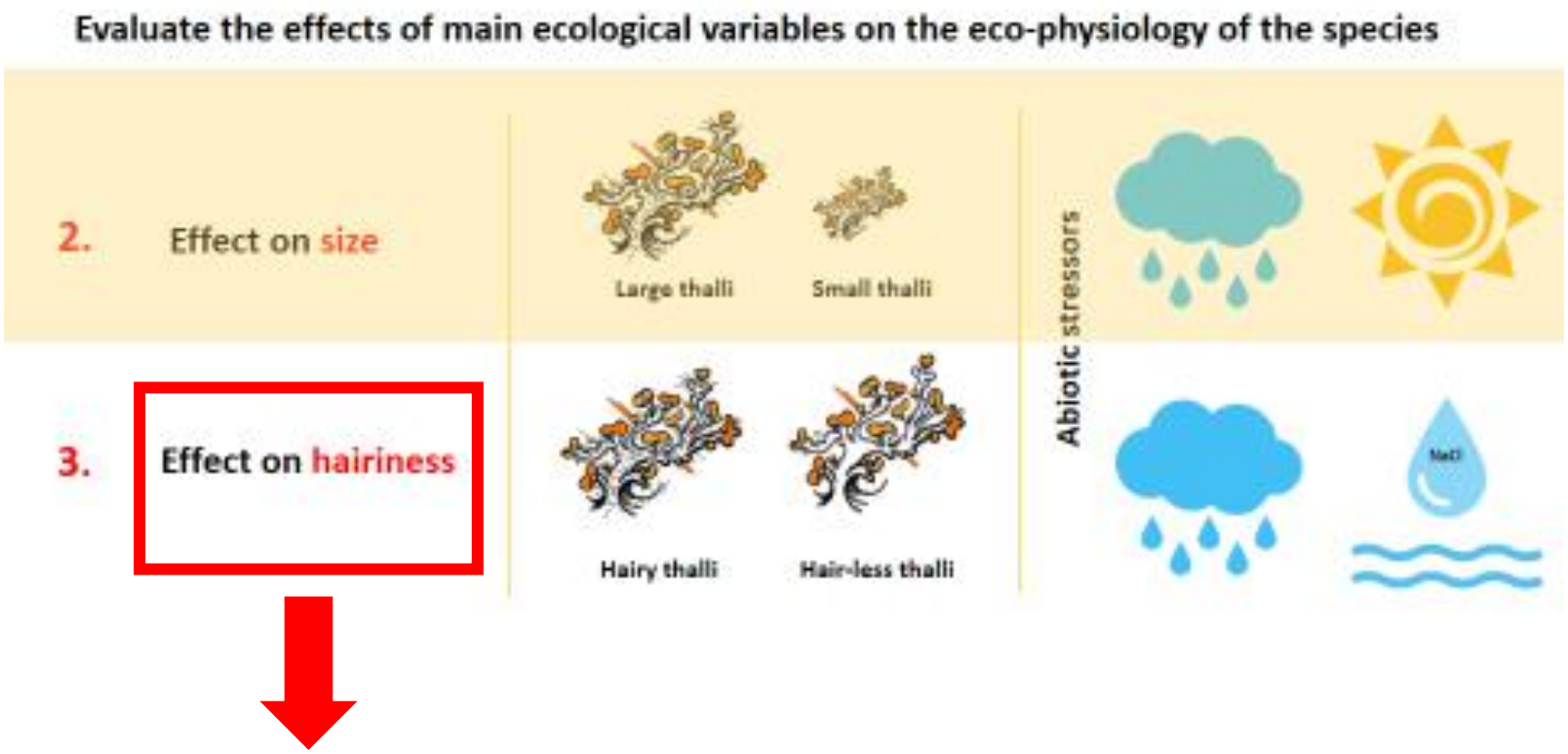








2. Conclusions: *S. villosa* and hair

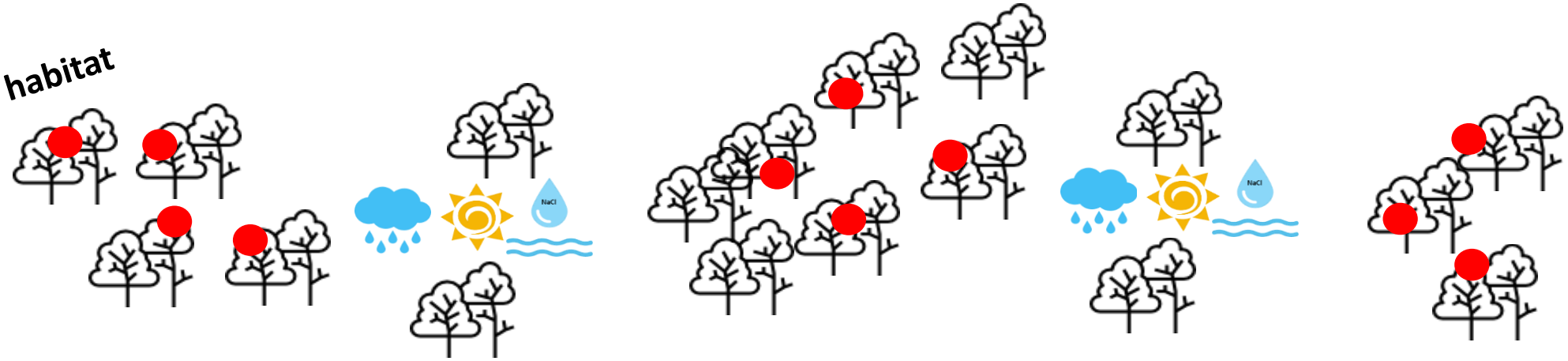


- a strategic morphological trait
- **offers a passive water control**: regulating water absorption and repelling it according to its availability
- supports slower dehydration to maintain photosynthetic process active, even at low water content
- **assists species to avoid salt stress**

General conclusions

S.villosa ●

Undisturbed habitat



Anthropogenic / natural **disturbances**

Disturbed habitat

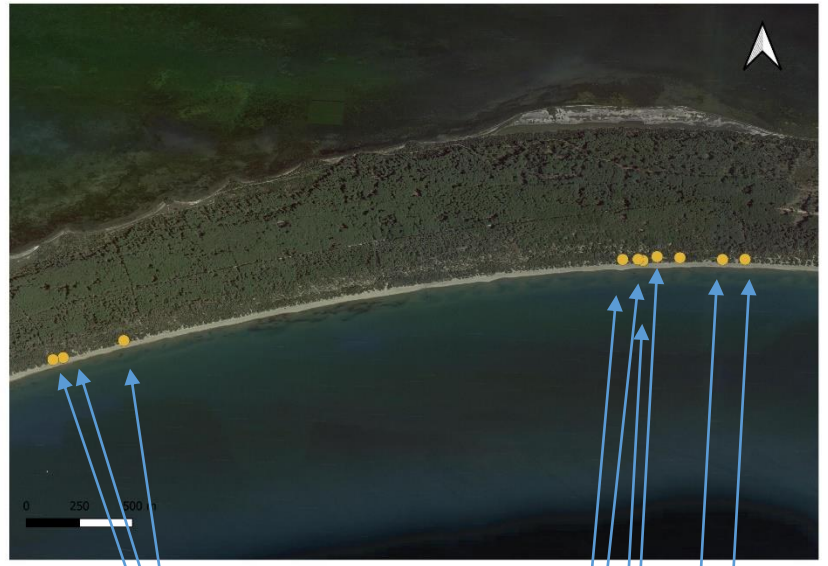
Work in progress: conservation actions *in situ*

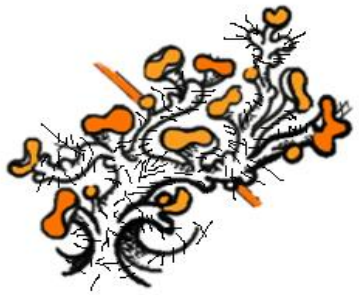
Marina di Bibbona (Li) colonized by *S. villosa* thalli

The aim of this study is to use these structures in the context of **management and reinforcement actions** for *S. villosa* populations. The nets will be used both as a "**nursery**" to increase the number of individuals and as "**stepping stones**" between suitable habitat areas that are spatially too distant from each other and are likely not colonized by *S. villosa*.

Number of nets= 10
Along a population density gradient

Parco Naturale della Duna Feniglia (Tuscany)





Thank you for your attention

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