

POSIDONIA MONITORING NETWORK OF THE BALEARIC ISLANDS

Xarxa de Monitoratge de la Posidònia de les Illes Balears

Introduction to the project and the methodology



GOVERN
ILLES
BALEARIS



The Posidonia Monitoring Network of the Balearic Islands is a project promoted by the Ministry of Agriculture, Fisheries and Natural Environment of the Balearic Islands

The objective of this Network is to determine the state of conservation of the posidonia meadows of the Balearic Islands over time

Web page and social networks of the Posidonia Monitoring Network:

Website: [Xarxa de Monitoratge de les Praderies de Posidònia - Definition \(caib.es\)](http://caib.es)

Instagram: [Xarxa de Monitoratge de la Posidònia \(@xarxa_posidonia \) on Instagram](https://www.instagram.com/xarxa_posidonia/)

Facebook: <https://www.facebook.com/redmonitorizacionposidonia/>

Twitter: https://twitter.com/xarxa_posidonia

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Cover photo: Xavier Màs

SUMMARY

The objective of the Posidonia Monitoring Network of the Balearic Islands is to determine the state of conservation of the posidonia meadows of the Balearic Islands over the years. The project started in 2002, although it was interrupted between 2012 and 2017. Data collection is done in scuba diving, with simple and non-destructive methods and with the voluntary participation of many entities and volunteer recreational divers.

The methodology consists on the periodic monitoring of fixed study points distributed around the islands. The studied parameters are *Posidonia oceanica* shoot density and cover, presence of shellfish individuals (*Pinna nobilis* and *Pinna rudis*) and presence of invasive algae. Additionally, water temperature is recorded in some of the points.

INTRODUCTION

Posidonia meadows (*Posidonia oceanica*) are the dominant ecosystem in the coastal seabed of the Balearic Islands, occurring between 1 and 45 meters deep. The meadows have an extraordinary biological and ecological importance since, among other things, they capture sediments, dampen the waves, consume carbon dioxide and produce oxygen and host a great biodiversity.

Due to its coastal location, posidonia meadows are exposed to many impacts of anthropic origin that have caused **degradation** or total loss of large surfaces of this seagrass in the Mediterranean.

The Posidonia Monitoring Network (*Xarxa de Monitoratge de la Posidònia*) was created to determine the state of conservation of posidonia meadows over the years, with the main objective of obtaining reliable information to properly manage these ecosystems in the Balearic archipelago.



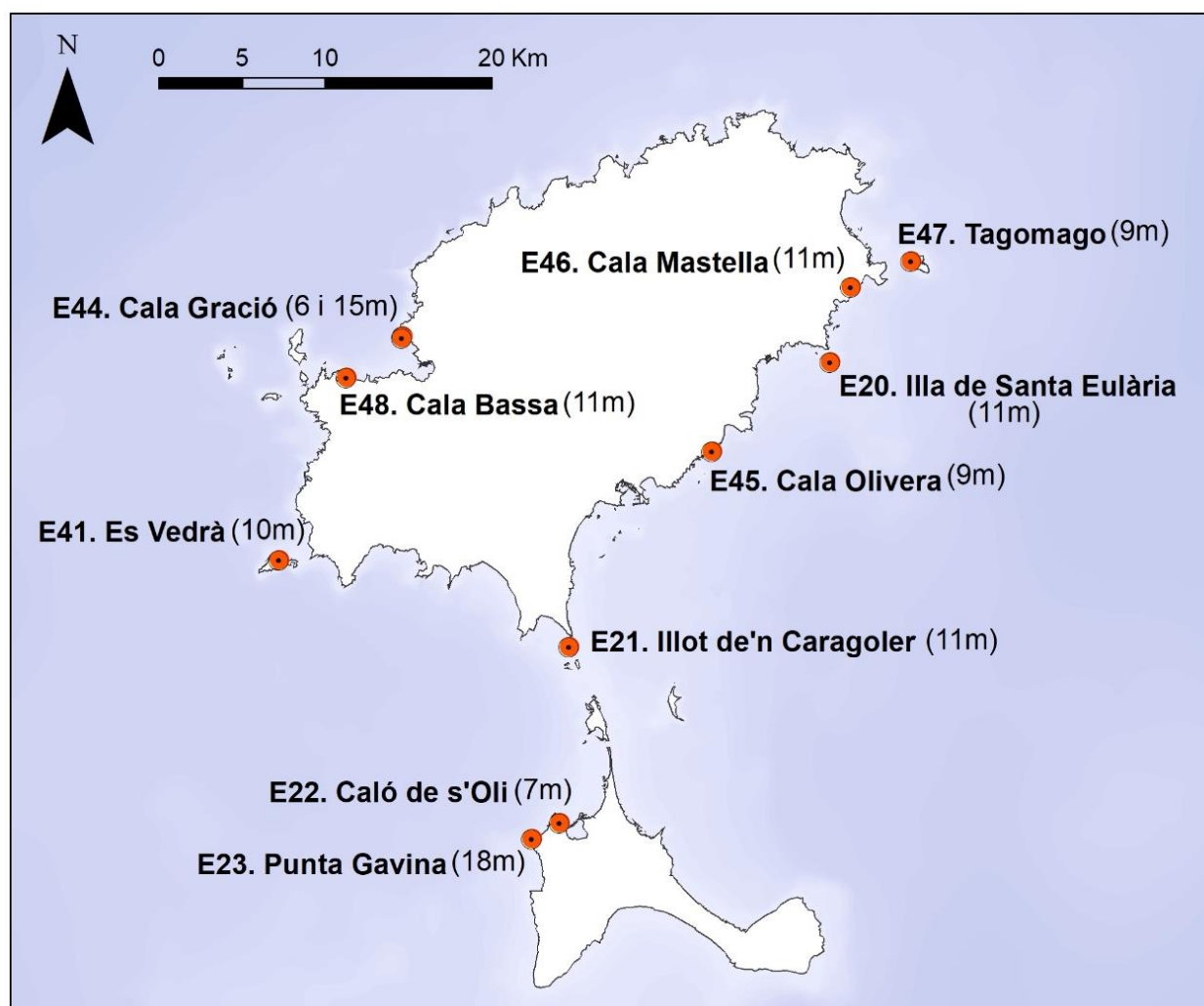
Volunteer divers of the Posidonia Monitoring Network during a dive

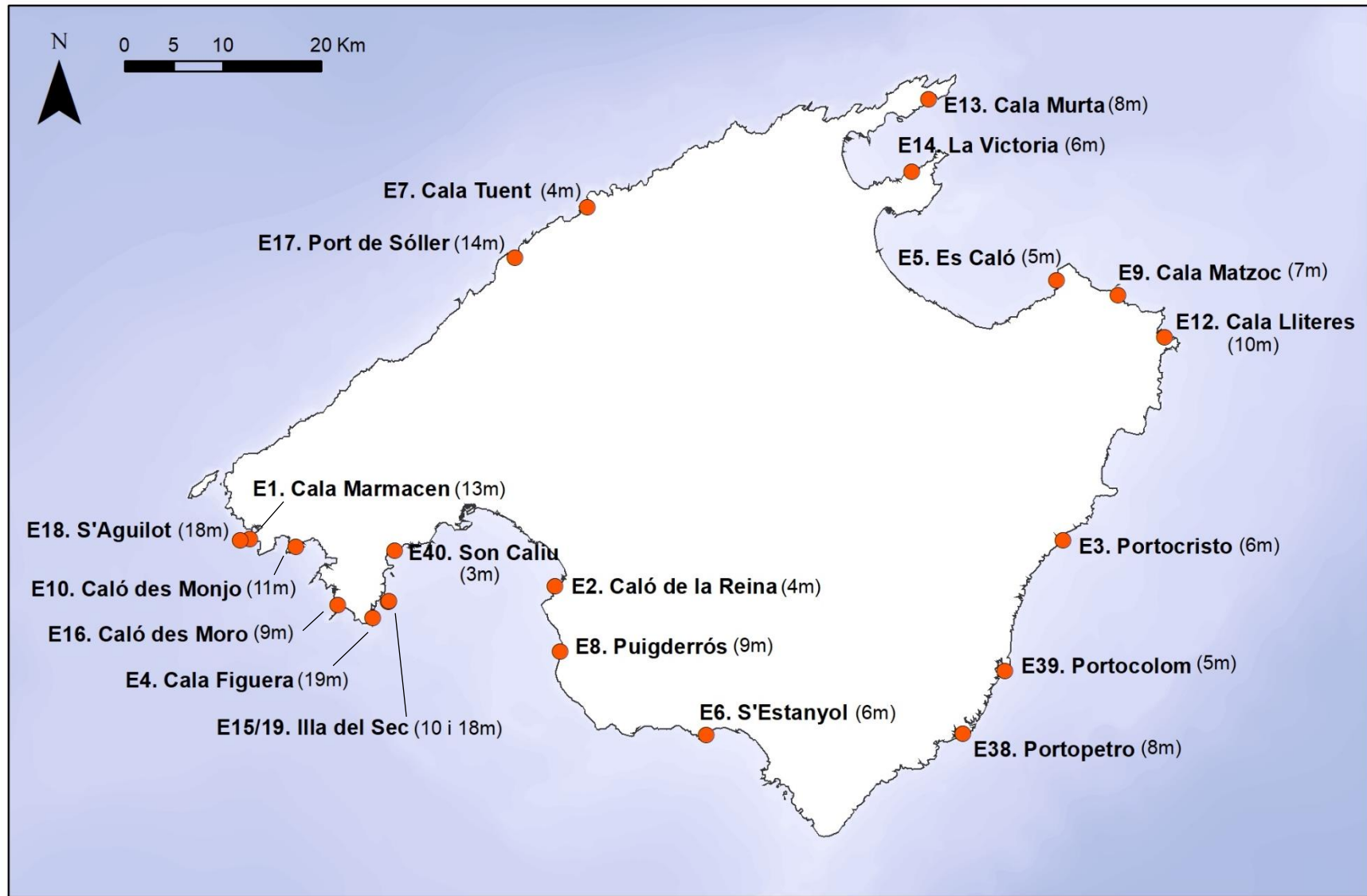
This study consists on the periodic monitoring of various **monitoring points** (which we call **stations or substations**) in which we control a series of parameters specific to the meadows and related to their state of conservation: density and cover of *Posidonia oceanica* (*dead and alive*), presence of shellfish (associated species of great interest), presence of invasive algae and, additionally, water temperature.

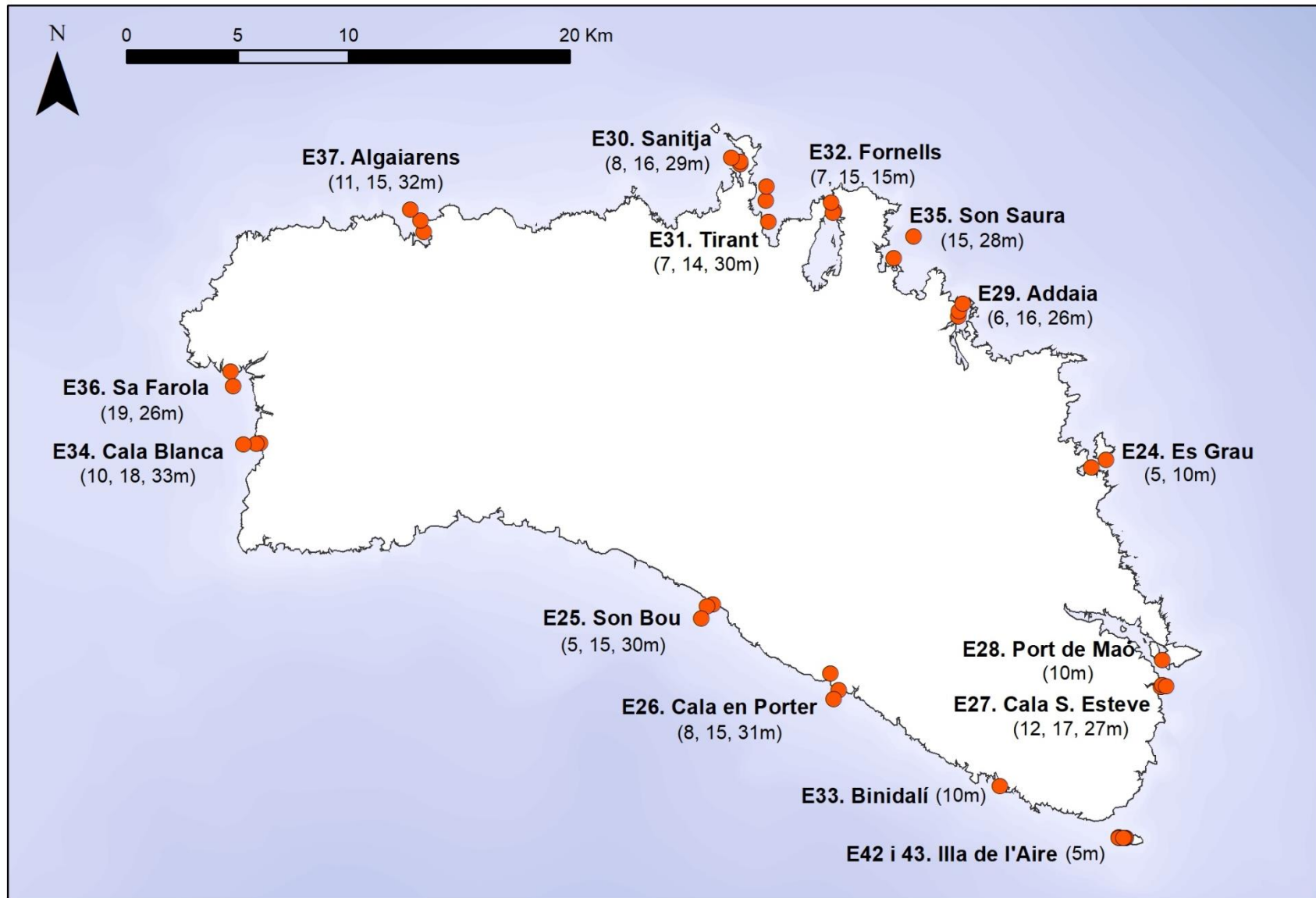
The Monitoring Network relies, in part, on **citizen participation** and each year numerous institutions, associations, diving centres, and volunteer recreational divers participate in the monitoring. The awareness and involvement of volunteers have always been essential for the proper functioning of the project.

MONITORING STATIONS

At present, the Monitoring Network is made up of **72 study points** (also substations) distributed among **48 study zones** (also stations). Some of the zones are only composed by one study point (here, *station* and *substation* are equivalent), while other zones are composed by different study points, which are near but have different depths (here, 2-3 substations make a station). The study points and zones are distributed as follows: 9 points (8 zones) in Ibiza, 2 points (2 zones) in Formentera, 21 points (20 zones) in Mallorca and 40 points (16 zones) in Menorca (all of them are studied in collaboration with OBSAM – *Observatori Socioambiental de Menorca*–).







ORGANIZATION

Generally, the annual **monitoring of a station** requires **a single dive** involving between 2 and 10 divers. Before each dive with volunteer divers, there is a brief training so that volunteer divers become familiar with the techniques and the materials. **The necessary material for sampling, with the exception of the diving equipment, is provided by the workers of the Network.** The dives can be carried out from the coast or from a boat provided by a collaborator or a voluntary immersion center. During the dives, all diving safety regulations are met and, in addition, the dives carried out by volunteer divers never exceed 20 meters in depth.

VOLUNTEER RECREATIONAL DIVER REQUIREMENTS

Recreational divers who want to collaborate with the Posidonia Monitoring Network must be **older than 18 years old (or have parental approval)**, have a **recreational diving license**, have a **diving insurance** and a valid **medical certificate**. Volunteers should consider the average depths of the stations, the limitations of their license and their own experience before choosing which station (or stations) to participate in.

Volunteers **do not need prior knowledge of marine biology or scientific diving**, but it is mandatory to understand Catalan, Spanish **or** English.

The scuba diving equipment would be provided by the volunteer divers, but often it can be rented or borrowed at the diving centers or diving clubs.

DIVING CALENDAR

The exact dates of the dives and the voluntary entities that every year is confirmed during the diving season (April-October).

Please, check the social networks or contact the coordinator of the Network for more information:

  610 544 741  eburgos@tragsa.es

 [Xarxa de Monitoratge de la Posidònia \(@xarxa_posidonia \) on Instagram](#)

METHODOLOGY

Each of the study points is marked with three metal bars with a buoy at its end. From each bar, a 30-meter measuring tape is placed on the seafloor, so that the variation in depth from the beginning of the tape to its end is as small as possible. The resulting lines are called *transects* and along them, we measure the following parameters:

1. *Posidonia oceanica* cover
2. *Posidonia oceanica* shoot density
3. *Posidonia oceanica* flowers and fruits density (if any)
4. Presence of invasive algae and shellfish (*Pinna nobilis* and *Pinna rudis*)

Shoot



During the activity, all divers will have submersible whiteboards to write down the data.

Posidonia oceanica meadows are composed of elements called **shoots**, which are each of the group of leaves joined at the base to the rhizome (the woody part of the plant).

1. Posidonia cover

Linear cover is measured along the 30-meter tapes. We record each meter and decimetre where there are changes in bottom type: live posidonia (shoots with green leaves), dead posidonia (rhizome without green leaves), sand, rock, gravel, mud, others.

Microcover is measured with 50x50 cm PVC squares subdivided into 4 equal parts. The squares are placed on the bottom every 2 meters along each 30 meter measuring tape, therefore 15 measurements are taken per transects. Within each square, the **percentage occupied by living posidonia shoots is visually estimated** (without considering the space occupied by the leaves).

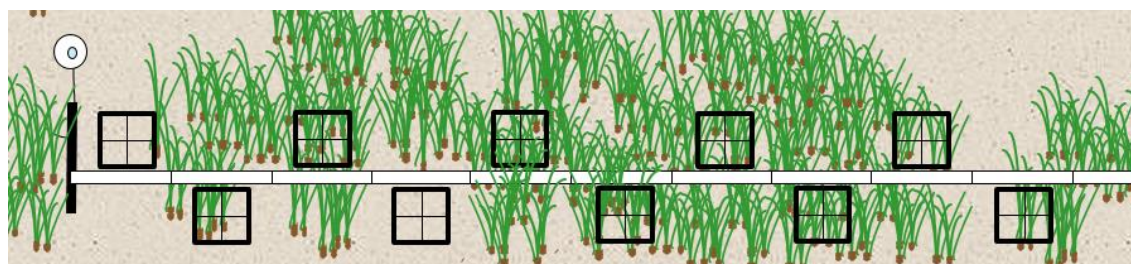


Diagram of the positioning of the squares for cover measures along a transect.

2. Posidonia shoot density

The shoot density is a proxy to describe the abundance of *Posidonia oceanica* and it is defined as the **number of living shoots in a given surface**. It is measured where the plant covers completely the seafloor, with 20x20 cm PVC squares, 10 times along each transect. First, the sampling square is placed along the measuring tape at random, but always where the substrate is completely covered by living posidonia, then we count the shoots within the square.

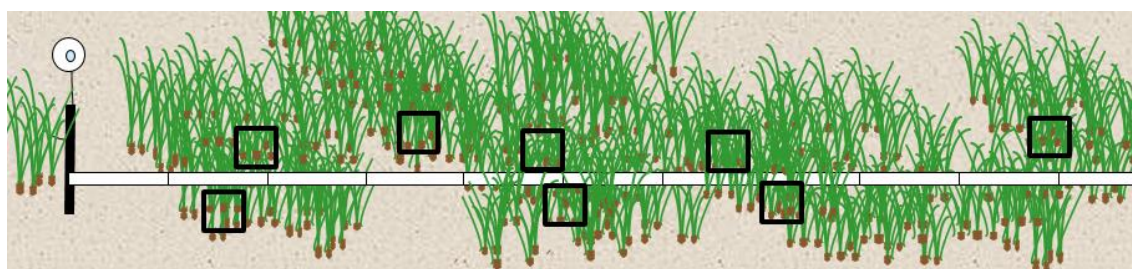
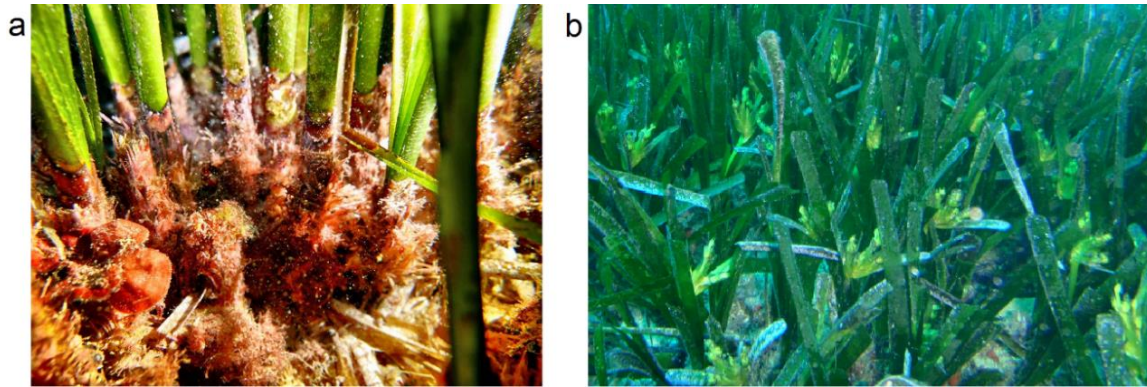


Diagram of the positioning of the squares to measure posidonia shoot density along a transect.

3. Posidonia flowers and fruits density

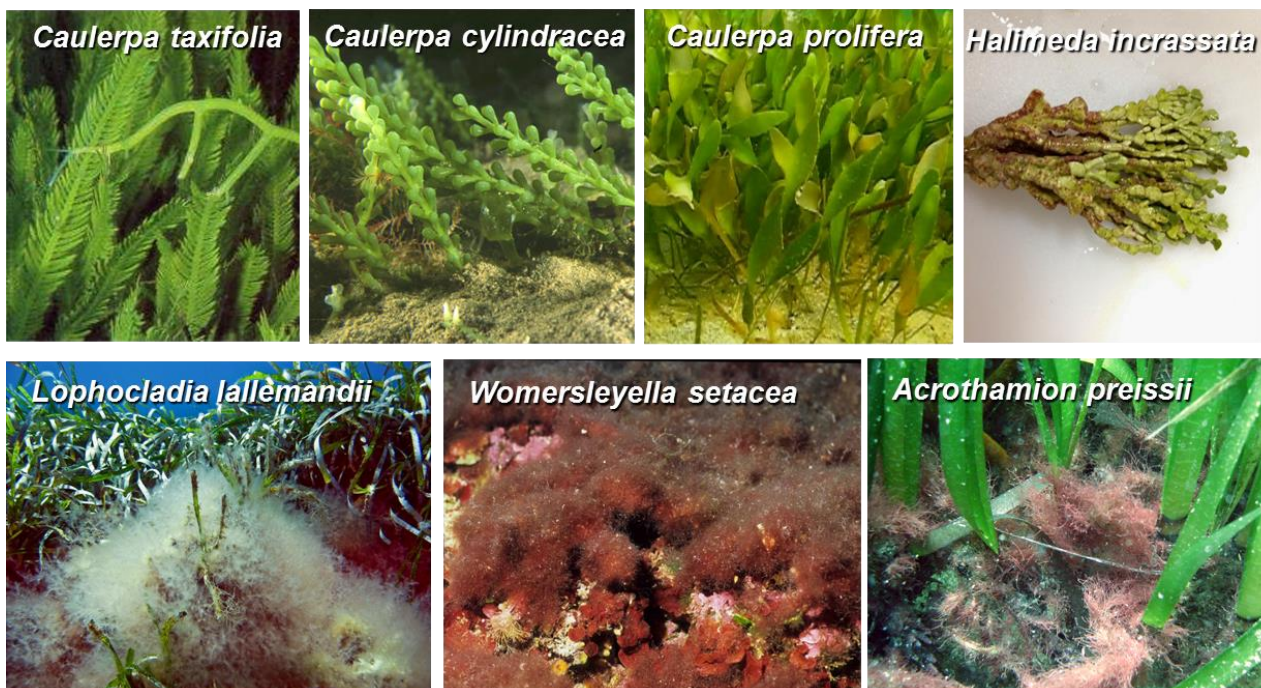
If, during the counting of the shoot density, posidonia flowers or fruits are observed, the flowers or fruits within each square will be counted (immediately after counting the shoots within the same square, without moving the square).



Detail of Posidonia oceanica shoots (a) and flowers (b).

4. Surveillance of invasive algae and shellfish

Invasive algae can compete with *Posidonia oceanica* for space and other resources and, therefore, can risk the integrity of the meadows. The surveyed invasive algae are: *Caulerpa taxifolia*, *Caulerpa cylindracea*, *Lophocladia lallemandii*, *Acrothamion preissii*, *Womersleyella setacea* and *Halimeda incrassata*. The presence of the autochthonous algae *Caulerpa prolifera* is also surveyed. If any of these species is found during data collection and they are securely identified, the name of the species will be noted.

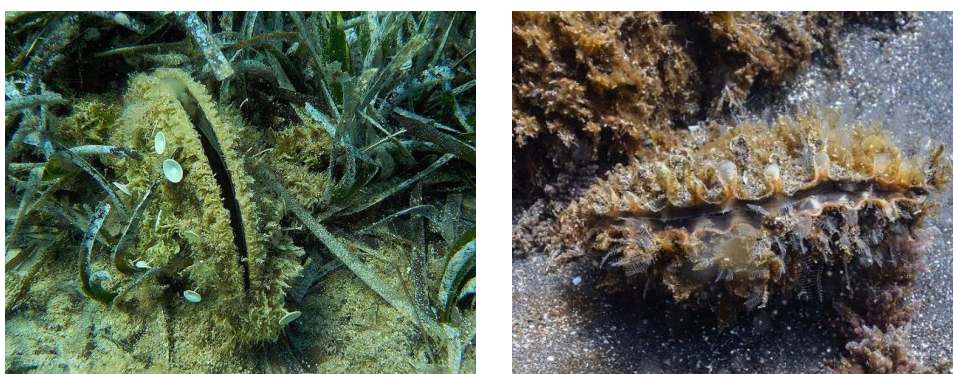


Surveyed algae species

The **shellfish** *Pinna nobilis* is a large filter-feeding bivalve (up to 120cm long) that lives on soft bottoms, frequently associated with posidonia meadows. It is an endemic species of the Mediterranean and is currently at extreme risk, because since 2016 it has been affected by an infectious disease with a mortality very close to 100%. In this context, the search for individuals of *P. nobilis* will be especially important, although the probability of finding them alive will be very low.

Pinna rudis is other filter-feeding bivalve, slightly smaller than *P. nobilis*, commonly found in posidonia meadows growing on rocky bottoms. Since 2017, due to the *Pinna nobilis* mortality, the only shellfishes found alive were *P. rudis*.

For each *Pinna sp.* individual found, we record: species (*P. rudis* or *P. nobilis*), state (alive, recently dead, non-recently dead) and maximum width of the shell.



Shellfish individuals of the species *Pinna nobilis* (left) and *Pinna rudis* (right)

Collaborators and volunteers 2024-2025

Collaborators: Observatori Socioambiental de Menorca (OBSAM, IME, Consell Insular de Menorca. Amb finançament de Menorca Preservation i l'Agència Menorca Reserva de Biosfera); Àrea Marina del GEN-GOB (amb finançament de l'Ajuntament de Sant Josep de Sa Talaia i Ibiza Preservation); Servei de Vigilància de la Posidònia de la Conselleria de Medi Ambient i Territori de les Illes Balears; Aquadiving (amb el finançament de l'Ajuntament de Santa Eulària del Riu); Anfíbios (amb el finançament de l'Ajuntament de Sant Josep de Sa Talaia); Servicio de Actuaciones de Conservación, Mejora del Conocimiento del Medio Marino y Protección Ambiental de los Hábitats y Especies Marinas y de los Espacios Marinos Protegidos del Ministerio para la Transición Ecológica y el Reto Demográfico; Salvem Sa Badia de Portmany; Ajuntament de Calvià, Mallorca; Reserva Marina del Llevant de Mallorca-Cala Ratjada (Gestionada per la Secretària General de Pesca del Ministerio de Agricultura, Pesca y Alimentación; Direcció General de Pesca i Medi Marí de la Conselleria d'Agricultura, Pesca i Alimentació del Govern de les Illes Balears.

Volunteers: ARENAL DIVING, BIG BLUE DIVING, ISURUS esport i aventura, CLUB DE BUSSEIG BOMBERS DE MALLORCA, DIVING DRAGONERA, MALLORCA DIVING ADVENTURE, MAR BALEAR, OCTOPUS, PETRODIVERS, TRAMUNTANA DIVING & ADVENTURE, VELLMARÍ FORMENTERA.



Ajuntament de Sant Josep de sa Talaia

Salvem sa Badia de Portmany



AJUNTAMENT DE SANTA EULÀRIA DES RIU



MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO

Club de bussejadors dels bombers de Calvià



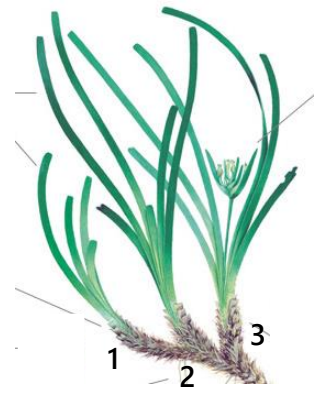
ANNEX – sheets used during the volunteer divers training

POSIDONIA SHOOT DENSITY

How many shoots there are in the square?

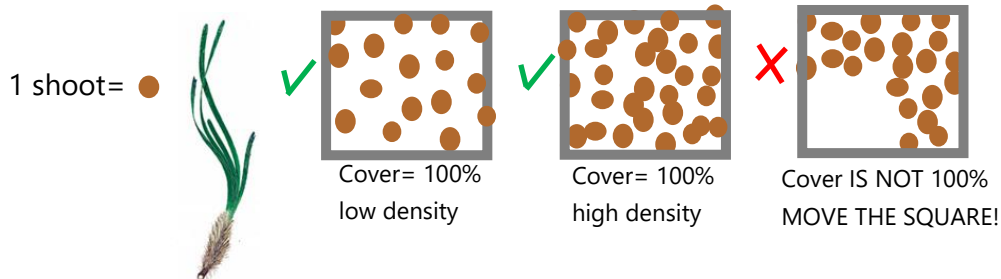
MATERIAL

- 20x20 cm square (1 per diver)
- Sheet to write down the data (1 per diver)



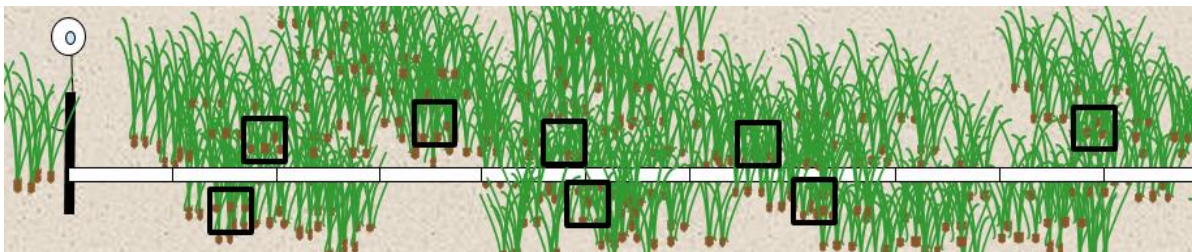
METHOD

- Place the square ONLY WHERE THE COVER IS TOTAL (100%)



There is always a certain distance between the shoots, also when the cover is 100%
 If you can **put your fist** on the bottom → there is a **gap** → THE COVER IS **NOT** 100%

- 10 measures per transect (30m lines)
- The **distribution** of the squares **along the line** can be irregular as it will **depend on the cover**



- To count the shoots, **touch the base of each shoot**
- Start from a corner of the square and trap the leaves with one arm (or hand) while you count with the other hand



IF YOU SEE FLOWERS OR FRUITS...

- Count the flowers or fruits in each square, right after counting the shoots, without moving the square



COVER MEASURES

Which percentage of the seafloor is covered by posidonia shoots?

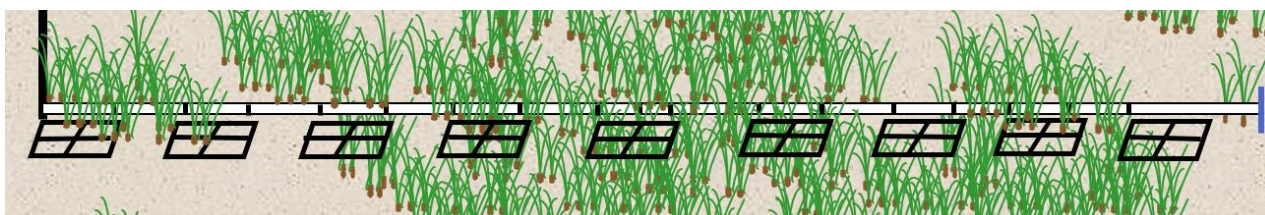
MATERIAL:

- 50x50 **squares** divided by 4 – **1 square per couple**
- **Sheets** to write down the data – **1 sheet per diver**



METHOD:

- **TWO DIVERS** go together and estimate the cover inside the same square (on the same surface).
- Place the square **every 2 meters** (aprox.), each time at a different side of the line.
- Place the square **all along the transect, in a regular way**, it does not matter if there is (or there is not) posidonia or its abundance.
- At the end of the transect **each diver** should have the data of **15 squares**. **Each diver writes down their own estimation on their own sheet**



EVERY TIME YOU PLACE THE SQUARE, IN EACH OF THE 4 DIVISIONS:

- PULL ASIDE THE LEAVES, **TOUCH THE BASE OF THE SHOOTS** AND THE SEAFLOOR
- **Imagine the meadow patches according to the surface covered by shoots (ignore the leaves)**
- **WRITE DOWN:** % of **POSIDONIA** (Percentages= 10-20-25-30-40-50-60-70-75-80-90-100)

Example:

1	20	90	2
3	0	40	4

40% occupied by posidonia

There is always a certain distance between the shoots (also when the cover is 100%)
 If you can place your fist on the bottom → there is a gap → **1 fist = aprox. 10%**

LIVING POSIDONIA SHOOTS (WITH GREEN LEAFS) **record only living posidonia**



DEAD MATTE = DEAD SHOOTS (WITH NO GREEN LEAFS)



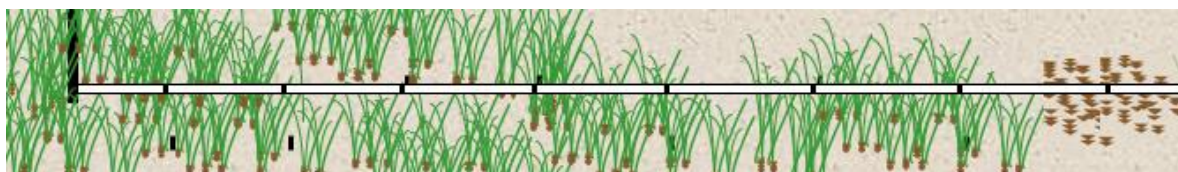
LINEAR COVER

MATERIALS:

- **Measuring tape** (30 meters)
- **Sheets** to write down the data

METHOD:

- 1 PERSON
- Go over the measuring tape along the 30m transects. Look at the sea floor right beneath the tape.



- Write down the meter and the decimetre every time there is a change in the type of seafloor:

EXEMPLE:

Living posidonia= P
 Dead posidonia= M
 Sand= S
 Rocks= R
 Mud= F
 Gravel= G
 + If another, specify

From (m. dm)	To (m. dm)	Type
0	4.2	P
4.2	8	S
8	19.5	P
19.5	20	S
20	24	M
24	30	P

- FURTHER CONSIDERATIONS:

- The minimum distance occupied by a different type of seafloor has to be 20 cm (you can use your palm as a proxy). *For example: if there were posidonia, then a 10 cm sand patch and then more posidonia, you don't need to write down the 10cm patch occupied by sand.*
- Pull aside the posidonia leaves (living or dead) to be able to see the seafloor covered by them.
- **VERY IMPORTANT: TO DISTINGUISH BETWEEN LIVING AND DEAD POSIDONIA**
 - **LIVING POSIDONIA SHOOTS=** THEY HAVE GREEN LEAVES



- **DEAD POSIDONIA=**

RIZOME REMAINS OR SHOOT BASES WITHOUT GREEN LEAVES

The dead rhizome may be covered by algae or sediment, to detect it: Look carefully, touch the seafloor and pull aside the sediment. If you hesitate between algae or posidonia rhizome, you can break a little fragment, if it is woody, then it is rhizome.

