THE MED FUND

HIGHLY PROTECTED MEDITERRANEAN INITIATIVE

Monitoring Marine Biodiversity

Assessing the response of Mediterranean marine ecosystems towards climate change

2 SURVEY PROTOCOLS

ECOSUSTAIN

N.E.C.C.A.
Natural Environment and Climate Change Agency

As part of this deliverable, led by ECOSUSTAIN G.P., a portion of the obligations stemming from the Grant Agreement between the Natural Environment and Climate Change Agency (NECCA) of Greece and MedFund for the project “Highly Protected Mediterranean Initiative” are fulfilled.

The “Highly Protected Mediterranean Initiative” is funded by MedFund, which was established in 2015 by France, Tunisia, and Monaco with the support of the Prince Albert II of Monaco Foundation. This initiative reflects the collective commitment of several Mediterranean countries and international environmental organizations, united by the belief that the future of the Mediterranean and its populations demands immediate action.

The main idea

Climate change is having a direct impact on the abundance, distribution and survival of living organisms worldwide, with serious consequences for the functioning of coastal ecosystems and the services they provide. These impacts are of particular concern in the Mediterranean Sea, which is warming faster than the oceans. Documenting these changes is a key pillar in supporting the Marine Strategy Framework Directive.

However, the complexity of the marine ecosystem, combined with insufficient human and financial resources, makes observation opportunities difficult. This series of standardized protocols provides practical guidance for monitoring climate change-related impacts in Mediterranean marine areas.

The indicators have been selected based on their scientific relevance, feasibility and cost-effectiveness.

The involvement of volunteers is another key component in the implementation of these protocols. The adoption of these protocols allows participants to join a common and integrated strategy for monitoring the impacts of climate change.

The results will provide key information to support management strategies

Climate Fish Protocol

Underwater Visual Census of Climate Change Indicators

Aim and Objectives

Alterations in the distribution of fish species and their abundance is one of the clearest signs of climate change worldwide. This is especially noticeable in some coastal fish species in the Mediterranean, whose presence changes depending on their thermal affinity and origins. To help track these changes, a simple visual survey method has been developed to monitor specific **coastal fish species**. This method, already in use across several Mediterranean countries, is designed to be easy for a wide range of people to use, covering large areas and repeated over time.

Target Species

Based on scientific knowledge, the following species are proposed as reliable indicators of global warming in the Mediterranean Sea.

✓ 7 native species:

Parrotfish *(Sparisoma cretense*)
Dusky grouper (*Epinephelus marginatus*)
Ornate wrasse (*Thalassoma pavo*)
Salema porgy (*Sarpa salpa*)
Painted comber (*Serranus scriba*)
Mediterranean rainbow wrasse (*Coris julis*)
Comber (*Serranus cabrilla*)

✓ 5 observed exotic species:

Lionfish (*Pterois miles*)
Rabbitfish (*Siganus luridus*)
Rivulated rabbitfish (*Siganus rivulatus*)
Blue-spotted cornetfish (*Fistularia comersonii*)
Redcoat (*Sargocentron rubrum*)

Materials

- ✓ Pre-printed **board** for collecting data underwater and a **pencil**
- ✓ Underwater watch to count **5 minutes**
- ✓ Computer/thermometer to measure **water temperature**

Sampling Sites

This protocol can be performed only over **rocky bottoms** with moderate slopes. Sandy bottoms or *Posidonica oceanica* meadows must be avoided.

Depth ranges are: 1-3m, 5-10m, 11-20m, 21-30m.

At 1-3m observations can be conducted by either SCUBA or snorkeling on the surface.

Period of Monitoring

Any time of the year.

Re-visits of sites are encouraged.

Suggested periodicity: between August and October, every year.

Field experience

Skills to identify and count fish underwater.

Sampling Design

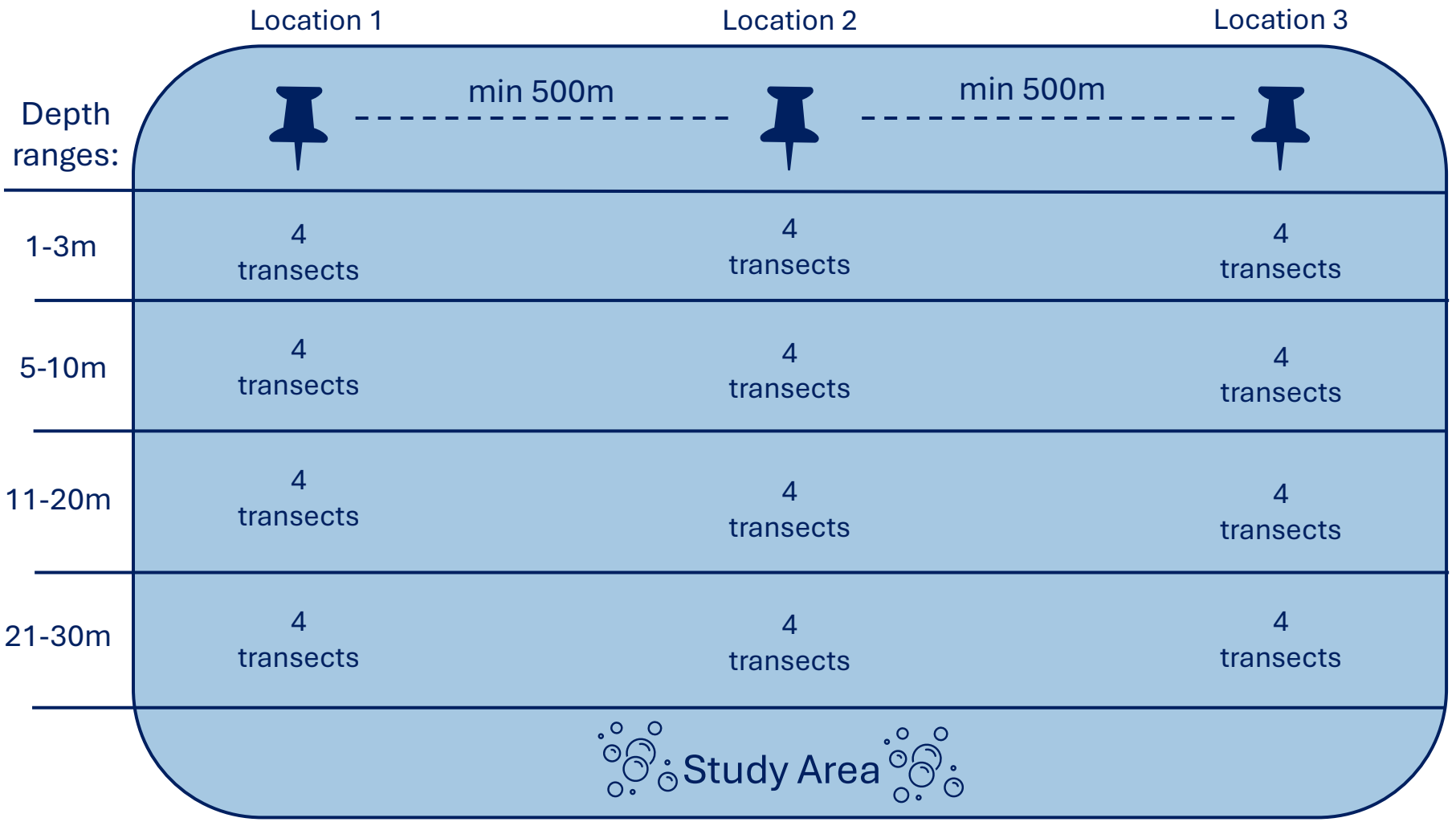
Within your study area select at least 3 permanent locations separated by a minimum distance of about 500m. At each location and for each depth range, 4 consecutive transects are required (combined effort).

For every dive you perform this assessment, you can choose one or more depth ranges.

You can work in teams and divide the task according to the number of participants.

For example, you can make teams of 4 divers to accomplish the 4 transects. Divers can then work in pairs with one diver counting the abundance of fish and the other controlling time and depth. For the second transect, participants can change roles. This way you can achieve the required 4 transects in one site and depth with a reasonable diving time and effort.

The depth of 1-3 m is the most important one: you might choose to monitor only this layer by snorkeling.



Sampling Design:

4 transects are requested at each depth range for 3 permanent locations in your study area within a year.

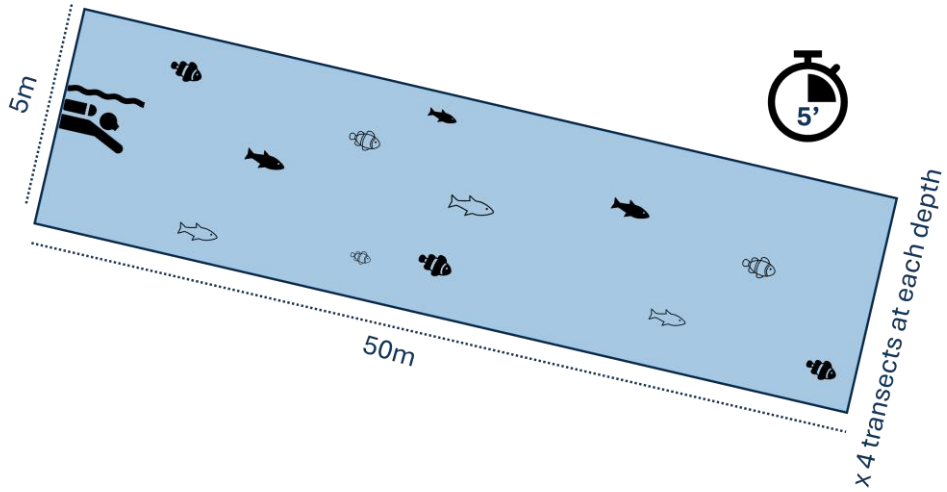
This is a combined effort that different divers can achieve during different visits.

You don't have to perform all transects in one dive!

It is recommended, however, to consecutively perform the 4 transects of a selected depth range.

How to count fishes

- ✓ Swim VERY slowly underwater for **5 minutes** for a distance of about **50m** (swimming speed: 10m/minute)
- ✓ While swimming forward, count all the species and individuals you observe within a **radius of 2.5m** (the transect is 5m wide). Do not count fishes too far from you
- ✓ Do not count fishes smaller than 2 cm
- ✓ Once you finish the first transect (after 5 minutes) you can proceed in the same direction starting a new transect (reminder: each census requires **4 transects per depth** range)



Data reporting

Scan the QR code on the pre-printed protocol board (also available **here**). A Google Forms document will open. Upload your data from the pre-printed board to the document.

Data can be used to build time series and track changes in the relative abundance of indicator species. For further information please contact: m.maryzotou@gmail.com

Scan me

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Tips

If you want to calibrate yourself underwater, you can use a plastic meter or a rope with a known length to understand the distances (5m width and 50m length = 1 transect).

One of the fields required (in both the protocol and the data report) is the “coordinates/ location”. You can use Google Maps to find the coordinates of your dive site and copy them in the Data Report.

Species List

Thalassoma pavo
(ornate wrasse)

Coris julis
(Mediterranean rainbow wrasse)

Sparisoma cretense
(parrotfish)

Sarpa salpa
(salema porgy)

Epinephelus marginatus
(dusky grouper)

Serranus scriba
(painted comber)

Serranus cabrilla
(comber)

Pterois miles
(lionfish)

Siganus luridus
(dusky spinefoot/ rabbitfish)

Sargocentron rubrum
(redcoat)

Fistularia commersonii
(blue-spotted cornetfish)

Siganus rivulatus
(marbled spinefoot/ rivulated rabbitfish)

Protocol preview

CLIMATE FISH

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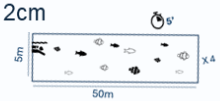
ONE TRANSECT = 1 CENSUS OF 5' = 5 x 50m
Choose a depth range
Perform 4 consecutive transects
Do not count fish smaller than 2cm



WHEN & WHERE
Location:
Name of permanent dive location:

Coordinates:
Date: __/__/___
Hours: __:__

OBSERVER
Name:
Diver level:
Species recognition skills:

☐ 1-3m ☐ 5-10m ☐ 11-20m ☐ 21-30m
Water temperature: °C

☐ 1-3m ☐ 5-10m ☐ 11-20m ☐ 21-30m
Water temperature: °C

	Transect 1	Transect 2	Transect 3	Transect 4
ornate wrasse				
Mediterranean rainbow wrasse				
parrotfish				
salema porgy				
dusky grouper				
painted comber				
comber				
lionfish				
rabbitfish				
rivulated rabbitfish				
blue-spotted cornetfish				
redcoat				

How to fill the protocol:

4. Write your location (e.g. Alonnisos)
5. Write the name of the permanent dive location
6. Insert the coordinates of the dive location (use Google Maps)
7. Write the date and time of your dive

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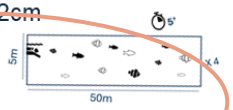
ONE TRANSECT = 1 CENSUS OF 5' = 5 x 50m
Choose a depth range
Perform 4 consecutive transects
Do not count fish smaller than 2cm

WHEN & WHERE
Location:
Name of permanent dive location:

Coordinates:
Date: __/__/___
Hours: __:__

OBSERVER
Name:
Diver level:
Species recognition skills:



☐ 1-3m ☐ 5-10m ☐ 11-20m ☐ 21-30m Water temperature: °C		☐ 1-3m ☐ 5-10m ☐ 11-20m ☐ 21-30m Water temperature: °C	

	Transect 1	Transect 2	Transect 3	Transect 4
ornate wrasse				
Mediterranean rainbow wrasse				
parrotfish				
salema porgy				
dusky grouper				
painted comber				
comber				
lionfish				
rabbitfish				
rivulated rabbitfish				
blue-spotted cornetfish				
redcoat				

1. Fill your name
2. Add your diving license level
3. Fill the shell icon according to your skills:

Medium

Good

Very good

How to fill the protocol:

8. Check the box for the depth range of your dive
9. Write the water temperature
10. For each transect, write the number of individuals from every species that you count

Don't forget to upload your observations!

CLIMATE FISH

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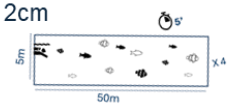
ONE TRANSECT = 1 CENSUS OF 5' = 5 x 50m
Choose a depth range
Perform 4 consecutive transects
Do not count fish smaller than 2cm



WHEN & WHERE
Location:
Name of permanent dive location:

Coordinates:
Date: __/__/___
Hours: __:__

OBSERVER
Name:
Diver level:
Species recognition skills:

☐ 1-3m ☐ 5-10m ☑ 11-20m ☐ 21-30m
Water temperature: °C

☐ 1-3m ☐ 5-10m ☐ 11-20m ☐ 21-30m
Water temperature: °C

	Transect 1	Transect 2	Transect 3	Transect 4
ornate wrasse	1			
Mediterranean rainbow wrasse				
parrotfish				
salema porgy	6			
dusky grouper				
painted comber				
comber	3			
lionfish				
rabbitfish				
rivulated rabbitfish				
blue-spotted cornetfish				
redcoat				

Reef Check Protocol

Underwater Visual Census of Rocky Reef's Health Indicators

Aim and Objectives

Mediterranean marine coastal habitats support a wealth of biodiversity and are essential to the health and balance of the ecosystem. To monitor their ecological status, this protocol has been developed to focus on species that represent key aspects of Mediterranean **rocky reefs**, and of the changes they may be undergoing.

By gathering data on the presence or absence, and abundance of these species, participants contribute to tracking shifts in biodiversity and assessing **habitat health**. The protocol also encourages reporting threats and other stressors that may impact these fragile ecosystems, offering a more comprehensive picture of the challenges they face.

Target Species

The proposed species are selected based on a combination of criteria including, being easily observable and identifiable underwater and one or more of the following: a Non-Indigenous Species (NIS) or a species protected under European directives or international conventions; sensitive to climate change; an ecosystem engineer; threatened by human activities or commercially exploited and inhabit the study area.

When it is not easy to distinct between species, genus level was chosen, as in the case of the two protected Mediterranean seahorses.

Participants can **choose which and how many of the 20 species** they will focus on, according to the expected habitat typology and personal preferences.

Reef Check Protocol

Materials

- ✓ Pre-printed **board** for collecting data underwater and a **pencil**
- ✓ Underwater watch/ **dive computer** to measure time and depth

Sampling Sites

This protocol can be performed only over **rocky reefs**. Sandy bottoms or *Posidonica oceanica* meadows must be avoided.

There is no depth limitation.

Observations can be conducted by either SCUBA or snorkeling on the surface.

Period of Monitoring

Any time of the year.

Re-visits of sites are encouraged.

Field experience

Skills to identify species underwater.

Participants must be able to make independent observations on the presence/absence and abundance of the selected species.

Methods

Underwater, record:

- ✓ the **abundance** (using numerical or descriptive classes according to the countability of organisms) of each searched species,
- ✓ the **depth range** (min and max) of each searched species,
- ✓ and the type of **habitat** where they are encountered (picked from a list).

Species actively searched for, but not encountered, are recorded as absent.

Total **survey depth** range (min and max), and observation **effort** (dedicated time) should be noted.

Threats, like: coral diseases (e.g. bleaching and necrosis) and injuries, epibionts overgrowth, species threatened by abandoned fishing lines and nets, mass mortality events, and mucilagenous algal bloom should be documented.

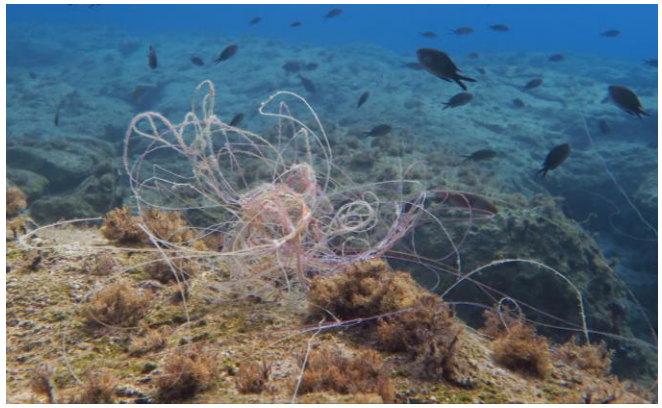
Types of Habitat

- ✓ Coastal rocky reef
- ✓ Offshore rocky reef
- ✓ Rocky cliff (wall dive)
- ✓ Cave
- ✓ Artificial substrates (e.g. wrecks)

Tips

Choose species you are more confident with (probably reducing errors), those you like the most (making the diving experience more satisfactory), or limit yourselves to a number of species you feel able to handle (which reduces pressure).

One of the fields required (in both the protocol and the data report) is the “coordinates/ location”. You can use Google Maps to find the coordinates of your dive site and copy them in the Data Report.



Data reporting

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Data can be used to build time series and trac changes in the relative abundance of indicato species. For further information please contact m.maryzotou@gmail.com

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Species List

Caulerpa cylindracea

Asparagopsis taxifomis

Axinella spp.

Aplysina spp.

Cladocora caespitosa
(pillow coral)

Oculina patagonica

Balanophyllia europaea
(pig-tooth coral)

Leptopsammia pruvoti
(sunset cup coral)

Paramuricea clavata
(violescent sea-whip)

Eunicella cavolini
(yellow gorgonian)

Savalia savaglia
(gold coral)

Epinephelus marginatus
(dusky grouper)

Species List

Hippocampus hippocampus

Hippocampus guttulatus

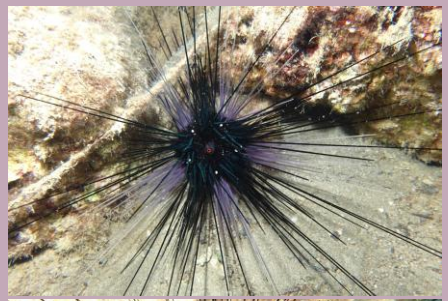
Pterois miles (lionfish)

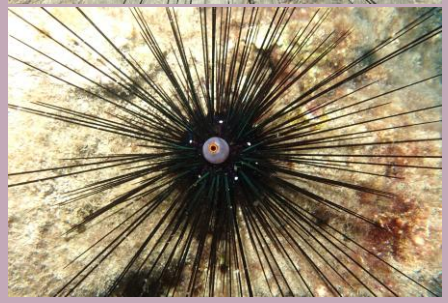
Sargocentron rubrum (redcoat)

Ophidiaster ophidianus

Centrostephanus longispinus

Paracentrotus lividus





Diadema setosum

Protocol Preview

REEF CHECK

QR

OBSERVER
Name:
Diver level:
Species id skills:

ABUNDANCE
A: one isolated specimen
B: some scattered
C: several scattered
D: one crowded area
E: some crowded areas
F: several crowded areas

WHEN & WHERE
Location:
Name of dive site:

Coordinates:
Date: __/__/____
Hours: __:__

Habitat type:

Total dive time:

Depth range:

THREATS
☐ Abandoned fishing gear ☐ Coral bleaching/ injuring
☐ Mass mortality event ☐ Mucilageous aglal bloom

Caulerpa cylindracea — 0 A B C D E F — Depth min: max:

Asparagopsis taxifomis — 0 A B C D E F — Depth min: max:

Axinella spp. — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

Aplysina spp. — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

Cladocora caespitosa — 0 A B C D E F — Depth min: max:

Oculina patagonica — 0 A B C D E F — Depth min: max:

Balanophyllia europaea — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

Leptopsammia pruvoti — 0 A B C D E F — Depth min: max:

REEF CHECK

Paramuricea clavata — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

Eunicella cavolini — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

Epinephelus marginatus (grouper) — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

Savalia savaglia — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

Hippocampus hippocampus — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

Hippocampus guttulatus — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

Pterois miles (lionfish) — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

Sargocentron rubrum (redcoat) — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

Ophidiaster ophidianus — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

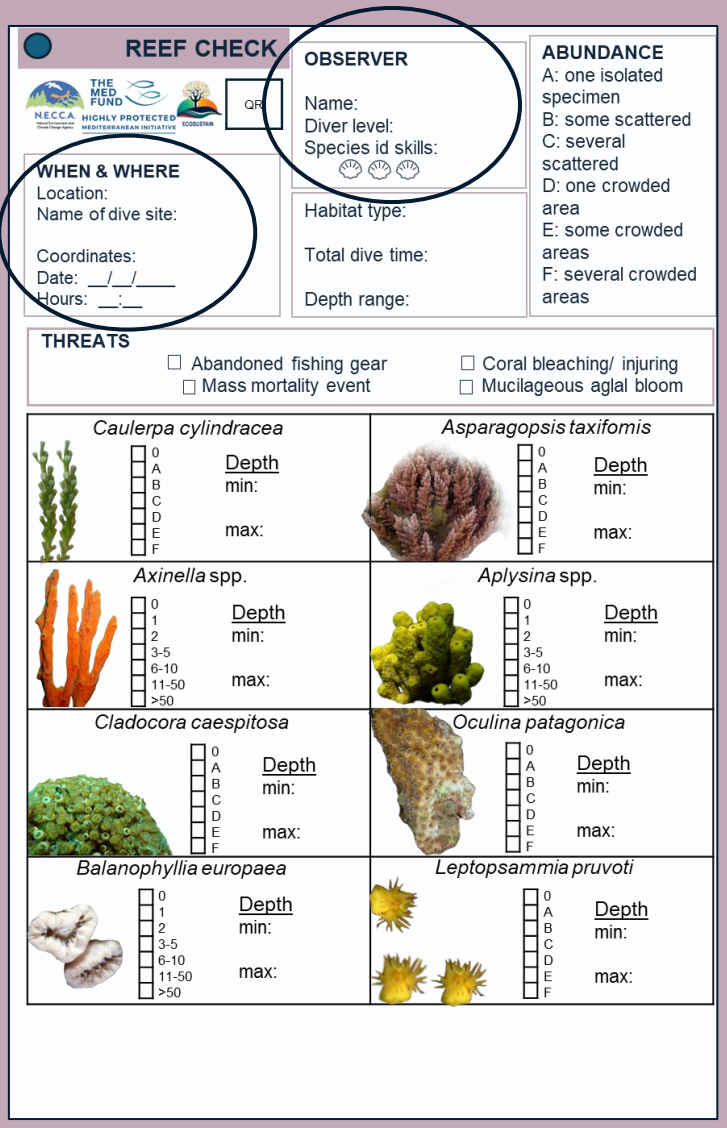
Paracentrotus lividus — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

Centrostephanus longispinus — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

Diadema setosum — 0 1 2 3-5 6-10 11-50 >50 — Depth min: max:

How to fill the protocol

4. Write your location (e.g. Alonnisos)
5. Write the name of the dive site
6. Insert the coordinates of the dive location (use Google Maps)
7. Write the date and time of your dive



1. Fill your name
2. Add your diving license level
3. Fill the shell icon according to your skills:

Medium

Good

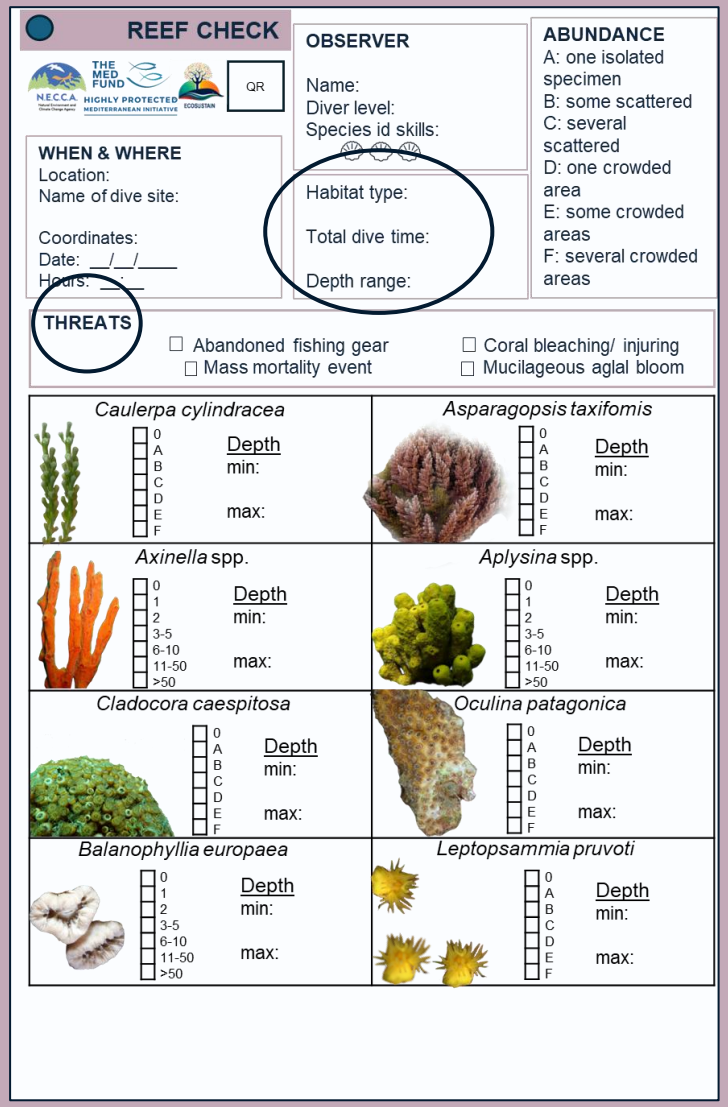
Very good

How to fill the protocol

8. Choose which and how many species you will observe
9. Choose and write the habitat type from:

   coastal rocky reef
   offshore rocky reef
   rocky cliff
   cave
   wreck

8. At the end of your census, write your total dive time and the depth range that you surveyed
9. In case you observe one or more of the listed threats, check the box



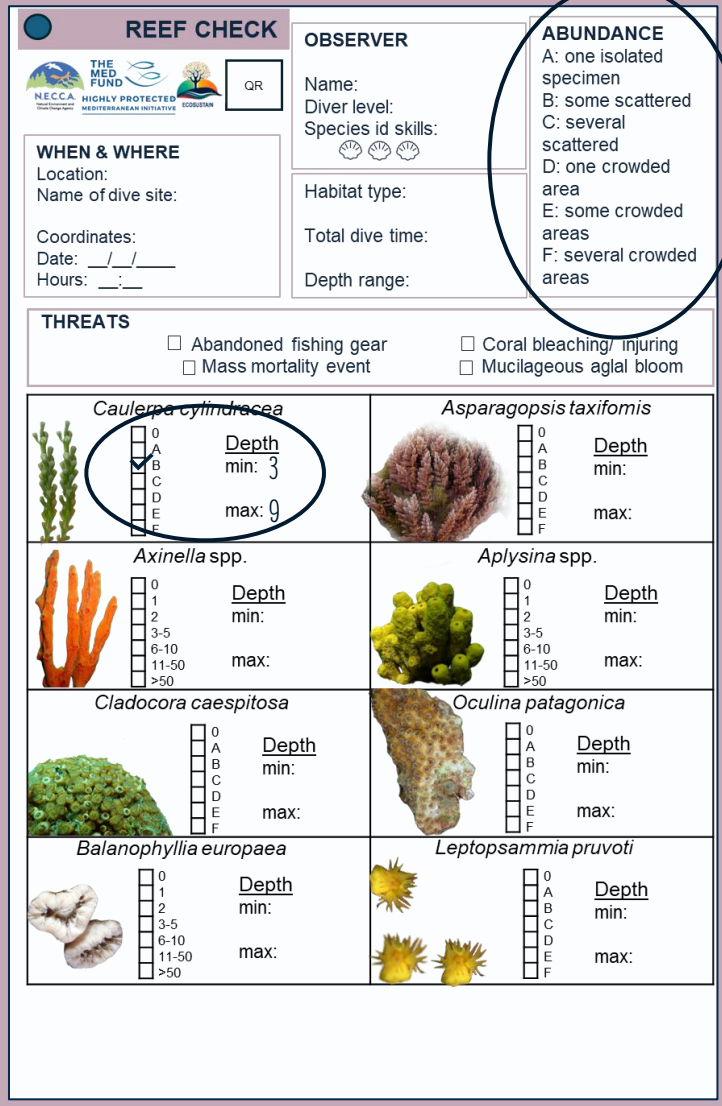
How to fill the protocol

12. For the species you selected, write the minimum and maximum depth that you found them
13. And for the same species, check one of the boxes that describe their abundance.

Choose “0” if you actively searched for a species, but was absent.

The boxes for the abundance characterization correspond to either numerical or descriptive classes. For descriptive classes use the legend in the top right corner of the protocol.

Don’t forget to upload your observations!



Credits

Photos: Dailianis Thanos, Faulwetter Sarah, Papadakis Orestis, Poursanidis Dimitrios, Ragkousis Michail, Ramfos Alexios, Sini Maria, Zotou Maria

The protocols for this project were adapted from the following existing frameworks and tailored specifically to the context of Alonissos:
Climate Fish: CIESM project Tropical Signals
Reef Check: Reef Check Med Underwater Coastal Environment Monitoring Protocol (RCMed U-CEM)

Edit: Maria Zotou, Maria Sini, Stelios Katsanevakis