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IATTC Ad Hoc WG on FADs, San Diego

Data Collection for Assessing Impacts of FAD Stranding Events
FAD-09 RD-F

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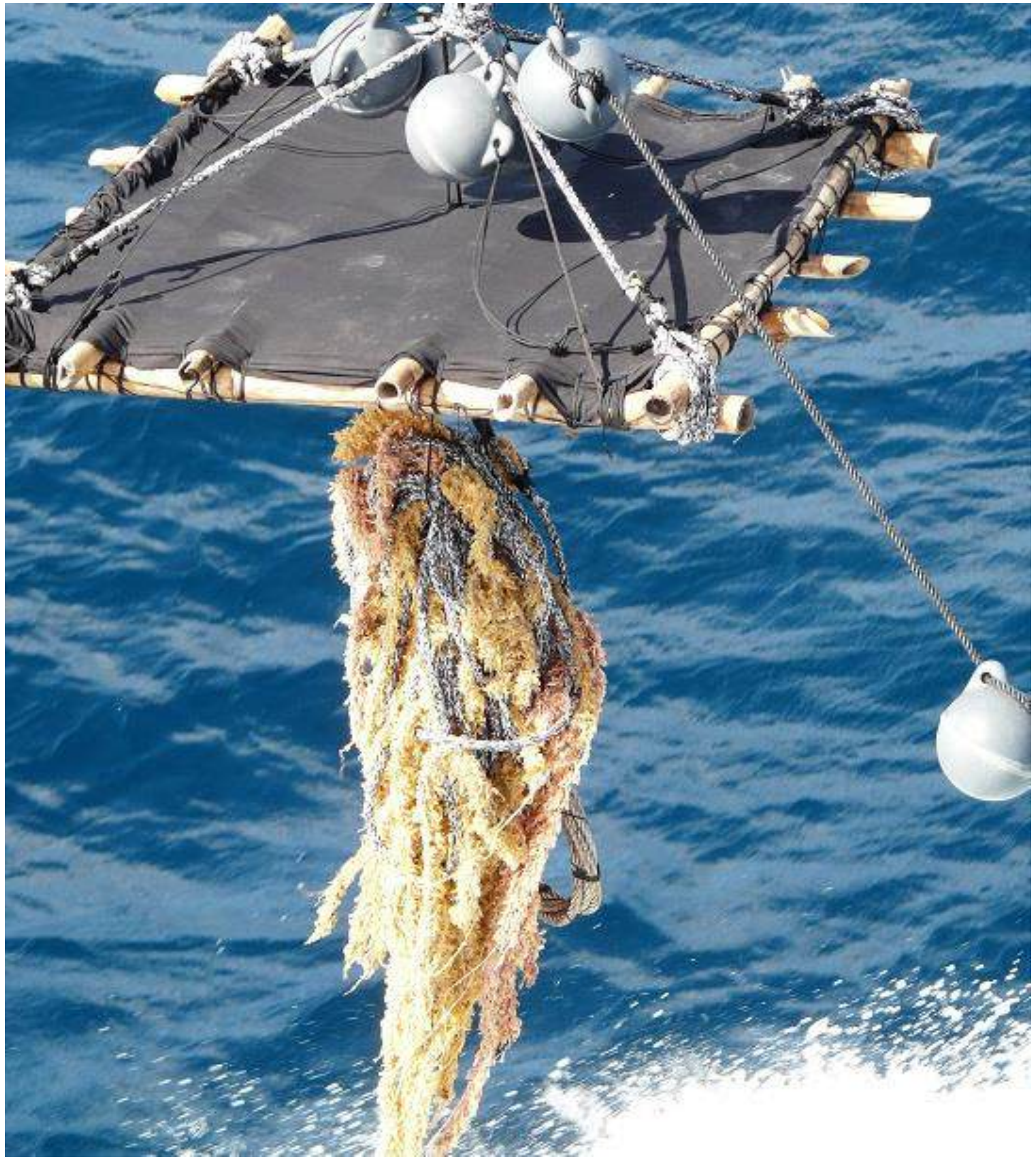


- **Fish Aggregating Devices (FADs)** are geo-localized floating objects that are strategically designed and deployed to **attract pelagic fish.**
- FADs are intensively **used in the tuna fisheries industry** worldwide, as means to make the fishing activity more efficient.
- FADs drift with currents and can move outside the fishing grounds, being lost and abandonned.
- Over the past few years, the **impacts of FADs on coral reefs** have become a **matter of discussion and concern**.
- Yet, these **discussions have often been based on observations rather than on scientific research**.
- This project aimed at **defining and testing a methodology** that would allow **assessing the impacts** of FADs on coral reefs **and** suggest **guidelines for Data Collection**.
- This work was carried out in D´Arros Island

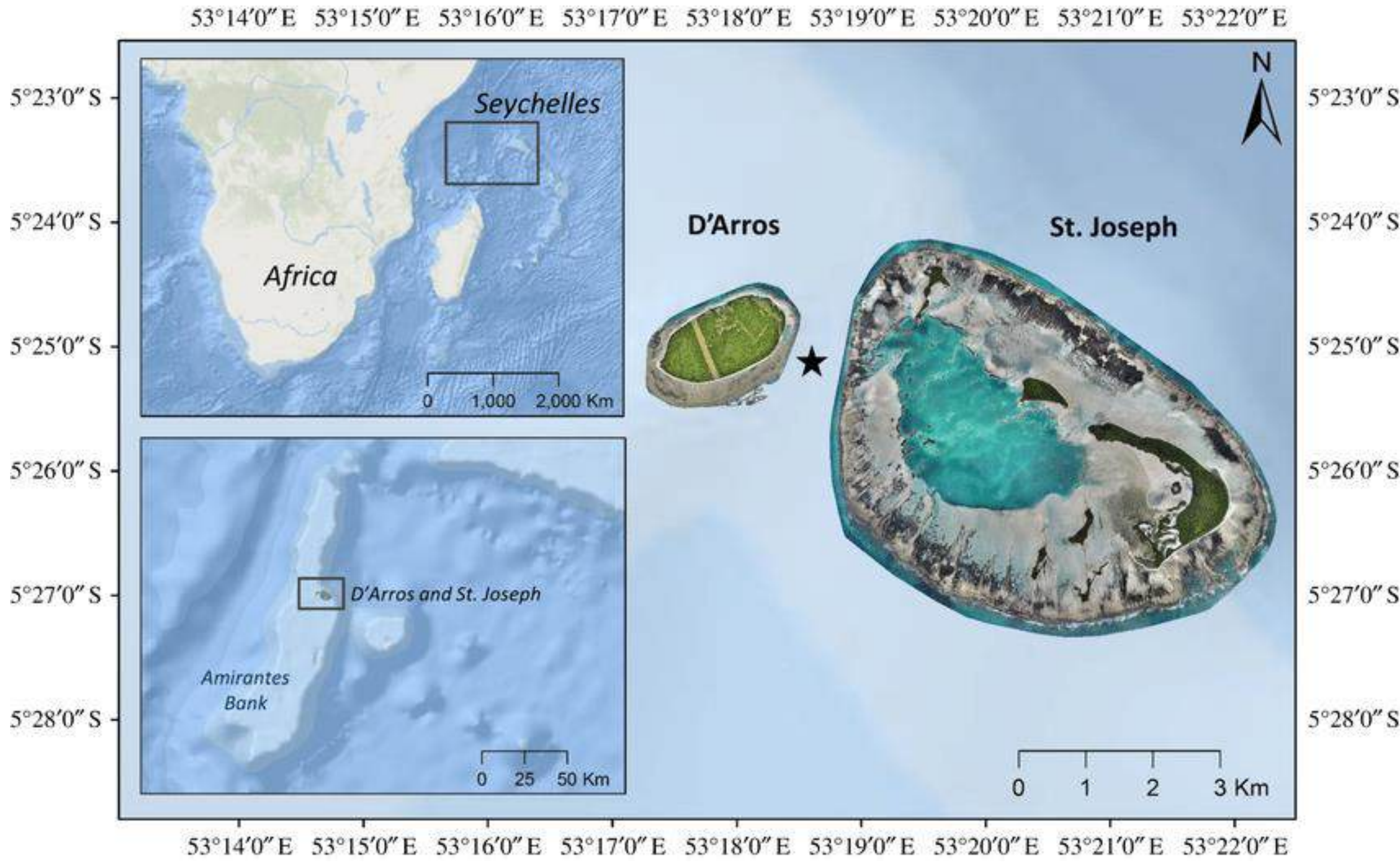
OBJECTIVES:

- Propose methodologies for assessing FAD impacts on coral reefs.
- Propose guidelines for data collection for assessing FAD impacts on coral reefs.
- Identify factors contributing to damage caused by FAD stranding.

STUDY AREA:

D´Arros Island and Saint Joseph Atoll were selected in the Indian Ocean based in the following criteria:

- Localized in the proximity of tuna FAD fisheries grounds.
- The presence of FADs.
- Coral reefs were available.
- Diving infrastructure was in place.
- They are virgin areas with other anthropogenic threats kept at minimum levels.



Source: Peel et al., 2019

(Source: https://features.saveourseas.com/darros-and-st-joseph-reserve/index.html)

- How to survey the potential impacts of FADs on coral reefs?

What about **fish impacts**?

Which **methodology** will suit best?

How and where can I find FADs?

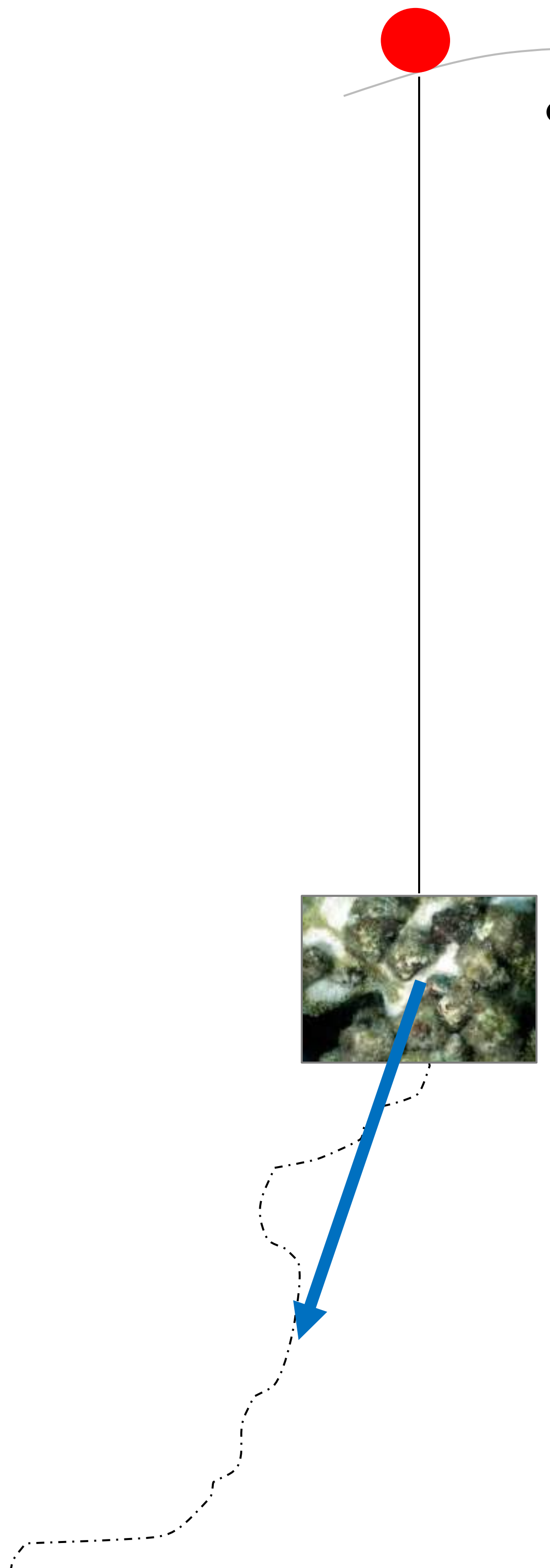
At which **depth** will they entangle?

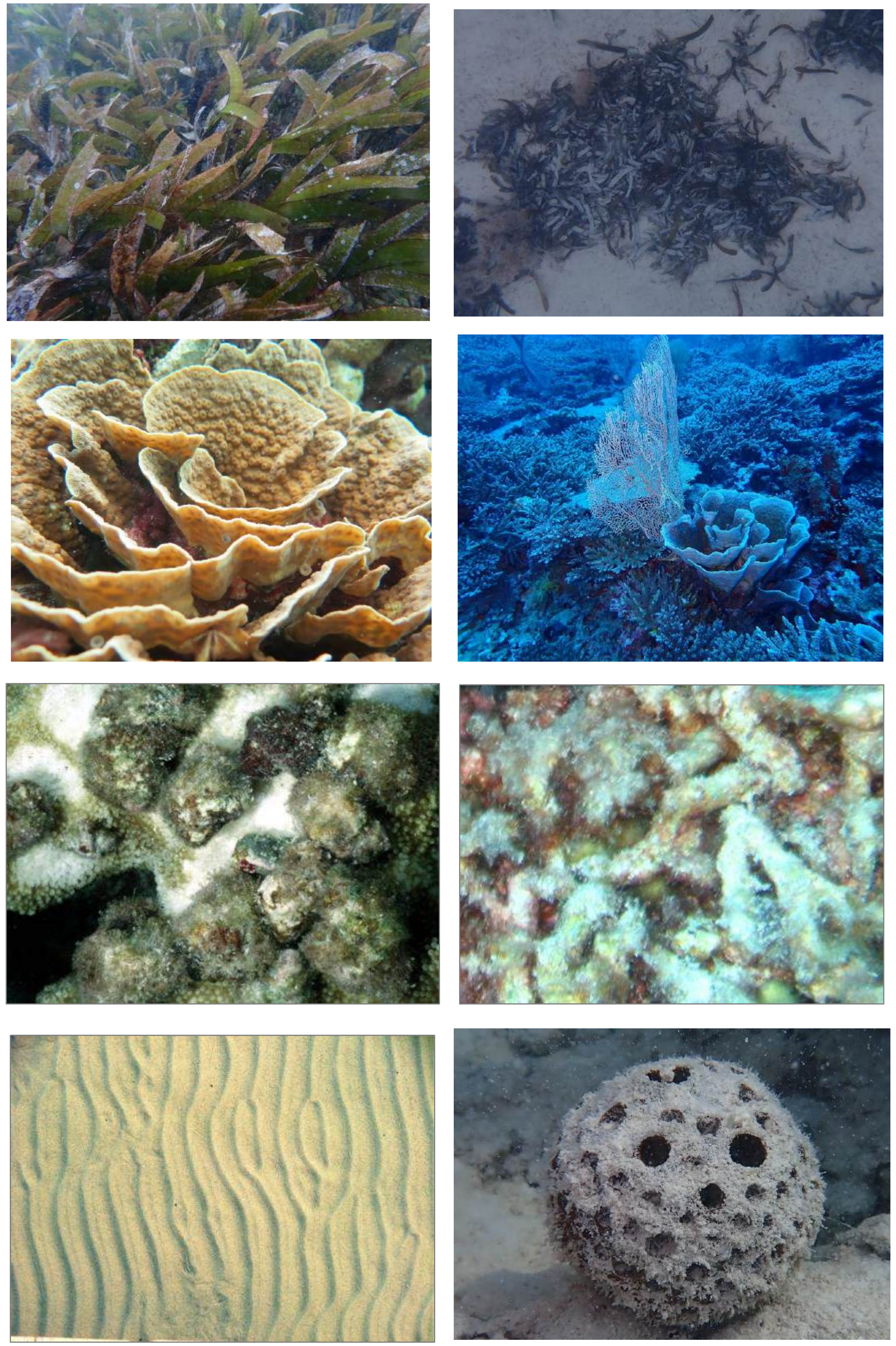
How can I **capture the impact**?

In **which habitat** type will I find FADs?

❖ Coral reef benthic surveys

- First, FADS were localized (SOSF support). (n=4)
- At each site, (FAD site and control site), **four perpendicular 10m transects** were deployed, starting at the centre of the FAD.
- Benthic cover of habitat types were identified after **two methodologies**: i) line intercept method and ii) photo quadrat method.
- For each FAD found (**FAD site**), a **control** site was identified at a minimum distance of 100m , same depth, and same habitat type.





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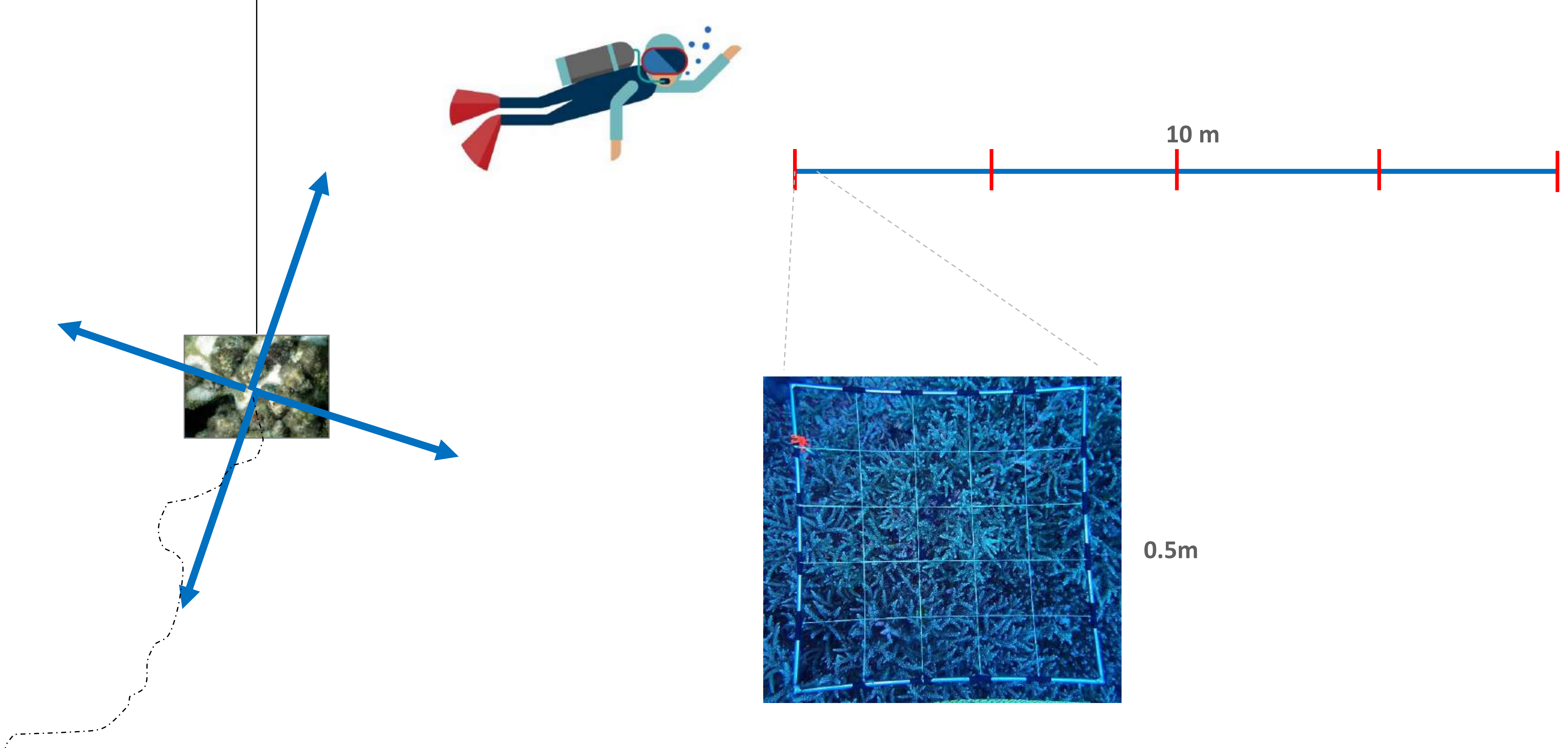
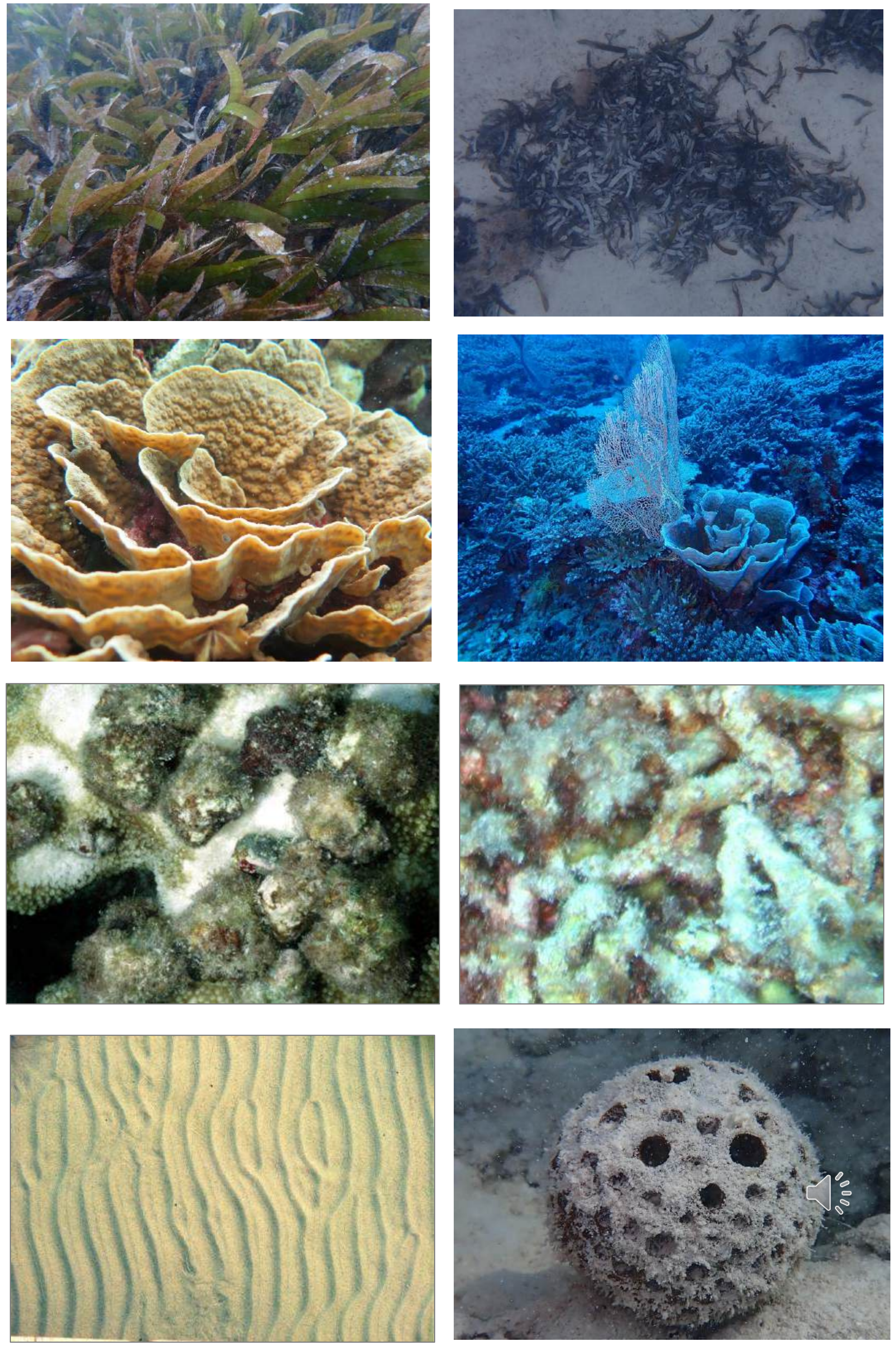


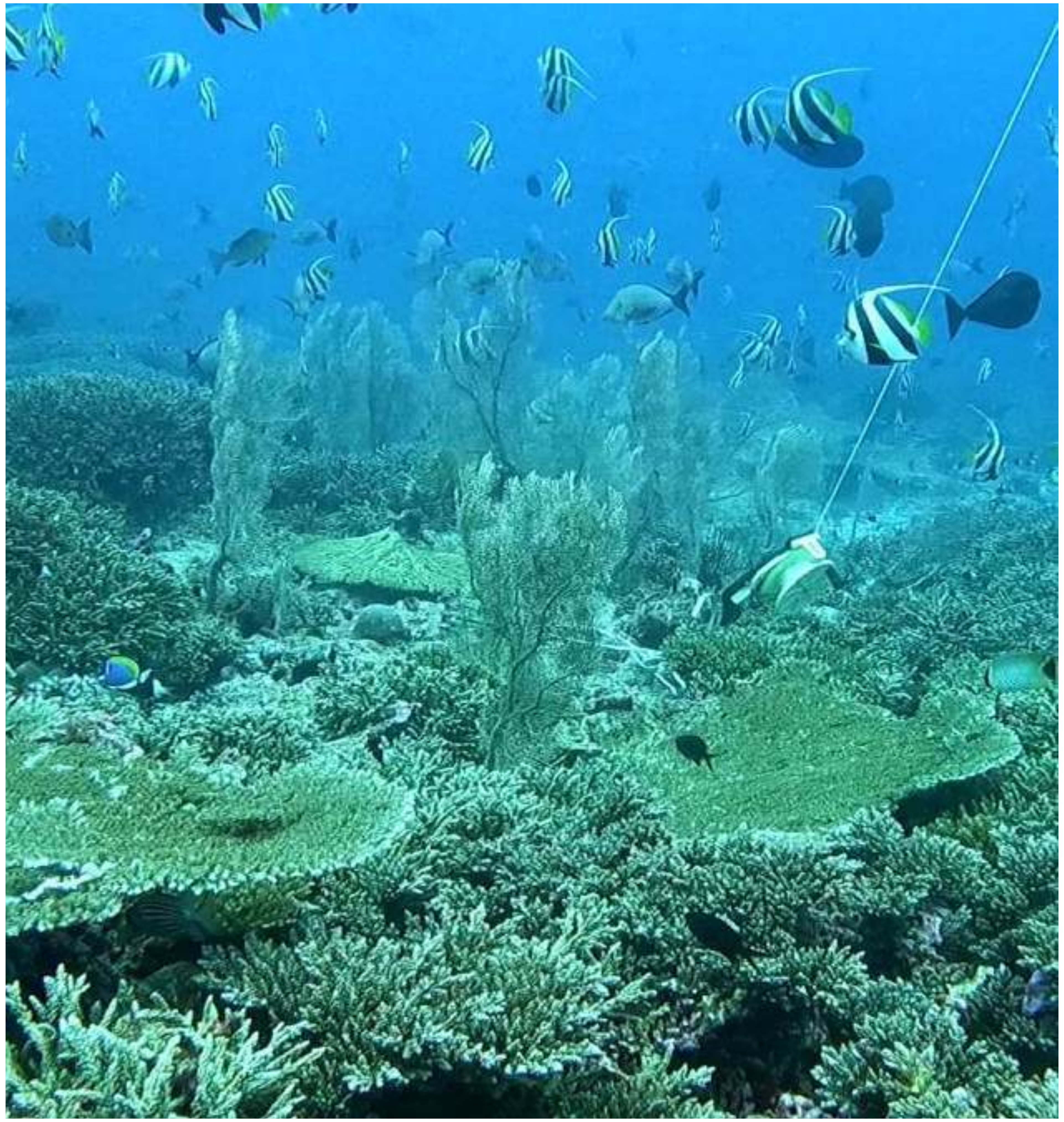


❖ Fish surveys

- At each site, (dFAD site and control site), **two 3 min observations** were conducted, looking at the dFAD from a 2.5 m distance. Each observation was conducted at opposing sides.

- Additional 2min 30 sec observations were carried out to explore for more **cryptic fish**.

- The fish surveys carried out at each FAD/control site turn into a unique value of fish abundance and fish species richness for each site.



FAD NUMBER				***1***
FAD CODE (GPS name)				
				XXX-XXX
BEACON CODE				***XXX-345677***
FAD TYPE				***"Jaula"***
OBSERVER				***Maria C. Uyarra***
DATE (First sighting)				***2022_05_15***
Latitude				***-5,43373***
Longitude				***53,32697***
Habitat type				***Patch reef***
Depth (m)				***18***
FLOATING PART	Length (beacon - raft)			***8***
	Beacon (Y/N)			***Y***
	Rope (Y/N)			***Y***
	Sausage net (Y/N)			***N***
	Floating devices (Y/N)			***Y***
	Floating devices	# Buoys		***3***
		Floating sausages	Hard/soft	***Soft***
			#	***2***
		Other	What?	
			#	
RAFT	Raft description	Canes	Yes/No	***N***
			#	
		Metallic	Yes/No	***Y***
			#	***1***
		PVC	Yes/No	***N***
			#	
		Other	Yes/No	***N***
			#	
	Superior coverage	Cov. w Net	Yes/No	***Y***
			Mesh size (cm)	***3***
		cov. w/o net (Y/N)		***N***
		non covered (Y/N)		***N***
		not visible (Y/N)		***N***
	Inferior coverage	Cov. W net	Yes/No	***N***
			Mesh size (cm)	
		cov. w/o net (Y/N)		***Y***
		non covered (Y/N)		***N***
		not visible (Y/N)		***N***
	Raft Sank		Yes/No	***Y***
			Substrate	***Seagrass***
			Aparent damage	***Seagrass erosion***
			Entanglement with...	***No***

	Availability (yes/No/I don´t know)		***Y***
SUBSURFACE STRUCTURE	Length (raft to weight) (m)		***45***
	net in sausage	Yes/No	***Y***
		Mesh size (cm)	***10***
	open net	Yes/No	***N***
		Mesh size (cm)	
	single net pieces	Yes/No	***N***
		Mesh size	
	rope / no mesh		***Y***
	Laying on benthic substrate	Yes/No	***Y***
		Substrate	***Seagrass***
		Aparent damage	***No***
		Entanglement with...	***No***
	Attractors	# Bags	***0***
		# Colour belts	***15***
		# Other	***0***
	Biodegradable materials	Yes / No / Don´t know	***Y***
		In which parts?	***Ropes***
WEIGHT	Available (Yes/no)		***Y***
	Type		***Motor piece***
	Weight Sank	Substrate	***Seagrass***
		Aparent damage	***Erosion***
		Entanglement with...	***N***
OTHER COMPONENTS	plastic containers		***N***
	Corks		***N***
	Wood		***Y***
	Palms, canes...		***N***
	Other (indicate)		
OBSERVATIONS	Indicate any relevant information you may consider of interest (environment, additional informaiton on the FAD, situation in which you found the FAD, etc.)		***The entrance path of the FAD is clear as there is visible erosion on the seagrass patch. The FAD was removed prior to the survey. The site was marked with an underwater rope and cork, and recording the coordinates to be able to return to the site***

❖Coral reef benthic surveys

Line intercept method

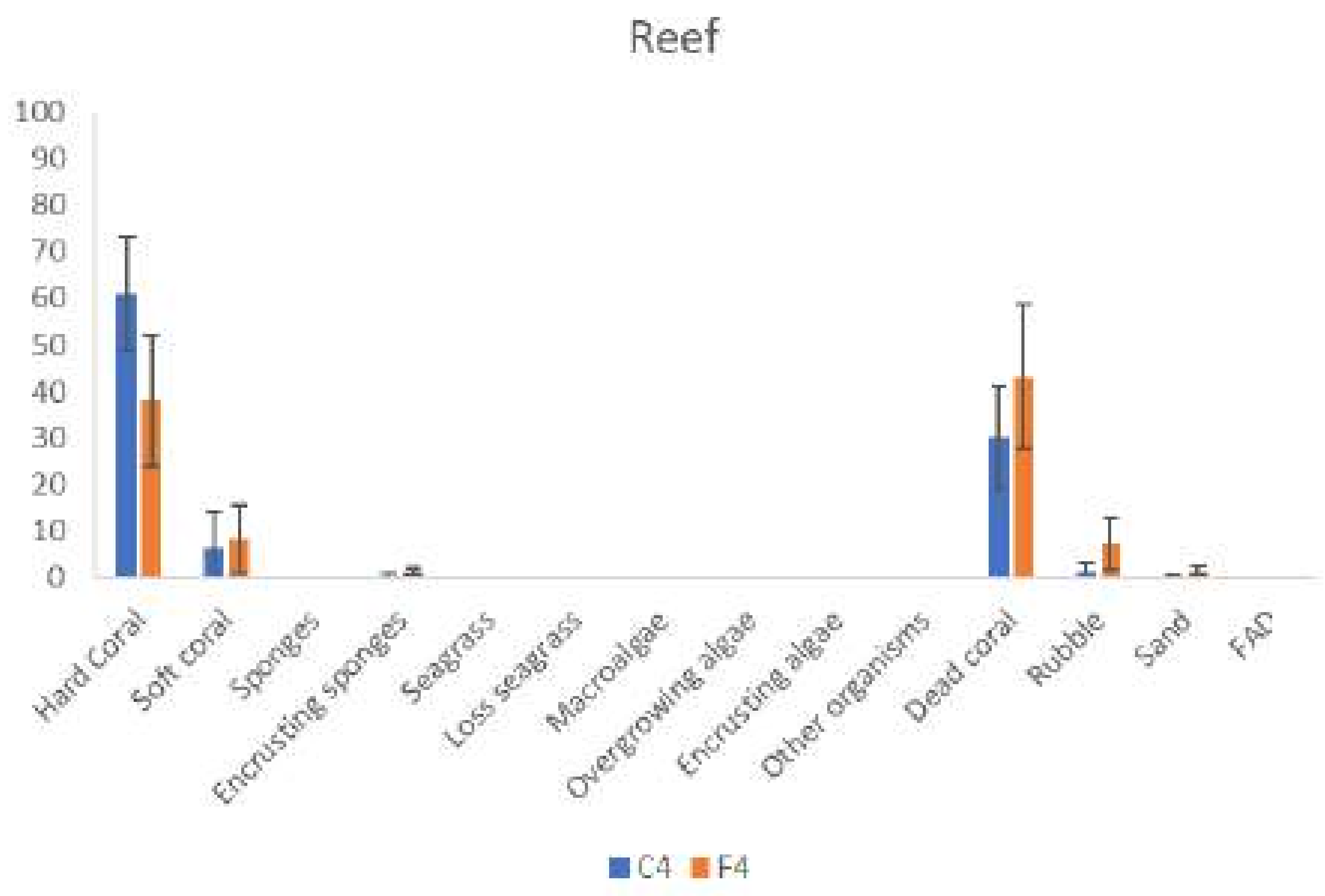
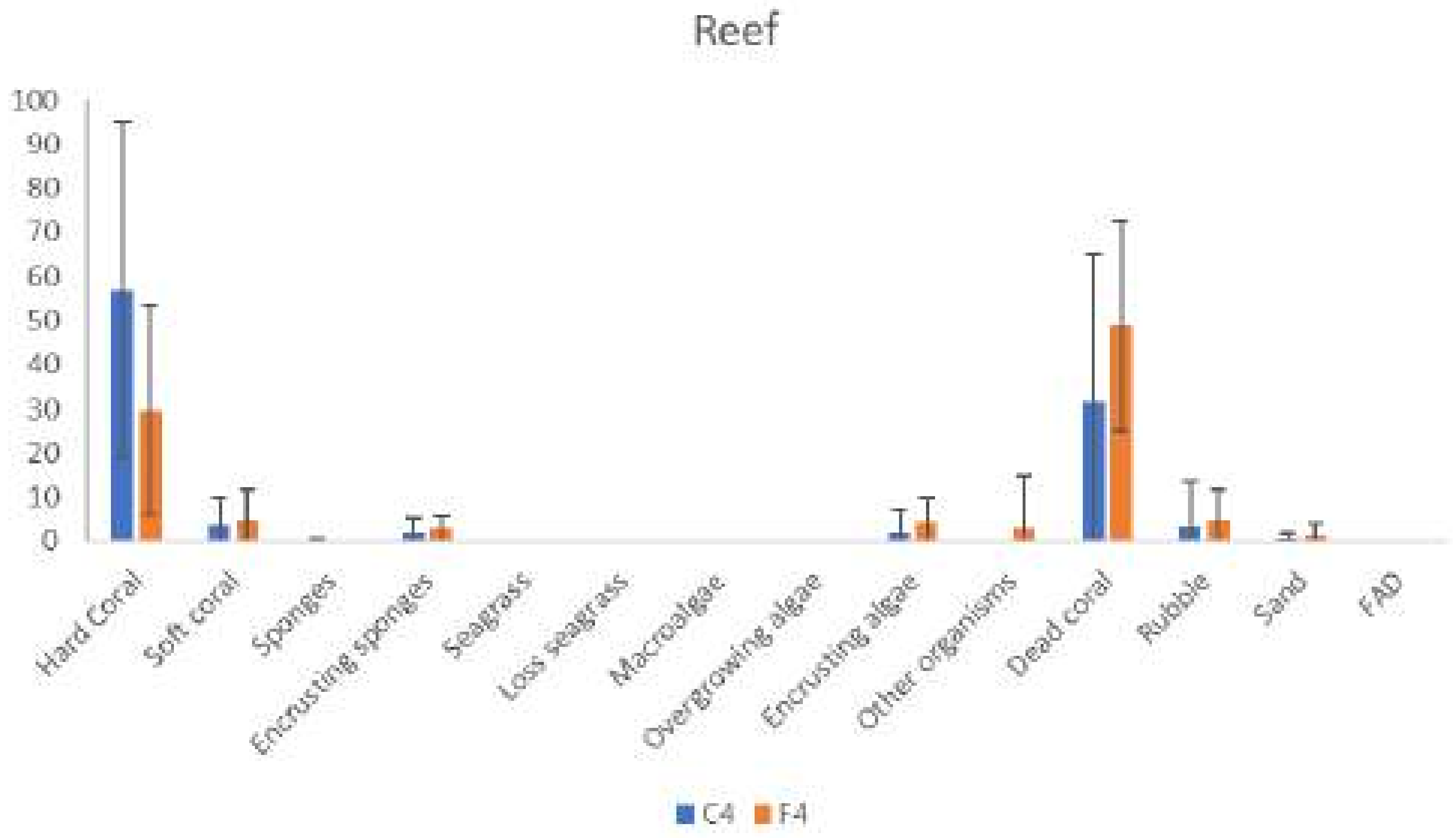


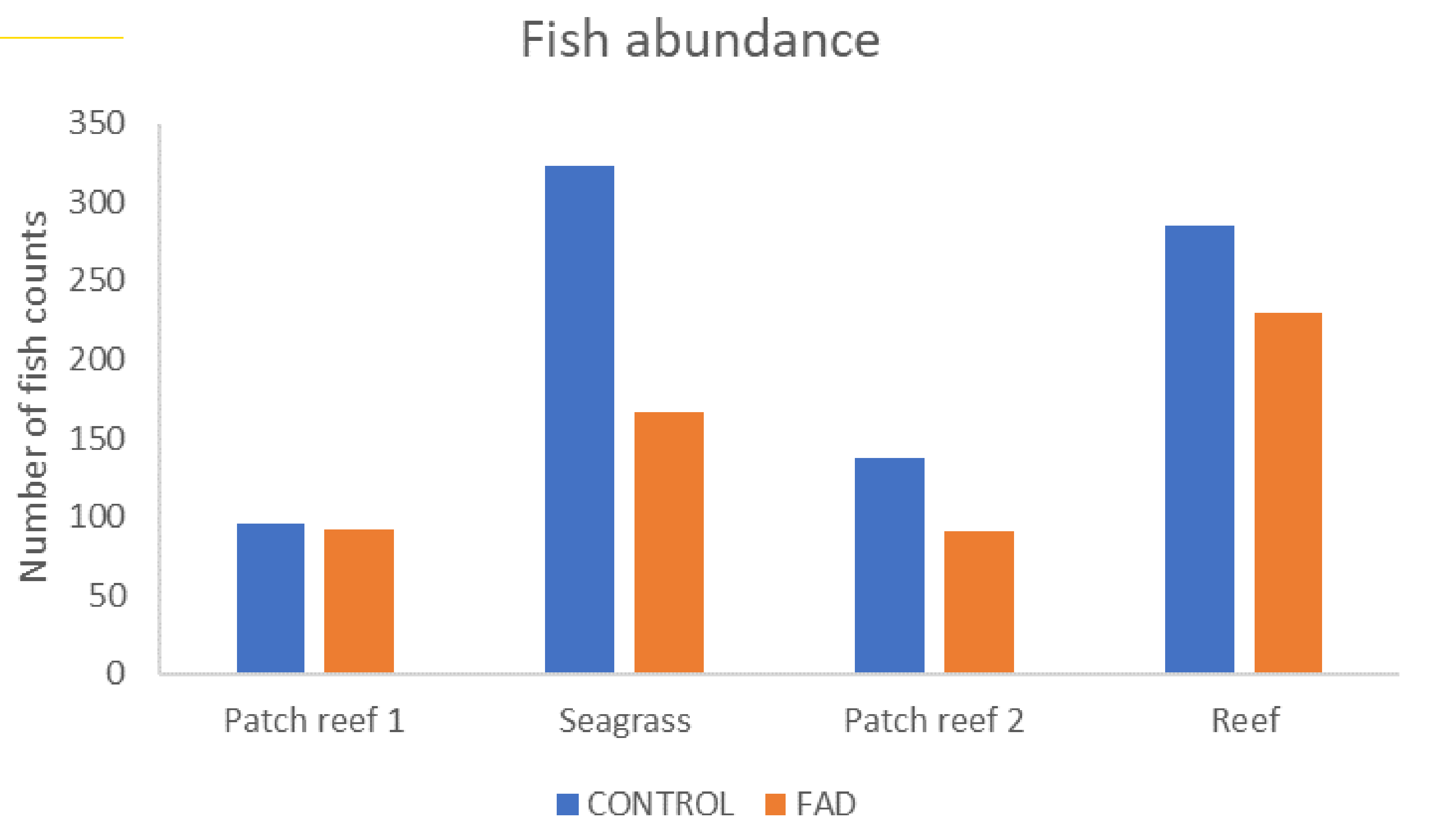
Photo Quadrants method

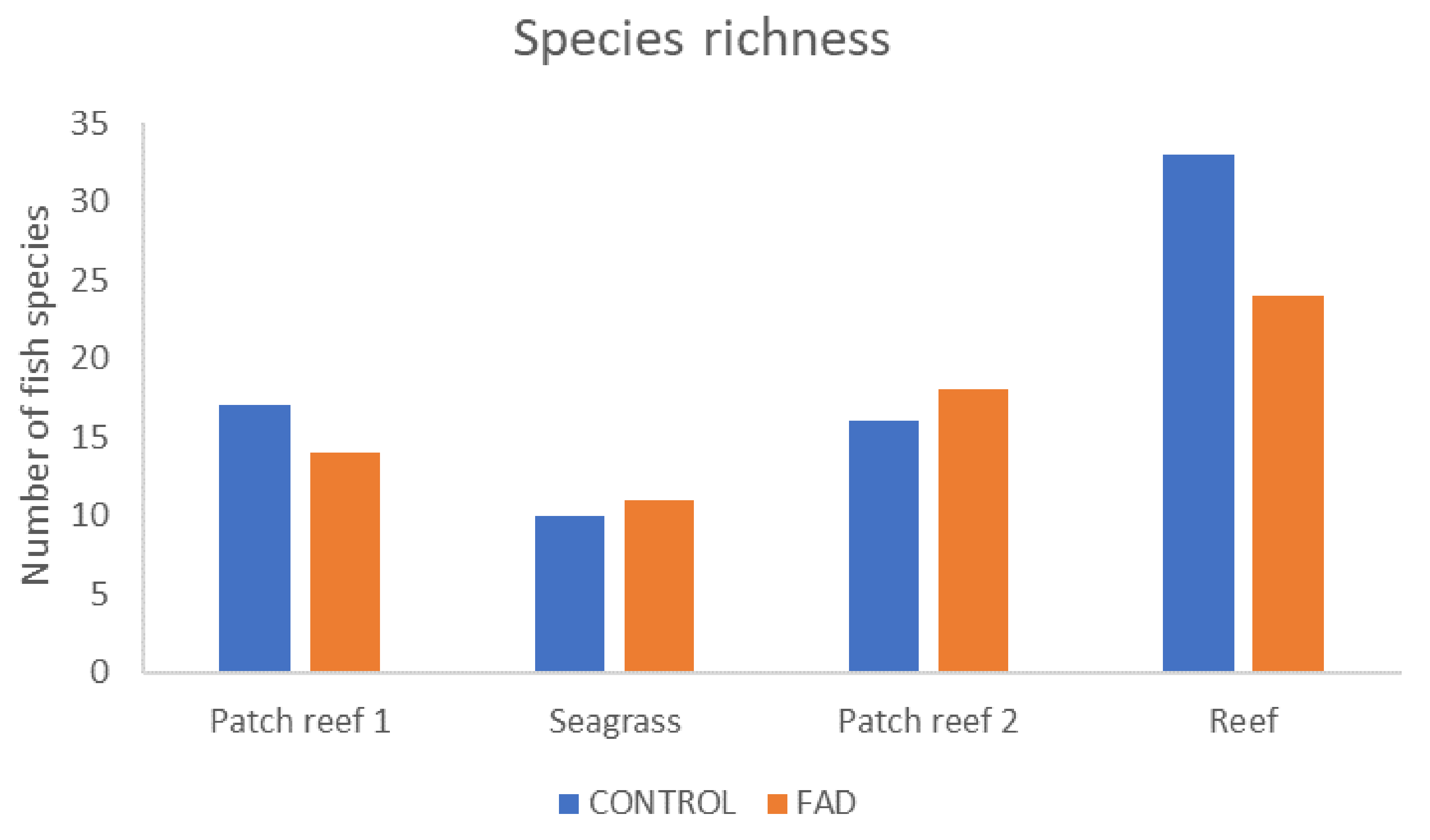


- The results are shown as illustrative examples of the implementation of the proposed methodology.
- Lower variability in **line intercept** method than when applying photo Quadrants.
- **Faster** and **less equipment** dependent than photo quadrant.
- Both methodologies are suitable for benthic components composition assessment.

❖ Fish surveys

- **Major source of variability** on fish abundance and fish species richness are the **tide and the time of the day** .
- The results are shown as illustrative examples of the implementation of the proposed methodology.
- **Higher abundance** of fish was generally found at **control** sites.
- **No clear pattern** was observed for fish **diversity**.





❖ Factor influencing to coral damage:

- **Type of injuries:**

- Scraping / Abrasion.
- Breakage.
- Tissue mortality

- **Reefs zones:**

- Reef crest.
- Fore reef.
- Back reef.
- Lagoon and lagoonal reefs
- Reef flats.

Coral types:

- Hard or sorf corals.
- Species.

❖ Factor influencing to coral damage:

○ Part of DFAD involved

Part of equipment	Type of interaction	Type of damage	Bibliographic evidence
Buoys	None		
Structure	Collision Shading Entanglement	Coral injuries	Fieldwork
Nets (e.g., aggregator nets, structure nets, sausage nets)	Shading Entanglement	Coral entanglement / injuries	Balderson & Martin, 2015 Consoli et al. 2020 Banks & Zaharia 2020 Zudaire et al. 2018 Fieldwork
Ropes	Shading Entanglement	Coral entanglement / injuries	Fieldwork
Attractors	Entanglement	Coral entanglement / injuries	Fieldwork
Weight	Collision Shading Entanglement	Coral injuries	Fieldwork

❖ Data Collection guidelines for FAD stranding events

General information	
Type of FAD	Anchored/drifting/log
FAD ID	Identification in the FAD, independent to the buoy ID
ID of the instrumented buoy	Alphanumeric code including the model and numerical series
Date	Date of first sighting
Latitude	Latitude in decimals
Longitude	Longitud in decimals
Habitat type	Beach, lagoon, mangrove, estuary, open ocean, rocky, sea grass, sand, patch reef, coral reef, unknown, other
Depth	Aproximate depth in meters

FAD information	
Type of FAD design	Cage type, tail shape, other
Floating elements	Material of the floating devices
	Number
	Length of the rope
Raft	Shape
	Dimension
	Materials of the structure (e.g., metal, canes, etc.)
	Material in the coverage if present
	Mesh size (if mesh present)
	Location (floating on the surface, floating on the water column, laying on the surface)
Submerged structure	Type of structure
	Materials
	Length
	Mesh size (if mesh present)
	Type of atractors
	Location (floating on the surface, floating on the water column, laying on the surface)
	Length laying in the substrate
Weigth	Materials
	Dimensions
	Weigth

Evaluation of the impact	
Type of substrate	Beach, lagoon, mangrove, estuary, open ocean, rocky, sea grass, sand, patch reef, coral reef, unknown, other
Reef zone (in case of coral reefs)	reef bank, reef slope, reef cliff
Type of corals	soft or hard
Type of damage	e.g tissue mortality (bleaching of corals), Abrasion (scars on the reef), breakage
Area affected	Estimation of the area affected
Species of corals affected	If the damage is observed in coral reef identify the species if possible
Part of the FAD causing the damage	raft, tail, weight, unknown, other
Entanglements	Species
	Number
	Location in the FAD

CONCLUSIONS

- **Results are shown as illustrative examples** of the implementation of the proposed methodology.
- The **line intercept method** for the study of the impacts of FADs on coral reefs was faster and could be adapted to variable topographies, required less equipment and generated lower standard error among samples.
- **Photo quadrats method** are the preferred option when aiming to identify the extent of damage.
- With the aim of understanding how different components of FADs interact with benthic communities, assessing their impact, planning FAD recovery, and identifying potential improvements in FAD design, we **propose recording information on**:

  - Spatiotemporal information (date, and position) and depth.
  - Identification of FAD type, FAD ID, Buoy ID.
  - Information about the FAD design, dimension, entangling character of materials (mesh size) and nature of the materials.
  - Position of the FAD components in the water column.
  - Type of substrate
  - Reef zone
  - Type of corals (soft or hard), and species if possible.
  - FAD parts interacting with biota.
  - Presence of entangled animals, including species, number and location in the FAD.
  - Area affected

- Data collection guidelines should be adapted to the people involved in FAD retrieval programs. The data could be easily collected with a mobile application, such as one based on FORMS.

ACKNOWLEDGEMENTS

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THANK YOU

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SOSF AND AZTI COLLABORATING TEAM IN D´ARROS, SEYCHELLES. PHOTO CREDIT: HENRIETTE GRIMMEL |. © SAVE OUR SEAS FOUNDATION