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Marine Biodiversity Observation Network

Sampling protocol for monitoring marine biodiversity on rocky shores

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INTRODUCTION

Rocky shores are ecologically important and culturally significant habitats along the coasts of the Americas. **Monitoring** these areas is essential to detect biodiversity changes and guide conservation and management strategies.

This **protocol** offers a simple, standardized, and low-cost methodology for monitoring sessile invertebrates and macroalgae in **rocky intertidal zones** using photo-quadrats, enabling repeatable and non-extractive sampling. It builds on four key pillars: standardized image collection, collaborative monitoring networks, AI-assisted data analysis, and the delivery of rapid, accessible results for decision-making.

Photo-quadrats | Collaborative monitoring networks | AI-assisted data analysis | Rapid, accessible results

Developed by the **Marine Biodiversity Observation Network Pole to Pole (MBON Pole to Pole)**, this guide reflects co-design efforts from workshops held in Argentina in 2023 (Camarones), 2024 (Ushuaia), and 2025 (Puerto Madryn and Puerto Pirámides). It supports the generation of comparable biodiversity data across regions and contributes to global efforts such as the UN **Sustainable Development Goal 14: "Life Below Water."**

This methodological manual is intended as a practical tool for park rangers, scientists, and communities working to protect coastal biodiversity.

SAMPLING MATERIALS

01. PHOTO-QUADRANT STRUCTURE

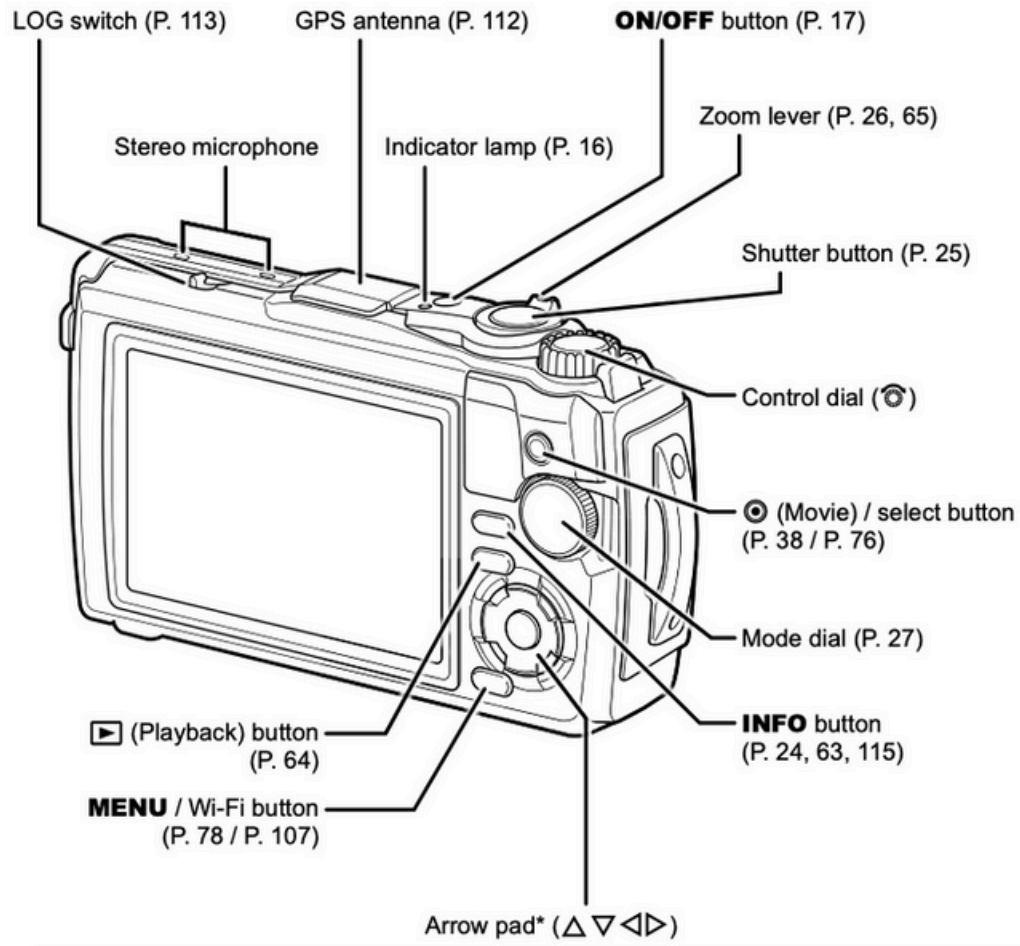
The pipe structure allows a camera to be placed 42 cm above the ground and take photographs of a **25 x 25 cm square**. These photographs (photo-quadrants) are used to calculate the coverage percentages of species and functional groups (for example, macroalgae) of the rocky intertidal zone. The camera is mounted on the structure using a bolt that must be adjusted until the camera is immobile. It is recommended to pass the camera strap through the pipe structure.

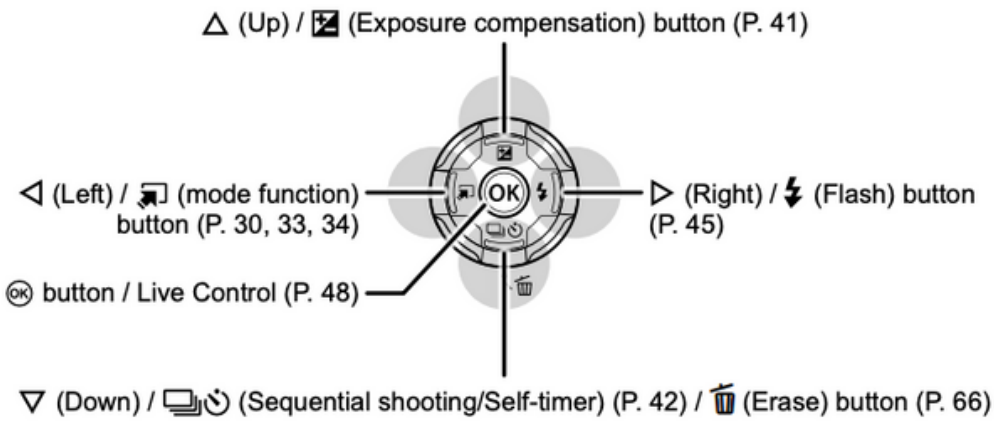
The adjustment key is number 11 or can also be adjusted using pliers.

02. OLYMPUS TG6 CAMERA

The camera used for sampling is designed to be used in fieldwork. It has an integrated GPS that allows the geographic position of each photograph to be attached. It captures photos of 12 megapixels.

TG-6 Instruction Manual (English)





03. FIELD FORM

To complement the collection of photographs, a field form must be completed with data that will serve for processing.

Link to excel sheet

LOCALIDAD			
SITIO 1			
FECHA (año-mes-día)		PARTICIPANTES	
HORA INICIO		HORA FIN	
FOTOGRAFÍA INICIAL		FOTOGRAFÍA FINAL	
OBSERVACIONES			

SITIO 2			
FECHA (año-mes-día)		PARTICIPANTES	
HORA INICIO		HORA FIN	
FOTOGRAFÍA INICIAL		FOTOGRAFÍA FINAL	
OBSERVACIONES			

SITIO 3			
FECHA (año-mes-día)		PARTICIPANTES	
HORA INICIO		HORA FIN	
FOTOGRAFÍA INICIAL		FOTOGRAFÍA FINAL	
OBSERVACIONES			

METODOLOGY

Finding tides suitable for sampling

To ensure the low intertidal level is properly exposed during sampling, low tide conditions of less than 1 meter are generally required, although this threshold may vary depending on the local tidal range and site-specific conditions. To identify the most suitable sampling dates, it is essential to consult local tide tables. These can typically be accessed through official national hydrographic services, mobile apps, or reliable local websites. Selecting the appropriate dates ensures safe and effective access to all intertidal zones.

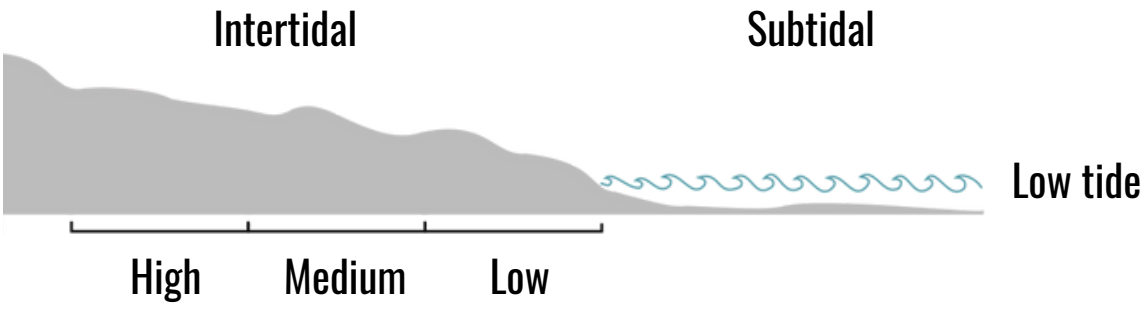
DIA	HORA:MIN	ALTURA (m)
01	02:29	4,87
	09:11	1,35
	14:37	4,90
	21:44	0,99

Example tide table with tide times and heights.

Argentina: this APP or from the website of the Naval Hydrographic Service.

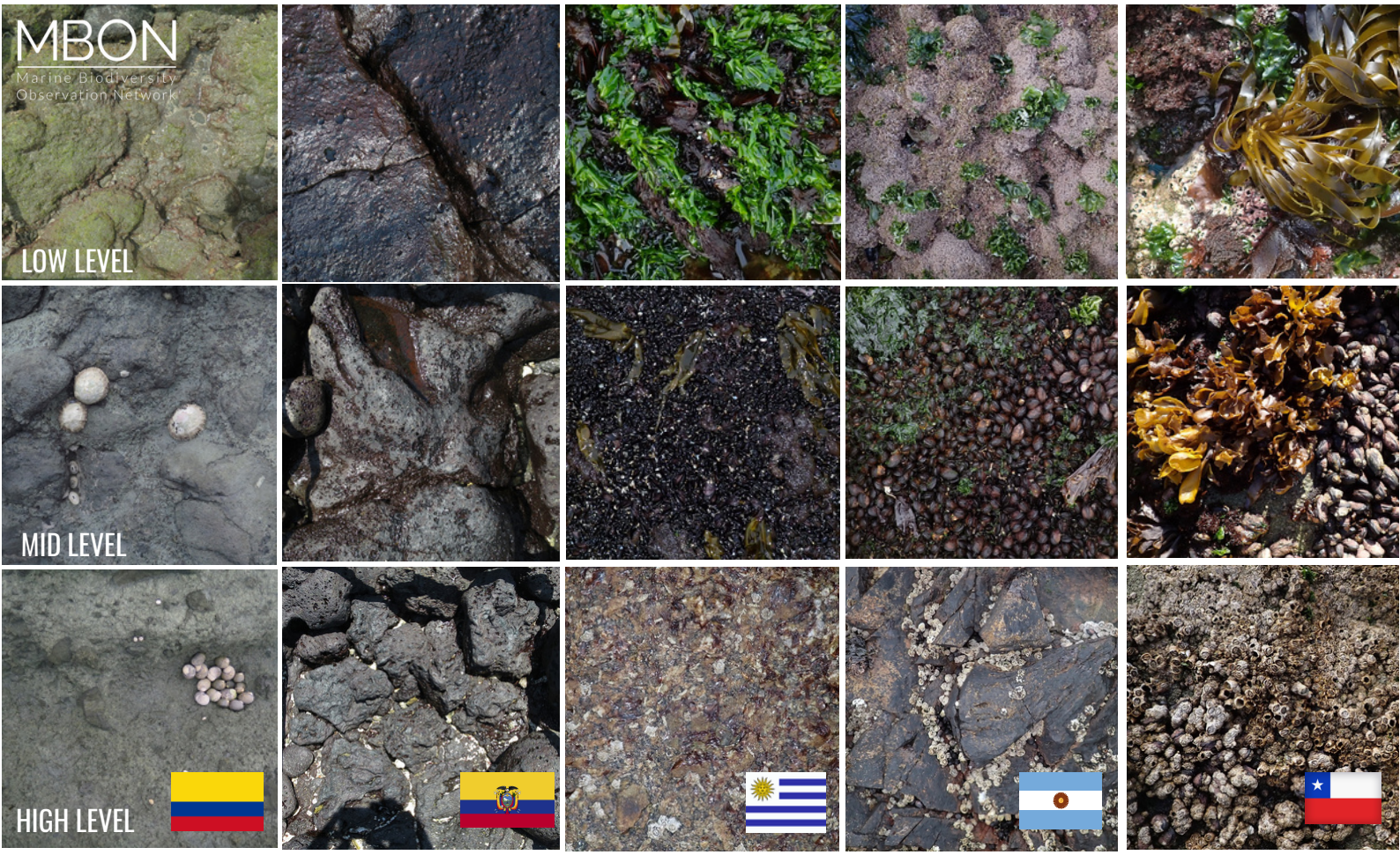
Selection of sampling sites

Within each locality, select three sites (separated by more than 1 km) that have a hard bottom and three identifiable intertidal levels (high, medium, and low) with the following characteristics:



Identification of intertidal levels

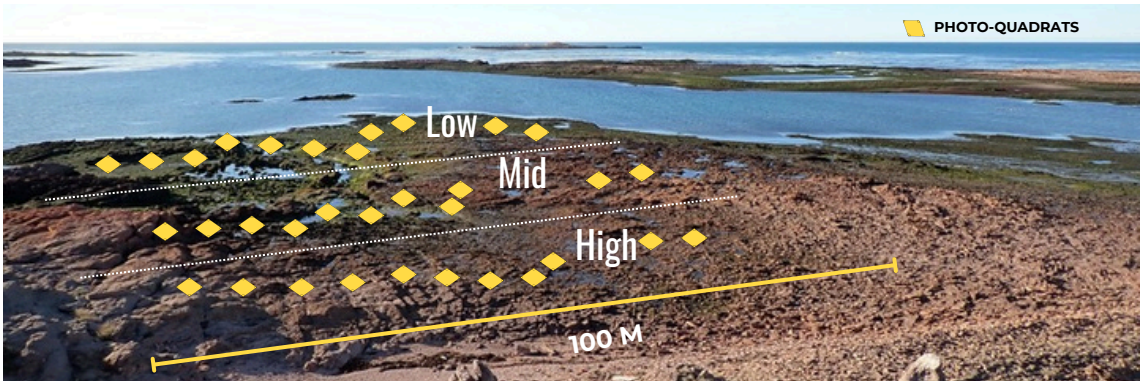
To identify each level of the intertidal zone, characteristic species can be used as biological indicators. It is important to recognize that each locality and region may present distinct species that define the upper, middle, and lower intertidal levels. In the images shown, which include examples from Colombia, Ecuador, Uruguay, Argentina, and Chile, we observe a general pattern: barnacles (Cirripedia) are commonly found in the upper intertidal, mussels dominate the mid-intertidal, and macroalgae tend to appear in the lower intertidal.



Photographic record

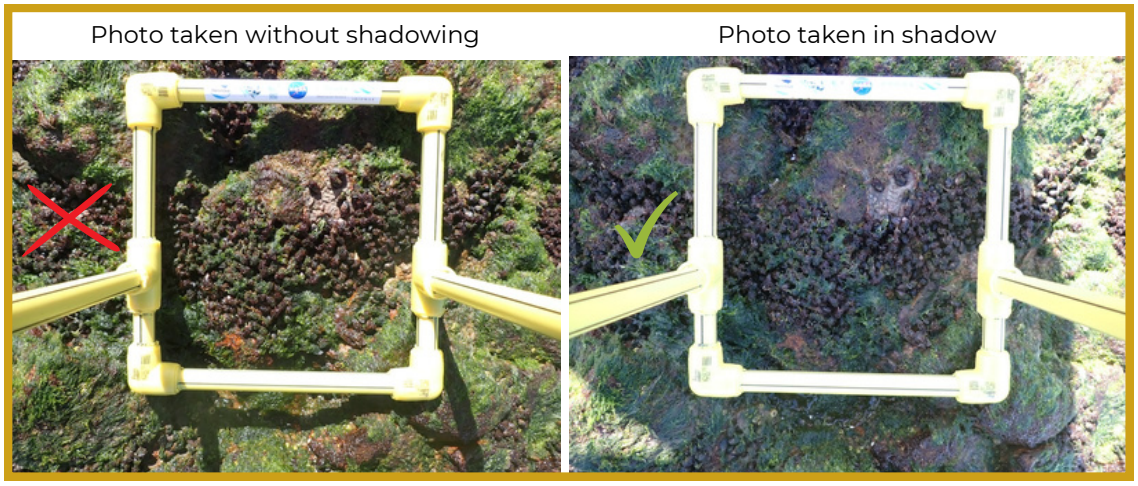
1. Sampling site

Take a panoramic photo of the sampling site at low tide only.
Mark the three levels on a PDF document for visual reference of the location for future expeditions.



2. Photo-quadrant

- On each level take between 40 to 60 photos, ideally walking through the middle of each level and covering more than 100 meters parallel to the coast.
- Take the photographs in a horizontal position or inclined up to 40° on the rocky intertidal (do not use vertical walls).
- Cover the sun with your body so that the quadrant is all shaded (see examples in the image below).
- Do not take photos in areas with puddles.
- At the end of each tidal level, take a photograph of the field sheet with information on that tidal level. This also serves to separate the photos of each level.



3. Photos of invertebrates and algae

- After taking photo-quadrants, if time permits, remove the camera from the pipe structure and walk along the intertidal zone looking for and photographing different species of algae and invertebrates.
- Try to photograph specimens in as much detail as possible and from different angles.
- These photographs aim to encourage photographic documentation of intertidal invertebrates and algae for later registration on iNaturalist, in order to contribute to knowledge and conservation of biodiversity in this important coastal ecosystem.

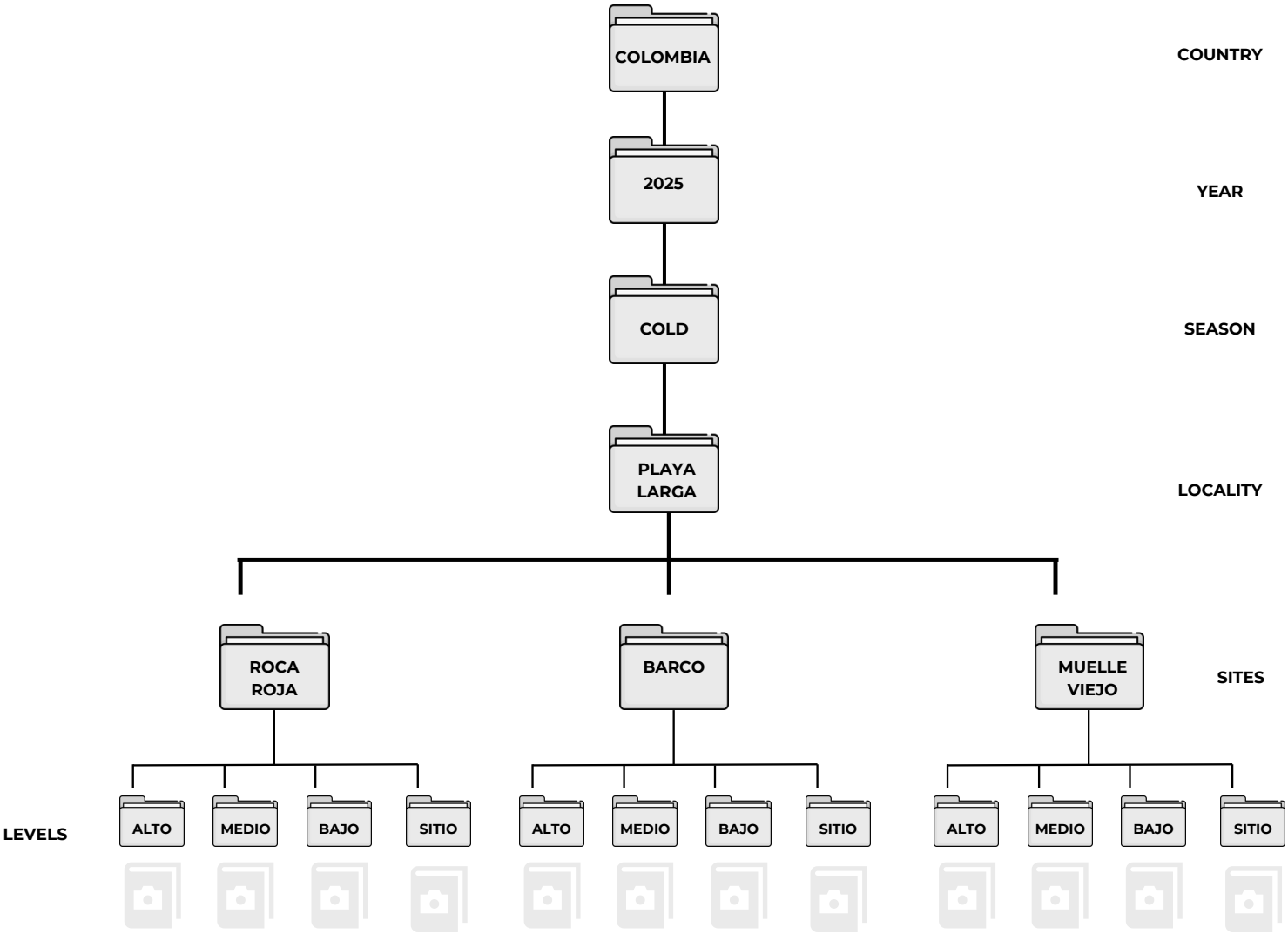
Examples of species photographs to upload to iNaturalist.

Example of on-site sampling

In each locality, 3 sites are selected separated by at least 1 km and in each site the 3 tide levels (high, medium and low) are identified. When repeating the sampling at each site, try to take the photographs in the same areas.

Processing photos and data generation

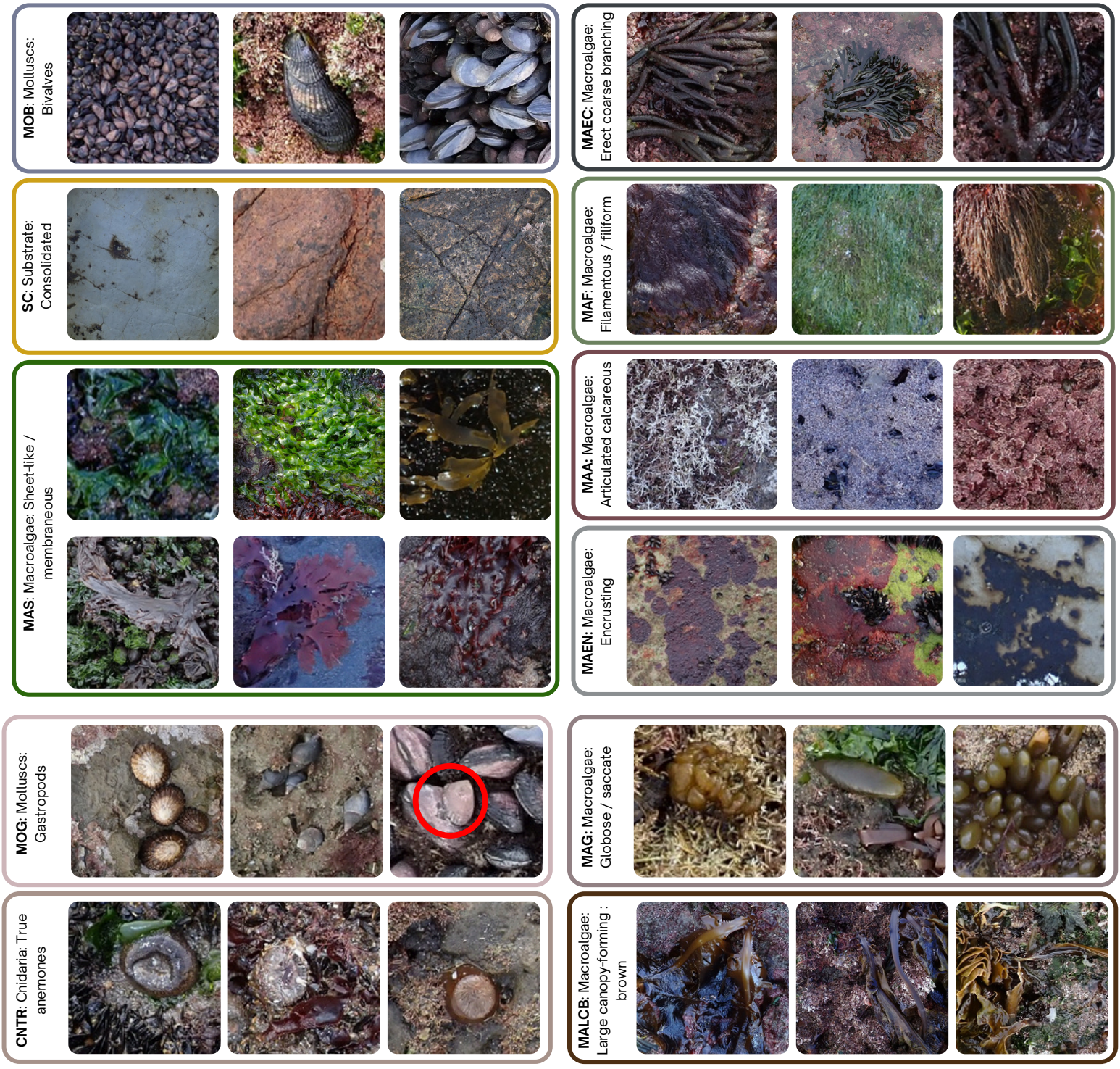
- Make a copy of the images on an institutional computer.
- Do not delete the camera's memory (the photos will remain in the memory and in the cloud).
- Upload photos to the corresponding folder, respecting the order shown in the following figure. Please note that this is a shared drive and uploading files will not use your personal storage space
- Do not delete any files from the directory.
- Upload photos of algae and invertebrate specimens to the iNaturalist platform.



CATAMI CATEGORIES

CLASSIFICATION SCHEME FOR SCORING MARINE BIOTA AND SUBSTRATA IN UNDERWATER IMAGERY

The species and substrate types found in the images are classified according to the CATAMI categories (Althaus et al. 2015). Here are the names of the most common categories and photos with examples.



Althaus et al. 2015: A standardised vocabulary for identifying benthic biota and substrata from underwater imagery: The CATAMI Classification Scheme

01. Before sampling

Equipment verification:

- **Battery** charged to 100%
- Verify that the camera's **date and time** are correct
- Check the cleanliness of the seal (o-ring) and the **closure of the battery and memory compartment**
- **Secure the camera** to the structure with the tape or strap provided
- Mount the camera on the top bracket of the quadrant with the screw, but do not tighten too much
- Ensure that the camera is **positioned horizontally**

02. During sampling

Photographic registration with quadrant:

- Use the **automatic function** for taking photos (Auto)
- Use the **2-second timer** function (lower key of the control keys to access this function)
- Verify that the GPS is turned on in the 'Menu' function and that the GPS key is in **'log'**
- Verify that the GPS signal on the screen does not blink. The GPS signal will be constantly on without blinking when the camera detects a satellite signal
- **Do not use zoom**
- Verify that the image on the screen covers the **entire quadrant**
- Take a photo with a **shadow** to ensure homogeneous lighting of the quadrant
- **Avoid taking photos of tidal pools** or flooded areas within the photo-quadrant
- **Avoid hitting** the camera

03. After sampling

Post-sampling care for equipment maintenance:

- Rinse the camera with **fresh water** at the end of the day
- **Turn off the GPS** with the key in the OFF position. The GPS consumes battery power when the camera is turned off and the key is in 'Log'
- Store the equipment in a dry place **with non-extreme temperature conditions.**

ACKNOWLEDGEMENTS

This protocol is the result of participatory work during the MBON 2023 workshop in Camarones, the MBON 2024 workshop in Ushuaia, and the MBON 2025 workshop held in Puerto Madryn and Puerto Pirámides.


Puerto Madryn 2025


Ushuaia 2024


Camarones 2023

Two reports were published in the journal Research Ideas and Outcomes (RIO Journal), documenting the progress and outcomes of the MBON Pole to Pole rocky shore monitoring workshop held in Argentine Patagonia. Along with this field manual, these publications aim to support the replication of the methodology.

Link Report 2025
Link Report 2023

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