



Sampling protocol for monitoring marine biodiversity on rocky shores

Enrique Montes Herrera, Gonzalo Bravo y Gregorio Bigatti.

2023



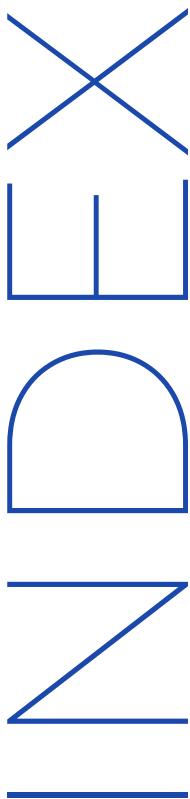
2021-2030 Decenio de las Naciones Unidas
de las Ciencias Oceánicas
para el Desarrollo Sostenible

MBON
Marine Biodiversity
Observation Network



CONICET
IBIOMAR

Index



01

Introduction

02.

Sampling materials

05.

Methodology

08.

Methodological considerations

05.

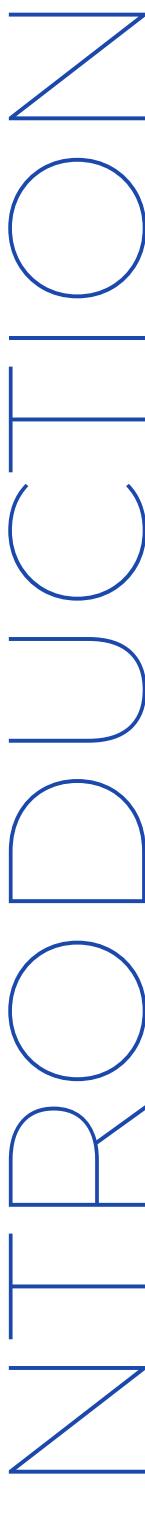
Sampling sites

09.

Sampling sites map

11.

Acknowledgments



Rocky shores are marine habitats of great scientific, commercial, cultural, and recreational interest. [Monitoring environmental changes and biodiversity](#) in these habitats is essential for implementing conservation and management strategies.

This protocol provides a practical and standardized methodology for characterizing the biodiversity of sessile invertebrates and algae on rocky coasts throughout the Americas. It allows the evaluation of changes through time with the collection of benthic images using photo-quadrants and data analysis with artificial intelligence tools.

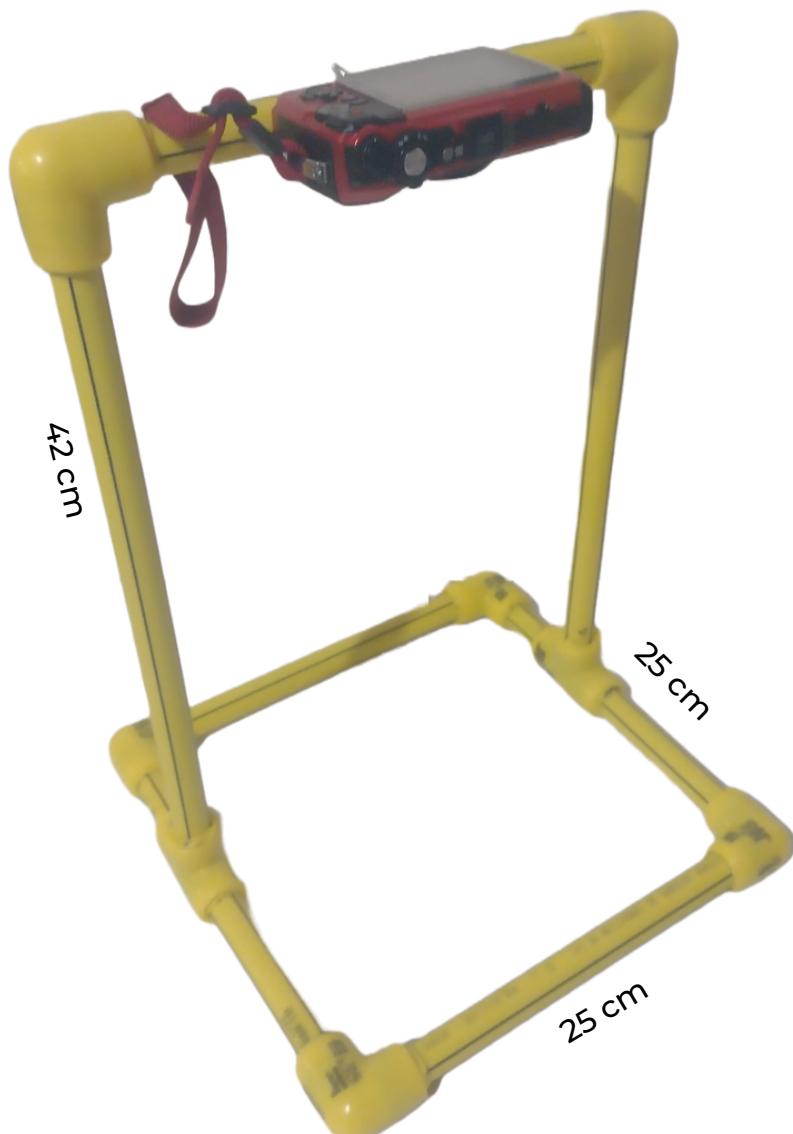
The Marine Biodiversity Observation Network Pole to Pole of the Americas ([MBON Pole to Pole](#)) aims to create a network of collaboration between marine conservation agents and scientists to implement long-term monitoring on intertidal ecosystems. The project aims to provide biodiversity data to government decision-makers and the international community to support the sustainable development goals, particularly in achieving Sustainable Development Goal 14 "Life Below Water" of the United Nations' 2030 Agenda.

The monitoring program is designed to detect drastic changes in marine biodiversity in rocky coastal areas to generate information for decision-making in the management of living resources in these habitats. The protocol is a co-designed contribution by the [MBON Pole to Pole project](#), CONICET, and personnel from the National Parks Administration (APN) and the Subsecretariat of Conservation and Protected Areas of Chubut during the [MBON 2023 Workshop](#) held in Camarones (Province of Chubut, Argentina) from March 27-31, 2023.

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.



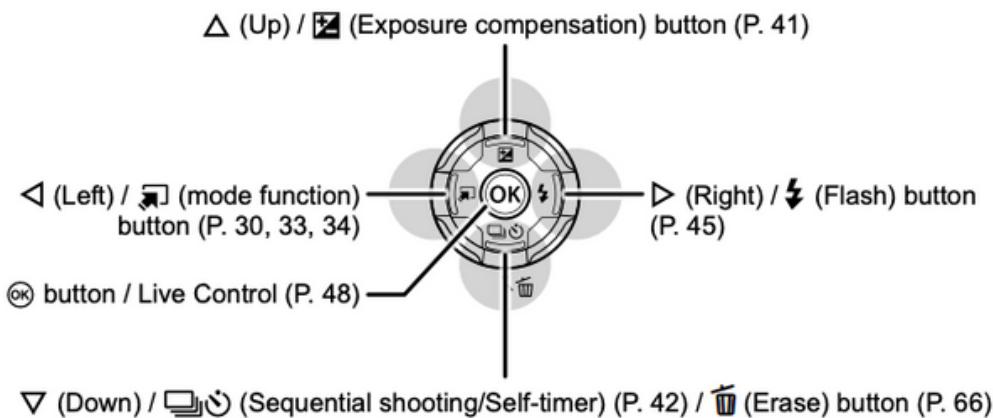
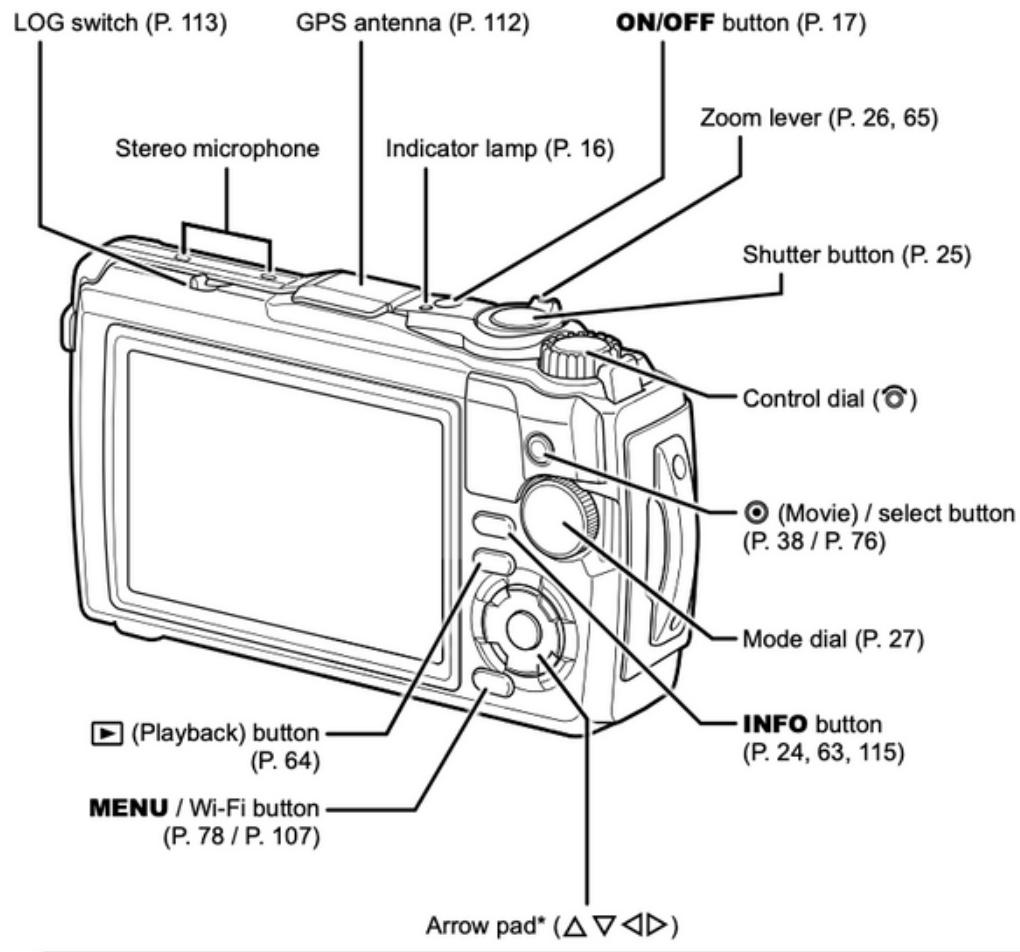
The adjustment key is number 11 or can also be adjusted using pliers.



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](#)

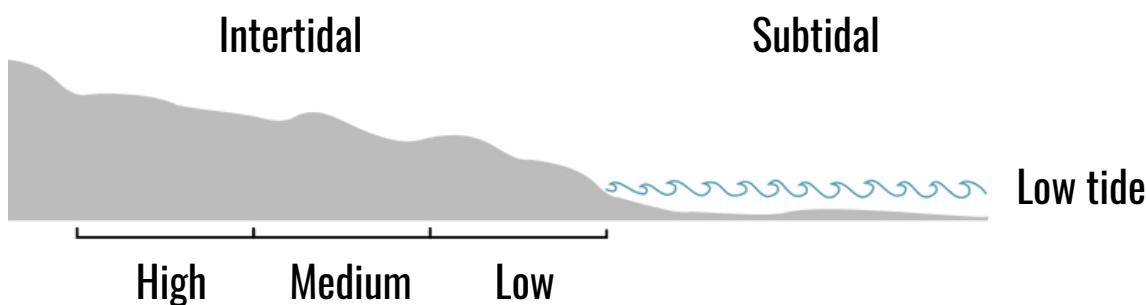
LOCALIDAD			
SITIO 1			
FECHA (año-mes-día)		PARTICIPANTES	
HORA INICIO		HORA FIN	
FOTOGRAFÍA INICIAL		FOTOGRAFÍA FINAL	
OBSERVACIONES			
SITIO 2			
FECHA (año-mes-día)		PARTICIPANTES	
HORA INICIO		HORA FIN	
FOTOGRAFÍA INICIAL		FOTOGRAFÍA FINAL	
OBSERVACIONES			
SITIO 3			
FECHA (año-mes-día)		PARTICIPANTES	
HORA INICIO		HORA FIN	
FOTOGRAFÍA INICIAL		FOTOGRAFÍA FINAL	
OBSERVACIONES			

METHODOLOGY



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:



High stratum

Barnacles (dog's teeth) and bare substrate



Medium stratum

Mussels and macroalgae



Low stratum

Calcified algae (coralline), other algae, and mussels



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

- Take between 40 to 60 photos at each level.
- Take the photos in a horizontal or tilted position up to 40° on the rocky intertidal zone (do not use vertical walls) and preferably on the same substrate.
- Avoid shadows of the structure in the photo. One way to do this is to block the sun with your body so that the quadrant is completely in shade.
- Try to take photos covering around 100 meters of length per parallel stratum to the coastline.
- At the end of each stratum, take a photo of the field sheet with information about that stratum.

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.



Example of on-site sampling



Processing photos and generating data

- 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, with the name of the site and separated into folders by stratum (HIGH, MEDIUM, and LOW).
- Do not delete any files from the directory.
- Upload photos of algae and invertebrate specimens to the iNaturalist platform (a registered account is required to upload observations, which can be personal or institutional).

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:

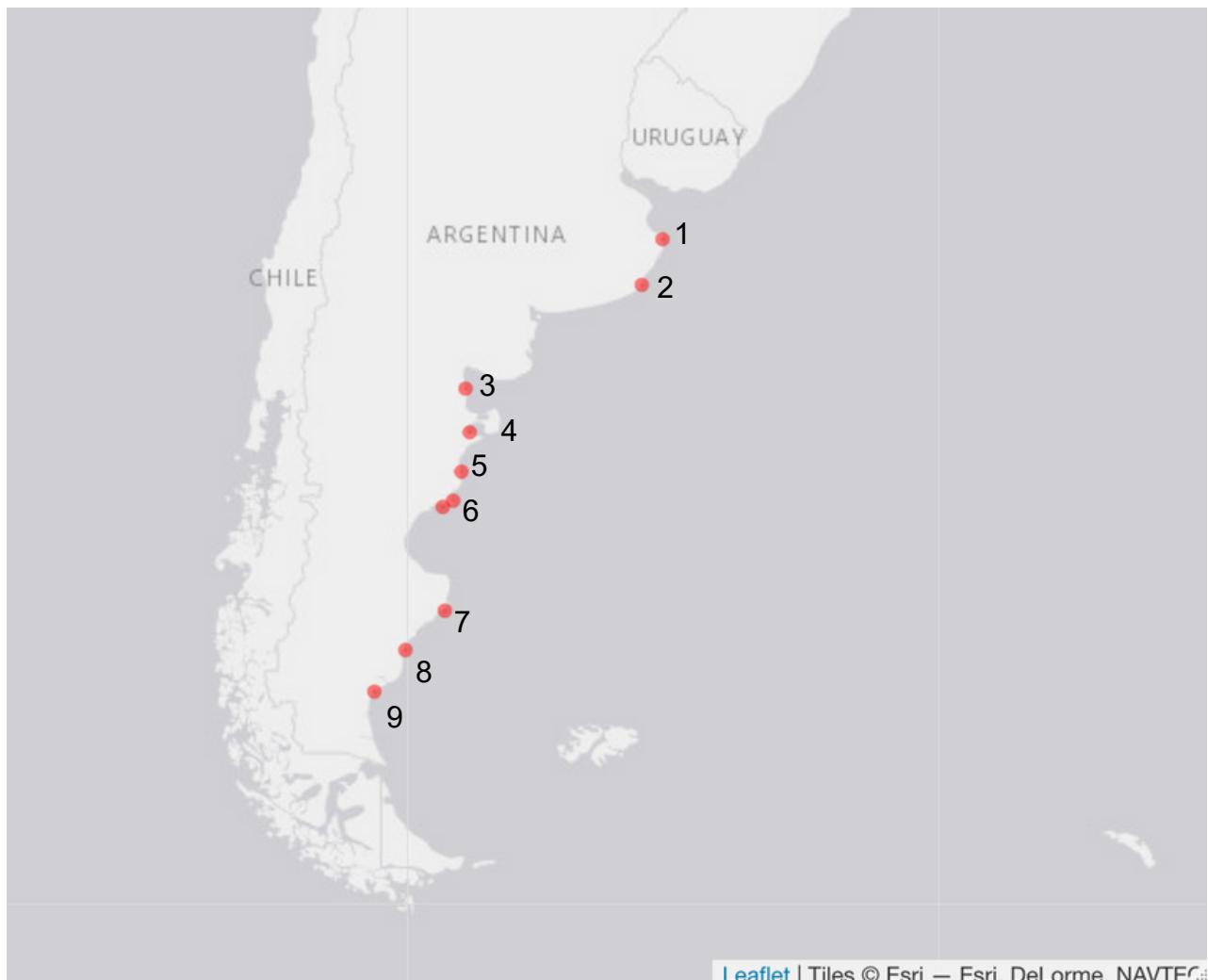
- Use the **automatic function** for taking photos (Auto)
- Use the **2-second timer** function (lower key of the control keys to access this function)
- Verify that the GPS is turned on in the 'Menu' function and that the GPS key is in '**log**'
- Verify that the GPS signal on the screen does not blink. 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**.

SAMPLING SITES ON THE ARGENTINE COAST



- 1- PN Campos del Tuyú (Pilotes Muelles): APN
- 2- Mar del Plata: CONICET
- 3- PN Islote Lobos: APN, CONICET
- 4- Golfo Nuevo (Madryn y ANP Punta Loma): CONICET y SsCyAP, ANP
Península Valdés (Punta Norte): SsCyAP
- 5- ANP Punta Tombo: SsCyAP
- 6- PIMC Patagonia Austral (ANP Cabo Dos Bahias e isla Tova): SsCyAP, APN
- 7- PIM Isla Pinguino: APN
- 8- PIM Makenke: APN
- 9- PN Monte Leon: APN

Argentina

CAMERA INVENTORY

SERIAL NUMBER	MODEL	CODE	SITE	RESPONSIBLE	INVENTORY DATA
BJ6C85883	Olympus tg6	AMP1	CAMPOS DEL TUYÚ	Mario Santos Beade	28/3/2023
BJ6C86134	Olympus tg6	AMP2	MAR DEL PLATA	Gabriela Palomo	28/3/2023
BJ6C85879	Olympus tg6	AMP3	ISLOTE LOBOS	Esteban David Tazzioli	28/3/2023
BJ6C86139	Olympus tg6	AMP4	PUNTA TOMBO	Soledad Diaz Ovejero	28/3/2023
BJ6C85876	Olympus tg6	AMP5	PIMCPA/CABO DOS BAHIAS	Pablo Luis Sugliano	28/3/2023
BJ6C85877	Olympus tg6	AMP7	ISLA PINGÜINO	Ariel Rodriguez Albertani	29/3/2023
BJ6C85878	Olympus tg6	AMP8	MAKENKE	Nicolas Manterola	29/3/2023
BJ6C85882	Olympus tg6	AMP9	MONTE LEON	Mariela Gauna	29/3/2023
BJ6C85880	Olympus tg6	AMP10	GOLFO NUEVO	Gregorio Bigatti	29/3/2023

S
T
E
R
E
O
D
E
L
I
N
G
Z
O
N
E

This protocol is the result of participatory work during the MBON 2023 workshop in Camarones, Chubut province, Argentina.

Marine Biodiversity Observation Network Pole to Pole of the Americas (MBON Pole to Pole), CONICET, National Parks Administration (APN), and Chubut's Subsecretariat of Conservation and Protected Areas.



AUTHORS

Enrique Montes Herrera, Gonzalo Bravo y Gregorio Bigatti.

Collaborators: Juan Pablo Livore, María Martha Méndez, Rocío Nieto Vilela, Ariel L. Rodríguez Albertani, Cecilia Astengo, Diego De Jesús, Dulce Melania Blanco, Esteban David Tazzioli, Fernando Lima, Rui Sebra, Francisco Nicolás Lewis Ferrero, Ian Axl Walker, Leonardo Juber, Mariela del Carmen Gauna, María Belén Cuello, Mario Santos Beade, Maximiliano Navarro, Nicolás Manterola Touyaa, Rui Seabra, Simón Ignacio Cumintetti, Soledad Diaz Ovejero, Susana García, Tania Klagges, Ramiro Danilo Tolosa, Susana García, y Pablo Luis Sugliano

Graphic design: Gonzalo Bravo



2021-2030 Decenio de las Naciones Unidas
de las Ciencias Oceánicas
para el Desarrollo Sostenible

