Protocol and sampling design for marine diversity assessments for the South American research group on coastal ecosystems 2.0

Prepared by South American Research Group on Coastal Ecosystems for sampling on rocky shores **SARCE**

2018

SARCE
South American Research Group on Coastal Ecosystems

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Protocol and sampling design for marine diversity for the South American Research group on Coastal Ecosystems (SARCE)

SOME DEFINITIONS

Species: whenever the species word is used means: species as such (i.e. *Fisurella barbadensis*) or morph-species (i.e. *Dictyota* sp. A) or a group of species that cannot be distinguished among them in the field (*Sargassum* spp.).

Matrix: final structure of our data that will consist basically of species (ordered along the rows of the matrix) and samples (ordered across the columns of the matrix).

STUDY AREA

This study is aimed to be carried out in most countries of the entire American continent.

DESIGN AND NUMBER OF QUADRATS PER SITE AND PER STRATA

Note that **LOCATIONS** are **separated by 30 - 100´s of kilometers**.

For each **LOCATION** it might be possible that you end up sampling different **SITES** (maximum three) depending on how much you decide to do. Those SITES will be separated by units of kilometers (maximum 5 km). Please note below different combinations of protocols are given depending on your time availability. Each site will be divided in **THREE STRATA** parallel to the coastline using the almost universal characteristics of rocky shores of **high-, mid- and low zones**. In each stratum **10 QUADRATS** will be sampled as specified in the protocol below.

Number of QUADRATS per SITE and per STRATUM: See Table 1 for details of each site. In the **first 10 QUADRATS**, you will count **slow moving animals and the percentage cover of space-occupying invertebrates and algae.** The latter includes those organisms that cover a considerable fraction of the rock surface and that are too many to be counted or cannot be easily separated into individuals; e.g. barnacles, mussels, some colonial invertebrates, including zoanthids and ascidians, algal turfs or large macroalgae. Counts and cover estimates should also be obtained in the understory of canopy-forming algae. In the rest of the quadrats, you will make a list of species present.

TIMING

The exact date will depend on the tides, but in a first step, all samplings should be done in between October and March. Some flexibility is allowed depending on particular circumstances and logistics of a given site/location.

PROTOCOL OF MONITORING PROGRAMME

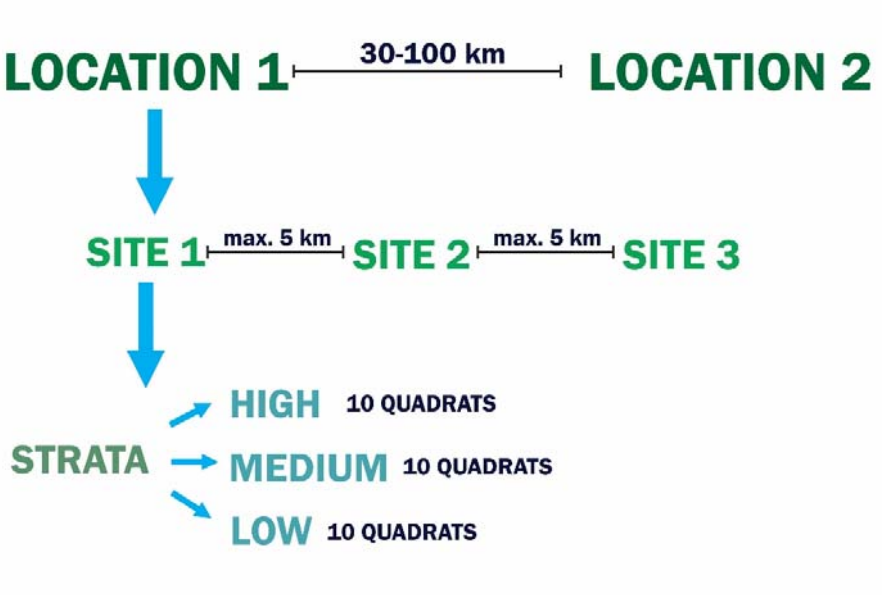
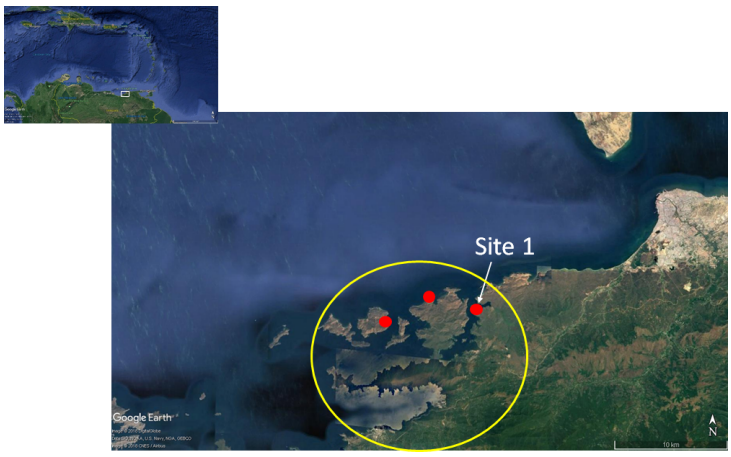


Figure 1. Scheme of locations, sites and strata.

1) Get to a specific site within a location (Fig. 2). The yellow line in this case, defines a LOCATION in the eastern side of Venezuela. The diameter of that location is about 15 km. Within that location a specific site was selected. **That specific site must be a stretch of rocky shore that goes along at least 50 meters (ideally 100 meters).**

- Remember that we want to cover as much as we can; please select your SITES trying to get the best geographic spread.
- If possible, avoid estuarine sites.



2) Figure 2. Example of locations (circle) and sites

3) Once in the site, take note of the exact geographical location and fill the Data Sheet 1 (See Below). This information is about the general characteristics of your sampling site and will be important later one to test various hypotheses (Table I).

Table I. - General characteristics of your sampling site.

Descriptor	**Definition**	**Outcomes**
Location	Name of a given location	It will be unique for this data sheet
Site	Name of a given site	
Urban Area	located within a radius of 10 kilometers of a human settlement of more than 5000 habitants	Yes/No
MPA	Marine Protected Area	Yes/No
Distance to Rivers	Can be done later using GIS	Distance value in Km
Slope	As measured with a "Clinometer" a scheme of this basic device will be sent shortly.	Degrees. It will be measured in the first 10 quadrats
Sand Burial	Likelihood of a given rocky shore to be affected by sand. To fill this cell you should answer the question: Is there a sand strip in between the rocky shore and the beginning of the land?	Yes/No
Substrate	Composition of substrate	Example: Biogenic (dead coral), sandstone, granitic, etc.
Rugosity	Take a 20 m long chain and lay it across a vertical gradient (perpendicular to the sea line) and measure the total length of the rope/chain and the length of a straight line linking both extremities of the rope (projected length).	A number expressing the ratio between the projected and total length.

4) Divide your site in three STRATA (High, Mid and Low). This is just a guideline as your site might be difficult to divide in three strata. In case of doubt take decisions on a case by case basis taking in consideration that what matters the most is to capture as best as possible the number of species in a given site; which means the biodiversity spanning the width of entire intertidal rocky shore. It is very important to take notes of criteria you used to define the three strata.

5) In each **stratum**, estimate **percentage cover of sessile organisms** (e.g. algae, small barnacles and mussels), **density of mobile organisms** and big barnacles (e.g. equinoderms, gastropods) on **quadrats** (50 * 50 cm) haphazardly chosen.

- Set a 50 * 50 cm plain frame and take a picture of the quadrat (Photo-quadrat provided by P2P MBON).
- Replace the plain frame by a 50 * 50 cm gridded frame, delimiting 5 x 5 cm subquadrats and providing 100 intersection points. **Count slow moving animals that you can see to estimate their density** (e.g. equinoderms, gastropods). Try to identify the organisms to species. Count organisms if 50% or more of its body lies inside the quadrat
- If there are hundreds/thousands of individuals of a particular species, you may susbsample the quadrat by counting individuals in randomly selected 5 x 5 cm subquadrats, until you reach 150 counts. It is very IMPORTANT that if you do this you take notes on your sampling data sheet.
- Estimate the **percent of sessile organisms** (e.g. algae, barnacles and mussels) using the point intercept method (100 points; Fig. 3), including those in the understory of canopy-forming algae. Try to identify the organisms to species.
- If your site has boulders (preferable look for unfragmented rock sites first), probably you will have situations as shown in the Figure 4. In this case, please include the category "without substrate" as a species and take % cover as metric. This will help estimate true % cover in your frame.
- If identification of species in the field is not possible, you should collect a sample for latter identification. There are several taxonomists in the SARCE and Pole to Pole Marine Biodiversity Observation Network of the Americas (P2P MBON) that can help with species identifications.

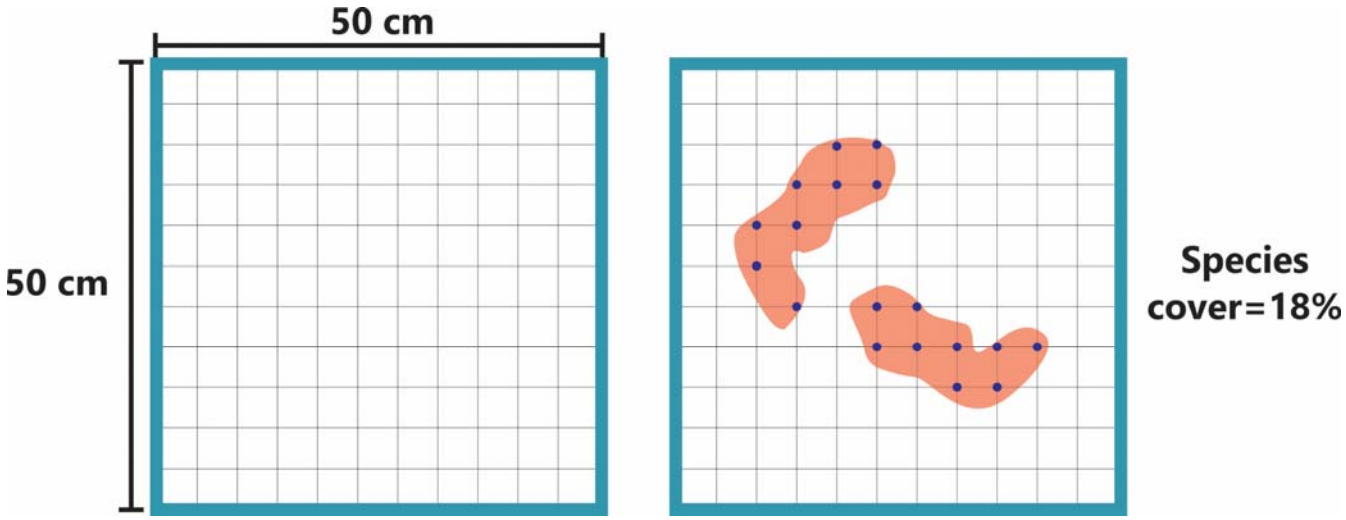


Figure 3. Schematic representation of how to calculate species cover using the point intercept method. A) there are 100 interceptions and b) counting the number of interceptions over a given species give an estimation of its cover. In this case the percentage cover is 18%.

Figure 4.- In boulders, sometimes your gridded quadrate could have points without substrate. Please count this points as "without substrate".

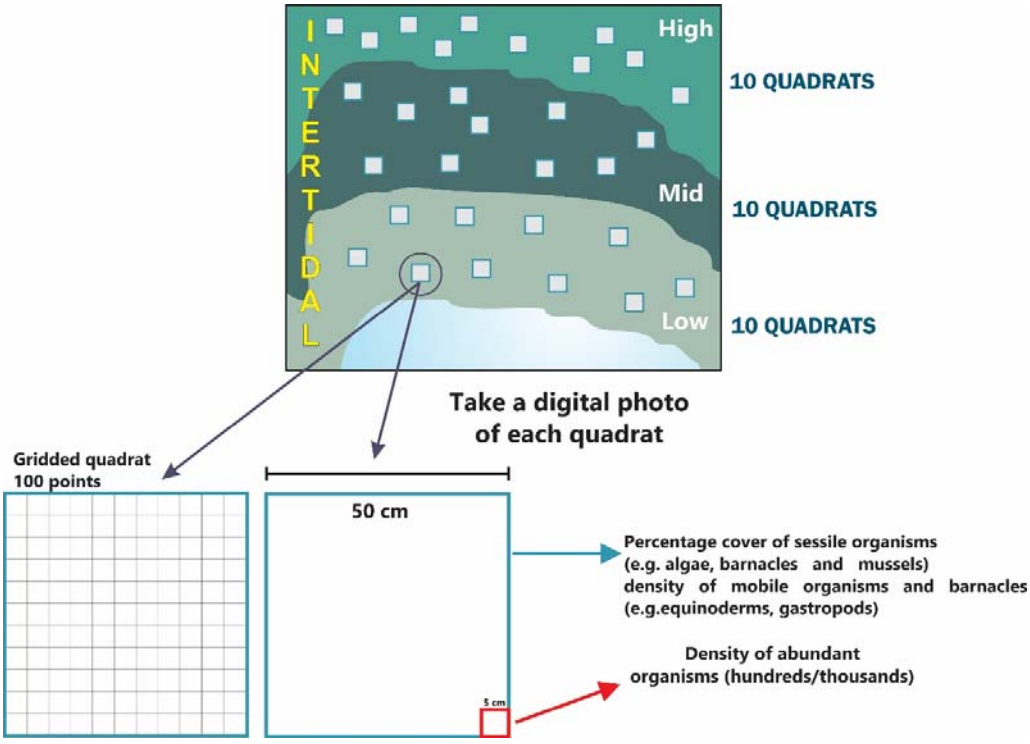


Figure 5.- Protocol for each site

6) Move to other two SITES within the LOCATION. These sites should be separated by about 1 km and no more than 5 km (Fig. 4). If there are not two sites in that location, choose at least one extra.

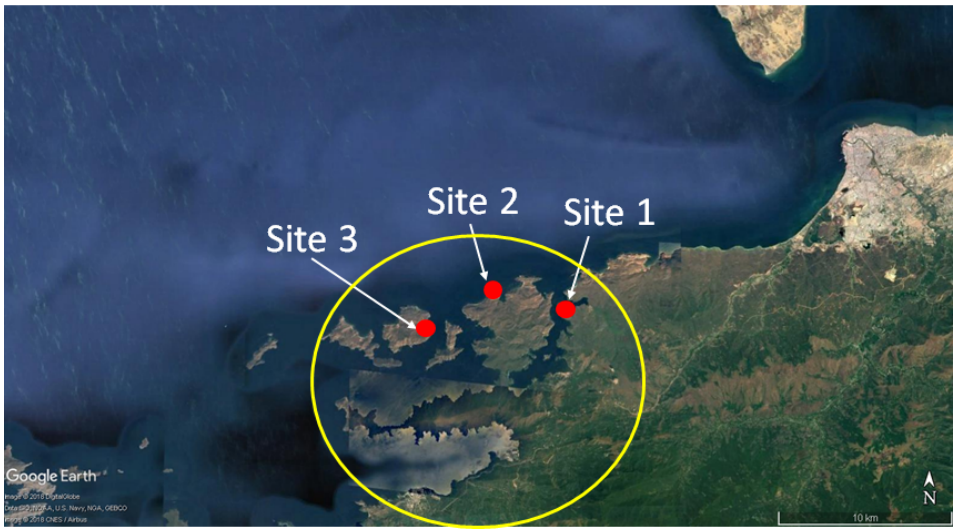


Figure 4. Example of locations (circle) and sites. Diameter of circle is about 15 km.

7) Repeat steps 2 to 5.

ONCE THE SAMPLING IS DONE

8) Upload the data in excel files that will be provided Data Sheet 2

9) Add additional information supporting your observations with regards species characteristics of that you encountered in your sampling sites. You should indicate:

a) feeding group (separated in 7 groups: primary producers, herbivores, filter feeders, carnivores, detritivores, omnivores, scavengers) a particular species belongs to, 2) whether a species is a habitat forming organisms, 3) whether a particular species is invasive or not, 4) whether a species is introduced or not (non-native) and 5) whether a species is active at daylight, night or both

10) The P2P MBON will provide server Github repository to upload data files. Detailed instruction on data handling will be provided to you.

11) NOTE: This collaboration is based in the premise that anyone contributing with data will be offered co- authorship on in scholarly products produced under the SARCE and P2P MBON (peer-reviewed scientific articles, conference papers, presentations, etc.).

South American research group on coastal ecosystems - Data Sheet 1

Country:_____ Province (State)_____ LOCATION

SITE: _____ Date:____/____/20____ Strata HT MT LT

Criteria to define Strata:

Remarks

Latitude: _____

Longitude:_____

Datum: _____

		Stratum		
		HT	MT	LT
Substrate composition	Biogenic (dead coral)			
	Granitic			

Marine Protected Area (MPA): Y N

Site located within a radious of 10 kilometers of a human settlement of more than 5000 habitants

Yes____

No____

Rugosity

Chain length: _____ Ratio:_____

Total length:_____

Distance to Rivers (Km)_____

Sand Burial (Likelihood of a given rocky shore to be affected by sand.)

Yes____

No____

		Slope									
		1	2	3	4	5	6	7	8	9	10
Strata	HT										
	MT										
	LT										