

Teaching Package: Comparison of different sites

This teaching resource was designed for the school partners of VIRTUE-s to use as a guide for conducting their first comparison studies using the VIRTUE racks. It is an attempt at standardising the methodology to make the comparisons meaningful. You can adapt this for your own comparison study.

Proposed Contents:

1. Identification of the common topic

Comparison of the fouling communities in three different locations, 2 in the Baltic Sea and 1 in the Mediterranean, will be undertaken. To realise this, 3 schools: one in each country; Sweden, Germany and Spain, will simultaneously deploy disc racks in the sea in their location. To make comparisons valid standardised methodology will be employed. The following parameters will be compared:

- Composition of the fouling community with regards to species present
- Species diversity of the communities found growing on the plates
- Community structure with regard to the presence of functional groups, and
- Biomass

2. Materials needed

- The discs and racks to be used should be new. UGOT has provided the school partners with the materials.
- The racks are composed of compact discs placed together at regular intervals on a rope. Two discs are placed back to back to form a disc unit. A rack will be composed of a series of disc units. These are placed and secured at equal distances on a rope (Fig.1). A weight is placed at the end of the rack so the construction will stay underwater. Details of rack construction are provided in:

<https://www.virtue-s.eu/english-content/how-build-virtue-rack>.

- Echo sounder (optional)
- Cameras; Microscope cameras; magnifying lenses
- Microscopes, Stereomicroscopes

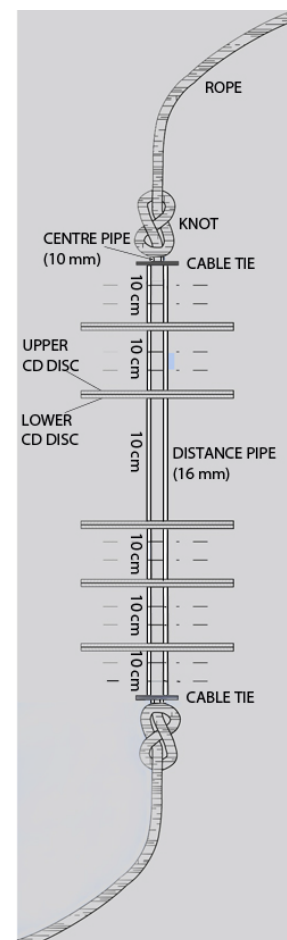


Fig. 1. A VIRTUE rack

3. Description of the Experiments:

Rack deployment

- For each location **2 racks each composed of 5 disc units** will be deployed.
- The depth of deployment should be 0.5 meters from the surface. However, adjust the depth according the varying water levels in your location. Just ensure that the racks are always underwater for the entire duration of the experiment.

- To prevent predators from climbing up the rope, be sure that the weight attached to the rack does not touch the bottom.

When to deploy

- The experiments will be started simultaneously. All racks should be deployed Between the **end of March to the end of the first week of April**.
- The racks will be retrieved **8-9 weeks after deployment**.

Disc evaluation

- Examine the discs visually or with the aid of a magnifying lens.
- Try to identify as many organisms as you can without using a microscope.
- Estimate visually the percentage of the disc covered with fouling organisms.
- If possible, estimate percentage of the disc covered by the individual species.
- The aid of a grid may be helpful for this. Lay a grid on top of the disc.
- **Make pictures of the whole disc first.**
- Label the discs correctly: which is the upper disc and which is the lower one.
- Be sure to **place a ruler or any reference scale** beside the disc when making photographs.
- Take pictures with the discs immersed in water. This is important specially if there is a thick algal growth on the disc.
- However, be sure that there is no light reflection on the water when taking pictures.
- Be sure that there is enough contrast between background and the object you want to analyse.
- Take pictures also of the underside of the discs.

Microphotography

- Place the disc under the stereomicroscope. The disc should be immersed in water.
- Examine the discs first under the lowest magnification and try to identify the major species you can find.
- Determine which magnification to use.
- Take photos of defined areas on the discs.
- Be sure to photograph a reference scale for the/or each magnification you use.

4. Activities

Component 1

Measurement of physico-chemical factors

- Temperature and salinity measurements of the surface waters in the deployment site are compulsory. These will be measured at the least at the start and at the end of the deployment period. Temperature will be measured with a thermometer and the salinity with a refractometer.
- Other parameters can also be measured (with): pH (pH meter), turbidity (Secchi depth), oxygen concentrations (titration or multimeter), oxygen saturation (multimeter), Chlorophyll concentrations (photometry), nutrient concentrations (Test kits or photometry)

Component 2

Photographic documentation of the deployment site

- Photographs of the deployment area should be taken. Special features should be noted. Examples:
 - Is the site near the mouth of a river?
 - Is the site more rural or urban?
 - Is the site exposed or protected from strong currents or wave action?
 - Is the site subject to pollution due to industry?
 - Is the site exposed to excessive shipping activities, is it a commercial harbour?
 - What big organisms can be found in the site? (Fishing ground, Abundance of birds?)
 - Is the site a recreation area?

5. Available Analysis Methods:

Details of how to do the analyses can be downloaded here:

<https://www.virtue-s.eu/english-content/quantification-analysis>

- **Method 1**

Grid analysis for counting organisms using ImageJ .

- **Method 2**

How to analyse photographs: Automated counting of organisms.

- **Method 3**

How to analyse photographs: Manual counting of organisms.

- **Method 4**

Measurement of percentage cover using ImageJ (Automated).

- **Method 5**

Measurement of percentage cover using ImageJ (Manual).

- **Biodiversity Calculation using on-line biodiversity calculator on the VIRTUE-s website:** <https://virtue-s.eu/english-content/biodiversity-calculator>

6. Presentation of results

- To compare results in the different locations, each partner can produce a video showing how the discs look like after retrieval.
- A list of organisms found on the discs can be made for each location and compared with the list from other locations.
- Comparison of biodiversity indices (if calculated) can be done.

7. Resources you may need for this activity like species identification plates, analysis methods and biodiversity calculation can be found in the VIRTUE-s website:

<https://virtue-s.eu/>