Sediment Organic Matter

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Introduction

This protocol provides standardized data on sediment bulk density and organic matter content, which is obtained through loss-on-ignition using a combustion furnace. Additional copies of this protocol, field datasheets, data entry templates, instructional videos, literature, and more can be found at: https://marinegeo.github.io/modules/sediment-organic-matter.

Measured Parameters

This protocol quantifies the organic matter content in marine sediments, measured as:

- Bulk density (g/mL)
- Sediment dry mass (g)
- Sediment ash-free dry mass (g)

Requirements

Personnel: 2 people

Estimated Total Time Per Location ($n = 3$ transects):

Preparation: 1 person x 1 day
Field work: 2 people x 1 day
Post processing: 1 person x 3-5 days
Data processing: 1 person x 1 day

*Estimated times will vary by site and conditions

Replication: Three (3) 5cm x 5cm sediment cores taken along three (3) transects (total $n = 9$)

Materials:

Survey Design:

- ☐ 1 50-m metric transect tape
- ☐ Hand-held GPS unit
- ☐ 2 PVC marker poles (diameter and length as needed)

Fieldwork:

- ☐ 9 small plastic bags with external and internal labels (example)
- ☐ 9 5-mL plastic syringes with graduations (at least every 1 mL) with the applicator tip cut off (example)
- ☐ 1 cooler with ice (optional)

Post-Processing:

- ☐ 9 pre-weighed foil tins (example)
- ☐ Pencil/pen
- ☐ Drying oven
- ☐ Combustion furnace

Methods

Fully review this and any additional protocols necessary for the sampling excursion. Address any questions or concerns to marinegeo@si.edu before beginning this protocol.

Preparation:

1. Review the MarineGEO Seagrass Habitats Survey Design for site selection and setup. This protocol assumes $n = 3$ sediment samples taken every 10-12 m along a 50-m transect, replicated along 3 separate transects.
2. Label 9 disposable plastic bags with the sampling location, transect, and replicate number using a permanent marker.
3. Place a plastic syringe and an internal label with the same metadata written on waterproof paper inside the corresponding plastic bag.
4. Fill a container with ice immediately before departing for the field.

Fieldwork:

1. At each predetermined point along the transect where the sample is to be collected, randomly select a small unvegetated patch ~1 m to any side of the transect.
2. Remove the plunger or cap from the syringe. Take the open end of the 5-mL syringe and gently insert it into the sediment to a depth of ~5 cm. Take care to avoid any structures like rhizomes or woody debris.
3. Place the plunger into or cap on the syringe to create suction, and then gently extract the syringe from the sediment.
4. Place the syringe with the trapped sediment into a plastic bag with an internal label and seal it.
5. Repeat steps 1-4 at the next location along the first transect until all 3 replicates are taken.
6. Repeat steps 1-5 for the remaining two transects for a total of 9 samples.
7. Place all bags on ice in the cooler. Transport cooler with samples back to the lab for processing.

Post-Processing:

Samples are best processed immediately (within 24 hours) of returning from the field. Samples can be stored for longer in the refrigerator, but risks evaporation.

1. Print lab data sheets.
2. Weigh foil tins and record the weight of the tin directly on the foil using a pen. Tins can be either pre-made or constructed by folding an aluminum foil square over on itself and sealing the sides.
3. Select a replicate syringe and push the plunger in or use another tool to discard all but the top 5 cm of sediment. If < 5 cm remains in the tube, do not discard any. In either case, record the volume of sediment (in mL) on the lab sheet.
4. Push the remaining sediment into a pre-weighed tin.
5. Remove all visible fauna, large shells, rhizomes/roots/woody debris from the sample. Work quickly to minimize loss of water.
6. Place the labeled foil tins in a drying oven at 60°C and dry to constant weight (usually 1-3 days, depending on the volume of material).
7. Weigh the tin and dried sediment, and record the dry weight on the lab sheet.
8. Combust the samples at 520°C for 5 hours.
9. Let the sample cool in the drying oven to avoid taking on any moisture, then weigh the tin and combusted sediment plug, and record the ash-free dry weight on the lab sheet.

Data Submission

1. Scan the completed field data sheets and save both paper and electronic versions locally. We do not require you to submit the scanned forms.

2. Enter data into the provided data entry template. Each template is an Excel spreadsheet. Please provide as much protocol and sample metadata as possible, such as the protocol version and contact information. Use the "notes" columns to provide additional information or context if a relevant column doesn't already exist, rather than renaming or creating columns.
3. Use our online submission portal to upload the Excel Spreadsheet: https://marinegeo.github.io/data-submission
4. Contact us if you have any questions: marinegeo@si.edu