SMMA Manual of Methods for Environmental Monitoring

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SMMA Manual of Methods for Environmental Monitoring

(*First draft*)

Purpose

1. To provide a guide and checklist for SMMA staff carrying out environmental monitoring

2. To provide a reference for new SMMA staff undergoing training in monitoring methods

Equipment, Methods and Reference Materials for Water Quality Monitoring

1. Assessing Levels of Faecal Coliform Bacteria

1.1. Field equipment checklist:
- Sample bottles
- Current list of test sites

1.2. Analysis equipment checklist
- Delagua test kit (see manual and DVD)

Step One

Collect two water samples from the each site {Barons Drive/Jalousie/Anse Chastanet/Soufriere River.

Step Two

Samples need to be analyzed within X hours of collection

Step Three

Every piece of apparatus for the test needs to be sterilized

Sterilize the filtration Apparatus

Carefully dry the sample cup and filtration assembly with a clean dry towel/tissue

Pour about 1ml (approx. 10 drops) of methanol in to the sample cup.

Tip the cup until the methanol runs toward the lid

Carefully ignite the methanol in the sample cup using the cigarette lighter (Keep the mouth of the sample cup away from your face and the hole uppermost to prevent methanol running unto your hand).

Place the cup on the flat surface which will not be damaged by heat make sure some methanol stays at the bottom allow methanol to burn for a few seconds, when almost completely burned up (as the flames are dying down), place the filtration head over the sample cup and push firmly into place to form a good seal

Keep the filtration apparatus sealed for at least 15 minutes before use.

Step Four

Using the absorbent pad dispenser (if not available use the sterilized tweezers), place one pad into each Petri-dish (two from each site).

Step five

Pour cultured medium using the medicine dispenser unto the absorbent pad in the Petri dish to soak the pad and leave a slight excess (to prevent the pad from drying out during incubation).

Step six

Remove the sterile sample cup from the filtration apparatus. Push the filtration apparatus firmly onto the vacuum cup. Place the assembly in an upright position. Unscrew the plastic collar and filtration in order that these may be easily removed. Do not place these on any surface other than the filtration base.

Step seven

Using the sterile tweezers, carefully remove a sterile membrane filter from th packet. Hold the membrane only by the edge and do not let the membrane filter touch anything while it is being transferred to the filtration apparatus.

With one hand, lift the filtration funnel and plastic collar above the filtration base. With the tweezers in your other hand, place the membrane filter (grid side facing upwards) unto the bronze disc filter support. Replace the filter funnel and collar immediately, without allowing them to come into contact with any external objects. Hold the funnel between the forefinger to ensure that the collar will not slip off and that the fingers do not come in contact with the interior surface of the funnel.

Screw the plastic collar down tightly to provide a water tight seal between the filter membrane and the filter funnel.

Rinse the sterile sample cup and the syringe once with the water before taking the sample. Take care not to allow external contamination to enter the sample cup. Using the syringe measure 10ml of the water from the sample and pour the water sample into the filtration funnel.

Insert plastic connector of the vacuum pump into the vacuum connection on the filtration base. Squeeze the pump bulb to draw all the water through the membrane filter. When all the water has passed through the filter, disconnect the pump from the filtration apparatus. Do not all excess air to be drawn down through the filter once all the water has gone through.

Unscrew the collar and remove the funnel and collar with one hand. Using the sterilized tweezers in the other hand, lift the membrane carefully from the filtration base. Hold the membrane by the edge only.

Place the membrane on a prepared Petri-dish, grid side up unto the absorbent pad soaked in cultured medium. Lower the membrane on the the pad by "Rolling" so as to avoid trapping air bubbles under the membrane.

Replace the lid of the Petri-dish with the marked lid with sample information.

Place the Petri-dish with the lid uppermost into the carrier (insert the dish at the bottom so that new dishes can be taken from the top of the carrier) and return the carrier to the incubator pot. All 16 Petri-dishes should be in the rack during incubation. This allows for an even distribution of heat in the incubator. Replace the incubator lid.

Resterilise the filtration apparatus

Place samples in the incubator for 4hrs

After four hours switch on the incubator and incubate the samples for 16 hours (make sure that the kit lid is closed).

Switch on the incubator and check that he *power on* indicator is lit.

NB: sterilize all test equipment before putting anything away.

Step eight
Counting Colonies and Recording Results

It is important that counting is completed as soon as possible after the Petri-dishes have been removed from the incubator (certainly within 15 minutes) as the positive colonies will change color on cooling and standing.

Once the incubation period is complete, remove the Petri dishes and their holder from the incubator pot. Remove the lid of the Petri-dish and observe the surface of the membrane in good incident light.

Count all the yellow colonies which have a diameter of between 1 & 3mm. Frequently two or more colonies will merge together. Examine the shape of the colony and it is usually clear how many colonies have merged together. Count each of the sub-colonies. Do not colonies that are transparent, red/pink or blue/grey.

If there are large numbers of yellow colonies, count methodically using the horizontal grid lines. In this way it is possible to count up to 100 colonies on a membrane. If there are more than 100 colonies on the membrane, the number can be estimated by dividing the membrane into sections and counting the number of colonies in one section.

Convert the count into numbers of thermo-tolerant coli forms per 100ml and record the results on a weekly report.

Disposal

All contaminated materials should be sterilized before disposal to avoid creating a risk to the public. DO NOT discard contaminated membranes and filter pads into the environment.

References

Delagua manual

2. Measuring Salinity

This procedure is done using a Refractometer which is an instrument that determines the amount of salt in the sea water.

Field equipment checklist

- Refractometer
- data form and pencil

Step one

Calibrate the Refractometer

- Pour three to five drops of distilled water under the transparent cover of the refractometer.

- The horizon line should fall on the zero, which would indicate the refractometer is ready to be use for testing.

Step two

- Using the pipette to collect the sample from the site, add a few drops under the transparent cover and look through the eyepiece to see the reading on a calibrated scale.

- The refractometer must be frequently recalibrated using distilled water.

Step three

- Wipe the glass surface and cover of refractometer with a tissue and fresh water after use.

Fig 1. The Refractometer, dropper, distilled water and screw driver for calibration

3. Measuring Turbidity

Field equipment checklist

- Secchi disk and measured line
- data sheet and pencil

This test measures the clarity or visibility of the water. Visibility decreases when there is more particulate matter in the water.

The Secchi disc is a round weighted disc 20 or 30 cm in diameter and can be divided into four equal sections in an alternating black and white pattern and is attached to a line or rope.

Lower the Secchi disc into the water until you can no longer see it.

Slowly pull up the disc until it just reappears and record the depth at that point.

If the bottom is visible, record “B” for bottom

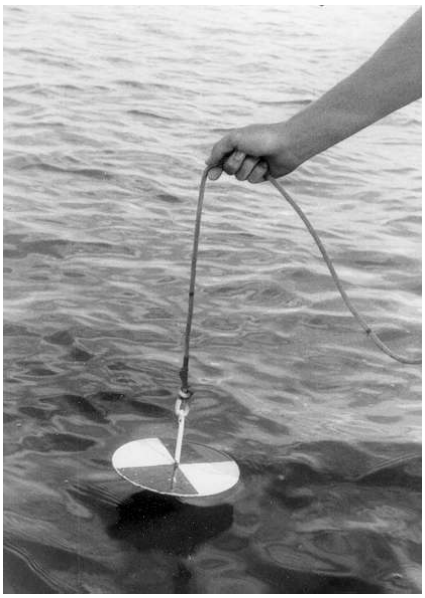

Figure 2. Secchi disk and measured line

4. Measuring Water Temperature

Field equipment checklist for individual measurements

- thermometer
- data sheet and pencil

Water temperature can be measured by holding a simple thermometer 0.5m below the surface and/or at the depth of the study site. Read the water temperature while the thermometer bulb is still in the water. A maximum/minimum thermometer left at the site will record the warmest and coldest that the water has been since the thermometer was last set. Monthly monitoring is generally adequate unless temperature is a special concern because of coral bleaching.

Field equipment checklist for temperature loggers

- loggers etc

Temperature loggers are installed at 0m, 5m and10m at Malgretoute, Virgin Cove at Anse Cochon, Coral Gardens. Temperature is recorded by the loggers every X hours
Every six months collected out of the water to read – give data at different intervals (need to give a bit more detail here?)

5. Measuring Sedimentation

Field equipment checklist

- set of sediment traps to be installed
- Covers? For sediment traps to be retrieved
- container for collected traps

Analysis equipment checklist

- Millipore filter and vacuum pump
- Filter papers
- Data sheet

Sediment traps are made of PVC pipes with couplings at the bottom which fit onto a PVC base that is cemented to the reef.

Every two weeks the sediment traps are collected from the different sites for analysis.

After the excess water is poured out of the sediment traps the samples are then filtered by pouring the contents through the filter.

Then it is filtered

a. Write the name of the sites where the sediment sample was collected on each filter paper.
b. Remove some of the excess water in the sediment traps
c. Pour the remaining contents through the filter

After each sample has been filtered it is then heated in the oven to dry until a constant weight is attained.

Weigh and record the samples.

After it is weighed that can illustrate how much sedimentation is present in the different sites.

5. Measuring the Distribution of Nutrient-indicator Green Algae

Field equipment checklist

- GPS
- Data sheet and pencil

The distribution of intertidal green algae can be an indicator of nutrients entering the sea from land or from boats. This can be mapped every few months to see which areas are most affected and if the extent is increasing or decreasing.

The distribution of green algae is monitored by taking GPS waypoints at the start and end of each affected area:

and record the information in a field data sheet:

Distribution of intertidal green algae		
Date	**Start waypoint**	**End waypoint**
25 March 2006	1	2
"	3	4

The waypoints are then added to a map of the SMMA and the distribution of algae on that date is drawn.