

SAMPLING WITH SUP TRAWL

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INTRODUCTION

The SUP-Trawl is an adapted model based on the LADI, developed by the Civic Laboratory for Environmental Action Research. This is an instrument to sample microplastics from surface water by pulling it behind a small, floating device that is propelled by muscle power. For instance a stand-up paddle board, canoe or kayak. It's a cheap, low-tech and easy to build trawl. This makes it ideal for citizen science projects.



WHAT DO YOU NEED?

SAMPLING

- SUP-trawl (see building protocol)
- Flow meter on rope
- Thin line (~15m)
- Datasheets
- Clipboard
- Clips
- Pencils
- Eraser
- Pencil sharpener
- Glass or plastic container (with a lid) for the sample (make sure the entire cod-end fits into it)
- Extra person that helps you write down data or a water tight bag to keep your datasheet in.

ANALYSIS

- A cod-end (net) with the sample
- 2 buckets
- Sieve 1 mm (optionally a sieve 0.355 mm for the smaller parts)
- Drip tray
- Sieve-lid
- Grid paper 5 mm
- Squeeze bottle with tapwater (and access to water tap)
- Magnifying glass
- Pincers/small spoons
- Petri discs/tubs
- Tape
- Marker/pen
- Head lamp/Waka waka lamp
- Data recording sheets
- Clipboard
- Clips
- Pencils
- Eraser
- Pencil sharpener

INFORMATION

SUP-TRAWL

The SUP-trawl was specifically designed to take samples behind a small floating means of transportation (<4m) powered by muscle, like a Stand Up Paddle Board (SUP), kayak, or canoe. It can also be used behind a dinghy or small motorised boat at a low speed and minimal disturbance of the water surface. The SUP-trawl is attached at a minimum of 1 meter behind the board/kayak or at least outside the bow wave of the boat.

DISTANCE LOG

The flow meter enters the water at the same time and measures the amount of water passing through the net. Every 3 rotations of the flow meter, represents a meter distance, so we can measure the water displacement and distance exactly. If you don't have a flow meter, it is important to note the exact coordinates of the start and end point of your measurement, to make sure you can calculate the distance afterwards.

WRITING DOWN DATA

Write on the datasheet all the information when you start and end the measurement. It is important to be as precise as possible. This includes the GPS-location. Use a GPS tool, Google Maps or another app that measures GPS-location. In addition to writing down all the info, we recommend taking pictures of the surroundings, the trawl and the sample during the sample taking and analysis.

TRAWL SPEED AND DIRECTION

The speed of the trawl depends on how fast you can paddle *at a continuous pace*. The fine mesh of the net creates a lot of pulling force, which is why you'll often not go faster than 0,5-1 knots. A constant speed is important, as well as making sure that the trawl stays neatly at the water surface. Make sure the trawl doesn't get submerged.

TRAWL DURATION

The SUP-trawl will have to be pulled for 30 minutes (maximum of 60 minutes). This depends on the amount of floating material in the water (e.g., algae or (non plastic) waste). When the net gets filled up with floating material, you'll have to end your sample collection. Depending on the water type and time of year, there can be a lot of organic material floating on the water. Pay attention to this when making your plan.



ANALYSIS

PREPARATION

As soon as you know which section of water you want to sample:

1. Take the datasheet and write down the sample number, date and personal information.
2. Assemble the SUP-trawl, zip up the net and make sure the cod-end is tightly attached.
3. Put you SUP (or other device) in the water and do a short trial round to test the stability.
4. Attach the SUP-trawl 1 meter behind the board. Make sure that the trawl is outside the bow wave and disturb the water surface as little as possible while moving around.
5. Attach the flowmeter behind your SUP. Make sure it doesn't get tangled up in the ropes.



The flow meter

6. Optional: put everything in the water and do another test round without collecting data. Adjust the ropes if the trawl or flow meter are not performing right. Take everything out of the water and rinse it really well (especially the net) before you start your official sample, so that you don't take any plastics from the testround into your official sampling.
7. Write down the starting number on the flow meter, the GPS-coordinates of the starting point and the starting time, at the moment the trawl and flow meter go into the water.
8. Go with as much of a constant speed as you can, without abrupt movements.
9. Do this for at least 30 minutes.
10. At the end, you take the trawl and flow meter from the water and you write down the final number on the flow meter, the GPS-coordinates of the end point and the time you ended the measurement.
11. Rinse water (from the river/lake/etc.) along the outside of the net and rinse as much of the sample as you can to the cod-end of the net. Make sure none of the rinsing water (with potential extra plastic pieces) gets into the net.
12. If needed: put the trawl on your board to finish the trail/get home.
13. If you want to take multiple samples, make sure you rinse the net really well and collect all the sample in the cod-end. Then replace the cod-end with a new one. Or replace the entire net.

Tips and tricks:

- If there is a lot of organic material floating in the water, shorten your trawl-time to 10 minutes.
- The trawl should go through the water in a straight line. You can adjust any imbalances with the three ropes.
- If the trawl raises up from the water, you can weigh it down with weights or fishing lead.
- Use a tracker app to record the exact route you're taking.
- Take pictures along the way.
- Share your research on social media!

ANALYSIS

Perform the next steps in a stable environment and with access to flowing tap water:

1. Real in the net and rinse it fully so that everything inside it is collected in the cod-end. Do not forget the seams. If it doesn't fit in the cod-end, carefully rinse it above the sieve or a really clean bucket to collect the remaining sample.
2. Empty the cod-end into the 1 mm sieve (or optionally place the 335 um sieve below the 1 mm sieve) and rinse everything with tap water using a squeeze bottle. Turn the cod-end inside out and carefully rinse everything into the sieve.
3. If possible, take out the big pieces of plastic manually and carefully rinse them above the sieve.
Watch out!: make sure nothing splashes out of the sieve while rinsing.
4. Start looking for plastics and remove the visible big pieces first. Rinse them above the sieve, because (micro) plastics can stick together. Use the metal pincers or a small spoon to separate stuck together pieces.

Recognizing plastics

5. You can recognize plastics by the following characteristics:
 - a. Uniformity/lack of structure - Organic material consists of many different cells, plastic consists of 1 uniform material. Threads or fibers are often equal in width over the entire thread/piece.
 - b. Color- bright colors stand out, but also look for transparent, black or white particles.
 - c. Weathering - look for scratches or sharp corners/edges.
 - d. Reflection - plastic can reflect light or look shiny.
 - e. Hardness - plastic is often hard, bendable or foamy. Organic material is often stretchable and disintegrates quickly when it is dried.
 - f. Moisture - place the piece on a piece of paper, let it dry and see if it loses shape. It doesn't? Than it can be plastic.
 - g. Meltability - hot needle test: touch the particle with a hot needle and smell if you can smell burned plastic.

Continue

6. Remove all the organic material from the sieve with the pincer and rinse it all carefully above the sieve. Use magnifying glass and a lamp to see if you're not missing any pieces of plastic (organic material can be qualified as sticks, leaves, algae, seaweed, small animals, etc.).



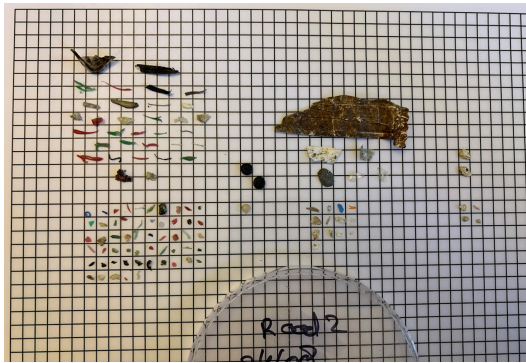
7. Move all the plastic material to a petri disc or glass jar.

Tips to make searching easier:

Put the organic material on a plasticized sheet and add drops of water to loosen up the organic material.

8. Fill a petri disc (or jar) with a layer of water and put some material from the sample in it to investigate it.
9. Divide the found plastic on the following characteristics:
 - a. Size: > 5mm (bigger than 5 mm), or < 5mm (smaller than 5 mm)

- b. Type:
- Fragment - small, often hard pieces broken off from bigger pieces
 - Foil - often coming from packaging material
 - Foam/foamy looking - styrofoam, PUR-foam, isolation materials, etc.
 - Pellet/Nurdle - plastic, uniform pellet, about the size of a lentil
 - Line/thread - often coming from fishing nets or lines, ropes, packaging ropes or nylon fabrics
 - Other - microbeads, sigaret butts, rubber (bands), etc.



- Put all the pieces on the grid (5*5 mm), count them, fill in your results on the datasheet, and take an overview picture. Put a piece of tape on it before you take a picture, with the date and sample number on it.
- Fill in the datasheet and take a picture of that as well.
- Calculate the distance you sampled with the flow meter. End number minus the starting number. Then divide it by 3 to calculate how many meters you travelled. Then divide by 1000 to calculate the number of km.

$$\frac{\text{Flowmeter end} - \text{flowmeter start}}{3000} = \text{Distance in kilometers}$$

- Calculate the number of plastics in your sample to compare them. Add all the pieces you found and use this calculation to calculate the number of pieces per square km.

$$\frac{\text{Total number of pieces (\#)}}{\text{Opening (km)} * \text{travelled distance (km)}} = \text{No. of particles per square kilometer (\#/km}^2\text{)}$$

- If you take multiple samples, keep the different samples separated, dry them and fold the sample (all plastic particles) in a piece of paper towel. Put it in an envelope, together with the datasheet and write the sample number on it. In this way you can store and record your samples.

ADVANCED TIPS:

- Option 1: Do you want to know the weight of the pieces? Weigh them separately (dried!) or weigh the entire sample and record it on the datasheet.
- Option 2: Do you have a microscope? That makes it easier to separate plastic from organic material!
- Option 3: For the real science geeks: use a Bogorov-chamber to assess the sample more systematically. .

DO YOU WANT TO SHARE YOUR SAMPLE? YOU CAN!

- Step 1: Package the sample in an envelope together with the datasheet and send it to: Jollenpad 14, 1081KC Amsterdam, The Netherlands. Please put each sample in a different envelope, so that they don't get mixed up during travel.
- Step 2: Send a picture of the sample, datasheet and the other pictures to info@theoceanmovement.org

DATASHEET

SAMPLE 1

Trawl #	Start info	Start time	Latitude	Longitude	Flowmeter
Date	End info	End time	Latitude	Longitude	Flowmeter
Sample number	Fragment	Foil	Foam	Pellet/nurdle	Line/thread
<5 mm					
>5 mm					

SAMPLE 2

Trawl #	Start info	Start time	Latitude	Longitude	Flowmeter
Date	End info	End time	Latitude	Longitude	Flowmeter
Sample number	Fragment	Foil	Foam	Pellet/nurdle	Line/thread
<5 mm					
>5 mm					

SAMPLE 3

Trawl #	Start info	Start time	Latitude	Longitude	Flowmeter
Date	End info	End time	Latitude	Longitude	Flowmeter
Sample number	Fragment	Foil	Foam	Pellet/nurdle	Line/thread
<5 mm					
>5 mm					

SAMPLE 4

Trawl #	Start info	Start time	Latitude	Longitude	Flowmeter
Date	End info	End time	Latitude	Longitude	Flowmeter
Sample number	Fragment	Foil	Foam	Pellet/nurdle	Line/thread
<5 mm					
>5 mm					