Sampling SUP-Trawl

Science Unites People

Sampling

Supplies

- SUP-Trawl (see building protocol)
- Flowmeter on a line
- Thin rope (~15m)
- Datasheets
- Writing board
- Clipboard
- Pencil
- Eraser
- Sharper (pencil)
- Glass jar or container with lid for the sample (best to fit the whole cod end)
- Guide boat to help you write down data OR waterproof bag to hold the datasheet

SUP-Trawl

The SUP-Trawl is specially designed for sampling behind a small floating device (<4m) that moves by muscle power such as a Stand Up Paddle Board (SUP), kayak, or canoe. It can also be done behind a sloop or small motorized boat where the speed is low, and the disturbance of the water is also low. The SUP-Trawl is pulled at least 1 length away from the floating device or at least out of the wake.

Distance logging

The Flowmeter enters the water at the same time as the net and measures the amount of water passing through the net. Every three rotations of the flowmeter is a meter which allows us to determine the exact amount of water displacement.
If you don't have a flow meter you can use a tracker app or sports watch. Or you can use the coordinates of the start and end point to calculate the distance.

Figure 1. Flowmeter on SUP board.

Data collection

Write down all information on the data sheet when starting and stopping. It is important to write this down as accurate as possible. This also applies to the GPS location. Use a GPS, Google-Maps or another app that measures the coordinates. We also recommend taking pictures of everything: the conditions during the supping; the SUP-Trawl; and during the sample analysis.

Trawl speed and direction

Trawl speed depends on how hard you can paddle at a constant speed. The fine mesh size of the net creates a lot of resistance so one does not go faster than 0.5-1 knot. It is important to maintain a constant speed at which the trawl stays neatly on the water. Make sure the trawl does not submerge. If this happens, adjust the pulling lines.

Trawl Duration

The SUP-Trawl will require 30 minutes (maximum 60 min) of trawling. This depends on the amount of floating material. If the net becomes too full, the measurement will be shorter. Floating material is dependent on the type of water and the seasons. Take this into account when making your sampling plans.

Once you know what stretch 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 tighten the connecting ring and cod end (Turn the thin part of the cod end opening away from the opening of the ring).
3. Launch your SUP and try a trial lap to test your stability on the SUP.
4. Hang the SUP-Trawl at least 1 length away behind your SUP. So, when the SUP is 3 meter, the rope to the SUP-Trawl is 3 meter. Make sure it stays out of the bow wave and disturbs the surface water as little as possible during the move.
5. Hang the flow meter behind your SUP. Make sure it does not get tangled in the ropes or net of the trawl.
6. *Optional: hang everything in the water, do a test run without collecting the data. Adjust ropes if the trawl or flow meter are not doing well. Take everything out of the water and make sure everything is rinsed properly after this test run!*
7. Write the initial position of the flowmeter, GPS coordinates of the starting point and the starting time on the datasheet when the trawl and flowmeter enter the water.
8. Peddle at a constant speed without too many abrupt movements.
9. Keep this up for at least 30 minutes.
10. At the end, take the SUP-Trawl and the flowmeter out of the water and write down the end position of the flowmeter, GPS coordinates of the end point and the end time on the datasheet.
11. Rinse some water along the outside of the net to bring most of the sample to the end of the net, in the cod end. While doing this, make sure that no new surface water enters the net. With tap water, this does not matter.
12. Put the SUP-Trawl on your board to finish your trip or detach it and put it in the dinghy.
13. If you want to take several samples, rinse the net well so everything gets into the cod end and replace the cod end. Or replace the whole net and zip-on a new net.

Tips

- Should there be a lot of organic material floating in the water? Then reduce the trawl sampling time to 10 minutes.
- The trawl should go straight through the water. If necessary adjust with the string at the bottom.
- If the trawl is too high out of the water you can weigh it down with weights or fishing weights.
- Use a tracker app to keep track of the exact route and distance
- Take extra photos along the way
- Share your cool research on social media!
- Enjoy being in nature and being active!

Figure 2. SUP-Trawl is taken out of the water. The net is full of duckweed which makes the analysis more difficult. Reduce the sampling time should that be the case.

Monster Analysis

Benodigdheden

- cod end with the sample
- 2 buckets
- sieve 1 mm
- *(optional: sieve 0.355 mm for smaller particles)*
- Pan (Drip tray)
- Lid of sieve
- Gridpaper 5 mm
- Squirting bottle with tap water
- Tap for tap water
- Magnifying glass
- metal tweezer/spoon
- Petri dish/ small container for plastics
- Tape
- Marker/pen
- Headlight/Waka waka
- Datasheet
- Clipboard
- Clips
- Pencil
- Eraser
- Sharpener

Analysis

Conduct the following steps in a stable environment with access to running water:

1. Bring the net in and rinse it completely so that everything in the net is collected in the end, the cod end. Do not forget the seams. If everything does not fit in the cod end, rinse it carefully over the sieve or over a properly cleaned bucket.

Empty the cod end into the 1 mm sieve (*optional with the 335 µm sieve underneath*) and rinse everything well with tap water/squirting bottle. Then turn the cod end inside out and carefully rinse everything in the sieve.

2. First remove the large pieces from the sieve if you see them and rinse them very well over the sieve. CAUTION: make sure nothing spills out of the sieve when rinsing.
3. Search for plastics, first of all removing the larger visible pieces. Rinse them above the sieve as well because plastics can stick together. Use the metal tweezers or a spoon for this.
4. Plastic can be recognized in the following ways
    - 4.1. Uniform structure versus lack of cellular structure - Organic material often consists of different cells, plastic often consists of a uniform substance. Threads or fibers are often uniform in thickness across the entire thread.
    - 4.2. Color - bright colors stand out quickly but also look for transparent, white, or black particles. Organic material is often green or brownish.
    - 4.3. Weathering - watching for scratches or sharp corners can help you
    - 4.4. Reflective - plastic can be reflective or shiny
    - 4.5. Hardness - plastic is often hard, bendable, or foamy. Organic material is stretchy and when dry it falls apart quickly.
    - 4.6. Moisture - put it on a piece of paper and see if it loses its shape. It doesn't? → then it may be plastic.
    - 4.7. Meltability - Hot needle test, touch the plastic with a hot needle. See and smell if it melts
5. Remove all the organic material from the sieve with the tweezers and rinse it all thoroughly collecting the water in the sieve. With the magnifying glass and lamp, check all the pieces so you don't miss anything. (Organic material are stick, leaves, weeds, animals, etc.)
6. Move all the plastic material to a petri dish or glass jar

7. Tip to make the search easier
   7.1. Place the organic material on a laminated sheet and add drops of water to loosen organic material
   7.2. Fill the petri dish (or transparent container) with a layer of water and put in a small amount of material from the sample to pick it out.
8. Divide on the following characteristics
   8.1. Size: >5mm or <5mm
   8.2. Type:
      Fragment - small, often hard, pieces derived from larger pieces
      Foil - often from packaging material
      Foam/Foam-like - Styrofoam, Pur foam, insulation material, etc.
      Pellet/Nurdle - plastic uniform pellet the size of a lentil
      Line/wire - often derived from fishing nets/line, ropes, packaging tires, and nylon
      Other - microbeads, cigarette filters, rubber, rubber bands, etc.
9. Put all the pieces sorted on the grid sheet (5*5mm), count them, fill it in on the data sheet, and take a picture of it. Stick a piece of tape in the frame of the photo with the sample number and date.
   Fill in the datasheet and take a picture of this as well.
   Calculate the distance you sampled. Subtract the end position from the flow meter's initial position and divide by 3 to get to meters. Divide by 1000 to get to kilometers (km).

$$\frac{\textbf{Flowmeter end - Flowmeter start}}{\textbf{3000}} = \textbf{Distance in Kilometers (km)}$$

10. Calculate the amount of plastic in the sample for comparison. Add up all the pieces and use the following calculation to get that the number of particles per square km (#/km2).

$$\frac{\textbf{Total Particles}}{\textbf{Width net (km) * Distance (km)}} = \textbf{Particles per square kilometer (\#/km}^2\textbf{)}$$

11. If you are taking multiple samples; keep the different samples separate, dry them, and fold the sample (all plastic particles) in a piece of kitchen paper and put it in with the datasheet in an envelope. On the outside, write the sample number on it that is the same as the number on the Datasheet (datasheet, see Appendix).

Figure 3. Sample in sieve with organic matter (left), plastic pieces removed to petri dish (middle), and plastics divided in groups on laminated grid-paper with sample name (right).

Do you want to help us please send us your sample:

12. Pack your plastic sample in an envelope together with the data sheet and send it to Jollenpad 14, 1081KC Amsterdam. Each sample in its own envelope.
13. Also send a picture of the sample, datasheet, and the other pictures to info@theoceanmovement.org.

Advanced tips

14. If you also want to determine the weight of the sample, make sure you use a scale!
15. If you have a microscope, this can make it easier to distinguish the plastic from the organic material! Especially if you look at the smaller particles (>0.355mm <1 mm).
16. For the real science-geeks: use a Bogorov-chamber to work through the sample more systematically. Especially if you look at the smaller particles (>0.355mm <1 mm).

Datasheet – Fill in the data

Sample 1

Trawl #		Starttijd	Breedtegraad (N)	Lengtegraad (W)	Flowmeter
	Start data				
Datum		Eindtijd	Breedtegraad (N)	Lengtegraad (W)	Flowmeter
	Eind data				

Sample #	Fragment	Folie	Schuim (foam)	Pellet / Nurdle	Lijn/draad
<5mm (kleiner)					
>5mm (groter)					

Sample 2

Trawl #		Starttijd	Breedtegraad (N)	Lengtegraad (W)	Flowmeter
	Start data				
Datum		Eindtijd	Breedtegraad (N)	Lengtegraad (W)	Flowmeter
	Eind data				

Sample #	Fragment	Folie	Schuim (foam)	Pellet / Nurdle	Lijn/draad
<5mm (kleiner)					
>5mm (groter)					

Sample 3

Trawl #		Starttijd	Breedtegraad (N)	Lengtegraad (W)	Flowmeter
	Start data				
Datum		Eindtijd	Breedtegraad (N)	Lengtegraad (W)	Flowmeter
	Eind data				

Sample #	Fragment	Folie	Schuim (foam)	Pellet / Nurdle	Lijn/draad
<5mm (kleiner)					
>5mm (groter)					