

Building a SUP-Trawl

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Introduction

The SUP-Trawl is a modified model based on the LADI developed by the Civic Laboratory for Environmental Action Research (CLEAR). This is a tool for sampling microplastics from surface waters by towing it behind a small floating device with propulsion by muscle power such as a stand-up paddle board, canoe, or kayak. It is cheap, low-tech, and easy to assemble it yourself. This makes it ideal for citizen science monitoring purposes.

Please note: produce as little plastic waste as possible during the construction of this SUP-Trawl by collecting the (micro)plastics, and properly dispose of the waste that is produced.

What do you need?

Frame

- Frame
- Hardwood plank (plank 1.8x14.5x180cm)
- Stain (water-resistant)
- 12x stainless steel screws suitable for hardwood 5x40 PK TX
- 3x screw eyes HCP 4.40x40x16
- Tensioner with ratchet 25mm-7m
- PVC pipe - sewage pipe 75mm 2m
- 2x pvc end cap
- 2x pvc end cap with thread
- 2x PVC
- PVC Glue
- Kit (small package)

Rope

- Rope pp braided 4mm 10 m

Net (see 2. Net for details)

- Micro Mesh Net with mesh size of 335 μ m (length: 2m)
- Zipper connection
- Connection ring
- Cod-end
- 8x bolts plus nuts stainless steel M08 (ST50)
- 8x washer M8 RVS
- 8x grommets M8-size plus grommet-maker

Equipment

- Drill
- Saw
- 2x socket wrench for nut M08 (or bahco)
- Scissors
- Lighter/tool cutter
- Pressing rings plus punch set
- Hammer
- Textile scissors

How to assemble the SUP-Trawl?

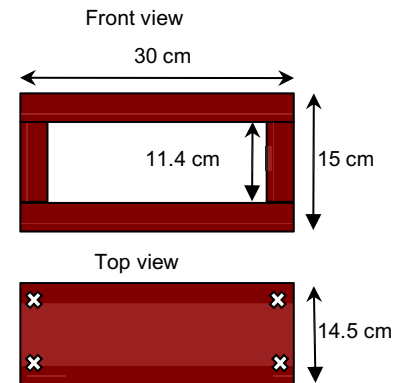


1. Frame (attention: 24 hour waiting time)

The frame consists of a wooden cube (30*15 cm) that is open at the front and back. A PVC tube is attached to both short sides for buoyancy. The dimensions of the cube are equal to the circumference of the opening of the net (90cm), so the dimensions of the frame should be adjusted accordingly.

Wooden frame

- Saw the planks to size
Width 2x 30cm
Height 2x 11.4 cm
- Drill holes for the 4 screws (smaller diameter than the screws)
- Stain the planks (including the holes) to make them waterproof
- **Wait 24 hours** for the stain to dry
- Attach the top and bottom planks to the side planks with two screws in the pre-drilled holes.



Floating wings

- Saw/cut two pieces of PVC pipe to a length of 45 cm (collect all the flakes in a container or with a vacuum cleaner). Length can be adjusted according to the weight of the frame.
- Using PVC glue, glue different parts of the wings together (see Figure 1 left).
- Repeat for the other PVC pipe.
- Drill a hole in the center of both caps with thread (1) large enough for an M8 bolt.
- Drill a hole in the side of the cube large enough for an M8 bolt. Do this at the top and front of the frame so that the float sits high enough and there is enough room at the back to attach the net.
- Attach the PVC screw cap to the side of the cube with bolt (threaded side outward) and nut (M8) and a washer in between.
- Plaster the nut side with sealant and tighten the nut firmly. This ensures that no water can enter the PVC pipes.



Figure 1. The parts of the floating wings (left), the assembled wings (right), and the wings attached to the frame (bottom)

2. Net

We purchased the net and the flow meter from Hydrobios GmbH, Germany. In the table below are the description of the products with the price indication in 2021 ex VAT and ex shipping costs.

Parts	Description	Article number	Price
1. Net Part for Neuston Net, mesh size 335 microns 30 x 15 x 200 cm	Net with a length 2 meters and mesh size of 335 um	Hydro-Bios No. 438 212	€465,00
2. Nylon webbing with zip fastener for Neuston Net acc. to David/Hempel 30 x 15 cm opening	Strap with a zipper to attach to the frame and to easily attach and unzip the net.	Hydro-Bios No. 438 210-001	€73,00
3. Fixing Ring for Soft Net Bucket 11 cm diam.	Fixing ring to attach the cod end (4.) to the net (1.)	Hydro-Bios No. 438 935	€92,00
4. Soft Net Bucket with Boltrope; diameter= 11cm, length= 25cm, mesh size 335µm	The end of the net, also known as a cod-end, where the sample is collected	Hydro-Bios No. 438 930	€153,00
5. Mechanical Flow Meter	The device measuring the displacement of the water	Hydro-Bios No. 438 110	€393,00

The net can also be sewn together yourself. This can save costs, but it does take more time. For a guide to this, we refer to the protocol for the LADI developed by the Civic Laboratory for Environmental Action Research (CLEAR).



Figure 2. The double amount of materials for the net (left) and the flow meter on a SUP board (right).

3. Frame & Net assembly

For a proper attachment of the net to the frame, we use a tension strap and bolts through grommets.

Grommets

Press six grommets in the nylon webbing with zipper, two at the top, two at the bottom and one on each side. Follow the instructions on the pressing tool. Make sure the grommets are a larger diameter than the M8 bolts. And make sure there is room left on the nylon webbing for the tension strap. Here are some images for illustration.

First make the grommets in the webbing and once they are all in, drill the holes in the wooden frame for the bolts (M8). Use the washers between the bolts and nuts.



Figure 3. Pressing grommets through nylon webbing (top 4 pictures), Materials (bottom left), and final results of the frame with grommets en tension strap (bottom right).

Tension strap

First pull the strap around the frame tightly before tensioning it. The tensioner (metal) sits on the bottom in the center of the frame after tensioning. This provides a low center of gravity and stability in the water during sampling. The remaining strap may be cut and burned off, so it does not fray.

4. Completion

The final step is to attach the screw eye rings to the frame and the lines to the screw eyes. To properly attach the screw eye rings to the frame, pre-drill the three holes that are smaller in diameter than the thread.

- Drill two holes in the top board and one in the bottom board.
- Screw a threaded ring into each hole.
Suggestion: should it be heavy use a socket wrench in the ring, it takes less force (see picture 4 left).
- Cut/cut three 1.5-meter pieces of rope and burn off the ends so they don't fray.
- Tie one end of each rope to one of the three screw eyes.
- In the other end, make a loop (pole stitch) that is the same distance from the frame as the other ropes.
- Using the remaining rope, tie the loops together with a pole stitch.

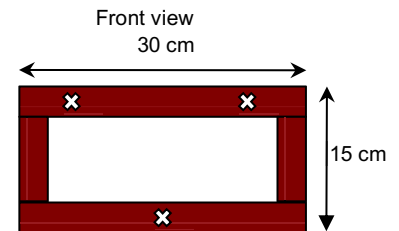


Figure 4. screwing in the screw eyes in pre-drilled whole in the frame (left) and the frame with rope attached through the eyes and dettached wings for transportation(right).