

Technology No. 13

DESIGN OF DOUBLE COMPARTMENT DEVICE FOR MICRO AND MACRO PLASTIC ENTRAPMENT IN FLOWING WATER

Inventors: Mr. Manickavasagam, S.; Dr. Satya Prakash Shukla; Dr. Kundan Kumar; Dr. Saurav Kumar; Dr. G.R. Bhuvaneshwari

Division: Aquatic Environment and Health Management Division

Technical Details

The debris and plastic collection device consist of two chambers made of laminated aluminium. Each chamber is fitted with a movable flap of bakelite at the proximal end and a double layer collection pouch of nylon net at the distal end. The bakelite flap moved inward during the flow of water in the chamber however, a reverse movement is checked by fixing a stopper on the lower arm of the frame. This facilitated the opening of chamber during a unidirectional flow of water during high and low tide conditions. The collection pouch had chambers made of two layers of nylon mesh of 5mm and 0.5 mm, respectively. The inner chamber (5mm pore size) collected the debris and plastic of 5mm and above however, the outer chamber collected the plastic and debris of 0.5mm or less. The collection pouches are attached to main frame of the chamber and can be removed after they are filled with the debris and plastics. The aluminium device has a mouth opening (260cm×65cm) fitted with two flaps of size (125 X60 cm) to prevent the escape of plastic debris during reverse flow of water. These flaps act like a door during water ingress into the unit. The thickness of bakelite flap is 3mm thickness for smooth movement during tides. The sides of the bakelite flaps are covered with aluminium layer. The main purpose of aluminium device is collection of marine debris and macroplastics (size more than 5 mm) from landward side during low tide and seaward side during high tide. The pore size used in the device is more than 0.5cm (5mm) for quantification of macroplastics and marine debris. The length and breadth of aluminium frame is 260 cm and 65cm. All sides of the device are covered with double layer of net except mouth portion of the device. A gap of 15 cm is provided below the chambers at the site of installation to facilitate free movement of small fish/organisms. The total volume of aluminum device is 5.07 cubic metre. The bakelite flaps attached to the mouth of the unit prevented the exit of buoyant and semi-buoyant materials such as debris and plastics once entering the chamber, during reverse flow of water due to change in amplitude of depth during high and low tide conditions. The legs of the device are adjustable through the nuts that can be tightened in the holes in the frame at different gaps. This helps to maintain the height of the device for maximum inflow of the running water either from land to sea or vice versa. The device can be anchored through its legs or tied to adjoining structures through nylon ropes attached to the four corners of middle and top aluminium frames. The collection chambers have openings at their distal ends which remain tied to the collection

pouches during the operation but can be opened anytime for the removal of the collected materials from the chambers. The device does not require any energy input for mechanical operations.

The installation, collection and quantification can be performed with least manpower as only two persons are required for entire operations. The nylon net pouches of 50.0mm and 5.0 mm are reusable after the collection as only washing under running water for half an hour is required for opening the clogged pores of the net. The catchment area of the device can be increased by attaching side arms of nylon nets. The lamination of the aluminium frame showed no leaching of the metal after coming in contact with water as confirmed by ICP-MS. Therefore, the contamination of water from aluminium is a ruled-out possibility.

Cost-Benefit Ratio: Cost of the device can vary from 15,000/- to 3,00,000/- depending upon the size of entrapment compartment of the device.



Microplastic, macro- and megaplastic collected in the lower compartment of the device during post-high tide duration . The upper compartment shows the plastic and floating debris collected during high tide

Contact details:

- Dr. S.P. Shukla, Principal Scientist, Aquatic Environment and Health Management Division
E-mail: spsukla@cife.edu.in ; Contact No.: +91 022 2636-1446 | Extn: 272(O)
 - Dr. K.V. Rajendran, Principal Scientist & Head, Aquatic Environment and Health Management Division
E-mail ID: kvrajendran@cife.edu.in; Contact No.: 91 22 26361446; Extn. 503 (0)
-