Simple Underwater Samplers for Limnological Work

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Received: 3 November 1998, accepted: 22 June 1999

An underwater sampler for collecting water samples and an underwater sampler for collecting soil samples for limnological work has been designed. The cost of fabricating the sampler is much less than that of conventional samplers. In addition, they collect samples from shallow water bodies, which is not possible with the conventional samplers.

Introduction

Among the samplers available for collecting water samples for limnological work from the bottom of water bodies are Kemmerer’s sampler, Castella bottle, and Peterson bottle. Underwater soil is mostly collected by Ekman Dredge. Most of the samplers are meant for use in deep waters and with them it is difficult to collect samples from shallow water bodies such as ponds, specially those which are choked with aquatic vegetation. The samplers described here overcome this difficulty.

Description and Working Principle

Water Sampler

The sampler (Figure 1) consists of a metal tube (a) having length 4 m and 4 cm diam. One end of the tube is partially closed and has an opening of about 2 cm at the centre. The tube has a metal rod (b) inside it along its whole length with 1 cm diam. The rod has two rubber stoppers at both the ends (c and d). The upper stopper closes the upper opening (f) of the metal tube when pushed in and in this position the rubber stopper (e) at the lower end of the rod remains pressed above the lower opening of the metal tube. When the upper stopper is lifted out of the tube the lower stopper also gets lifted up. Thus the upper and the lower entrance of the metal tube get opened.

While collecting water samples, the sampler is lowered down into the desired depth with both the entrance of the tube closed with the help of the rubber stoppers, taking care that the upper end of the metal tube is above the water level. Then the rod is pulled up to open the upper opening of the tube. The lower stopper is also lifted up and the lower entrance of the tube gets opened.

When the sampler is opened under water, water goes directly into the tube through the lower opening of the tube and replaces the air, which goes out through the upper opening of the tube without any bubbling. When the water is filled up the stoppers are lowered again. The upper and the lower opening of the tube get closed and the sampler gets lifted out of water. The water samples can be poured out in different containers by opening the lower stopper. As the sampler has a metal frame, it can be pushed through the aquatic vegetation also, which is not possible in the case of most samplers which are operated by rope or other flexible materials. According to Battish, Mayer’s water sampler is the simplest type of sampler available in the market. But it is rope operated and cannot prevent bubbling. It is very much essential to prevent bubbling, since the gas content of the water sample gets altered due to bubbling. The sampler described here prevents bubbling. A sampler described by Dasgupta also overcomes this difficulty of collecting water samples from shallow water bodies with excessive vegetation without bubbling.

The fabrication cost of the sampler is about Rs. 150. Compared to this, an indigenously manufactured Castella bottle costs Rs. 500 and imported Pettersson bottle costs more than Rs. 1000 (Durve).

Soil Sampler

The soil sampler (Figure 2) consists of an iron rod (a) having length 2 m and diam 1 cm. One end of this rod is fitted inside a metal cone (b) having length 15 cm and 5 cm diam. It has a circular metal lid (c) having 5.5 cm diam and 1.2 cm hole in the centre. It slides along the rod. When the lid is descended on the cone, the inlet of the cone gets closed and when the lid is raised up the inlet of the cone gets opened. While collecting soil samples, the sampler is lowered down the water level
and the pointed end of the cone is pushed inside the loose soil, so that the whole cone goes inside the soil, (keeping the metal lid above the water level). The loose soil collects inside the metal cone. Then the cone is pulled up above the soil level and the metal lid is released from above along the iron rod, which descends on the cone and closes it. This prevents washing away of the soil from the cone while pulling it out along the water column.

As the sampler has a metal frame, it can be pushed through the aquatic vegetation also, which is not possible in the case of most samplers which are operated by rope or other flexible materials. The fabrication cost of the sampler is only Rs 150 and is quite economical compared to the conventional samplers.

References