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Note

The HON-Kajak sediment corer

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Introduction

The HON-Kajak sediment corer described here (Fig. 1) is a modification of one designed by L. Henrikson, H. Oscarson and H. Nyman from the Department of Zoology, University of Göteborg. It is basically a Kajak corer (Kajak *et al.*, 1965; Brinkhurst *et al.*, 1969), but has several modifications: i) the release mechanism is smaller, ii) the suction cup of the closing mechanism covers the upper end of the core tube and is kept closed by a spring, and iii) the core tube is fitted to the corer by a bayonet joint. The corer fulfills the basic requirements for a good tube gravity corer: free water flow through the core tube during descent, slow and controlled entering and penetration of the tube into the sediment, and a large core tube diameter (Blomqvist, 1991).

The sampler is effective for taking short cores (< 30 cm) of unconsolidated surface sediments from lakes. Longer cores and cores to be recovered from clayey sediments require a corer with a piston (Blomqvist, 1991), and for detailed stratigraphic studies freeze-coring is preferable (Wright, 1980; Renberg, 1981). An extruder and a sectioning box for extrusion of contiguous samples in the field are also parts of the HON-Kajak coring device (Fig. 2). All the equipment has been designed for use both in summer and winter. When coring through ice, the corer will pass through a hole made by a 15 cm auger. The weight of the corer is 4.5 kg (incl. tube), and additional

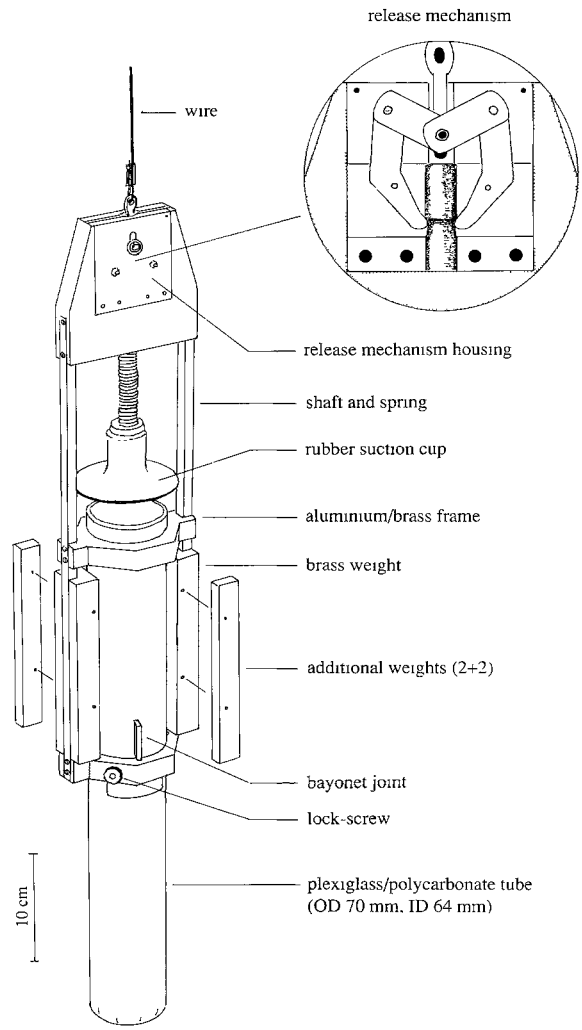

Fig. 1. The HON-Kajak corer.

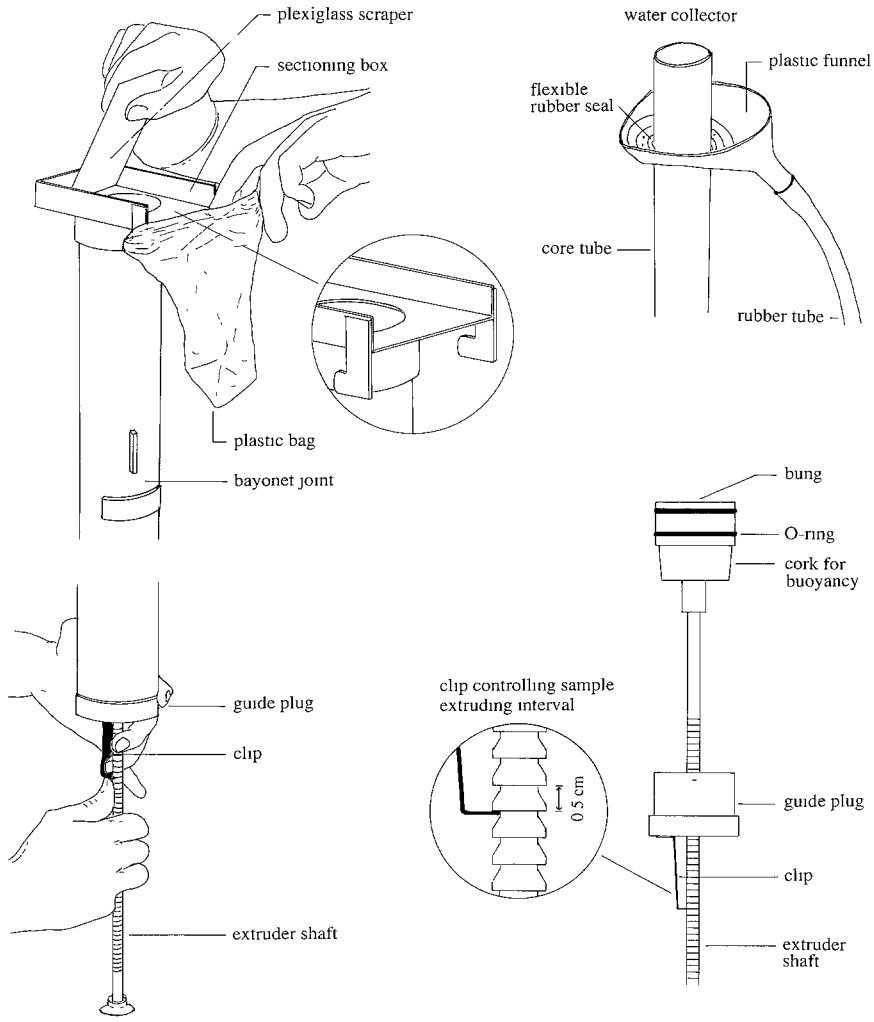

Fig. 2. The extruding and sectioning device.

weights (each pair weighs 1.2 kg) can be attached to the sampler-frame. The prototype is still in use after about 10 years without any need for repairs, and over two thousand cores have been taken. The corer has been used extensively in reconnaissance sampling in varved lake sediments, and for surface sampling (0–1 cm) for calibration data sets in connection with acidification investigations (Stevenson *et al.*, 1991; Korsman, unpubl) and studies of recent deposition of carbonaceous particles from fossil fuel combustion (Wik & Renberg, 1991).

Operation

The corer is operated using a steel wire, marked at each half metre. The release mechanism is cocked and the sampler is lowered through the water, without allowing the wire to slacken. It is recommended that the lowering operation is stopped when the tube is about half a meter above the sediment surface to allow the corer to stop swinging and to permit the operator to grip the wire in such a way that the corer can be lowered in one movement into the sediment. When the

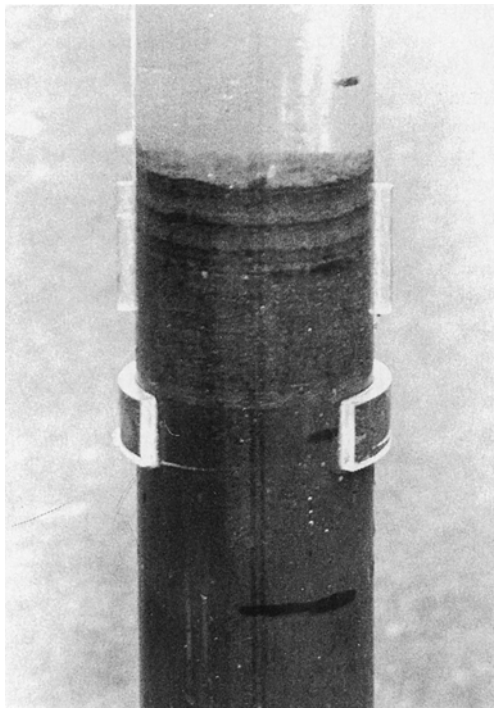

Fig. 3. Core from a lake with varved sediments. On top of the last year's dark winter layer, there is a thin layer of flocculent brown sediment. Even such easily suspended material can be sampled with this corer. The varves further down in the core are hidden by a thin layer of loose material between the tube wall and the core. This smearing is characteristic for all kinds of tube corers, and is a process which one must be aware of when using such cores for stratigraphic analyses, although the mass of the smeared sediment is very small compared to the mass of the core itself for any given level.

tension force of the wire decreases to about 2 N, the mechanism closes the upper end of the core tube. The closing of the corer can usually be sensed as a slight pull through the wire; at this point the device is hauled up.

The bung from the extruder is inserted before the lower end of the core tube is lifted above the water surface. The corer is separated from the tube by releasing the lock-screw and rotating the sampler-frame through 90°. The extruder shaft is screwed on to the bung, and the guide plug is moved up along the shaft and then fitted to the lower end of the tube. The core can then be pushed up through the tube. When working from a boat, a water collector made of a funnel and a rubber tube can be used to remove water from the top of the core tube and direct it over the side of the boat.

The extruder device is designed to be operated by two persons, one holding the core tube and operating the simple mechanism with the clip that allows 0.5 cm, or thicker, increments to be pushed up into the sectioning box. This box has two hooks on which plastic bags can be hung so the second person can easily scrape the sample into the bag without spilling any sediment, even when working in a small boat in rough water. There are more sophisticated extruding and sectioning devices (see e.g. Glew, 1988; Blomqvist & Abrahamsson, 1987, respectively), but the objective of the equipment presented here was that it should be simple, easy to clean and reliable in adverse field conditions.

Discussion

The corer is robust with the release mechanism covered to protect it from dirt and damage. The shaft of the closing mechanism is easily removed for cleaning. There are few movable parts that can freeze, and the bayonet joint makes it easy to connect and disconnect coring tubes at temperatures below the freezing-point without using any tools.

The corer closes automatically when it penetrates the bottom, thus the time the core has to be in the sediment is short compared with corers that are closed with a messenger mechanism. This is important when coring is conducted from a boat that is not anchored. The spring closes the suction cup effectively against the tube.

The release mechanism, which closes the core tube before the wire slackens entirely, requires that the tension on the wire must be maintained trough the entire descent of the corer to avoid premature closing. This requires the close attention of the operator, particularly in winter when ice freezes on the wire, and makes the lowering of the corer slower than with a messenger operated corer that can be allowed to fall freely through the water body.

The center of gravity of the corer is rather high, which makes the corer sensitive to tilting if sediments are hard. It is, therefore, important to pay attention to the signal from the closing mechanism and not slacken the wire too much, but immediately withdraw the corer after closing. The possible tilting problem could probably be avoided by mounting a buoyant device at the top of the corer, as on the newly published Glew-corer (Glew, 1991). More details about the components of the system are available on request.

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