Modified spade corer for seabed studies

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Modification has been made in the existing spade corer to accommodate a Niskin water sampler and an underwater camera for obtaining simultaneously sediment and water samples and seabed photograph in a single operation. The modified system has been tested at depths ranging from 300 to 4000 m in the Arabian Sea.

The spade corer provides samples for studying sediment stratification, animal burrows, influence of plants and animals, geotechnical strength, etc. The corer collects sediment sample of 20 cm × 30 cm × 40 cm. In the corer (2.8 m × 1.8 m × 2.4 m), the core box is fitted beneath a gimbal mounted sliding ram over a trapezoidal frame. The corer penetrates vertically into the seabed irrespective of the bottom topography. Although a perfectly undisturbed core is not given by this sampler

Underwater camera — A Preussag 35 mm single shot underwater camera is fitted at the bottom of the ram inside the core box (Fig.1). The camera is triggered by the same pilot weight which triggers the water sampler. The camera has a pressure switch which would activate the trigger only after the assembly gets into the water. This safety mechanism prevents the camera from accidental triggering on board before deployment. The length of the trigger rope determines the area covered (Table 1) in the photograph.

Water sampler — Conventional Niskin water samplers are fixed on a steel wire rope and are triggered by a steel messenger which hits the push rod assembly and releases the top and bottom lids. But in a combined assembly, it would not be practical to use the messenger to activate the water sampler. So the function of the push rod spring has been modified in such a way that it is preloaded by a trigger weight when the sampler is open (Fig.2).

In the existing push rod assembly once the messenger hits the push rod collar, the push rod spring is pressed down which in turn releases the monofilament line to close the bottle. In the modified push rod assembly, the push rod is modified by changing the position of the spring and incorporating a new safety lock. The spring is compressed and preloaded by a trigger weight. As soon as the trigger

<table>
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<th>Rope length (m)</th>
<th>Coverage area</th>
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<tbody>
<tr>
<td></td>
<td>Length (cm)</td>
<td>Breadth (cm)</td>
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<td>108</td>
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<tr>
<td>2.0</td>
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<td>142</td>
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Fig. 1—Assembly of water sampler and underwater camera over the spade corer
The lids of the water sampler are opened and the nylon monofilament line is held in the pin by pulling the trigger line downward. In order to avoid any inadvertent triggering on deck a stainless steel pin is inserted into the safety lock on the push rod which can be released when the system is taken overboard. The trigger rope is adjusted to the desired length depending on the height at which the camera has to be operated. The trigger rope of the camera is held in the spare pin available in the Niskin sampler. Care is taken to ensure that the stainless steel pin is removed from the safety lock before launching the spade corer assembly.

When the entire system approaches the seabed, the trigger weight first touches the sea floor and the load on the push rod spring is released which in turn releases the monofilament line of the sampler and the trigger rope of the camera. The sequence of operations enable the water to get trapped in the sampler and the camera takes the photograph of the seabed before the spade corer disturbs the sea floor for the collection of core.

The modified spade corer was operated at various depths ranging from 300 to 4000 m in the Arabian Sea. The modified device collects core and water samples and takes seabed photographs in one location in a single operation utilising the ship time effectively.

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References