SHORT COMMUNICATION

SARSIA

A SIMPLE BENTHIC SLEDGE FOR SHALLOW AND DEEP-SEA SAMPLING

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A sledge for sampling the infauna in the upper centimetres of soft bottom sediments and the epifauna on the sediment surface is described. The sledge is built from perforated stainless steel plates protected by heavy steel runners, measures 200 x 80 x 20 cm in outer dimensions and weighs about 80 kg. The solid construction enables it to function not only on soft sediments, but also on stony bottom. If damaged, its simple construction makes it easy to repair on board a research vessel where skilled crew are available. Sledges such as the one described have functioned well since 1974 and have been used from Faroese, Icelandic and Norwegian research vessels.

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INTRODUCTION

Many types of sledge have been designed for sampling the infauna in the upper centimetres of soft bottom sediments or the epifauna on the sediment surface itself. Sampling gears of various kinds have been described by among others, Ockelmann (1964), Salvini-Plawen (1975), Hessler & Sanders (1967) and Blomqvist & Lundgren (1996). Reviews are published by Menzies & al. (1973) and Eleftheriou & Holme (1984). Unfortunately all these sledges were equipped with unprotected canvas bags vulnerable to damage by scattered rough obstacles on the sea bed (personal observation).

To overcome these problems a sledge with large and heavy runners protecting a box of perforated plates was constructed.

DESCRIPTION

The sledge consists of two heavy steel runners (Fig. 1: 9) on either side of a box of perforated stainless steel plates 200 cm long, 80 cm wide and 20 cm high in outer dimensions (Fig. 1: 10). The holes in the perforated stainless steel plates are 1 mm in diameter and there are approximately 20 holes/cm^2. About 150 cm behind the front opening the box narrows so that its rear opening is only 50 cm wide. A shutter (Fig. 1: 8) running in grooves (Fig. 1: 11) across the rear opening is easily pulled aside to open the sledge. The sledge can then be emptied by simply raising it up by its pair of bridles (Fig. 1: 2) and letting the sediment run out through the rear end.

The broad steel runners are meant to prevent the sledge from sinking into the mud. These, together with the angle irons between the steel runners that run along all four sides of the sledge (Fig. 1: 5), protect the perforated box. The box is kept at a fixed distance from the square bars which gives further protection by preventing it from being exposed to large stones and other kinds of rough terrain.

The weight of the sledge is about 80 kg which is favourable when lowering gears into deep water. When the sledge was used at depths of 1000 to 2000 m in the Vesterålen basin of the Norwegian Sea during the years 1977 to 1979, and from 1982 up till now in the central Norwegian Sea, the strong underwater currents and rough weather conditions would have prevented the sledge from running properly over the bottom if it had not been heavy.

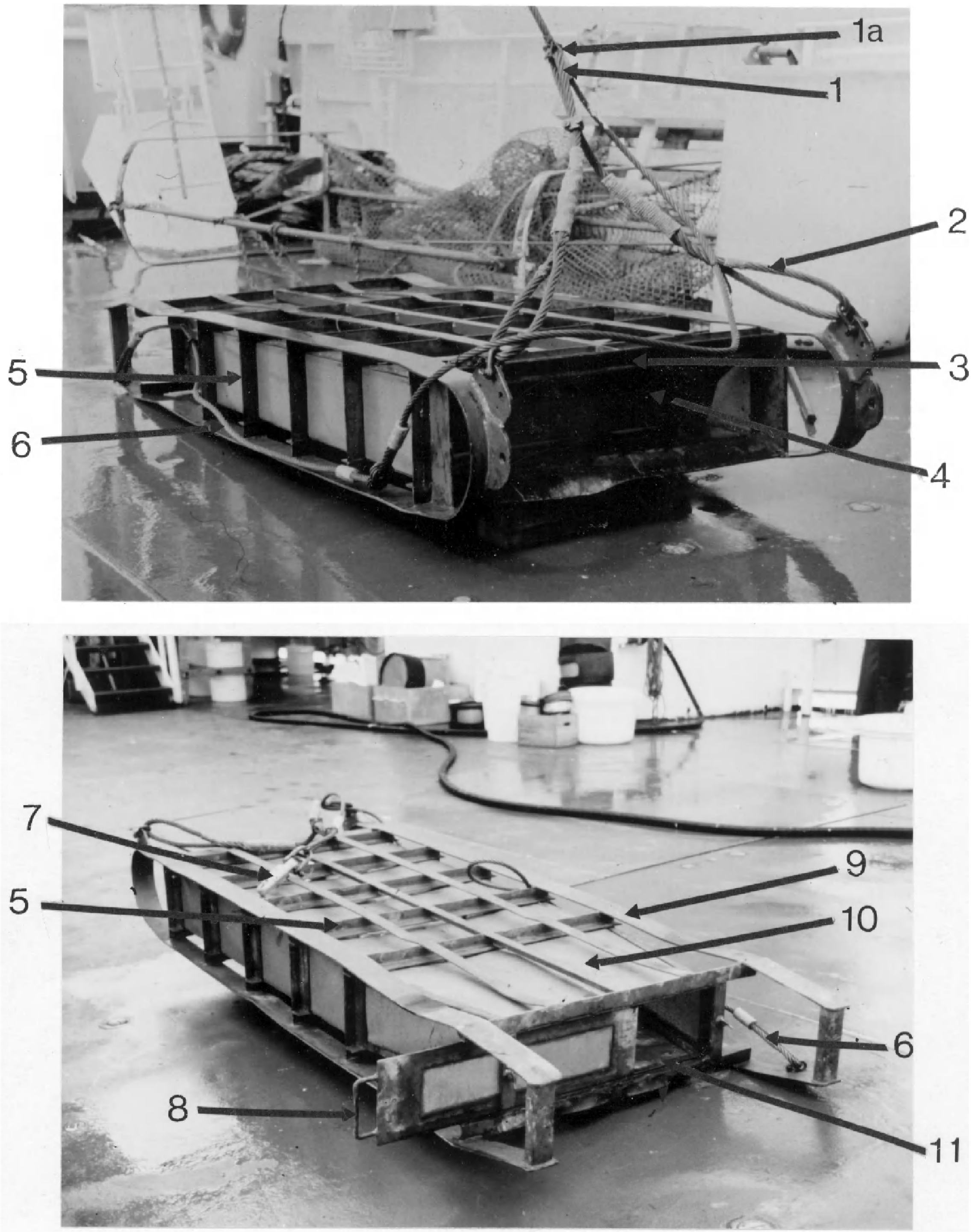

Fig. 1. The epibenthic sledge viewed from the front (top), and the rear (bottom). Key: 1, tow-wire; 1a, turns of twine; 2, bridle; 3, cross-bar; 4, flap; 5, angle iron; 6, safety wire; 7, swivel; 8, shutter; 9, steel runner; 10, perforated plate; 11, groove.

When waves are over 2.5 m in height a problem occurs if the sledge is used by a research vessel of about 50 m or more in length. Under these conditions, with the ship pitching up and down as the sledge is hauled back on board, the contents of the perforated box tend to be thrown out and lost before they reach the deck. In order to overcome this problem an aluminium flap (Fig. 1: 4), nearly the same size as the front frame opening is hung from a cross bar (Fig. 1: 3) mounted in the upper part of the box of the sledge, just inside the front. In principle this flap is meant to swing in time with the motion of the ship preventing the sledge from emptying its contents. Most of the time the flap works satisfactorily bringing the sledge on deck with a rather good sample, but in rough weather the sledge will still sometimes arrive on deck empty, or with very little material. However, in such cases any material left is usually free of sediment.

The solid construction of the sledge enables it to function not only on soft sediments, but also on rock and boulder bottoms. It will probably also be efficient collecting nodules and rock debris. It always maintains a level position with the same side down during towing. This can be confirmed by examining the runners which only develop rust on the unworn upper side. If the sledge becomes stuck on the bottom a weak-link arrangement enables it to be released. If the weak-link snaps, load is transferred to a safety wire attached to the rear end of one of the steel runners and the sledge jolts sideways, thus normally freeing itself and it is then pulled up by the rear end.

REMARKS

About a dozen sledges with different modifications have been made since the prototype was built in 1971. These various models of the benthic sledge, which my colleagues have named the 'Sneli-sledge', have been in extensive use during cruises in the Norwegian fjord Trondheimsfjorden, along the western and northern Norwegian coast, in the Norwegian Sea, in the BIOFAR (Marine Benthic Fauna of the Faroe Islands) and the BIOICE (Marine Benthic Fauna of Iceland) programmes and in the Arctic around Svalbard. It has worked satisfactorily to depths of 3800 m, which is almost the deepest part of the Norwegian Sea.

Improved from experiences during its extensive use most problems have been solved. It is important that the rear shutter (Fig. 1: 8) fits tightly in place and this is ensured by having an effective slide system. Sand and small stones etc. may fill the grooves of the slide system and make it very hard to pull the shutter aside. Because the cross-bar mechanism with the aluminium flap is mounted inside the front of the box, it is always recommended that the sledge is emptied through the rear opening after being lifted by the tow-wire.

Buhl-Mortensen & Høisæter (1993) and Svavarsson & Davidsdottir (1995) found that when properly handled, the 'Sneli-sledge' was at least as efficient as other benthic sledges.

During a M.S. course in Trondheim in 1995 students compared the efficiency of different sampling equipment. Using the van Veen grab and the Smögen box corer, both quantitative sampling equipment, they collected 22 and 27 taxa respectively. The 'Sneli-sledge' used on the same locality collected 34, and had more of the rare species.

For sampling hyperbenthos such as natant decapods or mysids, Rothlisberg & Pearcy (1977) described a simple and useful epibenthic sampler, the R-P sledge. This sledge has been used extensively in Norwegian coastal and off-shore areas as well as in the BIOFAR and BIOICE projects (Buhl-Jensen 1986; Brattegard & Fosså 1991). During the BIOFAR-project natant decapods were found respectively in 71 % of the R-P samples, 59 % of the trawl samples, 52 % of the 'Sneli-sledge' samples and 42 % of the rectangular dredge samples. For bottom dwelling mysids the numbers were respectively 86 % in the R-P sledge, 32 % in the 'Sneli-sledge' and in 13 % of the trawl samples (Torleiv Brattegard, pers. commn).

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