APPENDIX

APPENDIX I. NOTES ON TEST OF NEW SAMPLING INSTRUMENTS IN THE GH78-1 CRUISE

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Introduction

In order to obtain the bottom sample, Okean–70 grab sampler, shutter type box corer, double-spade box corer, free-fall photograb sampler and large dredge bucket were used in the GH78-1 area. Among them, three more or less new sampling instruments are shown with the result of test sampling. Large dredge bucket and shutter type box corer are not in the first trial, but have some improvement in the mechanism or usage. On the other hand, double-spade box corer improved by the Geological Survey of Japan and Rigosha & Co. Ltd. from the proto type designed by the Sea Bottom Sampling Committee, the Mining and Metallurgical Institute of Japan, is literally of the first test.

Double-spade box corer

This corer is easy to be handled and to obtain undisturbed soft sediments. It is divided into three major components, i.e. box (main body), trigger and spades. Its working sequence is mentioned below (Fig. AI-1).

(1) Descending with the spades opened (⑨ in the Fig.)

(2) Penetration of the box with inner case ⑦ into sediments.

(3) Loosing of the main wire, down-sliding of the trigger weight ① and opening the trigger hooks ② causing release of the hanging wires ③ from the hooks, just after the penetration.

(4) Simultaneous separation of the trigger weight from the box (main body) with up-rolling of the main wire, followed by pulling of the wires ④ to close the spades, and closing flaps ⑪ of the box with rotating of spade-shafts and the closing gears ⑩.

Fig. AI-2 shows the appearance of the corer, before descending (left) and after recovering (right).

To get the sample from the corer, two plates (⑧ in Fig. AI-1) are detached from the body, and the inner case is pulled out. Fig. AI-3 shows the feature of sample, mud and manganese nodules, in the case. The inner area of the case is 0.16 m^2 (0.4 × 0.4 m) and the depth is 0.4 m.

Fig. AI-4 shows a record of 12 kHz-PDR with explanation how to know when the corer hits the bottom and whether the trigger worked properly or not. Distance between direct signal from the sonar pinger and the one reflected on the corer is slightly longer after proper working than before that, as the distance between the main body and trigger weight, consequently the pinger attached to the main wire, gets 1.5 m longer after working.

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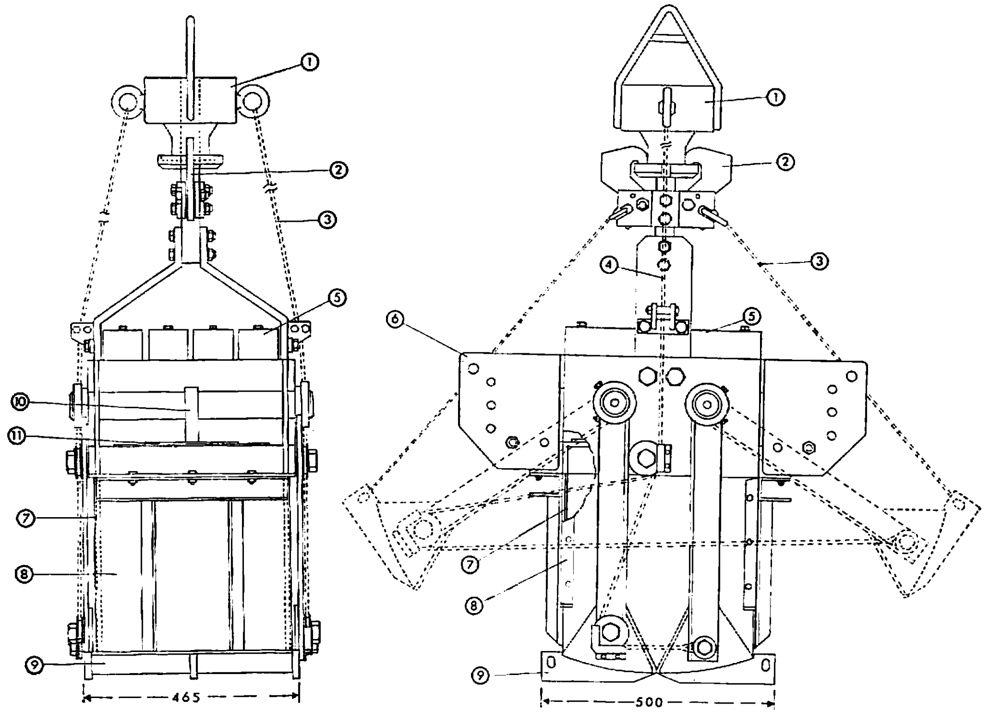

Fig. AI-1 Sketch of the double-spade box corer. See the text for the parts numbered.

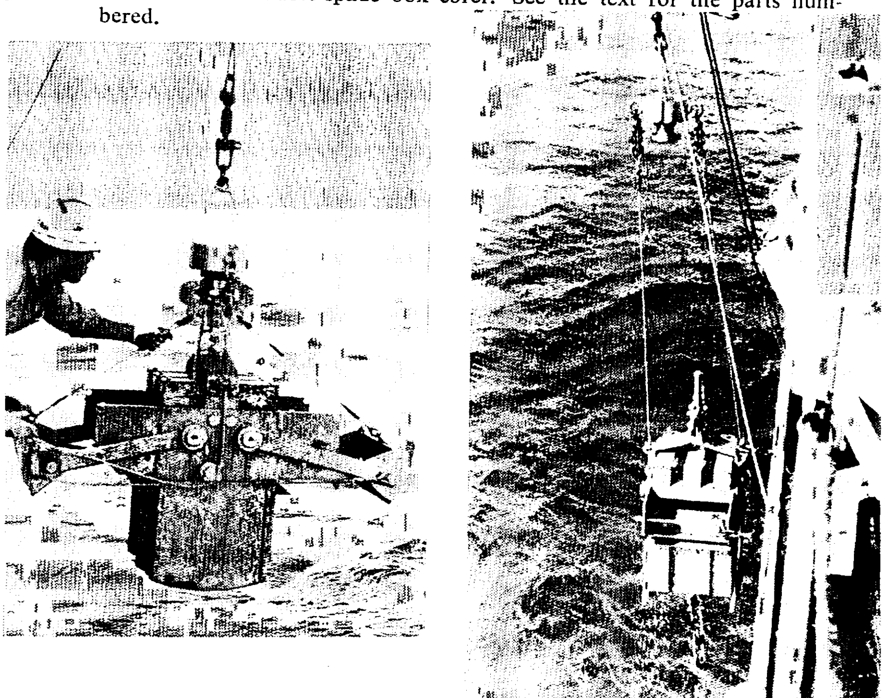

Fig. AI-2 Appearance of the double-spade box corer, before descending (left) and after recovering (right).

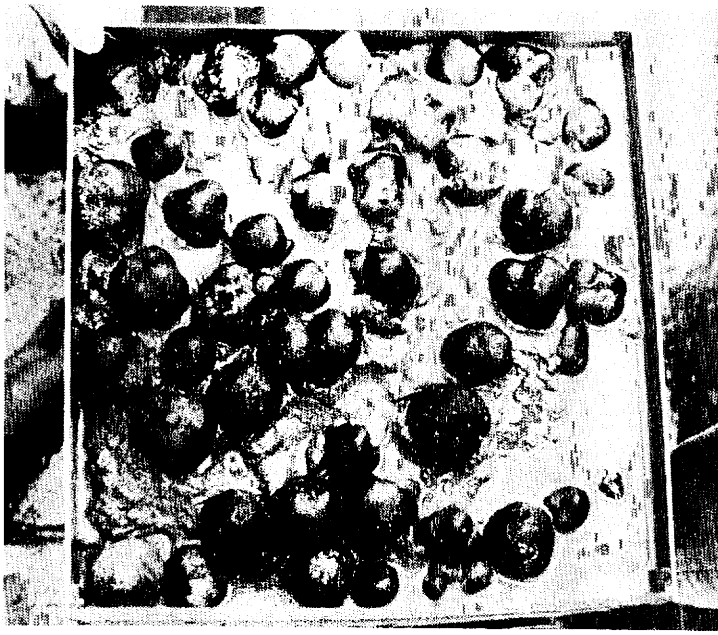

Fig. AI-3 Feature of bottom sample in the inner case of the double-spade box corer. The inner size of the case is 0.4×0.4 m).

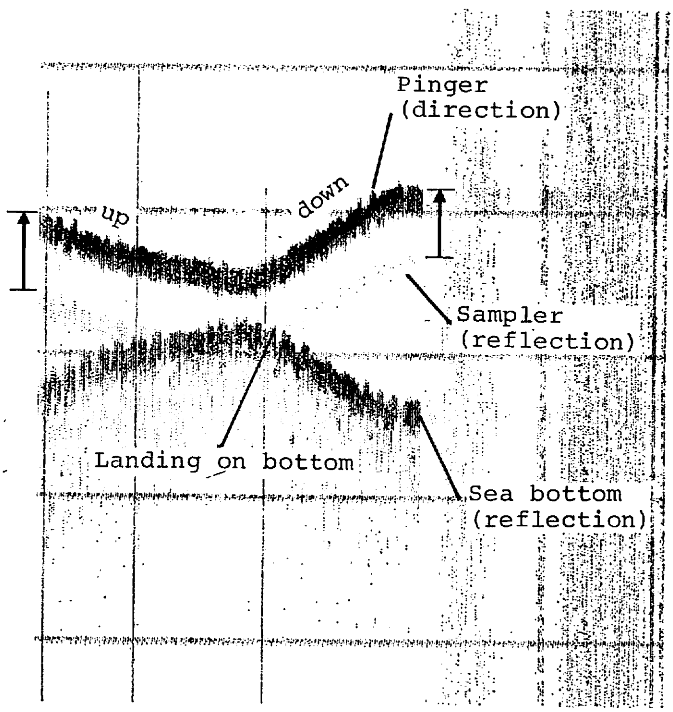

Fig. AI-4 Record of 12 kHz-PDR showing before and after the bottom hit of the corer.

Large dredge bucket

The large dredge bucket tested in this cruise is the same one which was used in the GH77-1 cruise, and the arrangement of towing system is almost similar to that in the GH77-1 cruise as shown in Fig. AI-5 (YAMAKADO and HANDA, 1979). In this test a small deep sea camera was used to take pictures of behavioral patterns of the bucket.

The deep sea camera, shown in Fig. AI-6, was composed of 16 mm still camera, electronic speed light, batteries and control circuit, which were mounted

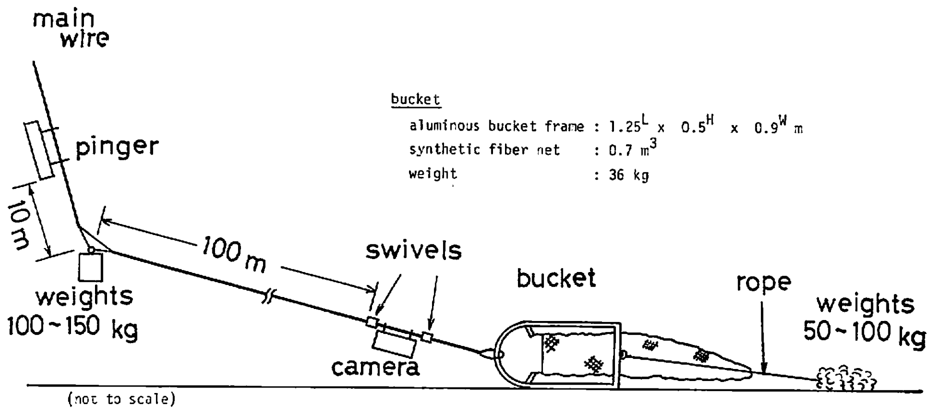

Fig. AI-5 Schematic diagram of towing system of large dredge bucket.

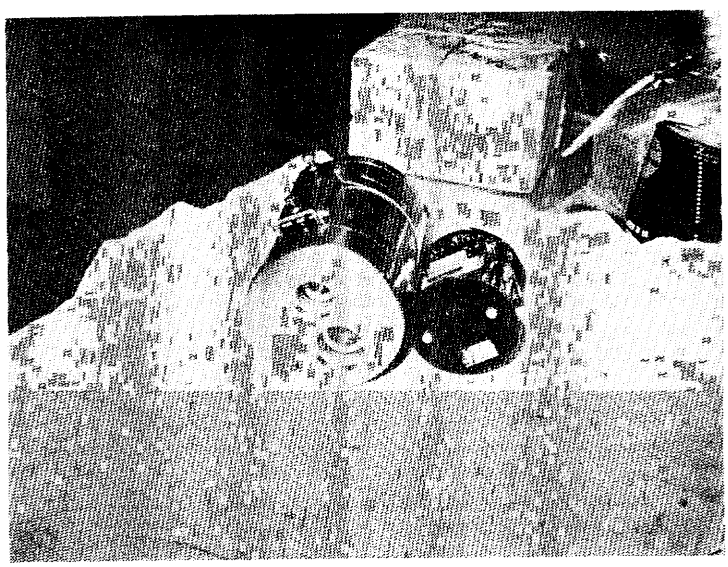

Fig. AI-6 Deep sea camera. Pressure case (left) and 16 mm still camera, electronic speed light etc. (right).

in a pressure-proof cylindrical container about 22.5 cm long by 14.5 cm in diameter.

The camera and speed light were automatically operated by the control circuit to take the picture of bucket behavior every thirty-five seconds.

Bulk sampling tests with this bucket were conducted at two stations of St. 1036A and St. 1072. Table AI-1 shows the test results, and Fig. AI-7 shows manganese nodules haul collected at St. 1036A. Some pictures taken by the deep sea camera showed the swing of the bucket in the water during its descending.

Table AI-1 The results of bulk sampling tests with the large dredge bucket

St. No. and observ. No.	St. 1036A D261	St. 1072 D 262
depth	5,175—5,330 m	5,725—5,535 m
position		
first hit	8°00.9 N	8°30.1 N
	176°57.1 E	176°59.4 E
final roll up	8°00.7 N	8°29.8 N
	176°55.9 E	176°57.8 E
max. wire rope length	5,597 m	6,294 m
actual dredging distance	1.3 km	1.8 km
actual dredging time	50 min	60 min
sampling results	200 kg	80 kg

Fig. AI-7 Manganese nodules sampled at St. 1036A, D261.

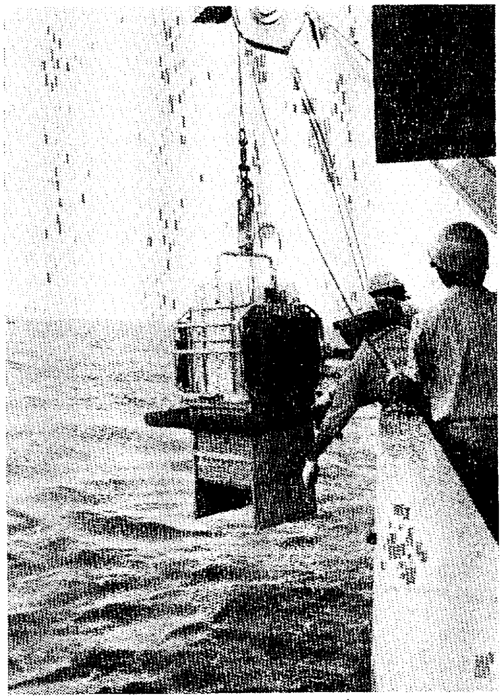
Fig. AI-8 Shutter type box corer.

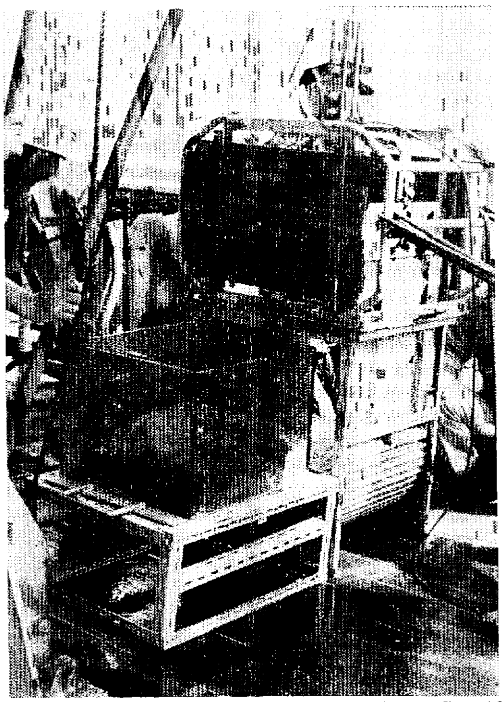
Fig. AI-9 Undisturbed bottom sediments sampled at St. 1058 (surficial 5 cm: siliceous clay, below: calcareous clay).

Shutter type box corer

On the results of the tests in the GH77-1 cruise (YAMAKADO and HANDA, 1979), the shutter mechanism which had the function to close the bottom of the corer was improved. The corer can take undisturbed bottom sediments of about 0.24 m^2 (0.52 m × 0.47 m) in area and about 0.75 m in depth into a transparent vinyl chloride inner case. The corer itself has the weight of about 250 kg and also the twenty-two additional weights (7.5 kg each) can be attached to the upper part of the corer. Fig. AI-8 shows the corer.

Sampling tests were conducted at two stations of St. 1037 and St. 1058. At St. 1037, it became a failure because the trigger of the corer did not operate. According to damaged appearances of the corer, it was inferred that the corer contacted with the sea bottom obliquely. At St. 1058, undisturbed bottom sediments were sampled in thickness of 40 cm as shown in Fig. AI-9.

The corer is apt to fall down when it contacts with the sea bottom, because the weights of the corer concentrate on its upper part. Therefore, it should be considered to make the lowering speed slow just before the corer hits the sea bottom. The corer is also expected to be improved on its structual strength. It seems to be necessary to make further improvements in the above mentioned points as well as in more simple shutter mechanism, in order to apply the corer to a routine sampling.

Reference

YAMAKADO, N. and HANDA, K. (1979) Sampling test with proto-type sampling instruments. *In* T. MORITANI (*ed.*), *Geol. Surv. Japan Cruise Rept.*, no. 12, p. 232–234.