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Amount of the Drifting Sand near the Bottom of the Shallow Sea

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The amount of the drifting sand near the bottom of shallow sea from the beach off to a position about 6 m in depth is remarkably more than that in a deeper position. In order to measure the amount of drifting sand in the desired direction a narrow long sack of 120-mesh wire-net is prepared, which can be laid in the required direction on the bottom of the sea. After the sack has remained in position for 24 hours in the water it is taken out and weight, density and size of the sand taken from the sacks are measured. The real state of the mean current and the amount of drifting sand in required direction near the bottom of the sea are discussed.

I Introduction

The amount of drifting sand can be measured approximately by a method using bamboo stick. From the results obtained by that method, it is found that the amount of drifting sand near the bottom of the shallow sea from shore to an off-shore depth of 6 m is remarkably more than that of the other place. In such a place the author intended to ascertain the motion of the drifting sand a few centimeters above the bottom.

II Apparatus

For the purpose an apparatus is made which consists of four long narrow sacks of 120-mesh brass wire-net and an accessory device to fix the sacks to the bottom of the sea. The four sacks kept at right angles to each other are tightly fixed to a ring of hard wire at such an inclination that the mouth of each sack, faced outward is about 5 cm higher than the ring, as shown in Fig. 1. The ring has two legs which stich in the bottom of the sea. But it is desirable for the apparatus to be provided with buoy and anchor so that afterwards it may be found easily. When

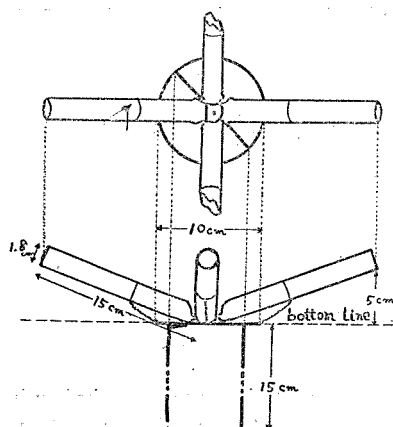


Fig. 1. Apparatus used

the apparatus is placed in the water the direction of one of the sacks was marked with magnet. The setting in the water and picking out of water are performed by diving at first. It may be expected to get the most accurate result by the diving of the investigator himself, but it is undesirable in cold water or dirty sea. Afterward it is found that nearly the same results can be obtained without diving after slight improving of the apparatus.

III Preliminary experiment

After the apparatus was kept for 5 hours at the bottom of the model river in the laboratory having a velocity of flow 50 cm/sec it was found that the sand flowed directly into the sack from its mouth, in other words sand flowed in only through the front entrance and did not flow in from the other entrance which did not open in the direction of stream.

Though the amount of sand obtained in the sack is not the total amount of drifting sand, it may be considered to be nearly the total amount. Moreover it can be concluded from the result of this experiment that the relative value of the drifting sand in required direction can be measured.

IV Observation by using this apparatus

The observations of the drifting sand with this apparatus have been made at many points on the coast of Hokkaidō: Ishikari, Zenibako, Tomakomai, Higashishizunai and Shimoyūbetsu. Twenty-four hours after setting the apparatus in the sea, it is taken out carefully not to upset the contents. The amount of sand in each sack is measured with a balance, size with mesh of sieve and density with pycnometer. The 24 hours measuring system proved to be satisfactory in order to get real information about the mean periodical longshore current of day and night as free from the

influence of the tide as possible. In practice we adopted the following method without diving into Water. In Fig. 2 is shown how to set it in the water and in Fig. 3 is shown how to take it out. In all events, it is very difficult to face the apparatus exactly toward the required direction.

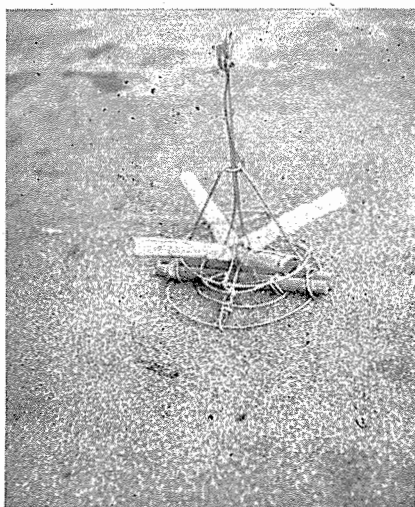


Fig. 2. Apparatus as set in the water without diving.

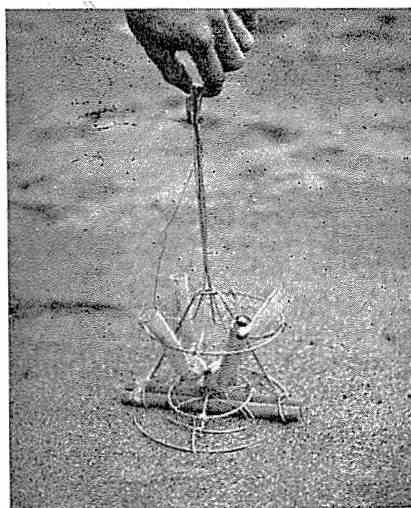


Fig. 3. Apparatus as it is taken out of the water.

V Result of Observation

In Fig. 4-8 the small circle shows the position where the apparatus is placed. The amount of sand in sack is indicated by the length of the thick line from the small circle in each direction, mean total, amount of the drifting sand from each direction near the bottom is shown by the arrow vectors equi-depth contour line is shown by dotted lines and surface current by broken arrow lines. From the figures the following points are made clear.

- 1 The direction of mean drifting sand near the bottom differs from the direction of the surface current.
- 2 The movement of the sand depends upon the local condition.

Generally speaking the drifting sand near bottom may or may not differ from that on the bottom, but that can be easily determined by analysing the distribution curve of the density and size.

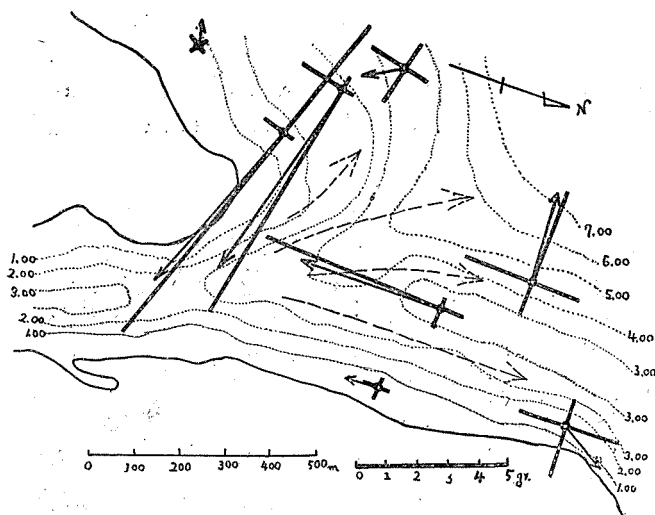


Fig. 4. Observed results at Ishikari, Aug. 23-24, 1951
(near the mouth of the Ishikari river)

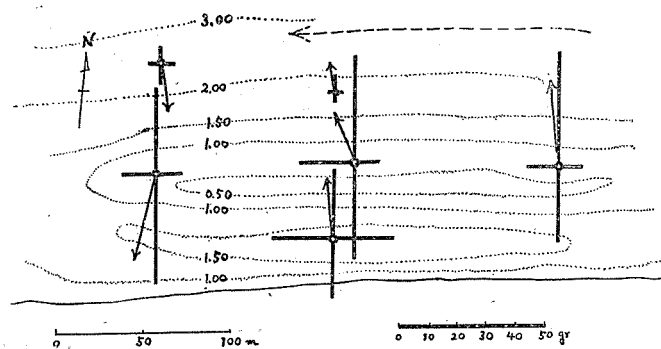


Fig. 5. Observed results at Zenibako, Sep. 23-24, 1950.

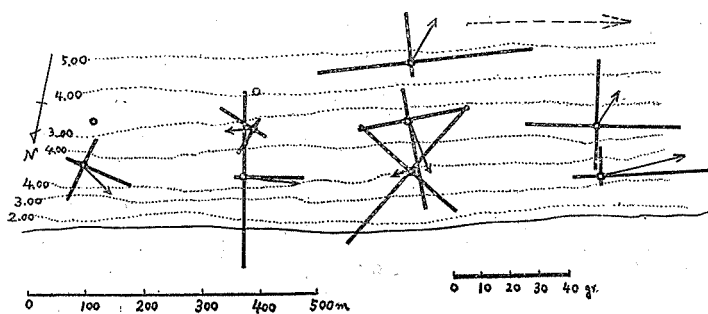


Fig. 6. Observed results at Tomakomai, Aug. 25-26, 1950.

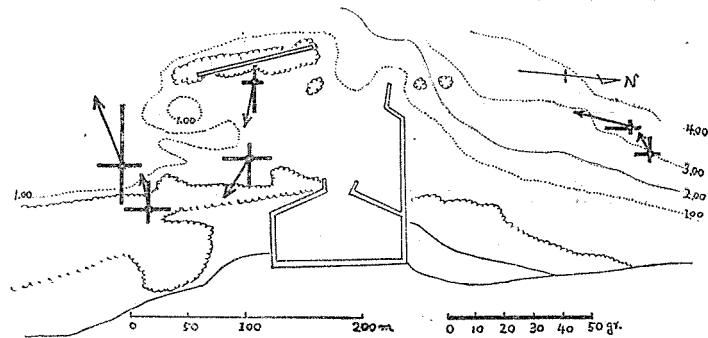


Fig. 7. Observed results at Higashishizunai, Aug. 23-24, 1950.

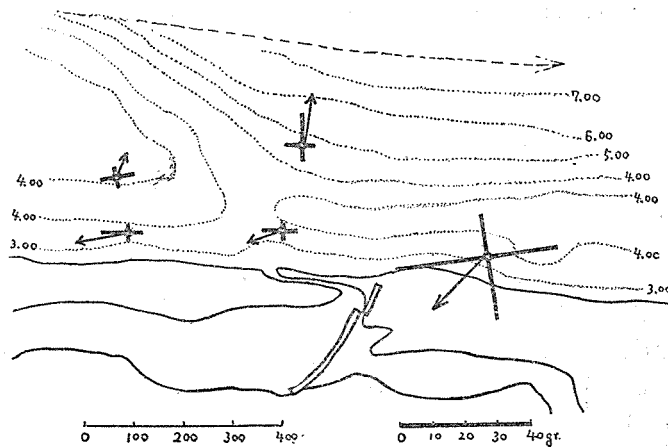


Fig. 8. Observed results at Shimoyubetsu, Oct. 25-26, 1951.

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