

Study on habitat mapping of benthos ecosystem in Antarctic lake using underwater Remotely Operated Vehicle (ROV).

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1. Introduction

In the recent studies, unique and luxuriant ecosystems were found in the lakes near Syowa station. A group of Moss-pillar which mainly composed of phototrophs exists on the lakebeds of Lakes Naga, Hotoke, and Kuwai in Skarvsnes. The process leading to development from invasion of organisms into the lakes is an important issue to know after the glacier retreat, but there are quite a few knowledge about even basic quantitative information such as the distribution, height, and angle of benthic communities. In the past, the surveys on the lakes have been usually carried out by scuba-diving, using boats, and from on the lake ice. However, it is difficult for an extensive and effective survey underwater covering a whole lake because of intense time limitation in a scuba-diving investigation under a low temperature condition. In this study, we aimed to create visual information as "habitat mapping" of the benthic communities on the lakebeds.

2. Survey method

For stable operations under the extreme condition of Antarctica, it is subject to various restrictions such as the type of power supply and the weight (in air) as well as robustness. Skarvsnes where located at about 55 km south from Syowa Station is an uneven outcrop, so snowmobiles or snowmobiles are unable to use to access to the lakes, we then need to access to the study lakes on foot, being limited in the transportable weight. For this reason, a compact and lightweight underwater robot, remotely operated vehicle (ROV) was newly developed in this time. The ROV is equipped with a stereo camera at the lower part, it is possible to take continuous pictures of the lakebed. The inflatable boat which attached a sonar was used for making of bathymetric maps. The sonar data is synchronized with GPS, measuring the water depth just under the route of cruising, and immediately creating the bathymetric map. Then, we created a habitat map of benthic communities "Moss-pillar" visualized in three dimensions at each depth by superimposing each data obtained by the above methods.

3. Result

We conducted a survey using the new ROV in Lakes Naga, Hotoke, and Kuwai in two summers, January 2017 and January-February 2018 (JARE 58 and JARE 59). The lakebed images obtained not from the whole lakes but from a part of the lakes, because the lake ice-cover remained until the latter half of the study period (late-January) in 2018. However, the continuous stereo images were successfully taken from northwest shore to the lake deeper area where Moss-pillars distributes in high density in Lake Naga.

4. Consideration

In this study, we succeeded to acquire the mosaic image of the lakebed in Lake Naga. This indicates that ROV bring a great advantage to the stable water navigation for a long time. In the future, we will create a complete mosaic image of the lakebed of Lake Naga from the all continuous images which were acquired in this study.



Figure 1. A newly developed small ROV.

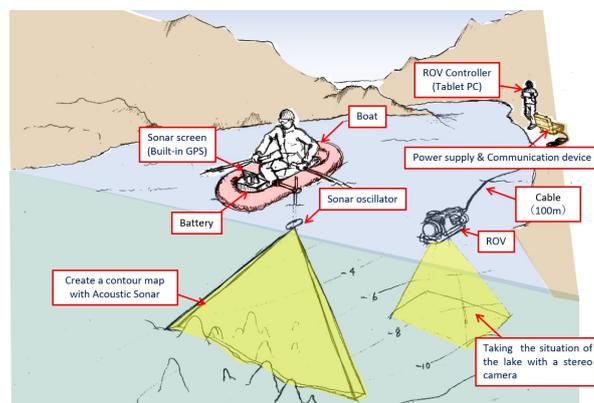


Figure 2. Schematic of habitat mapping in an Antarctic lake.



Figure 3. Mosaic map image which made from images acquired by ROV