

Limnological parameters in Sôya Coats lakes between the 53rd and 55th

Japanese Antarctic Research Expeditions in 2012–2014

—Long-term monitoring study—

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1. Introduction

This is a report on the limnological parameters which were continuously recorded by means of mooring data-logger arrays in two Skarvsnes lakes, Oyako Ike, Naga Ike, and a lake in Langhovde, Nurume Ike ([Fig. 1](#)) during the 53rd and 55th Japanese Antarctic Research Expedition (JARE) in 2012–2014. This study was a part of NIPR basic research observations entitled “Monitoring of terrestrial ecosystems (AMB06)”, that aimed to record of environmental conditions for terrestrial organisms living on ice-free areas in Syowa Oasis since 2010, under the umbrella of the VIII term of JARE plans. Water temperature, photosynthetically active radiation (PAR), chlorophyll fluorescence and turbidity, and water level in lakes were measured and recorded automatically at an interval of 60 min. Similar continuous observation of limnological parameters in those lakes and some shallow lakes in Skarvsnes using mooring arrays have been reported by Kudoh *et al.* (2003), Tanabe *et al.* (2008), Kudoh *et al.* (2009a, b), Tanabe *et al.* (2012a, b), and Kudoh and Tanabe (2015).

2. Materials and methods

Design of the mooring array: The mooring array consisted of temperature loggers (NWT, Nichiyu Giken Kogyo), PAR loggers (ALW-CMP, JFE Advantech), chlorophyll-turbidity loggers

(ACLW-CMP, JFE Advantech), and a water level logger (Hobo U-20, Onset). These were attached at given depths of a rope which was connected to a plastic float and a steel sinker on both sides, as shown in [Fig. 2](#). The array was moored at the lake center where the nearly-maximum depth was detected. Depths at the mooring sites were ca. 7 m, 10 m, and 16 m in Oyako Ike, Naga Ike, and Nurume Ike, respectively. The positions measured by a portable GPS (GPSMAP 60 CS, Garmin) were 69°28.514'S, 39°36.154'E, 69°29.240'S, 39°35.850'E, and 69°23.391'S, 39°39.544'E, in Oyako Ike, Naga Ike, and Nurume Ike, respectively.

Setting of the data loggers: Triplicate temperature data were recorded every 60 minutes from 10:00 (local time) on 17 January 2012 to 10:00 on 11 January 2014 in Oyako Ike, from 15:00 on 4 February 2012 to 11:00 on 16 January 2014 in Naga Ike, and from 12:00 on 25 January 2012 to 11:00 on 19 January 2014 in Nurume Ike. 10 times-repeats of PAR data, and chlorophyll & turbidity data were recorded at 60 minutes intervals during the same periods of the temperature loggers in the three lakes. And a water level data were recorded at 60 minutes intervals during the same periods in Oyako Ike, too. All loggers were pre- and post-calibrated by the manufacturers, who found no significant drifts in the measurements over the course of the study. Units of recorded data were °C and $\mu\text{mol}/\text{m}^2/\text{s}$ for temperature and PAR, respectively. Fluorescence from chlorophyll *a* was recorded as relative intensity against fluorescein sodium (Uranine) concentration, and turbidity was recorded as Formazin Nephelometric Units (FTU). The unit of water level was meter, which was calibrated using the record of a same sensor on lake shore.

3. Data

Triplicate temperature data measured at 3 different depths in Oyako Ike with 60 minutes intervals were averaged, summarized and converted to a CSV file ([Oyako_WT_3depths_53-55.csv](#)). Water level data with 1 hour intervals in Oyako Ike were converted to a CSV file ([Oyako_WL_53-55.csv](#)), and 10 times repeated PAR at 1.75 m and 6.0 m depths, chlorophyll *a* and turbidity data at 1.5 m depth in Oyako Ike were averaged every 1 hour interval, and summarized in a CSV file ([Oyako_PAR_CHL_TURB_53-55.csv](#)), too. Data recorded from mid-July to

mid-November by the chlorophyll-turbidity logger had large noise due to reflection by ice crystal formation around the optical sensors, then, we removed these data in this report.

Triplicate temperature data measured at 4 different depths in Naga Ike with 60 minutes intervals were averaged, summarized and converted to a CSV file ([Naga_WT_4depths_53-55.csv](#)). 10 times repeated PAR at 2.5 m and 7.9 m depths, chlorophyll *a* and turbidity data at 3.3 m depth in Naga Ike were averaged every 1 hour interval, and summarized in a CSV file ([Naga_PAR_CHL_TURB_53-55.csv](#)).

Triplicate temperature data measured at 4 different depths in Nurume Ike with 60 minutes intervals were averaged, summarized and converted to a CSV file ([Nurume_WT_4depths_53-55.csv](#)). 10 times repeated PAR at 3.0 m depth, chlorophyll *a* and turbidity data at 3.5 m depth in Nurume Ike were averaged every 1 hour interval, and summarized in a CSV file ([Nurume_PAR_CHL_TURB_53-55.csv](#)).

List of data files are as follows;

1. Data from Oyako Ike mooring array

[Oyako_WT_3depths_53-55.csv](#)

[Oyako_WL_53-55.csv](#)

[Oyako_PAR_CHL_TURB_53-55.csv](#)

2. Data from Naga Ike mooring array

[Naga_WT_4depths_53-55.csv](#)

[Naga_PAR_CHL_TURB_53-55.csv](#)

3. Data from Nurume Ike mooring array

[Nurume_WT_4depths_53-55.csv](#)

[Nurume_PAR_CHL_TURB_53-55.csv](#)

4. Members who carried out the field study

Installation of the mooring arrays was carried out by Yukiko Tanabe, Makoto Hori and Hideo Akiyoshi (the 53rd JARE members). And the retrievals and data acquisitions were carried through

by Sakae Kudoh, Kunio T. Takahashi, Tomoko Ishihara, and Yousuke Kokubo (the 54th and 55th JARE members).

5. Data policy

Before using the data for publication or presentation in any media, please request permission in writing. Inquiries should be addressed to:

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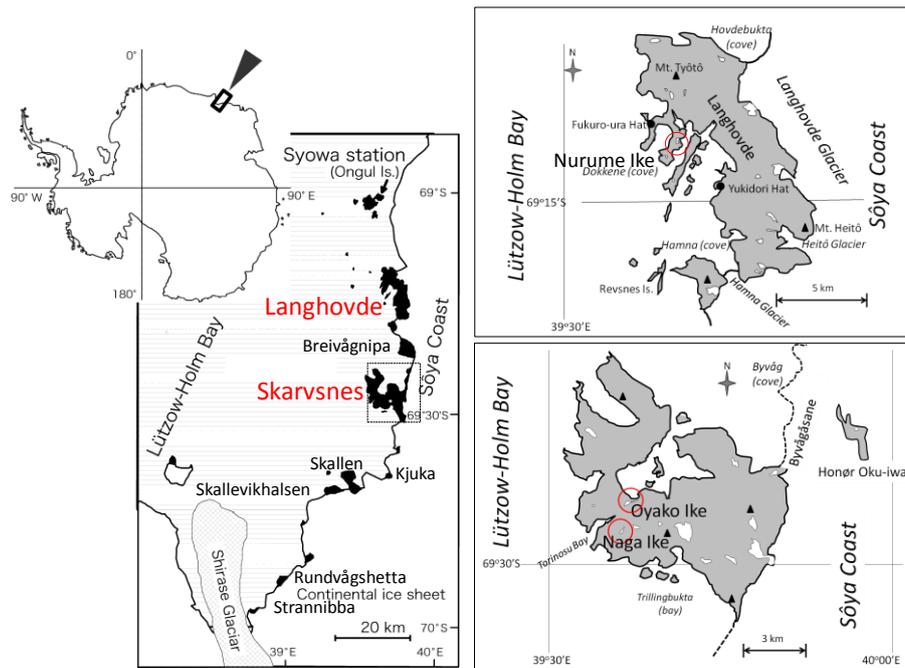


Fig. 1. Maps of ice-free areas in Sôya Coast (left) and studied lakes in Langhovde (right-upper), and Skarvsnes (right-lower).

Mooring arrays employed during the JARE-53 and -55

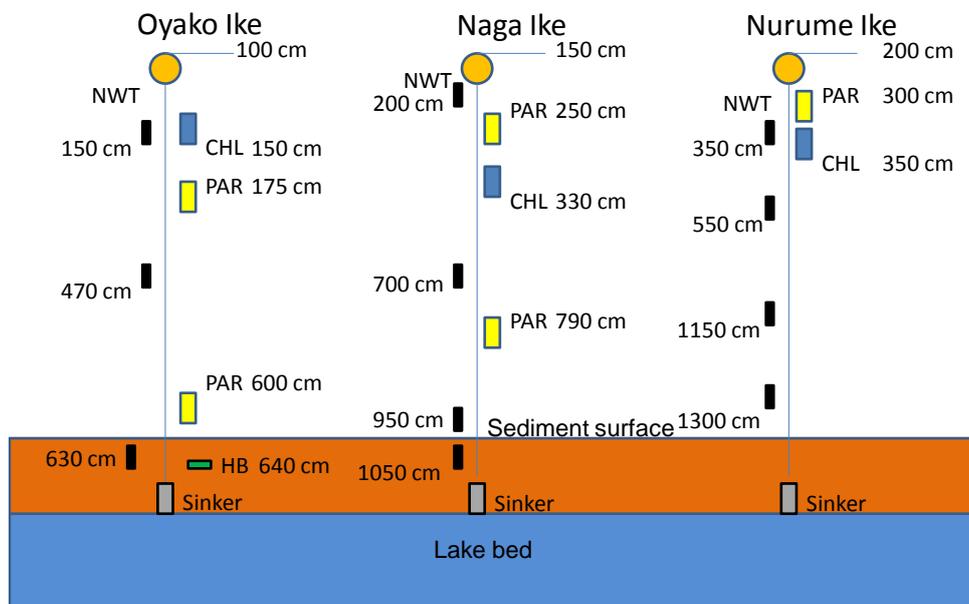


Fig. 2. Designs of mooring arrays set in Oyako Ike (left), Naga Ike (center), and Nurume Ike (right). Orange Circles on the top of each array indicate floats used for mooring. NWT: Water temperature logger, CHL: Chlorophyll and turbidity logger, PAR: Photosynthetically active radiation logger, HB: Water level logger. Numbers with unit of cm indicate the position (depth) of each float and sensor.