

## II. Water Quality

### 3. *In-situ* observations

#### 3-1. pH (by Morihiro Aizaki)

In situ measurements of pH were conducted using pH meters with glass electrodes. Although we used several types of pH meters, measured data were accurate enough to treat them as a single time-series data.

#### 3-2. Water Temperature (by Takehiko Fukushima)

Water temperatures were measured with thermistor thermometer, Hydrolab 8000 (Toho Dentan Co. Ltd.), and thermistor thermometer attached to digital DO meter, model 58 (YSI Co. Ltd.).

#### 3-3. Electric conductivity (by Takehiko Fukushima)

Water samples were brought back to our laboratory and measured at about 25 °C with Electric Conductivity Meter (Toa-Dempa Co. Ltd.) using a 1 cm cell. The water temperature was measured in parallel, and the measured conductivity was corrected to that at 25 °C.

#### 3-4. Dissolved oxygen (by Takehiko Fukushima)

Dissolved oxygen (DO) was measured with DO meter Hydro lab 8000 (Beckman Co. Ltd.) and digital DO meter model 58 (YSI Co. Ltd.).

#### 3-5. Secchi disc transparency and underwater light intensity (by Noriko Takamura)

##### 1. Measurement methods

Transparency has been measured at all 10 stations, while underwater light intensity was measured at Sts. 3, 7, 9 and 12. A Secchi disc (Rigo Co. Ltd.) with a diameter of 30cm was used for transparency measurement. The disc was lowered down in water until it was no longer visible from the surface and at this point the depth was measured. Under light intensity was measured at depths of surface (0m), 0.25m, 0.50m, 0.75m, 1.0m, 1.5m, 2.0m, 3.0m, 4.0m using a sensor. In actual measurement, a sensor was set on the boat to get a reference value. Measurements at all depths were conducted while light intensity was relatively stable, since the measurements on the boat and in

water could not be at the same time. According to Beer-Lambert law, the extinction of underwater light intensity is expressed as:

$$I_z = I_0 e^{-kz}$$

$I_z$ : Underwater light intensity at  $Z_m$

$I_0$ : Underwater light intensity at 0 m

$k$ : Extinction coefficient ( $m^{-1}$ )

A water depth where 1% of light intensity on the surface can reach is represented as the depth of euphotic layer ( $Z_e$  m).  $Z_e = 4.6/k$ , and therefore,  $k$  is 4.6 at the depth of 1m.

## 2. Measuring equipments (underwater light intensity)

1977 - 8 June 1981: Illuminometer ( $\lambda$ , LI-185)

24 June 1981 - March 1983: Quantum sensor (Licor, LI-192S)

April 1984 - March 1989: Quantum sensor (Biosphaerical QSP-170)

Since April 1989: Quantum sensor (LI-192SA/B), Multichannel data logger (Licor LI-1000)

## 3-6. Water depth (by Tomiji Hagiwara)

### Before March 1996:

Water depths were measured with scales marked on ropes (for measuring a temperature, DO and pH) which had a lead attached at the end.

### After April 1996:

An aluminum disk of 15.5 cm diameter was attached to the lead to prevent it from penetrating into the mud. Also, a fishfinder using echo sounding was used in combination with the scaled ropes.

## 3-7. Position of station (by Tomiji Hagiwara)

### Before March 1994:

More than two landmarks were set on land along the lake bank, and the position was determined from the cross-point of lines drawn in the observed orientations from these landmarks.

### After April 1994:

Global Positioning System (GPS) was used. The current position for observations is the center of scattered points, determined by the former method and plotted by GPS every month between 1994 and 1995.