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Diatoms in Bekanbeushi Wetland, Eastern Hokkaido

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Abstract

Bekanbeushi Wetland is located in Eastern Hokkaido, Japan. It consists of a large low-moor and isolated high-moors and preserves natural flora of acid low-moor. We collected diatoms from a wetland high-moor in November 2008 and May 2009. A total of 7 diatom species belonging to 4 genera were identified. Dominant species were *Pinnularia subcapitata* var. *elongata* in the November 2008 samples and *Eunotia bilunaris* var. *bilunaris* in the May 2009 samples.

Key index words : Bekanbeushi Wetland, diatom flora, *Eunotia*, high-moor, *Pinnularia*,

Introduction

Bekanbeushi Wetland, located in Akkeshi Town, Eastern Hokkaido, registered with the Ramsar Convention (The Convention on Wetlands of International Importance, especially as Waterfowl Habitat) has been preserved as non-artificial environments of wetland with *Sphagnum*, typical plants of high-moor and waterfowls. In order to keep them, entering the wetland has been prohibited except for scientific researches.

We got a Grant-in-Aid from the Akkeshi Town for Scientific Research of Lake Akkeshi and Bekanbeushi Wetland in order to clarify the formative processes and a research permission to enter the wetland for sampling diatom assemblages. We found some typical acidophilous diatoms from an isolated high moor.

Material and method

Samples were taken in high-moor part of Bekanbeushi Wetland (Fig. 1; 43°9′55″N, 144°50′27″E). We collected surface water (sample no. 108a) and surface sediment (108b) in November, 2008, and surface water (208a), surface sediment (208b) and an aquatic plant (208c) in May, 2009. Values of pH at each sampling are 5.1 and 4.8, respectively.

Samples (5-15 mL) were boiled with nitric acid and then neutralized with repeated rinses in distilled water using a centrifuge. After the rinsing

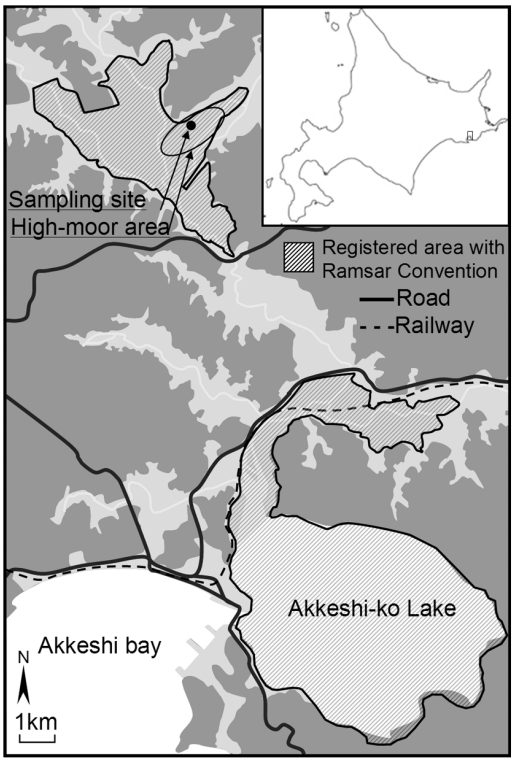

Fig. 1. Study area.

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of the samples, an aliquot of the treated sample was mounted to a glass slide with Mountmedia (Pleurax; Wako Pure Chemical Industries Ltd., Japan). Identification was based mainly on Watanabe *et al.* (2005), subsidiary on Krammer & Lange-Bertalot (1986, 1988, 1991a, b) and Hustedt (1927-1966). We counted and identified more than 500 diatom valves to each sample (Table 1).

Results

We identified 7 diatom taxa belonging to 4 genera listing in Table 1 in alphabetical order and calculated relative frequency (%) of diatom taxa. The ranges of length, breadth and striae density observed diatoms occurred in this study were described in each diatom taxon with data from the references above in parenthesis. As described below, the observed values were fitted the range of reference data in most taxa appeared in this observation.

Table 1. Relative frequency (%) of diatom taxa and the total number of the species

	108a	108b	208a	208b	208c
Chamaepinnularia soehrensis var. *hassica*	0.2	0.7			
Eunotia bilunaris	8.3	8.1	65.6	61.4	26.6
E. paludosa	6.8	5.4	3.2	9.3	9.9
E. parallela var. *angusta*					17.6
Frustulia saxonica	20.5	1.9	1.3		0.2
Pinnularia rupestris	19.7	16.6	23.4	20.7	16.0
P. subcapitata var. *elongata*	44.4	67.1	6.5	8.6	29.4
TOTAL	662	584	555	627	573

***Chamaepinnularia soehrensis* var. *hassica* (Krasske) Lange-Bert.**, Iconogr. Diatomol. **2**: 37. 1996; cf. Krammer & Lange-Bertalot 1986. p. 224. *pl. 78. f. 1-13*. (as *Navicula soehrensis* var. *hassica*) Fig 2

Length 11-12.5 (9-16) μm, breadth 2.5 (2～3.5) μm, striae 19-20 (17-24) in 10 μm

Acidophilous, oligosaprobous, oligotrophentic (Van Dam *et al.* 1994). Occurs in low electricity, lotic area, with *Sphagnum*, cosmopolitan, oligosaprobous (Krammer & Lange-Bertalot 1986).

Occurred in surface water (108a) and surface sediment (108b) in November, 2008 at low relative abundance.

Eunotia bilunaris* (Ehrenb.) Mills var. *bilunaris, Index Diatom. 675. 1934; cf. Watanabe *et al.* 2005. p. 161. *pl. IIB*$_1$*-15. f. 17-22*; cf. Krammer & Lange-Bertalot 1991a. p. 180. *pl. 137. f. 1-12.* Figs 3-5

Length 19-45.5 (10-150) μm, breadth 2.8-3.5 (1.9-6) μm, striae 19-20 (17-21) in 10 μm.

Indifferent taxon to organic water pollution, acidobiontic (Watanabe *et al.* 2005).

Occurred as dominant taxon in surface water (208a) and surface sediment (208b), and as subdoinant taxon on an aquatic plant (208c) in May, 2009.

***Eunotia paludosa* Grunow**, Verh. K. K. Zool. -Bot. Ges. Wien **12**: 336. *pl. 6, f. 10*. 1862; cf. Krammer & Lange-Bertalot 1991a. p. 203. *pl. 155, f. 1-20*. Fig. 6

Length 11.5-42 (6-60) μm, breadth 2.3-4 (2-4) μm, striae 19 (19-25) in 10 μm.

Occurred in all samples with below 10% in relative abundance.

***Eunotia parallela* var. *angusta* Grunow**, Akad. Wiss. Wien, Math. -Naturwiss. Kl., Denkscher. **48** 1884; cf. Krammer & Lange-Bertalot 1991a. p. 209. *pl. 152. f. 1-3*. Fig 7

Length 63-81 (30-200) μm, breadth 6-7 (5-8) μm, striae 9-11 (8-11) in 10 μm.

Coexist with *Sphagnum* in cold water area (Krammer & Lange-Bertalot 1991a).

Occurred on an aquatic plant (208c) in May, 2009.

***Frustulia saxonica* Rabenh.**, Süssw.-diat. 50. *pl. 7, f. 1.* 1853; cf. Watanabe *et al.* 2005. p. 229. *pl. IIB*$_3$*-2. f. 3, 4*; Krammer & Lange-Bertalot 1986. p. 259. *pl. 95. f. 4, 5*. (as *Frustulia rhomboids* var. *saxonica*) Figs 8, 9

Length 49-65 (40-70) μm, breadth 12.5-14.5 (12-20) μm.

Indifferent taxon to organic water pollution, acidobiontic (Watanabe *et al.* 2005).

Occurred as subdominant taxon in surface water (108a) in November, 2008.

***Pinnularia rupestris* Hantzsch in Rabenh.**, Algen Eur., No. 1203 1861; cf. Krammer & Lange-Bertalot 1986. p. 421. *pl. 186. f. 9, 10*. Figs 10-12

Length 57-79 (40-75) μm, breadth 10-12.5 (7-11) μm, striae 13-14 (12-15) in 10 μm.

pH circumneutral, oligotraphentic (Van Dam *et al.* 1994). Occurs in low electricity, lotic area, cosmopolitan (Krammer & Lange-Bertalot 1986).

Occurred in all samples as the dominant taxon.

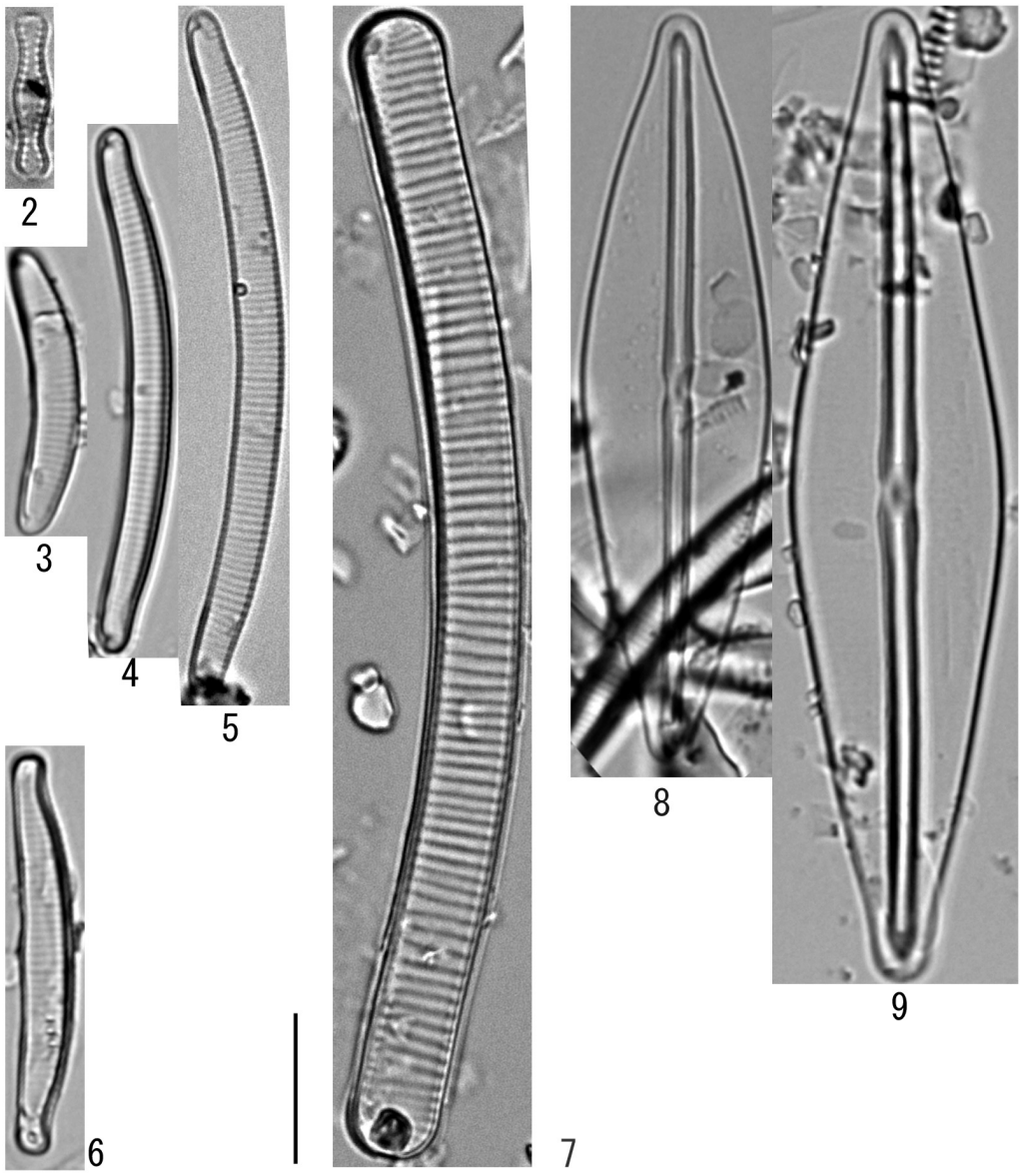


Fig 2. *Chamaepinnularia soehrensis* var. *hassica*. **Figs 3-5.** *Eunotia bilunaris* var. *bilunaris*. **Fig 6.** *Eunotia paludosa*. **Fig 7.** *Eunotia parallela*. **Fig 8, 9.** *Frustulia saxonica*. Scale bar = 10 μm.

***Pinnularia subcapitata* var. *elongata* Krammer.**, Biblioth. Diatomol. **26**: 108, 176. *pl. 38. f. 1-11. pl. 39. f. 1-15.* 1992; cf. Watanabe *et al.* 2005. p. 368. *pl. IIB₃-47. f. 18*. Figs 13-15

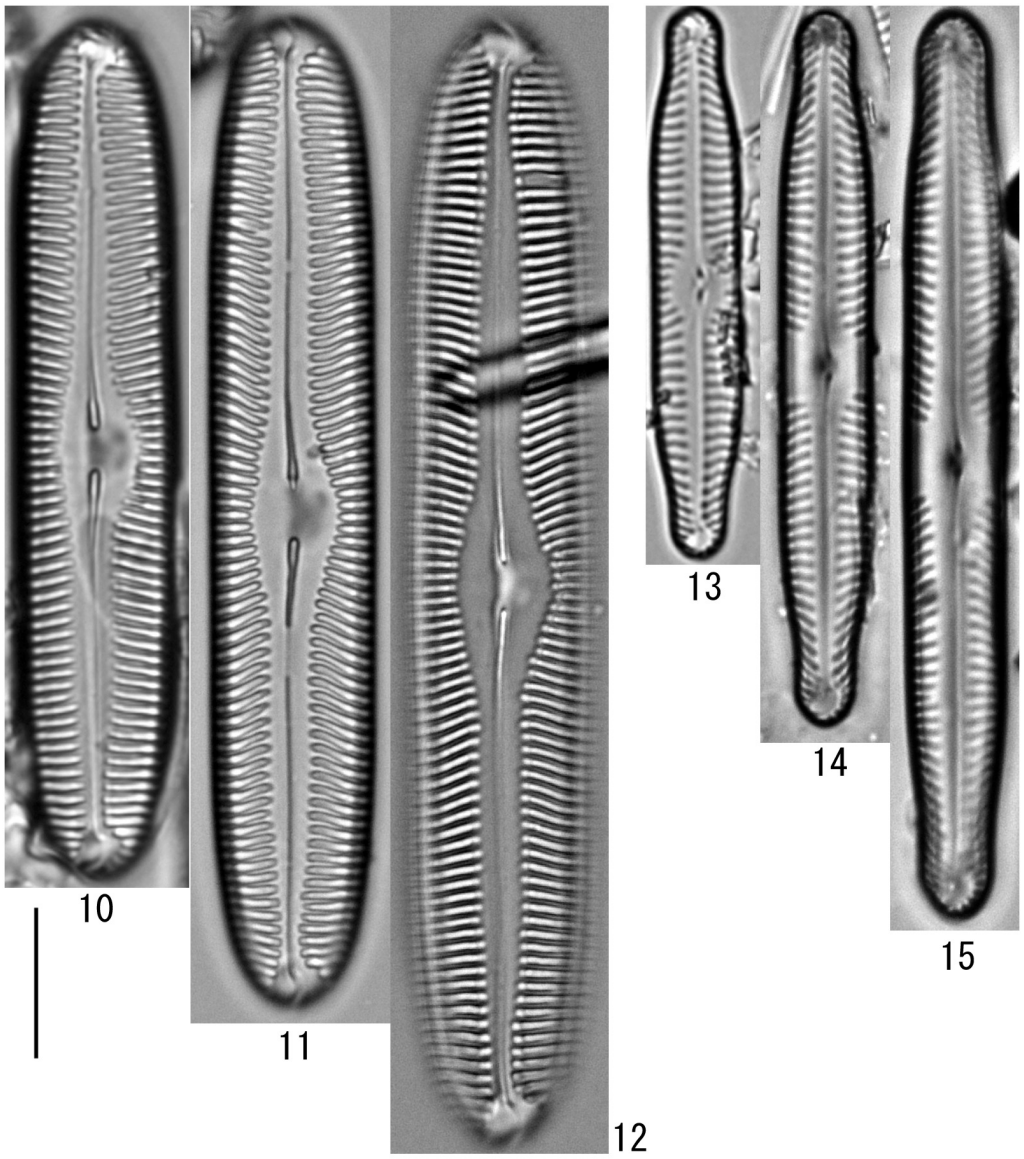
Length 35-61 μm, breadth 6-7 μm, striae 11-12 in 10 μm.

Watanabe *et al.* (2005) reported the size as length 64 μm, breadth 7 μm, striae 11 in 10 μm from one valve. These data are mostly same as ours except for the length.

Occurred as dominant taxon in surface water (108a) and surface sediment (108b) in November, 2008; besides as subdominant taxon on an aquatic plant (208c) in May, 2009.

Discussions

Bekanbeushi Wetland has been barely influenced by human activities, because it is situated in very thinly-populated area, and in addition, it



Figs 10-12. *Pinnularia rupestris*. **Figs 13-15.** *Pinnularia subcapitata* var. *elongata*. Scale bar = 10 μm.

has been off-limits except for scientific researches. The wetland therefore has kept original environment of low acid moor.

Only seven diatoms taxa belonging to four genera were found in the present study. The species number was much less than those of the other low acid moors heretofore reported. For example, 105 taxa of 27 genera were reported from Kurozo-moor, Tokushima (Mieno *et al*. 1997), and 121 taxa of 25 genera from Kusiro Mire, Hokkaido (Togashi & Ichimura 1997). The extraordinarily low taxa richness in the present study is partly explained by the restricted sampling only from an isolated high-moor. The previous reports above, however, always showed much more than seven taxa even from each single sample (Mieno *et al*. 1997, Togashi & Ichimura 1997).

Hirano (1981) reported a trend of diatom species composition at high-moors in Japan. He said that the percentage of *Eunotia* + *Pinnularia* taxa (E+P) among all diatom taxa was 31-66% and

that of *Cymbella* + *Gomphonema* taxa (C+G) was 0-13% at high-moors in Japan. In the present study, the percentages of E+P and C+G were 71% and 0%, respectively. These values over the ranging by Hirano (1981) suggest that Bekanbeushi Wetland has a specialty of diatoms flora as an undisturbed high-moor.

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