

# The Diatom Type Materials of Haruo Okuno

## 1. Five diatom species described by Okuno (1943, 1944) from the Yatuka deposit

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**Abstract** The original photographs of five diatom species described in Okuno (1943, 1944) from the Yatuka Deposit were found in the Okuno collection, which was newly donated to TNS. I discuss the taxonomic status of these five taxa using these original photographs. *Gomphonema yatukaensis* Horik. et Okuno is a synonym of *Gomphonema grovei* var. *lingulatum* (Hust.) Lange-Bert., and *Navicula yatukaensis* belongs to the genus *Pinnularia*.

**Key words:** *Navicula yatukaensis*, *Diploneis yatukaensis*, *Gomphonema tetrastigmatum*, *Gomphoneis tetrastigmatum*, *Didymosphenia fossilis*, *Pinnularia yatukaensis* (Horik. et Okuno) comb. nov.

### Introduction

Okuno (1943, 1944) described five new diatom taxa from the Yatuka Deposit. However, the photographs of these new species are too small (Fig. 10), and the species therefore very difficult to identify. Type slides for these taxa were deposited in HIRO (Herb. Hiroshima Univ.) (Okuno 1943, 1944). However, these original slides and raw materials could not be found in this herbarium, and these materials were likely destroyed by atomic bomb in World War II (Deguchi, personal communication). Okuno's original photographs and dry plates were found in his home after his death, and these materials were donated by his bereaved family to TNS in 2003. We have been organizing these photographs for the past year, and I came upon the original photographs of Okuno (1943, 1944) in this collection. In this report, I discuss the taxonomic status of these taxa based on these original photographs.

### Materials and Methods

The Okuno collection includes following materials.

1. Taxonomic photo plates ordered by taxonomic name (Figs. 2, 3).

Each photo plate includes an LM (Light Microscopy) photograph, and Okuno usually noted the LM photograph number, magnification, taxonomic name, slide number, locality, date, position of this individual on the slide, and synonyms. These taxonomic photo plates should be considered incomplete, and we sometimes could not find Okuno's new species on these taxonomic photo plates.

2. "ELECTRON MICROGRAPH" (EM) photo plates ordered by EM photograph number.

Each photo plate includes several EM photographs, and Okuno usually noted the EM photograph number, LM photograph number, magnification, taxonomic name, slide number, locality, date, position of this individual on the stab, and other information.

The SEM photograph number is the number in his original sequence, and it is very difficult to search for a photo plate using the taxonomic name.

3. "Lm" (LM: Light microscopy) photo plates ordered by LM photograph number (Fig. 1).

Each photo plate includes several LM photographs, and Okuno usually noted the LM photograph number, magnification, taxonomic name, slide number, locality, date, references, position of this individual on the slide, and other information. The LM photograph number is the number in his original sequence, and it is very difficult to locate a photo plate using the taxonomic name.

4. Un-mounted photographs (EM and LM) ordered by LM or EM number.

LM or EM number, magnification, and slide number were written on the backside of the photographs.

5. Photo dry plate (Figs. 4–7).

One dry plate was usually used for two LM photos or an EM photo. LM or EM number, magnification, and slide number were written directly on the dry photo plate.

6. Other materials.

Several slides and other materials were part of this collection. However, these materials do not include any type of slides and raw materials. These type slides and raw materials are still missing. I could not find any of Okuno's typed materials in other Japanese herbaria (including HIRO) or public organizations (including Kyoto institute of Technology and Showa Chemical Industry Co. Ltd.). His original manuscripts and photo plates for his published books are also included in this collection. We are now creating a database for this collection. All of Okuno collection are housed in TNS (Department of Botany, National Science Museum, Tokyo).

## Results and Discussion

1. *Navicula yatukaensis*.

*Pinnularia yatukaensis* (Horik. et Okuno) comb. nov.

Basionym: *Navicula yatukaensis* Horik. et Okuno in Okuno, Bot. Mag. Tokyo. 57: 368. f. 2f. 1943.

Holotype: Slide no. 1221 in HIRO. (should be

destroyed)

Lectotype (designated here): A photo dry plate numbered 1236 in TNS (Figs. 4, 8).

Locality: Yatuka Deposit, Okayama Prefecture, Japan.

The taxonomic photo plate for this taxon was not found, nor were any Lm photo plate or Un-mounted photographs found. For this taxon, only a photo dry plate (Fig. 4) numbered 1236 is found in Okuno collection. Lm photograph number (1236), magnification ( $\times 1000$ ), slide number (1221), locality (Okayama Tioraito in Japanese: this may be a brand name for diatomaceous earth), and date (1943. 1) are written on this photo dry plate. This photograph (Fig. 8) and these pieces of information completely agree with what is observed in the photograph and its description by Okuno (1943), and this photo dry plate was clearly used for the figure in Okuno (1943). This taxon belongs to the genus *Pinnularia*. This taxon does not appear to have been reported after Okuno (1943).

2. *Diploneis yatukaensis*.

*Diploneis yatukaensis* Horik. et Okuno in Okuno, Bot. Mag. Tokyo. 58: 8. f. 3a. 1944.

Holotype: Slide no. 1113 (1111?) in HIRO. (should be destroyed)

Lectotype (designated here): A photo dry plate numbered 1229 in TNS (Figs. 5, 9).

Locality: Yatuka Deposit, Okayama Prefecture, Japan.

No taxonomic photo plate for this taxon was found. A Lm photo plate for this taxon was found (Fig. 1). However, this photo plate does not include the taxonomic name; it includes only Lm number (1229), magnification (1000), and slide number (1111). The photo dry plate, numbered 1229, was also found (Fig. 5), and included information regarding magnification ( $\times 1000$ ), slide number (1111), locality (Okayama Tioraito in Japanese), and date (1943. 1). This slide number (1111) differs from the description (No. 1113) in Okuno (1944). However, the photograph of this dry plate (Fig. 9) completely agrees with the figure in Okuno (1944), and this photograph,

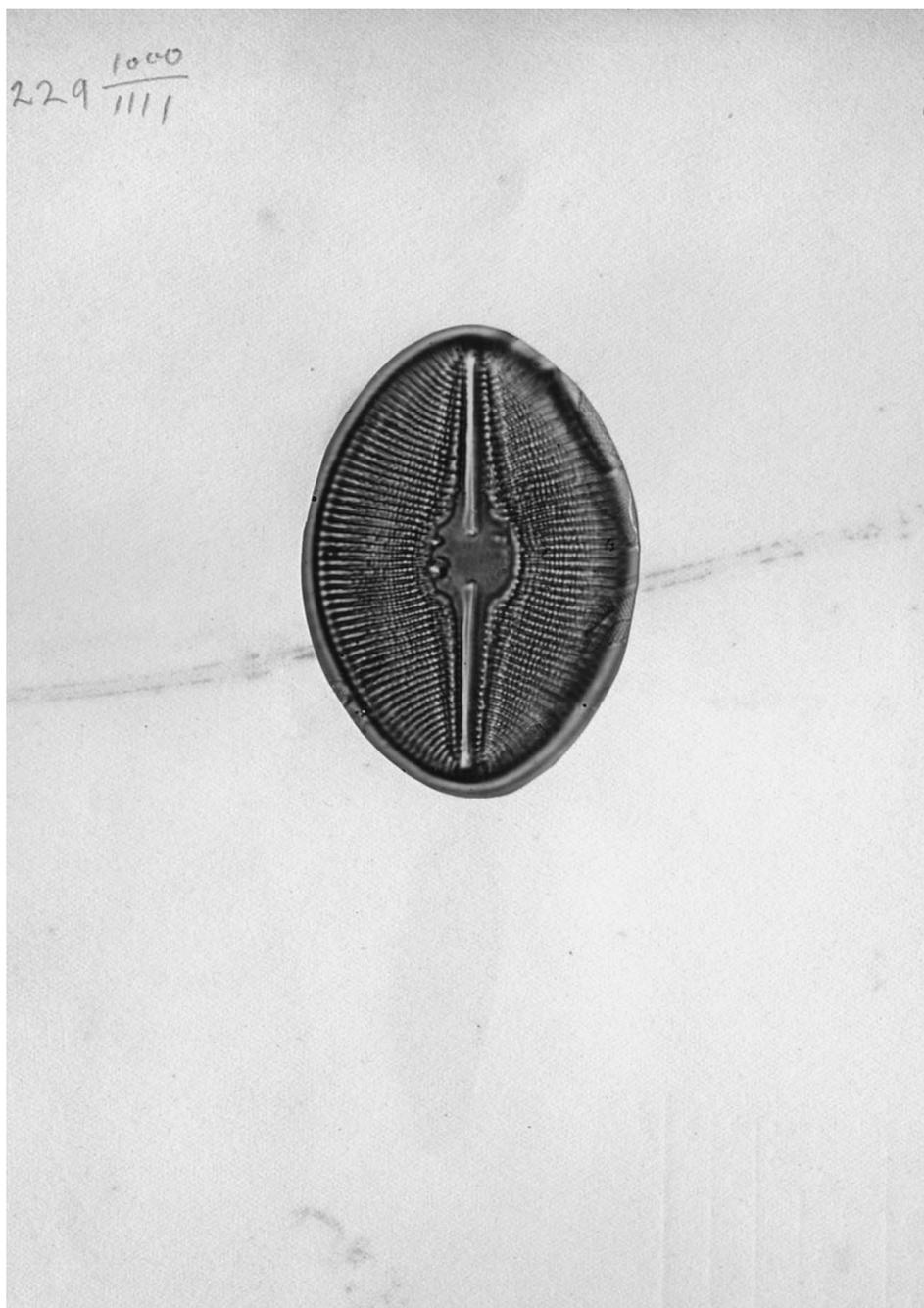


Fig. 1. Lm photo plate numbered 1229. *Diploneis yatukaensis* Horik. et Okuno. Actual size.

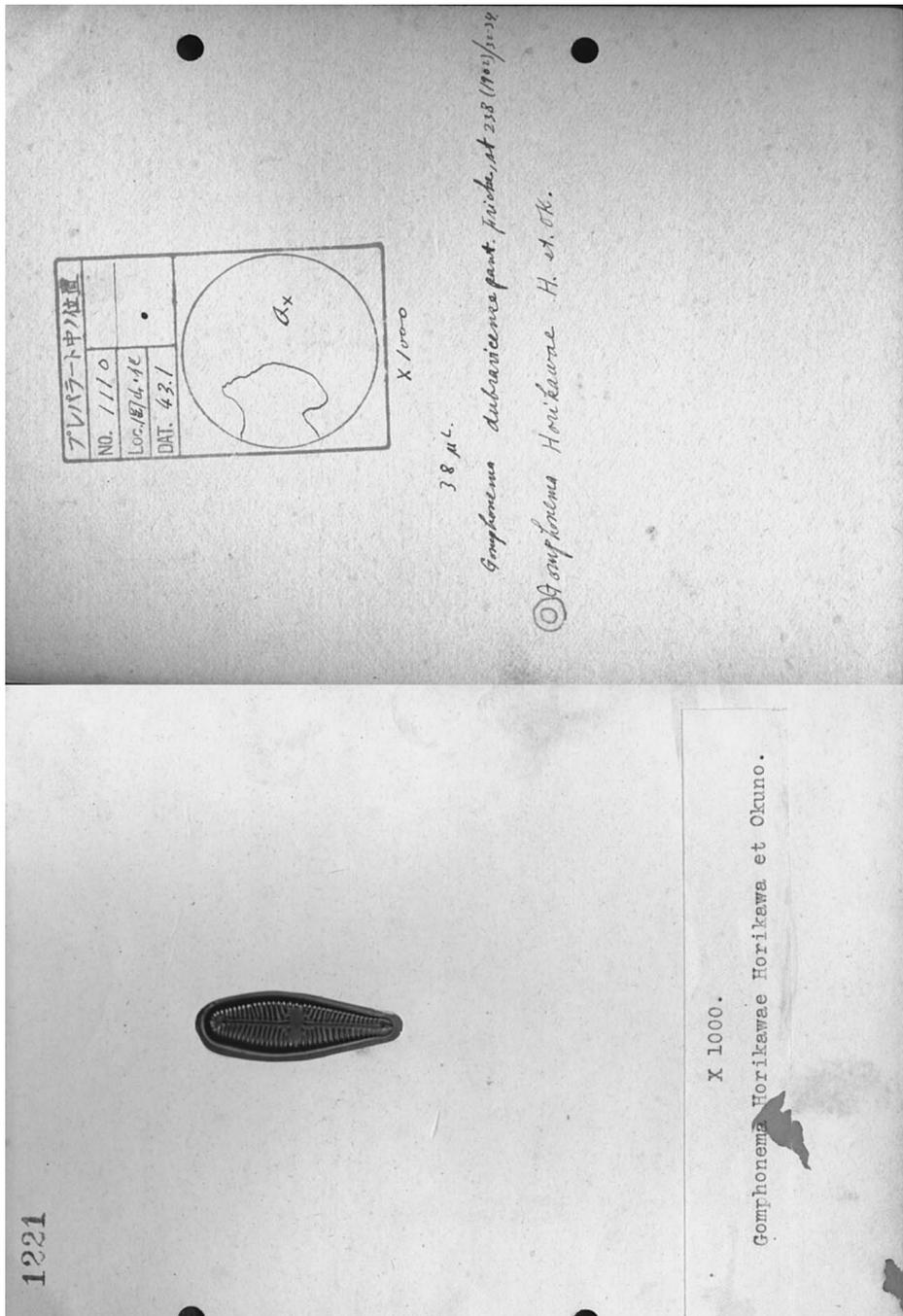


Fig. 2. Lm photo plate numbered 1221. *Gomphonema tetrastigmatum* Horik. et Okuno. 68% size.

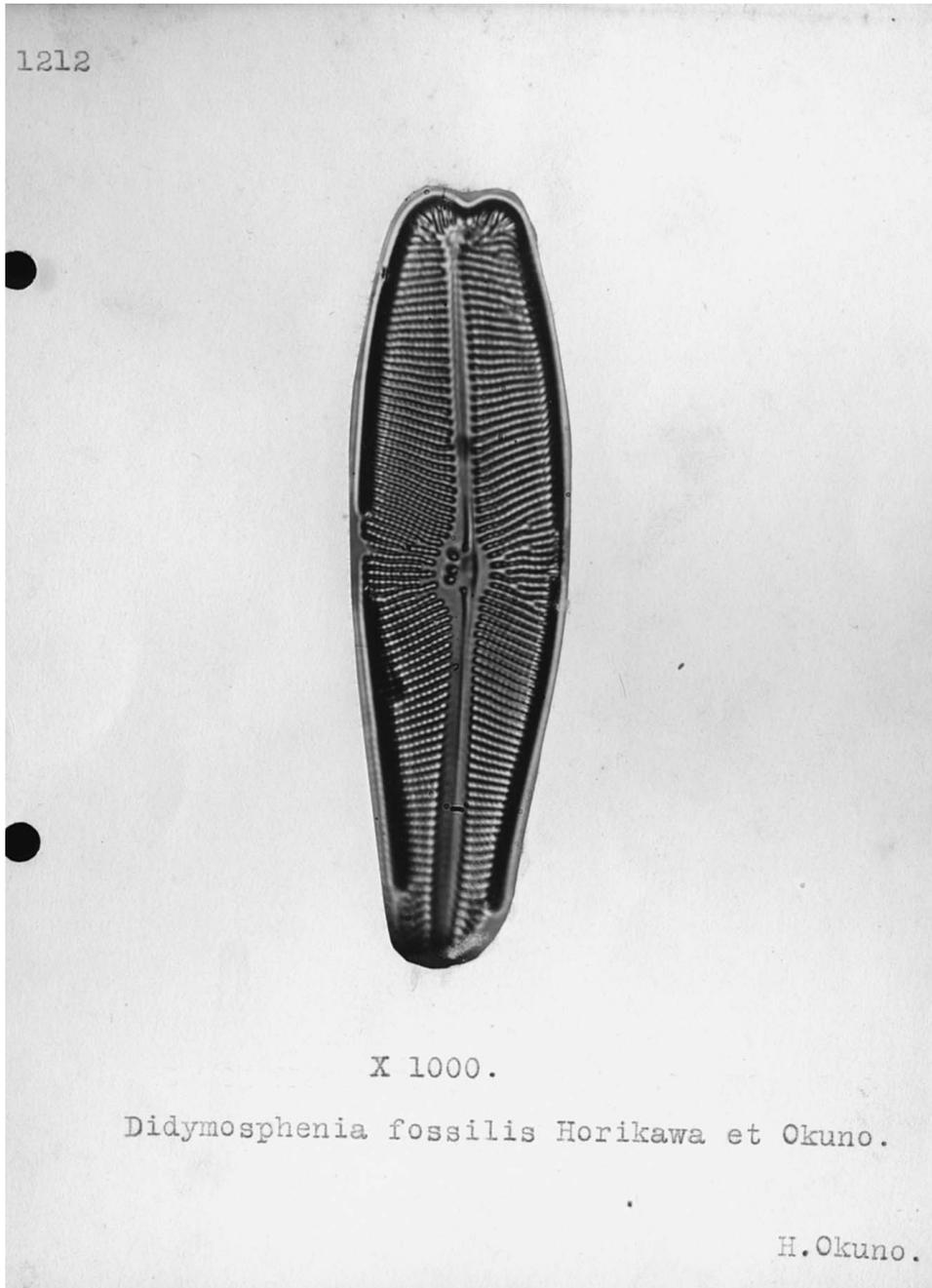


Fig. 3. Lm photo plate numbered 1212. *Didymosphenia fossilis* Horik. et Okuno. lectotype. Actual size.

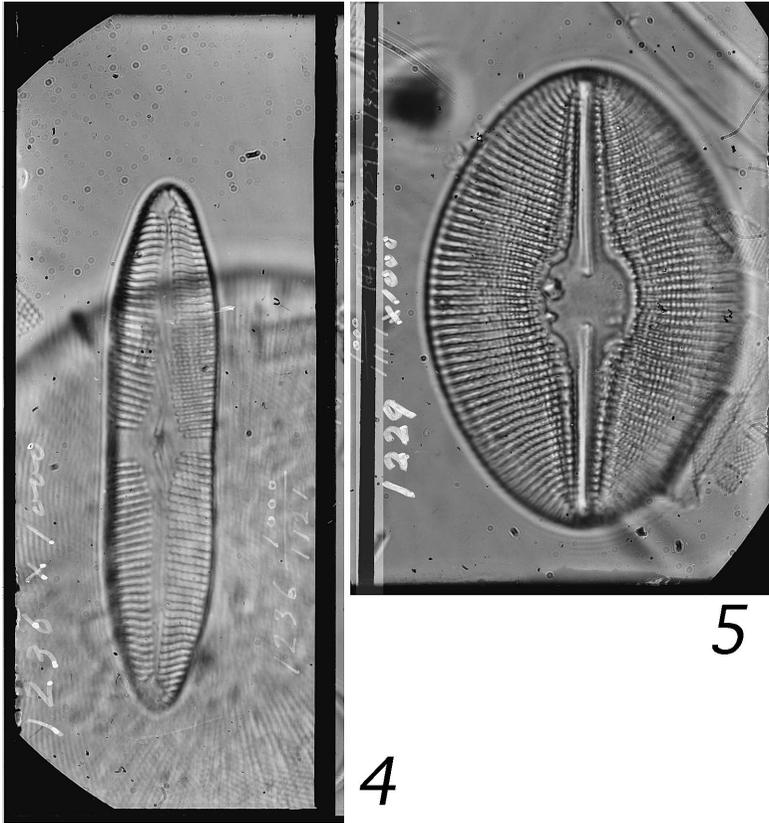


Fig. 4. Photo plate numbered 1236. *Pinnularia yatukaensis* (Horik. et Okuno) comb. nov. Fig. 5. Photo plate numbered 1229. *Diploneis yatukaensis* Horik. et Okuno. Figs. 4, 5. Lectotypes. Actual size.

numbered 1229, was clearly used for Okuno (1944). Descriptions in this photo plate agree with the description in Okuno (1944). This taxon has also been reported recently, in a lake (Lake Ashi: Negoro & Kawashima 1990) and in a pond (Nakai 1990).

### 3. *Gomphonema tetrastigmatum*.

*Gomphoneis tetrastigmata* (Horik. et Okuno) Ohtsuka, Diat. **18**: 32. 2002.

Basionym: *Gomphonema tetrastigmatum* Horik. et Okuno in Okuno, Bot. Mag. Tokyo. **58**: 10. f. 3e. 1944.

non: *Gomphonema tetrastigmatum* sensu Okuno, Diat. Elektr. Mikr. **9**: 36–37. f. 911–912. 1974.

non: *Gomphoneis tetrastigmatum* sensu Ohtsuka, Diat. **18**: 32. f. 77–80. 2002

Holotype: Slide no. 1110 in HIRO. (should be destroyed)

Lectotype (designated here): A photo dry plate numbered 1221 in TNS (Figs. 6, 11).

Locality: Yatuka Deposit, Okayama Prefecture, Japan.

A taxonomic photo plate labeled “*Gomphone-ma Horikawae* Horikawa et Okuno” was found (Fig. 2). Though the taxonomic name is different, the photograph in this plate completely agrees with the figure in Okuno (1944); it is possible that he changed this taxonomic name. Magnification ( $\times 1000$ ), slide number (1110), locality (Okayama, chemical), date (1943.1), synonyms, and other information are written in this plate. A photo dry plate numbered 1221 was also found (Fig. 6), with the same categories of information written on it. These pieces of information and a

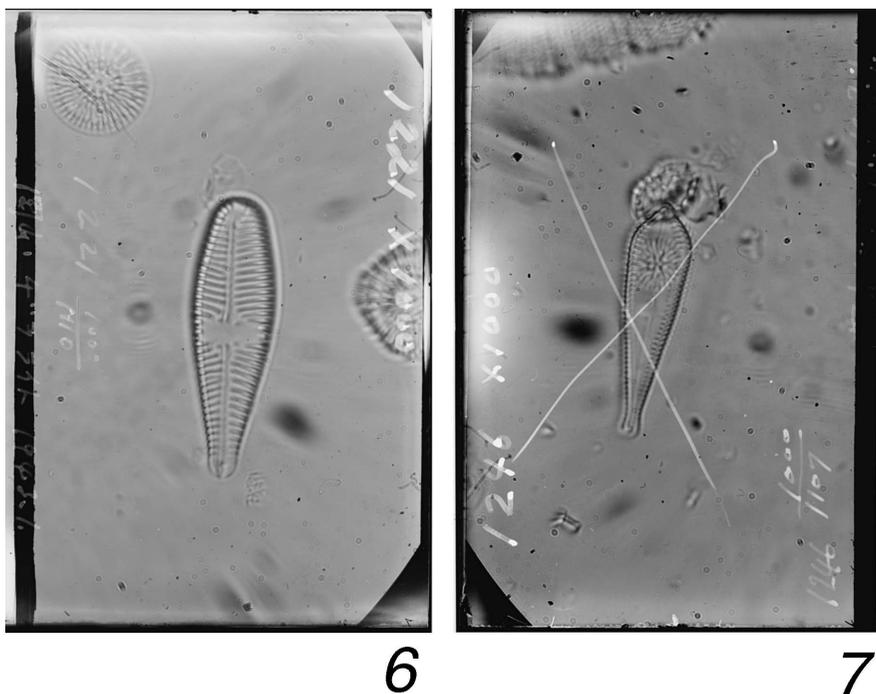


Fig. 6. Photo plate numbered 1221. *Gomphonema tetrastigmatum* Horik. et Okuno. Fig. 7. Photo plate numbered 1246. *Gomphonema yatukaensis* Horik. et Okuno. Figs. 6, 7. Lectotypes. Actual size.

photograph (Fig. 11) agree with the photograph (Fig. 11) and description in Okuno (1944). This photo dry plate was clearly used for the figure (Fig. 10) in Okuno (1944).

However, these photographs and descriptions do not match the photographs and description in Okuno (1974). *Gomphonema tetrastigmatum* sensu Okuno (1974) should not be this taxon, but, rather, another new taxon. Ohtsuka (2002) transferred this taxon to the genus *Gomphoneis* using Hii River specimens. However, the taxon Ohtsuka used was not *Gomphonema tetrastigmatum* either, but the same taxon as that used by Okuno (1974). Despite the misidentification in Ohtsuka (2003), the *Gomphoneis tetrastigmatum* (Horik. et Okuno) Ohtsuka must be the *Gomphonema tetrastigmatum* in ICBN (International Code of Botanical Nomenclature). This taxon should also belong to the genus *Gomphoneis* because it has four stigmata in the central area (Round et al. 1990). Though this taxon has been reported widely from Japan (Okuno 1974), most

of the reports using this taxonomic name probably carry the same misidentification (Tuji 2003). This correct taxon was observed in Lake Biwa and Lake Kutara (Tuji and Watanabe, personal data). Another new taxon, which had previously been identified as this taxon, will be described elsewhere.

#### 4. *Gomphonema yatukaensis*.

*Gomphonema yatukaensis* Horik. et Okuno in Okuno, Bot. Mag. Tokyo. **58**: 10. f. 5a. 1944.

Holotype: Slide no. 1107 in HIRO. (should be destroyed)

Lectotype (designated here): A photo dry plate numbered 1246 in TNS (Figs. 7, 12).

Locality: Yatuka Deposit, Okayama Prefecture, Japan.

*Gomphosphenia grovei* var. *lingulata* (Hust.) Lange-Bert., Nov. Hedw. 60: 243. 1995.

Basionym: *Gomphonema lingulatum* Hust., Arch. Hydrobiol. 18: 166. pl. 5. f. 5. 1927.

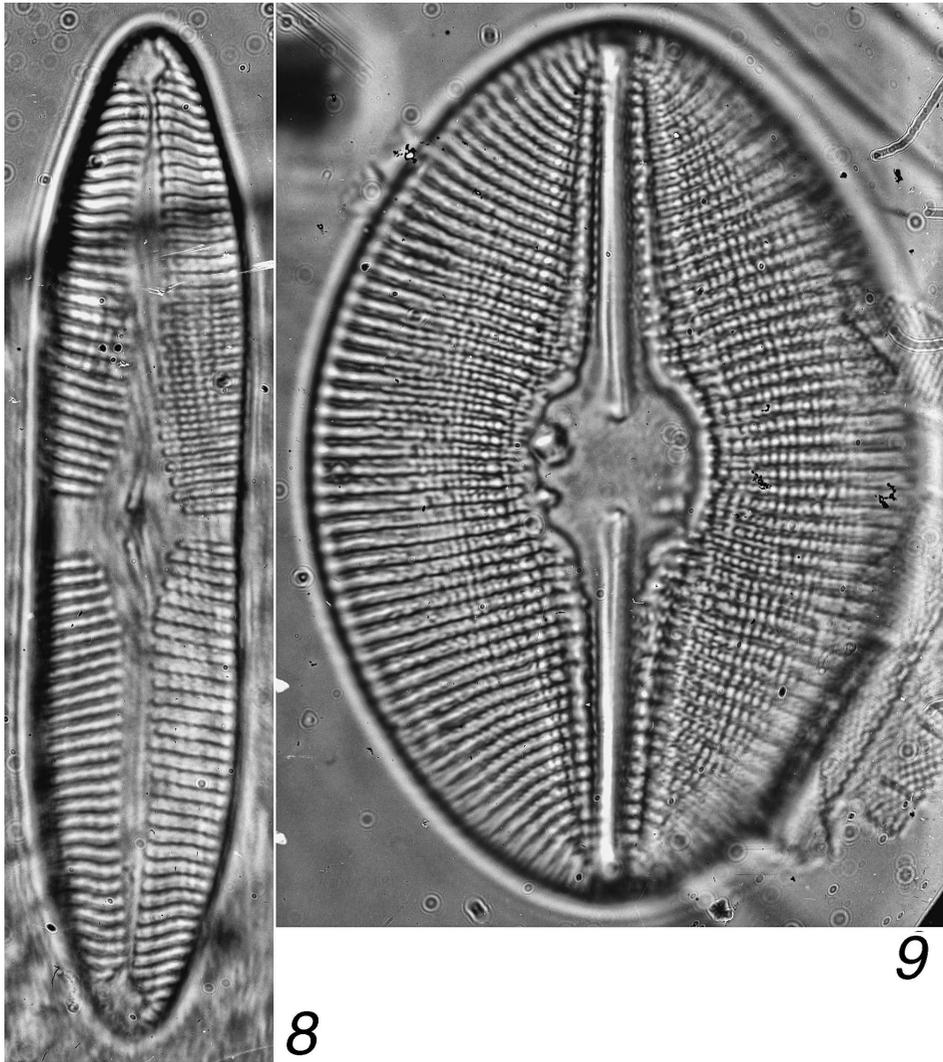


Fig. 8. *Pinnularia yatukaensis* (Horik. et Okuno) comb. nov. Enlarged photograph. Fig. 9. *Diploneis yatukaensis* Horik. et Okuno. Enlarged photograph. Figs. 8, 9.  $\times 2000$ .

Synonym: *Gomphonema yatukaensis* Horik. et Okuno in Okuno, Bot. Mag. Tokyo. 58: 10. f. 5a. 1944.

No taxonomic photo plate or Lm photo plate for this taxon were found. A non-mounted photograph and a photo dry plate (Fig. 7), which are very similar to the figure in Okuno (1944), were found. A crossed-through line is written on this plate. Magnification ( $\times 1000$ ), slide number (1107), locality (Okayama, chemical), and date (1943.1) are written in this dry plate. These de-

scriptions are in complete agreement with the description in Okuno (1944), and the individuals in this photo plate also agree with the description of dimensions in Okuno (1944). This photo dry plate was clearly used for the figure in Okuno (1944). Okuno (1944) used a manual illustration for this taxon. Because two other individuals are overlapped in this photograph (Fig. 7), this photograph may not have been selected for use in his paper.

This taxon should be a synonym of *Gom-*

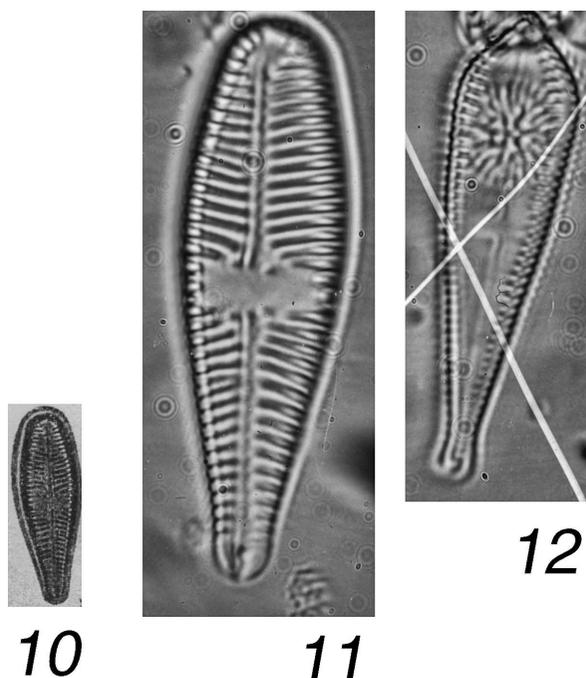


Fig. 10. *Gomphonema tetrastigmatum* Horik. et Okuno. A original illustration after Okuno (1944). Actual size.  
 Fig. 11. *Gomphonema tetrastigmatum* Horik. et Okuno. Enlarged photograph. Fig. 12. *Gomphonema yatukaensis* Horik. et Okuno. Enlarged photograph. Figs. 11, 12.  $\times 2000$ .

*phosphenia grovei* var. *lingulata* (Hust.) Lange-Bert., which was recently observed in lakes (Tuji 2003).

##### 5. *Didymosphenia fossilis*.

*Didymosphenia fossilis* Horik. et Okuno in Okuno, Bot. Mag. Tokyo. **58**: 10. f. 5a. 1944.

Holotype: Slide no. 1111 in HIRO. (should be destroyed)

Lectotype (designated here): A taxonomic photo plate numbered 1212 in TNS (Fig. 3).

Locality: Yatuka Deposit, Okayama Prefecture, Japan.

A taxonomic photo plate labeled “*Didymosphenia fossilis* Horikawa et Okuno.” was found (Fig. 3). Magnification ( $\times 1000$ ), slide number (1111), locality (Okayama, chemical), and other information are written on this plate. These pieces of information agree with the description in Okuno (1944). This taxonomic photo plate must have been used for the figure in Okuno (1944)

The original photo plate, numbered 1212 (Figs 9-10), agrees with the description and photographs in Okuno (1944). This taxon has not been reported in any recent samples, and should be classified as a fossil taxon.

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