

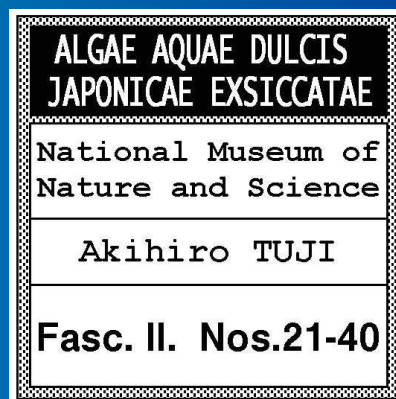


ALGAE AQUAE DULCIS JAPONICAE EXSICCATAE II

Published by
National Museum of Nature and Science
Tsukuba, JAPAN

Edited by
Akihiro Tuji

Microalgal Herbarium
Department of Botany
National Museum of Nature and Science
4-1-1, Amakubo, Tsukuba, Ibaraki
305-0005 JAPAN
tuji@kahaku.go.jp



25 March 2009

PREFACE

This exsiccata set, made from Japanese freshwater microalgal specimens, is issued by the National Museum of Nature and Science. This second fascicle comprises 20 slides.

The review of this exsiccata set by Hamilton and Edgar (2008, *Diat. Res.* 23: 349-354), pointed out two important subjects, one is adding SEM photographs, and another is incorporating the molecular data. I have tried the first one in this fascicle. I hope these photographs are helpful for the future research of diatomists. I am going to make the next issue using the culture strains cultivated in our laboratory. I am now trying to add the molecular data for some strains. Thank you very much Dr. Paul B. Hamilton and Dr. Robert K. Edgar for their kind review and advice on this exsiccata set.

I am grateful to Dr. Toshiharu Watanabe for allowing use of his collection in TNS for this exsiccata.

If there are any problems experienced using this exsiccata, please contact me. I will send another slide. I am always pleased to receive comments and suggestions.

CITATION

Tuji, A. 2009. *Algae Aquae Dulcis Japonicae Exsiccatae*. Fasc. II. nos. 21-40. 32pp. National Museum of Nature and Science, Tsukuba.

Nos. 021

Lake Yogo, Shiga Pref., Japan.

[36°31.752' N, 136°11.662' E]

Electric conductivity (EC: $\mu\text{s}/\text{cm}$): 94, pH: 8.1, Water temperature (WT: $^{\circ}\text{C}$): -.

Date: 18/iv/2000.

Coll. A. Tuji (duplicate of TNS-AL-55265m in TNS).

Ulnaria japonica (F.Meister) Tuji, Bull. Natul. Mus. Nat. Sci., Ser. B, **34**: in press.
2009.

$\equiv$ *Synedra japonica* F.Meister, Arch. Hydrobiol. **8**: 312. *pl. IV, f. 5-6*. 1913.

(Figs 1-14)

Lectotype: (designated in Tuji & Williams 2007): Slide “K2/59” ! in BRM.

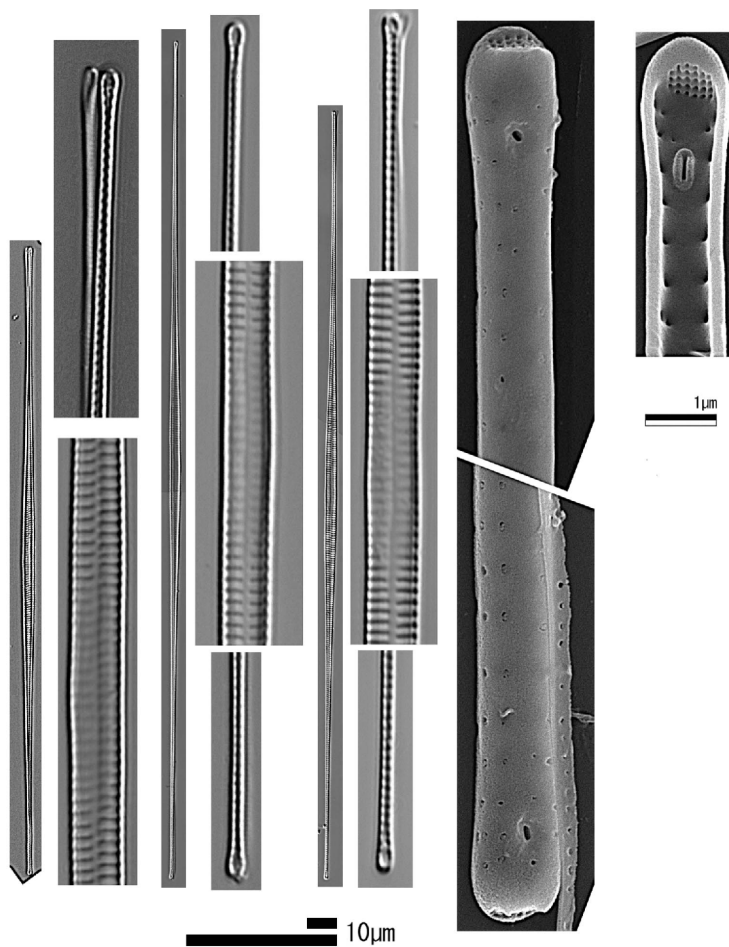
Isotype: Slide no 801, Tempère et Peragallo (2nd edition), BM69152!.

Type locality: Lake Suwa, Nagano Pref., Japan.

Ecology: plankton. Formally identified as *Synedra acus* or *S. delicatissima* var.
angustissima by Japanese diatomists.

Reference: Tuji, A. 2009. The transfer of two Japanese *Synedra* species
(Bacillariophyceae) to the genus *Ulnaria* Bull. Natul. Mus. Nat. Sci., Ser. B, **34**: in
press.

Nos. 021



Nos. 022

Lake Biwa, Shiga Pref., Japan.

[35°30'13.6" N, 136°10'55.4" E]

EC: 100, pH: 8.0, WT: 11.8.

Date: 18/iii/2008.

Coll. A. Tuji (duplicate of TNS-AL- 56459m in TNS).

Asterionella formosa Hassall, Diat. Water Suppl. London: 10. *pl.* 2. *f.* 5. 1850.

(Figs 1-9)

Type: prepared slides and / or material of the type are not known to exist (Pappas and Stoermer 2001).

Type locality: Thames at Brentford, U. K.

Ecology: plankton.

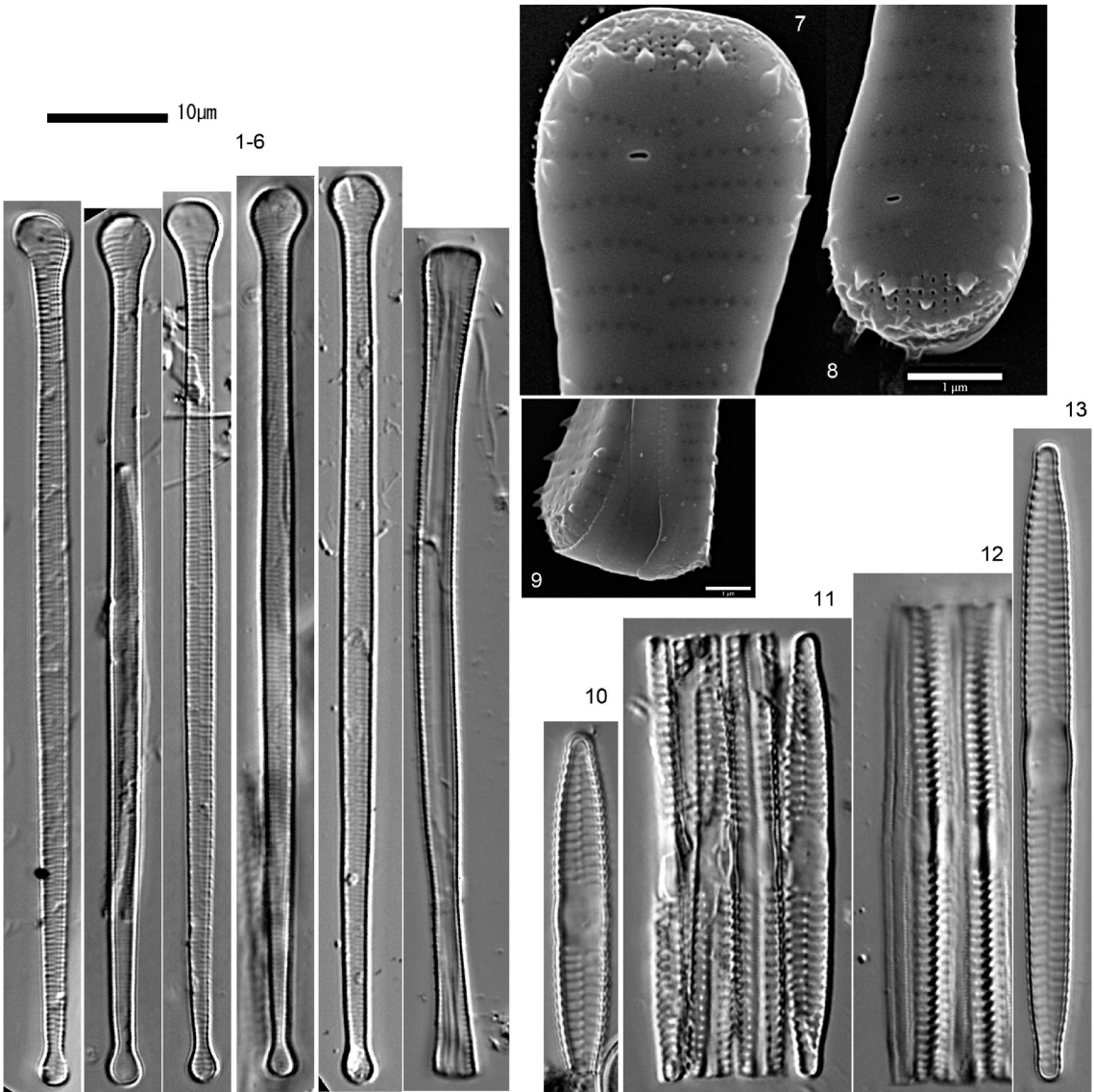
Reference: Pappas, J. L. & Stoermer, E. F. 2001. *Asterionella* Hassall (Heterokontophyta, Bacillariophyceae) Taxonomic history and quantitative methods as an aid to valve shape differentiation.

***Fragilaria* sp.**

(Figs 10-13)

This taxon should be new taxon, and I will describe in following paper.

Nos. 022



Nos. 023

Yutaki falls, River Yu-kawa, Tochigi Pref., Japan.

[36°47'42.2" N, 139°25'42.1" E]

EC: 130, pH: 7.8, WT: 4.8.

Date: 16/iii/2008.

Coll. A. Tuji (duplicate of TNS-AL- 56354m in TNS).

Gomphoneis herculeana (Ehrenb.) Cleve, K. Svenska Vet.-Akad. Handl., Ny Följd,
26(2): 73. 1984

≡ *Gomphonema herculeanum* Ehrenb. Ber. Akad. Wiss. Berlin, **1845:** 59, 78. 1845.

(Figs 1-6)

Type locality: Mackinac Island, Michigan.

Ecology: seems to prefer cool water (Patrick & Reimer 1975).

Reference: Kociolek, J.P. & Stoermer, E.F. 1988. Taxonomy, ultrastructure and distribution of *Gomphoneis herculeana*, *G. erienne* and closely related species (Naviculales: Gomphonemataceae). Proc. Acad. Nat. Sci. Phil. 140(2): 24-97.

Diatoma mesodon (Ehrenb.) Kütz., Kies. Bacill. 47. 1844.

≡ *Fragilaria mesodon* Ehrenb. Abh. Akad. Wiss. Berlin **1838:** 57. *pl.* 2(1). *f.* 9. 1839.

(Figs 7-8)

Ecology: saproxenous, alkalibiontic.

Reference: Williams D. M. 1985. Morphology, taxonomy and inter-relationships of the ribbed araphid diatoms from the genera *Diatoma* and *Meridion* (Diatomaceae: Bacillariophyta). Biblioth. Diat. vol. 8. J.Crammer.

Gomphoneis calcifuga (Lange-Bert. et E. Reichardt) Tuji, Bull. Natn. Sci. Mus. Tokyo ser. B. **31:** 92. 2005.

≡ *Gomphonema calcifugum* Lange-Bert. & E.Reichardt in Lange-Bert., *Iconogr. Diatomol.* **6:** 53. 1999. (new name)

≡ *Gomphonema olivaceum* var. *minutissimum* Hust. in Pascher, *Süsses.-Fl.*, ed. 2, **10:** 378, *f.* 720. 1930.

=? *Gomphonema separatipunctatum* H.Kobayasi, Bull. Chichibu Mus. Nat. Hist. **12**: 74, pl. 15, f. 57, 1964. nom. nud.

(Figs 9-10)

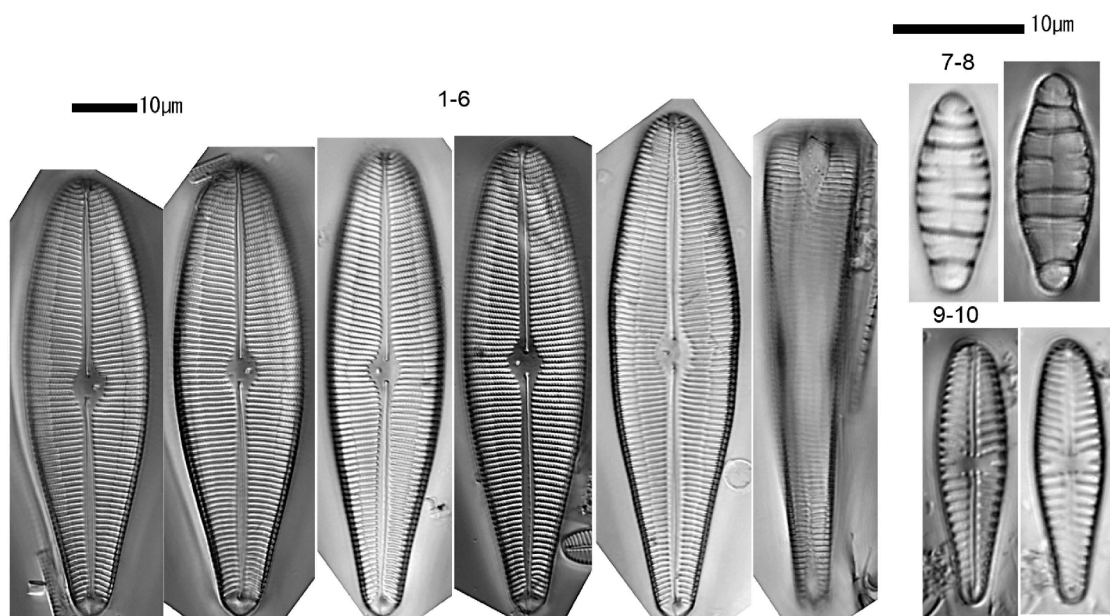
Holotype: S1/52. Passau, Brunnen. (micrographs Photographs presented in Simonsen 1987: Plate 195/8-11).

Type locality: Bayern (springs near Passau), Germany

Distribution: Europe (Carter and Bailey-Watts 1981 as *G. olivaceoides*), USA (Patrick and Reimer 1975), The far east of Russia (Watanabe personal data), Japan.

Freshwater lakes and rivers.

Reference: Tuji, A. 2005. Type examination and taxonomy of *Gomphoneis tetrastigmata* species complex from Europe and Japan. Bull. Natn. Sci. Mus. Tokyo ser. B. **31**: 89-108.



Nos. 024

Lake Ashino-ko, Kanagawa Pref., Japan.

[35°12'14.9" N, 139°01'44.4" E]

EC: 72, pH: 8.2, WT: 17.1.

Date: 2/x/2007.

Coll. A. Tuji & Soninkhishig (duplicate of TNS-AL- 56379m in TNS).

Fragilaria crotonensis Kitton, Hardwicke's Sci.-Goss. **5**: 110. *f.* 81. 1869.

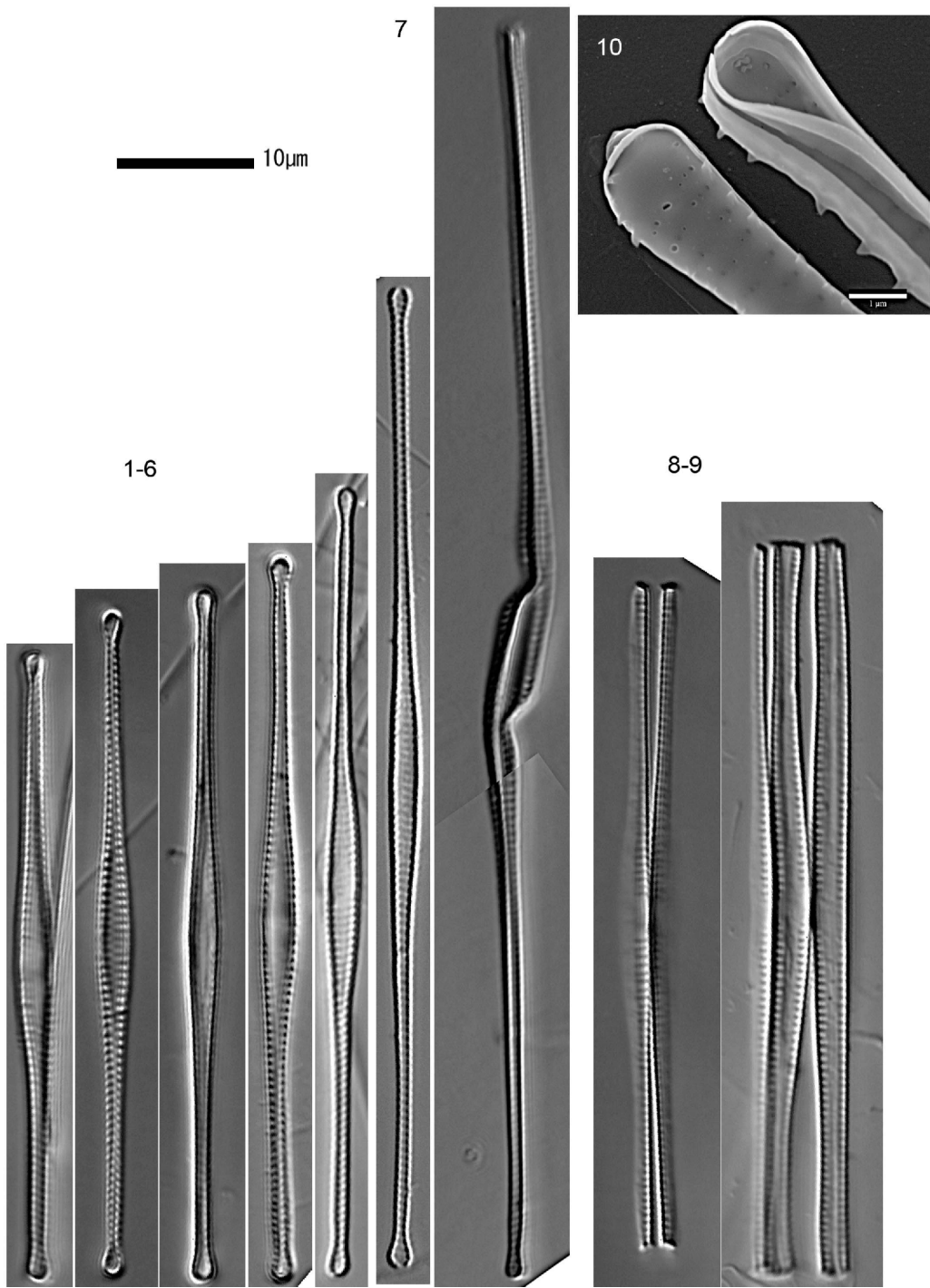
(Figs 1-9)

Type locality: Croton water supply for New York.

Ecology: plankton.

Morphological variation of this taxon in Japan is very wide. We need more taxonomic work on this taxon.

Nos. 024



Nos. 025

Lake Suwa, Nagano Pref., Japan.

[36°03'09.7" N, 138°06'42.4" E]

Date: 5/x/2002.

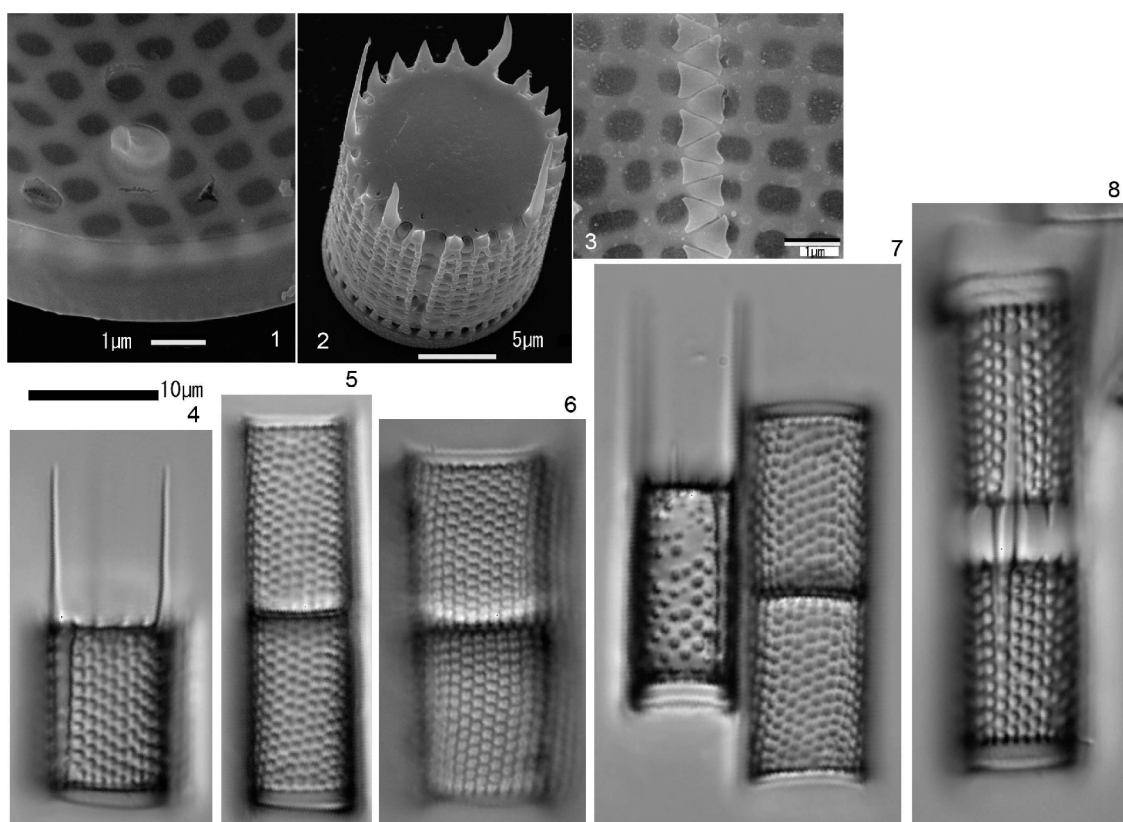
Coll. A. Tuji (duplicate of TNS-AL- 54071m in TNS).

Aulacoseira granulata (Ehrenb.) Simonsen, Bacill. **2**: 58. 1979.

≡ *Gaillonella granulata* Ehrenb. Abh. Königl. Akad. Wiss. Berlin **1841**: 415. 1843.

(Figs 1-8)

Ecology: Plankton. Eutrophic lakes and ponds.



Nos. 026

Lake Kitaura, Ibaraki Pref., Japan.

[35°59'24" N, 140°35'10" E from a map]

Date: 18/iii/2008.

Coll. A. Tuji (duplicate of TNS-AL- 56374m in TNS).

Cyclostephanos dubius (Fricke) Round ex E.C.Ther. et al., Brit. Phycoll. J. **22**: 346.
1987.

≡ *Cyclotella dubia* Fricke in Schmidt et al. Atlas Diat. *pl.* 222. *f.* 23-24. 1900.

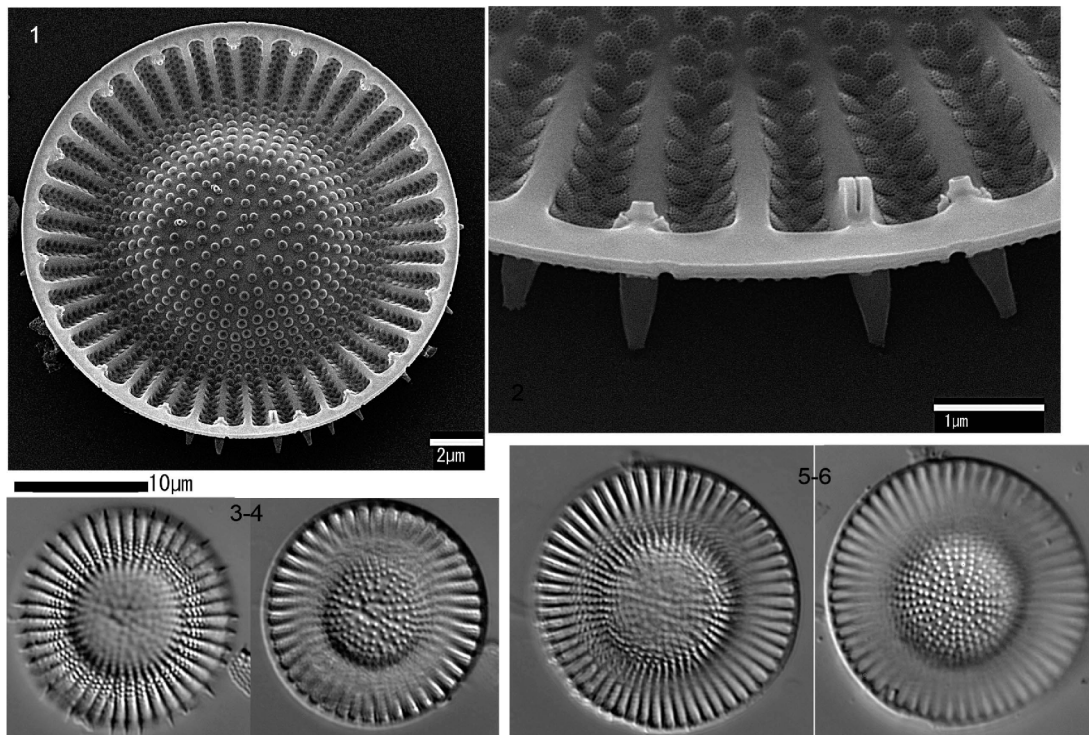
(Figs 1-8)

Type locality: Krim.

Ecology: indifferent, pH-circumneutral.

The large morphological variation of this taxon is found in Japanese materials, and it may include several taxa.

Reference: Hickel, B. & Håkansson, H.. 1987. Dimorphism in *Cyclostephanos dubius* (Bacillariophyta) and the Morphology of Initial Valves. *Dia. Res.* 2: 35-46.



Nos. 027

Ryutan pond, Syuri Castle, Okinawa Pref., Japan.

[26°13'08" N, 127°43'05" E from a map]

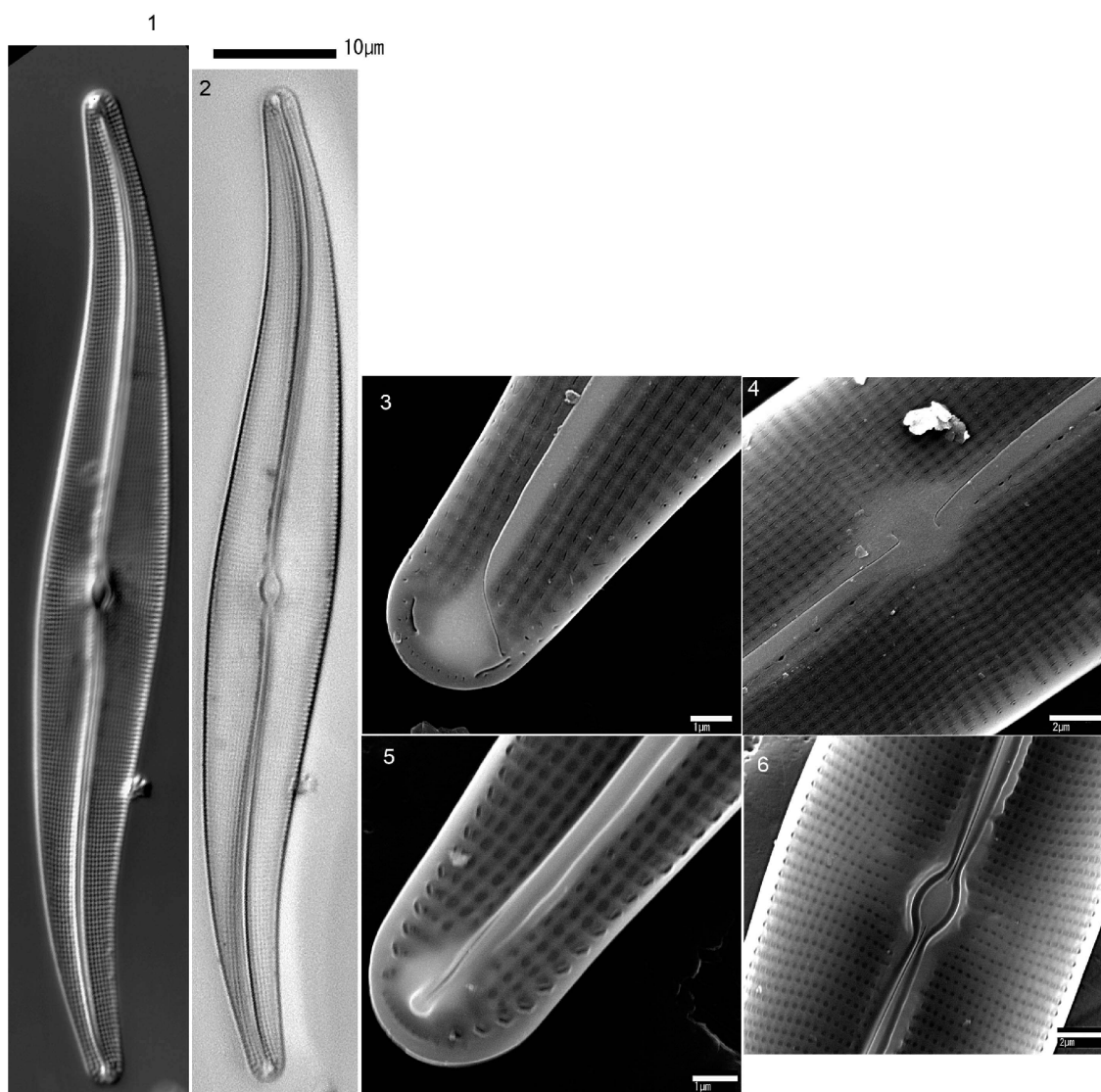
Date: 3/x/2008.

Coll. A. Tuji (duplicate of TNS-AL- 56589m in TNS).

Gyrosigma spencerii Cleve, Synops. Nav. Diat. 1: 117. 1894.

(Figs 1-6)

Ecology: indifferent, pH-circumneutral.



Nos. 028

Lake Inba-numa, Chiba Pref., Japan.

[35°45'03" N, 140°10'56" E from a map]

Date: 8/iv/2003.

Coll. A. Tuji (duplicate of TNS-AL- 55277m in TNS).

Aulacoseira ambigua f. *japonica* (F.Meister) Tuji et D.M.Williams, Bull. Natl. Mus.
Nat. Sci. Tokyo ser. B. **33**: 69-70. 2007.

(Figs 1-3)

Aulacoseira granulata (Ehrenb.) Simonsen, Bacill. **2**: 58. 1979.

(Fig. 4)

Aulacoseira granulata f. *spiroides* (Hust.) Czarn. & D.Reinke, Trans. Kansas Acad. Sci.
85: 174-175. 1982.

≡ *Melosira granulata* f. *spiralis* Hustedt, Rabenhorsts Kryptog.-Fl. **7(1)**: 251. 1927.

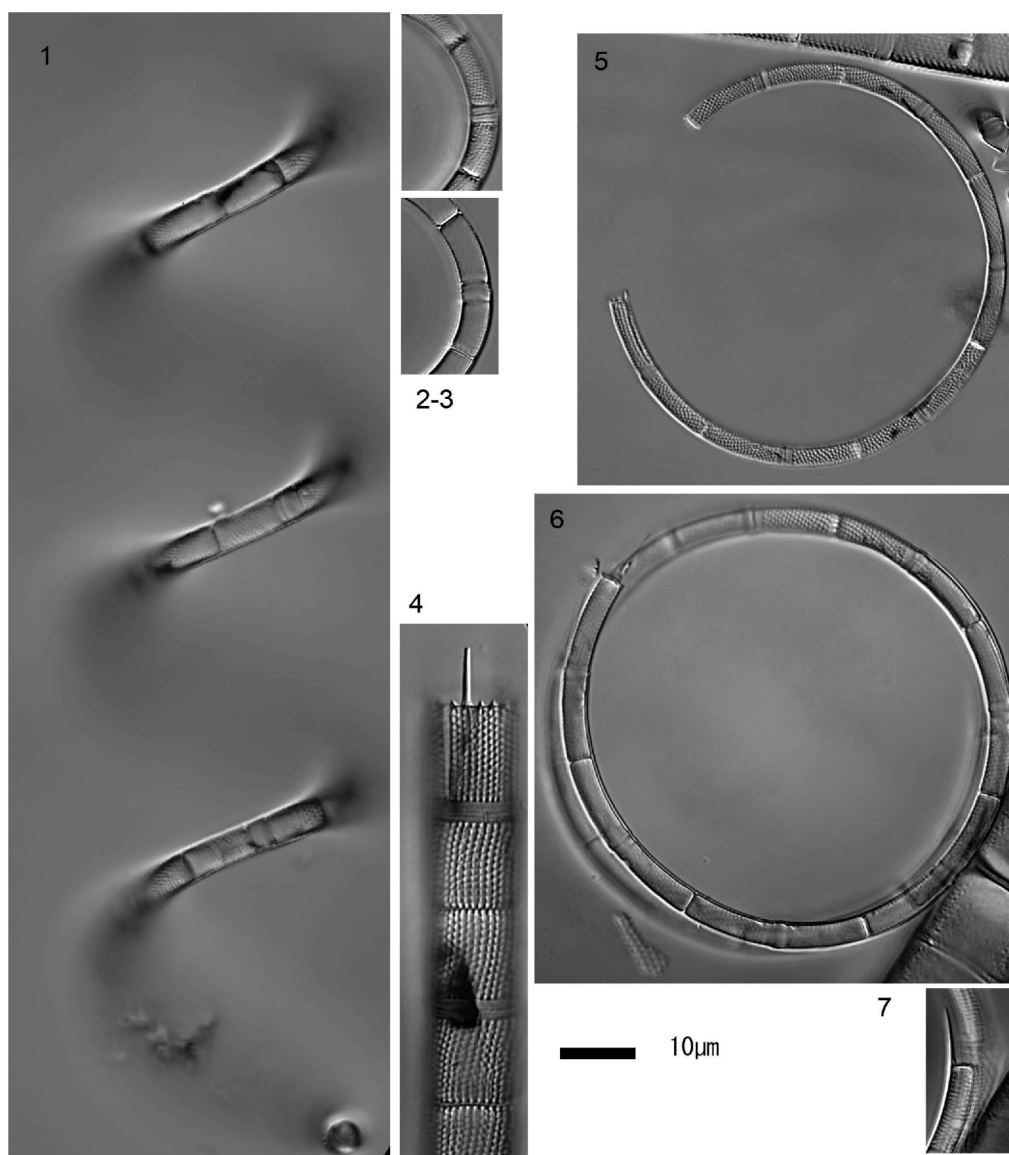
(Figs 5-7)

Reference: Tuji, A. 2006. The occurrence of *Aulacoseira granulata* f. *spiralis* (Hust.)
Czarn. & D.Reinke in the Japanese Lake (in Japanese). Diatom **22**: 76-77.

The spiral form of *A. ambigua* and *A. granulata* are confused in many Japanese ecological and floral diatom reports. The spiral form of *A. granulata* seems to be very rare in Japan.

Since the straight form and spiral form seem to have different habitat, I divide both form as the taxonomical rank of forma.

Nos. 028



Nos. 029

Lake Motosu, Yamanashi Pref., Japan.

[35°28' N, 138°35' E from a map]

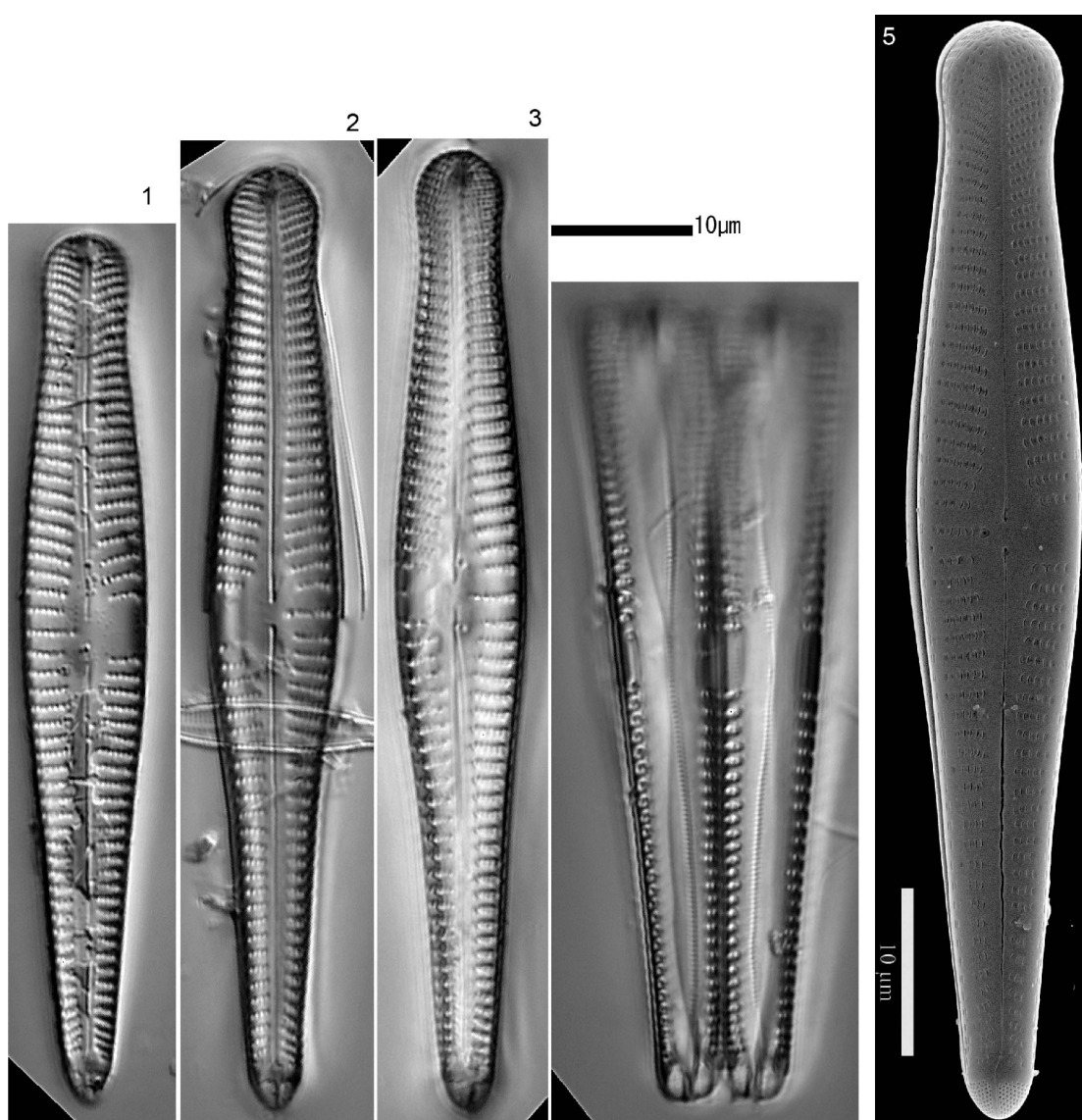
Date: 23/vii/1989.

Coll. T. Watanabe (duplicate of TNS-AL-TW12220m in TNS).

Gomphonema nipponicum Skvortsov, Philip. J. Sci. **61**: 54. *pl. 12. f. 3. pl. 13. f. 24.*
1936.

(Figs 1-5)

Ecology: rare.



Nos. 030

River Yahagi, Aichi Pref., Japan.

[35°00'57.1" N, 137°09'37.9" E]

pH: 7.2, WT: 5.9.

Date: 27/ii/2004.

Coll. A. Tuji (duplicate of TNS-AL-55894m in TNS).

Ulnaria acus (Kütz.) M.Aboal in M.Aboal et al., Diat. Monogr. **4**: 105. 2003.

≡ *Synedra acus* Kütz., Bacill. 68. *pl.* 15, *f.* 7. 1844.

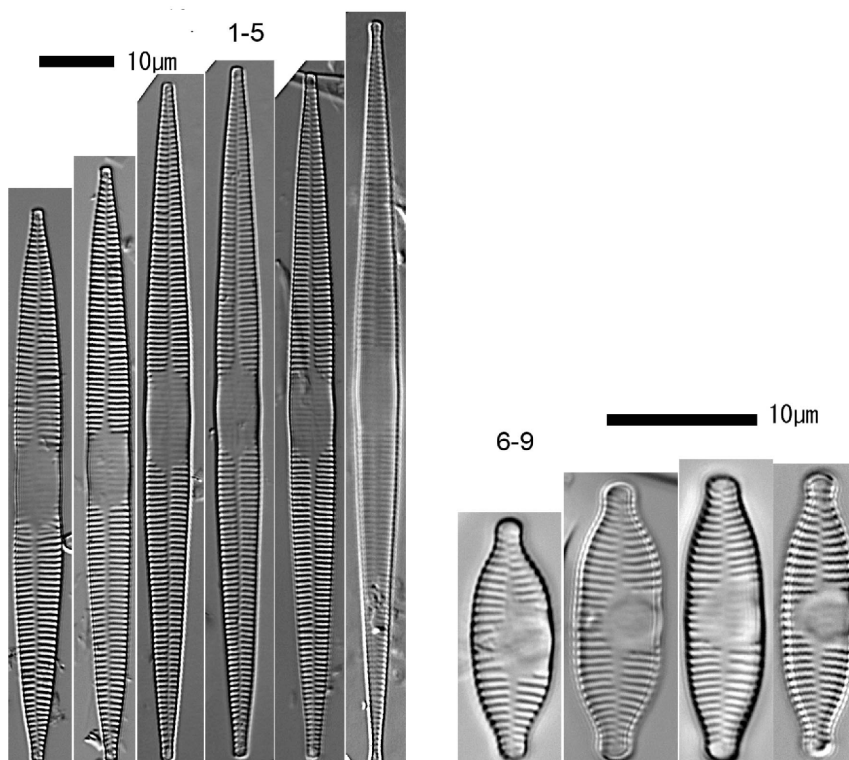
(Figs 1-6)

Ecology: indifferent, pH-circumneutral.

Frgilaria vaucheriae var. ?

(Figs 7-10)

This taxon should be new taxon, and I will describe following paper.



Nos. 031

River Urauchi, Okinawa Pref., Japan.

[24°21'25.5" N, 123°48'12.5" E]

Date: 10/iii/2005.

Coll. A. Tuji (duplicate of TNS-AL-55535m in TNS).

Encyonema cf. gracile

(Figs 1-7)

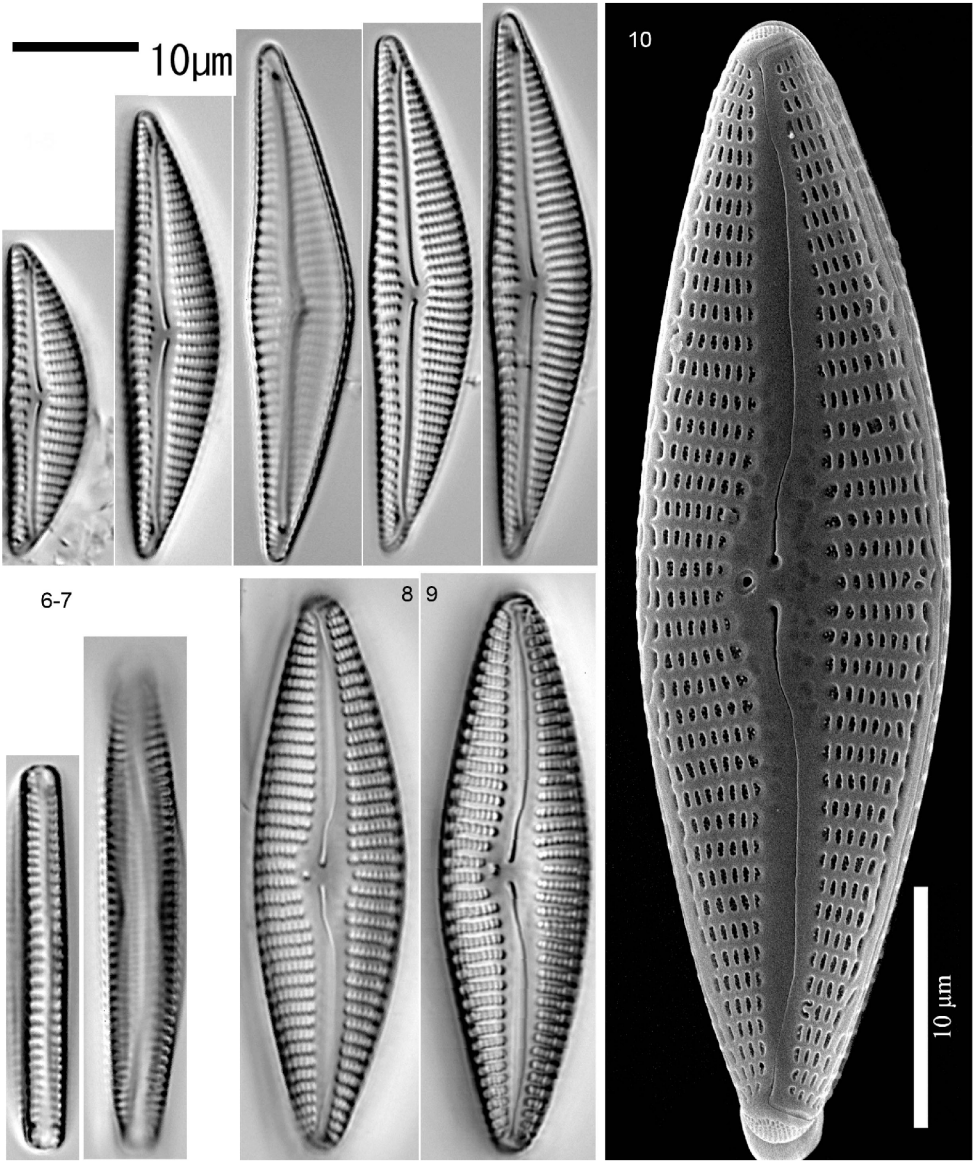
Cymbella japonica Reichelt *in* Kuntze, Revis. Gen. 391. pl. 3(2). 1898.

(Figs 8-10)

Ecology: saproxenous, pH-circumneutral. rare.

This taxon should be belongs genus *Cymbopleura*.

Nos. 031



Nos. 032

River Urauchi (pool), Okinawa Pref., Japan.

[24°21'25.5" N, 123°48'12.5" E]

Date: 10/iii/2005.

Coll. A. Tuji (duplicate of TNS-AL-55534m in TNS).

Navicula zanonii Hust, Süsw.-Diat. Albert-Nationalpark Belg.-Kongo: 92. pl. 5. f. 1-5.
1949.

(Figs 1-7)

Lectotype: (designated in Simonsen 1987): Slide BRM "f241/58" in BRM.

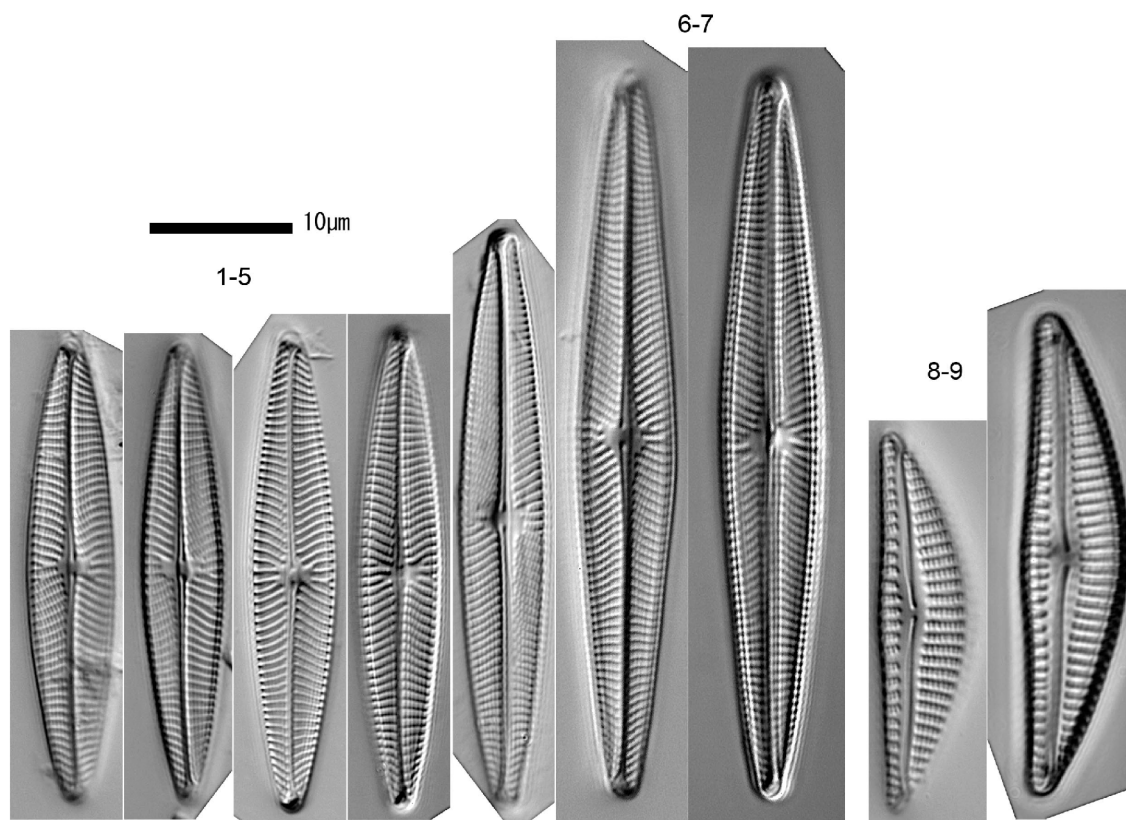
Type locality: Belg. Kongo.

Ecology: indifferent, pH-circumneutral.

Reference: Simonsen, R. 1987. Atlas and catalogue of the diatom types of Friedrich
Hustedt. J. Cramer.

Encyonema cf. gracile

(Figs 8-9)



Nos. 033

Lake Shikotsu, Hokkaido Pref., Japan.

[42°46'04" N, 141°24'10" E]

Date: 2/iii/2009.

Coll. A. Tuji (duplicate of TNS-AL-57110m in TNS).

Fragilaria gracilis Østrup, Danske Diat.: 190. *pl.* 5. *f.* 117. 1910.

(Figs 9-13)

Lectotype: (designated in Krammer and Lange-Bertalot 1991): slide 1342 in the Østrup collection in C.

Isotype (raw material): 352.1 in the Østrup collection in C.

Type locality: A basin in the Botanical garden, Kopenhagen.

Ecology: saproxenous.

Reference: Tuji, A. 2007. Type examination of *Fragilaria gracilis* Østrup (Bacillariophyceae). Bull. Natl. Mus. Nat. Sci., Ser. B. 33: 9-12.

Achnanathidium gracillimum (F.Meister) Mayama et H.Kobayasi in H.Kobayasi et al., H.Kobayasi's Atlas Jap. Diat. Electr. Microsc. **1**: 13. 2006.

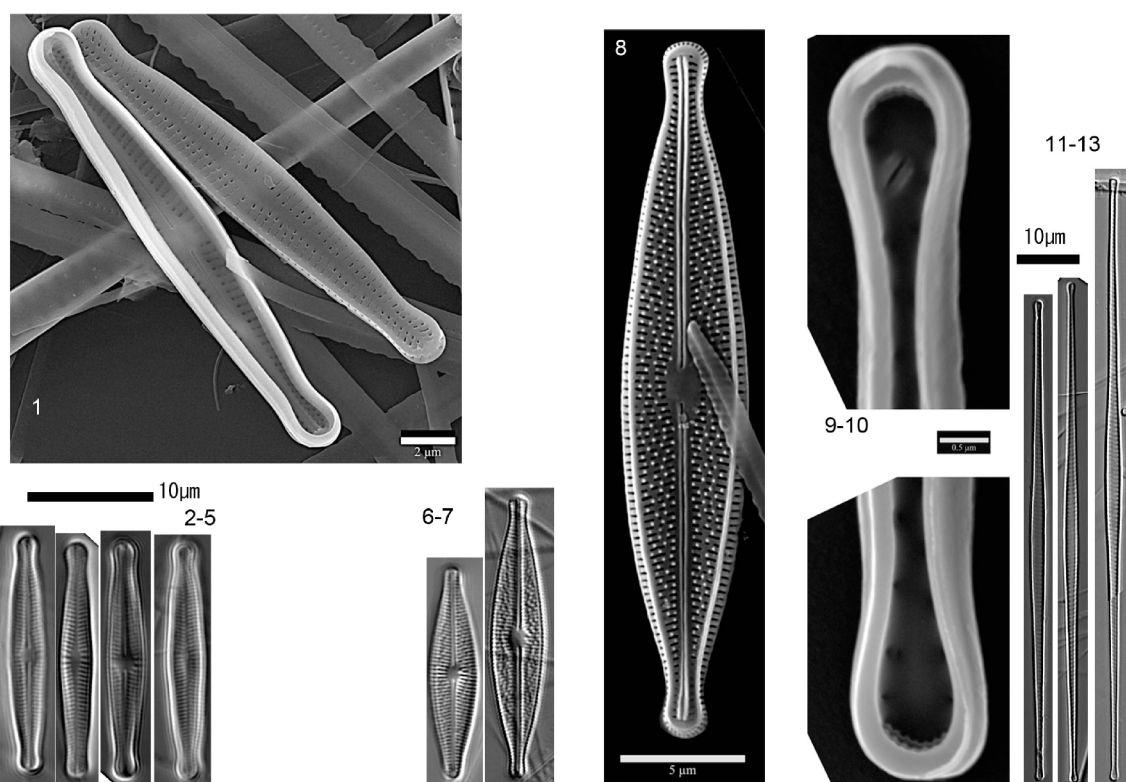
≡ *Microneis gracillima* F.Meister, Kiesel. Schw. 97. *f.* 12. 1912.

(Figs 1-5)

Brachysira neoexilis Lange-Bert. in Lange-Bert. et G.Moser, Bibl. Diat. **29**: 51. *f.* 5:1-35, 6:1-6, 17:7-11, 32:27-30, 46: 19-27. 1994.

(Figs 6-8)

Nos. 033



Nos. 034

River Chitose outflow of Lake Shikotsu, Hokkaido Pref., Japan.

[42°46'15" N, 141°24'23" E]

Date: 2/iii/2009.

Coll. A. Tuji (duplicate of TNS-AL- 57112m in TNS).

Gomphoneis pseudookunoi Tuji, Bull. Natn. Sci. Mus. Tokyo ser. B. **31**: 97. *pl. 15. f. 1–15. pl. 16. f. 1–5. pl. 17. f. 1–5.* 2005.

(Figs 1-6)

Holotype: Slide TNS-AL-TW- 6274sc in TNS.

Type material (Isotype): TNS-AL-TW- 6274m in TNS collected from northern part of Minae, L. Shikotsu by T. Watanabe on 24th June, 1990.

This material is not an isotype, but comes from the type locality (Lake Shikotsu).

Achnanthidium pusillum (Grunow in Cleve & Grunow) Czarnecki in Czarnecki & Edlund, Diat. Res. **10**: 208. 1995.

≡ *Achnanthes pusilla* Grunow in Van Heurck, Synops. Diat. Belg. *pl. 27. f. 33, 34.* 1880.

(Figs 7-12)

Achanthidium minutissimum var. ?

(Figs 13-15)

Gomphonema minutum (C.Agardh) C.Agardh, Consp. Criticus Diatom. **3**: 34. 1830.

≡ *Licmohora minuta* C.Agardh, Flora **2**: 629. 1827.

≡ *Gomphoneis heterominuta* Mayama & A.Kawashima in Mayama et al., Diat. **18**: 89. 2002. nom. nud.

(Figs 16-19)

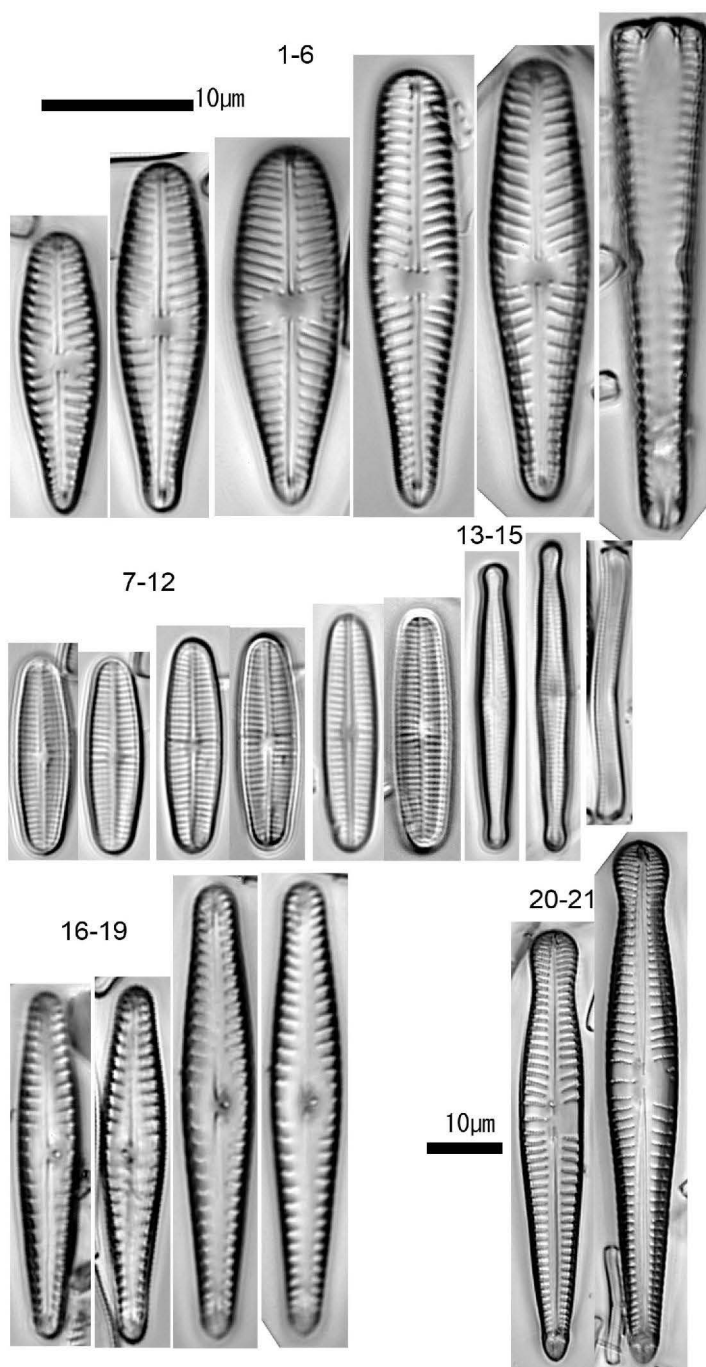
The new name for this taxon, *Gomphoneis heterominuta* Mayama et Kawashima, is nomenclatural invalid because of lacking the replaced synonym (ICBN Vienna code Art. 33.4), and there is not another combination for this taxon to genus *Gomphoneis*.

Nos. 034

(also see Catalogue of Diatom Names, California Academy of Sciences, On-line Version. Compiled by Elisabeth Fourtanier & J. Patrick Kociolek. Available online at <http://www.calacademy.org/research/diatoms/names/index.asp>)

Gomphonema* cf. *nipponicum

(Figs 20-21)



Nos. 035

River Kushiro, Hokkaido Pref., Japan.

[43°33'32.5" N, 144°20'22.8" E]

EC: 372, pH: 8.0, WT: 2.2.

Date: 5/iii/2009.

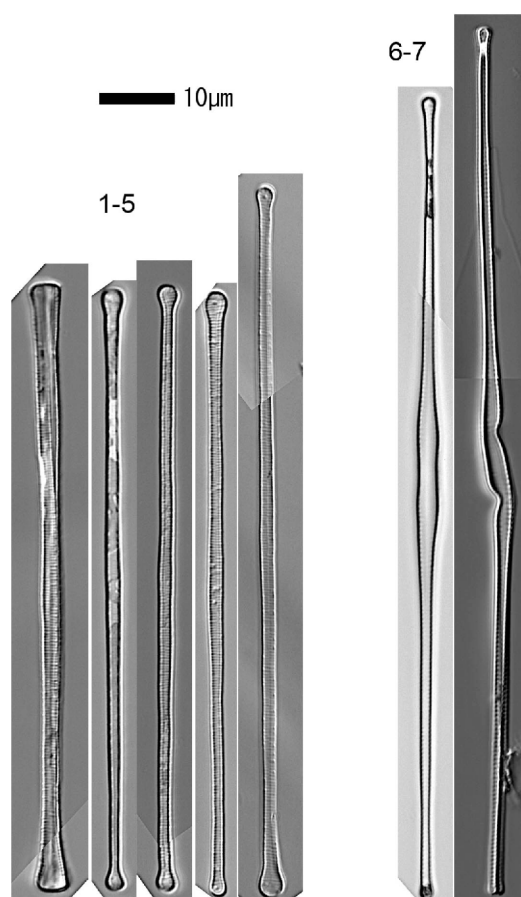
Coll. A. Tuji (duplicate of TNS-AL- 57126m in TNS).

Asterionella formosa Hassall

(Figs 1-5)

Fragilaria crotonensis Kitton

(Figs 6-7)



Nos. 036

Lake Kusyaro, Hokkaido Pref., Japan. (out flow of a hot spa)

[43°36'01.4" N, 144°20'53.9" E]

EC: 1233, pH: 6.9, WT: 20.9.

Date: 5/iii/2009.

Coll. A. Tuji (duplicate of TNS-AL- 57127m in TNS).

Navicula confervacea fo. *nipponica* Skvortsov

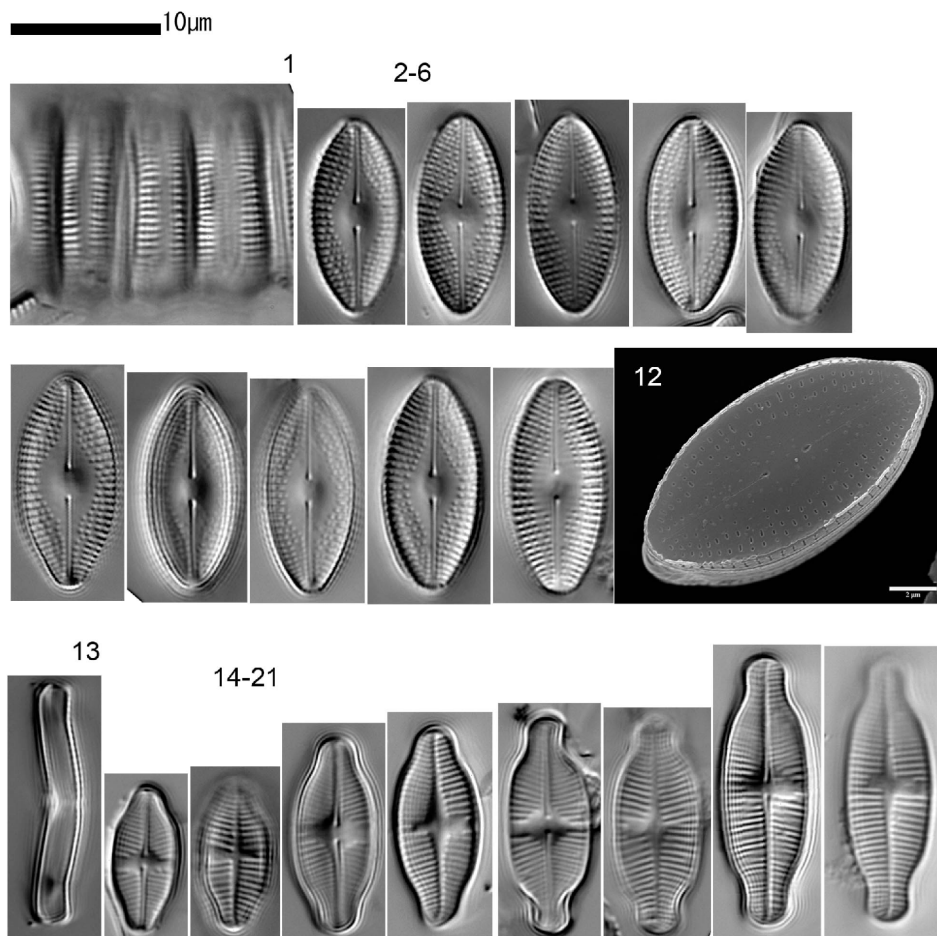
(Figs 1-12)

Achnanthidium exile (Kütz.) Heib., Consp. Diat. Dan. 119. 1863.

≡ *Stauroneis exilis* Kütz., Bacill. 105. pl. 30, f. 21. 1844.

≡ *Achnanthidium exiguum* (Grunow) Czarn., Proc. Int. Diat. Symp. 11: 157. 1994.

(Figs 13-21)



Nos. 037

Kawayu hot spa, Hokkaido Pref., Japan.

[35°12'14.9" N, 139°01'44.4" E]

EC: over 4mS, pH: 2.5, WT: 17.3.

Date: 6/iii/2009.

Coll. A. Tuji (duplicate of TNS-AL- 57150m in TNS).

Pinnularia osoresanensis (Negoro) Fukush., Yoshit. et Ts.Kobay. Diat. **18**: 8. 2002

≡ *Pinnularia acoricola* var. *osoresanensis* Negoro, Sci. Rep. Tokyo Bunrika Daigaku.
sect. B. **101**: 316. *f.* 3c. 1944.

(Figs 1-8)

Synonym: *Pinnularia acoricola* var. *acoricola* sensu Negoro, Sci. Rep. Tokyo Bunrika
Daigaku. sect. B. **101**: 314. 1944.

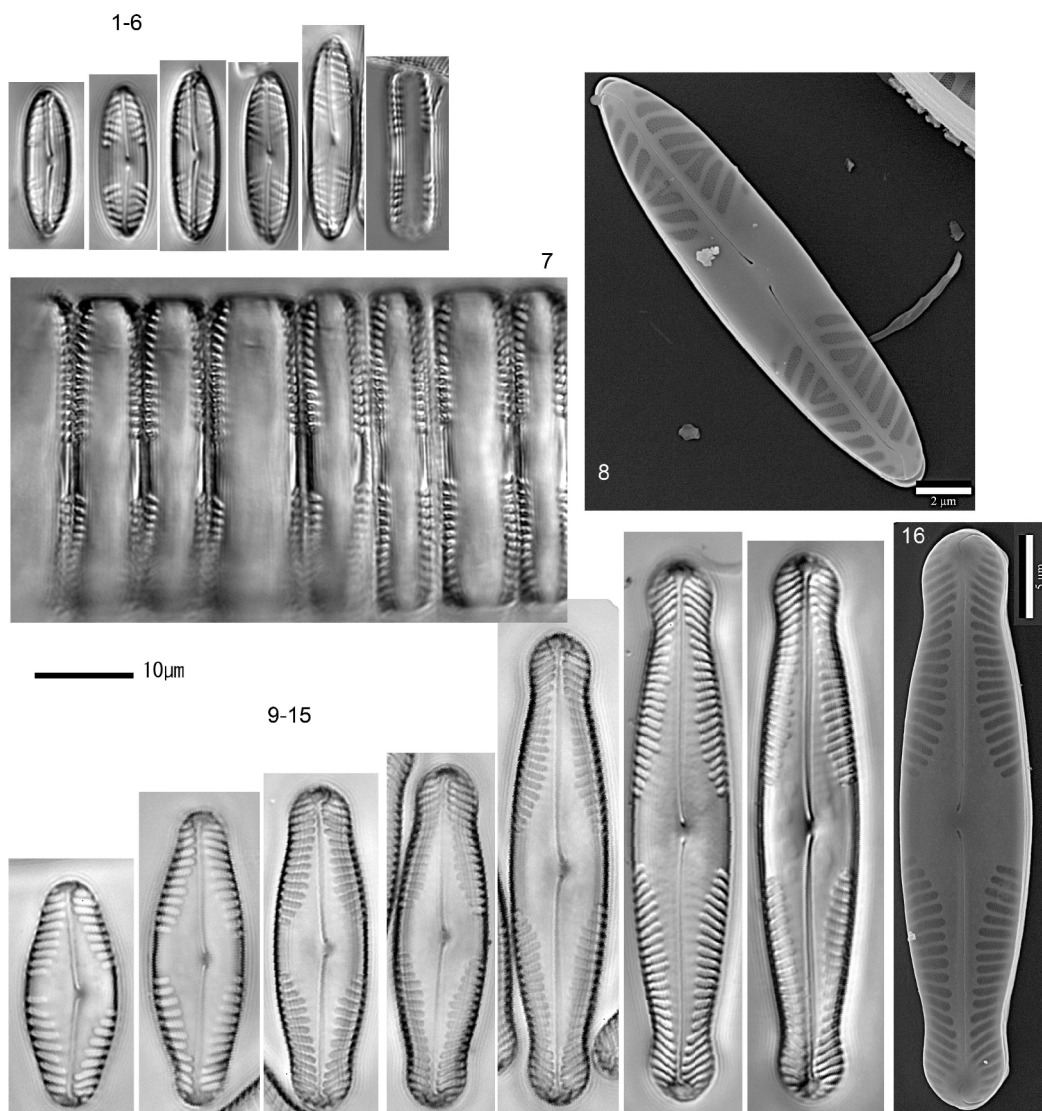
Type locality: Zigokudani, Osoresan, Aomori Pref., Japan.

Ecology: acidobiontic, common in Japanese acid (pH: 1-3.5) hot spa.

Pinnularia acidojaponica M.Idei et H.Kobayasi in M.Idei & Mayama, Lange-B.
–Festschr. 266. *f.* 1-29. 2001.

(Figs 9-16)

Nos. 037



Nos. 038

River Miyara, Okinawa Pref., Japan.

[24°22'34.1" N, 124°12'11.6" E]

Date: 11/iii/2005.

Coll. A. Tuji (duplicate of TNS-AL- 55548m in TNS).

Nitzschia clausii Hantzsch, Hedwigia 2: 40. *pl.* 4, *f.* 7. 1860.

(Figs 1-8)

Syntype: Hantzsch in Rabenhorst, Alg. Sachs. Dec. 95/96: no. 944. 1860. (exsiccata)

Collectors: [?] Claus and Carl August Hantzsch.

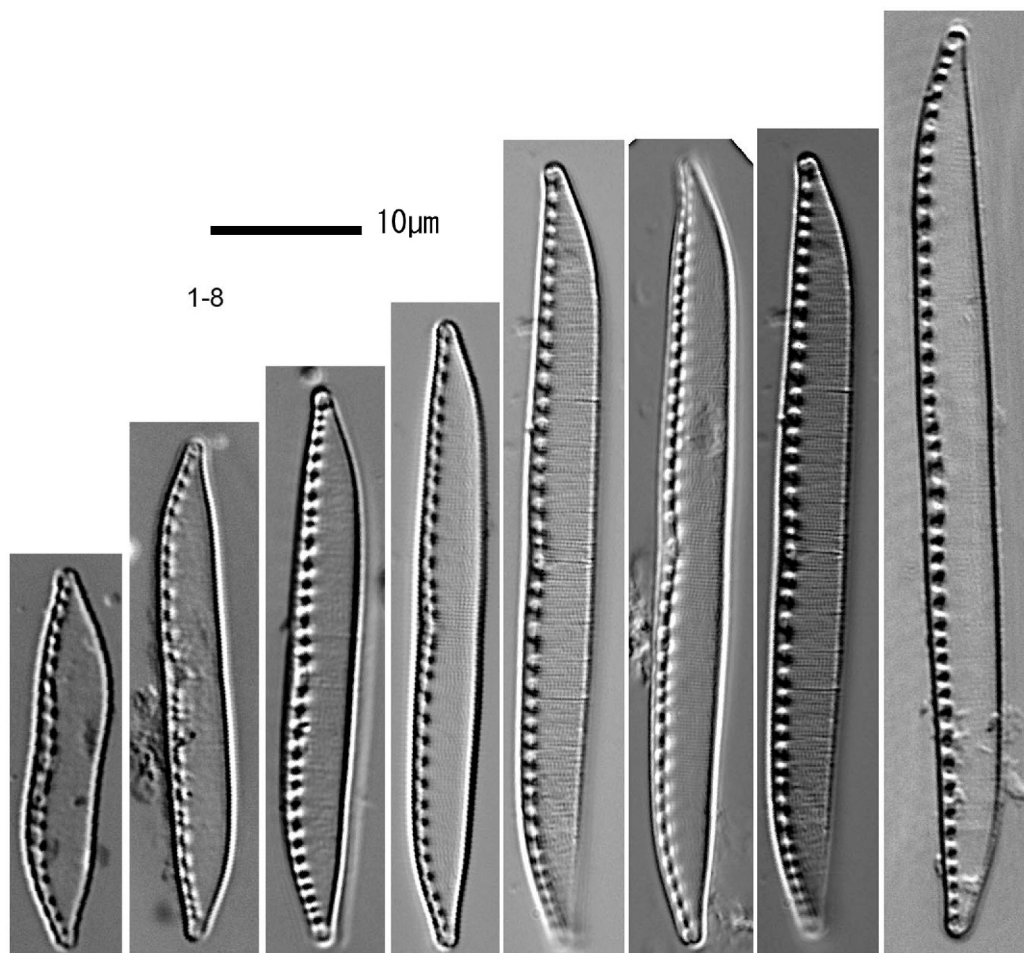
Type locality: Germany (Dresden) Tharandt, "Im September 1859 in einem Bache bei Tharandt (Sachsen)."

Sayre (1969: Mem. New York Bot. Gar. 19: 1-174) noted the publication date of exsiccata, Alg. Sachs. Dec. 95/96, as March 1860. I have not checked the publication date of Hedwigia volume 2, and have not judged which has priority for this taxon. However, there is the information of figure number of Hantzsch (1860) in the exsiccata label no. 944, and both should use the same material.

(Information of Alg. Sachs. Dec. label was referred using the home page of

Farlow Diatom Collection: <http://www.huh.harvard.edu/diatom/pubcollfset.htm>)

Nos. 038



Nos. 039

River Susawa, Yamagata Pref., Japan.

[35°12'14.9" N, 139°01'44.4" E]

EC: over 20mS, pH: 2.0, WT: 6.2.

Date: 12/xii/1993.

Coll. T.Watanabe (duplicate of TNS-AL- TW-10808m in TNS).

Nitzschia* cf. *amplectens

(Figs 5-12)

Watanabe & Asai (2004) reported two *Nitzschia* species, *Nitzschia paleaeformis* Hust. and *Nitzschia amplectens* Hust., from acid rivers. This material is one of the materials, Watanabe & Asai examined. Since the original habitats of both taxa differ our habitats, we need more research to identify these taxa.

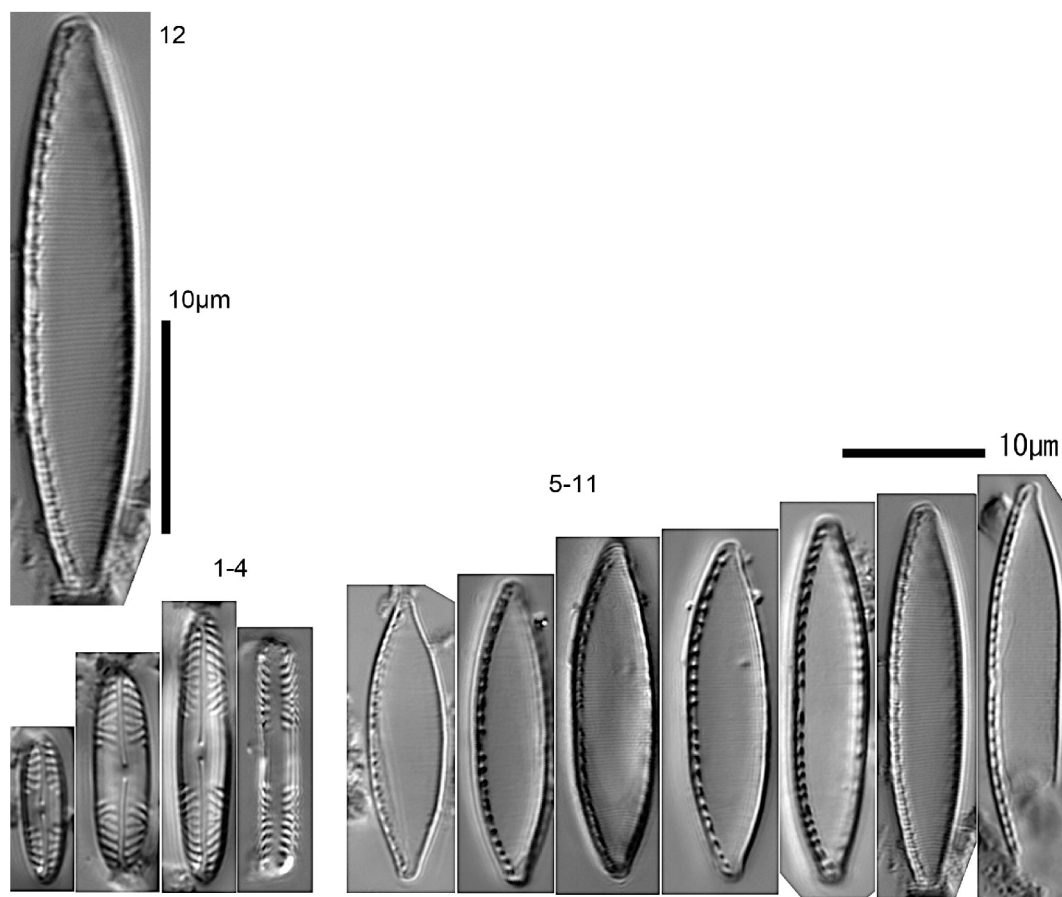
Ecology: acidbiontic. *Nitzschia* taxa are normally found in alkaline waters, and acidbiontic species are very rare.

Reference: Watanabe, T. & Asai, K. 2004. *Nitzschia paleaeformis* and *Nitzschia amplectens* occureing in strongly acid water of pH range from 1.0 to 3.9 in Japan. *Diatom* 20:153-158.

***Pinnularia osoresanensis* (Negoro) Fukush.**

(Figs 1-4)

Nos. 039



Nos. 040

River Goten, Aichi Pref., Japan.

[35°04'47.7" N, 137°38'22.9" E]

pH: 6.7, WT: 6.2.

Date: 27/ii/2004.

Coll. A. Tuji (duplicate of TNS-AL- 55906m in TNS).

Achnanthidium convergence (H.Kobayasi) H.Kobayasi, Nova Hedw. **65**: 159. 1997.

≡ *Achnanthes japonica* H.Kobayasi in H.Kobayasi et al. Diat. **2**: 84. f. 1-17, 37-43, 51-54. 1986.

(Figs 1-15)

Ecology: saproxenous, pH-circumneutral.

Reference: Kobayasi, H. 1997. Comparative studies among four linear-lanceolate *Achnanthidium* species (Bacillariophyceae) with curved terminal raphe endings. *Nova Hedw.* **65**: 147-163.

