

Examination of Type Material and Typification of Seven Diatoms Described by C. G. Ehrenberg

Akihiro Tuji

Department of Botany, National Museum of Nature and Science, 4-1-1, Amakubo, Tsukuba 305-0005, Japan
(e-mail: tuji@kahaku.go.jp)

Abstract Seven diatoms (*Cocconeis lineata*, *Cocconeis placentula*, *Gallionella sculpta*, *Gomphonema subtile*, *Gomphonema vibrio*, *Navicula rhomboides*, *Stephanodiscus sinensis*) described by Christian Gottfried Ehrenberg were examined using the materials in the Ehrenberg Collection in BHUPM (Museum für Naturkunde in Berlin). Lectotypes and epitypes are designated for these taxa.

Key words: *Ehrenberg*, *diatoms*, *Cocconeis lineata*, *Cocconeis placentula*, *epitype*, *Gallionella sculpta*, *Gomphonema subtile*, *Gomphonema vibrio*, *lectotype*, *Navicula rhomboids*, *Stephanodiscus sinensis*.

Introduction

Christian G. Ehrenberg was an early and important diatomist. Recent diatomists use many of the diatom names described by him. To understand Japanese diatom endemism, I examined historical diatom collections in European herbariums. In this paper, I discuss the seven diatom taxa described by Ehrenberg.

Materials and Methods

I examined material from Ehrenberg's Collection (EC) in the BHUPM (Museum für Naturkunde in Berlin; Lazarus and Jahn, 1998), which consisted of the following:

1. Ehrenberg's original raw material (EC sample),
2. Ehrenberg's original mica preparations (EC mica), and
3. Ehrenberg's original drawings (EC drawing).

I also referred to the geographic index by Clara Ehrenberg (ECGI) housed in the BHUPM, when searching the Ehrenberg collection. Several subsamples from Ehrenberg's original material were incinerated or oxidized with H₂O₂ and mounted onto glass slides and embedded in Pleurax or Zrax.

Results and Discussion

1. *Stephanodiscus sinensis* Ehrenb. Mikrogeol. 144. pl. 34/7. f. 7. 1854. (Fig. 1, a–e)

Type locality: Blumencultur-Erde von Canton, China.

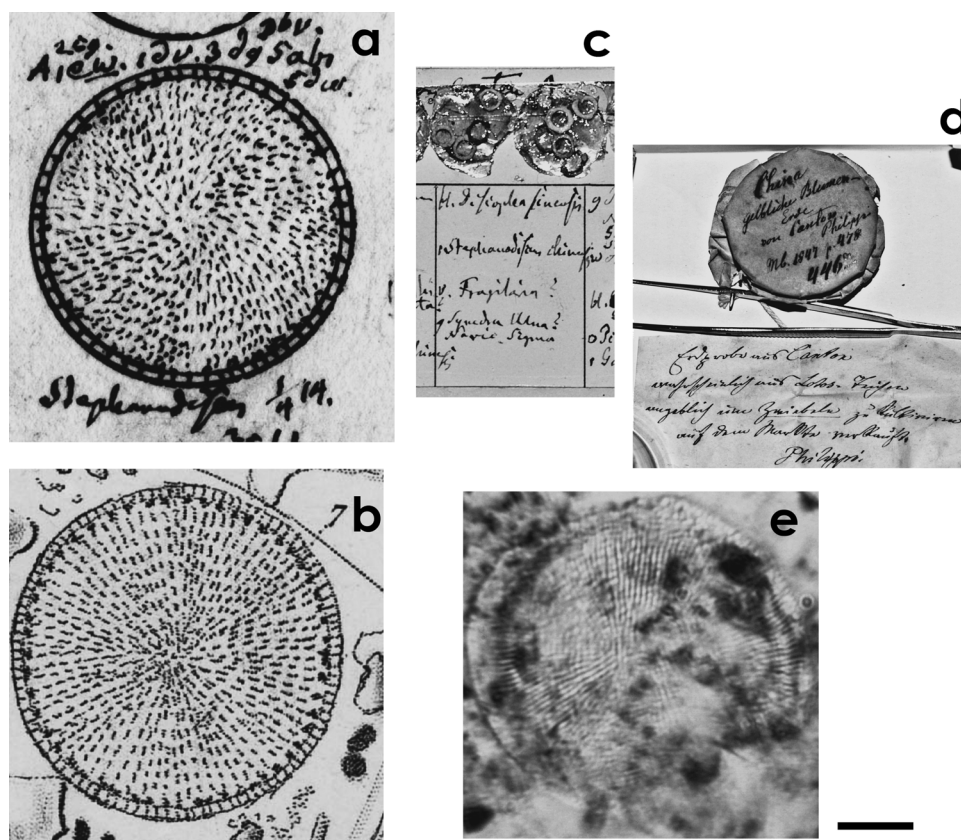
Lectotype (here designated): An illustration in EC drawing number 1996 (Fig. 1, a).

Epitype (here designated): An individual in EC Mica 070203-4g (Fig. 1, e).

Iso-epitype: EC sample 446a and 446b (292. Gelbliche Blumen-Erde von Canton A) (Fig. 1, d)

The drawing of *Stephanodiscus sinensis* Ehrenb. is found in EC drawing 1996 (Fig. 1, a). I designate this drawing as the lectotype for this taxon. The mica number for this taxon is written in this drawing, and also agrees with the description in ECGI. This taxonomic name is written on the label of EC mica 070203-4g (Fig. 1, c), and a suitable individual is found on this mica. I designate this individual as the epitype for the support of the lectotype.

Two EC samples for this taxon were found in the Ehrenberg Collection in the BHUPM (446a and 446b). These materials include so many taxa that I have not found suitable individuals for this taxon. Further study is needed to taxonomically identify this taxon.



Figs 1. a–e. *Stephanodiscus sinensis* Ehrenb. a. EC drawing 1996, b. Ehrenberg (1854). Mikrogeol. pl. 34/7. f. 7., c. the label of in EC Mica 070203-4g. d. the label of EC sample 446a. e. An individual in EC Mica 070203-4g, epitype, bar = 10 μ m.

2. *Gallionella sculpta* Ehrenb. Ber. K. Akad. Wiss. Berlin **1845**: 61, 77. 1845; Mikrogeol. pl. 33/12. f. 20. 1854. (Fig. 2, a–c)

Type locality: Oregon, fossil.

Lectotype (here designated): An illustration in EC drawing 2288 (Fig. 2, a).

Epitype (here designated): An individual in EC mica 240909-1o (Fig. 2, c).

Iso-epitype: EC sample 1418.

The drawing of *Gallionella sculpta* Ehrenb. is found in EC drawing 2288 (Fig. 2, a). I designate this drawing as the lectotype for this taxon. The mica number is described in ECGI; this taxonomic name is written on the label of EC mica 240909-1o, and a suitable individual is found on this EC mica. I designate this individual as the epitype supporting the lectotype.

3. *Navicula rhomboides* Ehrenb. Abh. Königl. Akad. Wiss. Berlin **1841**: 314, 419. f. 3-1-15. 1843. (Fig. 2, d–f: EC Mica 200312-4r)

The type material of this taxon was examined by Lange-Bertalot and Jahn (2000). I present

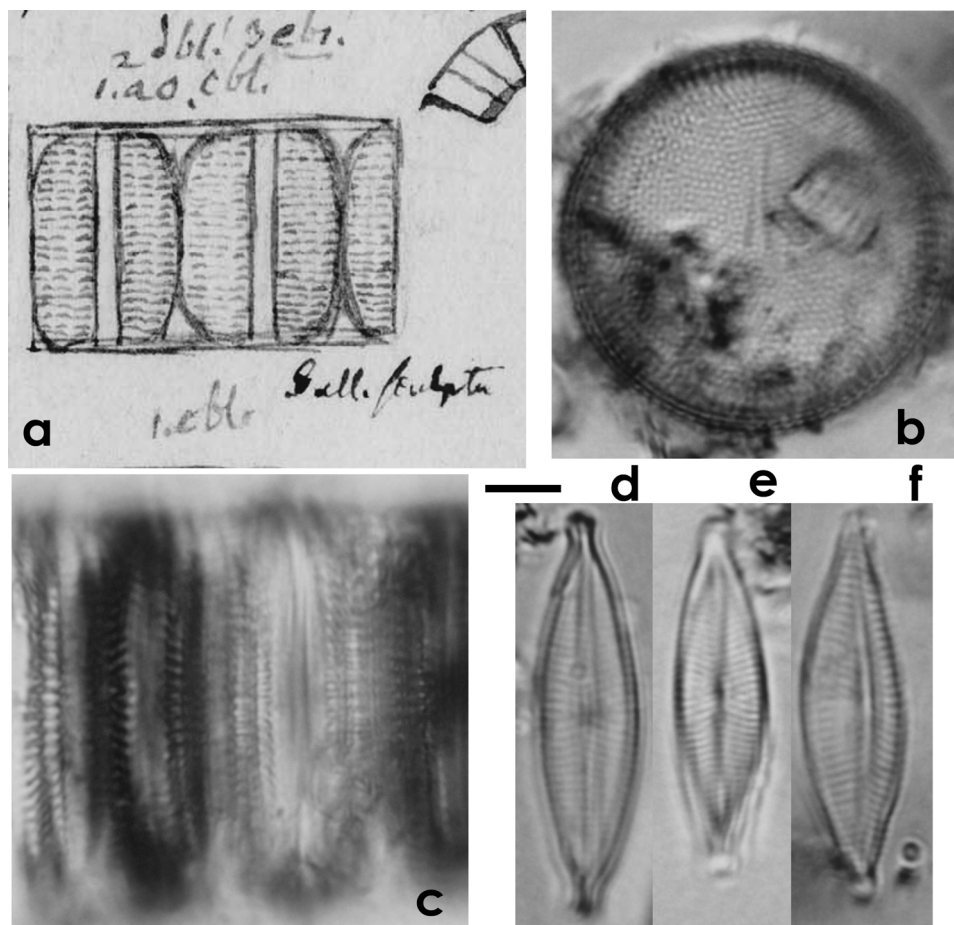


Fig. 2. a–c, *Gallionella sculpta* Ehrenb. a. An illustration in EC drawing 2288 (lectotype). b, c. individuals found in EC Mica 240909-1o, bar=10 μ m. c. epitype.

Fig. 2. d–f, *Navicula rhomboides* Ehrenb. Individuals found on EC Mica 200312-4r, bar=10 μ m.

additional images for this taxon. This taxon is very close to *Navicula rhynchocephala* Kütz., and the two may be synonymous.

4. *Gomphonema subtile* Ehrenb. Ber. K. Akad. Wiss. Berlin **1841**: 144. 1841; Mikrogeol. *pl.* 17/2. f. 43. 1854. (Fig. 3, a–c)

Type locality: New York. Bridgewater, Mass.

Lectotype (here designated): An illustration in EC drawing 2253 (Fig. 3, a).

Epitype (here designated): An individual in EC mica 260301-1v (Fig. 3, b).

The drawing of *Gomphonema subtile* Ehrenb. is found in EC drawing 2253 (Fig. 3, a). I designate this drawing as the lectotype for this taxon. The mica number is described in ECGI, and this taxonomic name is written on the label of EC mica 260301-1v. The individual on this mica agrees completely with the drawing, and I designate this individual as the epitype supporting the lectotype.

5. *Gomphonema vibrio* Ehrenb. Abh. Königl. Akad. Wiss. Berlin **1841**: 416. f. 2-1-40. 1843.

Type: Mahé, Seychelles, Van Heurck, Types Synopsis No. 213 (BORD) (typ. cons.). (Fig. 3, c, d)

I found a suitable EC drawing (Fig. 3, c) and individual on EC mica (Fig. 3, d). However, the type of this taxon has been conserved in the International Code of Botanical Nomenclature (ICBN: McNeill et al., 2007) because it falls outside the range of variation in this taxon as currently understood (Jahn and Lange-Bertalot, 1995). Because of the conservation of type, these materials are not type material.

6. *Cocconeis placentula* Ehrenb. Infus. vollk. org. 194. **1838**; Mikrogeol. *pl.* 9-I. f. 46. 1854. (Fig. 3, e, f)

Type locality: Bei Berlin.

Lectotype (here designated): An illustration in *Mikrogeologie* (Ehrenberg 1854) (Pl. 9-I, Fig. 46a) (Fig. 3, g).

Cocconeis placentula Ehrenb. was described by Ehrenberg (1838) without figures from near Berlin. Figures of this taxon were published in Ehrenberg (1843) (Fig. 3, g, h), but not from Berlin. The figure in Ehrenberg (1854) comes from “Kieselguhr von Ceysat, Puy de Dome” and seems to be the same locality as Ehrenberg (1838). I designate this figure as the lectotype for this taxon.

7. *Cocconeis lineata* Ehrenb. Abh. Königl. Akad. Wiss. Berlin **1841**: 318, 369. 1843; Mikrogeol. *pl.* 6. f. 40. *pl.* 9-I. f. 47. 1854.

Type locality: Atotonilco el Grande, Mexico.

Lectotype (here designated): An illustration in *Mikrogeologie* (Ehrenberg 1854) (Pl. 9-I, Fig. 47) (Fig. 3, f).

Cocconeis lineata Ehrenb. was described in Ehrenberg (1843) from Atotonilco el Grande, Mexico, without a figure. The figures for this taxon were published in Ehrenberg (1854) from “Bergmehl von Santaflora” (Ehrenberg 1854: Pl. 6, Fig. 40) and “Kieselguhr von Ceysat, Puy de Dome” (Ehrenberg 1854: Pl. 9-I, Fig. 47). Both localities do not agree with the first description

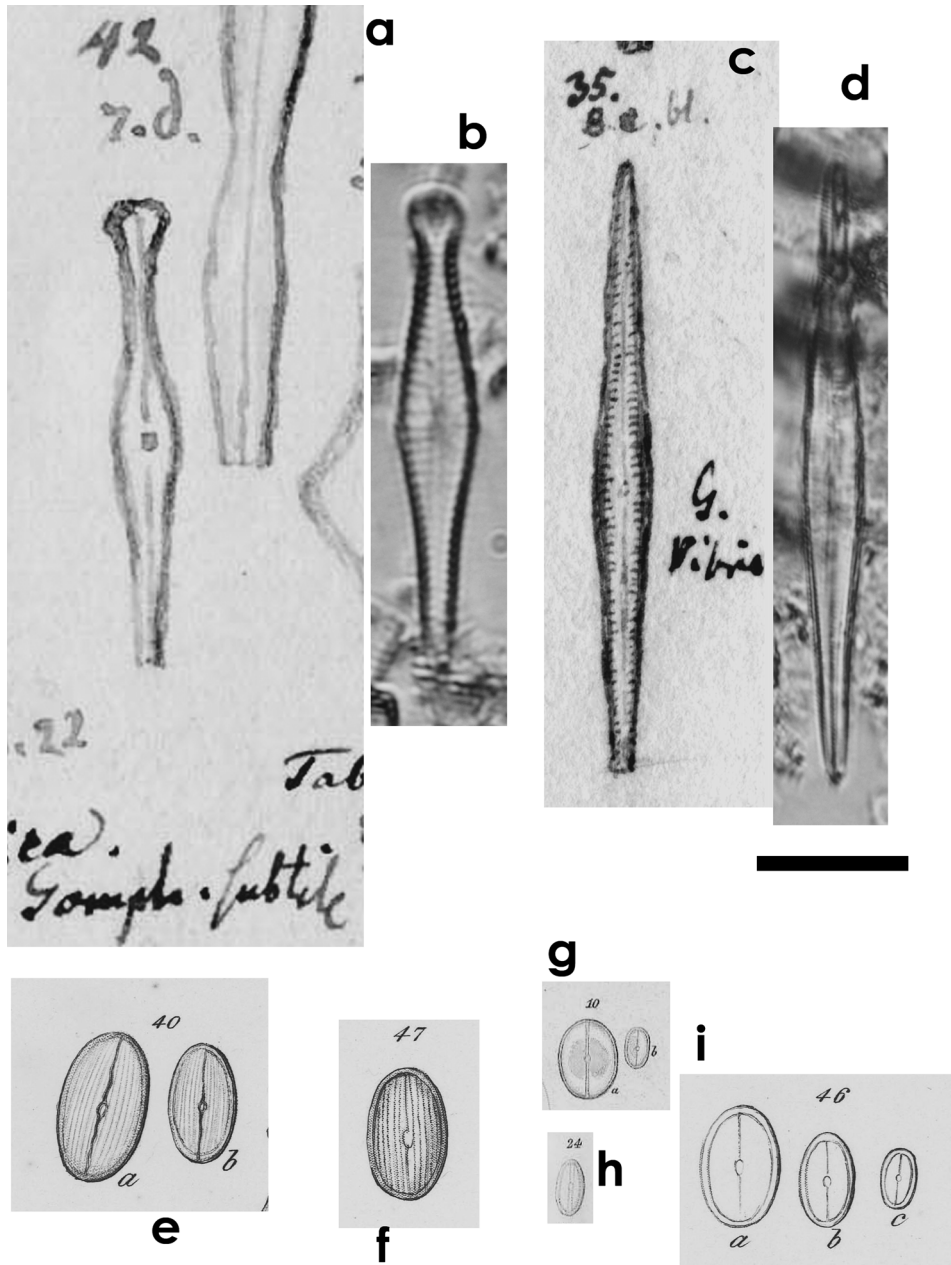


Fig. 3. a, b. *Gomphonema subtile* Ehrenb. a. An illustration in EC drawing 2253 (lectotype). b. An individual in EC Mica 260301-1v (epitype).
 Fig. 3. c, d. *Gomphonema Vibrio* Ehrenb. c. A drawing in EC drawing 2053. d. an individual on EC mica 180516-5bl
 Fig. 3. e, f. *Cocconeis lineata* Ehrenb. e. Ehrenberg (1854). Mikrogeol. pl. 6. f. 40. f. Ehrenberg (1854). Mikrogeol. pl. 6. f. 40. pl. 9-I. f. 47.
 Fig. 3. g-i. *Cocconeis placentula* Ehrenb. g, h. Ehrenberg (1843). i. Ehrenberg (1854). Mikrogeol. pl. 6. f. 40. pl. 9-I. f. 46.

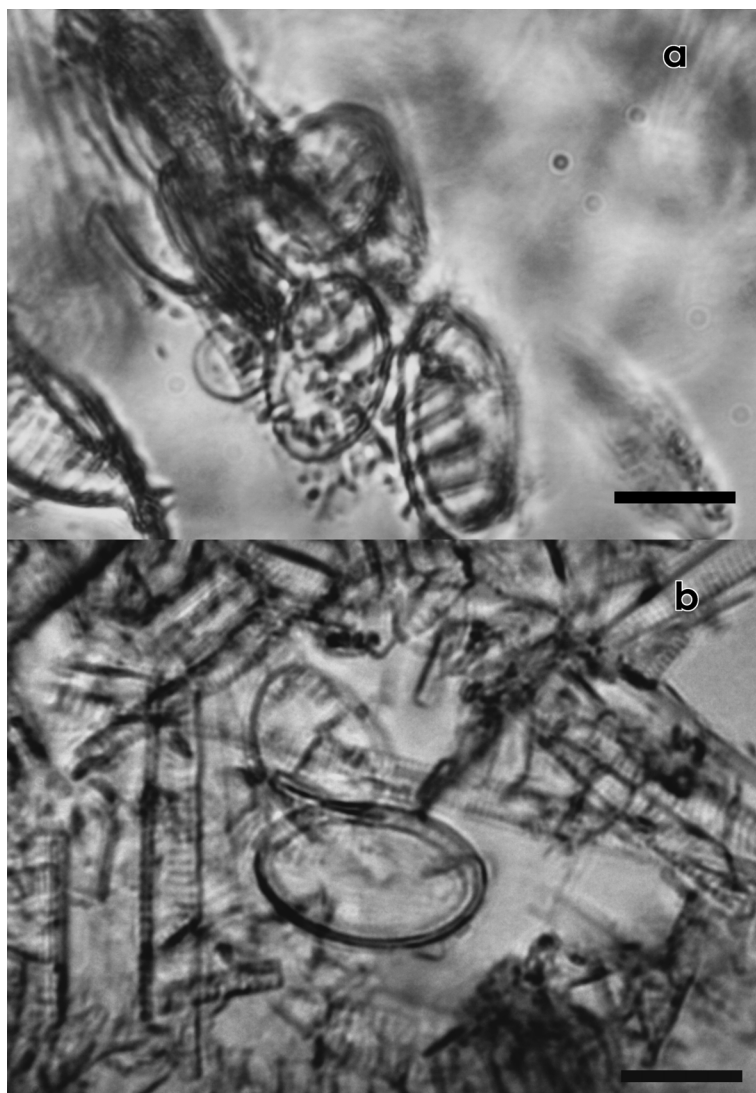


Fig. 4. Individuals found on EC mica (330805-4bl). *Cocconeis lineata* Ehrenb. and/or *Cocconeis placentula* Ehrenb., bar=10 μ m.

of this taxon. However, illustration is an important part of identification, and I designate a figure from “Kieselguhr von Ceysat, Puy de Dome” (Ehrenberg 1854: Pl. 9-I, Fig. 47) as the lectotype for this taxon.

The EC mica (330805-4bl: Fig. 4) and EC sample (2225: Figs. 5, 6), which were indicated as the original material of *Mikrogeologie* plate 9-I by ECGI, were found for two taxa, *Cocconeis placentula* and *C. lineata* in the Ehrenberg Collection. No information is on the label of the EC mica. The microscopic images on EC mica number 330805-4bl are shown in Figure 4. Though Ehrenberg (1854) suggested the coexistence of both taxa, I cannot divide two morphological types in *Cocconeis* individuals. Because of the low resolving power on the EC mica and no information on the label, the EC mica does not give enough information to differentiate both taxa.

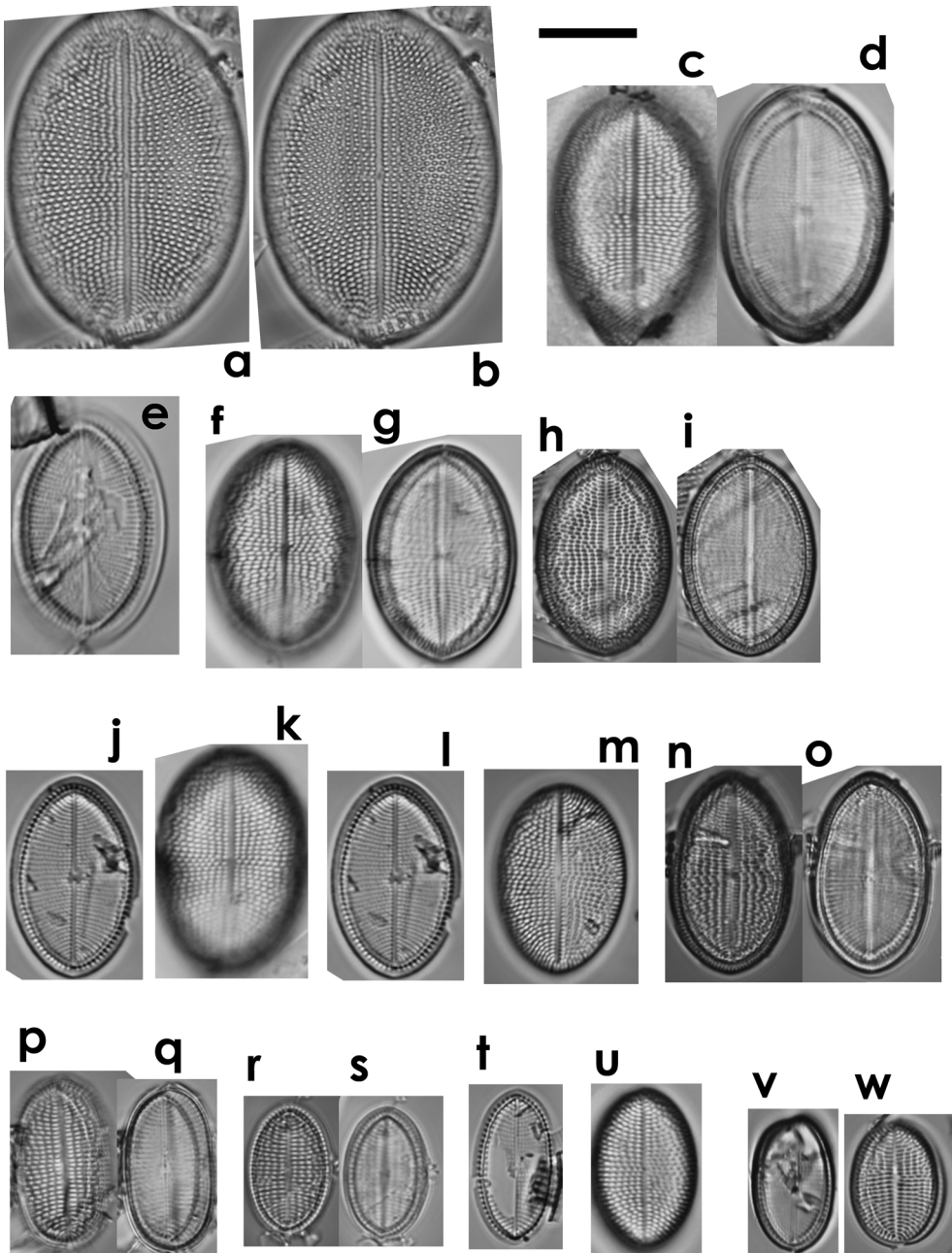


Fig. 5. Individuals found from a slide made from EC sample 2225, bar=10 μm . *Cocconeis lineata* Ehrenb. and/ or *Cocconeis placentula* Ehrenb.

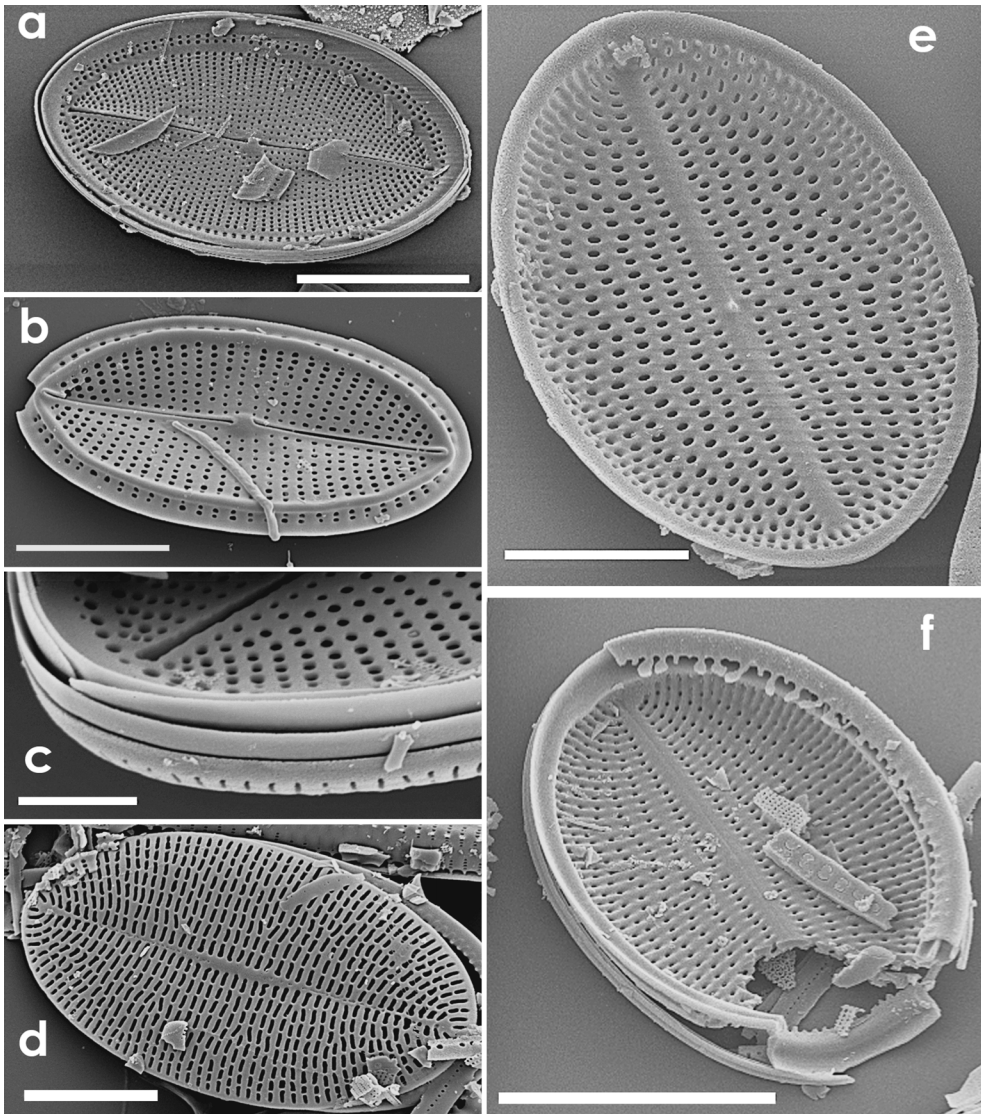


Fig. 6. Individuals found in EC sample 2225, a. bar=10 μm , b. bar=5 μm , c. bar=2 μm , d. bar=5 μm , e. bar=5 μm , f. bar=10 μm . *Cocconeis lineata* Ehrenb. and/or *Cocconeis placentula* Ehrenb.

Since EC sample 2225 is original raw material for the EC mica and figures in Ehrenberg (1854), it is most suitable for distinguishing both taxa. The light microscopy images in EC sample 2225 are shown in Figure 5, and scanning electron microscopy images from the Sample are shown in Figure 6. Although the range in valve size is very large, the morphological variation in Figures 5 and 6 seems to be the variation of one taxon. Ehrenberg may have distinguished the raphid valve and araphid valve as different taxa.

Acknowledgments

I thank Dr. David Lazarus, Museum für Naturkunde in Berlin, for the use of his laboratory facilities and his help in searching Ehrenberg's Collection.

References

- Ehrenberg, C. G., 1838. Die Infusionstierchen als vollkommene Organismen. Ein Blick in das tiefere organische Leben de Natur. Verlag von Leopold Voss, Leipzig. pp. i–xvii, 1–548, pls. 1–64.
- Ehrenberg, C. G., 1843. Verbreitung und Einfluss des mikroskopischen Lebens in Süd-und Nord-Amerika. *Abh. Königl. Preuß. Akad. Wiss. Berlin*, **1841**: 291–445, 4 pls.
- Ehrenberg, C. G., 1854. Mikrogeologie. Das Erden und felsen schaffende Wirken des unsichtbar kleinen selbstständigen Lebens auf der Erde. Texte. Leopold Voss, Leipzig, 374 p, 40 pls.
- Jahn, R. & H. Lange-Bertalot, 1995. Proposal to conserve the name *Gomphonema vibrio* Ehrenb. (*Bacillariophyceae*) with a conserved type. *Taxon*, **44**: 221–222.
- Lange-Bertalot, H. & R. Jahn, 2000. On the identity of *Navicula (Frustulia) rhomboides* and *Frustulia saxonica* (Bacillariophyceae). *Sys. Geogr. Plants*, **70**: 255–261.
- Lazarus, D. & R. Jahn, 1998. Using the Ehrenberg collection. *Diatom Res.*, **13**: 273–291.
- McNeill, J., F. R. Barrie, H. M. Burdet, V. Demoulin, D. Hawksworth, K. Marhold, D. H. Nicolson, J. Prado, P. C. Silva, J. E. Skog, J. H. Wiersma & N. J. Turland (eds.), 2007. International Code of Botanical Nomenclature (Vienna Code) adopted by the Seventeenth International Botanical Congress Vienna, Austria, July 2005. Gantner, Ruggell. *Regnum Vegetabile*: 146, XVIII: 568 pp.