

# Diatom Flora of the Mekong Water System, Cambodia

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## Abstract

The present contribution is based on collections made by the members of the Society for Investigation of the Mekong Water System of Kochi University from 27 December, 1969 till 20 January, 1970.

From the materials investigated this time, 77 taxa of diatom were found in Tonle Sap Lake (The Great Lake) and the Tonle Sap River, and 36 taxa of diatom were found in the Mekong River. 14 taxa of diatom were found in both regions. Main species of the Mekong Water System, Cambodia, were *Melosira granulata*, *Melosira granulata* f. *curvata*, *Synedra ulna* var. *oxyrhynchus*, *Gyrosigma kützingii* etc..

## Introduction

The present contribution is based on collections by the first expedition of the Society for Investigation of the Mekong Water System, Kochi University. The Materials collected by Ohno, M. of the members of first expedition. The survey carried out in the Mekong River, Tonle Sap River and Tonle Sap Lake (The Great Lake) of Cambodia from 27 December 1969 till 20 January 1970, using a Cambodia Gaverment's ship.

In the center of Cambodia situated in Southeast Asia, lies the great lake called Tonle Sap, and the northeastern part flows the Mekong River. This river rises from the Tibetan Plateau. The total length of the river is about 4200 km, and in this country covers about 500 km. Out of Tonle Sap Lake (The Great Lake) the Tonle Sap River runs, and joins the main stream of the Mekong River, and from there the Tonle Vassac River flows. The meeting place is called "Quatre Bras", and the capital Phnom Penh develops there.

The shap of Tonle Sap Lake (The Great Lake) is like a gourd with long axis about 150 km and short one maximum about 32 km in the dry season. The deepest areas in the dry season was about 4.5 m, and there was little difference in all the parts of the lake. In the wet season, water comes up from "Quatre Bras" and through the Tonle Sap River and pours into Tonle Sap Lake, and inundates from it. The area of Tonle Sap Lake increases three times as wide as that of the dry season. As for the phycological study in Cambodia, there is reports of Blache, J. (1950, '51) on the phytoplankton of Tonle Sap Lake and the Mekong River. Mizuno, T. and Mori, S. (1969) describe the report of preliminary hydrobiological research in Cambodia, but few study has been made except those reports.

This investigation was made on the diatom of the materials collected. The other algae have been investigated by Prof. Dr. Hirano, M., Kyoto University.

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### Diatom found in Mekong Water System

The following is a list of the places where we collected the materials: the Mekong River (from Kompong Cham to the vicinity of Neaklung), Tonle Sap River, "Petit Lac" in south-eastern of Tonle Sap Lake, "Grand Lac" in northwestern of Tonle Sap Lake and "neck part" of Tonle Sap Lake. The distribution map of Station is shown in Fig. (1). All of the samples were collected from the water surface by hauling plankton-net, and so, many species found in this time, are seemed to be planktonic algae.

From the materials investigated this time, 77 taxa of diatom were found in Tonle Sap Lake

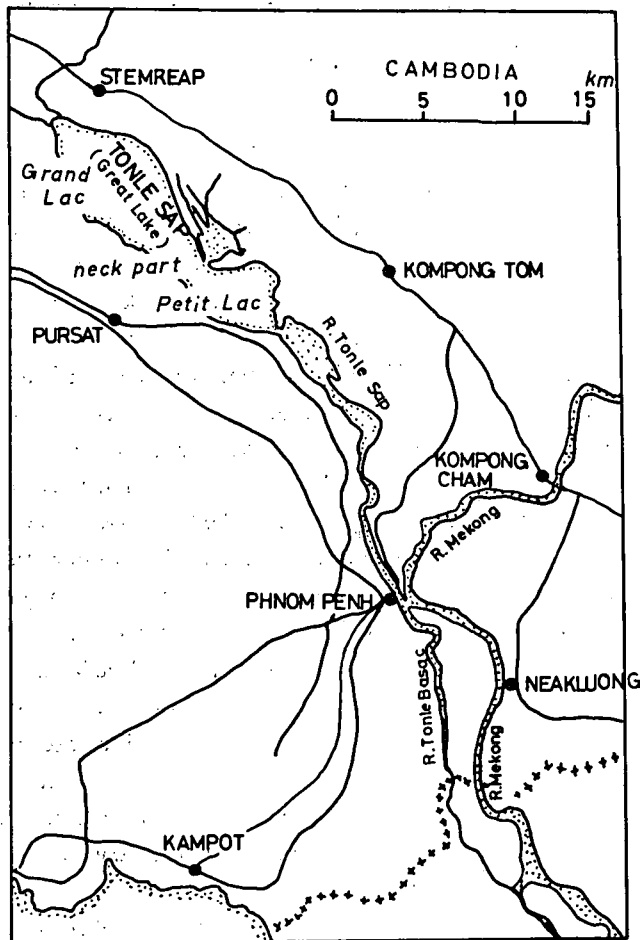


Fig. 1. The map showing observational station of The Mekong Water System, Cambodia.

and Tonle Sap River, and 36 taxa of diatom were found in the Mekong River. 14 taxa of diatom were found in both regions. Main species of the Tonle Sap Lake were *Melosira granulata*, *Melosira granulata* f. *curvata*, *Synedra ulna* var. *oxyrhynchus*, *Surirella* spp. Main species of neck part were *Melosira granulata*, *Melosira granulata* f. *curvata*, *Cyclotella comta*, *Synedra*, *Gomphonema*. Main species of Grand Lac were *Melosira granulata*, *Melosira granulata* f. *curvata*, *Gyrosigma kützingii*, *Synedra ulna* var. *oxyrhynchus*, *Nitzschia palea*, *Surirella tenera* var. *nervosa*, *Cyclotella stelligera*. Main species of the Mekong were *Melosira granulata*, *Melosira granulata* f. *curvata*, *Melosira pensacolata*, *Cyclotella stelligera*, *Synedra ulna*, *Gomphonema globiferum*, *Bacillaria paradoxa*, *Nitzschia palea*.

List of diatom from Mekong Water System,  
Cambodia

*Hab*: habitat    *Loc*: locality

+++ : Found most common in the samples

++ : Found common in the samples

+ : Found rare in the samples

*Achnanthes delicatula* (Kütz.) Grun. (pl. 3  
fig. 1, r)

Hustedt, Kieselalg. 2: 839 f. 386

L. 25  $\mu$ , W. 10  $\mu$ , ST. 13 in 10  $\mu$

*Loc.* Tonle Sap R. +

*Hab.* Found common in brackish water,  
often found in fresh water

———— *lanceolata* (Bréb.) Grun. (pl. 2  
fig. h, l)

Hustedt, Kieselalg. 2: 408 f. 863 a~d

*Loc.* Tonle Sap R. ++ Mekong R.  
+

*Hab.* Found common in fresh water of  
all kinds, a dominant form of  
spring and water course

———— var. *rostrata* (Oestrup)

Hustedt (pl. 2 fig. c)

Hustedt, Kieselalg. 2: 410 f. 863 i~m

L. 20  $\mu$ , W. 10  $\mu$ , ST. 9 in 10  $\mu$

*Loc.* Tonle Sap R. +

———— *minutissima* Kütz. (pl. 2 fig. i)

Hustedt, Kieselalg. 2: 376 f. 820 a~c

*Loc.* Mekong R. +

*Hab.* Found common in fresh water of  
all kinds, often found dominant  
in running water

———— *subhudsonis* Hust. ? (pl. 12 fig. i)

Hustedt, in Hedwigia 63: 144 pl. 1  
f. 10~12, 1922

*Loc.* Tonle Sap R. +

*Hab.* Previously known to exist in  
running water and spring of  
Africa and Asia

*Amphora ovalis* Kütz. var. *pediculus*. Kütz.  
(pl. 3 fig. j)

Hustedt, Bacill. 343 f. 629, 1930

L. 13  $\mu$ , W. 3  $\mu$ , ST. 18 in 10  $\mu$

*Loc.* Mekong R. +

*Anomoeoneis exilis* (Kütz.) Cleve var.  
*gomphonemacea* (Grun.) Cleve (pl. 3 fig. s)

Hustedt, Bacill. 264  
L. 30  $\mu$ , W. 6  $\mu$ , This species is  
under the name of *Anomoeoneis gom-*  
*phonemacea* (Grun.) Kobayasi,  
(Kobayasi. Haraguchi: Bul. Chichibu  
Museum of Nat. Hist. 15: 31, 1969)

*Loc.* Grand Lac +

*Asterionella gracillima* (Hantz.) Heib. var.  
*ralfsii* (W. Smith). Cleve-Euler (pl. 2  
fig. b)

Cleve-Euler, in K. Sv. Vet. — Akad.  
Handl. 4 (1): 77 f. 401.B i~k, 1953

- L. 32  $\mu$ , W. 2  $\mu$ , ST. 23 in 10  $\mu$   
 Loc. Grand Lac +
- Bacillaria paradoxa* Gmelin (pl. 10 fig. f, q; pl. 12 fig. m)  
 Hustedt, Bacill. 396 f. 755, 1930  
 L. 45~68  $\mu$ , W. 4~7  $\mu$ , ST. 7~9 in 10  $\mu$   
 Loc. Petic Lac +  
 Hab. Found common in the salt well, often found in the fresh water
- Ceratoneis arcus* Kütz. var. *vaucheriae* (Kütz.)  
 Fukushima et. Ko-Bayashi (pl. 2 fig. a)  
 Fukushima et. al. in Bull. Sugadaira Biol. Lab. 2: pl. 1 f. f~i, 1968  
 L. 19  $\mu$ , W. 5  $\mu$ , ST. 16 in 10  $\mu$   
 Loc. Grand Lac +  
 Hab. Found common in the fresh water, especially running water
- Cocconeis placentula* Ehr. var. *euglypta* (Ehr.) Cleve  
 Hustedt, Bacill. 190 f. 261, 1930  
 L. 12~20  $\mu$ , W. 8~13  $\mu$   
 Loc. Tonle Sap R. +++ Mekong R. ++  
 Hab. Common and wide spread in the fresh water
- Coccinodiscus lacustris* Grun.  
 Hustedt, Bacill. 113 f. 90, 1930  
 Loc. Mekong R. +  
 Hab. Found in the fresh water
- sp. (pl. 2 fig. j)
- Cyclotella comta* (Ehr.) Kütz.  
 Hustedt, Bacill. 103 f. 69, 1930  
 D. 14  $\mu$   
 Loc. Neck part + Mekong R. +  
 Hab. Common and spread in the running water and still water, often known from phytoplankton
- *quadriuncta* Schröter (pl. 2 fig. r, t~v)  
 Hustedt, Bacill. 104 f. 78, 1930  
 D. 15~23  $\mu$   
 Loc. Mekong R. ++
- *stelligera* Cl. et Grun. (pl. 2 fig. o~q, s)  
 Hustedt, Bacill. 100 fig. 65, 1930  
 D. 7~15  $\mu$   
 Loc. Neck part + Mekong R. ++++  
 Hab. Found wide and spread in fresh water of all kinds
- sp.  
 Loc. Mekong R. +
- Cymbella affinis* Kütz. (pl. 11 Fig. a)  
 Hustedt, Bacill. 362 f. 678, 1930  
 L. 36  $\mu$ , W. 8  $\mu$ , ST. 10 in 10  $\mu$   
 Loc. Mekong R. +
- *hungarica* (Grun.) Pant. var. *signata* (Pant.) A. Cl. (pl. 6 fig. g)  
 Cleve-Euler, in K. V. A. Handl. 5(4): 159 fig. 1245 h~n, 1955  
 L. 27  $\mu$ , W. 12  $\mu$ , ST. 10 in 10  $\mu$   
 Loc. Neck part +
- *hustedtii* Krasske  
 Hustedt, Bacill. 363 f. 674, 1930  
 L. 70  $\mu$ , W. 8  $\mu$ , ST. 11 in 10  $\mu$   
 Loc. Neck part +
- *leptoceras* (Ehr.) Grun. (pl. 6 fig. i, k, m~p, : pl. 10 fig. b)  
 Hustedt, Bacill. 353 f. 645, 1930  
 L. 23~47  $\mu$ , W. 8~13  $\mu$ , ST. 7~11 in 10  $\mu$   
 Loc. Tonle Sap R. ++++, Petic Lac +, Neck part +, Grand Lac +  
 Hab. Wide spread in the freshwater
- sp. (pl. 6 fig. a)

L. 47  $\mu$ , W. 12  $\mu$ , ST. 11 in 10  $\mu$

Loc. Tonle Sap R. +

——— *tumida* (Bréb.) van Heurck (pl. 6 fig. 1)

Hustedt, Bacill. 366 f. 677, 1930

L. 50  $\mu$ , W. 18  $\mu$ , ST. in 10  $\mu$

Loc. Tonle Sap R. +

Hab. Wide spread in the fresh water, often found a dominant form of running water

——— *ventricosa* Kütz. (pl. 6 fig. b, c)

Hustedt, Bacill. 359 f. 661, 1930

L. 20~41  $\mu$ , W. 7~10  $\mu$ , ST. 12~13 in 10  $\mu$

Loc. Petic Lac +, Neck part +, Grand Lac +, Mekong R. +

Hab. Common and wide spread in the fresh water, often become a dominant form

——— ——— var. *silesiaca* (Bleisch) A.

Cl. (pl. 6 fig. h)

Cleve-Euler in K. V. A. Handl. 5(4): 124 f. 1177 d~f, 1955

L. 13~23  $\mu$ , W. 7  $\mu$ , ST. 14~15 in 10  $\mu$

Loc. Mekong R. ++

*Diatoma vulgare* Bory

Hustedt, Kieselalg. 2: 96 f. 628 a~d

L. 36  $\mu$ , W. 11  $\mu$ , Costae 8 in 10  $\mu$

Loc. Petic Lac 7

Hab. Found in running water

*Diploneis smithii* (Bréb.) Cleve

Hustedt, Kieselalg. 2: 647 f. 1051, 1937

L. 54  $\mu$ , W. 29  $\mu$ , C. 8 in 10  $\mu$

Loc. Mekong R. ++

*Epithemia sorex* Kütz.

Hustedt, Bacill. 388 f. 736, 1930

L. 33  $\mu$ , W. 9  $\mu$ , C. 7 in 10  $\mu$

Loc. Tonle Sap R. +

Hab. Known from fresh and brackish water (Hustedt 1938~39)

*Eunotia lunaris* (Ehr.) Grun. (pl. 4 fig. q)

Hustedt, Kieselalg. 2: 302 f. 769 a~e, 1928

L. 98  $\mu$ , W. 7  $\mu$ , ST. 18 in 10  $\mu$

Hab. Mekong R. +

——— *pectinalis* (Kütz.) Rabenh. (pl. 3 fig. t)

Hustedt, Kieselalg. 2: 295 f. 763 a, 1928

L. 32  $\mu$ , W. 4  $\mu$ , ST. 15 in 10  $\mu$

Loc. Grand Lac ++

——— sp.

Loc. Grand Lac +

*Fragilaria capucina* Desm. (pl. 2 fig. m)

Hustedt, Kieselalg. 2: 144 f. 659 a~e 1927

L. 49  $\mu$ , W. 3  $\mu$ , ST. 18 in 10  $\mu$

Loc. Neck part +

Hab. Both littoral and in plankton

——— *pinnata* Ehr. (pl. 2 fig. k)

Hustedt, Kieselalg. 2: 160 f. 671, 1927

L. 7  $\mu$ , W. 4  $\mu$ , ST. 12 in 10  $\mu$

Loc. Tonle Sap R. +

Hab. Littoral form common in fresh waters of all kinds (Foged, 1948)

*Frustulia rhomboides* (Ehr.) De Toni var.

*saxonica* (Rabh.) De Toni f. *undulata* Hust.

Hustedt, Kieselalg. 2: 729 f. 1099 b, 1937

Loc. Grand Lac +

*Gomphonema angustatum* (Kütz.) Rabenh.

(pl. 6 fig. c: pl. 7 fig. a)

Hustedt, Bacill. 373 f. 690, 1930

L. 23~26  $\mu$ ; W. 6~7  $\mu$ , ST. 10~12 in 10  $\mu$

Loc. Tonle Sap R. +, Petic Lac +

———— *clevei* Fricke

Hustedt, in Arch. f. Hydrob. Supp. 15: 941 pl. 27 f. 15~18, 1938

Loc. Tonle Sap R. +

———— *globiferum* Meister (pl. 7 fig. c~i)

Hustedt, Kieselalg. 2: 333 f. 156

L. 20~35  $\mu$ , W. 6~7  $\mu$

Loc. Neck part +

———— *gracile* Ehr. (pl. 7 fig. o)

Hustedt, Bacill. 376 f. 702, 1930

L. 42  $\mu$ , W. 8  $\mu$ , ST. 12 in 10  $\mu$

Loc. Neck part +, Mekong R. +

———— var. *lanceolata* (Kütz.)

Cleve (pl. 7 fig. p~s)

Hustedt, in Arch. f. Hydrob. Supp. 15: 439 pl. 28 f. 14~16, 1938

L. 58~67  $\mu$ , W. 9~10  $\mu$ , ST. 11~12 in 10  $\mu$

Loc. Mekong R. +

———— *longiceps* Ehr. var. *subclavata* Ehr.

(pl. 7 fig. k, l)

Hustedt, Bacill. 375 f. 705, 1930

L. 37~44  $\mu$ , W. 6  $\mu$ , ST. 10~11 in 10  $\mu$

Loc. Grand Lac +

———— f. *gracilis* Hust. (pl. 7

fig. m, n)

Hustedt, Bacill. 375 f. 706, 1930

L. 40~48  $\mu$ , W. 7  $\mu$ , ST. 12~15 in 10  $\mu$

Loc. Tonle Sap R. + + +; Petic Lac +

———— *olivaceum* (Lyngb.) Kütz. (pl. 6

fig. d)

Hustedt, Bacill. 378 f. 789 a~c, 1930

L. 18  $\mu$ , W. 8  $\mu$ , ST. 14 in 10  $\mu$

Loc. Petic Lac +, Neck part +, Mekong R. +

———— *tetrastigmatum* Horikawa et Okuno

(pl. 7 fig. b)

Horikawa et Okuno, in Bot. Mag. Tokyo, 58 (685): 10 f. 3e, 1944

L. 25  $\mu$ , W. 8  $\mu$ , ST. 14 in 10  $\mu$

Loc. Grand Lac. +

———— sp.

Loc. Mecong R. +

*Gyrosigma kützingii* (Grun.) Cleve (pl. 5 fig. d~h)

Hustedt, Bacill. 224 f. 333, 1930

L. 98~110  $\mu$ , W. 13  $\mu$ , ST. 24~26 in 10  $\mu$

Loc. Tonle Sap R. + + +, Petic Lac. + +, Neck part + + +, Grand Lac. + + +, Mekong R. + + +

Hab. Found common in the samples of The Mekong Water System

———— *spencerii* (W. Sm.) Cleve var.

*nodifera* Grun. (pl. 5 fig. b, c)

Hustedt, Bacill. 226 f. 337, 1930

L. 115  $\mu$ , W. 13  $\mu$ , ST. 22 in 10  $\mu$

Loc. Tonle Sap R. +

Hab. Found in water with a generally low content of chloride (Foged, 1948)

*Hantzschia amphioxys* (Ehr.) Grun. (pl. 10 fig. h)

Hustedt, Bacill. 394 f. 747, 1930

L. 44  $\mu$ , W. 6  $\mu$ , Kp. 10 in 10  $\mu$

Loc. Tonle Sap R. +

*Melosira granulata* (Ehr.) Grun. (pl. 1 fig. a~m)

Hustedt, Bacill. 87 f. 44, 1930

D. 5~20  $\mu$ , H. 6~15  $\mu$

Loc. Tonle Sap R. + + +, Petic Lac

- +++ , Neck part +++ , Grand Lac +++ , Mekong R. +++  
*Hab.* Most common as planktonic form in lake (Foged, 1948), found common and wide spread in the Mekong Water System.
- *pensacolae* A. Schmidt (pl. 2 fig. g)  
 A. Schmidt, Atlas pl. 181 f. 76, 77, 1893  
*Loc.* Tonle Sap R. +++ , Petic Lac +++ , Neck part +++ , Grand Lac +++ , Mekong R. +++
- Navicula cinctaeformis* Hust. (pl. 5 fig. a, pl. 12 fig. c, h)  
 Hustedt, Arch. f. Hydrob. Supp. 15: 265 pl. 19 f. 11, 12, 1938  
 L. 12~15  $\mu$ , W. 5~7  $\mu$ , ST. 12~13 in 10  $\mu$   
*Loc.* Neck part + , Grand Lac + , Mekong R. +
- *clementis* Grun. (pl. 12 fig. e)  
 Cleve-Euler, in K. V. A. Handl. 4(5): f. 802, 1951  
 L. 23  $\mu$ , W. 12  $\mu$ , ST. 12 in 10  $\mu$   
*Loc.* Mekong R. +
- *cryptocephala* Kütz. (pl. 11 fig. f)  
 Hustedt, Bacill. 295 f. 496, 1930  
 L. 32  $\mu$ , W. 7  $\mu$ , ST. 15  $\mu$  in 10  $\mu$   
*Loc.* Tonle Sap R. + , Petic Lac +  
*Hab.* Common form in stagnant water as well as in running waters (Foged 1948)
- var. *veneta* (Kütz.) Grun. (pl. 3 fig. k)  
 Hustedt, Bacill. 295 f. 497 a, 1930  
 L. 16  $\mu$ , W. 4  $\mu$ , ST. 15 in 10  $\mu$   
*Loc.* Neck part +
- *cuspidata* Kütz. var. *heribaudi* Pergallo (pl. 13 fig. d)  
 Hustedt, Bacill. 268 f. 435, 1930  
 L. 50  $\mu$ , W. 18  $\mu$ , ST. 24 in 10  $\mu$   
*Loc.* Petic part +
- *decussis* Oestr. (pl. 11 fig. g, k)  
 Cleve-Euler, in K. V. A. Handl. 4(5): 175 f. 866 A, 1953  
 L. 20~22  $\mu$ , W. 6~7  $\mu$ , ST. 18 in 10  $\mu$   
*Loc.* Neck part +
- *gastrum* Ehr. (pl. 4 fig. t)  
 Hustedt, Bacill. 305, f. 537, 1930  
 L. 33  $\mu$ , W. 12  $\mu$ , 11 in 10  $\mu$   
*Loc.* Tonle Sap R. +  
*Hab.* Wide spread, but never common (Foged, 1948)
- *pupula* Kütz.  
 Hustedt, Bacill. 281 f. 476 a, 1930  
*Loc.* Mekong R. +  
*Hab.* Generally found in fresh water of all kinds
- var. *capitata* Hust. (pl. 4 fig. s)  
 Hustedt, Bacill. 281, f. 466c, 1930  
 L. 34  $\mu$ , W. 8  $\mu$ , ST. 20 in 10  $\mu$   
*Loc.* Petic part +
- *pygmaea* Kütz. (pl. 3 fig. i, m~o)  
 Hustedt, Bacill. 312 f. 561, 1930  
 L. 23~35  $\mu$ , W. 8~9  $\mu$ ,  
*Loc.* Tonle Sap R. +++ , Mekong R. +  
*Hab.* Known from slightly saliferous water and from fresh water (Foged 1948)
- *radiosa* Kütz. var. *minutissima* (Grun.) Cl. (pl. 4 fig. p)  
 Cleve-Euler, in K. V. H. Handl. 4(5): 156 f. 816 k, l, 1953  
 L. 20  $\mu$ , W. 4  $\mu$ , 15 in 10  $\mu$

- Loc.* Neck part +, Mekong R. +
- var. *tenella* (Bréb.) Grun.  
(pl. 3 fig. q: pl. 10 fig. o : pl. 13 fig. a)  
Hustedt, Bacill. 299, 1930  
L. 30~33  $\mu$ , W. 5~6  $\mu$ , ST. 16 in 10  $\mu$   
*Loc.* Neck part + + +, Grand Lac + + +
- *rhynchocephala* Kütz. (pl. 11 fig. c)  
Hustedt, Bacill. 296 f. 501, 1930  
L. 39  $\mu$ , W. 9  $\mu$ , 13 in 10  $\mu$   
*Loc.* Mekong R. +  
*Hab.* A littoral form common in fresh water of all kinds (Foged 1948)
- *schroeteri* Meist.  
Hustedt, in Arch. f. Hydrob. Supp. 15: 267 pl. 18 f. 16, 1938  
*Loc.* Mekong R. +
- *secreta* Krasske (pl. 4 fig. r, pl. 5 fig. j, pl. 10 fig. a, d pl. 11 fig. a)  
Cleve-Euler, in K. V. A. Handl. 4 (5): 135, f. 772A, 1953  
L. 20  $\mu$ , W. 5  $\mu$ , ST. 24 in 10  $\mu$   
*Loc.* Tonle Sap R. + + +, Petic Lac + + +, Neck part + + +, Mekong R. +
- sp.  
*Loc.* Tonle Sap R. +, Mekong R. +
- *terminata* (Hust.) Hust. (pl. 11 fig. e)  
Hustedt, Kieselalg. 3 (4) 589 f. 1594  
L. 35  $\mu$ , W. 8  $\mu$ , ST. 25 in 10  $\mu$   
*Loc.* Grand Lac +
- *viridula* Kütz. (pl. 13 fig. b, c)  
Hustedt, Bacill. 296 f. 503, 1930  
L. 33~45  $\mu$ , W. 8~9  $\mu$ , ST. 16 in 10  $\mu$   
*Loc.* Mekong R. + +
- Hab.* Hustedt (1938) indicated it as a littoral form.
- Nitzschia amphibia* Grun. (pl. 9 fig. k, q, r)  
Hustedt, Bacill. 414 f. 793, 1930  
L. 17  $\mu$ , W. 4  $\mu$ , ST. 20 in 10  $\mu$   
*Loc.* Mekong R. + + +  
*Hab.* The most common diatoms on temperate (Hustedt 1938)
- *dissipata* (Kütz.) Grun. (pl. 9 fig. h~j)  
Hustedt, Bacill. 412 f. 789, 1930  
L. 26~29  $\mu$ , W. 4  $\mu$ ,  
*Loc.* Mekong R. + + +
- *gracilis* Hantz.  
Hustedt, Bacill. 416 f. 794, 1930  
*Loc.* Petic Lac +
- *palea* (Kütz.) W. Sm. (pl. 9 fig. d, e, g, pl. 10 fig. e)  
Hustedt, Bacill. 416 f. 801, 1930  
L. 18~35  $\mu$ , W. 3~5  $\mu$ ,  
*Loc.* Petic Lac +, Neck part +, Grand Lac +  
*Hab.* It is a typical mesosaprobous diatom (Hustedt 1938)
- *parvula* Lewis  
Hustedt, Bacill. 421 f. 816, 1930  
*Loc.* Tonle Sap R. +
- *romana* Grun. (pl. 9 fig. f)  
Hustedt, Bacill. 415 f. 802, 1930  
L. 35  $\mu$ , W. 3  $\mu$   
*Loc.* Neck part +
- sp.  
*Loc.* Tonle Sap R. + +, Petic Lac + +
- *subtilis* (Kütz.) Grun. (pl. 12 fig. k, l)  
Hustedt, Bacill. 451 f. 806, 1930



- L. 110  $\mu$ , W. 4  $\mu$ , Kp. 9 in 10  $\mu$   
*Loc.* Tonle Sap R. +, Petic part +
- *tryblionella* Hantz. var. *debilis*  
 (Arnott) A. Mayer (pl. 6 fig. g, pl. 7  
 fig. j, pl. 12 fig. d)  
 Hustedt, Bacill. 400 f. 759, 1930  
 L. 17~20  $\mu$ , W. 9~10  $\mu$ ,  
*Loc.* Neck part +, Grand Lac +
- Pinnularia acrosphaeria* Bréb. (pl. 6 fig. 6)  
 Hustedt, Bacill. 330 f. 610, 1930  
 L. 45  $\mu$ , W. 9  $\mu$ , ST. 13 in 10  $\mu$   
*Loc.* Neck part +
- *gibba* Ehr. var. *parva* (Ehr.) Brun.  
 (pl. 6 fig. e)  
 Hustedt, Bacill. 327 f. 603, 1930  
 L. 25  $\mu$ , W. 18  $\mu$ , ST. 10 in 10  $\mu$   
*Loc.* Tonle Sap R. +
- *legumen* Ehr. (pl. 6 fig. q)  
 Hustedt, Bacill. 322 f. 587, 1930  
 L. 76  $\mu$ , W. 14  $\mu$ , ST. 9 in 10  $\mu$   
*Loc.* Tonle Sap R. +
- Stauroneis anceps* Ehr. var. *hyalina* Brun et  
 Per. (pl. 3 fig. p)  
 Hustedt, Bacill. 256 f. 408, 1930  
 L. 38  $\mu$ , W. 8  $\mu$   
*Loc.* Mekong R. +  
*Hab.* Quite common in the streams  
 (Hustedt 1938)
- Stenopterobia intermedia* Lewis ? (pl. 12 fig. n)  
 Hustedt, Bacill. 428 f. 830, 1930  
 L. 78  $\mu$ , W. 5  $\mu$ , ST. 24 in 10  $\mu$   
*Loc.* Petic lac +
- Surirella angusta* Kütz. (pl. 9 fig. p)  
 Hustedt, Bacill. 435 f. 844~845, 1930  
 L. 17  $\mu$ , W. 8  $\mu$ , C. 6 in 10  $\mu$   
*Loc.* Tonle Sap R. +  
*Hab.* Found in slightly alkaline run-
- ning water (Hustedt, 1938)
- *biseriata* Bréb. var. *bifrons* (Ehr.)  
 f. *punctata* Meister (pl. 11 fig. i~j)  
 Hustedt, Bacill. 433, 1930  
 L. 58~63  $\mu$ , W. 22~23  $\mu$ , C. 3 in 10  $\mu$   
*Loc.* Petic part +, Grand Lac +
- ——— var. *rostrata* Schulz (pl.  
 11 fig. h)  
 Hustedt, Bacill. 433 f. 834, 1930  
 L. 56  $\mu$ , W. 22  $\mu$ , C. 3 in 10  $\mu$   
*Loc.* Petic Lac. +
- *capronii* Bréb. (pl. 12 fig. g, j)  
 Hustedt, Bacill. 440 f. 857, 1930  
 L. 55~58  $\mu$   
*Loc.* Neck part +
- *elegans* Ehr. (pl. 12 fig. f)  
 Hustedt, Bacill. 440 f. 858~859, 1930  
 L. 130~180  $\mu$ , W. 50~70  $\mu$   
*Loc.* Petic Lac +
- *linearis* W. Sm. (pl. 10 fig. g, i,  
 k, n)  
 Hustedt, Bacill. 434 f. 837, 1930  
 L. 100~110  $\mu$ , W. 10~15  $\mu$   
*Loc.* Petic part +, Grand Lac +
- ——— var. *constricta* (Ehr.) G-  
 run. (pl. 10 fig. j)  
 Hustedt, Bacill. 434 f. 839, 1930  
 L. 130  $\mu$ , W. 23  $\mu$ , Kp. 16 in 100  $\mu$   
*Loc.* Grand Lac +
- *ovata* Kütz. (pl. 8 fig. a~c)  
 Hustedt, Bacill. 442 f. 863~864, 1930  
 L. 65  $\mu$ , W. 22  $\mu$ , Kp. 40 in 100  $\mu$   
*Loc.* Neck part +, Grand Lac +
- *pinnata* W. Sm.  
 Hustedt, Bacill. 442 f. 865, 1930  
*Loc.* Petic Lac +

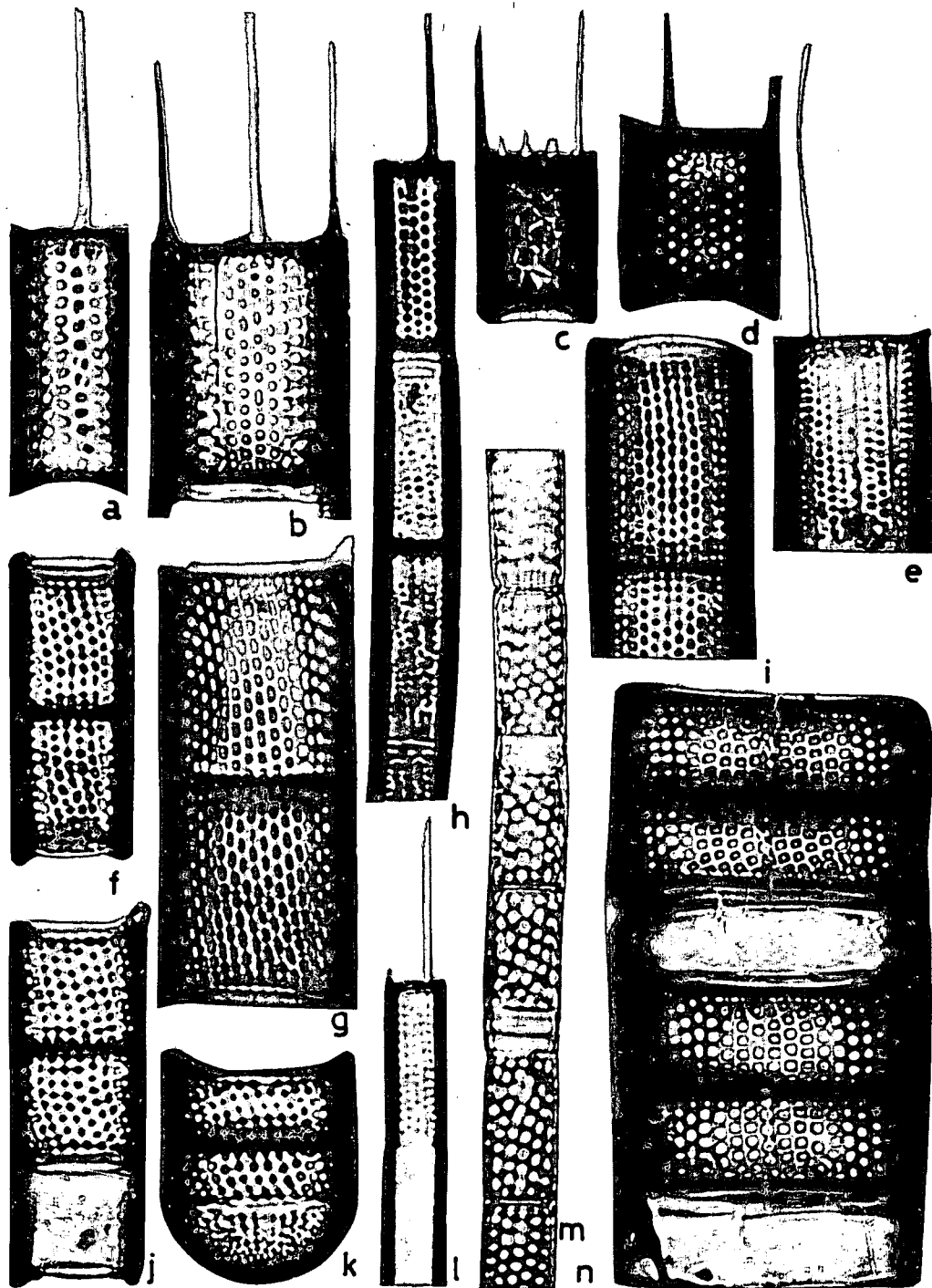
- *tenera* Greg. (pl. 9 fig. n, o)  
Hustedt, Bacill. 438 f. 853, 1930  
L. 160~180  $\mu$ , W. 38~40  $\mu$ , Kp. 20 in 100  $\mu$   
*Loc.* Petic Lac +, Grand Lac +  
*Hab.* Mainly found as a littoral form (Hustedt 1938)
- var. *nervosa* Mayer (pl. 8 fig. d~j, pl. 9 fig. a~c, 1, m)  
Hustedt, Bacill. 439 f. 854~855, 1930  
L. 100~125  $\mu$ , W. 30~35  $\mu$   
*Loc.* Petic Lac +, Grand Lac +++  
*Hab.* A form characteristic for running water, especially wells (Hustedt 1938)
- Synedra acus* Kütz.  
Hustedt, Kieselalg. 2: 201 f. 693 a, 1927  
*Loc.* Petic Lac +  
*Hab.* Often found as an epiphytic form upon other algae in fresh water (Hustedt 1930)
- *amphicephala* Kütz.  
Hustedt, Bacill. 156 f. 173, 1930  
*Loc.* Grand Lac +
- var. *austriaca* Grun. (pl. 4 fig. i, j)  
Hustedt, Bacill. 156 f. 173, 1930  
L. 200  $\mu$ , W. 12  $\mu$ , ST. 6 in 10  $\mu$   
*Loc.* Grand Lac +
- *rumpens* Kütz. var. *meneghiniana*  
Grun. (pl. 2 fig. n)  
Hustedt, Kieselalg. 2: 207, 1927  
L. 65  $\mu$ , W. 9  $\mu$ , ST. 5 in 10  $\mu$   
*Loc.* Grand Lac +
- *ulna* (Nitz.) Ehr. (pl. 4 fig. a, b)  
Hustedt, Kieselalg. 2: 195 f. 691 A a~c, 1927  
*Loc.* Mekong R. +++
- var. *aequalis* (Kütz.)  
Hust. (pl. 4 Hust. fig. c, d, f, k, l)  
Hustedt, Bacill. 152 f. 164, 1930  
L. 300  $\mu$ , W. 9  $\mu$ , ST. 9 in 10  $\mu$   
*Loc.* Tonle Sap R. +, Petic Lac +
- var. *amphirhynchus* (Ehr.)  
Grun. (pl. 4 fig. e, m~o)  
Hustedt, Bacill. 154 f. 167, 1930  
L. 210  $\mu$ , W. 7  $\mu$ , ST. 11 in 104  
*Loc.* Mekong R. +
- var. *oxyrhynchus* Kütz.  
(pl. 3 fig. a~h, pl. 4 fig. g, h)  
Hustedt, Kieselalg. 2: 198, f. 691B, q  
L. 43~70  $\mu$ , W. 7~9  $\mu$ , ST. 12  $\mu$   
*Loc.* Tonle Sap R. +++, Petic Lac +++, Neck part ++, Grand Lac ++, Mekong R. +++
- var. *biceps* Kütz.  
Hustedt, Bacill. 154 f. 166, 1930  
*Loc.* Mekong R. +

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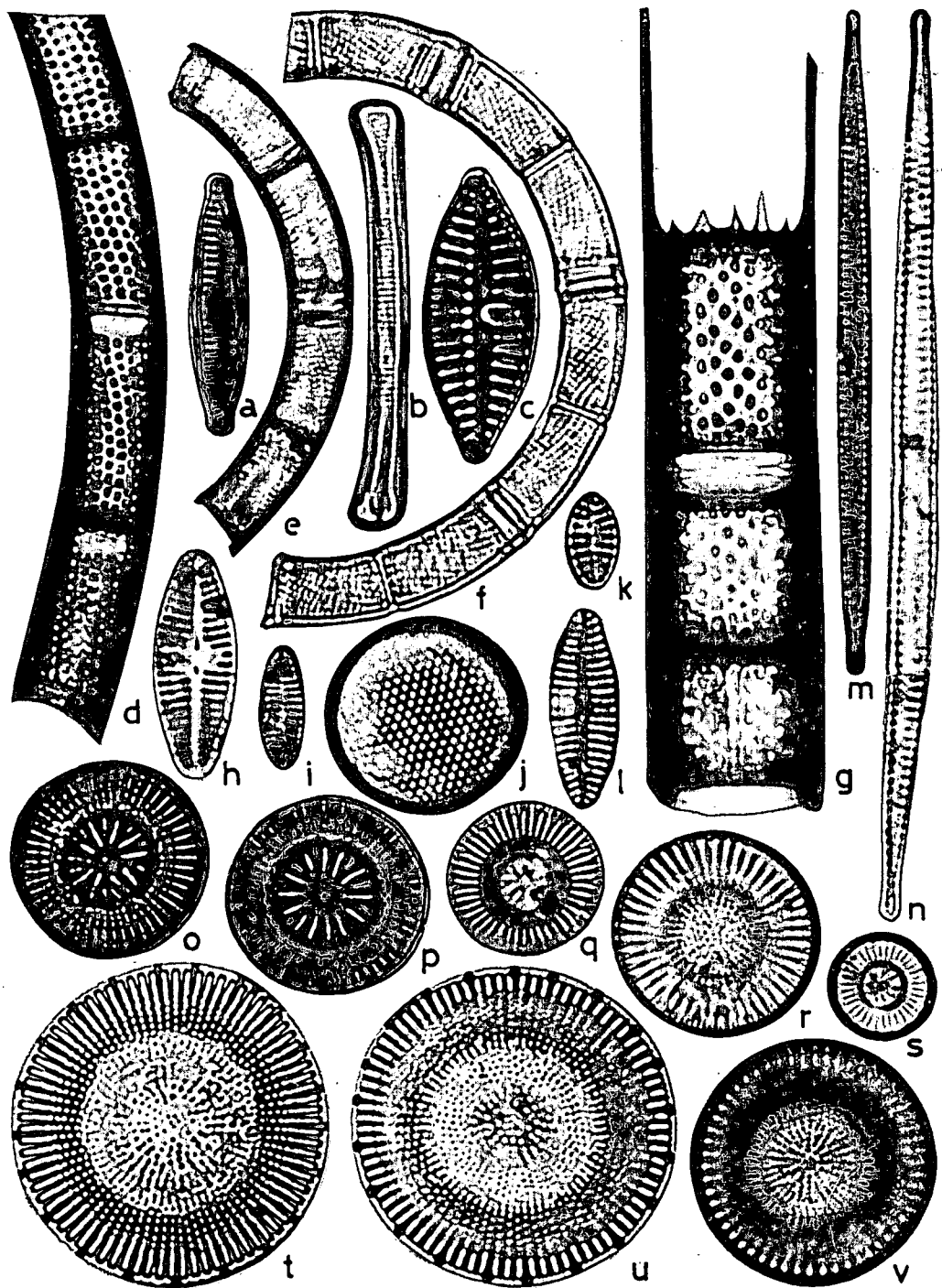


10 $\mu$

a~m *Melosira granulata*

Plate 2

- a        *Ceratoneis arcus* var. *vaucheriae*  
b        *Asterionella gracillima* var. *ralfsii*  
d~f      *Melosira granulata* f. *curvata*  
g        *M. pensacolae*  
h, l     *Achnanthes lanceolata*  
i        *A. minutissima*  
j        *Coscinodiscus* sp.  
k        *Fragilaria pinnata*  
m        *F. capucina*  
n        *Synedra rumpens* var. *meneghiniana*  
o~q, s   *Cyclotella stelligera*  
r, t~v   *C. quadriiuncta*



10μ

Plate 3

- a~h *Synedra ulna* var. *oxyrhynchus*  
i *Navicula pygmaea*  
j *Amphora ovalis* var. *pediculus*  
l *Achnanthes delicatula*  
m~o *Navicula pygmaea*  
p *Stauroneis anceps* var. *hyalina*  
q *Navicula radiosa* var. *tenella*  
r *Achnanthes delicatula*?  
s *Anomoeoneis exilis* var. *gomphonemacea*  
t *Eumotia pectinalis* var. *minor*

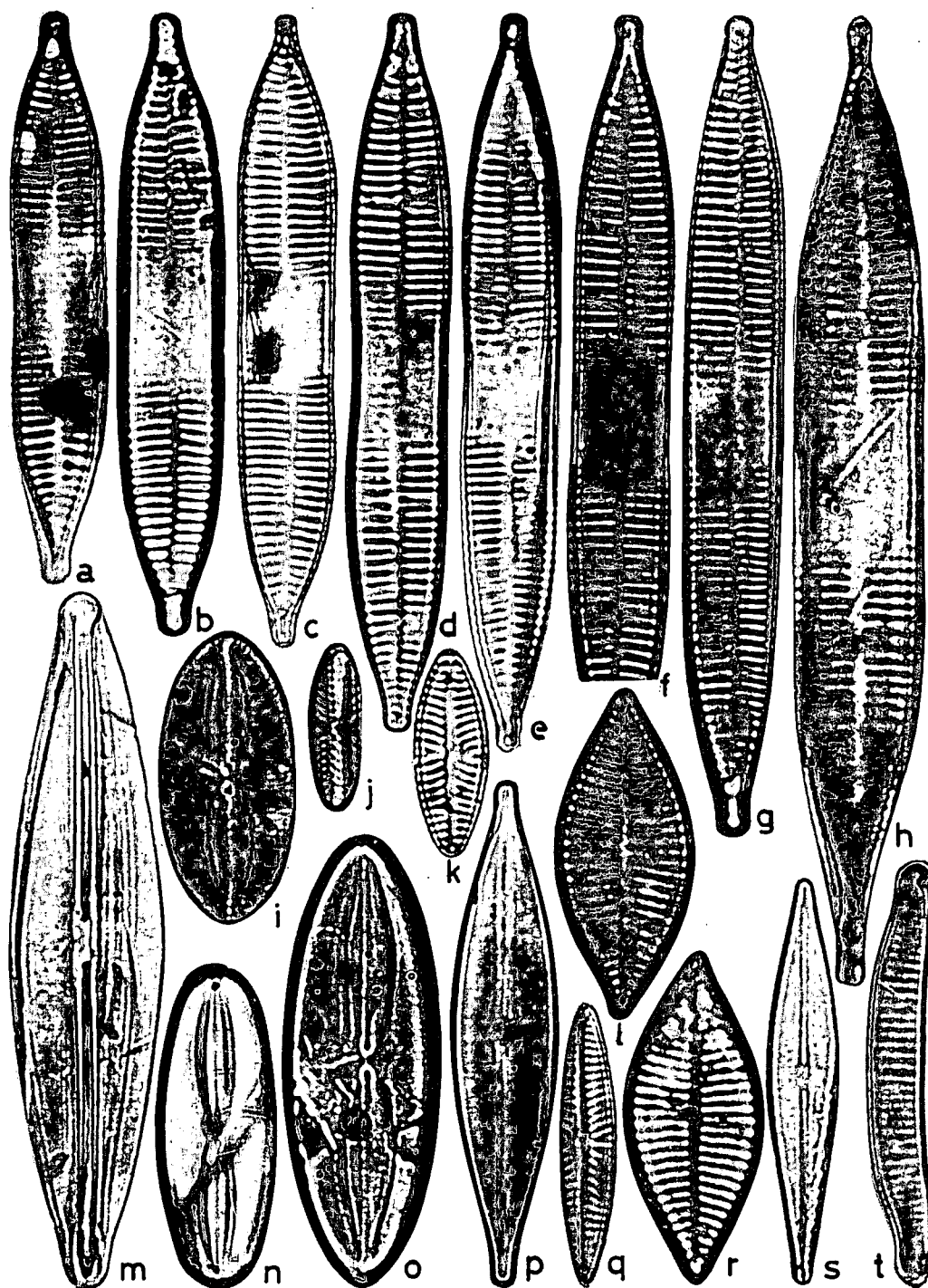
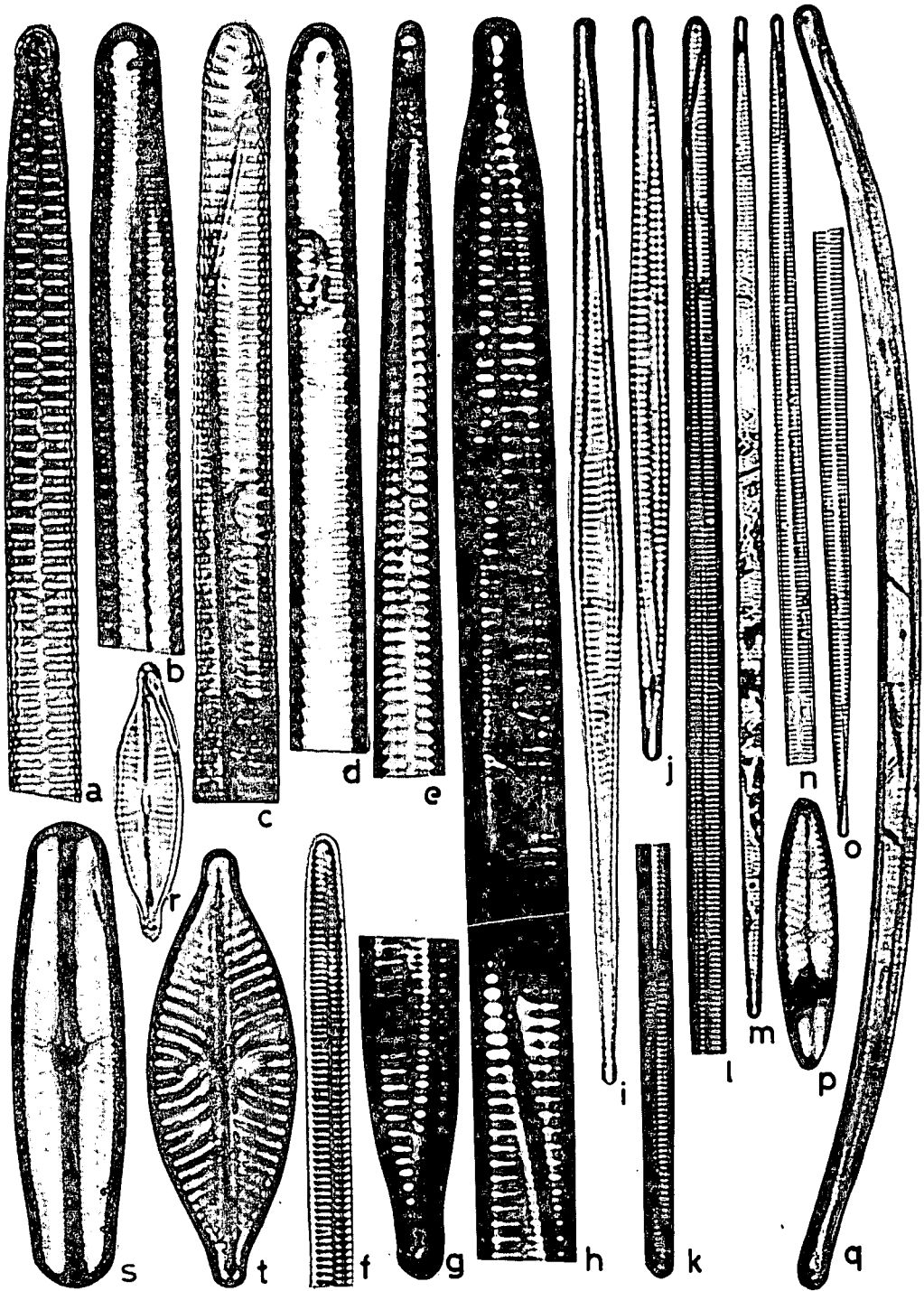




Plate 4

a, b	<i>Synedra ulna</i>
c, d	<i>S. u.</i> var. <i>aequalis</i>
e	<i>S. u.</i> var. <i>amphirhynchus</i>
f	<i>S. u.</i> var. <i>aequalis</i>
g, h	<i>S. u.</i> var. <i>oxyrhynchus</i>
i, j	<i>S. amphicephala</i> var. <i>austriaca</i>
k, l	<i>S. u.</i> var. <i>aequalis</i>
m~o	<i>S. u.</i> var. <i>amphirhynchus</i>
p	<i>Navicula radiosa</i> var. <i>minutissima</i>
q	<i>Eunotia lunaris</i> var. <i>capitata</i>
r	<i>Navicula secreta</i>
s	<i>N. pupula</i> var. <i>capitata</i>
t	<i>N. gastrum</i>

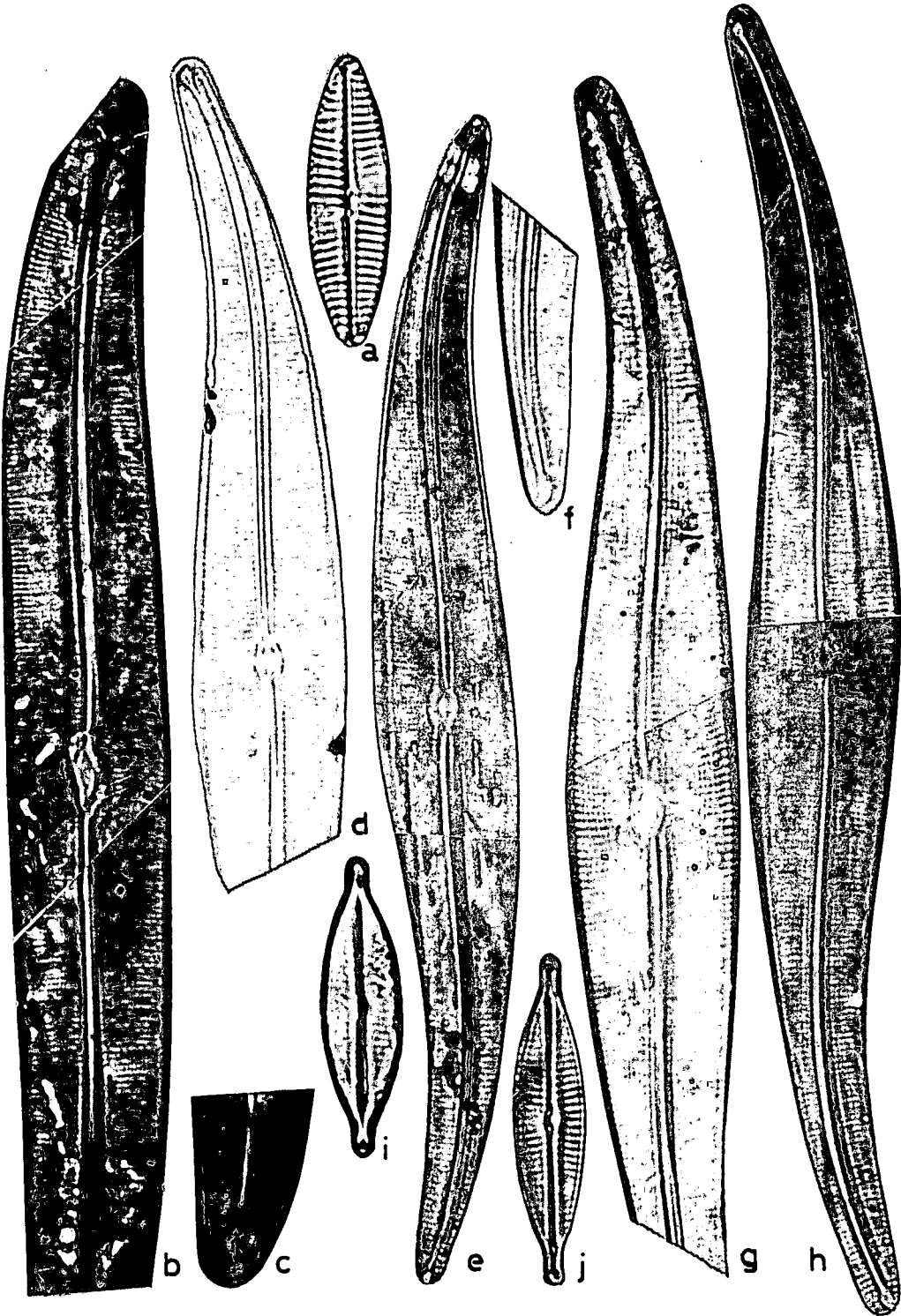


10 μ  
The other diatoms

0 10 20 30 40 50 μ  
f, k, l, m, n, o.

Plate 5

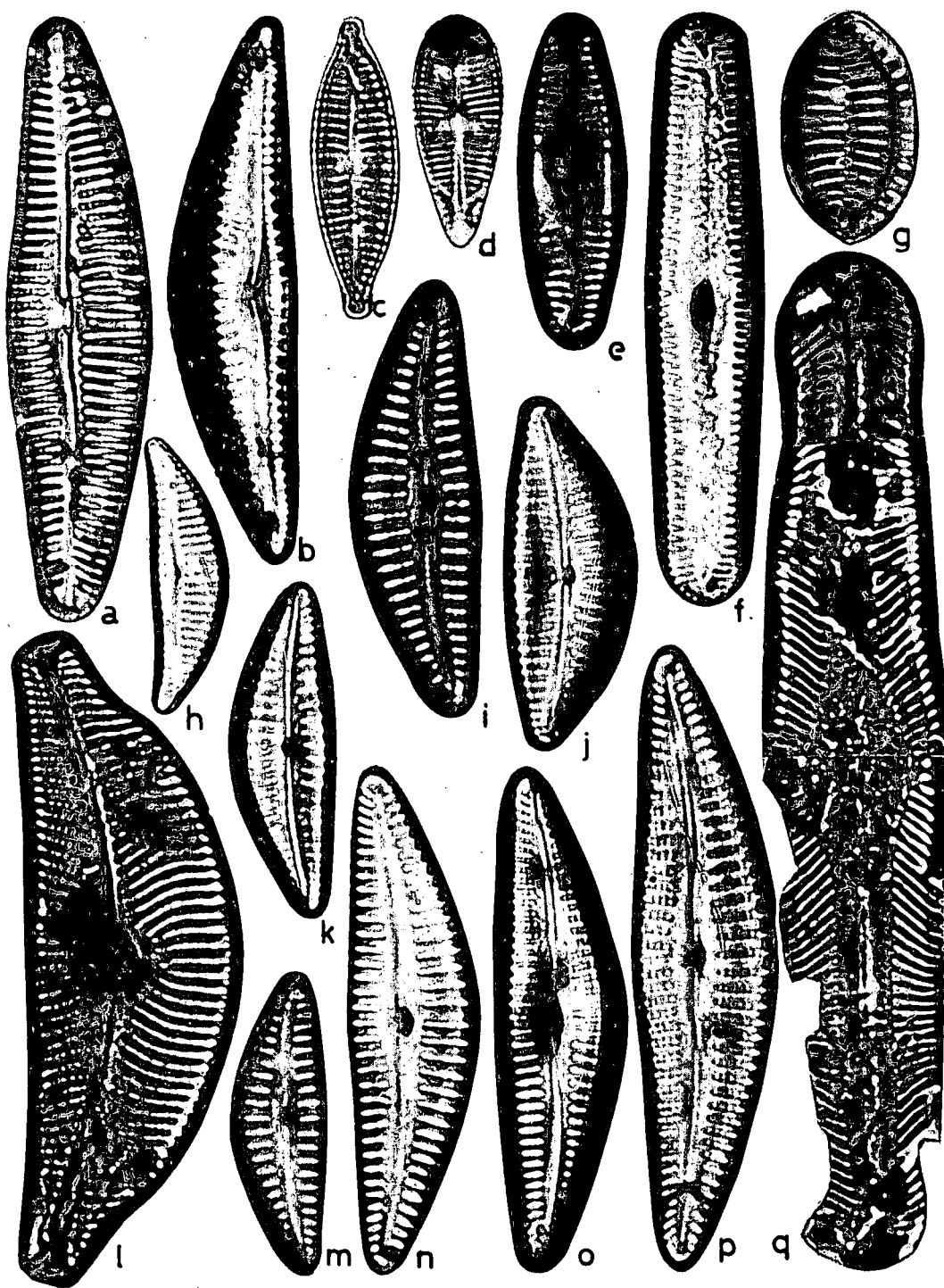
- a *Navicula cinctaeformis*
- b, c *Gyrosigma spencerii* var. *nodifera*
- d~h *G. kuetzingii*
- i *Navicula cryptocephala* var. *intermedia*
- j *N. secreta*



10 $\mu$

Plate 6

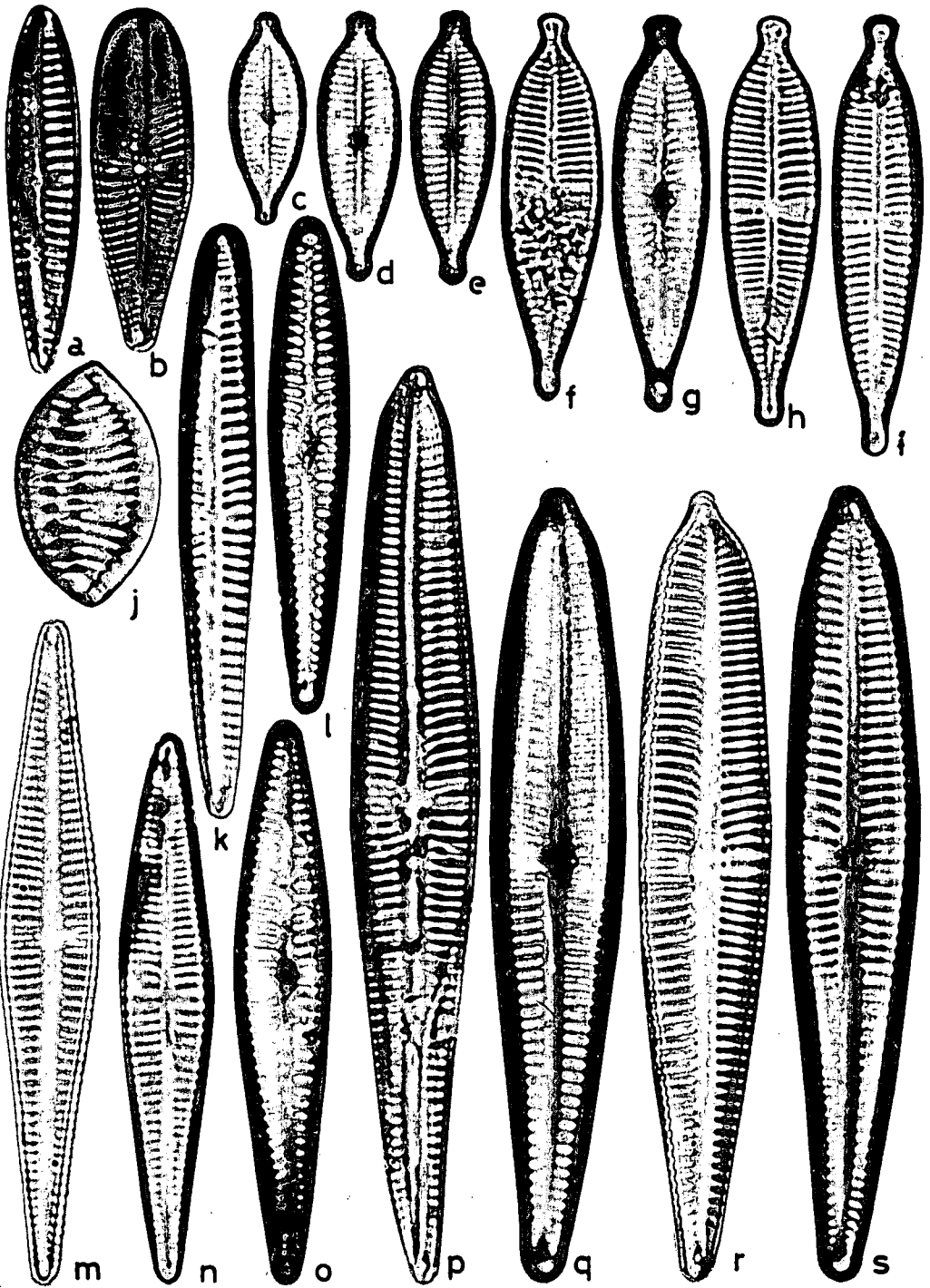
- a *Cymbella* sp. (auxospore)
- b *C. ventricosa*
- c *Gomphonema angustatum*
- d *G. olivaceum*
- e *Pinnularia gibba* var. *parva*
- f *P. acrosphaeria*
- g *Nitzschia tryblionella* var. *debilis*
- h *Cymbella ventricosa* var. *silesiaca*
- i *C. leptoceras*
- j *C. hungarica* var. *signata*
- k *C. leptoceras*
- l *C. tumida*
- m~p *C. leptoceras*
- q *Pinnularia legumen*



10μ

Plate 7

- a        *Gomphonema angustatum*  
b        *G. tetrastigmatum*  
c~i      *G. globiferum*  
j        *Nitzschia tryblionella* var. *debilis*  
k, l     *Gomphonema longiceps* var. *subclavata*  
m, n    *G. l.* var. *s. f. gracile*  
o        *G. gracile*  
p~s     *G. g.* var. *lanceolata* f. *turris*



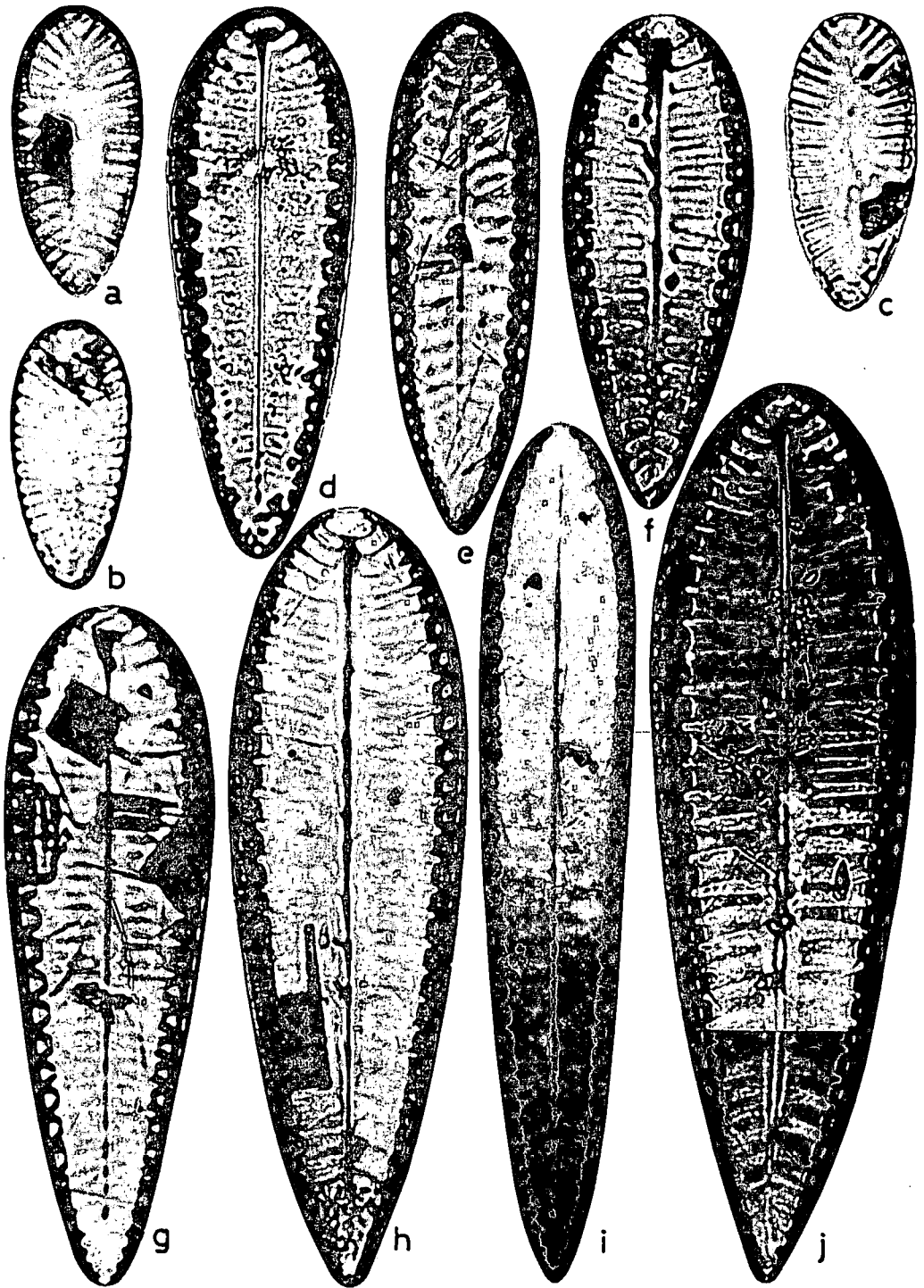
10  $\mu$



Plate 8

a~c *Surirella ovata*

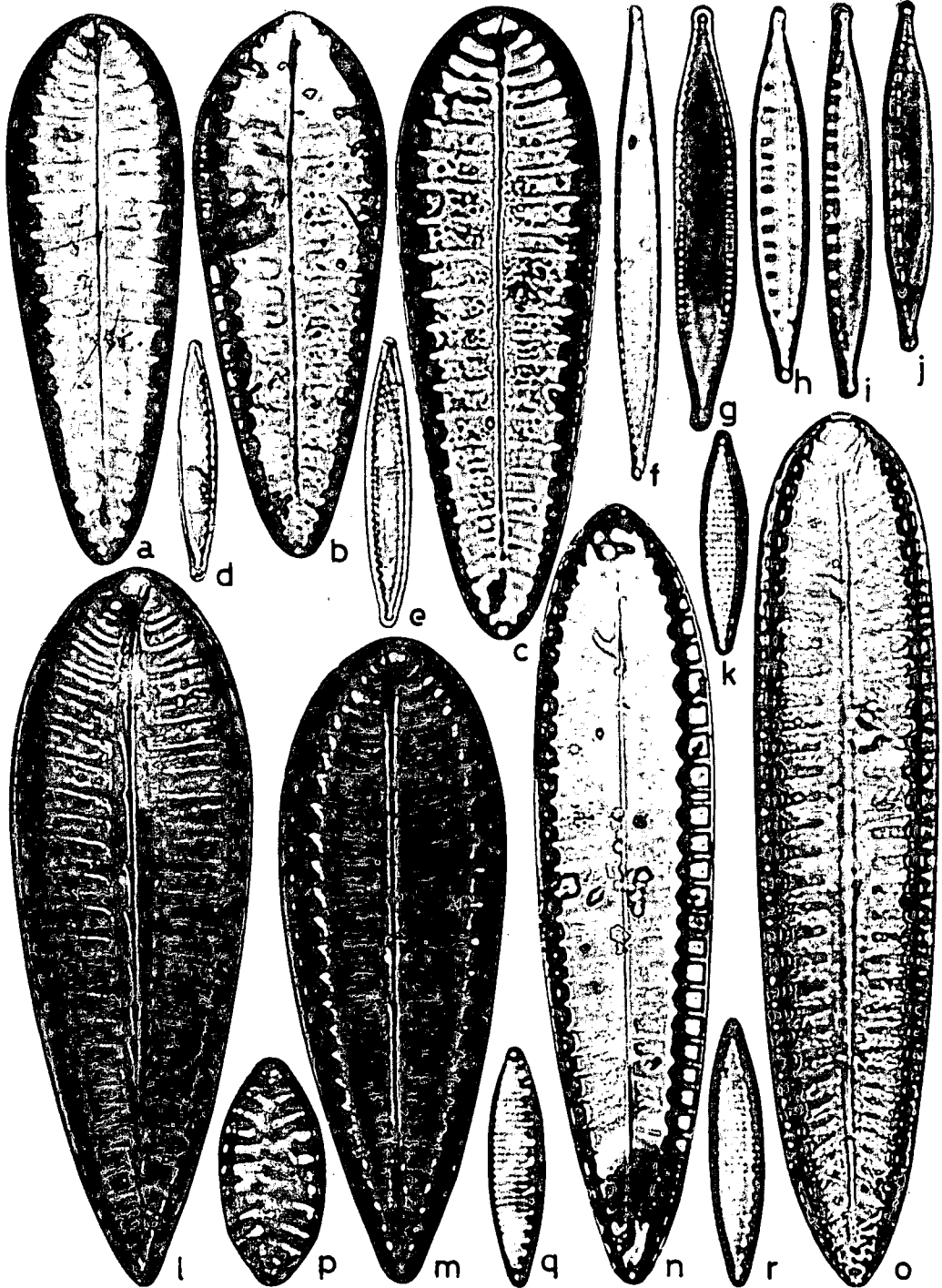
d~j *S. tenella* var. *nervosa*



0 10 20 30 40 50  $\mu$

Plate 9

a~c	<i>Surirella tenera</i> var. <i>nervosa</i>
d, e	<i>Nitzschia palea</i>
f	<i>Nitz. romana</i>
g	<i>Nitz. palea?</i>
h~j	<i>Nitz. dissipata</i>
k	<i>Nitz. amphibia</i>
l, m	<i>Surirella tenera</i> var. <i>nervosa</i>
m, o	<i>S. tenera</i>
p	<i>S. angustata</i>
q, r	<i>Nitzschia amphibia</i>



10 μ

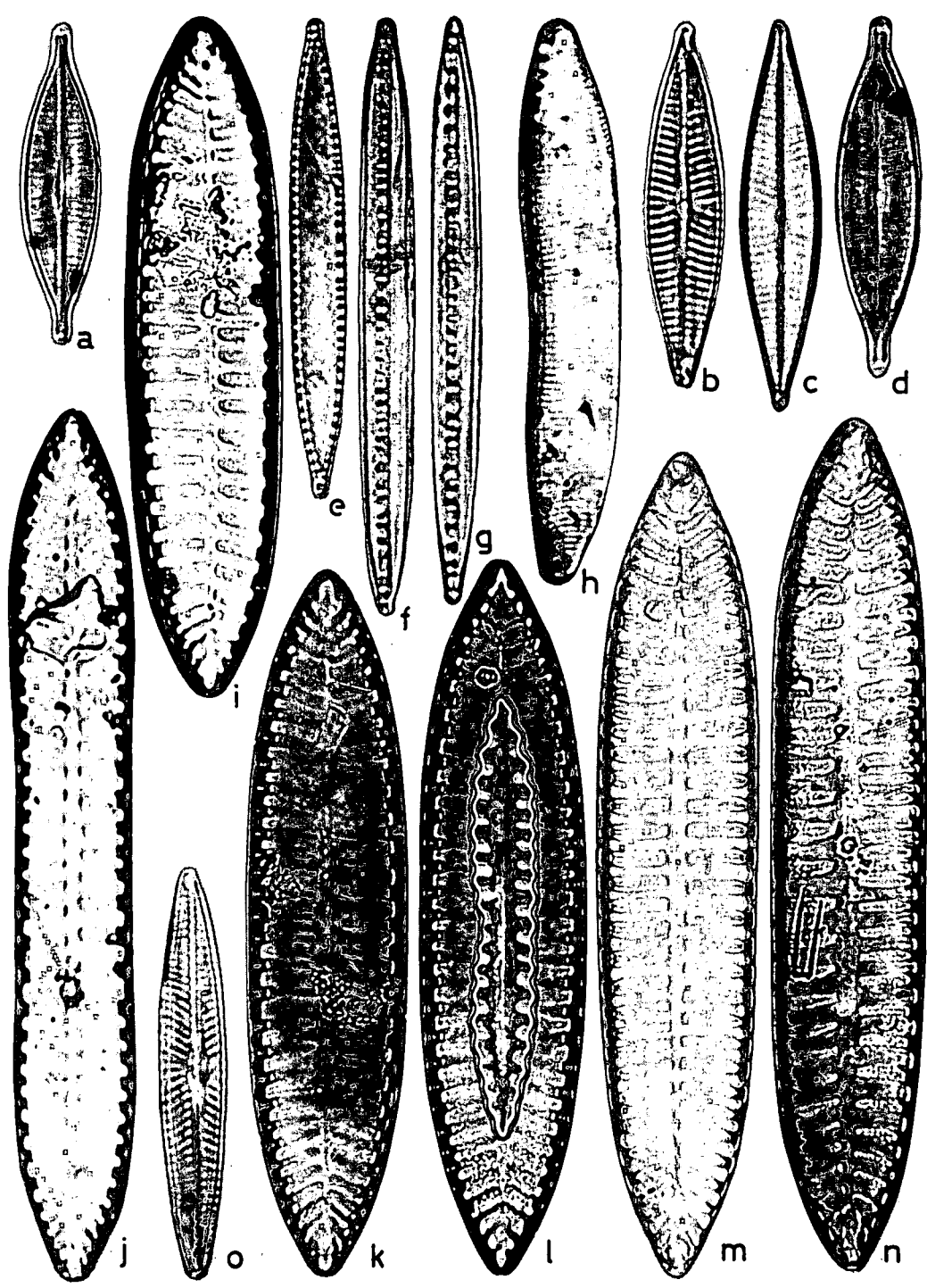
The other diatoms

0 10 20 30 40 50 μ

*Suriella*

Plate 10

- a *Navicula secreta*
- b, c *N. cryptocephala* var. *intermedia*
- d *N. secreta*
- e *Nitzschia palea*
- f, g *Bacillaria paradoxa*
- h *Hantzschia amphioxys*
- i *Surirella linearis*
- j *S. l.* var. *constricta*
- k~n *S. linearis*
- o *Navicula radiosa* var. *tenella*

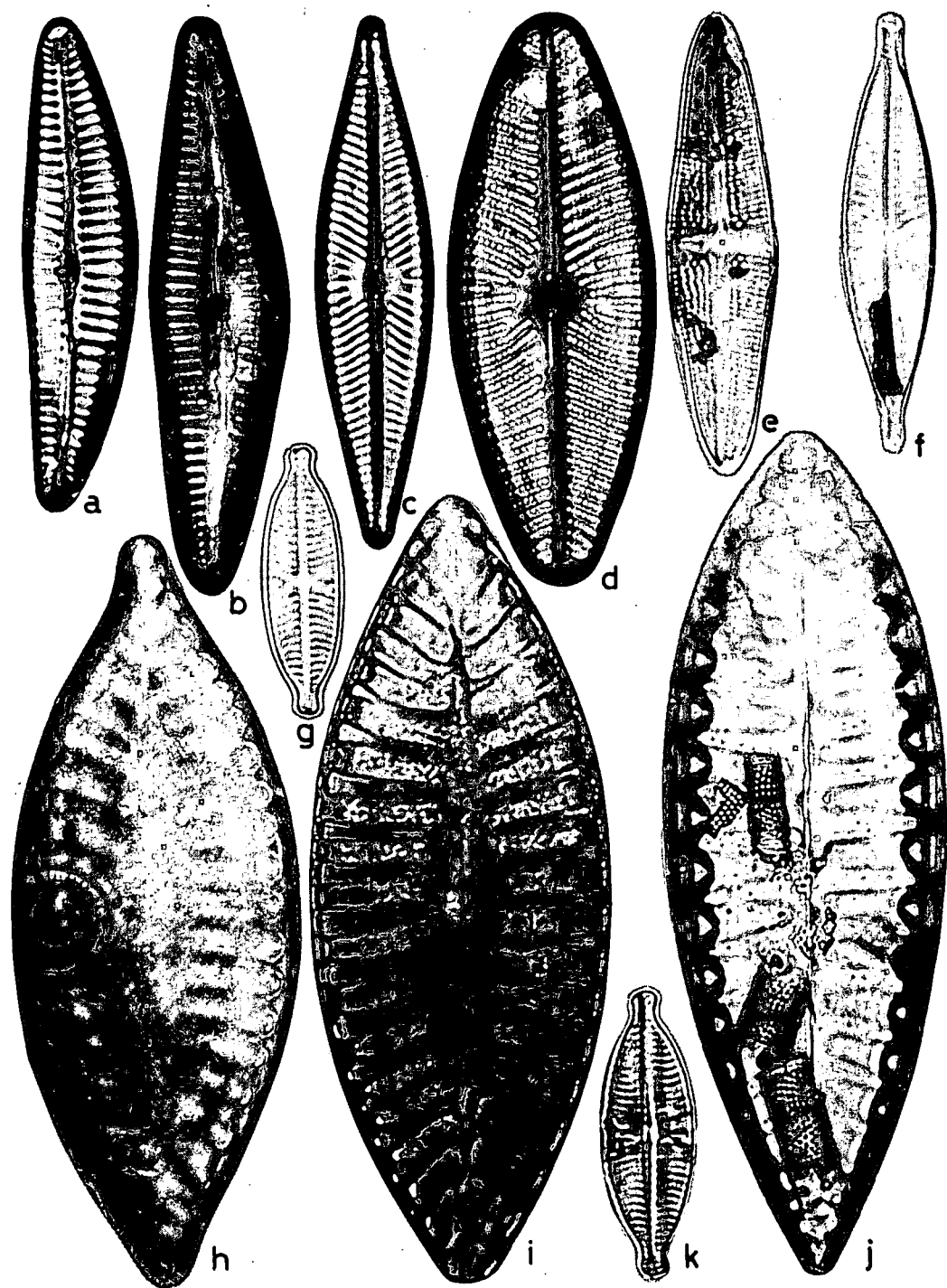


10  $\mu$   
The other diatoms

0 10 20 30 40 50  $\mu$   
*Surirella*

Plate 11

- a *Cymbella affinis*
- b *C. leptoceras*
- c *Navicula rhynchocephala*
- d *Navicula galikii*
- e *N. terminata*
- f *N. cryptocephala*
- g *N. decussis*
- h *Surirella biseriata* var. *rostrata*
- i~j *S. b.* var. *bifrons* f. *punctata*
- k *Navicula decussis*



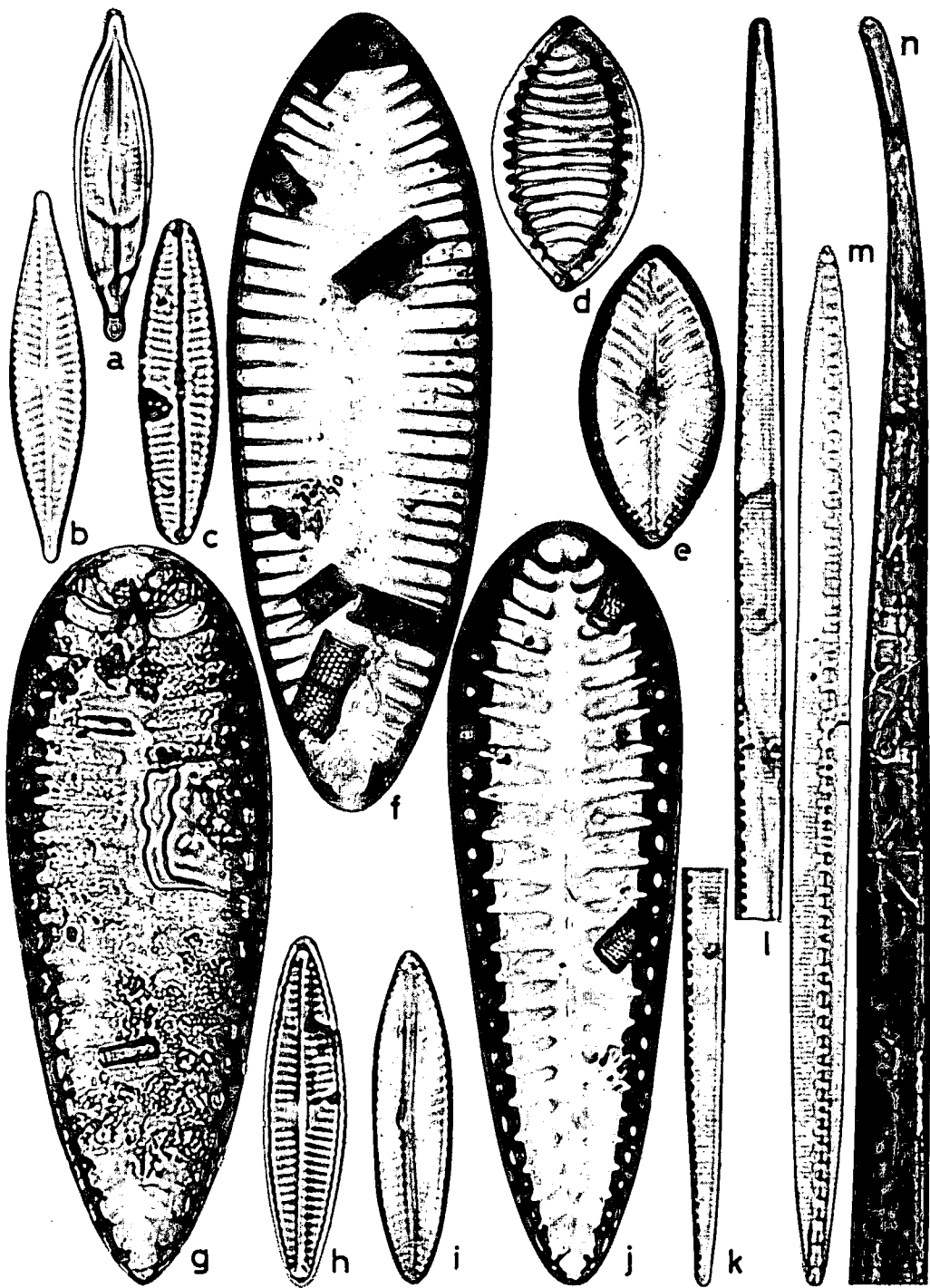
10 μ  
The other diatoms

0 10 20 30 40 50 μ  
*Suriella*



Plate 12

- a *Navicula secreta*
- b *N. cryptocephala* var. *intermedia*
- c *N. cinctaeformis*
- d *Nitzschia tryblionella* var. *debilis*
- e *Navicula clementis*
- f. *Surirella elegans*
- g *S. capronii*
- h *Navicula cinctaeformis*
- i *Achnanthes subhudsonis?*
- j *Surirella capronii*
- k, l *Nitzschia subtilis*
- m *Bacillaria paradoxa*
- n *Stenopterobia intermedia*



10  $\mu$

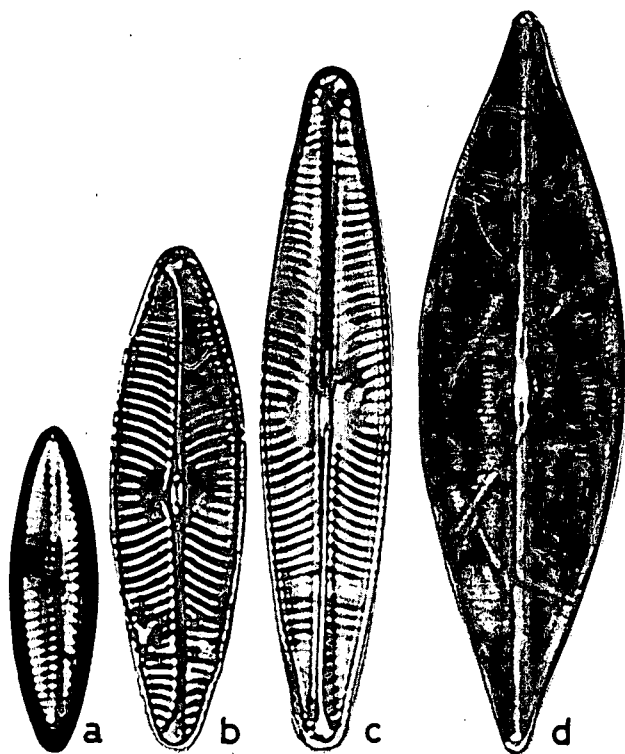
The other diatoms

0 10 20 30 40 50  $\mu$

*Suirella*

Plate 13

- a        *Navicula radiosa* var. *tenella*
- b, c     *N. viridula*
- d        *N. cuspidata* var. *heribaudi*



10 $\mu$