NOVA HEDWIGIA

ZEITSCHRIFT FÜR KRYPTOGAMENKUNDE

HERAUSGEGEBEN VON

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SONDERABDRUCK AUS

BAND XIII

CONTRIBUTIONS TO THE DIATOM FLORA OF SOUTH AFRICA

by

M. H. GIFFEN

3301 LEHRE

VERLAG VON J. CRAMER

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Diatomeenschalen im elektronenmikroskopischen Bild

von Prof. Dr. J. G. Helmcke (Forschungsgruppe für Mikromorphologie im Fritz-Haber-Institut, Berlin-Dahlem) u. Dr. W. Krieger (†). Unter Mitarbeit von Dr. U. Geissler (Berlin), Dr. J. Gerloff (Berlin) u. Dr. B. Reimann (La Jolla, Calif., USA).
Jeder Band mit etwa 100 Originalphotos und einem Textheft in dauerhafter Kassette. Groß-Oktav. Band I-V (wovon Band I u. II in zweiter Auflage) lieferbar. Preis je Band DM 75.– ($ 18.75)

Das Werk wird fortgesetzt, in jedem Jahr soll ein Band erscheinen.

Index Hepaticarum

An Index to the Liverworts of the world by C. E. B. Bonner, Geneva, Switzerland.
Volume i (containing issues 2-4): *Achiton* to *Cystolejeunea*. 1962/63. VIII, 926 pages. Wrappers.
DM 150.– ($ 37.50)

Issue 1: *Plagiochila*. 1962. VIII, 340 pages. Wrappers. DM 55.– ($ 13.75)

This Index including all species of Hepaticae described up to the end of 1960 will be published in issues at irregular intervals, it will be complete in 1965. The price per sheet of 16 pages is DM 2.50. Orders can only be accepted for the complete work. The first volume, consisting of issues 2-4, is now ready and can be bound. The first issue *(Plagiochila)* must remain unbound and will be inserted lateron in its alphabetical order.

Fungi in Oceans and Estuaries

by Prof. Dr. T. W. Johnson, jr. (Botany Department, Duke University, Durham, NC., USA) and Prof. Dr. F. K. Sparrow, jr. (Botany Department, University of Michigan, Ann Arbor, Mich., USA). 1961. XXIV & 668 pages, 19 tables, 7 figures in the text and 312 figures on 17 plates.
Clothbound DM 120.– ($ 30.–)

„With the comprehensive work the authors have solved the difficult problem of compiling all knowledge of marine mycology.... Even if the reader may have a different opinion in interpreting some of the problems, the book is a very valuable contribution to mycology and will be indispensable for the specialist in marine mycology. Also every other mycologist whether he is interested in taxonomy, physiology or ecology will profit by using it, and students of adjacent fields, like marine zoology or algology, will have to consult this book about many questions." (J. Kohlmeyer in Nova Hedwigia IV, 3+4)

Flora of Lowland Iraq

By Prof. Dr. K. H. Rechinger (Director of the Natural History Museum, Vienna). 1964. VIII, 736 pages. Clothbound. DM 150.– ($ 37.50)

This is the first and only existing flora of the area concerned. It is intended for the student as well as for any person interested in the botany of Iraq and adjacent countries. It will be welcome to the specialist as a source of quick reference as well as to ecologists, agronomists, range-managers etc. Many well known specialists have contributed treatments of individual families or genera, including the well known Kew Agrostologist Dr. N. L. Bor.

The Agaricales in Modern Taxonomy

By Dr. Rolf Singer (Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires). 2nd edition 1962 Royal-Octavo. VIII, 916 pages. 73 plates one of which is coloured. Clothbound.
Coloured dust jackett DM 120.– ($ 30.– £ 10 15 s)

"... In a short notice one cannot indicate all the important or novel conclusions adopted in such a monumental work. This is not just another system of classification. It is a comprehensive manual of Agaric studies up to 1950 and as such is indispensable to all serious mycologist whether specially interested in Agarics or not. Certainly it should be in the library of every higher educational institution where botany is taught..."
(R. W. A. Dennis in Kew Bulletin 1952: 98—100)

Die Gattung Cosmarium

von Dr. Willi Krieger † u. Dr. Johannes Gerloff (Kustos am Bot. Museum, Berlin-Dahlem).
Lieferung 1: 1962. Groß-Oktav. Seite III-XVIII, 1-112. Tafel 1-23. Eine Abbildung im Text.
Broschiert. DM 35.– ($ 8.75)

Dieses Werk war ursprünglich als Teil von Krieger's Desmidiaceenbearbeitung im Rabenhorst geplant. Die Grundkonzeption dieses Werkes wurde auch für die Bearbeitung der Gattung *Cosmarium* beibehalten. Aus diesem Grunde wurden auf den beigegebenen Tafeln auch alle infraspezifischen Taxa abgebildet. Der Beschreibung der Arten, die etwa 4—5 Lieferungen ausfüllen wird, folgt ein allgemeiner Teil mit ökologischen Angaben etc. Die Bestellung der ersten Lieferung verpflichtet zum Bezug des gesamten Werkes.

Contributions to the Diatom Flora of South Africa

III. Diatoms of the Marine Littoral Regions at Kidd's Beach Near East London, Cape Province, South Africa

By Malcolm H. Giffen[1])

With plates 59 (1) to 63 (5)

The diatom flora of the Marine littoral of South African coastal river estuaries is very superficially known. In a previous contribution (Giffen 1963) the author dealt with the diatoms of the Eastern Cape Province estuaries namely the Gulu River complex.

In the same year a paper on the Marine littorals of South Africa was published by Cholnoky (1963) which dealt with the Southern and South Western region of South Africa. Boden (1950) and Robinson (1952) covered the neritic diatom flora of the West coast of South Africa, but this does not properly belong to the littoral region.

The coastal regions from Knysna on the South Coast to the Northern boundary of South Africa has never been studied in detail, and its diatom flora is very imperfectly known.

The material for this contribution was collected in the vicinity of Kidd's Beach, a sea-side village about 20 miles south west of East London, an important seaport on the South African coast. The region enjoys a mild climate with warm rainy summers and dry mild winters. The coast is washed by the warm southward moving Mocambique current. The prevailing winds are north easterly and south westerly and they profoundly influence the movement of sea water along the coasts, considerably and rapidly changing the temperature of littoral waters which may range from 15°C to 24°C. During the rainy season, October to March (summer), when the coastal rivers are running

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strongly or in flood, great volumes of muddy fresh water are discharged into the sea, which becomes turbid and brown coloured for several miles out from the coastline. The salinity may drop from 35–36‰ to 30‰ or even lower near the river mouths.

As most truly marine diatoms are not tolerant of changes of salinity the littoral flora tends to show a great number of brack water or tolerant forms with an almost complete absence of genuine marine (planktonic) species. For example genera belonging to the Centricae *Stephanopyxis*, *Thalassiosira*, *Coscinodiscus*, *Rhizosolenia*, *Chaetoceros* which make up the bulk of planktonic diatoms are almost absent or represented by a few adaptable species.

Members of the Pennatae, viz. *Fragilarioideae*, *Achnanthoideae*, *Naviculoideae*, *Nitzschioideae* and *Surirelloideae*, which are present in plankton in restricted numbers of species, form the bulk of the littoral species. As an example, a comparison of species recorded from the plankton of the West Coast of South Africa by Boden (1950) shows 74 species belonging to the Centricae and only 18 from the Pennatae. In the littoral region under review the ratio is 20 Centricae and 237 Pennatae.

Another factor determining the species found in rock pools and sandy pools on the beaches is the constant seepage of fresh or brackish water from springs along the coast.

Between neap and spring tides tremendous changes in the salinity of these pools take place and only those species most tolerant and adaptable to rapid changes in salt concentration can survive.

In many cases rapid evaporation from pools which are cut off from the sea during neap tides can raise the salt concentration well above that of the sea. In my paper (cf. Giffen 1963: 214) I report a case of *Amphiprora gigantea* Grunow which showed a tolerance of salt (chloride) concentration from 1.5% to 4.18% *Nitzschia obtusa* var. *scalpelliformis* Grunow shows the same high adaptability.

Dimensions of Diatoms

A point which seems necessary to take into account in the determination of species from widely separated localities with their resultant different climates, temperature, altitude, etc., is the widely divergent dimensions shown by species. Throughout the discussions on the identity of certain diatoms, particularly in the genera *Amphora*, *Navicula* and *Nitzschia*, I have drawn attention to the differences observed in length, breadth and number of striae in specimens of which no doubt as to their identity can be entertained. A rigid ad-

herence to the measurements given by authorities such as CLEVE, HUSTEDT, PERAGALLO and VAN HEURCK in their various monographs, can inevitably lead to multiplication of synonyms or at most to an increase in varietal names.

This question is fully discussed by HENDEY (1951, 17–27 & 42 and Plates I, II and III) with regard to the variation in length and breadth in *Navicula Grevillei* (AGARDH) CLEVE, and particularly in *Achnanthes longipes* AGARDH caused by seasonal variations in a single locality.

I do not propose to rediscuss the problem so ably presented by HENDEY except to add that the climatic conditions and salinity in the littoral regions of South Africa also have their effect on dimensions, as seen and measured in my specimens and brought out in the systematic part of this paper.

Samples

The material for this paper is based on 10 samples collected within the estuary and at the mouth of the Umkantzi River, Kidd's Beach, from beach sands at the mouth of the "lagoon" and from rocky and sandy pools along the beaches on either side of the river mouth. The numbers refer to the samples and slides in the GIFFEN collection housed in the Botany Department of the University College of Fort Hare.

165 Collected from washings of *Codium* sp. This station was exposed after the mouth of the river lagoon opened after a high tide and the level dropped about 1.5 m. – 1. 1. 1946.

169 Scrapings from rocky banks of the lagoon. Strongly brack. – 1. 1. 1946.

195 Washings from *Ectocarpus* sp. in very brackish water. – 22. 9. 1963.

197 From pools at the high tide mark along the beach north east of the river mouth. – 30. 1. 1946.

210 From algal masses (*Cladophora* sp.) floating in the Childrens' Paddling Pool. This enclosure up to 30 cms. deep had been recently constructed above normal tide level and only refills after spring tides. It is contaminated with fresh water flowing in during rainy periods from the Village Commonage. – 10. 10. 1963.

211 From algal masses *Cladophora* sp. and *Ectocarpus* sp. floating near the mouth of the Umkantzi Lagoon. This is very brackish water regularly fed by sea water during spring tides. – 10. 10. 1963.

507 From masses of *Cyanophyta* (*Lyngbya* sp.) attached to rocks in rock pools north east of the river mouth above normal tide level. Fed by wave action at spring tides and by seepage of fresh or brackish water from the land above. – 23. 1. 1961.

509 Scraping from rock surfaces in similar pool to 507. – 23. 1. 1961.
510, 511 From diatom covered sand in pools on the beach refilled only during spring tides. – 23. 1. 1961.
518 From diatom covered sands at the mouth of the Umkantzi Lagoon. The river mouth was closed ("blind") at the time and evaporation and seepage through the sandy bar had lowered the level a few cms.

Systematic Part

References to original descriptions have only been given where species are of recent origin or not reported in wellknown modern literature or not previously reported by the author. Certain wellknown cosmopolitan species are dealt with without citation. These species are described and figured effectively in HUSTEDT 1930 *(Bacillariophyta)* and 1930–1963 (Kieselalgen). For convenience of reference, genera and species are reported in alphabetical order.

Achnanthes BORY 1822

A. brevipes AGARDH. This species was abundant in only one sample from the area under review and has been previously recorded from the Western Cape Province (CHOLNOKY 1963: 38). – 210

A. brevipes var. *angustata* (GRUNOW) CLEVE (cf. HUSTEDT in A. S. Atl., T. 418, f. 10–15). In a single sample (165) which proved very rich in individuals of *A. brevipes* var. *intermedia* (KÜTZING) CLEVE many examples could be identified as *A. brevipes* var. *angustata*. As it is possible, however, to arrange an unbroken series of forms from 50–90 µ long and 5–12 µ wide and with 6–13 striae in 10 µ, I feel that many of the varieties described can not really be upheld. In an earlier paper (cf. GIFFEN 1963: 211) I included *A. kuwaitense* HENDEY (1957) under *A. brevipes* var. *intermedia*. CHOLNOKY (1963: 39) places HENDEY's variety with *A. brevipes* var. *angustata*. It is in cases like this that the danger of multiplying varieties in an extremely variable species is so clearly seen. In my opinion varieties are only justified in a fairly stable species when no intermediates can be found between the species and its variety. For convenience, however, where a variety is of ecological significance it may be desirable to uphold some of the more pronounced varieties. – 165

A. brevipes var. *intermedia* (KÜTZING) CLEVE. This variety as mentioned above is very abundant, widespread, and extremely variable. – 165, 169, 195, 197, 210, 211

A. Hauckiana Grunow (cf. Hustedt, Kieselalg. 2: 388, f. 834). This species is never frequent in the material and always rare in the samples. – 195. 211. 507

A. longipes Agardh. This species occurred in large numbers in only one sample and showed great variation in shape and dimensions. Hendey (1951: as quoted in the introduction to this paper) gives a very clear account of the variability of this species. Similar conditions exist in the material under review in the Eastern Cape Province. – 210

A. manifera Brun (cf. Hustedt 1955: 18, Pl. 6, f. 1–8; Giffen 1963: 212, f. 1–4). Rare. – 509

Actinoptychus Ehrenberg 1839

A. splendens (Shadb.) Ralfs (cf. Hustedt, Kieselalg. 1: 478, f. 265). Rare. – 211

Amphipleura Kützing 1844

A. micans (Lyngbye) Cleve var. *fragilis* (Greville) Gregory (cf. Hustedt, Kieselalg. 2: 723, f. 1094b). This occurred rarely in two samples. The length is less than described by Cleve (1894: 126) and the breadth narrower in proportion than could be expected. The striae are very fine and delicate. Dimensions 47–52 µ long, 4 µ wide, striae ca. 40 in 10 µ as opposed to 32–36 in 10 µ (Cleve). – 197, 211

A. rutilans (Trentepohl) Cleve (cf. Giffen 1963: 212, f. 5). Apparently widespread in South Africa. Recorded also from the South Western Cape (Cholnoky 1963: 40). Typically estuarine. – 165, 169, 195, 211

Amphiprora Ehrenberg 1843

Amphiprora galerita n. sp. Frustule in girdle view deeply constricted with truncate widely hooked ends, 70–90 µ long, 30–40 µ wide. Valve strongly winged, about 15 µ wide at the ends, 7–10 µ in the middle, base line of the wings arcuate, raphe canal sharply defined. Valve with striae 20–25 (usually 25) in 10 µ on both wing and valve. The striae ending in a row of strong puncta both at the basal line and at the raphe canal. Slightly stronger striae curve around the hooked end, also decorated with strong puncta.

Type slide 197 in the Giffen collection.

Frustulae in visu connectivale valde constrictae, apicibus truncatis, hamulatisque, 70–90 µ longae, 30–40 µ lataeque. Valva distinctissime alata, ad apices versus 15 µ, in media parte 7–10 µ lata, linea basalis alarum arcuata, canalis rhaphae distinctissimus. Valvae alaeque striis 20–25 (fere

25) in 10 μ ornatae, punctis ultimis et apud lineam basalem alarum et apud rhaphem maioribus validioribusque. Striae in vicinitate apicium hamulatorum plus curvatae, autem punctis solitariis distinctis munitae.

Habitat in aquis subsalsis lacunarum litoris borealis prope ostium fluvii Umkantzi in colonia Kidd's Beach dicta in provincia Capense Africae Meridionalis.

Typus: praeparatum No. 197 in collectione GIFFEN, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 1–3.

This extraordinary and characteristic species occurred, always scarce, in several samples and when first observed was regarded as an abnormality. However, several others were seen in material from samples taken several miles apart and *A. galerita* n. sp. can be regarded as a valid species. – 197, 210, 510 (Fig. 1–3)

A. gigantea GRUNOW (cf. GIFFEN 1963: 214, f. 9). – 165, 169, 211

A. gigantea var. *tahitensis* GRUNOW (cf. CLEVE 1894: 18). Frustule and valve are very faintly silicified with faint and delicate striae arranged decussately on the wing which is very strongly sigmoid. As it occurs in the material with *A. paludosa* var. *duplex* (DONKIN) CLEVE and var. *hyalina* (EULENSTEIN) CLEVE it can be easily confused with these and be overlooked. Dimensions 35–45 μ, 9–10 μ broad, striae 22 in 10 μ very faint. – 210 (Fig. 4, 5)

A. paludosa W. SMITH var. *duplex* (DONKIN) CLEVE (cf. GIFFEN 1963: 214). Frequent in several samples and widespread in South Africa. – 169, 197, 210

A. paludosa var. *hyalina* (EULENSTEIN) CLEVE (1894: 15). This variety differs only in size from *A. paludosa* var. *duplex* (DONKIN) CLEVE and as it occupies the same ecological habitat should be included in *A. paludosa* var. *duplex*. In the rich material from the Eastern Cape Province no break in the size range between the two varieties could be observed. – 169, 197, 210

A. perplexa GIFFEN 1963: 215, f. 12. Found in only one sample and not common. – 518 (Fig. 6)

Amphora EHRENBERG 1840

A. acutiuscula KÜTZING (cf. CLEVE 1895: 121). This species is widespread in the South African littoral. – 195, 197, 510

A. angusta (GREGORY) CLEVE (cf. CLEVE 1895: 135, A. S. Atl., T. 25, f. 15; GIFFEN 1963: 216). Widespread and very variable. – 165, 169, 195, 210, 211

A. angusta var. *ventricosa* (GREGORY) CLEVE (cf. CLEVE 1895: 135; HUSTEDT 1955: 42, Pl. 16, f. 26). – 165, 169, 195, 210

A. arenicola Grunow (cf. Cleve 1895: 104, Pl. IV, f. 19–22, with vars., A. S. Atl., T. 27, f. 39–41). Characteristic and typical specimens were found in material chiefly from sandy beaches. – 165, 197, 507, 510

A. bigibba Grunow (cf. A. S. Atl., T. 25, f. 65–67, 70–77; Hustedt 1955: 40, Pl. 14, f. 19–25). Cholnoky (1963: 40) reports finding small specimens, only about 15 µ long in the South Western Cape Coast (Steenbras) Some of the specimens seen in Eastern Cape material, though undoubtedly identical with *A. bigibba* varied from 7–20 µ long with striae 15–20 in 10 µ. Hustedt (l.c.) discusses the possible identity of *A. binodis* Gregory and *A. bigibba* Grunow and also the variability of the striation. Scarce. – 509

A. castellata Giffen (1963: 216, f. 13, 14). Abundant throughout the locality. In many cases seen, the central shortened stria is fairly widely separated and considerably stronger than the others. – 197, 210 (Fig. 7)

A. exigua Gregory (cf. Giffen 1963: 217, f. 17, 18). – 169, 510

A. exilissima n. sp. Frustule elliptical with truncate ends 9–10 µ long. Valve with convex dorsal margin and almost straight ventral margin, 9–10 µ long, 2.5–3 µ broad. Ends of the valve more or less acute. Raphe straight close to the ventral margin. Striae ca. 25 in 10 µ scarcely visible. A well marked but narrow stauros crosses the middle of the valve.

Type slide 210 in the Giffen collection.

Frustula elliptica apicibus truncatis, 9–10 µ longa. Valvae margine dorsale convexo, ventrale paene directo, 9–10 µ longae, 2,5–3 µ latae, apicibus plus minusve acutis. Rhaphe directa, margine ventrale approximata. Striae transapicales circiter 25 in 10 µ, haud visibiles. In parte mediana valvarum stauros distinctissimus sed angustus bene visibilis.

Habitat in lacu uno subsalso semiartificiale prope ostium fluvii Umkantzi in colonia Kidd's Beach dicta provinciae Capensis in Africa Meridionale.

Typus: praeparataum No. 210 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 8 et 9.

This small Amphora probably belongs to the section *Oxyamphora* Cleve and seems closely allied to *A. laevis* Gregory, particularly to its smallest variety *A. laevis* var. *perminuta* Grunow, but even this var. is almost twice as long (16–18 µ in length). It is frequent in the material. – 210 (Figs. 8, 9)

A. gamtoosae Giffen (1963: 218, f. 21). A few typical examples were seen in one sample. – 210 (Fig. 10)

A. granulata Gregory (cf. Cleve 1895: 123; Hustedt 1955: 40, Pl. 14, f. 8–10, 26, 27). This species is recorded here with some doubt.

In shape, the individuals seen are identical with HUSTEDT's figures (l.c.) but, though the transapical striae on the dorsal side show double rows of puncta as described by HUSTEDT in number they are 17–18 in 10 μ. HUSTEDT discusses fully in his paper the relationship between *A. cymbifera* GREGORY and *A. granulata* GREGORY. For *A. cymbifera* GREGORY CLEVE gives 8–9 striae in 10 μ, which agrees with the figures in A. S. Atl., T. 15, f. 17–19, 33, 34, 36, whereas in *A. granulata* the number varies from 10–14 in 10 μ. This agrees with HUSTEDT's findings in material from the Balearic Isles and Beaufort, N.C., viz. 13 and 10–12 in 10 μ respectively. In the very few examples seen in my material the number in 17–18 in 10 μ which is closer than given in any description. In view, however, of the variation in the striation of many well authenticated species, and in the identity of shape, I am fairly satisfied that the species recorded here belongs to *A. granulata* GREGORY. – 510 (Fig. 11)

A. hyalina KÜTZING (cf. CLEVE 1895: 127, A. S. Atl., T. 26, f. 52–55; HENDEY 1951: 70, Pl. 15, f. 5). My specimens agree very closely with the cited figures although the striation is certainly finer (28–30 in 10 μ) than given in CLEVE's description (23 in 10 μ). – 210 (Fig. 12)

A. incredulata n. sp. Frustule linear with broad rounded ends, slightly constricted in the middle. Valves linear with obliquely rounded ends 52 μ long, 18 μ broad. Axial area narrow, raphe biarcuate more or less distant from the ventral margin. Striae 20 in 10 μ on both sides of the raphe, decorated with irregular moderately large puncta 8–11 in 10 μ along the ventral edge of the raphe. A slight fold or limbus also appears on the ventral side. Intercalary bands 8–10 in 10 μ, striate 25–26 in 10 μ.

Type slide 197 in the GIFFEN collection.

Frustula linearia apicibus late rotundatis, in parte mediana levissime constricta. Septa connectivalia numerosa, 8–10 in 10 μ, striis subtilibus sed distinctis 25–26 in 10 μ ornata. Valvae lineares apicibus oblique rotundatis, circiter 52 μ longae, 18 μ latae. Area axialis angusta, fissurae rhaphae arcuatae, margine ventrale valvae plus minusve distantes. Striae transapicales in semi-valvis utribus circiter 20 in 10 μ. Margo ventralis areae axialis punctis magnis, irregulariter positis munitus. In semivalva ventrale limbus unus indistinctus strias transapicales decussat.

Habitat in aquis subsalsis lacunarum litoris borealis prope ostium fluvii Umkantzi in colonia Kidd's Beach dicta provinciae Capensis in Africa Meridionale.

Typus: praeparatum No. 197 in collectione GIFFEN, Fort Hare, provincia Capensis.

Iconotypus: figura nostra No. 13.

This remarkable *Amphora* appears at first sight to be an *Amphiprora* or a *Tropidoneis* but its non-sigmoid raphe and general structure,

particularly of the ventral side of the frustule, place it with *Amphora*, and probably in the section *Calamphora* Cleve on account of the fold or limbus on the ventral margin. Though a few frustules were seen, it was not common. – 197 (Fig. 13)

A. laevis Gregory var. *laevissima* (Gregory) Cleve (cf. Cleve 1895: 130, A. S. Atl., T. 26, f. 3, 13, 14). Frustule more or less 10 µ wide. Valve 36–43 µ long, 4–5 µ broad. Striae invisible. Stauros well developed. – 210 (Fig. 14)

A. lineolata Ehrenberg (cf. Cleve 1895: 126, A. S. Atl., T. 26, f. 50, 51). Valves 42–50 µ long, 7–9 µ wide. Transapical striae 18 in 10 µ which are slightly wider than in Cleve's description (20–23 in 10 µ). Longitudinal striae ca. 30 in 10 µ, distinct. I have no doubt as to the identity of this species which follows many species of Amphora in having a variable number of striae in 10 µ. Frequent.
– 165, 210 (Fig. 15)

A. micrometra n. sp. Frustule very small, 7–8 µ long, up to 5 µ wide, elliptical with truncate ends. Valves 7–8 µ long, 2.5 µ wide, with convex dorsal margin, and slightly protracted rounded ends, ventral margin straight or slightly convex. Raphe almost straight, near the ventral margin. Striae on both sides of the raphe extremely fine and scarcely visible.

Type slide 210 in the Giffen collection.

Frustula minutissima 7–8 µ longa, usque ad 5 µ lata, elliptica, apicibus truncatis. Valvae 7–8 µ longae, circiter 2,5 µ latae, margine dorsale convexo, ventrale directo sive levissime convexo, apicibus leviter protractis, regulariter rotundatis. Rhaphe paene directa, margine ventrale approximata. Striae semivalvarum lateralium utrium delicatissimae, haud visibiles.

Habitat in aquis subsalsis lacus uni semiartificialis apud ostium fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionalis.

Typus: praeparatum No. 210 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 16 et 17.

This minute *Amphora* probably belongs to the section *Oxyamphora* Cleve, but the smallness of the valve and its hyaline appearance make its position uncertain. – 210 (Fig. 16, 17)

A. ostrearia Brébisson var. *vitrea* Cleve (cf. Giffen 1963: 220, f. 24, 25). – 197, 509

A. ovalis Kützing. This freshwater diatom is probably present through displacement from the upper reaches of the Umkantzi River.
– 165, 195

A. ovalis var. *pediculus* Kützing. – 165

A. proteoides Hustedt (1955: 37, Pl. 13, f. 9–11; Giffen 1963: 220, f. 26). – 169, 195

A. sublaevis Hustedt (1955: 41, Pl. 13, f. 3, 12–15). Valve 30 µ long, 6 µ broad. Striae not visible. Raphe with turned-down central pores in a strong rib. I have placed this form with Hustedt's *A. sublaevis* with some doubt, for although it agrees in dimensions and general shape, the convex ventral margin, the complete absence of a ventral portion (which may be due to position on the slide) and the fairly strong rib carrying the raphe may separate it on study of further material as a new species. Only one valve was seen. – 197 (Fig. 18)

A. tenuissima n. sp. Frustule lanceolate with obtuse rounded ends. Valve 30–66 µ long, 5–7 µ broad with protracted down curved ends. Raphe slightly biarcuate, near the ventral margin of the valve. Central pores sharply deflected towards the dorsal margin. Axial area narrow lanceolate, scarcely widened in the central area. Striae 15–16 in 10 µ, clearly punctate, puncta ca. 25 in 10 µ forming 4–5 more or less straight rows.

Type slide 165.

Frustula lanceolata apicibus obtuse rotundatis. Valvae 30–66 µ longae, 5–7 latae, apicibus protractis, in directione ventrale deflexis. Fissurae rhaphae curvatae, margine ventrale valvae approximatae, poris centralibus in directione dorsale valde deflexis. Area axialis angustissime linearis, centralis haud evoluta. Striae transapicales 15–16 in 10 µ, distincte punctatae. Puncta circiter 25 in 10 µ. Costae longitudinales directae, bene visibiles, rhaphe parallelae, itaque puncta striarum in lineis directis longitudinalibus ordinata esse conspiciuntur.

Habitat in lacuna ostii fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 165 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 19 et 20.

This species is very similar to a form figured by A. Schmidt in A. S. Atl., T. 25, f. 11, from Yokohama, without name, but his specimen is larger, 75 µ long, 8 µ broad, with dorsal and ventral striae 9–10 in 10 µ clearly punctate. Occasional individuals (possibly auxosporic types) were seen 60–66 µ long, 5 µ broad, with dorsal and ventral striae 12 in 10 µ. This has a wider axial area but is essentially the same as *A. tenuissima*. – 165, 211 (Fig. 19–21)

Arachnoidiscus Bailey 1849

A. ornatus Ehrenberg (cf. A.S. Atl., T. 73, f. 4–6, 10; Brown, N. E. 1933: 49, Pl. 3, f. 2–5). A tropical species wellknown along the South

African coasts epiphytic on algae. Represented in the local material by individuals washed up by wave action or from decayed algae. Very rare in one sample. – 197

Biddulphia S. F. Gray 1821

B. aurita (Lyngbye) Brébisson & Godey (cf. Giffen 1963: 222, f. 30). 210

B. aurita var. *obtusa* (Kützing) Hustedt (cf. Hustedt, Kieselalg. 1: 848, f. 502; A. S. Atl., T. 120, f. 20–24, T. 122, f. 15, 30, 31). – 197

B. mobiliensis Bailey (cf. Hustedt, Kieselalg. 1: 840, f. 495; Boden 1950: 394, f. 77). Previously recorded by Boden in plankton from South West African coast. This species occurred sparingly in only one sample. It is separable from *B. aurita* (Lyngbye) Brébisson & Godey by the slender valve processes, widely separated spines and the much finer areolation. A pelagic form washed up into the littoral. – 507

B. pulchella Gray (cf. Hustedt, Kieselalg.: 832, f. 490; A. S. Atl., T. 118, f. 26–33, T. 120, f. 26, T. 121, f. 1, 2). Occurs attached to algae in the littoral zone and is not uncommon in samples from beach sands, probably brought there by decaying algae. – 197, 510

B. reticulata Roper (cf. A. S. Atl., T. 78, f. 21–23, T. 84, f. 15, 16, T. 121, f. 11–15; Giffen 1963: 222). This is apparently a tropical species not recorded by Hustedt in the "Kieselalgen" (1930–1963). Its habitat here is unknown and it has only been found occasionally in samples from beach sands where it has probably been washed up. – 197

B. Tuomeyi (Bailey) Roper (cf. Hustedt, Kieselalg. 1: 834, f. 491; A. S. Atl., T. 118, f. 13–18, T. 119, f. 15–17). The distribution in Cape Eastern littoral is similar to that of the previous species. The epiphyte littoral diatom flora of South Africa is very imperfectly known and has as yet to be investigated. Such detailed observations will perhaps solve some of the problems of distribution of these rarely observed species. – 197

Caloneis Cleve 1891

C. brevis (Gregory) Cleve (cf. Cleve 1894: 61; Gregory 1857: 478, Pl. 9, f. 4; Donkin 1871: 19, Pl. 3, f. 4). This species is very variable in shape and dimensions. Cleve (l.c.) in his description gives the length as 60–80 µ but many individuals from my material may reach as much as 100 µ long. The striation also may be coarser, i.e. 11–12 in 10 µ. Very common in samples from beach sands.
– 197, 518 (Fig. 22)

C. brevis (Gregory) Cleve var. *distoma* Grunow n. f. *africana*. The var. *distoma* Grunow is distinguished from the type, which is elliptical with rostrate obtuse ends, in being elliptical with broad rounded ends. Cleve describes three forms of this variety, namely f. *latior* Cleve, f. *angustior* Cleve and f. *bicuneata* Cleve. Of these the first two can be compared with the South African specimens in shape, but both are considerably larger, namely 68–78 µ long, 20–26 µ broad and with 13–14 and 15–16 striae in 10 µ respectively. Average specimens from my material were 45 µ long, 22 µ wide and with 11–12 striae in 10 µ, with no individuals filling the gap between the 45 µ long members and the described forms of 66–78 µ long. These local forms are therefore separated as n. f. *africana*.

Valves elliptical 36–45 µ long, 20–22 µ broad with 11–12 striae in 10 µ. Frequent on sandy beaches. – 197, 518 (Fig. 23)

Differt a typo valvis brevioribus sed latis et striis distantioribus. Valvae ellipticae 36–45 µ longae, 20–22 µ latae, striae transapicales 11–12 in 10 µ.

Habitat in aquis subsalsis lacunarum litoris borealis prope ostium fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionalis.

Typus: praeparatum No. 197 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figura nostra No. 23.

C. liber (W. Smith) Cleve (cf. Giffen 1963: 222, f. 31). The variability in shape and size of this species in South Africa has been dealt with in a previous paper (Giffen, l. c.). Widespread and often abundant. – 165, 169, 195, 211

Campylodiscus Ehrenberg 1841

C. parculus W. Smith (1853: 30, Pl. 6, f. 56 = *C. simulans* Gregory, cf. Giffen 1963: 223, f. 35). Previously recorded from the Eastern Cape Province (Giffen 1963) and from the South Western regions also (Cholnoky 1963). Always rare in the region under review. – 165

Campyloneis Grunow 1862

C. Grevillei (W. Smith) Grunow (cf. Cleve 1895: 167; Hustedt, Kieselalg. 2: 321, f. 781). Previously recorded from South Western littoral by Cholnoky (1963: 42) and probably widespread along South African coasts. Epiphytic on green algae, e.g. *Codium platylobium* Areschough. – 197, 210, 510

Chaetoceros Ehrenberg 1844

C. cinctus Gran (cf. Hustedt, Kieselalg. 1: 748, f. 432a, b; Boden 1950: 369 ff.). This widespread and numerous genus of planktonic diatoms has been well investigated by Boden in his monograph on the marine planktonic diatoms from the West Coast of South Africa. He records 30 species of which several occur in samples from this Eastern region. They are probably driven ashore during storms which cause violent turbulence in the currents forcing planktonic diatoms on to the coast. The species observed here are almost invariably fragmentary, single damaged valves or fragments, many of which are unidentifiable as species. Of these *C. cinctus* Ehrenberg was found only in the resting spore state (Dauerspore). These are characterised by the strong anchorlike processes as figured by Hustedt, l. c., f. 432b. This species is notrecorded by Boden. – 507 (Fig. 24)

C. gracilis Schütt (cf. Hustedt, Kieselalg. 1: 758, f. 440; Boden 1950: 388, f. 69). Several examples of this small and delicate species were seen from beach sands. – 509

C. radicans Schütt (cf. Hustedt, Kieselalg. 1: 746, f. 431). Not recorded by Boden. This species is characterised by long pairs of bristles beset with fine spines. – 509 (Fig. 25)

Cocconeis Ehrenberg 1838

C. convexa n. sp. Frustule with slightly bent lower valve (hypovalva) and very strongly arched upper valve (epivalva) giving a partially hemispherical side view. Valve broadly elliptical 12–32 µ long, 9–20 µ broad. Epivalve with straight longitudinal pseudo-raphe, striae 28–30 in 10 µ crossed by numerous (6–8) slightly undulate blank areas, hypovalve with narrow straight axial area slightly widened around the central nodule and ending a short distance from the ends of the valve, raphe straight with moderately close central pores and strong elongate terminal pores. Striae radiate 20 in 10 µ, middle striae alternately longer and shorter, finely punctate.

Type slide 210 in the Giffen collection.

Frustula in conspectu pleurale semicircularia quia hypotheca haud, sed epitheca valde convexa est. Valvae late ellipticae, 12–32 µ longae, 9–20 µ latae. Areovalva: area axialis directa, linearis, striae lineis numerosis (6–8) longitudinalibus, leviter undulatis hyalinis decussatae, 28–30 in 10 µ. Rhaphovalva: rhaphe directa, poris centralibus modice approximatis, fissuris terminalibus valde elongatis. Area axialis anguste linearis, directa, marginem

valvae polarem non attingens, centralis abbreviatione striarum transapicalium mediocriter dilatata. Striae transapicales radiantes, circiter 20 in 10 μ, apud nodulum centralem brevioribus intercalatis, subtiliter punctatae.

Habitat in lacu uno subsalso semiartificiale prope ostium fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 210 in collectione GIFFEN, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 26–28.

This new species somewhat resembles *C. pediculus* EHRENBERG, but differs in having no hyaline margin, no hyaline areas at the ends and closer striae on both valves.

HAGELSTEIN (1938: 343, Pl. 4, f. 7, 8) figures *C. singularis* HAGELSTEIN whose epivalve is very like that of *C. concava* but has a sigmoid pseudoraphe. No hypovalve of *C. singularis* is known. Examination of many valves of the new species show no signs of a sigmoid raphe or pseudoraphe. *C. singularis* is also larger with somewhat coarser striation, thus no identity of the two species can be assumed.

– 210 (Fig. 26–28)

C. discrepans A. SCHMIDT (in A. S. Atl., T. 193, f. 26, 27; CLEVE 1895: 196). This species was figured by A. SCHMIDT in the Atlas l.c. (1894) without description. CLEVE (1895: 196) includes the species in his section "imperfectly known species which cannot for the present be admitted to the above monograph." The numerous individuals seen, agree completely with SCHMIDT's figures, which were drawn from material from Table Bay (South Africa) and Campeche Bay (South America). I give a diagnosis in addition to my figures.

Valves rather narrow elliptical with rounded ends, 12–16 μ long, 6–7 μ broad. Raphe valve with narrow axial area scarcely widened at the central nodule, raphe straight, filiform, ending shortly before the ends of the valve. Striae not visible but apparently crossed by a narrow line or blank band halfway between the raphe and the margin. There is apparently a rim round the margin.

Rapheless valve with lanceolate narrow axial area, striae 17–18 in 10 μ, crossed by one or two wide or narrow blank bands, one in the middle of the striae and one close to the margin (? rudimentary loculiferous annulus). – 510 (Fig. 31–33)

C. distans GREGORY. Not uncommon. – 510

C. distantula n. sp. Valve more or less flat, narrow elliptical to elliptical-lanceolate in shape, 16 μ long, 8 μ broad. Rapheless valve with narrow pseudoraphe, striae strong, 15 in 10 μ crossed by several blank areas on each side of the pseudoraphe, forming 3–4 rows of transapically elongated puncta (occasionally 1–2 rows). Raphe valve

with narrow rudimentary loculiferous annulus, loculi 17–18 in 10 µ. Raphe straight, axial area narrow widening slightly around the central nodule, striae 17–18 in 10 µ, faintly punctate not reaching the margin, stronger towards the margin than towards the central area.

Type slide 510 in the GIFFEN collection.

Valvae plus minusve planae, anguste ellipticae sive elliptico-lanceolatae, circiter 16 µ longae et 8 µ latae. Areovalva: area axialis anguste linearis, striae crassae, 15 in 10 µ, pluribus areis longitudinalibus hyalinis decussatae, itaque striae ex punctis transapicaliter elongatis 3–4 (nonnumquam 1–2 solum) compositae esse conspiciuntur. Rhaphovalva: valva cum anulo rudimentario loculifero marginata. Rhaphe directa, area axialis anguste linearis, in media parte leviter dilatata, aream centralem parvam, indistinctam formans. Striae transapicales 17–18 in 10 µ, subtiliter punctatae, marginem valvae non attingentes, sed ad margines versus crassiores.

Habitat in lacunis parvis litoralibus ad oras ostii fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 510 in collectione GIFFEN, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 29 et 30.

The epivalve is similar in appearance to that of *C. disculus* (SCHUMANN) CLEVE. – 510 (Fig. 29, 30, 30a)

C. heteroidea HANTZSCH. Widespread in the South African littoral. – 165

C. pellucida GRUNOW. Widespread in the South African littoral. – 165, 211

C. placentula EHRENBERG var. *euglypta* (EHRENBERG) CLEVE (cf. GIFFEN 1963: 224). A fresh water diatom found mostly in this region in seepage pools on beaches and springs. – 165, 169, 211

C. scutellum EHRENBERG (cf. GIFFEN 1963: 224, f. 40). One of the most abundant and widespread species of *Cocconeis* in the South African littoral. – 165, 197, 211

C. scutellum var. *parva* GRUNOW (cf. GIFFEN 1963: 224, f. 41). Usually found accompanying the type but not so abundant. – 165, 169, 195

C. scutellum var. *stauroneiformis* W. SMITH (cf. HUSTEDT, Kieselalg. 2: 339, f. 792). Never abundant nor apparently as widespread as the type or its var. *parva*. – 210

C. testudo GIFFEN (1963: 225, f. 37–39). This large epiphytic diatom occurs on species of the green alga *Codium*, and also on the red Corallines. It is found sporadically in samples from beach sands. – 197, 210

Coscinodiscus Ehrenberg 1838

C. nitidus Gregory (cf. Hustedt, Kieselalg. 1: 414, f. 221, A. S. Atl., T. 58, f. 18, 19). The majority of species of *Coscinodiscus* are marine and pelagic and thus occur rarely in the littoral regions, most of those being observed are not autochtonous in this habitat. *C. nitidus* Gregory, however, is recorded by Hustedt (l.c.) as being widespread along the coastal regions of all oceans. Previously recorded from the Cape of Good Hope in A. Schmidt's Atlas, l.c. – 197. 210

Cymbella Agardh 1830

C. gracilis (Rabenhorst) Cleve (1894: 169; cf. Hustedt 1930: 359, f. 663). A freshwater species washed into the estuary by local streams. – 197

C. pusilla Grunow (cf. Giffen 1963: 227). A brack water species common in the upper sections of coastal river estuaries in the East Cape. – 195

C. radiosa Reichelt (cf. Hustedt in A. S. Atl., T. 377, f. 8–10; Giffen 1963: 227). Similar in distribution and ecological habitat to the above *C. pusilla* Grunow. – 195

Diploneis Ehrenberg 1844

D. bombus Ehrenberg (cf. Giffen 1963: 227). This species is usually frequent and often abundant in most of the brackish water estuaries of the Eastern Cape rivers. – 165, 169, 195, 210, 211

D. bombus var. *bombiformis* Hustedt (cf. Hustedt, Kieselalg. 2: 707, f. 1086 f.). An estuarine form not uncommon and usually accompanying the type. – 165, 195 (Fig. 34)

D. didyma Ehrenberg. Occasional. – 197

D. fusca (Gregory) Cleve var. *hyperborea* (Grunow) Hustedt. Occasional on sandy beaches. – 197, 510

D. fusca var. *hyperborea* f. *excisa* (A. Schmidt) Hustedt (cf. Hustedt, Kieselalg. 2: 657, f. 1057b). This usually accompanied and was somewhat more abundant than the variety. – 197, 510

D. interrupta (Kützing) Cleve. Common and often abundant. – 165, 169, 197, 210

D. notabilis (Greville) Cleve var. *oblonga* Heiden (cf. Hustedt, Kieselalg. 2: 682 without fig.; Cholnoky 1963: 48, f. 22). Recently recorded by Cholnoky (l.c.) from the South Western Cape (Steenbras). – 510

D. parca (A. Schmidt) Boyer (cf. Cleve 1894: 81; Hustedt, Kieselalg. 2: 664, f. 1061; Cholnoky 1963: 48, f. 23). The specimens occurring in my material were all slightly more lanceolate than shown in Hustedt's figures and closer to forms figured by Cholnoky.
– 195 (Fig. 35)

D. pseudovalis Hustedt (cf. Hustedt, Kieselalg. 2: 668, f. 1063c; Giffen 1963: 228). Not uncommon in the brack waters of the upper portions of East Cape river estuaries. – 195

D. Smithii (Brébisson) Cleve. A widespread estuarine species.
– 165, 195, 210

D. Smithii f. *cuneata* (A. Cleve) Hustedt (cf. Giffen 1963: 228, f. 47). Previously recorded by the author from a neighbouring East Cape river (Gulu River). – 165, 195, 211

D. Smithii var. *recta* M. Peragallo (cf. Hustedt, Kieselalg. 2: 650, f. 1052b). This variety occurred in one sample and is sometimes difficult to distinguish from similar sized forms of the fresh water species *D. subovalis* Cleve. In South African waters *D. subovalis* is very variable and many individuals show almost parallel furrows round the central nodule placing them close to *D. Smithii* var. *recta*. These two forms have been separated here more on their ecological habitat than on clear morphological characters. – 210

D. subovalis Cleve (cf. Giffen 1963: 228). Abundant in most estuarine samples and very variable in size and shape.
– 165, 169, 195, 197

D. vacillans (A. Schmidt) Cleve var. *renitens* A. Schmidt (cf. Giffen 1963: 228, f. 49). – 210

Entopyla Ehrenberg 1841

E. ocellata (Arnott) Grunow var. *calaritana* Fricke (in A. S. Atl., T. 231, f. 12–15; cf. Hustedt, Kieselalg. 2: 9, f. 543 g–k). A form of *Entopyla* occurred in one sample as a fragmentary specimen. It is with some doubt that I have placed this on record here as it showed some characters not in keeping with Fricke's figures, namely that the puncta occur only in double rows instead of 3–4 rows between the silicified ribs.

A study of more material may show that this is a new species.
– 510 (Fig. 36)

Fragilaria Lyngbye 1819

F. pinnata Ehrenberg (cf. Hustedt, Kieselalg. 2: 160, f. 671 a–i). Most of the specimens seen are small, only 6–8 µ long. – 210, 211

Gomphonema Agardh 1824

G. aestuarii Cleve (1894: 188). A few individuals were seen which differed from the more common *G. exiguum* Kützing which is widespread in South African littoral waters. *G. aestuarii* differs from *G. exiguum* in having a central fascia, a narrow lanceolate axial area, and slightly closer striation. In the Eastern Cape material the central striae bounding the fascia are distinctly stronger than the others. Dimensions 17 µ long, 2.5 µ broad, with 20 striae in 10 µ. Not common. – 509 (Fig. 37)

G. exiguum Kützing (cf. Giffen 1963: 230). Widespread in South Africa. – 211

Grammatophora Ehrenberg 1841

G. angulosa Ehrenberg. – 210
G. hamulifera Kützing. – 197, 507
G. marina Grunow. – 165, 169, 211
G. oceanica (Ehrenberg) Grunow var. *macilenta* (W. Smith) Grunow (cf. Giffen 1963: 230). – 165, 210, 507
G. serpentina (Ralfs) Ehrenberg. – 197
G. undulata Ehrenberg. Always rare in the samples. – 197, 210, 507

These epiphytic diatoms occurred mostly in samples taken from washings of algae, namely *Codium* sp., *Cladophora* sp. and *Ectocarpus* sp.

Gyrosigma Hassall 1845

G. caffra Giffen (1963: 230, f. 50). Rare. – 195 (Fig. 38)
G. rectum (Donkin) Cleve (cf. Cleve 1894: 119; Peragallo 1897–1908, Pl. 8, f. 17). Not common. – 197
G. rectum var. *minutum* (Donkin) Cleve (cf. Cleve 1894: 120; Peragallo, l.c., Pl. 9, f. 9). In dimensions the Cape specimens fall slightly outside those given by Cleve (l.c.) namely 80 µ long as against 60 µ, but otherwise cannot be placed with any other variety. – 165
G. tenuissimum (W. Smith) Cleve (cf. Giffen 1963: 232, f. 52). Scarce. – 211
G. variipunctatum Hagelstein (1938: 367, Pl. 5, f. 8; Giffen 1963: 232, f. 53–56). Not common. – 195

Hantzschia Grunow 1877

H. insolita n. sp. Valves in girdle view linear-lanceolate, slightly constricted in the middle, with tapering somewhat produced rounded

ends 35–52 µ long, 6–9 µ broad, slightly narrower at the constriction. Keel excentric, strong, carinal pores elongate, 7–8 in 10 µ, slightly to very irregular, the central pores moderately distant from each other. Striae 10–12 in 10 µ clearly punctate with single rows of puncta ca. 12 in 10 µ forming undulate longitudinal lines on the valve surface but ending in short double rows of puncta on the keel.

Type slide 210 in the GIFFEN collection.

Frustula in visu pleurale lineari-lanceolata, valvae in parte media leviter constrictae, apicibus gradatim attenuatis, leviter protractis, regulariterque rotundatis, 35–52 µ longae, 6–9 µ latae, in constrictione mediana aliquantulum angustiores. Carina excentrica, valida, poris carinalibus elongatis, 7–8 in 10 µ, leviter sive valde irregulariter distributis, centralibus distantioribus. Striae transapicales 10–12 in 10 µ, distincte punctatae, punctis lineas longitudinales formantibus. Lineae longitudinales leviter undulatae, exceptae ultimae prope carinam, quo striae in lineas breves transapicales punctis geminatis formatas transeunt.

Habitat in aquis subsalsis lacus uni semiartificialis apud ostium fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 210 in collectione GIFFEN, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 39–41.

This new species occurred frequently in the material and is characterised by the peculiar structure of the striae namely single rows of puncta ending on the keel in short double rows of alternating smaller puncta. – 210, 507 (Fig. 39–41)

H. marina (DONKIN) GRUNOW (cf. GIFFEN 1963: 233, f. 58). – 197, 210

H. virgata (ROPER) GRUNOW (cf. HUSTEDT in A. S. Atl., T. 329, f. 24–26, T. 345, f. 10, 24, 25). – 211

H. virgata var. *gracilis* HUSTEDT (1930: 395, no fig.). Not uncommon in the material. – 197, 210 (Fig. 42)

Licmophora AGARDH 1827

L. grandis (KÜTZING) GRUNOW (cf. HUSTEDT, Kieselalg. 2: 79, f. 608). – 169, 211

L. hyalina (KÜTZING) GRUNOW (cf. HUSTEDT, Kieselalg. 2: 81, f. 611). – 210

L. nubecula (KÜTZING) GRUNOW (cf. HUSTEDT, Kieselalg. 2: 74, f. 604; GIFFEN 1963: 233). – 210

Mastogloia THWAITES 1856

M. baldjikiana GRUNOW (cf. HUSTEDT, Kieselalg. 2: 50, f. 981; GIFFEN 1963: 233). Not common. – 509

M. ciskeiensis n. sp. Valve linear lanceolate with obtuse rounded ends, 28–44 µ long, 8–9 µ broad. Raphe undulate, axial area narrow, widening somewhat into a lanceolate central area. Structure of cell wall faint, transapical striae ca. 28–30 in 10 µ, radiate throughout. Locular rim narrow, close to the margin of the valve, locules 10–12 in 10 µ, equal in size.

Type slide 211 in the GIFFEN collection.

Valvae lineari-lanceolatae, apicibus obtuse rotundatis, non protractis, 28–44 µ longae, 8–9 µ latae. Rhaphe fissuris undulatis, area axialis anguste linearis, in media parte lanceolate dilatata, aream parvam centralem formans. Striae transapicales subtiles, 28–30 in 10 µ, usque ad polos radiantes. Anulus cameriferus angustus, margine valvae approximatus, camerae 10–12 in 10 µ, aequales.

Habitat in lacuna ostii fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 211 in collectione GIFFEN, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 43–45.

This species is closely related to *M. inaequalis* CLEVE (1895: 150, Pl. 2, f. 15; cf. HUSTEDT, Kieselalg. 2: 556, f. 999b) but smaller in size, with slightly coarser striae and characterised by a locular rim of equal loculi. – Samples 165, 169, 195, 211 (Fig. 43–45)

M. exigua LEWIS (cf. GIFFEN 1963: 234). – 165, 169, 211

M. exilissima n. sp. Valve linear-lanceolate with somewhat broad, rounded ends, 24 µ long, 6 µ broad. Raphe slightly undulate, axial area narrow, central area a transverse fascia. Striae very faint and visible only near the middle of the valve. Locular rim marginal with small loculi, 20 in 10 µ and about 0.5 µ deep.

Type slide 509.

Valvae lineari-lanceolatae, apicibus modice late rotundatis, non protractis, circiter 24 µ longae, 6 µ latae. Rhaphe leviter undulata, area axialis anguste linearis, centralis vitta una transversale, hyalina, marginem valvae attingens. Striae transapicales subtilissimae, in vicinitate areae centralis solum visibiles. Anulus cameriferus margine valvae approximata, angusta, cameris parvis, aequalibus, circiter 0,5 µ latis, 20 in 10 µ.

Habitat ad scopulos in lacu uno parvo litorum boreali-orientalium ostii fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 509 in collectione GIFFEN, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 46 et 47.

This small species resembles in shape *M. ciskeiensis* but differs in size, closeness of the striae and the transverse fascia in the central area. Very scarce. – 509 (Fig. 46, 47)

M. pumila Grunow (cf. Hustedt, Kieselalg. 2: 553, f. 983; Giffen 1963: 234). In most specimens which were measured the striae are somewhat wider than given in Hustedt (l.c.), but agree with the 23 in 10 µ given in Cleve (1895: 157). – 169, 211

M. pumila Grunow n. f. *africana*. Differs from the type in having only one kind of locular chamber, namely 2–4 of large size.

Differt a typo cameris aequalibus, in latere uno anuli 2–4, uniformibus, in relatione magnisque.

Habitat in lacuna ostii fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionalis.

Typus: praeparatum No. 211 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 48–50.

These forms come close to *M. pusilla* var. *subcapitata* Hustedt (Kieselalg. 2: 569, f. 1002e) but differ in the structure of the valve which bears the usual longitudinal forks seen in *M. pumila*. The locular rim possesses 2–4 large chambers only. Dimensions 17–20 µ long, 6–8 µ broad, striae 22–23 in 10 µ loculi in 2.5–6 µ long by 1.5 µ deep. – 169, 211 (Fig. 48–50)

M. pusilla Grunow (cf. Hustedt, Kieselalg. 2: 568, f. 1002 a–c; Giffen 1963: 234). – 165, 211

M. pusilla var. *linearis* Oestrup (cf. Hustedt, Kieselalg. 2: 568, f. 1002d). The few specimens seen are extremely close in shape and dimensions to the descriptions and figures, but do not possess an enlarged chamber in the locular rim. This lack, however, cannot be regarded as having any taxonomic significance. – 195, 211 (Fig. 51, 52)

Melosira Agardh 1824

M. Juergensii Agardh (cf. Giffen 1963: 235). – 195

M. nummuloides (Dillwyn) Agardh (cf. Hustedt, Kieselalg. 1: 231, f. 95). – 210

M. octogona A. Schmidt (cf. Giffen 1963: 235, f. 61, 62). Abundant in most samples and widespread in Eastern Cape estuaries. – 165, 169, 195, 210, 211

M. sulcata (Ehrenberg) Kützing (cf. Hustedt, Kieselalg. 1: 276, f. 119). Never frequent in any sample. – 165, 197

Navicula Bory 1824

N. abunda Hustedt (1955: 27, Pl. 9, f. 10–12). My specimens show very close agreement with Hustedt's figures and description. – 165 (Fig. 53)

N. amicorum Grunow (cf. Cleve 1895: 36, Pl. 1, f. 31; Cholnoky 1963: 53, f. 34). My specimens agree more closely with those figured by Cholnoky than with the original of Cleve. A comparison shows those of Cholnoky and the author as being 19–20 µ long, 7.7–8 µ broad and with 11–12 striae in 10 µ. Cleve, 15–38 µ long, 8–15 µ broad with 8–9 striae in 10 µ. Despite these differences there can be no doubt as to the identity of the South African examples of this species. – 518 (Fig. 54)

N. ammophila Grunow (cf. Cleve 1895: 29). Widespread in South African coastal waters. – 197, 510

N. ammophila var. *flanatica* (Grunow) Cleve (cf. Cleve 1895: 30; Van Heurck 1880–1881: 86, Suppl., Pl. A, f. 17). – 165, 197 (Fig. 55)

N. bahusiensis Grunow (cf. Cleve 1895: 4; Hustedt, Kieselalg. 3: 267, f. 1396). A few typical examples were seen in one sample. – 518 (Fig. 56)

N. cancellata Donkin (cf. Cleve 1895: 30, A. S. Atl., T. 46, f. 29, 30). – 165, 518

N. cancellata var. *subcapitata* Grunow (cf. Cleve 1895: 30, A. S. Atl., T. 46, f. 66–68). Dimensions 26–40 µ long, 5–6 µ broad. Transapical striae 10–11 in 10 µ, longitudinal costae ca. 20 in 10 µ. Cleve gives the striation as 8–9 in 10 µ. – 197

N. cinctaeformis Hustedt (cf. Giffen 1963: 236). Not uncommon in estuarine waters of East Cape but rare in the present locality. – 210

N. complanata Grunow (cf. Hustedt, Kieselalg. 3: 335, f. 1449). – 509

N. complanatoides Hustedt (cf. Hustedt, Kieselalg. 3: 340, f. 1451). – 169, 211

N. complanatula Hustedt (cf. Hustedt, Kieselalg. 3: 338, f. 1163). The specimens seen in only one sample are very close to Hustedt's description and figure but the central area is faintly striate. Puncta in more or less straight lines. Dimensions 46 µ long, 6 µ wide, transapical striae 12 in 10 µ, longitudinal striae about 36 in 10 µ. – 169

N. confidens Cholnoky (1963: 54, f. 40). The few specimens seen agree completely with Cholnoky's figures and description. – 210

N. cruciculoides Brockman (cf. Hustedt, Kieselalg. 3: 320, f. 1437). – 195

N. cryptocephala Kützing (cf. Giffen 1963: 236). The brack-water var. *veneta* (Kützing) Grunow, now included with the type (Hustedt 1957: 290) occurred rarely in one sample through contamination by seepage from the Kidd's Beach Commonage. – 210

N. evulsa n. sp. Valve lanceolate with protracted, sometimes slightly capitate ends, 22–25 µ long, 6 µ broad. Raphe straight, axial area

narrow, central area roundish to quadrate through failure of the central striae. Transapical striae radiate in the middle, convergent at the ends 15 in 10 µ, clearly punctate, puncta forming 4–5 straight rows, 15–16 in 10 µ.

Type slide 518.

Valvae lanceolatae, apicibus protractis, nonnumquam leviter sive levissime capitatis, 22–25 µ longae, circiter 6 µ latae. Rhaphe directa. Area axialis anguste linearis, area centralis abbreviatione irregulare striarum medianarum formata, subrotunda sive quadrata. Striae transapicales in media parte valvae radiantes, ad polos versus convergentes, 15 in 10 µ, distincte punctatae, punctis in lineis directis longitudinalibus, rhaphe parallelis, 4–5 in semivalva laterale una – itaque in 15–16 striis longitudinalibus in 10 µ – ordinatis.

Habitat in superficie arenosa fundi lacunae apud ostium fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 518 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 57 et 58.

This new species occurred frequently in one sample.
– 518 (Fig. 57, 58)

N. forcipata Greville (cf. Cleve 1895: 65; Van Heurck 1880–1881, Pl. 10, f. 3). – 165

N. forcipata var. *densestriata* A. Schmidt (cf. Cleve 1895: 66; A. S. Atl., T. 70, fig. 12–16). This variety is common in most material from East Cape littoral and much more frequent than the type. – 165

N. fortis Gregory (cf. Cleve 1895: 31, A. S. Atl., T. 46, f. 37–39). – 197

N. Fritschii Lund (1946: 77, f. 7 A–G; Cholnoky 1957a: 62, f. 130; 1960a: 59, f. 188; Giffen 1963: 237). There is considerable controversy over the identity of this species. Hustedt (Kieselalg. 3: 181, f. 1315 a–h) considers this species as identical with *N. insociabilis* Krasske. Cholnoky (l.c.) discusses fully the taxonomy of these two species and follows Lund in his contention that two separate species are involved. *N. insociabilis* Krasske is an aerophile and freshwater species; *N. Fritschii* Lund favours alkaline water and is tolerant of moderately saline conditions (e.g. in the Gulu River – Giffen, l.c. – it was found living in water with 1,300 mg of chlorides per litre). The ecology alone should separate the two species. – 195

N. granulata Bailey (cf. Giffen 1963: 237; Hendey 1953: 158, Pl. 1, f. 5; 1951: 48, Pl. 7, f. 8, Pl. 12, f. 2). The identity of *N. granulata* Bailey and the difference between it and *N. punctulata* W. Smith were discussed fully by Hendey (1953). *N. granulata* is apparently widespread in South African waters and has been recorded (as *N.*

punctulata W. Smith) by Cholnoky (see Giffen 1963: 237) from the South Western Cape Province. – 165

N. Greviilei (Agardh) Cleve (cf. Cleve 1894: 152; Giffen 1963: 238, f. 68). Widespread in South African coastal waters. – 165, 195, 510

N. guluënsis Giffen (1963: 238, f. 70). This species is closely allied to *N. mutica* Kützing but differs in its straight raphe, more distant central pores and striate rounded ends. It was found in only one sample and is always rare. – 509 (Fig. 59)

N. halophila (Grunow) Cleve (cf. Cleve 1894: 109; Hustedt, Kieselalg. 3: 64, f. 1209). – 510

N. humerosa Brébisson (cf. Cleve 1895: 43; Heiden in A. S. Atl., T. 243, f. 5; Giffen 1963: 239). This species is found chiefly on the sandy beaches in the region occasionally entering the brack estuaries. – 197

N. humerosa var. *constricta* Cleve (1895: 43; Heiden in A. S. Atl., T. 243, f. 6; Giffen 1963, f. 72). Occurs with the type in the same samples. – 197

N. humerosa Brébisson n. f. *capensis*. Differs from the type in the puncta nearest the areas strong and elongated. Length 93 µ, breadth 31 µ, striae 10–11 in 10 µ, puncta 14 in 10 µ.

Differt a typo punctis ad marginem areae axialis centralisque maioribus et transapicaliter elongatis. Longitudo circiter 93 µ, latitudo circiter 31 µ, striae transapicales 10–11 in 10 µ, punctis 14 in 10 µ validis, distincte punctatae.

Habitat in aquis subsalsis lacunarum litoris borealis prope ostium fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 197 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figura nostra No. 60.

These forms are similar to those figured by Heiden in A. S. Atl., T. 243, f. 1–3, for *N. monilifera* Cleve, which, however, differ in having coarser punctate striae 7–8 in 10 µ and puncta 9–10 in 10 µ. In *N. humerosa* Brébisson the striae are 10–11 in 10 µ and puncta 14–15 in 10 µ. Fig. 60 shows a valve with strong elongated puncta nearest the areas which links it with *N. humerosa* var. *Fuchsii* (Pantocsek) Cleve (1895: 43). – 197 (Fig. 60)

N. hyalosirella Hustedt (Kieselalg. 3: 335, f. 1448). – 169 (Fig. 61, 62)

N. Johanrossii n. sp. Valve lanceolate with strongly convex surface and obtuse ends, 33–52 µ long, 8.5–10 µ broad. Raphe straight, axial area narrow, central area quadrate through shortening of the three middle striae. Transapical striae 11–12 in 10 µ in the middle to 15 in

10 μ at the ends, radiate in the middle, convergent at the ends, longitudinal striae obscure but about 15 in 10 μ.

Type slide 165.

Valvae lanceolatae, superficie valde convexo, apicibus obtuse rotundatis, non protractis, 33–52 μ longae, 8.5–10 μ latae. Rhaphe directa, filiformis, area axialis anguste linearis, centralis abbreviatione striarum medianarum trium (semperne?) formata, rectangularis. Striae transapicales in media parte valvae 11–12, ad apices versus usque ad 15 in 10 μ, apud nodulum centralem radiantes, ad polos versus convergentes. Costae longitudinales circiter 15 in 10 μ, verumtamen indistinctae.

Habitat in aquis marinis subsalinisque ostii fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 165 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae 63 et 64.

Owing to the strongly convex and probably slightly angular shape of the valve surface, the transapical striae have a curved or knee-bent appearance. I have much pleasure in naming this new species in honour of Professor Johan Ross, Rector of the University College of Fort Hare, to whom the College owes so much for his encouragement of original research. – 165, 510 (Fig. 63, 64)

N. kantsiensis n. sp. Valve broadly elliptical with rounded or slightly subrostrate ends, 17–30 μ long, 12–18 μ broad. Raphe straight, terminal fissures small and obscure but turned in the same direction and ending a short distance from the margin of the valve. Axial area narrow linear, central area small, lanceolate. Transapical striae 20–21 in 10 μ, strongly radiate, alternately longer and shorter in the middle, finely but distinctly punctate, puncta forming undulate rows about 18–20 in 10 μ.

Type slide 197.

Valvae late ellipticae, apicibus non sive levissime protractis, regulariter rotundatis, 17–30 μ longae, 12–18 μ latae. Rhaphe directa, filiformis, fissuris terminalibus parvis, indistinctis, sed in eadem directione declinatis et margine valvae modice distantibus. Area axialis anguste linearis, centralis parva, lanceolata. Striae transapicales valde radiantes, 20–21 in 10 μ, apud nodulum centralem brevioribus regulariter alternantibus intercalatis, subtiliter sed distincte punctatae, punctis in lineis leviter undulatis longitudinalibus ordinatis. Costae longitudinales 18–20 in 10 μ.

Habitat in aquis subsalsis lacunarum litoris borealis prope ostium fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionalis.

Typus: praeparatum No. 197 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 65–67.

This species is very like *N. sovereignae* Hustedt (1955: 25, Pl. 8, fig. 18–20), but differs in the slightly narrower valve, less rostrate to rounded ends and particularly in the terminal fissures which are not contrary but turn toward the same side. It was abundant in the material. – 197 (Fig. 65–67)

N. mollis W. Smith (cf. Giffen 1963: 240, f. 74, 75). Widespread and abundant. – 195, 197

N. nautica Cholnoky (1963: 62, f. 64). Typical specimens of this recently described diatom were abundant in one sample in the East Cape material. – 210 (Fig. 68)

N. nolens Hustedt (Kieselalg. 3: 174, fig. 1307). I have some doubts as to the identity of the few specimens seen, which I have assigned to this species. There is general agreement in shape, but the ends in my material are slightly more truncate than shown in Hustedt's figure, and the dimensions are slightly larger, viz. 12 µ long, 6 µ broad. With further study of more abundant material it may prove to be a new species. – 510 (Fig. 69)

N. normalis Hustedt (1955: 29, Pl. 9, f. 3; Cholnoky 1963: 62, f. 65). In the specimens seen the central pores are somewhat closer than shown in Cholnoky's figure, but otherwise identical with Hustedt's description in size, shape and number of striae (transapical striae 10 in 10 µ, longitudinal striae 30 in 10 µ). – 210 (Fig. 70)

N. orthoneoides Hustedt (1955: 31, Pl. 7, f. 14, Kieselalg. 3: 345, f. 1455). Only one specimen was seen which was shorter than the Hustedt's type. The striae were also somewhat wider disposed, being 18–20 in 10 µ for *N. orthoneoides*. The Cape specimen shows quite clearly the arrangement of puncta in decussating rows. I have very little doubt that my identification of this species is correct but further study of more abundant material may be needed for confirmation. – 510 (Fig. 71)

N. ostrearia (Gaillon) Turpin (cf. Cleve 1894: 106; Hustedt, Kieselalg. 3: 36, f. 1192a; 1955: 32). The group *Naviculae fusiformes* Cleve contains a number of species which are closely allied and difficult to separate. A species belonging to this group occurred in one sample from the East Cape which I have assigned to *N. ostrearia* (Gaillon) Turpin. In dimensions (88–96 µ long and 9–12 µ wide) it is somewhat wider than that given in Hustedt's description of *N. ostrearia*. The striae are excessively faint and scarcely visible and probably about 40 in 10 µ. The species in the group nearest to the above characters is *N. ostrearia*. In addition to the above evidence my species is a "blue diatom" and in the living condition is a brilliant blue, especially towards the ends, with two parietal chromatophores

which is characteristic also of *N. ostrearia*. HUSTEDT (1955: 32) suggests that *N. fasiformis* GRUNOW should be united with *N. ostrearia* as there seems to be no reason to separate them. – 210

N. paeninsulae CHOLNOKY (1963: 63, f. 67). This large and characteristic *Navicula* is frequent and widespread in South African littoral. Some specimens from the Eastern Cape material show a coarser striation than given by CHOLNOKY in the original description. This is an estuarine diatom tolerant of brack water and sudden changes in salinity. Dimensions 52–72 µ long, 10–10.5 µ wide, transapical striae 7–8 (occasionally 6–7) in 10 µ, longitudinal striae 17–22 in 10 µ.
– 165, 169, 195, 507 (Fig. 72)

N. peregrina (EHRENBERG) KÜTZING (cf. HUSTEDT 1930: 300, f. 516; HENDEY 1951, Pl. 16, f. 5). Frequent in most samples from the area under review. Most specimens seen are narrower and with more acute apices than given in the descriptions and figures, but as *N. peregrina* is a variable species (CLEVE 1895, 18 lists, 5 varieties) I feel that these Eastern Cape forms are not separable from the type. Dimensions 70–115 µ long, 12–14 µ broad, transapical striae 6–7 in 10 µ, longitudinal striae 25 in 10 µ. – 165, 195, 210, 507 (Fig. 73)

N. pertensa n. sp. Valve lanceolate with very long produced ends (beaks) sometimes slightly capitate 25–36 µ long, 5–6 µ wide, raphe straight, enclosed in a narrow silicious rib. Striae invisible.

Type slide 510.

Valvae lanceolatae apicibus longe angusteque protractis, regulariter rotundatis sive subcapitatis, 25–36 µ longae, 5–6 µ latae. Rhaphe directa, filiformis, in costa una valde silificata, axiale inclusa. Striae subtilissimae, invisibiles.

Habitat in lacunis parvis litoralibus ad oras ostii fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 510 in collectione GIFFEN, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 74 et 75.

The lanceolate body is about half the total length of the valve, and the long beaks make it a very characteristic and almost unique form.
– 210, 510 (Fig. 74, 75)

N. pragmatica n. sp. Valve broadly elliptical with rounded ends 22–28 µ long, 12–18 µ broad. Raphe slightly curved with somewhat incrassate central pores and long comma-like terminal fissures. Axial area rather large, linear-lanceolate, central area small, quadrate. Lateral areas narrow, lunate, tapering from the middle to the ends, separated from the central and axial areas by rows of moderately

strong puncta. Transapical striae parallel in the middle, radiate at the ends 12 in 10 µ. Near the central nodule are a few stigmas.

Type slide 510.

Valvae late ellipticae, apicibus regulariter rotundatis, 22–28 µ longae, 12–18 µ latae. Rhaphe fissuris leviter arcuatis, poris centralibus incrassatis, fissuris terminalibus longis, arcuatis, non deflexis. Area axialis modice lata, lineari-lanceolata; area centralis parva, rectangularis, areae laterales angustae lunataeque, ad polos versus gradatim attenuatae, lineis punctorum modice crassorum ab areis utribus separatae. Striae transapicales in media parte valvae parallelae, ad polos versus radiantes, circiter 12 in 10 µ. In vicinitate noduli centralis stigmae nonnullae umbrosae visibiles.

Habitat in lacunis parvis litoralibus ad oras ostii fluvii, Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 510 in collectione GIFFEN, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 126 et 127.

This species which is closely related to *N. Ny* CLEVE (1894: 75, Pl. 1, f. 24), differs from it in the smaller size and much coarser striae. It belongs, with *N. nicobarica* GRUNOW and *N. Ny* CLEVE to the small group *Naviculae Nicobaricae* CLEVE in which he placed those species of elliptical diatoms with a raphe with approximate central pores and large comma-like terminal fissures bordered on both sides by a longitudinal row of large, sometimes confluent puncta. *N. pseudony* HUSTEDT (1955: 23, Pl. 8, f. 11) may also belong to this small group. *N. pragmatica* n. sp. differs from *N. pseudony* in the type and number of striae surrounding the axial and central areas, and from *N. nicobarica* GRUNOW in the much closer striae (7–8 in 10 µ in *N. nicobarica* GRUNOW). – 510 (Fig. 126, 127)

N. pseudogamma n. sp. Valve elliptic-lanceolate with apiculate ends 30–70 µ long, 18–24 µ broad. Raphe straight, central pores moderately close, terminal fissures turned in contrary directions. Striae 8–11 in 10 µ, distinctly punctate, puncta forming curved or undulate longitudinal lines variable 6–12 in 10 µ (usually 9–10).

Type slide 197.

Valvae elliptico-lanceolatae apicibus apiculato-protractis, acutiuscule rotundatis, 30–70 µ longae, 18–24 µ latae. Rhaphe directa poris centralibus modice approximatis, fissuris terminalibus in directione controversa deflexis. Striae 8–10 in 10 µ, distincte punctatae, costae longitudinales leviter curvatae sive undulatae, itaque puncta striarum in lineis longitudinalibus arcuatis sive undulatis ordinata. Costae longitudinales inaequidistantes, 6–12, fere 9–10 in 10 µ.

Habitat in aquis subsalsis lacunarum litoris borealis prope ostium fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 197 in collectione Giffen, Fort Hare, provincia Capensis.
Iconotypus: figurae nostrae No. 76 et 77.

This new species closely resembles *N. gamma* Cleve (1895: 44) as interpreted by the author (Giffen 1963: 237, f. 67), but differs in the curved or undulate longitudinal striae, the broader valve, wider transapical striae and wider spaced puncta. Frequent. – 197 (Fig. 76, 77)

N. pseudony Hustedt (1955: 23, Pl. 8, f. 11). Always rare, this species occurred in several samples. It was noted that in a number of individuals the striae forming the inner margin of the lateral areas often fail except for a few puncta near the ends of the valve.
– 165, 195, 211 (Fig. 78)

N. Rogersii Giffen (1963: 241, f. 78). The very few specimens seen in the material were shorter than given in the original description. Dimensions 56 µ long, 8 µ broad, transapical striae 10 in 10 µ, longitudinal striae 20 in 10 µ. Always rare. – 210 (Fig. 79)

N. salinaroides Cholnoky (1963: 64, f. 72, 73). The Eastern Cape specimens agree very closely with the original figures and description, but the terminal striae tend to be more or less transverse at the ends and very slightly wider in the middle, i.e. 13–14 as against 16 in 10 µ.
– 518 (Fig. 80)

N. salinarum Grunow (cf. Cleve 1895: 19; Hustedt 1930: 295, f. 498). Frequent in only one sample. – 510

N. salinicola Hustedt (cf. Giffen 1963: 242, f. 79, 80). Widespread in the South African littoral and estuaries. – 169, 195, 210, 211

N. Stompsii Cholnoky (1963: 66, f. 77–78). The specimens seen in the Eastern Cape region differed from the original in the closer transafrical and longitudinal striae being 11–12 in 10 µ and 25–30 in 10 µ respectively. The valve surface is slightly convex and the raphe curved. The specimens are otherwise identical in appearance and in my opinion fall within the form cycle of Cholnoky's species.
– 165, 169, 195, 211 (Fig. 81)

N. soodensis Krasske (cf. Hustedt, Kieselalg. 3: 277, f. 1408, Kieselalg. 2: 793, f. 1138, as *Stauroneis Legleri* Hustedt). – 197, 510

N. subinflatoides Hustedt (Kieselalg. 3: 294, f. 1416). – 197, 510

Nitzschia Hassall 1845

N. amphibia Grunow (Giffen 1963: 243). – 195

N. apiculata (Gregory) Grunow (cf. Giffen 1963: 243).
– 195, 210, 211

N. closterium W. Smith (1853: 42, Pl. 15, f. 16–18; cf. Hustedt in A. S. Atl., T. 352, f. 5). Reimann and Lewin (1964) on the basis of electron micrographs and study of the cell wall, elect to place this species with the genus *Cylindrotheca* as *C. closterium* (W. Smith) Reimann and Lewin. It is, however, a moot point whether *Cylindrotheca* should not be included in *Nitzschia* from which it differs only in its spiral valve. – 169, 195, 210, 211

N. cocconeiformis Grunow (cf. Mann 1925, Pl. 28, f. 5; Giffen 1963: 244). This species is common throughout the region in brack water and is very variable in size and shape. References to its occurrence are few. Mann records it from the Phillipines and recently Cholnoky (1955: 20, f. 36, 37) from the Western Cape and Natal (Cholnoky 1960: 92). – 165, 169, 195, 211

N. constricta Gregory (cf. Hustedt in A. S. Atl., T. 333, f. 8; Cholnoky 1963: 72, f. 89). – 169, 197

N. corpulenta Hendey (1957: 78, Pl. I, f. 5; Giffen 1963: 244, f. 84). Widespread and common in the Eastern Cape region. Specimens seen were not so constricted as seen in previous material, but otherwise agree. – 165, 169, 195, 211 (Fig. 82)

N. distans Gregory (cf. Giffen 1963: 245, f. 85). – 165, 169, 210, 211

N. distantoides Hustedt (1958: 171, f. 161; Cholnoky 1963: 72, f. 90, 91 with emended description). In the Eastern Cape material even greater diversity of size is shown than given either in Hustedt's original or Cholnoky's emended descriptions, namely in length, width and wider carinal pores 3–6 in 10 µ. Occasionally portions of the keel show the pores as 2.5 in 10 µ and usually irregular. There is no doubt that the specimens seen belong to *N. distantoides* Hustedt for the unbroken range of length and breadth cover both Hustedt's and Cholnoky's published dimensions. The Cape East specimens range from 50–96 µ long, 5 µ wide, carinal pores 2.5–5 in 10 µ. Frequent. – 210 (Fig. 83. 84)

N. erosa n. sp. Frustule in girdle view rectangular with rounded angles, slightly constricted in the middle, 36–56 µ long, 14–18 µ broad. Valve linear with oblique rounded ends, 5–8 µ broad, with a small rounded sinus at the end, close to the margin and producing a more or less S-shaped end. Keel somewhat excentric, constricted in the middle, carinal pores irregular 10–14 in 10 µ and irregularly elongated into ribs, some but not all reaching the margin. The two median pores fairly widely separated. Transapical striae very delicate and scarcely visible.

Type slide 510.

Frustula in visu pleurale rectangularia angulis rotundatis, in parte mediana leviter constricta, 36–56 μ longa, 14–18 lata. Valvae lineares, apicibus obtuse rotundatis, 5–8 μ latae, prope apices sinu parvo rotundo marginem approximato munitae, itaque partes terminales valvae plus minusve sigmoideae. Carina leviter excentrica, in media parte constricta, pori carinales irregulariter distributi, 10–14 in 10 μ et irregulariter elongati in costas irregulares transeuntes, quae nonnumquam, sed non fere, marginem oppositum valvae attingent. Pori carinales centrales distantiores. Striae transapicales subtilissimae, haud visibiles.

Habitat in lacunis parvis litoralibus ad oras ostii fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 510 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 85–87.

This new species is related to a small number of species of *Nitzschia* belonging to section *Costatae* Hustedt, which includes *N. epithemioides* Grunow (Hustedt 1930: 407, f. 779), *N. rhopalodioides* Hustedt (1955: 45, Pl. 15, f. 16), *N. Thienemannii* Hustedt (1937–1939, Suppl. 15, Pl. 41, f. 34–36) and *N. incognita* Krasske (1941: 276, Pl. 5, f. 2, 3). *N. erosa* differs from all the above species in the great irregularity of the elongated carinal ribs and in the peculiar sinus at the ends of the valves. Frequent. – 197, 210, 510 (Fig. 85–87)

N. filiformis (W. Smith) Schütt (cf. W. Smith 1856: 80, Pl. 55, f. 348, as *Homeocladia filiformis*; Van Heurck 1899: 406, Pl. 33, f. 882; Cholnoky 1960: 94). Cholnoky, in dealing with this species, gives the correct authority. – 211

N. frustulum (Kützing) Grunow (cf. Giffen 1963: 245). – 195, 211

N. frustulum var. *subsalina* Hustedt (1930: 415, f. 796; Giffen 1963: 245). – 195, 211

N. hungarica Grunow (cf. Giffen 1963: 245). – 169, 210

N. Hustedtiana Salah (1952: 166, Pl. II, f. 9) Cholnoky 1959: 59, f. 313–315; Hustedt in A. S. Atl., T. 330, f. 12 [as *N. punctata* (W. Smith) Grunow formae *minores* Hustedt]. Both Salah (1952) and Cholnoky (1959) placed Hustedt's *N. punctata* f. *minores* under the new name *N. Hustedtiana*. The author-name Salah has therefore priority over that of Cholnoky. The species is not uncommon in brack-water estuaries and in salt marsh conditions. – 165, 169, 211

N. hybrida Grunow (cf. Hustedt 1930: 406, f. 778). – 195, 210

N. insignis Gregory 1880–1881 (cf. Van Heurck 1880–1881, Pl. 61, fig. 1; 1899, Pl. 32, f. 875). Very rare. – 210, 211

N. insignis var. *adriatica* Grunow (cf. Hustedt 1955: 45, Pl. 15, f. 18–20; Peragallo 1897–1908, Pl. 75, f. 11–12). Rare. – 210

N. interrupta (Reichelt) Hustedt (cf. Giffen 1963: 246). Fresh water form. – 195

N. laevis Hustedt (1939: 662, f. 116–118; 1955: 46, Pl. 15, f. 5). Frequent. – 210, 211

N. lanceolata W. Smith (cf. Peragallo 1897–1908, Pl. 73, f. 20, 21). This species is frequent and very variable in size in the Cape East samples. Dimensions 90–116 µ long, 8–12 µ broad. – 210, 211

N. lanceolata f. *minor* Grunow (in Van Heurck 1880–1881, Pl. 68, f. 3; Van Heurck 1899, Pl. 17, f. 550). Dimensions 40 µ long, 3–4 µ broad. – 195

N. linearis (Agardh) W. Smith (cf. Hustedt 1930: 409, f. 784; Giffen 1963: 246). A freshwater species displaced from the upper sections of the Umkantzi River. – 195

N. longissima (Bréhisson) Ralfs (cf. Hustedt in A. S. Atl., T. 335, f. 1, 2). Reimann and Lewin (1965) included this species in *Cylindrotheca* as *C. longissima*. (See note on *N. closterium* W. Smith above.) – 195

N. Lorenziana Grunow var. *subtilis* Grunow (cf. Giffen 1963: 246, f. 87). Rare. – 211

N. microcephala Grunow (cf. Giffen 1963: 246). – 210

N. miserabilis Cholnoky (1963: 74, f. 95). A few specimens of this recently described species were seen in my material. The forms from the Eastern Cape samples differed only in the more rostrate ends and wider carinal pores about 4–5 in 10 µ, length 18–20 µ long, 5–6 µ wide. – 510 (Fig. 88, 89)

N. mollis Hustedt (1952: 313, f. 22; Cholnoky 1959: 58; Giffen 1963: 246, f. 88). Frequent and widespread in South African coastal region. – 169, 210

N. obtusa W. Smith (cf. Hustedt in A. S. Atl., T. 336, f. 20, 21, T. 352, f. 7). This species is never common in any sample and has rarely been recorded in samples from Eastern Cape waters. – 195

N. obtusa var. *scalpelliformis* Grunow (cf. Hustedt 1930: 415, f. 801; Giffen 1963: 247). This variety is very much more abundant and widespread particularly in the brackish water of estuaries, frequently becoming dominant in small, moderately to very strongly brackish pools. – 195, 210

N. ovalis Arnott (cf. Hustedt 1930: 417, f. 808; Cholnoky 1963: 75, f. 97). This species occasionally becomes very abundant in strongly brackish beach pools. It was frequent in the sample collected from the "Children's paddling pool" which receives sea water at spring tides and fresh water seepage from slow springs on the playground above. – 210

N. partita Hustedt (1952: 311, f. 14; Giffen 1963: 247, f. 89, 90). – 165, 195

N. perindistincta Cholnoky (1960: 101, f. 304; 1963: 75, f. 98, 99). Specimens that I have assigned to this species seem to agree very closely with Cholnoky's figures and description. They are very weakly silicified and similar in shape, and in the number and type of carinal pores, but are longer, being 15–17 µ long as against 8–10 µ in the original description. – 211, 509 (Fig. 90)

N. perversa Grunow (1880: 395, Pl. 12, f. 6; cf. Hendey 1957: 77, Pl. 3, f. 9, Pl. 5, f. 7) Valve broadly elliptical with obtuse ends. Keel narrow and marginal with small carinal pores, 5–6 in 10 µ. The two halves of the valve-surface are quite differently marked. That nearest the keel is faintly punctate with shadowy puncta irregularly arranged on a background of almost invisible very close striae, while the other is strongly costate, costae 10–12 in 10 µ. Beyond the costae is a hyaline sub-marginal region, 24–28 µ long, 10–12 µ broad. This characteristic species has been seen in one sample from the region under review (scarce) but has also been found in hitherto undescribed material from the Kowie River estuary, near Port Alfred, E. Cape. The figures are drawn from Kowie River samples. Hendey's photographs (l.c.) are from material from West Africa (Sierra Leone) where it is also rare. – 195 (Fig. 91, 92)

N. plicatula Hustedt (1953: 150, f. 1, 2; Giffen 1963: 247, f. 91). This species has been recorded previously by Cholnoky (1960: 101–102, f. 292–295) from Natal, and South Western Cape Province (Cholnoky 1959: 58, f. 295, 296; 1962: 58). – 165

N. pseudohybrida Hustedt (1955: 45, Pl. 15, f. 3, 4). My specimens agree in most characters but are considerably longer, 72–75 µ, against 25–45 µ long. Dimensions 48–75 µ long, 7–8 µ broad (max.), carinal pores 10–13 in 10 µ, striae not visible. – 165, 169, 195, 210 (Fig. 93)

N. pulchra Hustedt (cf. Hustedt 1955: 44, Pl. 16, f. 4, 5). The specimens seen fall well within the dimensions given by Hustedt in the original description although mostly towards the minimum limits. – 169 (Fig. 94)

N. punctata (W. Smith) Grunow var. *coarctata* Grunow (cf. Hustedt 1930: 401; Giffen 1963: 248, f. 93). Frequent and widespread in South African brack and estuarine waters. – 165, 169, 195, 211

N. rhombica Hustedt (1955: 47, Pl. 16, f. 14, 15). As Hustedt states in his original description, this species can be distinguished from *N. frustulum* (Kützing) Grunow by its delicate structure. The specimens seen are weakly silicified and agree completely with the description. They were collected from mud scraped from rocks in the strongly brackish estuary, a somewhat similar habitat to the original collecting place. – 165

N. sigma (Kützing) W. Smith (cf. Hustedt 1930: 420, f. 813; Giffen 1963: 248). Rare. – 165

N. sigmaformis Hustedt (1955: 47, Pl. 16, f. 2, 3). I have considerable doubt as to the identity of the specimens I have placed under the above taxon. In general appearance the local specimens are very like those figured by Hustedt, but differ in two important characters: firstly, there is no impressed centre in the keel and secondly, the median carinal pores are equidistant. In length, breadth, number of carinal pores and striae in 10 µ are, however, identical. The specimens were never abundant in the samples so the full range of variation can not be determined. – 195, 197 (Fig. 95)

N. socialis Gregory (cf. Peragallo 1897–1908, Pl. 72, f. 7, 8; Gemeinhardt 1935, T. 15, f. 200). Typical specimens were observed in several samples. Dimensions 72–96 µ long, 5–7 µ broad, carinal pores 6–9 in 10 µ, somewhat irregularly disposed, transapical striae 17–20 in 10 µ, longitudinal very faint. – 165, 197, 507, 509

N. spathulata W. Smith (1853: 40, Pl. 31, f. 268; Giffen 1963: 248, f. 94). – 197, 210

N. staurophora n. sp. Valve broadly linear, more or less constricted in the middle with oblique acute ends, 56–75 µ long, 8–9 µ broad in the widest part, 6 µ wide at the constriction. Keel moderately excentric lunate, very wide in the widest part of the valve tapering towards the middle and the ends. Carinal pores elongate, 6–10 in 10 µ, very irregularly spaced and of irregular lengths. From the central nodule a strong stauros crosses the valve to the margin. Transapical striae 25–28 in 10 µ.

Frustule more or less oval with rounded truncate ends, constricted in the middle.

Type slide 210.

Frustula plus minusve ovalia apicibus truncato-rotundatis, in parte mediana constricta. Valvae late lineares, in parte mediana plus minusve constrictae, apicibus acutiusculis, obliquis, 56–75 µ longae, in partibus latissimis 8–9 µ, in constrictione mediana 6 µ latae. Carina modice excentrica, lunata, ad nodulum centralem itaque ad apices versus gradatim attenuata. Pori carinales 6–10 in 10 µ, transapicaliter elongati, irregulariter distributi, longitudine valde varia. Nodulus centralis in staurum unum distinctissimum, transapicaliter marginem oppositum valvae attingentem elongatus. Striae transapicales 25–28 in 10 µ.

Habitat in aquis subsalsis lacus uni artificiali apud ostium fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 210 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figura nostra No. 96.

This new species belongs to the section *Dubiae* Grunow, and is characterised by the strong stauros crossing the valve and the partitions of the carinal pores which may be produced into short ribs outside the keel itself. The presence of a stauros in a species of *Nitzschia* seems to be unique. Scarce. – 210, 510 (Fig. 96)

N. Stompsii Cholnoky (1963: 75, f. 100–102). In most cases there is close agreement with Cholnoky's description and figures but occasionally forms are seen which are longer, up to 112 µ long and with 20–22 striae in 10 µ. These may be early post-auxosporic stages. – 195, 197, 210 (Fig. 97)

N. subvitrea Hustedt (cf. Hustedt in A. S. Atl., T. 347, f. 18, 19). A displaced fresh-water species. – 169

N. thermalis Kützing (cf. Hustedt 1930: 403, f. 771; Giffen 1963: 249). A displaced fresh-water species. – 195

N. tryblionella Hantzsch var. *victoriae* Grunow (cf. Hustedt 1930: 339, f. 758; Giffen 1963: 249). A fresh-water species displaced from the fresh-water stream above. – 195

N. vacillata n. sp. Valve linear-lanceolate with straight or slightly convex keel and deeply curved outer margin, ends moderately long produced into beaks, 40–55 µ long, 6–7 µ broad. Carinal pores 10–15 in 10 µ, somewhat irregular, striae not visible.

Type slide 197.

Valvae lineari-lanceolatae, marginibus lateralibus curvatis, apicibus in rostros modice longos protractis, 40–55 µ longae, 6–7 µ latae. Carina excentrica arcuata sive directa, poris carinalibus 10–15 in 10 µ, modice irregulariter distributae. Striae invisibles.

Habitat in aquis subsalsis lacunarum litoris borealis prope ostium fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 197 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 98 et 99.

This species occurred in fairly large numbers in one sample. It belongs to the section *Vivaces* Grunow and is related to *N. vivax* W. Smith, *N. Petitiana* Grunow and *N. fluminensis* Grunow, to none of which it can be assigned on account of its delicate structure and size. – 197 (Figs. 98, 99)

N. Vidovichii (Grunow) Peragallo (Grunow in Van Heurck 1880–1881, Pl. 67, f. 7, as *Homoeocladia Vidovichii* Grunow; cf. Cholnoky 1963: 76, f. 103–105). This species occurred in several samples and was very numerous in one (169). Examination of numerous individuals leads me to the opinion that *N. knysnensis* Cholnoky (1963:

72, f. 92) shows insufficient differences from *N. Vidovichii* Grunow to be separated. *N. knysnensis* is a form with a more pronounced sigmoid shape; at the most it might be retained as a variety.
– 165, 169, 197, 211

N. vulpecula n. sp. (Synonym: *N. fasciculata* Cholnoky non Grunow, cf. Cholnoky 1955b: 20, f. 38). Valve linear, slightly constricted in the middle with obliquely rounded slightly produced ends 44–55 µ long, 4.5–6 µ broad. Keel moderately excentric, fairly strong, carinal pores elongate 8–10 in 10 µ, median pores distant. Striae oblique, delicate, crossing each other at an angle of about 90°, 17–18 in 10 µ, finely punctate, decussate.

Frustule in girdle view straight, linear with truncate ends, slightly constricted in the middle.

Type slide 210.

Valvae lineares, in media parte modice constrictae, apicibus obtuse rotundatis, leviter protractis, 44–55 µ longae, 4.5–6 µ latae. Carina modice excentrica, bene evoluta, pori carinales transapicaliter elongatae, 8–10 in 10 µ, medianes distantiores. Striae transapicales subtiles, costae longitudinales aequidistantes sed obliquae, systema unum punctorum in quincunx positorum efficientes, itaque superficies valvae cum striis punctatis, obliquis, decussatis ornata esse conspiciuntur. Striae transapicales, obliquaeque 17–18 in 10 µ.

Habitat in aquis subsalsis lacus uni semiartificiali apud ostium fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 210 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 100 et 101.

Cholnoky (l.c.) in assigning this species to *N. fasciculata* Grunow did so with considerable doubt. The straight frustule separates the new species from *N. fasciculata* which is sigmoid. *N. vulpecula* n. sp. should be placed in the section *Dubiae* (Grunow) Hustedt emend.
– 210 (Figs. 100, 101)

Opephora Petit 1888

O. gemmata (Grunow) Hustedt (Kieselalg. 2: 136, f. 657). Though specimens observed in the Eastern Cape material have very strong transapical ribs, 5–6 in 10 µ, which is slightly closer than in the description and are longer providing a somewhat narrower pseudoraphe than shown in Hustedt's figures (l.c.) I have no doubt that they belong to this species. – 509 (Fig. 103)

O. Martyi Héribaud (cf. Hustedt, Kieselalg. 2: 135, f. 654). These small specimens fall within the description except that most seen are somewhat narrower or at the minimum width. Scarce.

– 210, 507 (Fig. 104)

O. pacifica (Grunow) Petit (cf. Hustedt, Kieselalg. 2: 135, f. 655; = *O. angusta* Cholnoky 1955b: 21, f 39–43; cf. Cholnoky 1959: 61, f. 323–325). Not frequent. – 195 (Fig. 102)

O. perlonga n. sp. Valve lanceolate 148–232 μ long, 6–7 μ broad, tapering gradually from the middle towards the rounded apex and slightly capitate base. Transapical ribs short and stout 10–11 in 10 μ, parallel in the middle, somewhat radiate at the ends. Pseudoraphe wide, more or less lanceolate, about half the width of the valve. At the apex and base the transapical ribs end in a row of small puncta around the mucilage pores which are clearly defined.

Type slide 195.

Valvae anguste lanceolatae, 148–232 μ longae, 6–7 μ latae, gradatim attenuatae ad apicem regulariter et late rotundatum, itaque ad polum basalem subcapitatum angustiorem versus. Costae transapicales breves, crassaeque, 10–11 in 10 μ, in media parte parallelae, ad polos versus levissime radiantes. Area axialis in relatione lata, lanceolata, partem dimidiam valvae superficiei occupans. Striae apud poros polares mucilaginis bene visibiles, cum serie punctorum parvorum separatorum terminatae.

Habitat in aquis valde salinis lacunarum apud ostium fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 195 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 105 et 106.

This new species is very closely related to *O. gemmata* (Grunow) Hustedt but differs in the longer and more slender shape, shorter and stronger and more closely set transapical ribs and the wide pseudoraphe. – 195 (Fig. 105, 106)

O. perlonga n. sp. n. var. *clavata*. Valve clavate with broad rounded apex, tapering towards the slightly capitate base, 75–135 μ long, 7 μ broad at the widest portion. Transapical ribs 10 in 10 μ.

Valvae claviformes apicibus late rotundatis, gradatim ad polos basales, subcapitatos versus attenuatae, 75–135 μ longae, in parte latissima 7 μ latae. Costae transapicales circiter 10 in 10 μ.

Habitat in aquis valde salinis lacunarum apud ostium fluvii Umkantzi in colonia provincae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 195 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figura nostra No. 107.

Accompanying the type but less frequent. – 195 (Fig. 107)

Pinnularia Ehrenberg 1843

P. cruciformis (Donkin) Cleve (Donkin 1873: 65, Pl. 10, f. 4a as *Navicula cruciformis*; cf. Cleve 1895: 97). Frequent in samples from sandy beaches. Dimensions 40–52 µ long, 8.5–10 µ broad, striae 10–11 in 10 µ. – 210, 507 (Fig. 108)

P. rectangulata Gregory (cf. Donkin 1873: 66, Pl. 10, f. 5 as *Navicula rectangulata*; Cleve 1895: 98). Small and narrow examples occur, 60–65 µ long, 12–15 µ broad, with rather wider spaced striae 5–6 in 10 µ in the middle to 6–7 in 10 µ at the ends, but otherwise identical with the descriptions. – 197 (Fig. 109)

Pleurosigma W. Smith 1853

P. carinatum Donkin (cf. Cleve 1894: 44; Hustedt 1955: 36, Pl. 12, fig. 3). Transverse and oblique striae as given by Cleve are related as 19:18, 21:20 in 10 µ. In carefully measured specimens from my material the two sets of striae are equidistant viz. 17:17 and 21:21. Where the numbers of transverse and oblique striae are so close I do not think that the differences can be regarded as significant. – 195, 197 (Fig. 110)

P. delicatulum W. Smith (1853: 64, Pl. 21, f. 202; Cleve 1894: 37; Giffen 1963: 250). – 195

P. delicatulum var. *africanum* Grunow (cf. Cleve 1894: 38). Cleve (l.c., p. 39) lists three varieties of *P. delicatulum* namely var. *obtusinscula* Grunow M. S., var. *africana* Grunow in Cleve M. D. Nos. 197, and var. *americana* Cleve. Of these only var. *obtusiuscula* Grunow, with somewhat obtuse ends could be considered as sufficiently characteristic to be considered as a distinct variety. The other varieties seem to differ only in dimensions and number of striae in 10 µ. In a previous paper (Giffen 1963: 250) the author commented on the great variability of *P. delicatulum* W. Smith as found in samples from South Africa (Alice, Cape Province, Gulu River, East Cape, Natal) (Cholnoky 1960) and Hustedt's comments on the species from Hawaii. With regard to the number of striae the variation from 19–24 in 10 µ found on one slide in the Gulu material covers the variation in all the so-called varieties. I feel that with the natural variation of any species in respect of temperature, altitude and climatic and ecologic factors in general, too much adherance to a limited description leads to a multiplication of unnecessary varieties. If any of the varieties

of *P. delicatulum* are to be upheld, we find that most of the forms found in South African waters fall within *P. delicatulum* var. *africanum* Grunow. – 165, 195, 210

P. marinum Donkin (cf. Cleve 1894: 37; Hustedt 1955: 36, Pl. 11, f. 2). Hustedt (l.c.) discusses the identity of this species fully and after examination of the original from Northumberland, emended Cleve's description. Hustedt gives the striae as "nearly equidistant about 23–24 in 10 µ or the oblique striae are a little closer than the transapical ones, about 24:22–23 in 10 µ contrary to Cleve's description. The central pores of the raphe are distinctly hook-shaped, curved in the same direction." The South African specimens from the Kidd's Beach littoral agree in shape and size and possess the hook-shaped central pores, but the striae in four carefully measured specimens vary in transverse to oblique striae as 18:15, 18:18, 20:18, 21:19 in 10 µ. As these specimens undoubtedly belong to *P. marinum* Donkin, it seems, again, that more account must be taken of the natural variability of species. – 169, 197, 210 (Fig. 111)

P. naviculaceum Brébisson f. *minutum* Cleve (1894: 36). Only three individuals were seen but they conform to Cleve's description of the type very closely. In his diagnosis Cleve states that the median oblique striae are more distant than the terminal ones which are at an acuter angle. In the South African specimens the oblique striae make their greatest angle in the middle of the valve and become more flattened (acute) towards the ends of the valve forming more or less curved lines. The raphe curves from the central nodule towards the ends. The striae are variable, the ratio of transverse to oblique being 25:20, 22:22, 20:20. In Cleve's f. *minuta* the striae are given as 20:22. Peragallo (1897–1908, Pl. 33, f. 11) shows a much more robust form. – 197, 510 (Fig. 112, 113)

P. strigosum W. Smith (1853: 64, Pl. 21, f. 203; Giffen 1963: 250, f. 99). – 165, 169

Podosira Ehrenberg 1840

P. Montagnei Kützing (cf. Hustedt, Kieselalg. 1: 281, f. 122; Giffen 1963: 250). – 165, 169

Pyxidicula Ehrenberg 1833

P. africana Cholnoky (1960: 114, f. 333). Numerous specimens were observed in several samples which probably belong to the above

species, the dimensions being 16–26 µ in diameter with 9–10 rows of areolae in 10 µ, which, although greater in diameter are close to CHOLNOKY's species. However, one or two examples showed areolation of 7.5–8.5 in 10 µ which serve to link up *P. africana* CHOLNOKY with *P. minuta* GRUNOW which HUSTEDT (Kieselalg. 1: 301, f. 139) describes as being 18.5 µ in diameter with 6.5 areolae rows in 10 µ.
– 195, 197, 210

Raphoneis EHRENBERG 1844

R. capensis A. SCHMIDT 1894 in A. S. Atl., T. 193, f. 18 [Synonym: *R. surirella* (E.) GRUNOW var. *australis* CHOLNOKY non PETIT 1963: 77, f. 108]. This species without description was figured by A. SCHMIDT (l.c.) in 1894 from material gathered in Table Bay, Cape of Good Hope. It was recorded by CHOLNOKY (1963, l.c.) from Steenbras, South Western Cape, with considerable doubt under the name *R. surirella* (E.) GRUNOW var. *australis* PETIT. Considerable numbers were seen in the Eastern Cape material and are assigned to *R. capensis* A. SCHMIDT. The valves are elliptical or rhombic-elliptical with broad rounded ends 12–20 µ long, 7–9 µ broad, structure of the cell wall strong, transapical areolae rows about 12 in 10 µ, radiate. Areolae round, strong in two or three rows, leaving a wide elliptical pseudoraphe or central area. At each end of the central area is a shining granule which may be a mucilage pore.
– 197, 509, 510 (Fig. 114, 115)

R. mirabunda GIFFEN (1963: 25, f. 101, 102). This species shows considerable variation in shape and size. Dimensions 25–86 µ long (average 48–50 µ), 7.5–8 µ broad (up to 10 µ), striae 8–9 in 10 µ, very constant. – 197, 509 (Fig. 116, 117)

R. superba (JANISCH) GRUNOW (cf. JANISCH 1862, Pl. 2, f. 8 as *Cocconeis superba*; HUSTEDT 1951: 305, f. 1, 2; A. S. Atl., T. 193, f. 9–11 as *Cocconeis superba* JANISCH). Not uncommon in samples from beach sand. *Coscinodiscus cocconeiformis* A. SCHMIDT in A. S. Atl., T. 58, fig. 24–28 may belong to this species. Dimensions 29–30 µ in diameter, areolae rows 6–7 in 10 µ. – 197, 210, 511, 516 (Fig. 118)

R. surirella (EHRENBERG) GRUNOW (cf. HUSTEDT, Kieselalg. 2: 173, f. 679 a–c; 1955, p. 14). Dimensions 17 µ long, 8.5 µ wide, transapical areolae rows 11 in 10 µ, areolae 12 in 10 µ. Scarce. – 197, 510

Rhopalodia O. MÜLLER 1895

R. gibba (EHRENBERG) O. MÜLLER. – 210
R. gibberula (EHRENBERG) O. MÜLLER. – 165, 169, 210, 211

R. musculus (KÜTZING) O. MÜLLER. – 165, 210, 211
R. musculus var. *mirabilis* FRICKE. – 169, 211
All the above species are widespread and abundant in Cape Eastern estuaries and littoral.

Stauroneis EHRENBERG 1843

S. salina W. SMITH 1853: 60, Pl. 19, f. 188; cf. HUSTEDT, Kieselalg. 2: 786, f. 1133). Usually abundant in most samples of marine and brackish water. – 197, 507

S. exilissima n. sp. Valves narrow lanceolate to slightly rhombic-lanceolate with capitate or produced ends 12–16 µ long, 2–3 µ broad. Stauros narrow reaching the margin. Striae very delicate, scarcely visible.
Type slide 211.

Valvae lanceolatae sive leviter rhomboideo-lanceolatae, apicibus protractis sive capitatis, 12–16 µ longae, 2–3 µ latae. Stauros angustus, marginem valvae attingens. Striae subtilissimae haud visibiles.
Habitat in lacuna magna ostii fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.
Typus: praeparatum No. 211 in collectione GIFFEN, Fort Hare, provincia Capensis.
Iconotypus: figurae nostrae No. 119 et 120.

This small species is very similar to *S. gracillima* HUSTEDT (Kieselalg. 2: 784, f. 1130) and *S. Abbottii* CHOLNOKY and CLAUS (1961b: 338, Abb. 2, f. 20, 21) both of which are, however, freshwater forms. – 195, 211 (Fig. 119, 120)

Stephanodiscus EHRENBERG 1845

S. astraea (EHRENBERG) GRUNOW (cf. HUSTEDT, Kieselalg. 1: 368, f. 193). This freshwater or slightly brack water species is recorded from a damaged fragment which, however, was sufficient for identification. The species has been observed in neighbouring brackish streams (viz. Nahoon River) near East London. Here it must be regarded as a displaced specimen which does not truly belong to the local littoral region. – 197

Striatella AGARDH 1832

S. unipunctata (LYNGBYE) AGARDH (cf. HUSTEDT, Kieselalg. 2: 32, f. 560). Not uncommon and often frequent in samples. – 210

Surirella Turpin 1828

S. atomus Hustedt (cf. 1955: 48, Pl. 16, f. 23; Cholnoky 1963: 79, f. 112, 113). The specimens observed were smaller than described, being only 9–10 µ long and 4.5–5 µ broad with canals about 7.5 in 100 µ which agrees with Cholnoky's (l.c.) emendation. They are similar to *S. ostentata* Cholnoky (1955b: 21, f. 46; 1957c: 84, f. 137–139; 1962b: 73) but differ in the rounded basal pole which is produced into a beak in *S. ostentata* Cholnoky. – 165, 169, 211

S. fastuosa Ehrenberg var. *cuneata* Wittrock (cf. A. S. Atl., T. 4, f. 1, 2; Giffen 1963: 253, f. 109). – 169

S. gemma (Ehrenberg) Kutzing (cf. W. Smith 1853: 32, Pl. 9, f. 65; Cholnoky 1960: 118, f. 341; Hendey 1951: 76, Pl. 8, f. 10). The species is apparently wide-spread and abundant in South African waters. – 165, 169, 195, 211

S. ostentata Cholnoky (1962: 73; 1955b: 21, f. 46; 1957c: 84, f. 137–139 as *S. ovata* var. *africana* Cholnoky). – 169

S. scalaris n. sp. Valve delicate, heteropolar, elliptical to ovate with broad rounded ends 18–32 µ long, 13–24 µ broad. Wing narrow with canals 25–30 in 100 µ, canals narrow traversing about ¼ of the width of the valve, leaving a wide more or less lineal axial area or pseudoraphe which is decorated with a row of strong striae (folds) 15–18 in 10 µ on either side of the middle line. The surface of the valves is striate with 20–23 striae in 10 µ.

Type slide 197.

Valvae subtiliter silificatae heteropolares, ellipticae sive ovatae, apicibus late regulariterque rotundatibus, 18–32 µ longae, 13–24 µ latae. Ala angusta cum canalibus 25–30 in 100 µ, canales angustae, quartam partem superficiei valvae occupantes, aream axialem latam, lineari-lanceolatam formantes. Area axialis cum lineis crassis ornata, lineae 15–18 in 10 µ in seriebus singulis in lateribus utribus areae. Superficies valvae striis 20–23 in 10 µ munita.

Habitat in aquis subsalsis lacunarum litoris borealis prope ostium fluvii Umkantzi in colonia provinciae Capensis Kidd's Beach dicta in Africa Meridionale.

Typus: praeparatum No. 197 in collectione Giffen, Fort Hare, provincia Capensis.

Iconotypus: figurae nostrae No. 121–123.

This new species is similar in appearance to *Campylodiscus parvulus* W. Smith but undoubtedly belongs to *Surirella*.

– 169, 197, 210 (Fig. 121–123)

Synedra Ehrenberg 1830

S. formosa Hantzsch (cf. Hustedt, Kieselalg. 2: 233, f. 720). Not uncommon in the brackish water estuary of the Umkantzi River. – 165, 169

S. fulgens (Greville) W. Smith (cf. Hustedt, Kieselalg. 2: 229, f. 717; Giffen 1963: 254, f. 104, 105). Not common in the material under review. – 165

S. provincialis Grunow (cf. Hustedt, Kieselalg. 2: 212, f. 705). Infrequent. – 210

S. tabulata (Agardh) Kützing var. *fasciculata* (Kützing) Grunow (cf. Hustedt, Kieselalg. 2: 218, f. 710 i–l; Giffen 1963: 254). One of the most frequently observed species of *Synedra* and often very abundant in the brack waters of the Eastern Cape river estuaries. – 165, 169, 195

Thalassiothrix Cleve & Grunow 1880

T. Frauenfeldii Grunow (cf. Hustedt, Kieselalg. 2: 247, f. 727). – 210, 509

Trachyneis Cleve 1894

T. aspera (Ehrenberg) Cleve (1894: 191; Giffen 1963: 255, f. 106, 107). Widespread in South Africa. – 165, 169

Triceratium Ehrenberg 1841

T. dubium Brightwell (cf. Hustedt, Kieselalg. 1: 806, f. 469, A. S. Atl., T. 78, f. 24, 35). Usually three angled, the forms occurring in Cape East Province may also be four or six angled. – 210

Tropidoneis Cleve 1891

T. lepidoptera (Gregory) Cleve (1894: 25; Peragallo 1897–1908, Pl. 39, f. 3–7; Giffen 1963: 255). This variable species is apparently widespread in South African waters, particularly in river estuaries. – 165, 197, 210

T. semistriata (Grunow) Cleve (cf. Grunow, A. M. D. 1879, No. 196, as *Amphiprora semistriata*; Cleve 1894: 27, Pl. 3, f. 9–11). This species, described by Grunow from material from South Africa inhabiting brackish water, differs from *T. lepidoptera*, which it closely

The taxa mentioned

Genera	Species	New species	Varieties	New varieties	Forms	New forms	Totals
Achnanthes	4		2				6
Actinoptychus	1						1
Amphipleura	1		1				2
Amphiprora	2	1	3				6
Amphora	13	4	4				21
Arachnoidiscus	1						1
Biddulphia	5		1				6
Caloneis	2					1	3
Campylodiscus	1						1
Campyloneis	1						1
Chaetoceros	3						3
Cocconeis	7	2	3				12
Coscinodiscus	1						1
Cymbella	3						3
Diploneis	7		5		1		13
Entopyla			1				1
Fragilaria	1						1
Gomphonema	2						2
Grammatophora	5		1				6
Gyrosigma	4		1				5
Hantzschia	2	1	1				4
Licmophora	3						3
Mastogloia	4	2	1			1	8
Melosira	4						4
Navicula	36	6	5			1	48
Nitzschia	40	4	6		1		51
Opephora	3	1		1		1	6
Pinnularia	2						2
Pleurosigma	5		2				7
Podosira	1						1
Pyxidicula	1						1
Raphoneis	4						4
Rhopalodia	3		1				4
Stauroneis	1	1					2
Stephanodiscus	1						1
Striatella	1						1
Surirella	3	1	1				5
Synedra	3		1				4
Thalassiothrix	1						1
Trachyneis	1						1
Triceratium	1						1
Tropidoneis	2						2
	186	23	40	1	2	4	256

resembles, in the slighter constriction of the frustule, in the excentric keel and the striae which do not reach the margin leaving a blank band. The ends of the striae are often of irregular lengths forming a somewhat undulate line. – 165, 510 (Fig. 124)

ACKNOWLEDGEMENTS

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SUMMARY

1. The diatom flora from several stations on the Eastern Cape Coast has been studied. Of these, namely the Umkantzi River, has a lagoon-like estuary open to the sea only during spring tides or during heavy rains. The other localities are rock and beach pools in the littoral zone.

2. The occurrence of a number of species of cosmopolitan distribution not previously recorded from South Africa have been established. The rediscovery of *Cocconeis discrepans* A. Schmidt and *Raphoneis capensis* A. Schmidt is recorded.

3. A number of species new to science were described. These are: *Amphiprora galerita* n.sp.; *Amphora exilissima* n.sp., *A. incredulata* n.sp.; *A. micrometra* n.sp.; *A. tenuissima* n.sp.; *Cocconeis convexa* n.sp.; *C. distantula* n.sp.; *Hantzschia insolita* n.sp.; *Mastogloia ciskeiensis* n.sp.; *M. exilissima* n.sp.; *Navicula evulsa* n.sp.; *N. Johanrossie* n.sp.; *N. kantziensis* n.sp.; *N. pertensa* n.sp.; *N. pragmatica* n.sp.; *N. pseudogamma* n.sp.; *Nitzschia erosa* n.sp.; *N. staurophora* n.sp.; *N. vacillata* n.sp.; *N. vulpecula* n.sp.; *Opephora perlonga* n.sp.; *Stauroneis exilissima* n.sp.; *Surirella scalaris* n.sp.

4. Reference is made in the text to systematic details and comments.

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EXPLANATION OF PLATES

All figures are drawn × 1000 unless otherwise stated

PLATE 1

1–3. *Amphiprora galerita* n.sp. – 4, 5. *A. gigantea* GRUNOW var. *tahitiensis* GRUNOW – 6. *A. perplexa* GIFFEN – 7. *Amphora castellata* GIFFEN – 8, 9. *A. exilissima* n.sp. – 10. *A. gamtoosae* GIFFEN – 11. *A. granulata* GREGORY – 12. *A. hyalina* KÜTZING – 13. *A. incredulata* n.sp. – 14. *A. laevis* GREGORY var. *laevissima* (GREGORY) CLEVE – 15. *A. lineolata* EHRENBERG – 16, 17. *A. micrometra* n.sp. – 18. *A. sublaevis* HUSTEDT – 19–21. *A. tenuissima* n.sp.

PLATE 2

22. *Catoneis brevis* (Gregory) Cleve – 23. *C. brevis* var. *distoma* Grunow n.f. *africana* – 24. *Chaetoceros cinctus* Gran – 25. *C. radicans* Schütt – 26–28. *Cocconeis concexa* n.sp. – 29, 30, 30a. *C. distantula* n.sp. – 31–33. *C. discrepans* A. Schmidt – 34. *Diploneis bombus* Ehrenberg var. *bombiformis* Hustedt – 35. *D. parca* (A. Schmidt) Boyer – 36. *Entopyla ocellata* (Arnott) Grunow var. *calitrana* Fricke – 37. *Gomphonema aestuarii* Cleve – 38. *Gyrosigma caffra* Giffen – 39–41. *Hantzschia insolita* n.sp. – 42. *H. virgata* (Roper) Grunow var. *gracilis* Hustedt – 43–45. *Mastogloia riskeiensis* n.sp. – 46, 47. *M. exilissima* n.sp. – 48–50. *M. pumila* Grunow n.f. *africana* – 51, 52. *M. pusilla* Grunow var. *linearis* Oestrup.

PLATE 3

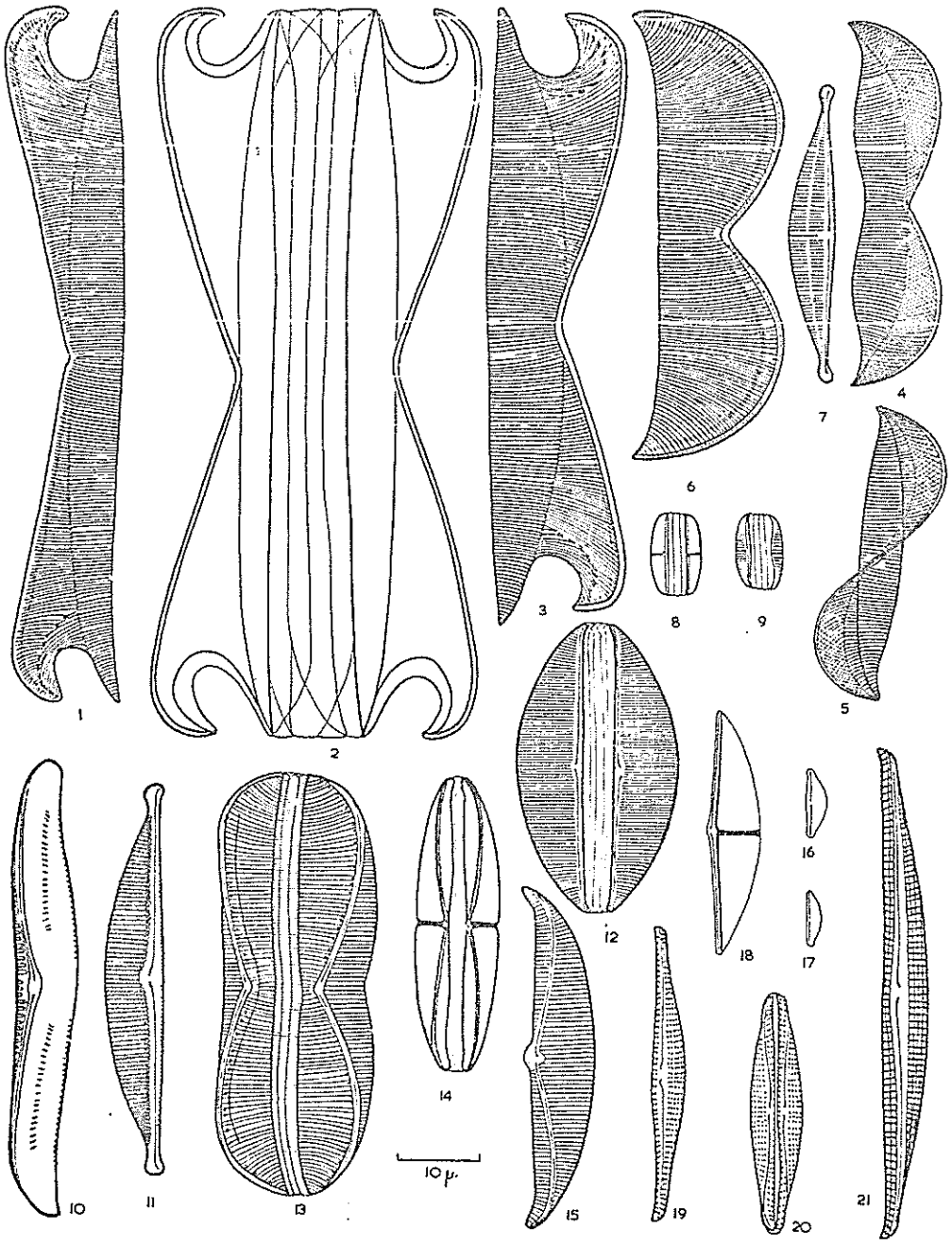
53. *Navicula abunda* Hustedt – 54. *N. amicorum* Grunow – 55. *N. ammophila* Grunow var. *flanatica* (Grunow) Cleve – 56. *N. bahusiensis* Grunow – 57, 58. *N. evulsa* n.sp. – 59. *N. guluensis* Giffen – 60. *N. humerosa* Brébisson n.f. *capensis* – 61, 62. *N. hyalosirella* Hustedt – 63, 64. *N. Johanrossii* n.sp. – 65–67. *N. kantsiensis* n.sp. – 68. *N. nautica* Cholnoky – 69. *N. nolens* Hustedt – 70. *N. normalis* Hustedt – 71. *N. orthoneoides* Hustedt – 72. *N. paeninsulae* Cholnoky – 73. *N. peregrina* (Ehrenberg) Kützing – 74, 75. *N. pertensa* n.sp. – 76, 77. *N. pseudogamma* n.sp. – 78. *N. pseudony* Hustedt – 79. *N. Rogersii* Giffen – 80. *N. salinaroides* Cholnoky.

PLATE 4

81. *N. Stompsii* Cholnoky – 82. *Nitzschia corpulenta* Hendey – 83, 84. *N. distantoides* Hustedt – 85–87. *N. erosa* n.sp. – 88, 89. *N. miserabilis* Cholnoky – 90. *N. perindistincta* Cholnoky – 91, 92. *N. perversa* Grunow – 93. *N. pseudohybrida* Hustedt – 94. *N. pulchra* Hustedt – 95. *N. sigmaeformis* Hustedt – 96. *N. staurophora* n.sp. – 97. *N. Stompsii* Cholnoky – 98, 99. *N. vacillata* n.sp. – 100, 101. *N. vulpecula* n.sp. – 102. *Opephora pacifica* (Grunow) Petit – 103. *O. gemmata* (Grunow) Hustedt – 104. *O. Martyi* Héribaud.

PLATE 5

105. *Opephora perlonga* n.sp. – 106, 107. *O. perlonga* n. var. *clavata* – 108. *Pinnularia cruciformis* (Donkin) Cleve – 109. *P. rectangulata* Gregory – 110. *Pleurosigma carinatum* Donkin – 111. *P. marinum* Donkin – 112, 113. *P. naviculaceum* Brébisson f. *minutum* Cleve – 114, 115. *Rhaphoneis capensis* A. Schmidt – 116, 117. *R. mirabunda* Giffen – 118. *R. superba* (Janisch) Grunow – 119, 120. *Stauroneis exilissima* n.sp. – 121, 122. *Surirella scalaris* n.sp. – 124. *Tropidoneis semistriata* Grunow – 126, 127. *Navicula pragmatica* n.sp.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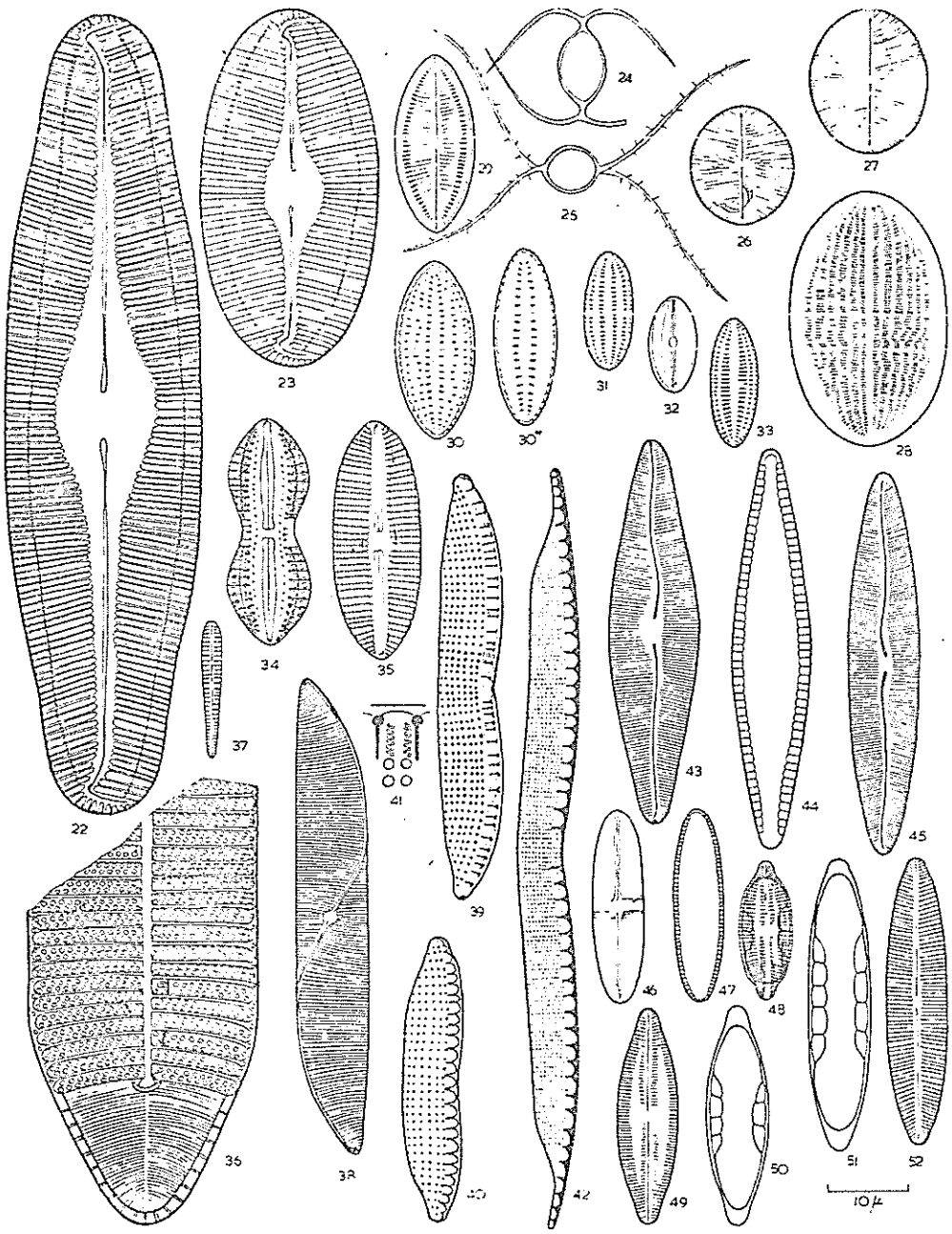
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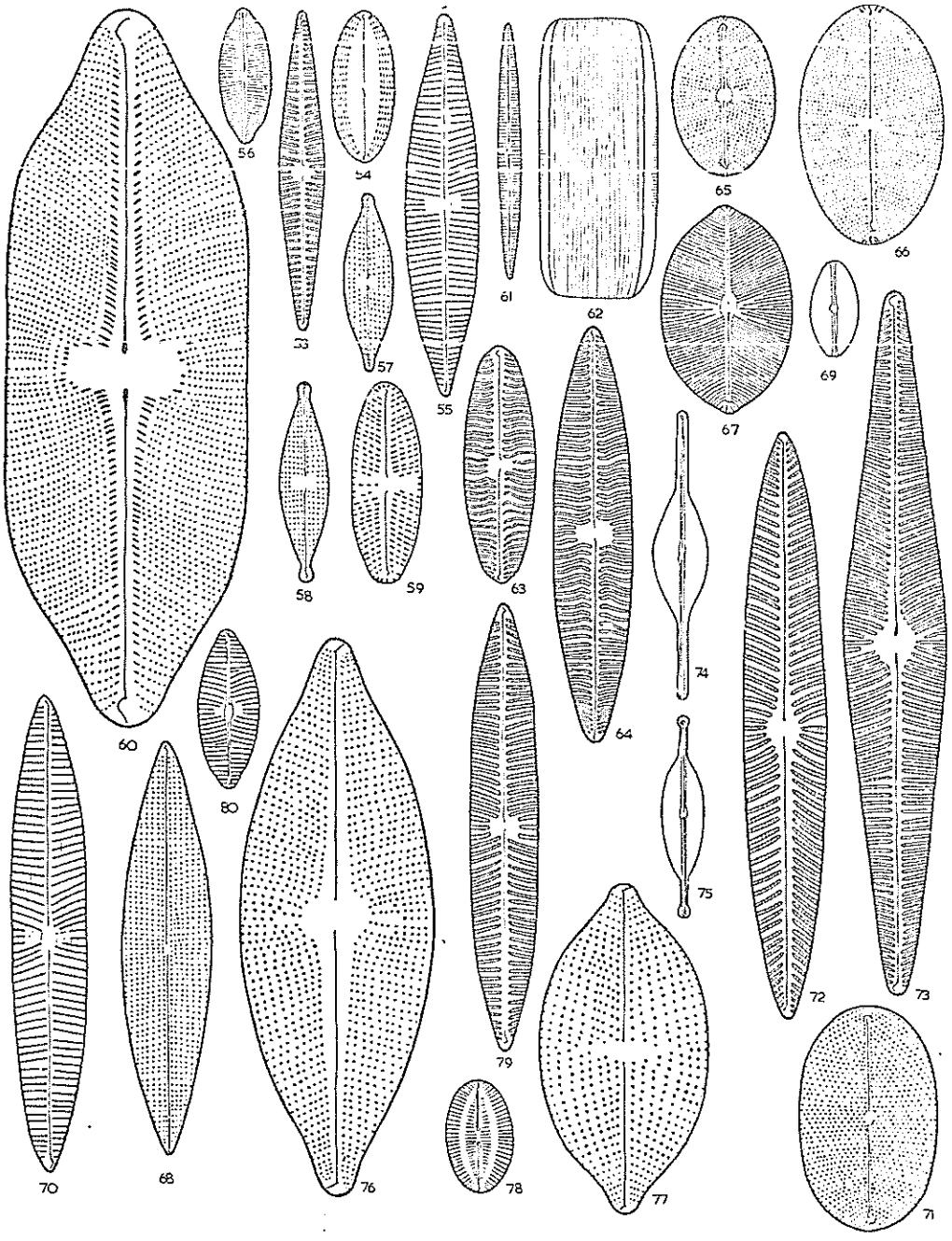
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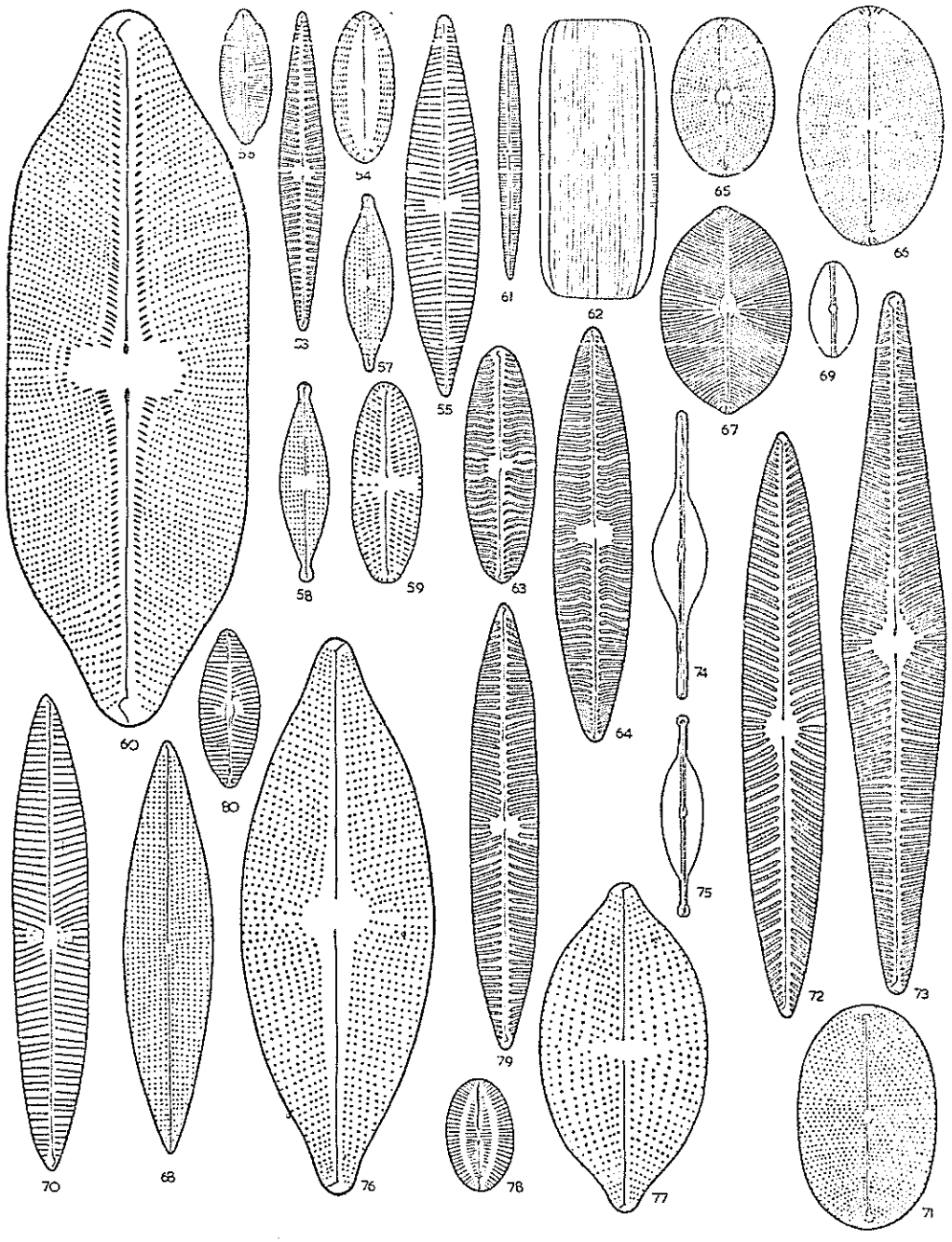
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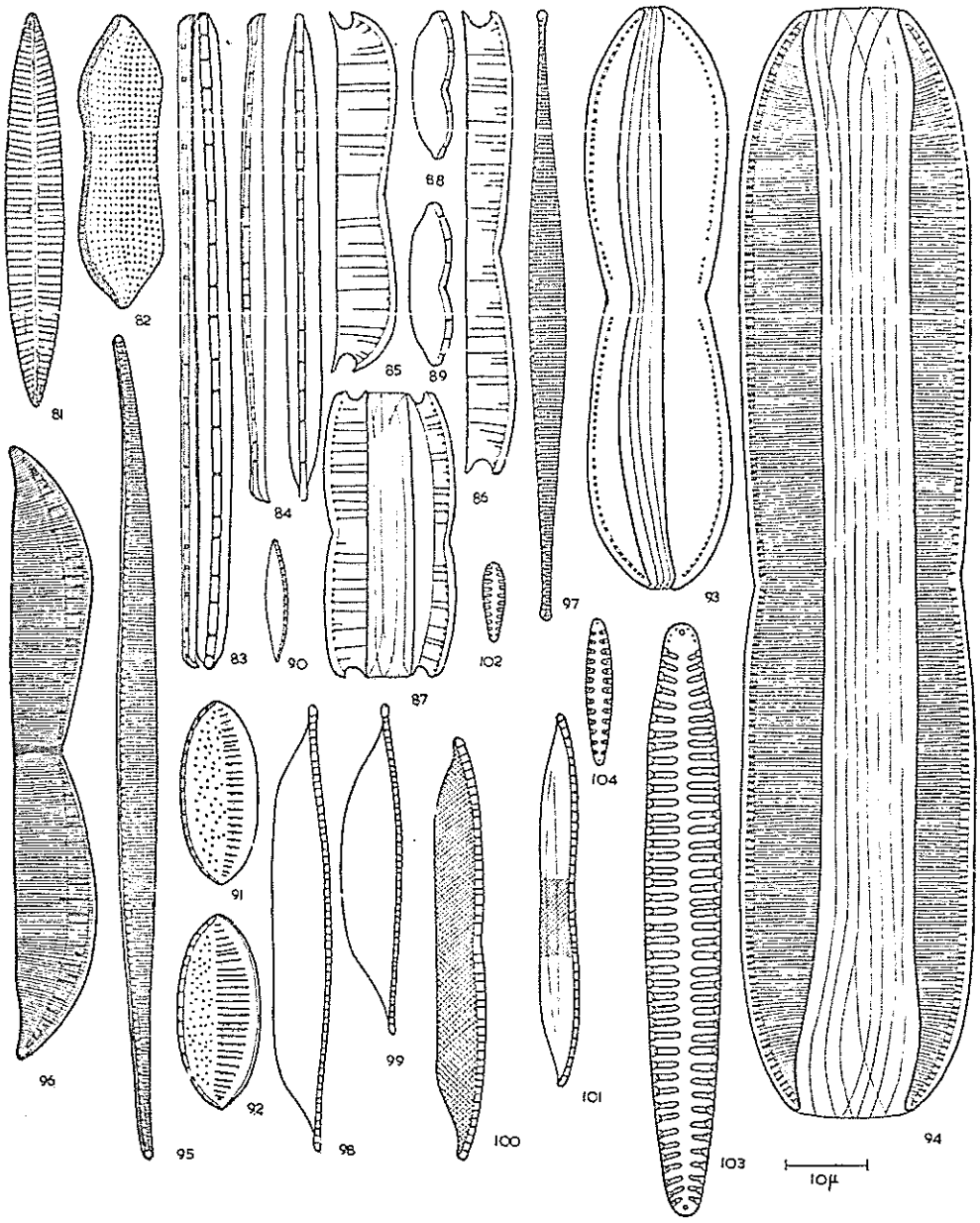
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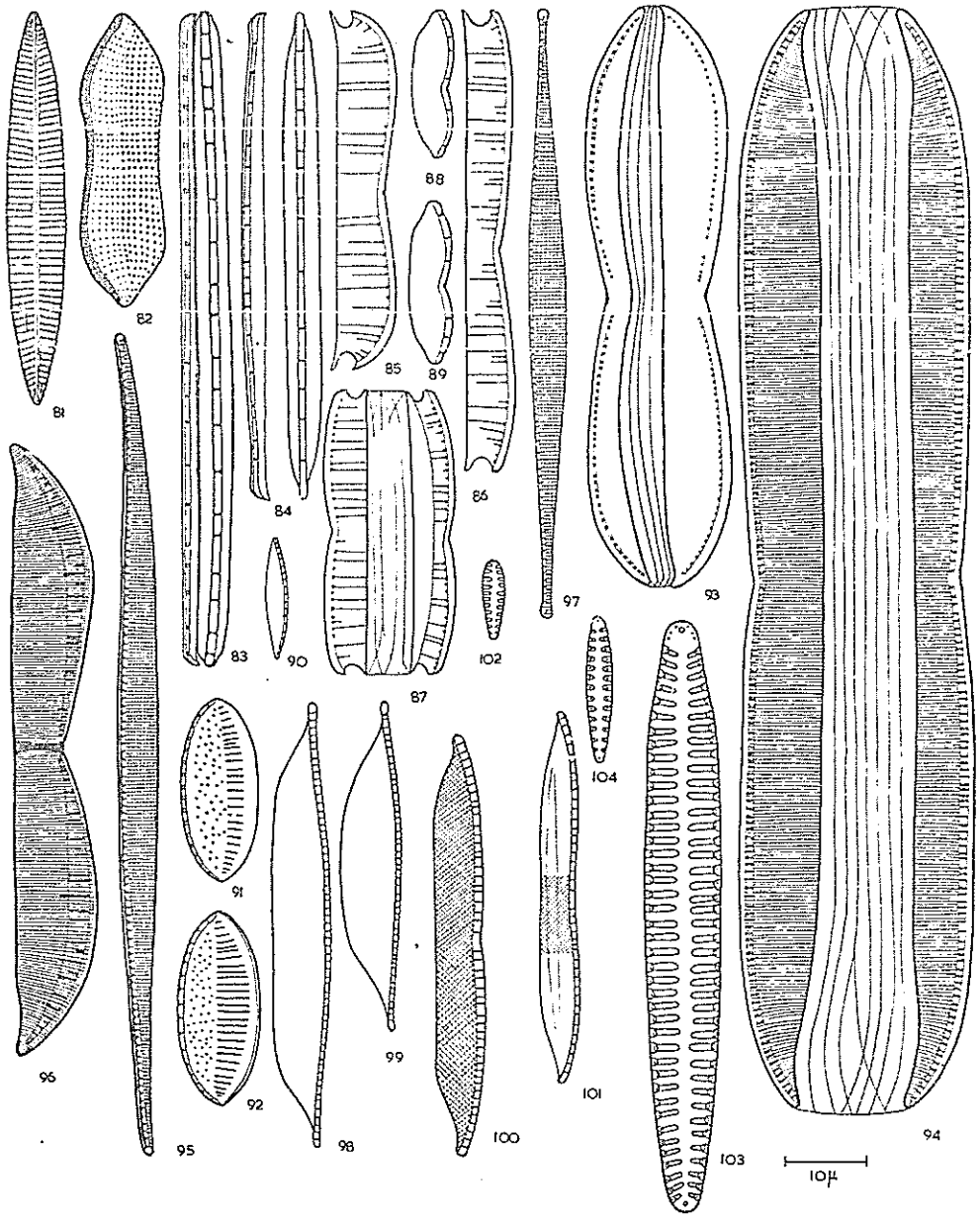
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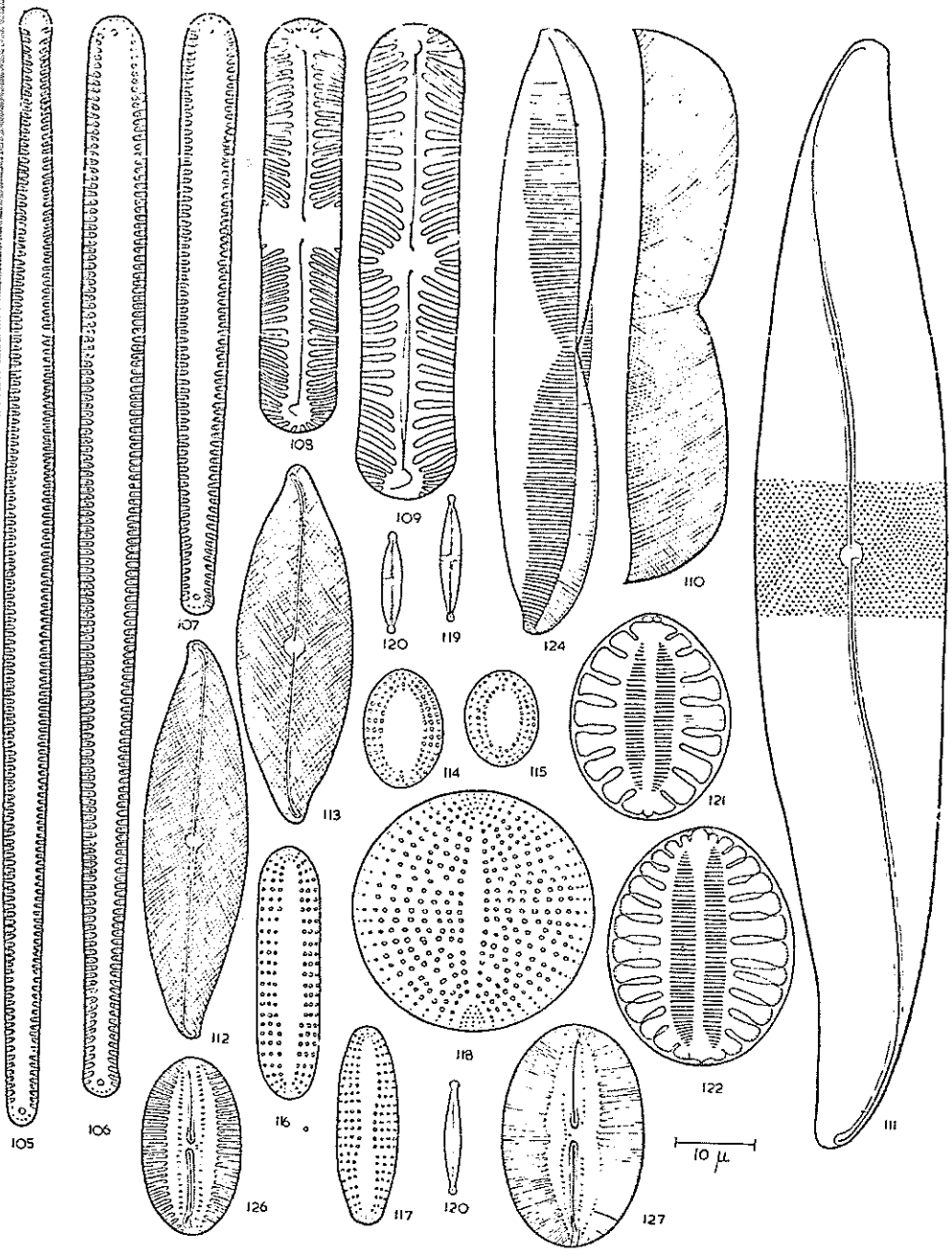
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