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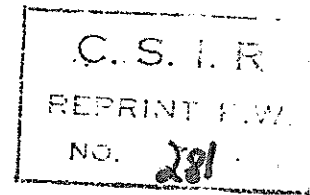
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Some New and Rare Diatoms  
from South Africa 2

by

R. E. M. ARCHIBALD



3301 LEHRE  
VERLAG VON J. CRAMER

1966

## 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. GRISLER (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+II in zweiter Auflage) lieferbar. Preis je Band DM 75.- (\$ 18.75)

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## 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 later on 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.

DM 120.- (\$ 30.-)

Clothbound  
„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. Kohlmeier 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. Box.

## 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 jacket

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.

Some New and Rare Diatoms from South Africa 2.  
Diatoms from Lake Sibayi and Lake Nhlange in  
Tongaland (Natal).

By R. E. M. ARCHIBALD<sup>1)</sup>

*With Plate 97 (1)*

In January, 1966, the Zoology Department of Rhodes University, Grahamstown, undertook a second expedition to Lake Sibayi under the leadership of Professor B. R. ALLANSON. A botanist, Mr. C. M. BREEN, from the Botany Department, accompanied this expedition, and made collections of the flora, both aquatic and terrestrial, from Lake Sibayi and Lake Nhlange.

Lake Sibayi is a lake situated in the central littoral section of Tongaland in North-eastern Natal. This area is subtropical with a summer rainfall. The lake is 25.2 sq. miles in extent and is landlocked, cut off from the sea by a sand-dune about 400 ft. high in parts and  $\frac{1}{2}$  mile wide running parallel to the coast. The surrounding country is undulating grassland on a sandy white soil. (TINLEY 1958: 9).

Lake Nhlange is the fourth of a chain of freshwater lakes in the Kosi Lake System. This lake system is open to the sea and comprises a chain of five lakes connected one with another by short channels. This chain of lakes is situated parallel to the coast and about 30 miles to the north of Lake Sibayi.

The material used for the investigation of the diatom flora consists of aquatic plants collected from these two lakes by Mr. BREEN, to whom I would like to express my sincere thanks for making this material available to me. I would also like to acknowledge my thanks to Dr. B. J. CHOLNOKY for his assistance and advice, at all times freely given.

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<sup>1)</sup> Council for Scientific and Industrial Research; National Institute for Water Research, Grahamstown, South Africa.

The following are brief descriptions of the sampling points from which the material was collected: -

- Sib. 1 - Lake Nhlange. From *Utricularia* sp. growing on the eastern shore of the lake. 20.1.66.
- Sib. 2 - Lake Sibayi. From *Potamogeton pectinalis* LINNAEUS growing in a sandy substrate on the marginal shelf of the eastern shore of the lake. Submerged about 4 ft. below the water surface. 21.1.66.
- Sib. 3 - The location of this sample cannot be stated with certainty. However, from the diatom association found in this sample it would appear that it comes from Lake Nhlange, or the Kosi Lake System.

A list of the diatom species found in these samples, together with the descriptions of new species and comments on interesting species, is enumerated below.

#### ACHNANTHES BORY 1822

##### *A. Breenii* n. sp.

This small species bears a resemblance to *A. sublaevis* HUSTEDT (1937: 180, F. 15, 16; A. S. Atl. T. 409, F. 74-82) but differs in a number of features. The areo valve of the new species is less finely striated than in *A. sublaevis*, and the central area found in the rapho valve of *A. sublaevis* is lacking in *A. Breenii*. The shape of the valve differs to a small degree in that the ends are not as broadly rounded as in *A. sublaevis*, and the central portion of the valve tends to be more linear. The valve is linear-elliptical, in most cases with the walls of the central portion almost parallel, the ends are produced and relatively broadly rounded, 10-11  $\mu$  long, and about 4.5  $\mu$  broad. The rapho valve has a straight filiform raphe, the axial area is linear and narrow and does not widen to form a central area. The transapical striae are radial throughout, about 30 in 10  $\mu$ ; one or two of the central striae are shortened. The areo valve has a wide lanceolate axial area with consequently shorter transapical striae, which are radial throughout, about 24 in 10  $\mu$ , with occasional shortened striae in the central portion of the valve. The longitudinal costae are invisible. This species is named in honour of C. M. BREEN who collected these samples. - F. 1-3. - Sib. 3.

Valvae lineari-ellipticae, in partibus medianibus marginibus fere parallelis, apicibus valde subcapitato-protractis, regulariter sive leviter obtuse rotundatis, 10-11  $\mu$  longae, circiter 4,5  $\mu$  latae. Raphovalva: rraphe filiformis, directa, area axialis angustissime linearis, area centralis nulla. Striae

transapicales in tota longitudine valvae radiantes, apud nodulum centralem singulis abbreviatis intercalatis, circiter 30 in  $10\mu$ . Areovalva: area axialis ad polos versus in partibus protractis linearis, in parte mediana late lanceolata, area centralis nulla. Striae transapicales breves, in tota longitudine valvae radiantes, in partibus medianibus singulis brevioribus intercalatis, circiter 24 in  $10\mu$ . Costae longitudinales invisibiles.

Habitat in aquis dulcibus lacus Nhlange prope Kosi Bay ad oras boreales provinciae Natalensis in Africa Meridionale.

Typus: in praeparato no. Sib. 3 in collectione C.S.I.R., Grahamstown.  
Iconotypus: figurae nostrae no. 1-3.

*A. lanceolata* BREBISSON var. *rostrata* (ÖSTRUP) HUSTEDT (1927-1962, Part 2: 408, F. 863 i-m). - Sib. 3.

*A. linearis* (W. SMITH) GRUNOW (cf. HUSTEDT 1927-1962, Part 2: 378, F. 821 a, b).

CHOLNOKY (1960: 16) found this species fairly frequently in weakly acid waters of Natal rivers. - Sib. 3.

*A. minutissima* KÜTZING (cf. HUSTEDT 1930: 198, F. 274).

This species occurred in relatively large numbers in the sample Sib. 2 (20.5%), but was not found in the other two samples. - Sib. 2.

*A. montana* KRASSKE (cf. HUSTEDT 1927-1962, Part 2: 398, F. 847).

As only the areovalve was seen it is difficult to state positively that this is *A. montana*, although the areovalve fits the description of this species. If, however, this is *A. montana* then it is of interest to note it here, as it has only been recorded in Africa. MÖLDER (1962: 35) reports it from the Kangari and Sula Mountains in Sierra Leone. This, therefore, is a new record for South Africa. - Sib. 2.

*A. sibayiensis* n. sp.

This new species differs from *A. plönensis* HUSTEDT (1930: 199, F. 280) by being more finely striated, and having a relatively narrower pseudoraphe in the areovalve. It also resembles *A. Biasoletiana* (KÜTZING) GRUNOW (cf. HUSTEDT 1927-1962, Part 2: 379, F. 823) but differs from this species in the shape of the pseudoraphe and in the axial area of the raphovalve, which is narrowly but quite clearly lanceolate in *A. sibayiensis*; the direction of the striae at the poles also differs, being parallel in *A. sibayiensis*. The valve is linear-lanceolate to linear-elliptical, with relatively broadly rounded and produced ends. The poles are sometimes only slightly produced. The valves are  $10.5-13.5\mu$  long and  $3-3.5\mu$  wide. The raphovalve has a straight filiform raphe, and a narrow lanceolate axial area, there is no central area; the transapical striae are slightly radial in the middle and parallel at the poles, 22-26 in  $10\mu$ . The areovalve has a narrow lanceolate or sometimes linear axial area, a central area is absent; the

transapical striae are slightly radial in the middle and parallel at the poles, about 24 in  $10\mu$ . - F. 4-7. - Sib. 1, 3.

Valvae lineari-lanceolatae sive lineari-ellipticae apicibus plus minusve leviter protractis, regulariter sive levissime obtuse late rotundatis,  $10,5-13,5\mu$  longae,  $3-3,5\mu$  latae. Rhaphovalva: rhaps directae, filiformis, poris centralibus modice distantibus, area axiali angustissime lanceolata, area centrali nulla; striae transapicales in media parte valvae leviter radiantes, ad apices versus in partibus protractis parallelae, 22-26 in  $10\mu$ . Areovalva: area axiali anguste lanceolata sive nonnumquam linearis, area centrali nulla; striae transapicales in parte media valvae levissime radiantes, ad apices versus parallelae, circiter 24 in  $10\mu$ .

Habitat in aquis dulcibus lacus Nhlange prope Kosi Bay ad oras boreales provinciae Natalensis in Africa Meridionale.

Typus: in praeparato no. Sib. 1 in collectione C.S.I.R., Grahamstown.  
Iconotypus: figurae nostrae no. 4-7.

#### AMPHIPRORA EHRENBERG 1841

*A. corrugata* GIFFEN (1963: 213, F. 6, 7).

The specimen figured in this publication, although much larger than the dimensions given in the original description, agrees in all other respects with *A. corrugata*, and can therefore be assigned to this species. This specimen is  $138\mu$  long; the valve in girdle view is, at its maximum width,  $24,5\mu$  wide, and its minimum width at the central nodule, is  $12\mu$  wide. The original description must therefore be altered to accommodate these new observations. GIFFEN found the original specimens in the brackish waters of the Yarra Stream, the Gulu River, and also recorded it in the Umlele and Umkantzi Rivers of the Eastern Cape Province. - F. 8. - Sib. 3.

#### AMPHORA EHRENBERG 1840

*A. angusta* (GREGORY) CLEVE (1895: 135).

This species is regarded by CLEVE (l.c.) as a marine form found quite widely distributed in the world. In South Africa it has been recorded by CHOLNOKY (1960 B: 234) from the Zwartkops River near Port Elizabeth, and by GIFFEN (1963: 216), who found it in the brackish water lagoons of rivers in the neighbourhood of East London. - Sib. 2, 3.

*A. exigua* GREGORY (cf. CLEVE 1895: 135).

This species, according to CLEVE, is also a marine form. It has been recorded by CHOLNOKY (1959: 12, F. 76-78) from the Cape Province in brackish water, and from Natal (CHOLNOKY 1960 A: 22, F. 56).

GIFFEN (1963: 217, F. 17, 18) records this species from the brackish waters of the Gulu River. — Sib. 2.

*A. ovalis* KÜTZING var. *libyca* (EHRENBERG) CLEVE (1895: 104; HUSTEDT 1930: 342). — Sib. 1.

*A. ovalis* var. *pediculus* KÜTZING (cf. HUSTEDT 1930: 343, F. 629). — Sib. 2.

*A. lacustris* n. sp.

The specimen figured here shows a similarity to *A. Grundleri* GRUNOW (cf. A. S. Atl. T. 28, F. 24–27, and T. 39, F. 25; CLEVE 1895: 112). It differs from GRUNOW's species in its smaller dimensions, the arrangement of the finer striae and the shape of the central area. *A. lacustris* also shows a close affinity to *A. gamtoosae* GIFFEN (1963: 218, F. 21); it differs, however, in that it does not have a quadrate central area, and in the arrangement of the ventral striae. In GIFFEN's species the ventral striae or punctae are a curved band in the middle of the valve, while in *A. lacustris* the striae lie closer to the raphe. The frustule is rectangular with broad truncate ends, it has about 9 intercalary bands in  $10\mu$  which are striate, the striae about 36 in  $10\mu$ . The valves are linear, with a straight dorsal margin, and slightly gibbous central portion of the ventral margin, the ends are produced and incurved. The length of the valves is  $31\text{--}46\mu$  long, and the width of the valve is  $7\text{--}8\mu$  broad; however, the full range of variation cannot be determined as only two specimens were seen. The raphe is arcuate curving up towards the dorsal wall and then running parallel to the dorsal wall. On the dorsal side the axial area is narrow and linear, widening in the region of the central nodule into a semi-lanceolate central area due to regular shortening of the striae. On the ventral side the axial area at the poles is narrow and linear, becoming gradually wider, and in the region of the central nodule it extends to the margin of the ventral wall due to the absence of striae in this region. The valve is striated on both the dorsal and ventral sides, about 16 transapical striae in  $10\mu$ . On the dorsal side the striae are parallel in the middle and radial at the poles, the striae are crossed by a narrow longitudinal band near the dorsal wall. On the ventral side the transapical striae are short, radial in the middle and convergent at the poles. A further row of striae extends for a third of the length of the valve from either pole along the ventral margin of the valve, about 16 striae in  $10\mu$ . — F. 9, 10. — Sib. 2.

Frustula rectangularia, apicibus late truncatis, lineis connectivis circiter 9 in  $10\mu$  transversaliter striatis, striis circiter 36 in  $10\mu$ . Valvae lineares, margine dorsale directo, margine ventrale subdirecto, parte mediana leviter

inflata, apicibus protractis in directione ventrale declinatis, 31–46  $\mu$  longae, 7–8  $\mu$  latae. Rraphe fissuris arcuatis margine dorsale approximata. Area axialis lateris dorsalis anguste linearis, in media parte apud nodulum centrale abbreviacione striarum dilatata, arcum centrale parvam, semilanceolatam formans. In latere ventrale area axialis ad polos versus anguste linearis, ad centrum valvae versus gradatim dilatata, apud nodulum centrale arcum centrale vittaeformem marginem valvae ventralem attingentem formans. Striae transapicales in lateris utribus valvae circiter 16 in 10  $\mu$ , in latere dorsale in media parte parallelae, ad apices versus radiantes, linea angustissima hyalina margine dorsale approximata decussatae. In latere ventrale striae transapicales breves in parte mediana parallelae, ad polos versus convergentes. Series secunda striarum ad margines ventrales valvae in partibus apicalibus tertiis apparet, quae similiter 16 in 10  $\mu$  densae positae sunt.

Habitat in aquis subsalsis lacus Sibayi ad oras boreales provinciae Natalensis in Africa Meridionalis.

Typus: in praeparato no. Sib. 2 in collectione C.S.I.R., Grahamstown.  
Iconotypus: figurae nostrae no. 9 et 10.

*A. robusta* GREGORY (cf. CLEVE 1895: 103; A. S. Atl. 1872–1960: T. 27, F. 38–41).

This relatively large marine species has not been found in South Africa before and it is thus of interest to record it from this country.  
– Sib. 3.

*A. tenerrima* ALEEM et HUSTEDT (1951: 16, F. 3 a–f). – F. 11. – Sib. 3.

#### ANOMOEONEIS PFITZER 1871

*A. brachysira* (BREBISSE) CLEVE (1895: 7). – Sib. 1.

*A. exilis* (KÜTZING) CLEVE (1895: 8). – Sib. 1, 3.

#### CALONEIS CLEVE 1891

*C. Clevei* (LAGERSTEDT) CLEVE (1894: 51; HUSTEDT 1930: 236, F. 359).  
– Sib. 2.

*C. silicula* (EHRENBERG) CLEVE (1894: 51; HUSTEDT 1930: 236, F. 362).  
– Sib. 2.

#### COCCONEIS EHRENBERG 1838

*C. diminuta* PANTOCSEK (cf. HUSTEDT 1927–1962, Part 2: 346, F. 800).

The specimens seen in these samples agree with the description given by HUSTEDT (l.c.) and there is no doubt that they are this species. In some cases, however, the areoalve has a greater number



of striae than is given in the description, up to 18 in  $10\mu$ . – Sib. 1, 2, 3.

*C. Engelbrechtii* (CHOLNOKY 1955A: 16, F. 11–16). – Sib. 1, 3.

*C. placentula* EHRENBERG (cf. HUSTEDT 1927–1962, Part 2: 347, F. 802). – Sib. 2.

*C. pusilla* n. sp.

I cannot associate this small species with any *Cocconeis* species known to me. It shows some similarity to *C. microscopica* CHOLNOKY (1959: 17, F. 105, 106), but differs in that the areoalve has a relatively wide lanceolate axial area. Further, the number of striae per  $10\mu$  differs from *C. microscopica* in both the raphoalve and the areoalve. The valves are linear-elliptical to elliptical,  $5.5\text{--}7\mu$  long and  $3.5\text{--}4\mu$  wide. The raphoalve has a straight filiform raphe, the axial area is narrow and linear, the transapical striae are fine with indistinct punctae, radial throughout and about 36 in  $10\mu$ . The areoalve has a relatively wide linear-lanceolate to lanceolate axial area, the transapical striae are radial throughout, about 26–28 in  $10\mu$ . – F. 12–14. – Sib. 3.

Valvae lineari-ellipticae sive ellipticae,  $5.5\text{--}7\mu$  longae,  $3.5\text{--}4\mu$  latae. Raphoalva: rraphe directa, filiformis; area axialis anguste linearis; striae transapicales subtiles, indistincte punctatae, in tota longitudine valvae radiant, circiter 36 in  $10\mu$ . Areoalva: area axialis late lanceolata, partem tertiam superficiei valvae occupans, striae transapicales indistincte punctatae, in tota longitudine valvae radiant, 26–28 in  $10\mu$ .

Habitat in aquis dulcibus lacus Nhlange prope Kosi Bay ad oras boreales provinciae Natalensis in Africa Meridionale.

Typus: in praeparato no. Sib. 3 in collectione C.S.I.R., Grahamstown. Iconotypus: figurae nostrae no. 12–14.

*C. scutellum* EHRENBERG (cf. HUSTEDT 1927–1962, Part 2: 337, F. 790). – Sib. 2, 3.

*C. scutellum* var. *parva* GRUNOW (cf. HUSTEDT 1927–1962, Part 2: 338, F. 791). – Sib. 3.

*C. subdirupta* CHOLNOKY (1959: 16, F. 102–104). – Sib. 1, 2, 3.

*C. thumensis* MAYER (cf. HUSTEDT 1927–1962, Part 2: 346, F. 801). – Sib. 2.

#### COSCINODISCUS EHRENBERG 1838

*C. lacustris* GRUNOW (cf. HUSTEDT 1927–1962, Part 1: 432, F. 235).

This species is not very common in South Africa and has been recorded by CHOLNOKY from Lake Kiwu (CHOLNOKY 1954: 423), from the Western Cape Province (CHOLNOKY 1959: 19), the Zwartkops

River (CHOLNOKY 1960B: 237), and from Lake Tanganyika, Ruvenzori (CHOLNOKY 1964: 61). - Sib. 3.

*CYCLOTELLA* KÜTZING 1834

*C. Meneghiniana* KÜTZING (cf. HUSTEDT 1927-1962, Part 1: 341, F. 174). - Sib. 1, 3.

*C. striata* (KÜTZING) GRUNOW (cf. HUSTEDT 1927-1962, Part 1: 344, F. 176). - Sib. 3.

*C. substylorum* n. sp.

On account of the smaller measurements and finer structure of this new species I cannot equate it with *C. stylorum* BRIGHTWELL (cf. HUSTEDT 1927-1962, Part 1: 348, F. 179). It differs also from *C. striata* (cf. HUSTEDT 1927-1962, Part 1: 344, F. 176) by having a peripheral row of chambers and finer structure of the striae. The valve is disc-shaped about 23  $\mu$  in diameter, with a tangentially folded valve. The marginal zone is broad, and radially striated, about 15 striae in 10  $\mu$ . Around the periphery there is a row of chambers, about 6-8 in 10  $\mu$ , which are probably formed from ribs which project inwards from the valve mantle. The central area of the valve is irregularly flecked with punctae, and on the convex side there is a semicircular row of sharply defined punctae. - F. 15. - Sib. 3.

Valvae circulares diametro circiter 23  $\mu$ , valde undulatae. Zona marginalis lata, striis radiantibus, circiter 15 in 10  $\mu$  ornata. Ad margines valvae camerae parvae, 6-8 in 10  $\mu$  dense affixae, veri similiter costis brevibus pallio valvae fictae visibiles sunt. Zona centralis punctis irregularibus munita, quae in latere convexo undulae superficiei distincte definitae sunt.

Habitat in aquis dulcibus lacus Nhlange prope Kosi Bay ad oras boreales provinciae Natalensis in Africa Meridionale.

Typus: in praeparato no. Sib. 3 in collectione C.S.I.R., Grahamstown.  
Iconotypus: figura nostra no. 15.

*CYMBELLA* AGARDH 1830

*C. amphicephala* NAEGELI (cf. HUSTEDT 1930: 355, F. 651). - Sib. 1.

*C. bengalensis* GRUNOW (cf. A. S. Atl. T. 9, F. 12, 13; HUSTEDT in A. S. Atl. T. 375, F. 2, 3, 6). - Sib. 2.

*C. gracilis* (RABENHORST) CLEVE (cf. HUSTEDT 1930: 359, F. 663). - Sib. 1.

*C. microcephala* GRUNOW (cf. HUSTEDT 1930: 351, F. 637).

This species was fairly common in sample Sib. 2. - Sib. 2, 3.

*C. pusilla* GRUNOW (cf. HUSTEDT 1930: 354, F. 646).

This species is a brackish water one, which is also found commonly in inland saline waters. – Sib. 1, 2, 3.

*C. turgida* (GREGORY) CLEVE (cf. HUSTEDT 1930: 358, F. 660). – Sib. 2.

*C. ventricosa* KÜTZING (cf. HUSTEDT 1930: 358, F. 661). – Sib. 1, 2.

#### DIPLONEIS EHRENBERG 1844

*D. interrupta* (KÜTZING) CLEVE var. *clancula* (SCHMIDT) CLEVE (1894: 84; HUSTEDT 1927–1962, Part 2: 602, F. 1019b).

This species is a marine one; CLEVE records it from Australia and HUSTEDT from the shores in the coastal regions of Europe. CHOLNOKY (1955A: 22) found it in two samples from the Jakkals River in the Western Cape Province. – Sib. 2.

*D. ovalis* (HILSE) CLEVE (cf. HUSTEDT 1927–1962, Part 2: 671, F. 1065a–e). – Sib. 3.

*D. subovalis* CLEVE (1894: 96, T. 1, F. 27; HUSTEDT 1927–1962, Part 2: 667, F. 1063a, b). – Sib. 2, 3.

#### EPITHEMIA BREBISSEON 1838

*E. sorex* KÜTZING (cf. HUSTEDT 1930: 388, F. 736). – Sib. 2.

*E. turgida* (EHRENBERG) KÜTZING (cf. HUSTEDT 1930: 387, F. 733). – Sib. 3.

*E. zebra* (EHRENBERG) KÜTZING var. *saxonica* (KÜTZING) GRUNOW (cf. HUSTEDT 1930: 384, F. 730). – Sib. 1, 2.

#### EUNOTIA EHRENBERG 1837

*E. flexuosa* (BREBISSEON) KÜTZING (cf. HUSTEDT 1927–1962, Part 2: 312, F. 778). – Sib. 1, 3.

*E. lunaris* (EHRENBERG) GRUNOW (cf. HUSTEDT 1927–1962, Part 2: 302, F. 769; 1949: 70, T. 2, F. 11–15).

From a close study of material which he collected in the Albert National Park in the Belgian Congo, HUSTEDT (l.c.) found that *E. lunaris* had a small backward projecting appendage of the terminal nodule. This appendage was also found in European material, which HUSTEDT used for comparison, although in some cases it was difficult to observe. As in most species of *Eunotia*, *E. lunaris* has an optimum

pH of below 6.0 (CHOLNOKY 1962: 71). HUSTEDT in the results of the Sunda Islands Expedition (HUSTEDT 1937-1939: 170) also found this species inhabiting waters with pH values which ranged from 4.3 to 6.8. - Sib. 1, 3.

*E. pectinalis* (KÜTZING) RABENHORST (cf. HUSTEDT 1927-1962, Part 2: 296, F. 763a, k). - Sib. 1.

*E. pseudoveneris* HUSTEDT (1942: 29, F. 24-29).

In the samples Sib. 1 and 3 this species comprises the bulk of the diatom association, being 86.0% and 75.8% respectively in the two samples. This according to CHOLNOKY (1959: 23) is also an acid water species. - Sib. 1, 3.

#### FRAGILARIA LYNGBYE 1819

*F. brevistriata* GRUNOW (cf. HUSTEDT 1927-1962, Part 2: 168, F. 676 a-e).

This species was quite common in the sample Sib. 3, but most of the specimens seen here were of smaller dimensions than those given in the description. My specimens were 7.5-12.5  $\mu$  long and 2.5-3.5  $\mu$  wide. The description must therefore be altered to accommodate these new observations. - F. 16, 17. - Sib. 3.

*F. construens* (EHRENBERG) GRUNOW (cf. HUSTEDT 1927-1962, Part 2: 156, F. 670a-c). - Sib. 3.

*F. exiguissima* n. sp.

This very small species of *Fragilaria* is very similar to *F. atomus* HUSTEDT (1927-1962, Part 2: 164, F. 672B), but differs in the shape of the valve and its dimensions. The cells are rectangular with rounded corners, forming compact bands. The valve is linear to linear-lanceolate and sometimes slightly capitate at the poles, 4-9.5  $\mu$  long and 1-1.5  $\mu$  wide. The transapical striae are parallel, fine, and about 28 in 10  $\mu$ . The axial area is very narrow and linear.

This species is fairly common in sample Sib. 3. - F. 18-22. - Sib. 2, 3.

Cellulae in visu pleurale rectangulares, angulis rotundatis, catenas congestas formantes. Valvae lineares sive lineari-lanceolatae, apicibus nonnumquam subcapitato-protractis, 4-9,5  $\mu$  longae, 1-1,5  $\mu$  lataeque. Area axialis angustissime linearis, striae transapicales parallelae, subtiles, circiter 28 in 10  $\mu$ .

Habitat in aquis dulcibus lacus Nhlange prope Kosi Bay ad oras boreales provinciae Natalensis in Africa Meridionale.

Typus: in praeparato no. Sib. 3 in collectione C.S.I.R., Grahamstown.  
Iconotypus: figurae nostrae no. 18-22.

- F. familiaris* (KÜTZING) HUSTEDT (1957: 229). – Sib. 3.  
*F. fonticola* HUSTEDT (1937–1939: 151, T. 10, F. 61, 62). – Sib. 2.  
*F. intermedia* GRUNOW (cf. HUSTEDT 1927–1962, Part 2: 152, F. 666).  
– Sib. 2.

*FRUSTULIA* GRUNOW 1865

- F. rhomboides* (EHRENBERG) DE TONI (cf. HUSTEDT 1930: 220, F. 324).  
– Sib. 1.  
*F. rhomboides* var. *saxonica* (RABENHORST) DE TONI (cf. HUSTEDT  
1930: 221, F. 325). – Sib. 1, 3.

*GOMPHONEMA* AGARDH 1824

- G. gracile* EHRENBERG (cf. HUSTEDT 1930: 376, F. 702).  
This species is common in all three samples. – Sib. 1, 2, 3.  
*G. longiceps* EHRENBERG var. *subclavatum* GRUNOW (cf. HUSTEDT  
1930: 375, F. 705). – Sib. 2, 3.  
*G. parvulum* (KÜTZING) GRUNOW (cf. HUSTEDT 1930: 372, F. 713a).  
– Sib. 1, 2, 3.

*MASTOGLOIA* THWAITES 1856

- M. Braunii* GRUNOW (cf. HUSTEDT 1927–1962, Part 2: 551, F. 982).  
HUSTEDT (l.c.) regards this as a brackish water form, which is also  
found in coastal areas and saline inland waters. – Sib. 3.  
*M. elliptica* (AGARDH) CLEVE (cf. HUSTEDT 1927–1962, Part 2: 501,  
F. 927a).  
This is also a brackish water form from the coastal areas. – Sib. 2.  
*M. elliptica* var. *Dansei* (THWAITES) GRUNOW (cf. HUSTEDT 1927–1962,  
Part 2: 501, F. 927b).  
The variety is far more common than the type. – Sib. 2, 3.  
*M. pumila* (GRUNOW) CLEVE (cf. HUSTEDT 1927–1962, Part 2: 553,  
F. 983).  
This is a marine form found on almost all coasts. – Sib. 3.  
*M. pusilla* GRUNOW (cf. HUSTEDT 1927–1962, Part 2: 568, F. 1002a–c).

This is also a coastal marine and brackish water form. – Sib. 3.  
*M. Smithii* THWAITES (cf. HUSTEDT 1927–1962, Part 2: 502, F. 928a).

This diatom species is normally found in brackish waters of the coastal areas, and inland saline waters. Some of the specimens seen in these two samples are relatively narrower than normal. I have illustrated one specimen which is only  $3.5\mu$  wide. – F. 23. – Sib. 2, 3.

#### MELOSIRA AGARDH 1824

*M. granulata* (EHRENBERG) RALFS (cf. HUSTEDT 1927–1962, Part 1: 248, F. 104). – Sib. 2, 3.

*M. granulata* var. *angustissima* O. MÜLLER (cf. HUSTEDT 1927–1962, Part 1: 250, F. 104d). – Sib. 2.

#### NAVICULA BORY 1824

*N. Breenii* n. sp.

This new species cannot be associated with any *Navicula* species known to me, except with an apparently undescribed species, *N. subpatrickae* n. sp., which will be dealt with later in this paper. The essential differences between these two species are first the difference in shape of the axial areas of the two species, and secondly the absence in *N. Breenii* of the hyaline line near the margin of the valve found in *N. subpatrickae*. The valve is elliptical to linear-elliptical with broadly rounded ends, which are not produced,  $12.5$ – $19.5\mu$  long and  $6.5$ – $8.0\mu$  wide. The raphe is straight and filiform and the central pores are relatively distant. The axial area is narrow and lanceolate in shape, and does not widen in the region of the central nodule into a central area. The transapical striae are radial throughout, 21–24 in  $10\mu$ . In the central portion of the valve there are one to a few irregularly spaced shortened striae. I have named this species in honour of C. M. BREEN, who kindly collected the sample material – F. 24, 25. – Sib. 3.

Valvae ellipticae sive lineari-ellipticae, apicibus late regulariterque rotundatis, non productis,  $12,5$ – $19,5\mu$  longae,  $6,5$ – $8\mu$  latae. Rraphe directa, filiformis, poris centralibus modice distantibus. Area axialis anguste lanceolata, in media parte apud nodulum centalem non dilatata, itaque area centralis nulla. Striae transapicales in tota longitudine valvae radiantes, in vicinitate noduli centralissimulis abbreviatis intercalatis, irregulariter distributis, 21–24 in  $10\mu$ . Costae longitudinales invisibiles.

Habitat in aquis dulcibus lacus Nhlange prope Kosi Bay ad oras boreales provinciae Natalensis in Africa Meridionale.

Typus: in praeparato no. Sib. 3 in collectione C.S.I.R., Grahamstown.  
 Iconotypus: figurae nostrae no. 24 et 25.

*N. cincta* (EHRENBERG) KÜTZING (cf. HUSTEDT 1930: 293, F. 510). – Sib. 3.

*N. cinctaeformis* HUSTEDT (1937–1939: 265, T. 19, F. 11, 12). – Sib. 3.

*N. cryptocephala* KÜTZING (cf. HUSTEDT 1930: 295, F. 496). – Sib. 1, 2.

*N. cryptolyra* BROCKMANN (cf. HUSTEDT 1927–1962, Part 3: 534, F. 1570).

HUSTEDT (l.c.) remarks that this small species is a marine form wide-spread on the coasts of Europe, and also found in the surroundings of river mouths. The specimen figured here is so typical that there is little doubt that this is *N. cryptolyra*. This is the first time that this species has been recorded in South Africa. – F. 26. – Sib. 2.

*N. forcipata* GREVILLE (cf. HUSTEDT 1927–1962, Part 3: 531, F. 1568).

This is also a marine species (HUSTEDT l.c.). – Sib. 1.

*N. humerosa* BREBISSON (cf. HUSTEDT 1930: 311, F. 559).

*N. humerosa* is a marine species often found in the surroundings of river mouths, and sometimes in inland saline waters (HUSTEDT l.c.). In South Africa it has not been recorded very often. CHOLNOKY (1960A: 65) records it from the mouth of the Umlalazi River in Zululand (Northern Natal) and GIFFEN (1963: 239) from the sandy beaches near the Gulu River estuary. – Sib. 3.

*N. micropupula* CHOLNOKY (1957: 353, F. 61–63). – Sib. 2.

*N. minima* GRUNOW (cf. HUSTEDT 1927–1962, Part 3: 249, F. 1374). – Sib. 1, 2, 3.

*N. mollis* (W. SMITH) CLEVE (1895: 26).

This species, according to CLEVE (l.c.), is a marine form. CHOLNOKY (1960B: 252) records it from the Zwartkops River. GIFFEN (1963: 240, F. 74, 75) records it as coming from many moderately brackish water samples from the Eastern Cape Province. – Sib. 3.

*N. mutica* KÜTZING (cf. HUSTEDT 1930: 274, F. 453a). – Sib. 1.

*N. nyassensis* O. MÜLLER (cf. HUSTEDT in A. S. Atl. T. 396, F. 35–38; T. 397, F. 43, 44). – Sib. 2.

*N. platycephala* O. MÜLLER (cf. HUSTEDT in A. S. Atl. T. 396, F. 34). – Sib. 2.

*N. seminuloides* HUSTEDT (1927–1962, Part 3: 244, F. 1369). – Sib. 2, 3.

*N. sibayiensis* n. sp.

This species belongs to the group *Naviculae lyratae* CLEVE emend. HUSTEDT, and bears some affinity to *N. oculiformis* HUSTEDT (1955:

22, Pl. 8, F. 6, 7) and *N. pseudony* HUSTEDT (1955: 23, Pl. 8, F. 11); it also shows some resemblance to *N. microlyra* ЧОЛНОКЪ (1959: 44, F. 233-235). *N. sibayiensis* differs from all these species by having a very broad axial area, which is bounded on either side by two curved shadow lines. There are also no lateral areas similar to those found in *N. oculiformis* and *N. pseudony*. The valves are broadly elliptical with broadly rounded ends, 8.5-14.5  $\mu$  long and 5.5-8  $\mu$  broad. The raphe is straight and filiform, with widely distant central pores, the polar fissures are unobserved. The axial area is a very broad linear-lanceolate area, about a third of the width of the valve. This area is bounded by a structureless curved shadow-line. Very faint shadow-lines in the shape of a lyre are sometimes found in the axial area. The transapical striae are radial throughout, 24 in 10  $\mu$ , and project as far as the shadow-lines so that no lateral area is formed. - F. 27. - Sib. 2, 3.

Valvae late ellipticae, apicibus late regulariterque rotundatis, 8,5-14,5  $\mu$  longae, 5,5-8  $\mu$  latae. Rraphe directa, filiformis, poris centralibus valde distantibus, fissuris terminalibus invisibilibus et poris terminalibus ab margine polare valvae distantibus. Area axialis late lanceolata, tertiam partem superficiei valvae occupans, linea umbrosa una distinctissima et lata definita, quae structuram nullam ostendit. In area axiale nonnumquam striae subtilissimae aream lyraeformem definiunt. Striae transapicales in tota longitudine valvae radiantes, lineam umbrosam ad margines areae axialis attingentes, circiter 24 in 10  $\mu$ .

Habitat in aquis dulcibus lacus Nhlange prope Kosi Bay et in aquis subsalsis lacus Sibayi ad oras boreales provinciae Natalensis in Africa Meridionale.

Typus: in praeparato no. Sib. 3 in collectione C.S.I.R., Grahamstown.  
Iconotypus: figura nostra no. 27.

#### *N. subpatrickae* n. sp.

This diatom bears a very strong resemblance to *N. vara* HUSTEDT (1955: 25, F. 5-7; ЧОЛНОКЪ 1963: 71, F. 85) and also to *N. Patrickae* HUSTEDT (1955: 26, F. 15, 16). The main difference which separates *N. subpatrickae* from the other two species is the presence of a hyaline line, probably a fold in the valve surface, which runs round the valve just within the margin of the valve. It differs further from *N. vara* in that there is no central area in *N. subpatrickae*. In this new species the raphe branches extend to the valve margin, interrupted only by the hyaline line mentioned above, which is unlike *N. Patrickae* in which the raphe branches do not reach the valve margin, i.e. the terminal nodules are distant from the valve ends. The valve is linear-elliptical with very broadly rounded ends, 18.5-20.5  $\mu$  long, and about 11  $\mu$  broad. The raphe is straight and filiform, with the branches extending to the margin of the valve. The axial area is narrow and



linear and widens only very slightly at the central nodule. The central area is very narrow lanceolate. The transapical striae are radial throughout, about 20 in  $10\mu$ , in the central portion of the valve there are a few irregularly shortened striae at irregular intervals. In the region of the valve margin the transapical striae are cut by a hyaline line. On the outer side of this line there are extra short striae, which could possibly result from bifurcation of the striae. The transapical striae are also crossed by a number of undulate longitudinal costae. The striae are distinctly punctate. — F. 28, 29. — Sib. 3.

Valvae lineari-ellipticae, apicibus late regulariterque rotundatis, 18,5–20,5 $\mu$  longae, circiter 11 $\mu$  latae. Rhaphe directa, filiformis, nodulis terminalibus margine approximatis, centralibus modice distantibus. Area axialis anguste linearis, apud nodulum centalem abbreviatione regulare striarum medianarum nonnullarum leviter dilatata, aream centalem parvam, angustissime lanceolatam formans. Striae transapicales in tota longitudine valvae radiantes, apud nodulum centalem nonnullis irregulariter abbreviatis intercalatis, circiter 20 in  $10\mu$ . Margine valvae approximata linea una hyalina sed distincta strias transapicales decussat. Inter lineam istam et marginem striae brevissimae numerosae verisimiliter bifurcatione striarum profluentes striae transapicales terminant. Costae longitudinales undulatae, item circiter 20 in  $10\mu$ , strias transapicales decussant, eae itaque ex punctis transapicaliter elongatis compositae esse conspiciuntur.

Habitat in aquis dulcibus lacus Nhlange prope Kosi Bay ad oras boreales provinciae Natalensis in Africa Meridionale.

Typus: in praeparato no. Sib. 3 in collectione C.S.I.R., Grahamstown.  
Iconotypus: figurae nostrae no. 28 et 29.

*N. taniula* HUSTEDT (1927–1962, Part 3: 250, F. 1375). — Sib. 1.

*N. tenella* BREBISSON [cf. GRUNOW in VAN HEURCK 1880–1881: 84, T. 7, F. 21, 22; = *N. radiosa* var. *tenella* (BREBISSON) GRUNOW in HUSTEDT 1930: 299]. — Sib. 2.

*N. tenelloides* HUSTEDT (1937–1939: 269, T. 19, F. 13). — Sib. 3.

*N. terrestris* BOYE PETERSEN (cf. LUND 1946: 80, F. 7 M–T; CHOLNOKY 1960A: 84). — Sib. 1.

*N. Zanonii* HUSTEDT (1949: 92, T. 5, F. 1–5). — Sib. 2.

#### NITZSCHIA HASSALL 1845

*N. adapta* HUSTEDT (1949: 135, T. 12, F. 3–6). — Sib. 2.

*N. amphibia* GRUNOW (cf. HUSTEDT 1930: 414, F. 793).

This species is found in all three samples. In sample Sib. 2 specimens less than  $10\mu$  long are found. The specimen figured here is lanceolate

in shape with produced and relatively acute ends,  $9.5\mu$  long. – F. 30.  
– Sib. 1, 2, 3.

*N. capitellata* HUSTEDT (1930: 414, F. 792). – Sib. 1.

*N. confinis* HUSTEDT (1949: 145, T. 11, F. 49–54; T. 13, F. 84–90).  
– Sib. 2.

*N. fonticola* GRUNOW (cf. HUSTEDT 1930: 415, F. 800). – Sib. 2, 3.

*N. Kützingiana* HILSE (cf. HUSTEDT 1930: 415, F. 802). – Sib. 1, 2.

*N. microcephala* GRUNOW (cf. HUSTEDT 1930: 414, F. 791). – Sib. 3.

*N. palea* (KÜTZING) W. SMITH (cf. HUSTEDT 1930: 416, F. 801). –  
Sib. 1, 2.

*N. parvuloides* CHOLNOKY (1955B: 179, F. 72–73). – Sib. 1.

*N. perminuta* GRUNOW (cf. HUSTEDT 1943: 230, F. 80–87). – Sib. 2, 3.

*N. pseudobacata* CHOLNOKY (1958: 129, F. 130–131). – Sib. 1.

#### PINNULARIA EHRENBERG 1840

*P. gibba* (EHRENBERG) W. SMITH var. *sancta* (GRUNOW) MEISTER (cf.  
HUSTEDT 1937–1939: 395, T. 20, F. 35).

This species, according to HUSTEDT (l.c.), is an acid to slightly  
alkaline water form, particularly common at pH 6.5 or thereabouts.  
– Sib. 1.

*P. maior* (KÜTZING) CLEVE (cf. HUSTEDT 1930: 331, F. 614). – Sib. 1.

*P. mesolepta* (EHRENBERG) W. SMITH (cf. HUSTEDT 1930: 319, F. 575a).

CHOLNOKY (1962: 102) regards this species as an acid water form  
with a pH optimum of about 6.0. – Sib. 1.

#### RHOPALODIA O. MÜLLER 1897

*R. gibba* (EHRENBERG) O. MÜLLER (cf. HUSTEDT 1930: 390, F. 740).  
– Sib. 2, 3.

*R. gibberula* (EHRENBERG) O. MÜLLER (cf. HUSTEDT 1930: 391, F. 742).  
– Sib. 2, 3.

#### STAURONEIS EHRENBERG 1843

*S. Karstenii* (O. MÜLLER) HUSTEDT (1927–1962, Part 2: 757, F. 1117,  
in the systematic notes below F. 1117).

This species has only been found previously in two areas. O. MÜLLER (l.c.) originally described this species as *Schizostauron Karstenii* O. MÜLLER from Lake Nyasa in Central Africa, where it is found commonly. CHOLNOKY (1966: 70) records it from the Okavango River in South West Africa. The specimen illustrated here undoubtedly belongs to this species and is a new record for South Africa. – F. 31. – Sib. 2.

#### SYNEDRA EHRENBERG 1830

*S. acus* KÜTZING var. *radians* (KÜTZING) HUSTEDT (1927–1962, Part 2: 202, F. 693b). – Sib. 2.

*S. ulna* (NITZSCH) EHRENBERG (cf. Hustedt 1927–1962, Part 2: 195, F. 691a–c). – Sib. 3.

#### TROPIDONEIS CLEVE 1891

*T. maxima* (GREGORY) CLEVE (1894: 26).

It has been recorded in South Africa only by GIFFEN (1963: 255, F. 110) from the Yarra Stream running into the Gulu River Lagoon, where the water is brackish. – Sib. 3.

#### SUMMARY

1. The diatom flora of three samples, one from Lake Sibayi, one from Lake Nhlange and the third from a doubtful locality in the same area (probably Lake Nhlange), have been investigated.

2. 9 new species from these samples are described and illustrated. The new species are *Achnanthes Breenii*, *A. sibayiensis*, *Amphora lacustris*, *Cocconeis pusilla*, *Cyclotella substylorum*, *Fragilaria exiguissima*, *Navicula Breenii*, *N. sibayiensis*, and *N. subpatrickae*.

3. 3 species are recorded for the first time in South Africa. These are *Amphora robusta* GREGORY, *Navicula cryptolyra* BROCKMANN and *Stauroneis Karstenii* (O. MÜLLER) HUSTEDT.

4. A list of the diatom species found in the samples is given together with comments on interesting species.

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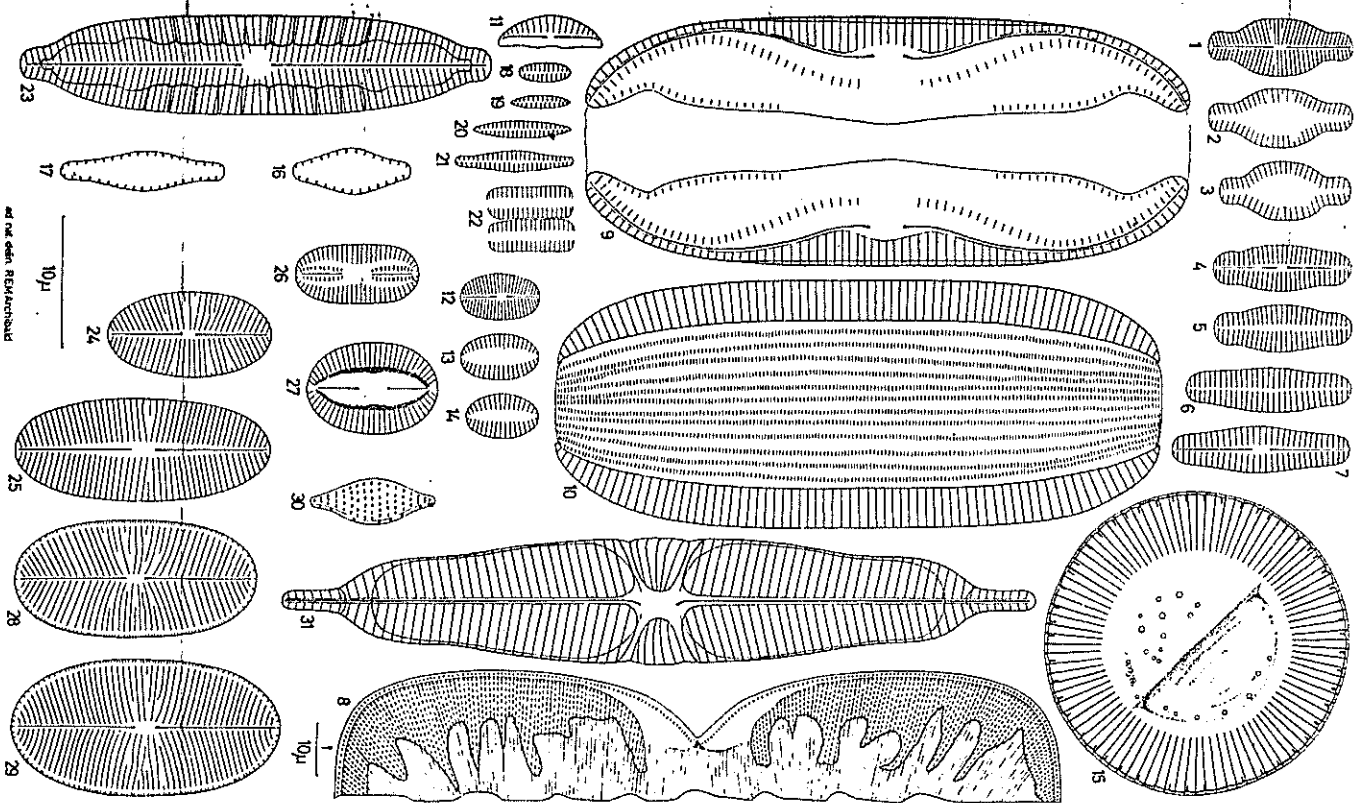
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## EXPLANATION OF PLATE 97 (1)

- 1-3. *Achnanthes Breenii* n. sp. - 4-7. *Achnanthes sibayiensis* n. sp. - 8. *Amphiprora corrugata* GIFFEN. - 9, 10. *Amphora lacustris* n. sp. - 11. *Amphora tenerrima* ALEEM et HUSTEDT. - 12-14. *Cocconeis pusilla* n. sp. - 15. *Cyclotella substylorum* n. sp. - 16, 17. *Fragilaria brevistriata* GRUNOW. - 18-22. *Fragilaria exiguissima* n. sp. - 23. *Mastogloia Smithii* Thwaites. - 24, 25. *Navicula Breenii* n. sp. - 26. *Navicula cryptolyra* BROCKMANN. - 27. *Navicula sibayiensis* n. sp. - 28, 29. *Navicula subpatrickae* n. sp. - 30. *Nitzschia amphibia* GRUNOW. - 31. *Stauroneis Karstenii* (O. MÜLLER) HUSTEDT.



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