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An Account of the Littoral Diatoms from Langebaan, Saldanha Bay, Cape Province, South Africa

Malcolm H. Giffen

University of Fort Hare, Cape Province, Republic of South Africa.

(with 120 figures on 3 plates)

(Rec. 10. 7. 74)

The diatom flora from several stations on the eastern shore of Saldanha Bay (South Africa) has been studied. A number of species new to science are described. These are:

Achnanthes danicoides n. sp.
Amphora langebaanae n. sp.
Campylosira inane n. sp.
Cocconeis deperdita n. sp.
Cymatosira capensis n. sp.
Grammatophora lepida n. sp.
Navicula infirmitata n. sp.
N. lusoria n. sp.
N. melanocephala n. sp.
N. occasa n. sp.
N. pseudoinflata n. sp.
N. pseudosalinarum n. sp.
N. viminoides n. sp.
Nitzschia rorida n. sp.
Plagiogramma appendiculatum n. sp.
P. occasum n. sp.

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

In pursuance of the project of making a survey of the marine littoral diatoms of the South African coastline, the author has published a series of papers on various stations along both the Southern Atlantic and the west Indian Ocean coasts of the Republic of South Africa, viz. Giffen 1963, 1967, 1970a, 1970b, 1971, and 1973. The following paper deals with a set of six samples collected in a small bay near the holiday resort of Langebaan (long. 18,02° E, lat. 33,05° S) on the eastern shore of Saldanha Bay.

Saldanha Bay is situated on the western coast of South Africa some 110 km north of Cape Town, and forms a long narrow bay or tidal lagoon, 28.5 km in length with an average width of 3.05 km. The western shore of the lagoon is separated from the sea by a very narrow promontary, with the consequence that the sea around Langebaan is very calm and well protected from stormy sea action. The tide flows through a narrow gap 5 km wide at the extreme north western end. As no river enters the lagoon the only fresh water comes from the local rainfall. This has an average precipitation of 317 mm (12.46 inches) on 63 days per annum about 79 % during April to September (i.e. winter rainfall). The region can therefore be regarded as semi-desert. The salinity of the sea water at Langebaan was 35 $^0/_{00}$. The average temperature range of the air in summer is from 16.5° C minimum to 18° C maximum and in winter from 7° C minimum to 12° C maximum. As the South Atlantic outside the bay is washed by the cold upwelling of the Benguella Current the sea water can be regarded as eutrophic, and this is borne out by the wealth of life in the Lagoon, both animals and plants, mainly algae.

Samples were collected from exposed rocky outcrops in a sandy cove by scraping off the attached algae and diatoms. These were numbered as follows:

628. Brown masses of *Melosira nummuloides* filaments.
629. Brown masses of *Melosira nummuloides* with gelatinous filaments of *Berkeleya rutilans.*
630. *Enteromorpha* mats.
631. Filaments of *Berkeleya rutilans.*
632. Masses of brown filaments of *Melosira* and *Ectocarpus.*
633. *Berkeleya* filaments together with *Enteromorpha* sp. and *Ectocarpus* sp.

These samples were examined in detail and all proved to be very rich in genera and species. The systematic results have been arranged in alphabetical order for convenience. References to original descriptions have been made where species are of recent origin or not reported in wellknown modern literature or not previously reported by the author. Certain well-known cosmopolitan species are dealt with without citation. These are described and figured in Hustedt, 1930, and 1927–1966.

SYSTEMATIC PART

Achnanthes Bory 1822.

A. biceps Hustedt, 1959: 41. fig. 22, 23. This small species of *Achnanthes* was identified in one sample and agrees fully with the original description and figures. Dimensions: 9 μm long, 3.5 μm broad, transapical striae on areovalve 21 in 10 μm, on the raphovalve ca. 30 in 10 μm. Fig. 1, 2. – 628.

A. brevipes Agardh. – 628, to 633.

A. brevipes var. *intermedia* (Kützing) Cleve. – 628–631, 633.

A. brevipes var. *parvula* (Kützing) Cleve. (cf. Hustedt, 1927–1964, part 2: 426, fig. 877 f–i; Giffen, 1970a, 263, fig. 5, 6). Not frequent in the material or in the locality. – 629.

Achnanthes danicoides n. sp.

Valve elliptic-lanceolate with short rostrate narrow ends, 24–30 μm long, 9–11 μm broad. Areovalve with narrow lanceolate axial area, transapical striae radiate throughout 9–11 in 10 μm, coarsely punctate, puncta 12–15 in 10 μm. Raphovalve with very narrow axial area, raphe straight, filiform, central pores approximate, terminal fissures near the ends of the valve obscure. Central area a short transverse fascia due to shortening of one or two central striae. Transapical ribs parallel in the centre, radiate at the ends, 10–11 in 10 μm. Between the ribs are double rows of very obscure puncta.

Valvae elliptica-lanceolatae apicibus anguste breveque protractis, non capitatis, 24–30 μm longae, 9–11 μm latae. Areovalva: area axialis angustae linearis, costae transapicales toto longitudinae valvae radiantes, 9–11 in 10 μm grosse punctatis, punctae 12–15 in 10 μm. Raphovalva: raphe directa, filiformis poris centralibus valde approximatis fissuris terminalibus non in superficie valvae. Area axialis angustissime linearis centralis parva transverse oblonga, abbreviatione striarum medianarum duarum. Striae transapicales in media parte valvae parallelae ad polos versus modice radiantes, 10–11 in 10 μm ex punctis indistinctis in seribus duobus compositae. Habitat: in aquis marinis oceani Atlantici lacunae Saldanha loci Langebaan dicti, Provincia Capensis.

Typus: praeparatum no. 629 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 3–6.

A. danicoides n. sp. is distinguished by the double rows of puncta on the raphovalve particularly along the margins and possibly almost to the raphe. These puncta are obscure and only visible with some difficulty even under phase contrast. The areovalve has transapical striae which are moderately coarsely punctate. Fig. 3–6. – 628, 629, 631, 632, 633.

A. groenlandica (Cleve) Grunow f. *meridiana* Giffen, 1973, p. 33, fig. 1–4.

This form differs from the type in the smaller valve size viz. 14–18 μm long and the closer striation, 6–8 in 10 μm on the areovalve and 8–10 in 10 μm on the raphovalve. – 628, 629, 630, 631, 632.

A. Hauckiana Grunow (cf. Hustedt, 1927–1964, part 2: 388, fig. 834). Typical specimens were observed but were usually on the small size being only about 13–15 μm long, 6–7 μm broad with 11 transapical striae in 10 μm. They were never frequent in the samples. – 628, 629, 633.

A. longipes Agardh (cf. Hustedt, l.c. fig. 878; Giffen, 1967, 249). A single individual was seen in one sample. –633.

Actinocyclus Ehrenberg 1839.

A. octonarius Ehrenberg. (cf. Hustedt, l.c. part 1, 525, fig. 289 as *A. Ehrenbergii* Ralfs; Hendey, 1964, 83, Pl. 24, fig. 3; Giffen, 1970b, 88). Observed in one sample and not frequent. – 628.

Actinoptychus Ehrenberg 1839.

A. senarius Ehrenberg. (cf. Hustedt, l.c. 475, fig. 264; 1955, 7 as *A. undulatus* (Bailey) Ralfs; Giffen 1970b, 88). Wide-spread in South African plankton and littoral of both Atlantic and Indian Ocean coasts. – 628, 629, 632.

A. splendens (Shadbolt) Ralfs. (cf. Hustedt, l.c. 478, fig. 265; Giffen, 1970b, 88). Wide-spread and often frequent in the South African material. – 628.

Amphiprora Ehrenberg 1843.

A. sulcata O'Meara (cf. Cleve, 1894, as *A. gigantea* var. *sulcata*; Peragallo, 1897–1908, Pl. 48, fig. 1–3; Hustedt, 1955, 37; Giffen 1971a, 2, fig. 2). This species has never been recorded as frequent in any South African samples. Striae 21 in 10 μm. – 629.

Amphora Ehrenberg 1840.

A. acutiuscula Kützing (cf. Cleve, 1895, 121; Giffen, 1967, 250). – 629.

A. angusta (Gregory) Cleve (cf. Cleve, 1895, 135; A. Schmidt, Atlas, T. 25, fig. 15; Giffen, 1963, 216; 1970b, 88). Wide-spread and frequent. – 629.

A. angusta var. *Eulensteinii* Grunow (cf. Cleve, 1895, 135; A. Schmidt, Atlas, T. 25, fig. 1–3; T. 40, fig. 35–37; Giffen, 1970b, 88; 1973, 33, fig. 5). This variety has proved to be, as yet, confined to the Atlantic shores of South Africa, where it is wide-spread and frequent. Dimensions: 120–135 μm long, 8 μm wide, striae dorsal and ventral 14–15 in 10 μm. – 628.

A. angusta var. *ventricosa* (Gregory) Cleve, 1895, 135. (cf. Hustedt, 1955, 42, pl. 16, fig. 26; Giffen, 1967, 250). In assigning specimens seen in the South-African material, I have followed Cleve (l.c.) in his definition of "dorsal striae 8–9 in 10 μm". The local individuals had striae measuring 10–11 μm. However Hendey, (1964, 269, pl. 38, fig. 12) describes the striae as being "very fine and often indistinct, 18–20 in 10 μm" and separates his form from *A. angusta* as *A. ventricosa* Gregory. Hendey's form may have to be redefined. Hustedt (1955, l.c.) figures the species and states that the striae vary from 9–12 on the same valve. There is no doubt that the species and its varieties are very variable and some of the varieties should not be upheld.

A. arcus Gregory (cf. Cleve, 1895, 127, pl. 4, fig. 4; Peragallo, 1897–1908, pl. 50, fig. 6, and as *A. arcus* var. *sulcata* A. Schmidt. Cleve, l.c. 127; A. Schmidt, Atlas, T. 26, fig. 46, 47 and Hagelstein, 1939, 329, pl. 3, fig. 13 both as *A. sulcata*).

The dimensions of the Saldanha Lagoon specimens are 50–54 μm long, 6–9 μm broad, striation of the valve 12 in 10 μm and on the intercalary girdle bands (zones) 17–18 in 10 μm. The dimensions given by the various authorities quoted above show that the local examples agree in the number of dorsal striae (9–12) with *A. arcus* Gregory, but with *A. sulcata* (? Bréb.) A. Schmidt in the number of striae, viz. 17–21 in 10 μm, on the intercalary bands. In one measured individual however, from the local material the dorsal striae were 15 in 10 μm which is more or less intermediate between *A. arcus* and *A. sulcata*. It is my opinion that the two species cannot be separated on the number of dorsal or zonal striae and that *A. sulcata* A. Schmidt should be included in *A. arcus* Gregory. The species was not common in the sample but sufficient were seen to yield the above conclusion. Fig. 7. –632.

A. beaufortiana Hustedt, 1955, 38, pl. 14, fig. 1–6. A few individuals of this species were seen in two samples. They agree in almost all characters except, firstly, they were very slightly shorter and secondly, they show a slight elongation of the central nodule which forms a short but noticeable stauros. This condition has not been mentioned by Hustedt but is indicated in his figures 1 and 2 by a strenghtening of the central nodule. *A. beaufortiana* is somewhat closely related to *A. africana* Heiden and Kolbe (1928, 637, t. 1, fig. 4, 5) described from Simon's Bay, Cape of Good Hope, which however differs in its coarser striae (15 in 10 μm), its very strong stauros stretching to the dorsal margin and the very few short striae at the ends of the ventral margin. I have no doubt, however, of the identity of the South African species with *A. beaufortiana* Hustedt. Fig. 8. – 628, 632.

A. crassa Gregory (cf. Cleve, 1895, 109; A. Schmidt, Atlas, T. 39, fig. 30, T. 28, fig. 30–33; Giffen, 1970a, 266, fig. 14–15). More or less typical examples were seen, differing only in slightly closer striae, 11 in 10 μm, instead of the described 5–8 in 10 μm. Fig. 9. – 632.

A. cingulata Cleve, 1895, 133, pl. III, fig. 39 as *A. ocellata* var. *cingulata* Cleve; (cf. A. Schmidt, Atlas, T. 26, fig. 17; Peragallo, 1897–1908, pl. 48, fig. 5–7).

This species occurred only in one sample and the examples observed were somewhat shorter than described with striae 21 in 10 μm which is the limit described by Cleve (l.c.) for his var. *typica* Cleve. This is apparently a very variable species. Dimensions of the local material: 55–58 μm long, 10–11 μm broad, transapical striae 21 in 10 μm. Fig. 10. – 633.

A. eunotia Cleve, 1895, 122, pl. IV, fig. 2, 3. (cf. A. Schmidt, Atlas, T. 25, fig. 35 as *A. cymbifera* var.; Cholnoky, 1960a, 28, fig. 55; Giffen, 1963, 217, fig. 16). Apparently a fairly wide-spread species in African waters. Cholnoky quotes localities in North Africa and made the first record of the species in Natal, South Africa. It has been recorded also from the east coast of the Cape Province (Giffen, 1963). – 628, 632.

A. exilissima Giffen, 1967, 251, fig. 8, 9. A very small species 9–10 μm long, 2.5 μm broad with faint, scarcely visible striae ca. 25 in 10 μm and characterised by a stauros across the middle of the valve. – 630.

A. exilitata Giffen, 1971, 2, fig. 5–7. Another very small species of *Amphora* 6–11 μm long, 2.5–3 μm broad with ca 30 transapical striae in 10 μm. Fig. 11. – 632.

A. exigua Gregory (cf. Cleve, 1895, 123; Cholnoky, 1960a, 22, fig. 26; Giffen, 1963, 217, fig. 17–19). Wide-spread and frequent in South African marine littoral. – 628–633.

A. gigantea Grunow var. *obscura* Cleve, 1895, 106, pl. IV, fig. 28, 29; Peragallo, 1897–1908, pl. 45, fig. 9, 10). The varieties of *A. gigantea* seem to differ from the type only in the amount of striae on the ventral side. As they occur only sporadically in our material, it is impossible to say whether there are any intermediate forms linking up these varieties with the type. – 632.

A. helenensis Giffen, 1973, 33, fig. 7–9. A small *Amphora* 10–20 μm long, 3–4 μm broad, with transapical striae 17–20 in 10 μm, crossed by a lanceolate blank band across the middle of the dorsal striae and with a unilateral gap in the centre of the ventral striae. Fig. 12. – 630, 633.

Amphora langebaanae n. sp.
Frustule in girdle view elongate-elliptical with truncate ends 31–55 μm long, 7–9 μm broad. Valve semi-lanceolate with convex dorsal and slightly concave ventral margins and obtuse ends, about 6–8 μm broad. Raphe with moderately curved parts somewhat distant from the ventral margin. Axial area narrow on both sides of the raphe, central area a unilateral fascia on the ventral side. Transapical striae on the dorsal side 12 in 10 μm, crossed by several (2–3) longitudinal blank bands forming elongated puncta, on the ventral side 12 in 10 μm. Intercalary bands few and structureless. Type slide 632/7 in the Giffen Collection. Iconotype figures no. 13–15.

Frustula anguste elliptica apicibus truncatis 31–55 μm longae, 7–9 μm latae. Valvae 31–55 μm longae, 6–8 μm latae margine dorsale convexo, ventrale laevissime concavo, apicibus rotundatis. Raphe subarcuatae margine ventrale plus minusve distantis. Area axialis angusta utrinque raphae, area centralis stauros margine ventralis valvae attingens. Striae transapicales in latere dorsale 12 in 10 μm, striae longitudinale numero 2–3, striae ventrale 12 in 10 μm. Habitat: in aquis marinis Oceani Atlantici in lacunae Saldanha loci Langebaan dicti, Provincia Capensis. Typus: praeparatum no. 632/7 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 13–15.

A. langebaanae n. sp. is somewhat similar to some varieties of *A. crassa* Gregory but differs in the simple intercalary bands which are heavily punctate in *A. crassa*. One other species, *A. egregia* (Ehr.) A. Schmidt, (Atlas, t. 28, fig. 12–14, 18) shows resemblances but this is also much coarser in structure with a complex zone. Fig. 13–15. – 632, 633.
A. laevis (Gregory) Cleve, 1895, 130. (cf. Giffen, 1970a, 267). Wide-spread and often frequent in South African material from the littoral zones. – 628.

A. laevis var. *laevissima* (Gregory) Cleve, l.c. 130; (cf. A. Schmidt, Atlas, T. 26, fig. 3, 13, 14; Giffen, 1967, 253, fig. 14). Wide-spread. – 629.

A. lineolata Ehrenberg (cf. Cleve, l.c. 126; A. Schmidt, Atlas, T. 26, fig. 50; Giffen, 1967, 253, fig. 15). Infrequent to rare in South African material. – 629.

A. obtusa Gregory (cf. Cleve l.c. 131; Peragallo, 1897–1908, pl. 48, fig. 9–10; A. Schmidt, Atlas, T. 40, fig. 4–7, 11–13; Heiden & Kolbe, 1928, 641).

A single specimen of this species was seen which fitted within the dimensions given by Cleve exactly. The measured specimen was 85 μm long, 13 μm broad, transapical striae 18 in 10 μm in the middle to 21 towards the ends. Few of the figures given by the authorities are very good although those of Peragallo give the best view of the direction of the striae across the valve. In the var. *oceanica* Castracane (fig. 4) and the var. *radula* Cleve (fig. 5) the abrupt change of direction from radial to convergent can be clearly seen. In the var. *typica* Cleve (fig. 9, 10) the striae are all radial. In the South African example the striae change direction, although the other characters place it in the var. *typica*. As the range of variability of these forms is not completely known yet, some of the varieties may have to be included in the type. *A. obtusa* has been previously recorded from Simon's Bay by Heiden & Kolbe (1928, l.c.). Fig. 16. – 632.

A. ocellata Donkin (cf. Cleve, 1895, 135; A. Schmidt, Atlas, T. 26, fig. 17; Peragallo, 1897–1908, pl. 49, fig. 4)

A single example was observed in one sample which agreed fully with the description and figures. – 629.

A. ostrearia Brébisson (cf. Peragallo, l.c. pl. 49, fig. 13; Cleve, 1895, 129; Giffen, 1963, 220).

The few examples seen were more closely allied to the var. *typica* Cleve than to the previously recorded var. *vitrea* Cleve. Here again, the variation is not sufficiently known to justify all the described varieties. Fig. 17. – 632.

A. piper Cholnoky, 1968, 20, fig. 19. The species is somewhat variable in that some of the individuals seen and measured showed wider striae and a fine line crossing the dorsal striae. These forms are 14 μm long, 8 μm wide (frustule), valve 3.5 μm broad, with slightly wider striae than described. Whether these should be separated is a moot question but they are otherwise identical in appearance. Fig. 18, 19. – 631, 632.

A. proteus Gregory (cf. Cleve, 1895, 103; Giffen, 1970a, 267, fig. 19; 1971, 3). The species which has been reported as rare on the eastern coast (Indian Ocean)

proves to be much more abundant on the Atlantic coast. – 628, to 633.

A. spectabilis Gregory (cf. Cleve, 1895, 132; Peragallo, 1897–1908, pl. 48, fig. 8; A. Schmidt, Atlas, T. 40, fig. 18–23; Hendey, 1964, 268, pl. 38, fig. 8, 9). The South African examples of this species are occasionally smaller and possess closer striae than described but are otherwise indistinguishable in appearance. Dimensions: 42–52 μm long, 10 μm broad, transapical striae on the dorsal side 11 in 10 μm on the ventral side 14 in 10 μm, very irregular, with some forked and interpolated striae. Fig. 20. – 629, 633.

Anorthoneis Grunow 1867.

A. eurystoma Cleve, 1895, 166, pl. III, fig. 12. (cf. Hustedt, 1955, 15, pl. 2, fig. 16, 17; Giffen, 1970a, 268, fig. 22, 23). In the material under review, this species was recorded from two samples and was exceedingly rare, only two individuals bring recognised, one with areovalve alone, the other a complete cell. The single areovalve agreed in size with a previous recording (Giffen, 1970a, l.c.) being only 16 μm long and 12 μm broad, i.e. a very small example. The complete cell was typical of the description, length 30 μm, breadth 25 μm, transapical striae on the areovalve 8–9 in 10 μm, on the raphovalve 18 in 10 μm very finely punctate. Fig. 21, 22. – 629, 633.

Auliscus Ehrenberg 1844.

A. sculptus (W. Smith) Ralfs *in* Pritchard (cf. Hustedt, 1927–1964, part 1, 517, fig. 290; *A. caelatus* Bailey, idem, 518. fig. 291).

Hendey, 1964, 99, reports that he has examined the type slide from Bailey's material collected from Ballast Point, Florida and labelled "*Mastodiscus caelatus* Bailey" and finds that it and *A. sculptus* are identical. Hustedt, l.c. 517, 518, himself really thought that the two that he had recognised were in fact indistinguishable for he states "*Auliscus sculptus* geht vollkommen in *Auliscus caelatus* über . . . ." Examination of the abundant material in South African waters convinces me also of their identity. The species was very frequent in the samples. – 628, 629, 630, 633.

Auliscus sculptus var. *strigillatus* (A. Schmidt) comb. nov. (Basionym: *A. caelatus* var. *strigillatus* A. Schmidt, Atlas Diat. T. 32, fig. 24–26 (1875) "*strigillata*"). It is my opinion that *A. caelatus* var. *strigillatus* differs sufficiently from the type to justify a varietal name and therefore a new combination is necessary as *A. caelatus* becomes a synonym of *A. sculptus*. This variety is characterised by the very strong development of the radial structure of the transverse area. The figures in A. Schmidt, Atlas do not do justice to the strong ribs which can develop in this area as seen in the South African material. Dimensions: 48–88 μm long, 46–84 μm broad, almost circular, striae 20 in 10 μm. Fig. 23. – 630, 631, 633.

Auliscus sculptus var. *rhipis* (A. Schmidt) comb. nov.

(Basionym: *A. rhipis* A. Schmidt, Atlas Diat. T. 32, fig. 10, 11 (1875). *A. caelatus* var. *rhipis* (A. Schmidt) Hustedt *in* Rabenhorst Krypt.-Fl. Deutschl., Österr. & Schweiz, 7 (1): 520 (1929).

"H. & M. Peragallo, to whom Hustedt credits this varietal name, treated this as a separate species in the text and index, but as *A. caelatus* var. *rhipis* in the explanation of the plate. I think the former must be regarded as representing their real intention and that the varietal name should be attributed to Hustedt". I am indebted to Mr. R. Ross of the British Museum for the above fact and his assistance in defining the new combinations.

Whether this variety should be retained or not is somewhat doubtful in view of the author's observations on the life history of *A. reticulatus* Greville (see below). The species seen in the material agrees very closely with Peragallo's figures (l.c.) particularly pl. 109, fig. 3 and 4. Fig. 2 is related to an under-developed var. *strigillatus* (A. Schmidt), and fig. 5 is also under-developed and belongs to the type. The variety was infrequent in the two samples – 628, 632.

A. ovalis Arnott *in* Pritchard, Inf. p. 846 (cf. Rattray, 1888, 891, without figure; A. Schmidt, Atlas, T. 30, fig. 16, 17; T. 125, fig. 3; Heiden & Kolbe, 1928, 507).

A. ovalis is characterised by its oval shape and the very large processes (ocelli) set fairly close to the margin. Striae 15–18 in 10 μm. The figures in the Atlas are drawn from South African samples. Dimensions: 48–62 μm long, 36–52 μm broad, ocelli to 16 μm in diameter. The species was not frequent. Fig. 24. – 630, 633.

A. reticulatus Greville (cf. Rattray, 1888, 894; A. Schmidt, Atlas, T.30, fig. 1–4). This species was frequent in several samples and a number of abnormal specimens with 3 and occasionally 4 ocelli occurred. The most important observation, however, was made on the structure of the new cell-wall during cell division. A number of individuals were seen in which careful focussing below the surface revealed the new inner cell-wall. In structure these walls either do not show the marginal costae or only thin and short portions thereof,

the remaining surface being covered with bundles of punctate striae (fig. 25). These forms have much the appearance of *A. pruinosus* Bailey with only 2 ocelli (cf. Hustedt, 1927–1964, part 1, 511, fig. 286). In his account of *A. pruinosus*, Hustedt comments that "In A. S. Atlas ist kein typischer *Aul. pruinosus* abgebildet". There is no doubt that many of A. Schmidt's figures refer, not to *Aul. pruinosus* but to the inner developing walls of possibly several species of *Auliscus*. Fig. 25. – 630, 631, 632, 633.

Berkeleya (*Amphipleura*) Greville 1827.

B. rutilans (Trentepohl) Grunow (cf. Hustedt, 1927–1964, part 2, 720, fig. 1093; Giffen, 1970b, 89). The author (Giffen l.c.) restored the legitimate generic name for the genus previously classified under *Amphipleura* Kützing 1944. In several samples, particularly 631 and 633, which consisted almost entirely of mucilage tubes containing "*Schizonema rutilans*", the species was dominant and almost every described variety with intermediate forms could be sorted out. Many individuals considerably exceeded the maximum length given by Hustedt (l.c.), namely up to 44 µm long. – 628 to 633.

Biddulphia Gray 1821.

B. obtusa (Kützing) Ralfs (cf. Hustedt, 1927–1964, part 1, 848, fig. 502 as *B. aurita* var. *obtusa*; Giffen, 1973, 34).

Wide-spread and often frequent. Abundant in all samples under review. – 628 to 633.

Caloneis Cleve 1891.

C. liber (W. Smith) Cleve (cf. Giffen, 1970b, 89).

In the paper cited above the author considers, from a study of South African material, that *C. linearis* (Grunow) Boyer, which is either regarded as an independant species (vide Hendey, 1964, 230, pl. 29, fig. 3) or as a variety of *C. liber* (Cleve 1894, 54), should be included in the above named species. It was not frequent in the material and was recorded from only one sample. Dimensions: 49 µm long, 12 µm broad, transapical striae 21 in 10 µm. – 628.

Campylosira Grunow 1882.

In nearly all samples there occurred a lunate diatom with a margin of faint puncta and no other markings whatsoever on the surface of the valve except for a slight shadowy colouration. As I feel that such a form should be given a name I have placed it in the only genus into which it will fit without undue distortion.

Campylosira inane n. sp. Valve lunate with almost straight to slightly convex ventral margin and produced slightly rostrate ends, 18–25 µm long, 3–4 µm broad. Marginal puncta on both dorsal and ventral margins small and obscure 18–22 (21) in 10 µm. Surface of valve shadowed as though exceedingly finely punctate, some valves showing a brighter axial area and two brighter spots at the ends of the valve. Type slide 628/6 in the Giffen Collection. Iconotype figures 33–35.

Valvae lineari-lunulatae marginibus ventralibus paene directis sive modice convexis apicibus productis subrostratis, 18–25 µm longae 3–4 µm latae. Puncta parvae indistinctae ad marginem dorsalem ventralemque posita, 18–22 (21) in 10 µm. Superficies valvae inanes velut punctis tenuissimis composites. Area axiales valvae interdum maculae duae apicalibus modice clariores. Typus: praeparatum no. 628/6 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 33–35. Habitat: in aquis marinis Oceani Atlantici lacunae Saldanha loci Langebaan dicti, Provincia Capensis.

Cocconeis Ehrenberg 1838.

C. californica Grunow (cf. Cleve, 1895, 171 as *C. scutellum* var. *californica*; A. Schmidt, Atlas, T. 191, fig. 40–43; Hustedt, 1927–1964, part 2, 343, fig. 796; Giffen, 1970b, fig. 9, 10 but not fig. 11). Typical examples occurred in several samples but in restricted numbers. The species is wide-spread along the Atlantic coast of the Cape Province. – 631, 632.

C. californica var. *kerguelensis* Heiden & Kolbe, 1928, 585, T. 5, fig. 109 (cf. Giffen, 1970b, 90, fig. 11; 1973, 35, fig. 11, 12). The variety is linked with the type by an unbroken series of intermediates and can only be upheld as a matter of convenience in describing the forms found in the clones occurring in each sample where the different degrees of variation are rarely mixed. – 629, 630, 631, 633.

C. convexa Giffen. 1967, 257, fig. 26–28 (cf. Giffen, 1971, 5, fig. 19, 20).
This species, characterised by the almost hemispherical areovalve, occurred very rarely in two samples. – 631, 633.

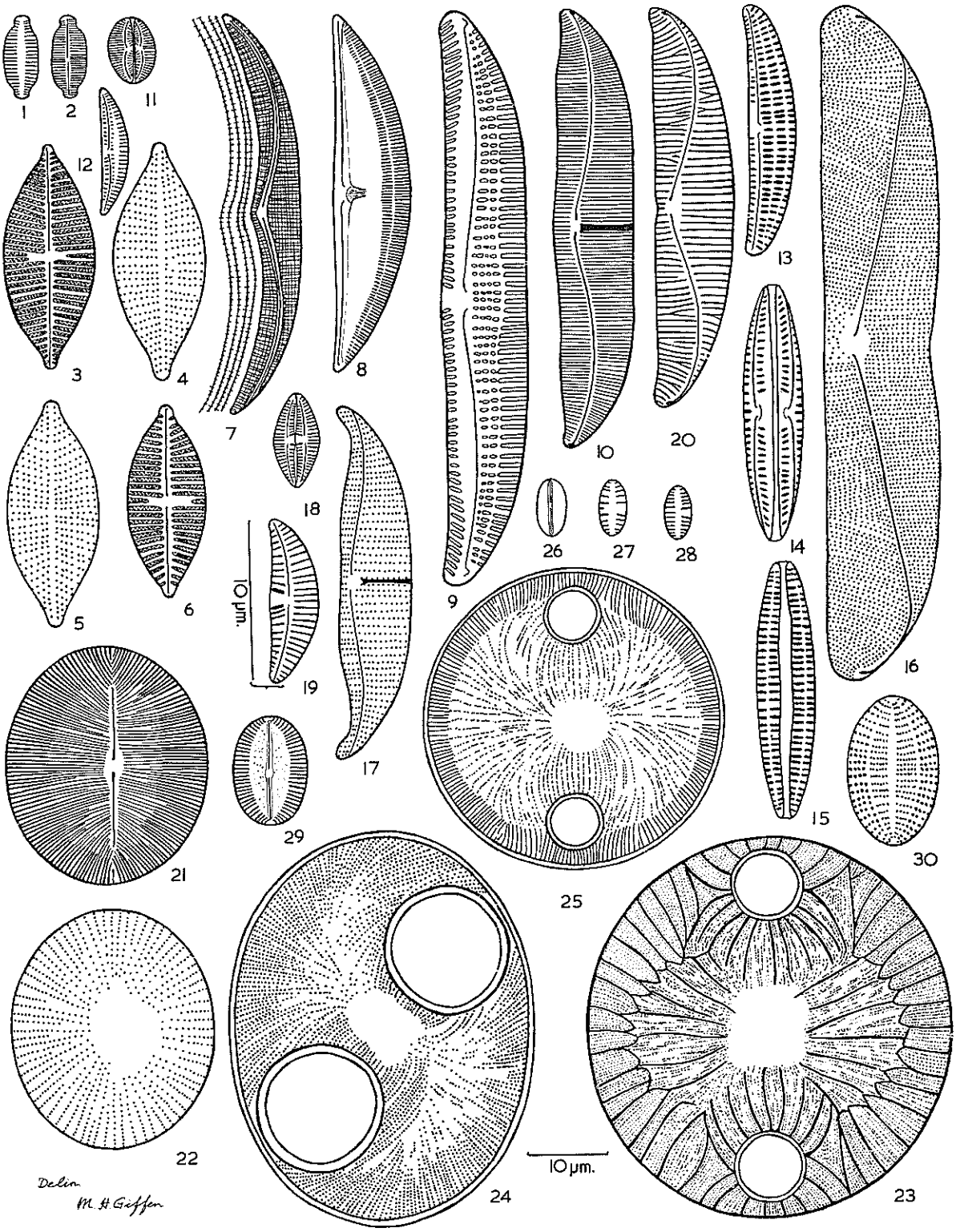

Plate I.

Fig. 1, 2: *Achnanthes biceps* Hustedt. Fig. 3–6: *A. danicoides* n. sp. Fig. 7: *Amphora arcus* Gregory. Fig. 8: *A. beaufortiana* Hustedt. Fig. 9: *A. crassa* Gregory. Fig. 10: *A. cingulata* Cleve. Fig. 11: *A. exilitata* Giffen. Fig. 12: *A. helenensis* Giffen. Fig. 13–15: *A. langebaanae* n. sp. Fig. 16: *A. obtusa* Gregory. Fig. 17: *A. ostrearia* var. *vitrea* Cleve. Fig. 18, 19: *A. piper* Cholnoky. Fig. 20: *A. spectabilis* Gregory. Fig. 21, 22: *Anorthoneis eurystoma* Cleve. Fig. 23: *Auliscus sculptus* var. *strigillatus* comb. nov. Fig. 24: *A. ovalis* Arnott. Fig. 25: *A. reticulatus* Greville. Fig. 26–28: *Cocconeis deperdita* n. sp. Fig. 29: *C. pelta* A. Schmidt. Fig. 30: *C. peltoides* Hustedt.

Cocconeis deperdita n. sp.

Valves small elliptical 6.5–7.5 μm long, 3.5 μm broad. Areovalve with narrow slightly lanceolate axial area and central area which is small or absent on one side of the raphe but unilaterally reaching the margin on the other side. Transapical striae 15–17 in 10 μm, radiate at the ends and either radiate or parallel in the middle. Raphovalve with straight filamentous raphe lying in a slightly silicified rib, central pores moderately close, terminal fissures near the ends of the valve, transapical striae very fine, invisible. Type slide no. 632 in the Giffen Collection, iconotype figures 26–28.

Valvae minutissimae, ellipticae, 6,5–7,5 μm longae, 3,5 μm latae. Areovalvae: area axialis anguste linearis in media parte lanceolatis, area centralis unilaterale usque ad marginem dilatata. Striae transapicales 15–17 in 10 μm, radiantes in media parte parallela. Raphovalvae: delicatissime, raphe directa in costa angustissima inclusa, striae inconspicuae. Habitat: in aquis marinis Oceani Atlantici in lacunae Saldanha loci Langabaan dicti, Provincia Capensis. Typus: praeparatum no. 632 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 26–28.

This exceedingly small species occurred somewhat infrequently in two samples. Owing to the almost structureless raphovalve it can be readily confused with such fresh water species as *Navicula pelliculosa* (Bréb.) Hilse, *N. permitis* Hustedt or the marine *N. nolens* Simonsen (cf. Hustedt, 1927–1964, part 3, pp. 172–173 and fig. 1305–1307 respectively). It is only when both valves or the areovalve are seen that the identity of this species can be determined. Fig. 26–28. – 632, 633.

C. dirupta Gregory var. *flexella* (Janisch *ex* Rabenhorst) Grunow. (cf. Hustedt, 1927–1964, part 2, 255, fig. 809 d–i). Very rare. – 631, 632.

C. nitens Edsbagge, 1966, 65, pl. 1, fig. 6, pl. 2, fig. 6 (cf. Giffen 1973, 35, fig. 13–15). Frequent in most samples. – 628, 630, 631, 633.

C. pelliculosa Grunow (cf. Hustedt, 1927–1964, part 2, 357, fig. 812). Very rare. – 631.

C. pelta A. Schmidt, Atlas, T. 191, fig. 6–8 (cf. Hustedt, l.c. 361, fig. 815a–c; Giffen, 1970a, 271, fig. 27 (but not fig. 28 which is *C. peltoides* Hustedt). The specimens seen show somewhat closer striation than described viz. 17–18 in 10 μm as against 12–16 in 10 μm. They were also slightly shorter in length. Dimensions: 14–15 μm long, 9–9.5 μm broad, transapical striae 17–18 in 10 μm. Fig. 29. – 630 to 633.

C. peltoides Hustedt, 1939, 606, fig. 23–27 (cf. Brockmann, 1950, 13, T. 6, fig. 5–6; Edsbagge, 1966, T. 5, fig. 3; Giffen 1970a, fig. 28 as *C. pelta* A.S.). This species appeared sporadically in the samples but never was frequent. In Giffen l.c. it was confused with *C. pelta*. Dimensions: 16–17 μm long, 10 μm broad, transapical striae 10–12 in 10 μm. Fig. 30. – 633.

C. placentula Ehrenberg var. *euglypta* (Ehrenberg) Cleve (cf. Giffen, 1963, 224). A brackish water species probably displaced. It was very scarce in the sample. – 628.

C. pseudomarginata Gregory (cf. Hustedt, 1927–1964, part 2, 359, fig. 813; Giffen, 1970a, 211). Wide-spread and often frequent in the South African littoral. – 632.

C. scutellum Ehrenberg. Very numerous in sample 630. One of the most wide-spread and abundant diatoms of the littoral, epiphytic on most algae. – 628, 630, 631, 632, 633.

C. St Pauli Heiden & Kolbe, 1928, 588, pl. 5, fig. 110, 110a. Synonym: *Cocconeis sublittoralis* Hendey, 1951, 44, pl. 13, fig. 1–9; 1964, 181, pl. 28, fig. 14–17. (cf. Giffen, 1970b, 90, fig. 13; 1973, 35 (but not Fig. 31, 32, nor sample no. 632 in that paper). The South African material, the identity of which I have no doubt, falls well within the limits of length and breadth, although the transapical striae are somewhat finer approaching the outer limit described by Heiden and Kolbe i.e. ca. 8–9 on the areovalve and 9 in 10 μm on the raphovalve. The figures are drawn from a single cell. Fig. 31, 32. – 632.

Coscinodiscus Ehrenberg 1838.

C. curvulatus Grunow (cf. Hustedt, 1927–1964. part 1, 406, fig. 214; Giffen, 1970a, 272). Diameter 38 μm, areolae 6–7 in 10 μm. Wide-spread in the local littoral. – 629.

C. excentricus Ehrenberg (cf. Hustedt, l.c. 388, fig. 201; Giffen, 1970b, 90; 1973, 36). Wide-spread in both the littoral and plankton of the South African coasts. – 628, 631, 633.

C. Kützingiana A. Schmidt, Atlas, T. 57, fig. 17, 18 (cf. Hustedt, l.c. 398, fig. 209; Giffen, 1970b, 90). Not frequent in the material. Diameter 52 μm, rows of areolae 10 in 10 μm which is closer than described viz. 7 in 10 μm. – 629.

C. lineatus Ehrenberg (cf. Hustedt, l.c. 392, fig. 204; Giffen, 1970a, 272). – 632.

C. marginatus Ehrenberg (cf. Hustedt, l.c. 416, fig. 223; Giffen, 1970a, 272). – 628, 629, 631.

C. nitidus Gregory (cf. Hustedt, l.c. 444, fig. 221; Giffen, 1970a, 272: 1973, 36). Small forms of this species are probably the most wide-spread and abundant of the genus along the South African coast. – 632.

C. oculus-iridis Ehrenberg (cf. Hustedt, l.c. 454, fig. 252; Giffen, 1971, 5). This planktonic species has been previously recorded from the plankton of the East coast by Taylor (1966, 454) and by Heiden & Kolbe from Simon's Bay and by the author from Gordons's Bay, both the least localities in False Bay. Its presence in most of these stations should probably be regarded as displaced. – 628.

C. perforatus Ehrenberg (cf. Hustedt, l.c. 445, fig. 245; Giffen, 1973, 36). – 628.

C. perforatus var. *cellulosus* Grunow (cf. Hustedt, l.c. 447, fig. 246; Taylor, 1966, 454). A single cell which agreed in all characters with this variety was seen, associated with the type. – 628.

Cyclotella Kützing 1934.

C. striata (Kützing) Grunow (cf. Hustedt, 1927–1964, part 1, 344, fig. 176; Giffen 1973, 36, fig. 20). Specimens of this organism proved to be exceedingly rare in South African waters. In three accounts by the author (1970b, 1971, 1973) no more than one or two individuals have ever been observed in any sample (three in all that have been investigated). – 632.

Cymatosira Grunow 1862.

Cymatosira capensis n. sp. Cells in girdle view more or less rectangular with rounded corners and undulate, almost smooth margins. Valve narrow elliptical to lanceolate with broad rounded ends 6.5–11 μm long, 2–3 μm broad. Surface faintly areolate, areolae in irregular quincunx 15–18 in 10 μm. Intercalary bands often many, ca. 10 in 10 μm, Type slide 630/7 in the Giffen Collection.

Frustulae in visu connectivele rectangulatae, angulis parvis rotundatis, margine undulatis paene glabris. Valvae linearilanceolata apicibus obtuse rotundatis 6,5–11 μm longae, 2–3 μm latae, superficies valvae leviter areolatae, ex punctis distinctis in seribus irregulariter quincuncem ordinatis compositae 15–18 in 10 μm. Copulae saepe numerosis circiter 10 in 10 μm. Habitat: in aquis marinis Oceani Atlantici in lacunae Saldanha loci Langebaan dicti, Provincia Capensis. Typus: praeparatum no. 630/7 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 36–39.

Cymatosira capensis n. sp. occurred abundantly in several samples. It is a small species, faintly silicified and difficult to resolve even under phase contrast. It differs from *C. belgica* Grunow (cf. Hustedt, 1927–1964, part 2, 126, fig. 649) to which it seems most closely related, by the failure of the crown of spines on the margin, by the undulate margin seen in girdle view and the very much closer striation. It differs also from *C. elliptica* Salah (1955, 92, pl. 1, fig. 18–21) by the two lines of coarser puncta shown by that species on the valve and by the breadth of the valve. Fig. 36–39. – 629–633.

Dimerogramma Ralfs 1861.

D. minor (Gregory) Ralfs (cf. Hustedt, 1927–1964, part 2, 118, fig. 640; Giffen, 1970a, 274 (misprinted as *D. minus*). – 628 to 633.

D. minor var. *nana* (Gregory) Van Heurck (cf. Hustedt, l.c. 119, fig. 641; Giffen, 1970a, 273). – 630.

D. maculatum (Cleve) Frenguelli (cf. Hustedt, 1955, 13, pl. 4, fig. 44, 45). A single individual was observed which I have assigned, with considerable doubt, to this species. It has the same shape as figured by Hustedt (l.c.), but differs in size being 15 μm long and 6 μm broad (as against 25–50 μm long, 8–15 μm wide). Also the transapical striae are closer being 18 in 10 μm (Hustedt: 9–15 in 10 μm). With this latter variation a further jump from 15 to 18 seems still to be acceptable as the inverse proportion of length to striae is the same. Fig. 40. – 633.

D. marinum (Gregory) Ralfs (cf. Hustedt, 1927–1964, part 1, 119, fig. 642; Peragallo, 1897–1908, pl. 82, fig. 10, 11). This species was very scarce in one sample and not completely identical with the description and figures. It was intermediate between the typical more or less linear forms with rounded ends and the var. *lanceolatum* (Peragallo) Hustedt (see below) as it showed greater tapering towards more or less acute ends. Dimensions: 70 μm long, 15 μm broad, transapical striae 9 in 10 μm with puncta ca 10 in 10 μm. fig. 41. – 630.

D. marinum var. *lanceolatum* (Peragallo) Hustedt (cf. Hustedt, l.c. 120, without figure; Peragallo 1897–1908, pl. 82, fig. 12). The forms of this variety are also not quite typical of Peragallo's variety, being strongly lanceolate to almost quadrate in shape, with somewhat produced more or less acute ends, 25–54 μm long, 10–18 μm wide, transapical ribs 8–9 in 10 μm with 3–5 more or less straight longitudinal rows of puncta

10–12 in 10 μm. These forms occurred in most samples and were fairly numerous. Fig. 42–44. – 628, 630, 632, 633.

Diploneis Ehrenberg 1844.

D. bombus Ehrenberg (cf. Hustedt, 1927–1964, part 2, 704, fig. 1086a–c; Giffen, 1963, 227). A brackish water species scarce in the region under review. – 628, 629, 633.

D. cythnia (A. Schmidt) Cleve var. *mediterranea* (Grunow) Hustedt, 1927–1964, part 2, 596, fig. 1014 and footnote p. 598. Hustedt in the footnote states that wider observations have convinced him that *D. mediterranea* and *D. cythnia* cannot be regarded as specific and therefore places *D. mediterranea* as a variety of *D. cythnia*. Fig. 45. – 633.

D. didyma Ehrenberg (cf. Hustedt, l.c. 685, fig. 1075a, b; Peragallo, 1897–1908, pl. 18, fig. 3–5, pl. 19, fig. 12; Giffen, 1967, 260, 1970a, 273). In previous recordings from South African littoral, this species was always regarded as rare, a condition borne out on the present material. – 628.

D. litoralis (Donkin) Cleve, 1894, 94; Hustedt, l.c. 665, fig. 1062a; Giffen, 1971, 5, fig. 25). Somewhat rare in the material but completely typical specimens reported. Fig. 47. – 632, 633.

D. notabilis (Greville) Cleve var. *oblonga* Heiden & Kolbe, 1928, 609, T. 2,fig. 54. (cf. Hustedt, l.c. 683; Cholnoky, 1963, 48, fig. 22; Giffen, 1967, 260). – 628, 631.

D. papula (A. Schmidt) Cleve (cf. Cleve, 1894, 85; A. Schmidt, Atlas, T. 7, fig. 45–47. as *Navicula papula* A.S.; Hustedt, l.c. 679, fig. 1071). Previously recorded by the author, it was found to be scarce in the present samples. It is characterised by its wide spaces on either side of the raphe, together with the single longitudinal rib crossing the striae. More important, in the case of the present paper, is the divergence of the bases of the horns of the central nodule which distinguishes it from *D. vetula* var. *americana* Hustedt (see below). – 633.

D. Smithii (A. Schmidt) Cleve. – 629.

D. vetula (A. Schmidt) Cleve var. *americana* Hustedt, 1955, 21, pl. 6, fig. 17). This variety of *D. vetula* (A.S.) Cleve, which was described by Hustedt from material from Beaufort, Atlantic coast of the United States of America, occurred in considerable numbers in most of the samples under review. At first sight it can readily be confused with smallish forms of *D. papula* but is distinguished particularly by the shape of the area around the central nodule which is more or less elliptical in shape due to the shortening of the few middle transapical ribs. In *D. papula* these central striae are slightly elongated, yielding a rectangular or dumb-bell shaped space. The South African examples are completely typical of Hustedt's description and figures. Dimensions: 26–32 μm long, 11–14 μm broad, ribs 10–11 in 10 μm. Fig. 48, 49. – 628, 629, 630, 632, 633.

D. vetula var. *americana* f. *minutissima*?, Hustedt, 1955, 21, pl. 6, fig. 18. Numerous individuals of length from 16 to 25 μm, 8–12 μm wide with 13–16 transapical ribs in 10 μm were seen, which might be assigned to Hustedt's f. *minutissima*. However though the density of the striae were never as close as 18 in 10 μm, they reached 16 in 10 μm which seems to link up the f. *minutissima* with the variety. Incidentally many of these small forms were defective in their striation. It seems that f. *minutissima* Hustedt should be united with *D. vetula* var. *americana* Hustedt. – 628, 629, 633.

Eunotogramma Weisse 1854.

E. marinum (W. Smith) Hustedt (cf. Hustedt, 1955, 10, pl. 4, fig. 10–17; Cholnoky, 1963, 49, fig. 26, 27). The authority for this species was quoted by Hustedt (l.c.) as (W. Smith) Peragallo, but in Peragallo, 1897–1908, pl. 82, fig. 36, the diatom is placed in the genus *Smithiella* by Peragallo. Cholnoky points out that Hustedt appears to be the first author to combine the epithet of W. Smith with the genus *Eunotogramma* and must be regarded as the final authority. – 631, 632, 633.

E. rostratum Hustedt, 1955, 10, pl. 4, fig. 18–22. This faintly silicified species occurred fairly frequently in the samples but nearly all the forms observed remained as cells in the girdle view. Only one individual was seen with a valve turned over to show the surface of the valve. This is drawn as seen (fig. 50). Most of the valves were somewhat shorter than described by Hustedt i.e. 12 μm long. Fig. 50. – 631, 632, 633.

Gomphonema Agardh 1824

G. kamtschaticum Grunow (cf. Cleve, 1894, 188; M. Schmidt in A. Schmidt, Atlas, T. 213, fig. 46–51; Giffen, 1970b, 92, fig. 27, 28). Not common in the samples. – 628, 633.

G. pseudoseptatum Giffen, 1970b, 92, fig. 29–32. Very rare in one sample. – 629.

Glyphodesmis Greville 1862.

G. distans (Gregory) Grunow (cf. Hustedt, 1927–1964, part 2, 125, fig. 647; Giffen, 1973, fig. 25). Frequent in all samples. – 628 to 633.

Grammatophora Ehrenberg 1839.

Grammatophora lepida n. sp.

Frustule in girdle view rectangular with small rounded corners. Internal septa irregularly undulate, on the inner end hookshaped and bent inwards. Short coarsely punctate striae lie between the septum and the valve margin. Valve strongly constricted in the middle with cuneate or elliptic-lanceolate segments and obtuse ends, 15–50 μm long, maximum width 12 μm, at the constriction about 9 μm, valve with short pseudosepta. Transapical striae 10–12 in 10 μm, coarsely punctate, puncta in more or less wavy (undulate) lines, parallel to the narrow but distinct pseudoraphe, on the girdle sides of the raphe in irregular diagonal rows, 12–13 in 10 μm, hyaline polar areas moderately large. A septum shows up as four transverse bars. Type preparation 631/8 in the Giffen Collection. Iconotype figures no. 51–54.

Frustula in visu connectivale rectangulata angulis parvis rotundatis, septis irregulariter undulatis extremitatis interioris unciformis. Inter marginem valvae et septa striae ex punctis grossis compositae faciem pleuralem ornant. Valvae in parte media valde constricta, segmenta terminale cunatave elliptica-lanceolata apicibus rotundatis, 15–50 μm longae, latae 12 μm (maximum) ad constrictum circiter 9 μm, pseudoseptis brevibus. Striae transapicales 10–12 in 10 μm punctis crassis in ordinatis plus minusve undulatis compositae,area axialis angusta sed distincta, area hyalinae polares mediocres. Habitat: in aquis marinis Oceani Atlantici in lacunae Saldanha loci Langebaan dicti. Typus: praeparatum 631/8 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 51–54.
Grammatophora lepida n. sp. is a species related in its undulate (bigibbous) margin to *G. undulata* Ehrenberg (cf. Hustedt, 1927–1964, part 2, 48, fig. 576) from which it differs in the shape of the septa and in the quincunx arrangement of the puncta of the striae, 14–20 in 10 μm. It resembles in girdle view *G. angulosa* Ehrenberg (Hustedt, l.c. 39, fig. 565) and *G. hamulifera* Kützing (Hustedt l.c. 40, fig. 566) both of which possess closer striae. Fig. 51–54. – 628, 631, 633.

G. marina (Lyngbye) Kützing (cf. Hustedt, l.c. 43, fig. 569; Giffen, 1967, 262). – 629, 630, 631.

G. oceanica (Ehrenberg) Grunow (cf. Hustedt, l.c. 47, fig. 573; Giffen, 1967, 262). – 629, 630, 631.

Hantzschia Grunow 1880.

H. insolita Giffen, 1967, 262, fig. 39–41; 1973. fig. 27. Rare in one sample but apparently wide-spread and occasionally abundant on the South African littoral. – 632.

Hyalodiscus Ehrenberg 1845.

H. scoticus (Kützing) Grunow (cf. Hustedt, 1927–1964, part 1, 293, fig. 133; Heiden & Kolbe, 1928, 474). Previously recorded by Heiden and Kolbe from Simon's Bay, Cape Province. Diameter: 28–32 μm, alveolar rows 27 in 10 μm. – 631, 632, 633.

Licmophora Agardh 1827.

L. Ehrenbergii (Kützing) Grunow f. *Grunowii* (Mereschkowsky) Hustedt (cf. Hustedt, 1927–1964, part 2, 70, fig. 593, 594; Giffen, 1971, 6, fig. 26, 27). The f. *Grunowii* should be sunk in the type as Hustedt suggests. – 629, 632, 633.

L. nubecula (Kützing) Grunow (cf. Hustedt, l.c. 74, fig. 604; Giffen, 1963, 233; 1970b, 93). – 630.

L. opephoroides Giffen, 1970b, 93, fig. 35–37. This species, which is closely related to *L. Ehrenbergii*, differs in the density of the transapical striae which are 7–8 as against 8–12 in 10 μm, and the clearly visible double rows of puncta between the transapical ribs (in *L. Ehrenbergii* these double puncta are obscure and difficult to resolve). The species seems to be fairly wide-spread along the Atlantic coast of the Cape Province. – 628, 629.

L. paradoxa (Lyngbye) Agardh (cf. Hustedt, l.c. 76, fig. 605; Heiden & Kolbe, 1928, 572). Previously recorded from Simon's Bay by Heiden and Kolbe. – 628.

L. paradoxa var. *tincta* Hustedt (cf. Hustedt, l.c. 76, fig. 607). – 631, 632.

L. Pfannkucheae Giffen, 1970a, 278, fig. 41, 42. This species is characterised by its narrow elongated form and fairly large capitate ends and transapical striae ca.

25 in 10 μm, wider than that of *L. flabellata* (Carmichael) Agardh which is its nearest affinity. Along the whole length of the valve are a number of small mucilage pores. It was never frequent in any of the local samples. Dimensions: to 150 μm long, 8 μm broad, striae 24 in 10 μm. – 628, 629, 632.

Melosira Agardh 1824.

M. nummuloides (Dillwyn) Agardh (cf. Hustedt, 1927–1964, part 1, 231, fig. 95; Giffen, 1967, 265; 1970a, 280). In the sample no. 628, it was the dominant species present. Dimensions: 12–22 μm in diameter, auxospores 28–44 μm. – 628–633.

M. sol (Ehrenberg) Kützing (cf. Hustedt, l.c. 270, fig. 115; Peragallo, 1897–1908, pl. 119A, fig. 10). Wide-spread but rarely found in great numbers in any locality on the South African littoral. – 628.

Navicula Bory 1824.

N. abrupta (Gregory) Donkin (cf. Hustedt, 1927–1964, part 3, 516, fig. 1558; Giffen, 1963, 235, fig. 63). Wide-spread along the South African littoral and abundant in the samples under review. – 628–633.

N. abunda Hustedt, 1955, 27, pl. 9, fig. 10–12 (cf. Cholnoky, 1968, 44, fig. 50; Giffen, 1967, 265, fig. 53). Wide-spread but rare in the local area. – 629, 631.

N. aequorea Hustedt (cf. Hustedt, 1927–1964, part 3, 184, fig. 1318). Typical examples of this small and easily overlooked but characteristic species were observed. Dimensions: 10–12 μm long, 6–6.5 μm broad, transapical striae 20–21 in 10 μm. Fig. 55, 56. – 628, 633.

N. agnita Hustedt, 1955, 27, pl. 9. fig. 13–16 (cf. Cholnoky, 1968, 44, fig. 51; Giffen, 1973, 38, fig. 31). – 630, 631.

N. amphipleuroides Hustedt, l.c. 30. pl. 5, fig. 33, 34 (cf. Hustedt, 1927–1964, part 3, 175, fig. 1308; Cholnoky, 1968, 44, fig. 52). Frequent in several samples. Dimensions: 10–11 μm long, 5–6 μm broad, transapical striae 21–24 in 10 μm. Fig. 57. – 629–633.

N. cancellata Donkin (cf. Cleve, 1895, 30; A. Schmidt, Atlas, T. 46, fig. 29; Giffen, 1967, 266, 1970b, 94). – 628, 630, 632.

N. cingulatoides Cholnoky, 1963, 54, fig. 38; 1968, 46 fig. 58. In Cholnoky, 1968, the author of the species amended the number of transapical striae in 10 μm, given incorrectly in the original description. My specimens are somewhat more oval than shown in Cholnoky's figures and slightly more obtuse, but they undoubtedly belong to the above species. Dimensions: 16 μm long, 8 μm broad, striae 12 in 10 μm, puncta ca. 20 in 10 μm. Fig. 58. – 632.

N. clamans Hustedt (cf. Hustedt, 1927–1964, part 3, 179, fig. 1313; Cholnoky, 1959, 36, fig. 191; Giffen, 1970a, 281, fig. 45, 46). This is a very variable species and several varieties have been described which vary not so much in shape or size as in the number of transapical striae from 15 in 10 μm (Giffen, 1970a) from the Kowie River, Eastern Cape Province to 23–26 in 10 μm (Cholnoky, l.c. fig. 191, 192 from the Berg River-Veld-drift, Western Cape Province) and from the local material 21 in 10 μm, which forms a link between the type and Cholnoky's var. *africana.* - 633.

N. clavata Gregory (cf. Hustedt, 1927–1964, part 3, 444, fig. 1509a–c). Very rare, only one complete individual seen with numerous recognizable fragments. Recorded from Simons Bay also (Heiden and Kolbe, 1928). – 632.

N. clipeiformis Hönig (cf. Hustedt, l.c. 553, fig. 1589). Typical examples of this small species occurred in one sample. Dimensions: 12–14 μm long, 9.5 μm broad, transapical striae 18–20 in 10 μm. fig. 59, 60. – 633.

N. comoides (Agardh) Peragallo (cf. Hustedt, l.c. 304, fig. 1423; Giffen, 1963, 231, fig. 69 as *N. Grevillei* var. *comoides*; 1971, 281). – 629.

N. complanata Grunow (cf. Hustedt, l.c. 335, fig. 1449; Giffen, 1967, 266). – 632.

N. cruciculoides Brockmann (cf. Hustedt, l.c. 320, fig. 1437; Giffen, 1967, 266; 1970a, 281, fig. 48). I record this species from the local material with some doubt. The individuals were shorter with somewhat wider striae. Dimensions: 30 μm long, 8 μm broad, transapical striae 12 in 10 μm in the middle, closer towards the ends, not very clearly punctate. Fig. 61. 633.

N. cryptolyra Brockmann (cf. Hustedt, l.c. 534, fig. 1570; Møller, 1950, 206, fig. 11, as *N. praestocensis* M. Møller). In the South African forms the length is usually 14–15 μm, width slightly greater to 6 μm. The transapical striae are also wider viz. 22 in 10 μm, being closer to Møller's description of 25 in 10 μm. Hustedt records 27 in 10 μm. Fig. 62. – 632.

N. dehissa Giffen, 1973, 39, fig. 35, 36. This species is somewhat similar to the small varieties of *N. palpebralis* (Brébisson) *ex* W. Smith (1853, 50, pl. 31, fig. 273) but has less than half the breadth of any variety. The striae have about the same density, 11 in 10 μm, but the usual shortened middle striae of *N. palpebralis* are absent. The raphe is enclosed in a narrow axial rib. Dimensions: 40 μm long, 7–8 μm broad, striae 10 in the middle to 18 in 10 μm towards the ends. Fig. 63. – 631.

N. directa (W. Smith) Ralfs *in* Pritchard (cf. Cleve, 1895, 27; Peragallo, 1897–1908, pl. 12, fig. 6; Cholnoky, 1963, 57). Slightly shorter and narrower individuals with 10–12 transapical striae and 27 longitudinal striae were observed in one sample. – 632.

N. diversistriata Hustedt, 1955, 28, pl, 9, fig. 6–9. The single cell seen in one sample almost completely agreed with Hustedt's figures and description, except that the puncta are somewhat coarser on the valve with the wider striae, i.e. 25 in 10 μm as against Hustedt's 36 in 10 μm. Dimensions: 24 μm long, 9 μm broad, striae 12 and 15 in 10 μm, puncta 25 on the 12-striate valve. Fig. 64, 65. – 632.

N. forcipata Greville (cf. Hustedt, 1927–1964, part 3, 531, fig. 1568; Cholnoky, 1968, 50; Giffen, 1967, 267). The South African individuals belong to forms previously described as var. *densistriata* A. Schmidt (Atlas, T. 70, fig. 12–16). The transapical striae vary in these local forms from 15 to 19 in 10 μm. – 632.

N. fromenterae Cleve, 1895, 32, pl. I, fig. 33; (cf. Hustedt, 1955, 29, pl. 7, fig. 28, 29 as *N. formenterae* Cl.; Giffen, 1970a, 282, fig. 50, 51). This species has been recorded from both the Atlantic and Indian Ocean coasts of South Africa. Cholnoky (1960, 59, fig. 185, 186) states that the name *N. formenterae* is a printing error in Cleve l.c. (cf. also Mills, 1933, 1042, 1044). – 629, 633.

N. Gregorii Ralfs *in* Pritchard (cf. Hustedt, 1930, 631 as *N. cancellata* var. *Gregorii* Grunow *in* Cleve and Grunow 1880, 37; Giffen, 1971, 7, fig. 28). – 628, 629.

N. Grevilleana Hendey, 1964, 191, pl. 30, fig. 1, pl. 41, fig. 2. (*Schizonema grevillei* sensu W. Smith, 1856, 77, pl. 58, fig. 364 non Agardh; *N. Grevillei* (Agardh) Cleve, 1894, 152; Hustedt, 1927–1964, part 3, 302, fig. 1422; Giffen, 1963, 238, fig. 68). Hendey says that "Aleem, 1949, p. 429, who examined Agardh's type material states that *Schizonema grevillei* Ag. collected by Greville is more closely related to *S. ramosissimum* Ag. but that other material in the Agardh collection received from Griffiths from Torbay agrees well with the specimens illustrated by Smith on Pl. 58, fig. 364. As these specimens are quite different from *S. Grevillei* Ag., a new name is necessary for them".

The South African forms agree with those illustrated by W. Smith (q.v.) and therefore must be assigned to *N. Grevilleana* Hendey. – 629.

N. Hanseni M. Møller, 1950, 205, fig. 10. Synonym: *N. pseudoincerta* Giffen, 1970a, 285, fig. 60–62; 1973, 40, fig. 45, 46; and in Giffen 1963, 240 fig. 74, 75 erroniously as *N. mollis* W. Smith. This species, previously described as *N. pseudoincerta* before the author had the privilege of seeing Møller's paper, has proved to be wide-spread in South African waters, occurring sporadically in the Indian Ocean coastal region but often in great numbers along the Atlantic coast. In a recent paper the author showed that the South African form, at least, lives in *Fragilaria*-like colonies previously described under the now obsolete generic name "*Diadesmis*". Fig. 66, 67. – 628 to 633.

N. humerosa Grunow var. *constricta* Cleve (cf. Heiden in A. Schmidt. Atlas, T. 6, fig. 1--3; T. 243, fig. 6; Giffen, 1963, 72, fig. 72; 1967, 268). – 628, 629, 630, 632.

N. hyalinula De Toni (cf. Hustedt, 1927–1964, part 3, 554, fig. 1591). Hustedt, l.c., states that De Toni changed the name *N. hyalina* Donkin to *N. hyalinula* De Toni on account of Kützing's *N. hyalina,* (Syll. Alg. 1894, 82) and declares that Kützing's *N. hyalina,* although it is true that it is indefinable, is probably a *Diploneis.*

The examples seen in the South African material, which were fairly numerous, are typical of the description, but Hustedt's figure (fig. 1591) does not correctly show the borderline of marginal striae as seen under phase contrast. Here the border between the striae at the margin and their faint continuation towards the side areas is not sharp but forms a wavy (undulate) line with occasional striae crossing clearly to the areas. In many cases, occasional larger puncta are present. Dimensions: 30–36 μm long, 13–14 μm broad, transapical striae 20–21 in 10 μm. Fig. 28. – 628, 629, 631, 632, 633.

N. hyalosirella Hustedt, 1927–1964, part 3, 335, fig. 1448. (cf. Giffen, 1967, 268, fig. 61, 62). – 628.

Navicula infirmitata n. sp.

Valve very slightly silicified, lanceolate with subrostrate to rostrate ends, 6–15 μm long, 3–4 μm broad. Raphe straight filiform, embedded in a weakly silicified rib, central pores moderately close terminal fissures obscure. On one side of the central nodule is a distinct punctum or stigma. Transapical striae very close, not visible. Type slide 629 in the Giffen Collection. Iconotype figures: no. 69–73.

Valvae delicatissima lanceolata apicibus sub-rostratis interdum rostratis 6–15 μm longae, 3–4 μm latae. Raphe directa filiformis, in costae angustae augustissime inclusae. Pori centrales raphae modice approximatae, pori terminales fissures obscuris. In latera una noduli centrali punctum distinctum est. Striae transapicales inconspicuae. Habitat: in aquis marinis Oceani Atlantici in lacunae Saldanha loci Langebaan dicti. Typus: praeparatum no. 629 in collectione Giffen, Fort Hare. Provincia Capensis. Iconotypus: figurae nostrae no. 69–73.

N. infirmitata n. sp was present in most samples and varied greatly in length and the length of the produced ends, the most distinct character is the punctum or stigma and the absence of visible striae. This is a species that can be easily overlooked. Fig. 69–73. – 628, 629, 631, 632, 633.

N. litoricola Hustedt, 1955, 23, pl. 8, fig. 13, 14. (cf. Giffen, 1963, 240, fig. 73). Present infrequently in one sample. – 628.

N. lucens Hustedt ex Salah. (cf. Hustedt, 1927–1964, part 3, 177. fig. 1311). The examples of this form were somewhat wider than described but otherwise identical. Dimensions: 15–16 μm long, 4,5–6 μm broad, transapical striae 14–15 in 10 μm. Fig. 74. – 629, 632.

Navicula lusoria n. sp.

Valve elliptical with rounded or obtuse ends, 17–22 μm long, 7–8 μm broad. Raphe straight, central pores moderately close, Terminal pores small, hooked. Axial area narrow, very slightly widened into a short lanceolate area around the central nodule. Transapical striae strongly radiate in the centre to parallel at the ends, the middle striae either alternately longer and shorter or with some shortened striae, 10–11 in 10 μm in the middle to 14–15 at the ends, longitudinal striae ca. 30 in 10 μm, obscure. Type slide 623/7 in the Giffen Collection. Iconotype figures no. 75–77.
Valvae ellipticae apicibus obtuse rotundatis, 17–22 μm longae, 7–8 μm latae. Raphe directa, poribus centralibus modice approximatis, fissuris terminalibus parvis et unciformis. Area axialis anguste linearis centralis parva lanceolata. Striae transapicales in partibus medianibus valvae valde radiantis ad polos versus parallelae, in medio nonnullis brevioribus intercalatis, 10–11 in 10 μm, ad polos versus leviter densior positae 14–15 in 10 μm, costae longitudinales circiter 30 in 10 μm, indistinctis. Habitat: in aquis marinis Oceani Atlantici in lacunae Saldanha loci Langebaan dicti. Typus: praeparatum no. 632/7 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 75–77.
Navicula lusoria n. sp is a somewhat lightly silicified species related to *N. digito-radiata* Gregory (Cleve, 1895, 20) from which it differs in size and density of striation and to *N. Reinhardtii* Grunow (Cleve, 1895, 20) which is also larger and a fresh water species. Cholnoky (1963, 57, fig. 48) records from Steenbras, Cape Province a small form of *N. digito-radiata* which is very near to the new species but again is considerably longer and possesses some 8–9 striae in 10 μm. Fig. 75–77. – 632.

N. lyra Ehrenberg var. *atlantica* A. Schmidt, Atlas, T. 2. fig. 33. (cf. Hustedt, 1927–1964, part 3, 509, fig. 1555; Giffen, 1970a, 283, fig. 56). Not frequent. – 629.

N. marina Ralfs *in* Pritchard.

(Synonym: *N. punctulata* W. Smith, 1853, pl. 16, fig. 51 non *N. punctulata* Ehrenberg which is *Anomoeoneis serians* Ehr.) (cf. Peragallo, 1897–1908, pl. 27, fig. 10; Hendey, 1953, 156, pl. 1, fig. 6; Cholnoky, 1968, 54). This species is often confused with *N. granulata* Bailey (Hustedt, 1927–1964 part 3, 702, fig. 1696 (which is now *N. Baileyi*, Cholnoky, 1968, 51) but this latter has closer punctation in the middle of the valve. – 632, 633.

Navicula melanocephala n. sp. (cf. Cholnoky, 1960, 249, fig. 22 under *N. carminata* var. *africana* non *N. carminata* var. *africana* Cholnoky, 1959, 35, fig. 189, 190). Cholnoky, 1960, l.c. reported and figured a diatom from the Swartkops River near Port Elizabeth which he assigned to *N. carminata* var. *africana* Cholnoky (1959, 35, fig. 189, 190). This Swartkops form, however differs from his original drawings (vide 1959 above, also 1968, 45) in several important characters. In three samples of the material under review numerous examples of the Swartkops form were observed and in all cases the differences are maintained. I therefore consider that Cholnoky's *N. carminata* var. *africana* consists of two species and that the Swartkops form should be separated from those described in his original paper as an independant species to which I give the name *N. melanocephala* n. sp.

Navicula melanocephala n. sp. Valve elliptical with broad rounded ends, 12–19 μm long, 7–10 μm broad. Raphe with slightly curved axes, filiform, central pores moderately distant from each other, terminal pores some distance from the ends of the valve with long fissures. Axial area narrow to moderately wide linear-lanceolate, central area combined with wide side areas to one third of the width of the valve, separated from the central area by narrow bands of short transapical striae broken in the central area. These striae consist of one or two longitudinal rows of puncta. Marginal zone with radiate short transapical striae, 16–18 in 10 μm, faintly punctate. Type slide 632/1 in the Giffen Collection. Iconotype figures: no 78–80.
Valvae ellipticae, polis obtuse rotundatis, 12–19 μm longae, 7–10 μm latae. Raphe leniter curvatis filiformis,

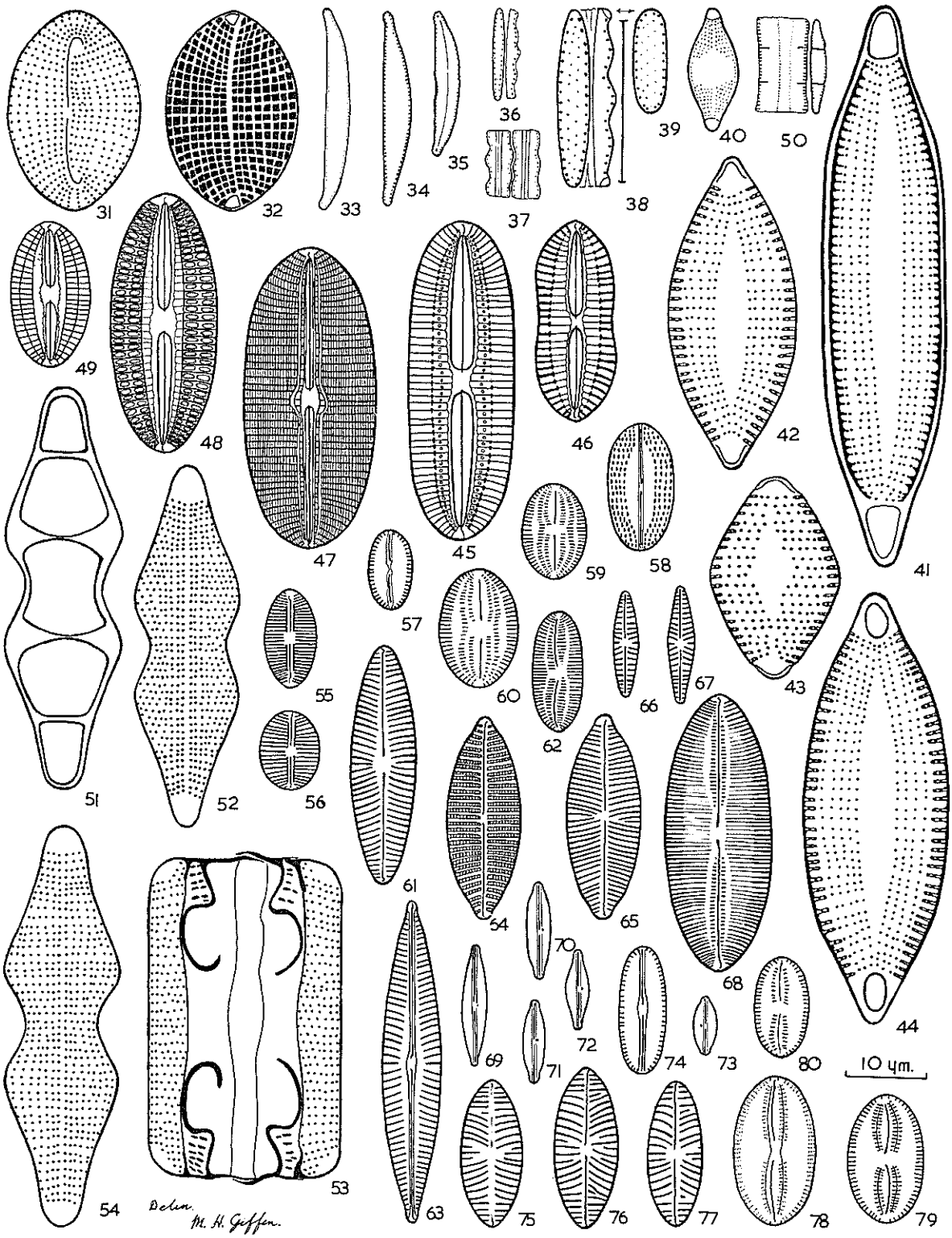

Plate II.

Fig. 31, 32: *Cocconeis St. Pauli* Heiden & Kolbe. Fig. 33–35: *Campylosira inane* n. sp. Fig. 36–39: *Cymatosira capensis* n. sp. Fig. 40: *Dimerogramma maculatum* (Cleve) Frenguelli. Fig. 41–44: *D. marinum* var. *lanceolatum* (Peragallo) Hustedt. Fig. 45: *Diploneis cythnia* var. *mediterranea* (Grunow) Hustedt. Fig. 46: *D. incurvata* (Greg.) Cleve f. *dubia* Hustedt. Fig. 47: *D. litoralis* (Donk.) Cleve. Fig. 48, 49: *D. vetula* var. *americana* Hustedt. Fig. 50: *Eunotogramma rostratum* Hustedt. Fig. 51–54: *Grammatophora lepida* n. sp. Fig. 55, 56: *Navicula aequorea* Hustedt. Fig. 57: *N. amphipleuroides* Hustedt. Fig. 58: *N. cingulatoides* Cholnoky. Fig. 59, 60: *N. clipeiformis* Hönig. Fig. 61: *N. cruciculoides* Brockmann. Fig. 62: *N. cryptolyra* Brockmann. Fig. 63: *N. dehissa* Giffen. Fig. 64, 65: *N. diversistriata* Hustedt. Fig. 66, 67: *N. Hansenii* M. Møller. Fig. 68: *N. hyalinula* De Toni. Fig. 69–73: *N. infirmitata* n. sp. Fig. 74: *N. lucens* Hustedt. Fig. 75–77: *N. lusoria* n. sp. Fig. 78–80: *N. melanocephala* n. sp.

poris centralibus modice distantibus, fissuris terminalibus elongatis ab apicibus distantibus. Area axialis angustae lineari-lanceolatae sive modice latae. Area centralis vitta una transversalis cum areis lateralibus conjuncta. Areae laterales angustissime lanceolatae ab area acialae utroque laterae una vel duo serie punctorum separatae. Striae transapicales breves in zona marginale subradiantes, 16–18 in 10 μm punctis inconspicuis. Habitat: in aquis marinis Oceani Atlantici in lacunae Saldanha loci Langebaan dicti, Provincia Capensis. Typus: praeparatum no. 632/1 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 78–80.

N. meniscoides Hustedt, 1955, 29, pl. 9, fig. 4, 5. The specimens of *N. meniscoides* Hustedt seen in these samples differed from Hustedt's description only in being slightly smaller, the dimensions being 24–25 μm long, 9–10 μm broad, with 25–27 striae in 10 μm. Fig. 81. – 629, 632.

N. mollis (W. Smith) Cleve (*Schizonema molle* W. Smith, 1856, 77, pl. 58, fig. 365; Peragallo, 1897–1908, pl. 12, fig. 11, 12; Giffen, 1970a, 284, fig. 58). The species is wide-spread and frequent in the South African littoral. – 630.

N. nasuta Giffen, 1973, 39, fig. 38, 39. This species was frequent in all the samples and is characterised by a unilateral axial area and very distinct longitudinal striae. Dimensions: 60–80 μm long, 10 μm broad, transapical striae 25–27 in 10 μm. Fig. 82. – 628–633.

N. nautica Cholnoky, 1963, fig. 64 (cf. Giffen, 1967, 270; 1973, 39, fig. 40). Wide-spread in the South African littoral along both Indian and Atlantic coasts. – 628, 632, 633.

N. normalis Hustedt, 1955, 29, pl. 9, fig. 3 (cf. Cholnoky, 1963, 62, fig. 65; Giffen, 1967, fig. 70). *N. normalis* was abundant in most of the samples. – 630, 631, 632, 633.

Navicula occasa n. sp.

Valve elliptical to linear-lanceolate, 14–16 μm long, 6 μm broad. Raphe straight, filiform, central pores moderately close, terminal pores small hooked, near the ends of the valve. Axial area narrow slightly widened around the central nodule into a small lanceolate area. Transapical striae slightly radiate in the middle to parallel or very slightly radiate at the ends, 15 in 10 μm, faintly punctate occasionally the middle pair somewhat shortened, forming a small quadrate area. Type slide 629/7 in the Giffen collection. Iconotype figures no. 83, 84.

Valvae ellipticae sive lineari-ellipticae, 14–16 μm longae, 6 μm latae. Raphe directa filiformis, poris centralibus modice approximatae, fissuris terminalibus curvatis muniti. Area axialis anguste ad nodulum centralem modice lanceolata interdum area centralis parva transverse oblonga, abbreviatione striarum medianarum duarum formata. Striae transapicales in media parte modice radiantes, in apicibus ad lineam mediam perpendiculares sive subradiantes, 15 in 10 μm, leviter puctatis. Habitat: in aquis marinis Oceani Atlantici in lacunae Saldanha loci Langebaan dicti. Typus: praeparatum 629/7 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 83, 84.

N. occasa n. sp. was somewhat infrequent in one sample. It is similar to *N. protracta* var. *elliptica* Gallik (cf. Hustedt, 1927–1964, part 3, 317, fig. 1435) but differs in the somewhat closer striae and the obscure punctation. Several other species viz. *N. aequorea* Hustedt, l.c. 184, fig. 1318, from which it differs in the larger size and coarser striation; *N. pullus* Hustedt (l.c. 265, fig. 1349) and *N. regularis* Hustedt, ibid. 266 fig. 1395, both have transapical striae much closer i.e. 24 in 10 μm and radiate throughout. Fig. 83, 84. – 629.

N. palpebralis Brébisson *ex* W. Smith (1853, 50, pl. 31, fig. 273). (cf. Cleve, 1895, 71; Peragallo, 1897–1908, pl. 10, fig. 15–24). These specimens come near *N. palpebralis* var. *angulosa* Bréb. Peragallo, pl. 10. fig. 22). They were not frequent. Dimensions: 50 μm long, 10 μm broad, transapical striae 10 in 10 μm. Fig. 85. – 628, 632.

N. pelliculoides Hustedt, 1927–1964, part 3, 298, fig. 1418. A very few individuals were present in one sample which seem to agree fairly closely with the above species. They were, however, smaller being only 34–37 μm long, 10–12 μm broad with 16 striae in 10 μm. The punctation, described by Hustedt as very clear but loosely distributed, was on the contrary, rather fine and obscure. Fig. 86. – 628.

N. pennata A. Schmidt in A. Schmidt, Atlas, T. 48, fig. 41–43. (cf, Cleve, 1895, 32; Peragallo, 1897–1908, pl. 11, fig. 25, 26). Heiden & Kolbe, 1928, 600, record this species from Simon's Bay and remark that they noted many cases where the number of transapical striae differed in the two halves of the same valve. This could not be confirmed in the local material owing to the scarcity of individuals particularly in girdle view. The species shows a very convex valve. Dimensions: 50–56 μm long, 10–11 μm broad, with 5–6 transapical striae in 10 μm. – 628, 632, 633.

N. ponticola Giffen, 1970a, 284, fig. 101, 102. A few examples were seen in one sample. In the original description the figure in A. Schmidt, Atlas, T. 2, fig. 34, was cited as representing this species. Hustedt, 1927–1964, part 3, 510, discusses this figure at some length in his observations on *N. lyra* Ehr. and states "that the figure represents no form of *N. lyra* and at present the

reproduction of the structure is not completely correct". The discovery of *N. ponticola* Giffen solves this problem. Fig. 87. – 628.

N. poretzkajae O. Koretkevich (cf. Nikolajev, 1967, 45–50, with figure (in Russian with Latin summary) – *N. complanata* Hustedt, 1927–1964, part 3, 338, fig. 1450; Giffen, 1973, 40, fig. 43, 44). A few typical examples were seen in the material. The species is apparently wide-spread and not infrequent in the South African littoral. – 629, 632.

N. protracta (Grunow) Cleve f. *elliptica* Gallik (cf. Hustedt, 1927–1964, part 3, 316, fig. 1435). A single valve was observed which fits the description and measurements of the species and I have no doubt as to its identity. In the South African material the puncta of the transapical striae are somewhat more obscure and probably coarser than shown in Hustedt's figure. Dimensions: 27 μm long, 8 μm broad, transapical striae 12–13 in 10 μm, puncta ca. 18 in 10 μm. Fig. 88. – 628.

N. pseudoforcipata Hustedt, l.c. 536, fig. 1572. Moderately abundant in the material. Dimensions: 7–9 μm long, 5–5.5 μm broad, transapical striae 20 in 10 μm Fig. 89. – 631, 632.

Navicula pseudoinflata n. sp.

Valve linear with almost parallel to slightly convex margins and broad rounded ends, 30–35 μm long, 7–9 μm broad. Raphe straight, filiform with moderately close central pores and hooked terminal fissures. Axial area very narrow, linear, widening slightly around the central nodule, central area a broad fascia, reaching the margin on both sides of the valve, often with one or two very strong central striae. Transapical striae slightly radiate and very irregular in the middle and either parallel or somewhat convergent at the ends, the central striae on both sides of the central area (fascia) being very strongly marked and often widely spaced, usually 18–20 in 10 μm in the middle to ca. 30 at the ends. Longitudinal striae obscure. Type slide 633 in the Giffen collection. Iconotype figures no. 90–93.
Valvae lineares marginibus paene parallelis sive subconvexis et apicibus latissime rotundatis, 30–35 μm longae, 7–9 μm latae. Raphe directa filiformis poris centralibus modice approximatis, fissuris terminalibus in hamos curvatis. Area axialis angustissime linearis, area centralis vitta lata usque ad marginem percurrentes formantes utrinque valvae. Striae transapicales leviter radiantes et in media parte valde irregulares ad apices nunc parallela nunc subconvergentes, striis centralibus valdissime utrinque fascia, nonnumquam in media parte late composita, im medio circiter 18–20 in 10 μm, apices versus usque ad circiter 30 in 10 μm. striis longitudinales invisibilis. Habitat: in aquis marinis Oceani Atlantici in lacunae Saldanha loci Langebaan dicti, Provincia Capensis. Typus: praeparatum no. 633 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 90–93.
N. pseudoinflata n. sp is closely related to a group of *Naviculae Microstigmaticae* Cleve viz.
N. ulvacea (Dickie) Cleve (cf, Hustedt, 1927–1964, 289, fig. 1413) from which it differs in size, slightly closer transapical striae and striae radiate throughout.

N. subinflata Grunow (cf. Hustedt, ibid. 292, fig. 1415) differs in the structure of the transapical striae being more or less evenly spaced in the middle and central area is more irregular. *N. subinflatoides* Hustedt (ibid. 294, fig. 1416) again has a more regular central striation. I feel that on the above grounds, particularly on the general appearance, this species should be separated as an independant species. Fig. 90–93. – 628, 629, 633.

N. pseudony Hustedt, 1955, 23, pl. 8, fig. 11 (cf. Hustedt, l.c. part 3, 370, fig. 1460; Cholnoky, 1968, 58, fig. 89, 90; Giffen, 1967, 273, fig. 78). The species is apparently widely distributed along all parts of the South African sea coast. – 633.

Navicula pseudosalinarum n. sp.

Valve lanceolate with shortly rostrate ends, 24–35 μm long, 6–7 μm broad. Raphe straight, filiform, axial area very narrow, central area small more or less transapically widened but scarcely more than half the width of the valve. Transapical striae 20 in 10 μm in the middle and more or less alternately longer and shorter, transverse at the ends and somewhat closer, longitudinal striae obscure. Type slide no. 630 in the Giffen Collection. Iconotype figures: 94–96.
Valvae lanceolatae apicibus laevissime rostratis 24–35 μm longae, 6–7 μm latae. Raphe directa filiformis area axialis angustissime area centralis parva plus minusve transapicaliter lata vix ad dimidium valvae attingens. Striae transapicales 20 in 10 μm radiantes, in media parte valvae alternatum longiores breviores-que ad apices versus fere perpendiculares et paulo densiores, striae longitudinales vix visibiles. Habitat: in aquis marinis Oceani Atlantici in lacunae Saldanha loci Langebaan dicti, Provincia Capensis. Typus: praeparatum no. 630 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 94–96.
This new species has the appearance of *N. salinarum* Grunow (cf. Cleve. 1895, 18; Hustedt, 1930, 295, fig. 498) but is only slightly more than half of the width of that species and has much closer transapical striae 20 as against 14–16 in 10 μm. It was frequent in the material. Fig. 94–96. – 630.

N. raphoneis Cleve, 1895, 36, pl. I, fig. 30. (cf. Giffen, 1971, 7, fig. 33–35). Not common in the sample. – 632.

N. salinarum Grunow (cf. Cleve, 1895, 18; Hustedt, 1930, 295, fig. 498; 1955, 27, pl. 7. fig. 25). Most of the individuals seen conformed almost exclusively to those described by Hustedt (1955 l.c.) as f. *angustiore lanceolata.* Dimensions: 22–25 μm long, 8–10 μm broad, transapical striae 15 in 10 μm. Fig. 97. – 629.

N. subforcipata Hustedt (cf. Hustedt, 1927–1964, part 3, 533, fig. 1669). This small but characteristic species was present in fair numbers in the material. It conformed in all respects to the description. Fig. 120. – 633.

N. umpatica Cholnoky, 1968, 65, fig. 102. A few specimens, which I have assigned to this species without any doubt, agree very closely with Cholnoky's description, measurements and figures except that the local examples are very slightly broader by an almost insignificant amount. Dimensions: 10–11 μm long, 6 μm broad, transapical striae 20 in 10 μm. Fig. 98. – 632.

Navicula viminoides n. sp.

Valve elliptical with somewhat cuneate very slightly rostrate obtuse ends, 10–14 μm long, 5.5–6 μm broad. Raphe filiform, straight or very slightly curved near the terminal pores which are close to the ends of the valve. Axial area narrow, central area absent or variously lanceolate through failure of the ends of some of the middle striae. Transapical striae transverse in the middle, very slightly radiate at the ends, 12 in 10 μm, longitudinal striae strong, 15–16 in 10 μm. Type slide no. 632/1 in the Giffen collection. Iconotype figures no. 99–101.

Valvae ellipticae apicibus modice cuneatis rostratisque, 10–14 μm longae, 5,5–6 μm latae. Raphe plus minusve directa filiformis pori centralis raphae modice approximatae, fissuris terminalibus ad apices approximatis composita. Area axialis anguste, area centralis absens sive prope nodulum centralem abbreviatione striarum medianarum in lateris utrinque aream centralem modice lanceolatum formans. Striae transapicales 12 in 10 μm in media parte, perpendiculares ad polos modice radiantes. Striae longitudinales valde 15–16 in 10 μm. Habitat: in aquis marinis Oceani Atlantici in lacunae Saldanha loci Langebaan dicti, Provincia Capensis. Typus: praeparatum no. 632/1 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 99–101.

This new species is very closely allied to *N. viminea* Hustedt, in A. Schmidt, Atlas, T. 397, fig. 10–11, but differs in the type of central area and the structure of the raphe which terminates at the margin, whereas in Hustedt's species they are somewhat distant from the ends of the valve. Fig. 99–101. – 629, 632.

N. vittata (Cleve) Hustedt (cf. Cleve, 1894, 80, pl. I, fig. 15; Hustedt, 1955, 22, pl, 8, fig. 3–5, 12; Cholnoky, 1963, 70, fig. 86). Frequent in many of the samples. It is apparently wide-spread in the South African marine littoral. – 629, 630, 632, 633.

Nitzschia Hassall 1845.

N. aerophila Hustedt (cf. Cholnoky, 1960, 90, fig. 269, 270; 1968, 67, fig. 108–111). Cholnoky records this species from the brackish waters of Natal viz. Zeekoe River, near Durban and from the St. Lucia Lagoon. The examples from Saldanha Bay (Lagoon) agree very fully with Cholnoky's figures and measurements, differing only in slightly coarser striation (24 in 10 μm.) –629, 632.

N. aestatis Giffen, 1973, 40, fig. 48–49. Examples of this newly described species agree fully with the original diagnosis. Valves linear with parallel slightly curved margins, 44–50 μm long, 4–5 μm broad, keel excentric, carinal pores small oblong to roundish, irregular 12–15 in 10 μm, striae scarsely visible, but somewhat stronger in the middle, ca. 30 in 10 μm. – 628 to 633.

N. closterium W. Smith = *Cylindrotheca closterium* (W. Smith) Reimann & Lewin (cf. Giffen, 1967, 274). Present in all samples and often abundant. – 628 to 633.

N. cocconeiformis Grunow (cf. Cholnoky, 1955, 20, fig. 36; Giffen, 1963, 244). A characteristic species of the brackish estuaries of the South African coast and easily recognised and identified by its structure. In one sample fragments of valves were observed, probably displaced. – 631.

N. composita Giffen, 1971, 8, fig. 42, 43. (cf. Giffen, 1973, 41, fig. 53). Very large specimens of this recently discovered species were seen. *N. composita* is characterised by the transverse ribs from the keel to the margin and the fine striation between the ribs. In the original description the length was given as 60–75 μm long and the breadth as 4–7 μm, carinal pores 9–11 in 10 μm, transverse striae ca 20 in 10 μm. In Giffen, 1973 the lengths fell within the original limits, but in the material under review, however, luxurient individuals up to 154 μm long with 8 carinal pores and 8 costae in 10 μm were not uncommon. Dimensions 132–154 μm long, 9 μm broad. – 629.

N. condemnata Cholnoky, 1968, 69, fig. 117. The Saldanha Bay examples differ from Cholnoky's figures only in slightly more tapered ends and somewhat

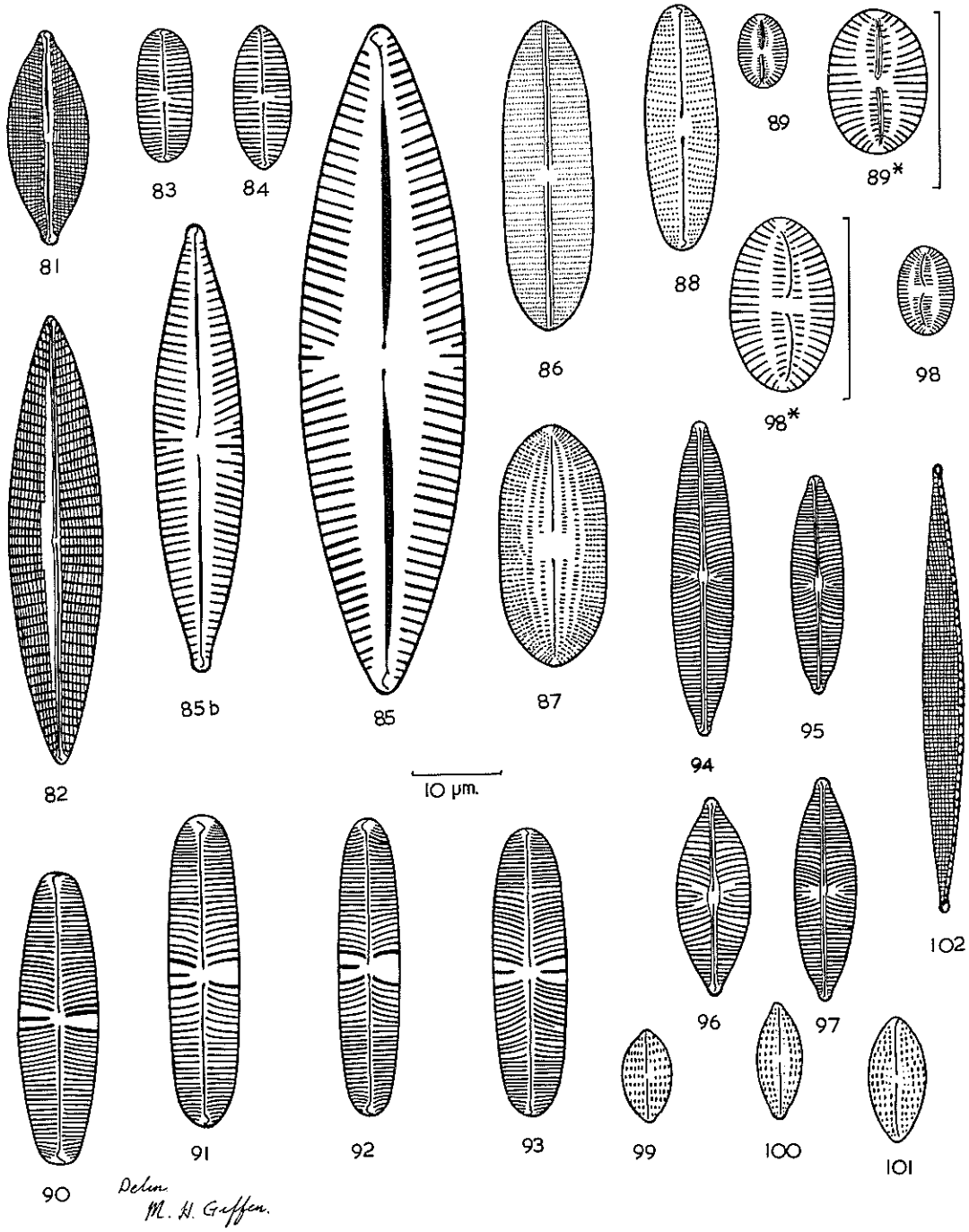

Plate III.

Fig. 81: *N. meniscoides* Hustedt. Fig. 82: *N. nasuta* Giffen. Fig. 83, 84: *N. occasa* n. sp. Fig. 85: *N. palpebralis* Bréb. Fig. 86: *N. pelliculosa* Hustedt. Fig. 87: *N. ponticola* Giffen. Fig. 88: *N. protracta* f. *elliptica* Gallik. Fig. 89: *N. pseudoforcipata* Hustedt. Fig. 90–93: *N. pseudoinflata* n. sp. Fig. 94–96: *N. pseudosalinarum* n. sp. Fig. 97: *N. salinarum* Grunow. Fig. 98: *N. umpatica* Cholnoky. Fig. 99–101: *N. viminoides* n. sp. Fig. 102: *Nitzschia condemnata* Cholnoky.

coarser longitudinal striae. Dimensions: 50 µm long, 4,5 µm broad, carinal pores 10 in 10 µm, transapical striae 20 in 10 µm. longitudinal striae ca 24 in 10 µm. Fig. 102. – 633.

N. dissipata (Kützing) Grunow (cf. Hustedt, 1930, 412, fig. 789; Giffen, 1963, 245). A displaced brackish water species very rare in one sample. – 632.

N. distans Gregory (cf. Peragallo, 1897–1908, pl. 73, fig. 3; Giffen, 1963, 245, fig. 85). – 632.

N. frustulum (Kützing) Grunow (cf. Hustedt, 1930, 415, fig. 795; Giffen, 1963, 245). A few examples were seen which were somewhat larger than described but otherwise indistinguishable. Lenght to 90 µm breadth

5 μm, carinal pores 10 in 10 μm, transapical striae 24 in 10 μm. – 629.

N. frustulum var. *subsalinum* Hustedt, 1930, 415, fig. 796; Giffen, 1963, 245, 1973, 41. Wide-spread and frequent. – 628, 629, 631, 632.

N. hybridaeformis Hustedt, 1955, 44, pl. 15, fig. 9–11 (cf. Cholnoky, 1968, 73, fig. 133; Giffen, 1973, 41). Dimensions: 68–72 μm long, 6–8 μm broad, carinal pores 8–10 in 10 μm, transapical striae 27–33 in 10 μm. – 632.

N. lanceolata W. Smith (cf. Peragallo, 1897–1908, pl. 73, fig. 20, 21; Giffen, 1967, 276). Dimensions: 104 μm long, 10 μm broad, carinal pores 5 in 10 μm, transapical striae 24 in 10 μm. – 633.

N. litoralis Grunow (cf. Peragallo l.c. pl. 69, fig. 15–18; Van Heurck, 1899 (1963), 400, pl. 15, fig. 496 as *N. tryblionella* var. *litoralis* Grun.; Giffen 1973, 41, fig. 54, 55). – 631, 632, 633.

N. longissima (Brébisson) Ralfs (cf. Hustedt in A. Schmidt, Atlas, T. 335, fig. 1, 2; Giffen 1967, 276: 1970a, 291). Not frequent in the locality under review. – 629.

N. media Hantzsch (cf. Peragallo, 1897–1908, pl. 72, fig. 12; Giffen, 1971, 9, fig. 49, 50). – 632.

N. miserabilis Cholnoky, 1963, 74, fig. 95. (cf. Giffen, 1967, 267, fig. 88, 89). – 628.

N. ovalis Arnott (cf. Hustedt, 1930, 417, fig. 808; Cholnoky, 1963, 75, fig. 97). Not very common. – 631.

N. pseudohybrida Hustedt, 1955, 45, pl. 15, fig. 3, 4 (cf. Giffen, 1967, 277, fig. 93). This species varies considerably in the distribution of the carinal pores which are 10–16 in 10 μm (Hustedt, l.c.). In the South African material the general dimensions are 44–75 μm long, 5–8 μm broad, transapical striae somewhat wider than in the original description viz. 27–36 in 10 μm, carinal pores 10–13 in 10 μm. – 628, 629, 632.

N. procera Hustedt, 1955, 47, pl. 16, fig. 6, 7. (cf. Giffen, 1970a, 292, fig. 79: 1971, 10, fig. 51). – 631.

Nitzschia rorida n. sp.

Valve linear, more or less strongly constricted in the middle with shortly produced rostrate rounded ends 23–32 μm long, 9–10 μm broad in the widest part, 8–9 μm at the constriction. Keel strongly excentric, interrupted in the middle, carinal pores transapically elongated, somewhat irregular, 10–12 in 10 μm, the middle pair more widely separated. Transapical striae 24–27 in 10 μm, very finely punctate in two systems crossing each other obliquely (quincunx). The valve is very strongly folded showing a blank area on the carinal half of the valve. Type slide no. 633/1 in the Giffen Collection. Iconotype figures no. 103, 104. Valvae late lineares plus minusve valde constricta apicibus laeviter protractis rotundatisque 23–32 μm longae, 9–10 μm latae in parte lata, in constrictione 8–9 μm. Carina valde excentrica, in media parte interrupta poris carinalibus transapicaliter elongatis modice irregulariter distributis, medianis doubus remotioribus 10–12 in 10 μm. Striis transapicales subtilis 24–27 in 10 μm, costae longitudinales aequidistantes sed oblique, unum punctorum in quincunx positorum efficientes. Superficies valvae valde plicatae, areae unae hyalinae in dimidiae carinale valvae posita. Habitat: in aquis marinis Oceani Atlantici in lacunae Saldanha loci Langebaan dicti, Provincia Capensis. Typus: praeparatum no. 633/1 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 103, 104. This species which almost certainly belongs to Grunow's section *Panduriformes* is closely allied to *N. mollis* Hustedt, (1951, 313, fig. 22) which however shows a coarser structure, and to *N. ruda* Cholnoky (1968, 79, fig. 144–146) from which it is separated in size i.e. almost twice as long and broad, the wider striation 24–26 in 10 μm as against 28–30 in *N. ruda* and particularly in the characteristic strong fold along the apical axis. Fig. 103, 104, – 633.

N. ruda Cholnoky, 1968, 79, fig. 144–146. (cf. Giffen, 1970a, 293, fig. 83 as *N. rudis* Cholnoky). This small species was abundant in many samples. They conform to the original description, but showed only very faint oblique striae and were almost inseparable from certain very small individuals of *N. litoralis* Grunow. Fig. 105. – 629, 630, 631, 632, 633.

N. spathulata W. Smith, 1853, 40, pl. 31, fig. 269. (cf. Giffen, 1963, 248, fig. 94). Very scarce. – 632.

N. steenbergensis Giffen, 1973, 42, fig. 61, 62. This recently described species has a linear to lanceolate valve with elongate produced acute or slightly capitate ends, 48–54 μm long, 5–6 μm broad, carinal pores small, 9–11 in 10 μm median pores not separated. Transapical striae 24–25 in 10 μm clearly punctate in undulating rows ca. 17 in 10 μm. It occurred infrequently in one sample. Fig. 106. – 628.

N. Stompsii Cholnoky, 1963, 75, fig. 100–102. (cf. Giffen, 1967, 279, fig. 97). Dimensions: 554–95 μm long, 4–5 μm broad, carinal puncta 10–12 in 10 μm, transapical striae 21–24, longitudinal striae ca. 24 in 10 μm (i.e. 6 to 7 lines). – 629.

N. Vidovichii (Grunow) Peragallo (cf. Grunow *in* Van Heurck, 1880–1881, pl. 67, fig. 7 as *Homeocladia Vidovichii* Grun.; Cholnoky, 1963, 76, fig. 103–105 and also *N. knysnensis* Cholnoky ibid. 73, fig. 92; Giffen, 1967, 279). – 633.

N. vulpeculoides Giffen, 1973, 42, fig. 63–65. Not frequent in the material. This species which belongs to the section "*Bilobatae*" Grunow, possesses a quincunx arrangement of the puncta of the transapical striae. – 633.

Opephora Petit 1888

O. gemmata (Grunow) Hustedt, 1927–1964, part 2, 136, fig. 657. (cf. Giffen, 1967, 280, fig. 102). Larger specimens of this species, under carefully arranged illumination, show that the marginal areolae consist of double rows of small alternating puncta, cf. *O. Schwartzii* (Grunow) Petit and *O. pacifica* (Grun.) figured in Hustedt, 1955, 13, pl. 4, fig. 46–49. Frequent in most samples. Fig. 107. – 629, 631, 632, 633.

O. Martyi Heribaud (cf. Hustedt, 1927–1964, part 2, 135, fig. 654; Giffen, 1967, 281, fig. 104). The transapical ribs in this species also show double rows of puncta between them. This character seems to be common to most of the species of the genus. – 628 to 632.

O. pacifica (Grunow) Petit (cf. Hustedt, l.c. 135, fig. 655; Giffen, 1967, fig. 102). Frequent. – 628 to 633.

O. Schwartzii (Grunow) Petit (cf. Hustedt, 1955, 13, pl. 4, fig. 56; Hendey, 1970, 125, pl. 5, fig. 50). The species was very scarce in the material, only two individuals being observed. Fig. 108. – 628, 632.

Plagiogramma Greville 1859.

Plagiogramma appendiculatum n. sp.

Cells in girdle view linear to rectangular with more or less convex margins and sharply rounded corners, 10–46 μm long, from the middle of the valve towards the rounded ends appendaged with small flat-topped appendages which increase in size towards the ends. Pseudosepta only a pair around the middle of the valve, very flat, appearing in girdle view as small thickenings or knots. Valve rhombic lanceolate with obtuse rounded ends 10–46 μm long, 5–6.5 μm broad. Transapical striae parallel in the middle to somewhat radiate towards the ends, 14–15 in 10 μm, longitudinal striae straight 14–16 in 10 μm. Along the margins towards the ends the appendages appear as marginal puncta, varying in number. Middle portion of the valve a hyaline expanse as also are the small polar fields. Type slide no. 632/7 in the Giffen Collection. Iconotype figures no. 109–112. Frustula in visu pleurale lineares rectangularesve marginibus leviter convexis angularis acute rotundatis 10–46 μm longae, in media parte valvae versus apicibus rotundatis appendiculis peltatis parvis ornatis ad polos amplitudine crescentis. Pseudoseptae binate unae planissime circum mediam valvae posita, in aspectu pleurale nodis parvis visa. Valvae rhombicae-lanceolatae apicibus obtuse torundatis 10–46 μm longae 5–6,5 μm latae. Striae transapicales in media parte valvae perpendiculares ad polos modice radiantes 14–15 in 10 μm, striae longitudinales directa 14–16 in 10 μm. Ad marginem apicem versus appendiculis punctis marginalibus visa numero variabilis. Areae hyalinae magne in parte media valvae, apud polos modice parvae. Habitat: in aquis marinis Oceani Atlantici in lacunae Saldanha loci Langebaan dicti, Provincia Capensis. Typus: praeparatum no. 632/7 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 109–112.

Plagiogramma appendiculatum n. sp is characterised by the T-shaped appendages along the margin of the valve as seen in girdle view. These appendages are longest and most widely spaced about 10–12 in 10 μm at the ends, becoming smaller, more obscure and closer towards the middle (to 18 in 10 μm). In valve view these appendages appear as moderately large puncta disposed along the margin. The valve view is very like that of *P. interruptum* (Gregory) Ralfs (cf. Hustedt, 1927–1964, Part 2, 110, fig. 636) but differs in the very much wider striae and the appendaged ends. Fig. 109–112. – 628, 629, 631, 632.

This genus is very much in need of revision and apart from the recent account of the North American species (Hustedt, 1955, pp. 11–12) little has been done since A. Schmidt published Plates 209–211 in the Atlas Diat. in 1897. Hustedt states (l.c.) that the taxonomy is not clear, since the original descriptions and the figures are not adequate and the variability of the species is insufficiently known.

Plagiogramma occasum n. sp.

Frustule in girdle view more or less rectangular with slightly convex, subundulate margins and short rounded ends. Valve rhombic lanceolate, constricted in the middle with tapered to slightly produced ends, 31–56 μm long, 9–12 μm broad. Transapical striae radiate throughout 12 in 10 μm, longitudinal striae 12 in 10 μm. Pseudoraphe very narrow, central area hyaline, marked by flat and almost obsolete pseudosepta, terminal areas hyaline. Type slide no. 629/7 in the Giffen collection. Iconotype figures no. 113–116.

Frustula in visu pleurale plus minusve rectangularis marginibus valvarum leviter convexis, subundulatis angulis breviter rotundatis. Valvae rhombicae-lanceolatae in media parte constrictae apicibus gradatim contractis versus protractis rostratisque, 31–56 μm longae, 9–12 μm latae. Striae transapicales radiantes 12 in 10 μm, costae longitudinales 12 in 10 μm. Pseudoraphe angustissime areae centralis hyalinae, pseudoseptis planis paene obsoletis, areae terminalibus hyalinis. Habitat in aquis marinis Oceani Atlantici in lacunae Saldanha loci Langebaan dicti, Provincia Capensis. Typus: praeparatum no. 629/7 in collectione Giffen, Fort Hare, Provincia Capensis. Iconotypus: figurae nostrae no. 113–116.

Plagiogramma occasum n. sp. is characterised by its constant constriction, radiate transapical striae, and the shape of the frustule in girdle view, all of which separate it from *P. staurophorum* (Gregory) Heiberg (cf. Hustedt, 1927–1964, part 2, 110, fig. 635) which it otherwise resembles. The species was frequent in the material. Fig. 112–116. – 628, 629, 632, 633.

P. pygmaeum Greville (cf. Hustedt, 1927–1964, part 2, 108, fig. 634; 1955, 11, pl. 4, fig. 30–34). In the samples investigated the species was very variable in size from 20 to 40 μm long, 7–9 μm broad with 7–10 transapical striae in 10 μm. One or two very large specimens were observed up to 52 μm long and 17 μm broad. The species was present and usually frequent in all samples. Fig. 117. – 628 to 633.

P. Vanheurckii Grunow (cf. Hustedt, 1927–1964, part 2, 112, fig. 638; Giffen, 1971, fig. 52, 53). – 629, 632, 633.

Pleurosigma W. Smith. 1852.

P. aestuarii Brébisson (cf. Cleve, 1894, 42; Peragallo, 1897–1908, pl. 33, fig. 9; Giffen, 1970a, 295. – 632.

P. carinatum Donkin (cf. Cleve, 1894, 44; Hustedt, 1955, 36, pl. 12, fig. 3; Giffen, 1967, 282, fig. 110). – 632.

P. intermedium W. Smith (cf. Cleve, 1894, 35 as *P. nubecula* var. *intermedia* W. Sm.; Giffen, 1970b, 95, fig. 66). rare in the samples. – 628.

P. lanceolatum Donkin (cf. Hustedt, 1955, 35, pl. 12, fig. 5; Cleve, 1894, 37). Hustedt l.c. discusses the identities of *P. rostratum* Hustedt and *P. lanceolatum* Donkin together and figures both species with critical notes on the structure separating the species. The single individual observed, which I have assigned to *P. lanceolatum*, was almost identical with Cleve's description. The dimensions of the South African specimens are 76 μm long, 16 μm broad, transapical striae and oblique striae equidistant, 20–21 in 10 μm, thus agreeing with Cleve. The characteristic change from oblique to longitudinal striae at the ends was clearly seen as figured by Hustedt, l.c. The only difference is a slight curvature at the ends, making the valve seem more sigmoid than shown by Hustedt. Hustedt, in discussing the distribution, states that *P. lanceolatum* seemed to be restricted to the northern regions. The discovery of this species in the southern hemisphere, however, should come as no great surprise for a considerable number of northern (cold water) species have been recorded recently from the South Atlantic littoral by the author. Fig. 118. – 632.

P. Normanii Ralfs in Pritchard (cf. Cleve, 1894, 40; Peragallo, 1897–1908, pl. 32, fig. 4–6, as *P. affine* var. *Normannii*; Giffen, 1970a, 297). – 628, 629, 632, 633.

P. pelagicum Peragallo, 1891, 7, pl. 3, fig. 3 (not seen by me) (cf. Cleve, 1894, 37). This species also proved to be scarce in the material. The valve is lanceolate, acute, scarcely sigmoid and very convex. The raphe, however, is strongly sigmoid. Small specimens, little over half the published length of 160–170 μm were observed, with transapical striae the same as described but the oblique somewhat closer viz. transapical to oblique 18–19 to 24 in 10 μm. Fig. 119. – 632.

Raphoneis Ehrenberg 1844.

R. capensis A. Schmidt, Atlas, T. 193, fig. 18 (cf. Giffen, 1967, 284, fig. 114, 115). This species, which has been recorded from several regions of the South African littoral, was exceedingly rare in the samples. – 628.

Rhopalodia O. Müller 1895.

R. gibberula (Ehrenberg) O. Müller, var. *protracta* Grunow (cf. Hustedt, 1930, 391, fig. 743; Fricke *in* A. Schmidt, Atlas, T. 253, fig. 29, 30). Very large specimens, probably displaced from brackish water seepages along the beach, were recorded from one sample. – 631.

Rhabdonema Kützing 1844.

R. arcuatum (Lyngbye) Kützing (cf. Fricke *in* A. Schmidt, Atlas, T 220, fig. 5, 5a as *R. Crozierii* Ehr.

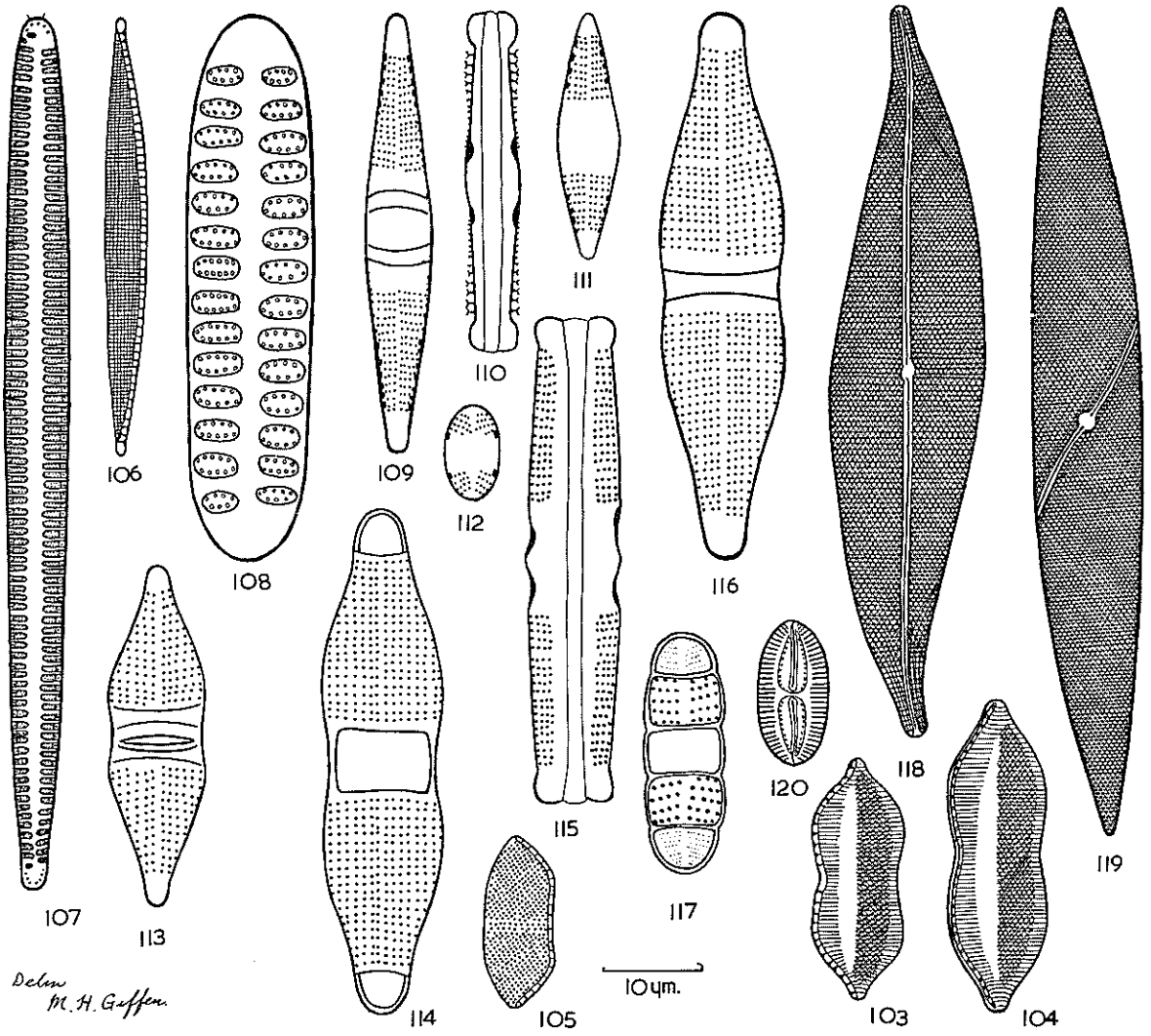

Plate IV.

Fig. 103, 104: *Nitzschia rorida* n. sp. Fig. 105: *N. ruda* Cholnoky. Fig. 106: *N. steenbergensis* Giffen. Fig. 107: *Opephora gemmata* (Grun.) Hustedt. Fig. 108: *O. Schwartzii* (Grun.) Petit. Fig. 109–112: *Plagiogramma appendiculata* n. sp. Fig. 113–116: *P. occasum* n. sp. Fig. 117: *P. pygmaeum* Greville. Fig. 118: *Pleurosigma lanceolatum* Donkin. Fig. 119: *P. pelagicum* Peragallo. Fig. 120: *Navicula subforcipata* Hustedt.

and T. 220, fig. 18, as *R. arcuatum*; Giffen, 1970b, 95). Wide-spread along the Atlantic coast of South Africa. – 629.

R. arcuatum var. *robustum* (Grunow) Hustedt, 1927–1964, part 2, 20, fig. 550 (cf. Giffen, 1970b, 95). Wide-spread and frequent in most samples. – 628 to 633.

R. minutum Kützing (cf. Hustedt, l.c. 18, fig. 584a–d). Abundant in all samples and very variable in size, varying from 10 µm to 70 µm in length. – 628 to 633.

Rhoicosphenia Grunow 1860

R. flexa Giffen, 1970b, 96, fig. 55–58. *R. flexa* differs from the cosmopolitan *R. marina* (W. Smith) M. Schmidt, in the well-marked radiate striae, 8–10 in 10 µm in the middle of the concave valve and 12–13 in 10 µm on the convex valve whereas these values are 15–20 and 18–24 respectively. This species has been reported from several stations in the littoral of the Atlantic coast of South Africa. – 628.

R. marina (W. Smith) M. Schmidt *in* A. Schmidt, Atlas, T. 213, fig. 28–34 (cf. Hustedt, 1927–1964, part 2, 432, fig. 880). The species was very scarce and consisted of a few completely typical examples. *R. marina* has been recorded previously by Heiden & Kolbe (1928, 581) from "Gaussberg", South Atlantic Ocean, (as *R. curvata* f. *marina* Grun.) – 631.

Stauroneis Ehrenberg 1843.

S. salina W. Smith, 1853, 69, pl. 19, fig. 188 (cf. Hendey, 1951, 55: 1964, 218 non Hustedt, 1927–1964, part

2, 786, fig. 1133 which is *S. africana* Cleve). The specimens agree with the description given by Hendey, l.c. and the characters he uses to separate this species from *S. africana* Cleve (1895, 145). Dimensions of the local examples to 70 μm long, 10 μm broad, transapical striae 18 in 10 μm, stauros slightly widened towards the margins and interrupted by short striae on one or both sides of the valve. – 629.

S. decipiens Hustedt, 1927–1964, part 2, 827, fig. 1170. (cf. Giffen, 1973, 44, fig. 69–71). *S. decipiens* was present in most samples but never very frequent. – 628, 629, 631, 632.

Striatella Agardh 1832.

S. delicatula (Kützing) Grunow (cf. Hustedt. l.c. 33, fig. 561; Giffen, 1971, 11; Cholnoky, 1968, 89, fig. 163). Reported from Gordon's Bay (Giffen, 1971) as very rare, *S. delicatula* occurred in considerable numbers in the present samples, particularly sample 630. The valves are very variable in length from 8 μm to 36 μm with striae 15–24 in 10 μm. – 630, 632, 633.

Synedra Ehrenberg 1830.

S. tabulata (Agardh) Kützing var. *fasciculata* (Kützing) Grunow. Present in all samples and probably the commonest *Synedra* in the South African littoral. – 628 to 633.

Trachyneis Cleve 1894.

T. aspera (Ehrenberg) Cleve. Wide-spread. – 628, 629, 633.

Triceratium Ehrenberg 1841.

T. alternans Bailey (cf. Hustedt, 1927–1964, part 1, 825, fig. 488; Peragallo, 1897–1908, pl. 103, fig. 1; Heiden & Kolbe, 1928, 534). Sporadic in most samples. A great number of individuals were seen to be abnormally developed both in the margins and the areolae. – 628, 631, 632, 633.

T. antediluvianum (Ehrenberg) Grunow (cf. Hustedt, l.c. 811, fig. 472; Peragallo, 1897–1908, pl. 102, fig. 1–4 as *Amphitetras antediluviana*; Cholnoky, 1963, 80; Giffen, 1971, 15; Heiden & Kolbe, 1928, 544. Rare in one sample. – 633.

T. favus Ehrenberg (cf. Hustedt, l.c. 798, fig. 463; Peragallo, 1897–1908, pl. 99, fig. 1–3; Giffen, 1973, 48). Scarce. – 632.

T. reticulatum Ehrenberg (cf. Hustedt, l.c. 823, fig. 485; Peragallo, pl. 104, fig. 7–9). A few individuals were observed in most samples. – 628, 629, 630, 632, 633.

Tropidoneis Cleve 1891.

T. vitrea (W. Smith) Cleve (cf. Cleve, 1894, 27; Giffen, 1970a, 302, fig. 99). Rare. – 629.

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