Contributions to the Diatom Flora of Southern Africa.

II. Diatoms from the Hog's Back Region of the Amatola Mountains, Eastern Cape Province, South Africa

by Malcolm H. Giffen

(University College of Fort Hare, Cape Province, South Africa, and Council for Scientific and Industrial Research, National Institute for Water Research, Pretoria), (with 95 figs.)

This paper deals with the diatom flora of the Hog's Back region of the Amatola Mountains in the Eastern Cape Province, South Africa. These mountains form part of the Great Winterberg Range which constitutes a portion of the great escarpment of Southern Africa, separating the Coastal regions from the Central Plateau. The area under review lies some 32 Km north of the town of Alice, which is 107 Km due west of the port of East London.

Geologically the region is situated in the sedimentary shales of the upper Beaufort Series of the Karroo System and the mountains appear to owe their existence to the presence of thick sheets of igneous dolerite that have protected the sedimentary rocks from destruction. These eroded sheets usually form precipitous cliffs, below which the talus slopes and upper parts of the shales are clothed with dense indigenous temperate forest (Auckland Forest section of the Hog's Back Forest Conservancy).

The region is drained chiefly by the Tyumie River and its numerous tributary streams viz. Auckland Stream, Kaffirkop Stream, Crab River, together with many small unnamed rivulets, some arising as springs at the base of the rocky cliffs enclosing the head of the valley which falls rapidly from 1800 m to 710 m above sea level at the floor of the valley.

The climate of the region may be regarded as warm temperate to sub-tropical, with summer rainfall, i.e. 70% precipitation during the summer months from October to March. There are few periods of great heat, an average of 8 days of 38°C., and frosts occur on about 13 days per year. The average rainfall from 1880—1951 is 585 mm. (In 1945 the absolute maximum temperature recorded was 45.2°C. The average of days of high temperature 38°C. is 8. The record year of 1931 produced 23 days.)
Summary of Climatic Conditions during the years 1948—1951.

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The hydrogen-ion concentration of the waters of the various stations was determined by means of a portable pocket pH meter and are as follows:

- **Station 1.** Kaffirkop stream: Samples 24—28, pH 6.8
- **Station 2.** Kaffirkop stream (spring): 29, 6.4
- **Station 3.** Auckland stream: 30—31, 6.6
- **Station 4.** Stream in forest, 4000 ft (1220 m): 75—76, 6.8
- **Station 5.** Dolerite Cliffs, 4300 ft (1310 m): 48, 48a, 51, 163, 7.2
- **Station 6.** Tor Doone Stream, 5120 ft (1560 m): 146, 6.4

The water can therefore be regarded as neutral to slightly acid. Analysis of the diatom flora bears this out very clearly as well known basiphilic species are scarce and not well represented. The waters are also fairly unpolluted as shown by the scarcity of known pollution indicators, e.g., *Nitzschia palea* (Kg.) W. Sm., which occurred in numbers in only one sample.

During the years 1948 to 1951, over 100 samples were collected from the Hog's Back streams but only the following have been fully investigated. They may be taken as typical samples chosen from six stations at varying altitudes from the base of the mountains, e.g., Kaffirkop Stream (825 m above mean sea level) to the general level of the plateau (Tor Doone Stream: 1560 m). This survey excludes the highest altitudes, viz., those of the Elandsberg (1980 m) and Gaika's Kop (1955 m).

The following samples are included:

- 24. Kaffirkop Stream, 810 m, surface of mud in pools; 44 forms recorded.
- 25. The same: from roots of trees in the stream: 9 forms.
- 27. The same: from surface of mud in pools upstream: 35 forms.
- 28. The same: from surface of mud in pools further upstream: 46 forms.
- 29. The same: from the sandy surface of a spring entering the main stream: 28 forms.

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30. Auckland Stream (840 m) from mud washed off sticks in the stream: 44 forms.
31. The same: from mud on rocks in the stream: 46 forms.
48. Auckland Forest: from wet seepage on dolerite rocks (1070 m): 32 forms.
48a. The same: later collection from locality of 48: 37 forms.
51. Auckland Forest: scrapings of rocks near to but above 48: 58 forms.
75. Auckland Forest: from a small stream in the forest (1220 m) on loose bark in stream: 50 forms.
76. The same: from mud in stream: 31 forms.
146. Tor Doone Stream (1560 m) on wet sand with Vaucheria sp.: 42 forms.
163. Auckland Forest: same locality as 48, from a large lump of moss detached from high up on the cliff during a storm: 24 forms.

Table

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Summary of Genera and Species
Achnanthes, Bory 1822.

*A. affinis* Grunow (cf. Hustedt, Kießl. 2: 419, F. 872a—c). The species occurred rarely in my material in only a few samples and in restricted numbers. In its ecology it belongs to waters with low pH values, which probably accounts for its presence. In the two samples viz, seepage from a swampy stream bank (31) and floating rotten bark (151). — Samples 24, 31, 28.

*A. alpistica* Husted var. caseata (1959a: 11, F. 1—4). The species occurred rarely in my material. A few individuals were seen, mostly the raphe-valve. — Samples 27, 146. — (Fig. 1, 2).

*A. coarctata* (Bréb.) Grun. (cf. Hustedt, Kießl. 2: 419, F. 872a—c). This species occurred rarely in its ecology it belongs to waters with low pH values, which probably accounts for its presence. In the two samples viz, seepage from a swampy stream bank (31) and floating rotten bark (151). — Samples 24, 31, 28.

*A. exigua* Grun. (cf. Hustedt, Kießl. 2: 386, F. 832a, b; Cholnoky 1962b: 5). This species occurred rarely in my material in only a few samples and in restricted numbers. In its ecology it belongs to waters with low pH values, which probably accounts for its presence. In the two samples viz, seepage from a swampy stream bank (31) and floating rotten bark (151). — Samples 24, 31, 28.

*A. exiguus* var. constricta Hustedt (cf. Hustedt, Kießl. 2: 386, F. 832g). More frequently observed and in greater numbers than the species but never common. — Samples 24, 31, 28, 30, 146.

*A. exigua* var. elliptica Hustedt (cf. Hustedt in A. S. Afr. T. 413, F. 15, 14; Cholnoky 1954b: 205, F. 1, 2). — Sample 51, not common. — (Fig. 3, 4).

*A. exilis* Kützing (cf. Hustedt, Kießl. 2: 378, F. 822; Cholnoky 1962b: 60). This species has been previously recorded from the Cape Province (Cholnoky l. c.). — Samples 27, 30.

*A. inflata* (Kütz.) Grun. (cf. Hustedt, l. c.: 421, F. 673). Well represented in a great many samples throughout the Amatola region. Cholnoky (1962b: 6) remarks that this diatom occurs more infrequently in the temperate parts of South Africa than in the subtropical regions. The striae vary in density in the local specimens, usually being closer than in the description. Some individuals were seen with abnormal striation. — Samples 24, 25, 26, 27, 28, 29, 31, 51.


*A. lanceolata* (Bréb.) Grun. l. rostrata (Oestr.) Hustedt (cf. f. Hustedt, l. c.: 410. F. 8632—m). This variety is much more common than the type and occurs generally in greater numbers. Cholnoky (1956: 56; 1957a: 39; 1962a: 60; 1962b: 6). discusses the ecology of *A. laceolata* and its variety *rostrata* more common in the Cape Province than in the temperate areas. Hence more common in the Cape Province in its maximum conditions of *A. lanceolata*, var. *rostrata*.


*A. linearis* var. linearis. Generally distributed. — Samples 26, 28, 30, 146.


*A. lanceolata* (Bréb.) var. rostrata (Oestr.) Hustedt (cf. f. Hustedt, l. c.: 410. F. 8632—m). This variety is much more common than the type and occurs generally in greater numbers. Cholnoky (1956: 56; 1957a: 39; 1962a: 60; 1962b: 6). discusses the ecology of *A. lanceolata* and its...
variety *rostrata* in a number of papers. He points out that the species is more common in Europe than the variety (1962a) and that the distribution in the Cape Province is similar. I feel that this latter statement needs clarification. In his paper "Diatomeen aus der Kaap-Provinz" (1962b) CHOLNOKY dealt with the Western Cape, a region of Winter rainfall in which the maximum growth and multiplication of diatoms takes place during moderately cool temperatures somewhat similar to the European climate. Hence he is correct in stating that the typical *A. lanceolata* will be more common. In the region under investigation for this paper, the Eastern Cape Province, the climate differs in being a Summer rainfall area, with the maximum development of the flora taking place under sub-tropical conditions of moderately high temperatures. From this it follows that *A. lanceolata* var. *rostrata* will reach full development in the Eastern Cape Province in suitable conditions. This is well shown in the abundance of the var. *rostrata* in the Amatola region. — Samples 24, 25, 146.

*A. linearis* (W. Smith) GRUN. (cf. HUSTEDT, Kieselalig. 2: 378, F. 821 a). Generally distributed in the neutral to slightly acid waters of the region. — Samples 26, 30, 31, 75.

*A. microcephala* (KG.) GRUN. (cf. HUSTEDT, l. c.: 376 F. 819). Recorded from two samples, but rich in individuals. — Samples 24, 48.

*A. minutissima* KG. (cf. HUSTEDT, l. c.: 376, F. 820 a—c). Abundant in all samples throughout the region. — Samples 24, 26, 30, 31, 48, 48 a, 75, 76.

*A. oblongella* OESTR. (cf. HUSTEDT 1937—1939, Suppl. 15: 199; A. S. Atl. T. 407 F. 49—54; CHOLNOKY 1954 c: 272, F. 13—17; 1959 a: 8, F. 41—45). This species was identified in only three samples. My observations agree with those of CHOLNOKY (1954 c) in that many forms are irregular in shape and show irregular striation. — Samples 27, 51, 75, 76 (Figs. 5—7).

*A. Krausei* HUSTEDT (l. c. 2: 403, F. 854 b; CHOLNOKY 1959 a: 11, F. 66—69; 1960 b: 8). Present in most samples from the area. — Samples 24, 26, 28, 29, 30, 51, 75 (Fig. 8, 9).

*A. subaffinis* CHOLNOKY (1959 a: 11, F. 70, 71; 1960 a: 18, F. 25—28). This species, first described by CHOLNOKY from the Western Cape Province, occurs in the Eastern Cape in very similar conditions i. e. mountain streams near the foot of the mountains. It has also been recorded from mountain gorges. My specimens agree within very close limits with CHOLNOKY's figures (1959 a: 11, F. 70, 71) in the stronger striae bounding the transverse area, in the slightly radial striae, but the striae are closer on both valves being 34—36 in 10 μ as against 30—32 in 10 μ. Dimensions 13—15 μ long, 3.5—4 μ wide, striae 34—36 in 10 μ. — Samples 31 (rare), 51 (frequent). (Fig. 10—12).

*A. subhudsonis* HUSTEDT var. *Krausei* CHOLNOKY. (1954 c: 271, F. 5—10; 1956 a: 56; 1960 a: 18, F. 29—32). This small species was recorded from
only one sample but may have been overlooked in others. The forms seen were typical of Cholnoky’s description and figures. In this region it occurs in similar habitats amongst wet mosses and liverworts and on wet rocks. This is apparently the first record from the Cape Province. — Sample 26, infrequent. (Fig. 13, 14).

Amphipleura Kützing 1844.


Amphora Ehrenberg 1840.

A. coffeaeformis (Agardh) Kützing. (cf. Hustedt, Bacill.: 345, F. 634; Cholnoky, 1960b: 234). This species can be regarded as rare in the region as it occurred in very small numbers in a few samples. It belongs to neutral to weakly basic waters and its habitat in the Kaffir Kep Stream is near the limit of its distribution. — Samples 24, 29, 31.


A. normani Rabenhorst (cf. Hustedt, Bacill.: 343, F. 630.) — Samples 27, 28, 29, 30.

A. ovalis KG. (cf. Hustedt, Bacill.: 342, F. 628.) — Samples 31, 51.

A. ovalis var. libyca (Ehr.) Cleve. This variety usually occurs in greater numbers than the type in any of the samples. — Samples 31, 51.

A. ovalis var. pediculus (KG.) Grun. (cf. Hustedt, Bacill.: 343, F. 629.) Common in the region and usually frequent in all samples. — Samples 24, 26, 27, 29, 51.


Anomoeoneis Pfitzer 1871.

A. exilis (KG.) Cleve (1895: 8; Hustedt, Bacill.: 264 F. 429; Kieselalg 2: 751, F. 1114a—d.) Found only in one sample and rare, thus possibly displaced. — Sample 26.

A. brachysira (Bréb.) Cleve (1895: 7; cf. Hustedt Kieselalg. 2: 748, F. 1112e—h; Cholnoky 1960c: 352.) I have followed Cholnoky (l.c.) in regarding A. brachysira (Bréb.) Cleve as a species rather than as a variety of A. seriata (Bréb.) Cleve. I include also the var. thermalsis Grun. (= l. thermalsis Hustedt). The species and acidic waters of 51, 163.

C. aequatoria 14, F. 88—91.) individuals were

C. bacillarum (Cholnoky, 1960b: 236, F. 361.) —

C. silicula (E J. Jahrb. 43, 11, 1 sample some from and figures by recorded and.)

Cholnoky (l.c. Calcis eral in 10.y.). Both continuing as very (Fig. 15—16).

C. placenta occurs in many

C. placenta and figs. F. 802e, d.) Four to rectangular bluntly apicula valve 10 μ. It is usually mounted in hyd. elongated punc 24, 25, 26, 27.

C. placenta F. 802c.) — Sa

C. placenta F. 802d.) Four
thermalis Hustedt) as in my material there is no sharp boundary between the species and the variety. This form occurs only in the neutral to slightly acidic waters of the mountain streams in the region. — Samples 28, 48, 48a, 51, 163.

Caloneis Cleve 1891.

C. aequatorialis Hustedt (1922: 148, T. 1, F. 5, 6; Cholnoky, 1959a: 14, F. 88–91.) This was recorded in only two samples and only a few individuals were seen. — Samples 29, 51.

C. bacillum (Grun.) Mereschk. (cf. Hustedt, Bacill., 236, F. 359; Cholnoky, 1960b: 237.) — Sample 51 (rare).

C. bacillum var. lancetula (Schultz) Hustedt. (cf. Hustedt, Bacill.: 236, F. 361.) — Sample 29 (rare).

C. silicula (Ehr.) Cleve var. brevistriata O. Müller (1909, Engl. Bot. Jahrb. 43, 11, T. 1 F. 13. Frisch and Rich, 1930: 99, F. 3 A–D.) In one sample some forms were seen which agree very closely with the description and figures given by O. Müller (1909: 11, T. 1, F. 13). This variety is also recorded and figured by Frisch and Rich (l. c.) from the Cape Province. Cholnoky (1962b: 15, F. 19, 20) describes and figures a new species Caloneis vehemens, also from the Cape Province, which seems to be identical with Müller’s variety in shape, dimensions and number of striae (18–20 in 10 μ). Both forms also show the striae as radiate at the ends and continuing as very short striae beyond the terminal nodules. — Sample 24 (Fig. 15–16).

Cocconeis Ehrenberg 1838.

C. placentula Ehr. (cf. Hustedt, Kieselalg. 2: 347, F. 802a, b.) This occurs in many samples. — Samples 24, 26, 27, 31.

C. placentula Ehr. var. ranomafanaensis Manguin (1952: 19 Plate I, f. 1, and figs. 28a, b). This variety differs from the type in the broadly elliptical to rectangular shape with rounded to cuneate ends, which are shortly and bluntly apiculate. Dimensions 29–50 μ long, 15–33 μ broad, striae in raphless valve 16–18 in 10 μ, in the raphe valve 15–19 (mostly 18) in 10 μ. It is usually strongly silicified and appears yellow to orange when mounted in hyrax. It is closely related to C. placentula var. euglypta in the elongated puncta, 5–6 in 10 μ, disposed in longitudinal rows. — Samples 24, 25, 26, 27, 28, 29, 30, 31, 75, 76. (Fig. 17, 18).

C. placentula var. euglypta (Ehr.) Cleve (cf. Hustedt, Kieselalg. 2: 345, F. 802c.) — Sample 24.

C. placentula var. lineata (Ehr.) Cleve (cf. Hustedt, Kieselalg. 2: 348, F. 802d.) Found in only one sample. — Sample 24.
Cymbella AGARDH 1830.

C. Abbotitii CHOLNOKY and CLAUS (1961 b: 329, Abb. 2, F. 3; CHOLNOKY 1962b: 17, F. 21—24.) In one sample occurred a number of individuals which I have assigned to Cymbella Abbotitii CHOLNOKY and CLAUS. They were not entirely typical of CHOLNOKY’s figures (l. c.) though very close in shape and size to figure 3 (1961 b) but not as curved nor tapered as in figures 21—24 (1962 b). In fact they could be taken as forms of Navicula subtilissima CL. but for the very slight asymmetry of the valve and the complete lack of resolvable striae in the middle of the valve. Dimensions 15—18 μ long, 3—4 μ broad. — Sample 48a, (Fig. 19).


C. amatolensis n. sp. Valve lanceolate, almost symmetrical, with very slightly produced ends and broad rounded poles, 70—93 μ long, 9—12 μ broad. Raphe almost centrally placed in the valve, with the fissure obliquely oriented to the surface, appearing narrowly band-shaped; central pores moderately distant, bent slightly towards the dorsal side, terminal pores comma-shaped curving ventrally; axial area lanceolate very broad, about 1/3 to 1/2 of the width of the valve, central area variable from scarcely widened on one side by shortening of the central striae to a small rounded area. Striae strongly radiate in the middle, convergent near the ends, 11—13 in 10 μ in the middle to 16—18 at the ends, distinctly but finely punctate; from one to three of the middle striae, usually only one, on the dorsal side end in isolated puncta.

Cymbella amatolensis shows affinities to Cymbella incerta GRUN. (cf. CLEVE 1894; 170; 1881: 13, T. 16, F. 12 as C. naviculacea GRUN.), from which it differs in the wider striae, convergent at the ends and the presence of isolated puncta on the middle striae. A similar form is Cymbella Olifi CHOLNOKY (1956: 63, F. 23—27) which differs in the radiate striae throughout and the moderately narrow longitudinal area. Type slide No. 48. (Fig. 20 to 23.) — Samples 27, 48, 48a, 163.

Valvae lanceolatae, paene symmetricae, apicibus levissime protractis, polis late regulariter rotundatis, 70—93 μ longae, 9—12 μ latae. Raphe paene in axe valvae decurrentes, fissuris membranam oblique penetrantibus, itaque imagine microscopica anguste vittaformis, poris centralibus modice distantibus, leviter in directione dorsale deflexis, fissuris terminalibus comma-formibus, in directione ventrale deflexis. Area axialis late lanceolata, tertiam sive secundam partem superficii valvae occupans, area centralis abbreviatiore striarum medianarum, nonnumquam unilaterali solum, sive saepo asymmetricae evoluta. Striae in media parte valvae radiales, 11—13 in 10 μ, ad spices versus convergentes, 16—18 in 10 μ, distincte sed subtiliter punctatae. Striae dorsales medianae 1—3 — fere unum solum — punctis isolatis in area centrale ornatae.
Habitat in aquis dulcis torrentium montium Hog's Back in vicinitate oppidi Grahamstown provinciae Capensis in Africa Meridionale.

Typus: praeparatum Nr. 48 in collectione GIFFEN, Fort Hare, Cape Province.

Iconotypus: figureae nostrae Nr. 20—23.

C. cistula (HEMPFR.) GRUNOW (cf. HUSTEDT, Bacill.: 363, F. 676a, b). — Sample 31.

C. cryptocaphala HUSTEDT (cf. HUSTEDT 1942a: 99, F. 196—200). I have little doubt that the forms I have assigned to the above species are correctly determined. The species was represented by numerous examples which agree closely with HUSTEDT's description and figures, although some of the individuals show a more linear shape than given by HUSTEDT. — Samples 48, 48a, 146. (Fig. 24, 25).

C. gracilis (RAHm.) CLEVE (1894: 169; cf. CHOLNOKY, 1958a: 107, F. 22, 23; HUSTEDT, Bacill.: 359, F. 663.) My specimens agree with the description in CLEVE (I. c.) and the figures given by CHOLNOKY. I am also in agreement with CHOLNOKY that weak silicification cannot be regarded as a character as it is not evident in the specimens from this region. — Samples 48a, 163. (Fig. 26).

C. Kappi CHOLNOKY (1953a: 142 — under the name C. turgidula GRUN. var. Kappii CHOLNOKY; 1956: 61, F. 17—20.)

Specimens were seen in only one sample from the region and agree in most characters with CHOLNOKY's description and figures. However in my specimens the only difference that can be seen lie in the central pores which are, at first, looped towards the ventral margin and then turn upwards dorsally. — Sample 27. (Fig. 27, 28.)

C. microcephala GRUN. (cf. HUSTEDT, Bacill.: 351, F. 637; CHOLNOKY, 1960b: 238.) Not uncommon in the neutral or slightly acid waters of the region under investigation. — Samples 48, 48a.


C. perpusilla A. CLEVE-EULER (cf. HUSTEDT, Bacill.: 361, F. 666; CHOLNOKY 1954b: 207 F. 13—15; 1955a: 161 F. 13). Typical forms were seen in moderate numbers. — Samples 48a, 163.

C. turgida GREG. var. pseudogracilis CHOLNOKY (cf. CHOLNOKY 1958a: 112, F. 49, 50; CHOLNOKY 1955a: 160, F. 11, 12 under the name C. Mesiana CHOLNOKY; HUSTEDT, 1937—1939, Suppl. 15, 428, T. 25, F. 15, 16 under the name C. gracilis HUSTEDT nec CLEVE). This variety occurred in large numbers in several samples. It can readily be separated from C. gracilis (RAHm.) CLE by the wide longitudinal area. The form has been previously recorded from the Western Cape Province by CHOLNOKY (1962b: 19). — Samples 26, 27, 51, 48a, 163. (Fig. 29—31).
Diploneis Ehrenberg 1844.

_D. Smithii_ (Bréb.) Cleve (1894: 96; cf. Cholnoky 1960a: 37; 1962b: 20.)

Previously recorded from the fresh waters of South Africa and widely distributed. — Samples 24, 26, rare in 27, 28, 29.

_D. subornis_ Cleve (1894: 96, pl. 1, F. 27; Hustedt, Kieselalg. 2: 667, F. 1063 a, b.) — Samples 24, 26, 28, 48a.

Epithemia Brébisson 1838.

_E. zebra_ (Ehr.) Kützing var. _saxonica_ (Kütz.) Grun. (cf. Hustedt, Bacill.: 385 F. 730; Fricke in A. S. Atl. T. 252 F. 3—14; Cholnoky, 1962b: 21.) This form is common in the region under investigation and is very variable. Cholnoky (i. e.) is of the opinion that this variety can scarcely be maintained and his contention is supported by the variation seen in my samples. — Samples 27, 28, 29, 30, 31.

Eunotia Ehrenberg 1837.

_E. exigua_ Bréb. (cf. Hustedt, Kieselalg. 2: 285, F. 751 a—5.; Cholnoky, 1962b: 23.) This species has been recorded from the Western Cape Province, (Cholnoky, 1962b: 23). Dimensions 32—34 μ long, 3 μ broad, striae 19—21 in 10 μ. — Samples 48, 48a, 163. (Fig. 32, 33).


_E. flexuosa_ var. _transvaalensis_ Cholnoky (1955a: 166, F. 33, 34; 1959a: 22, F. 129; 1963a: 167, F. 23.) Recorded by Cholnoky from the Western Cape Province (Du Toit's Kloof) and recently from Dutch New Guinea (1963a: 23). This variety occurred in one sample in the Eastern Cape material. Dimensions 50—100 μ long, 5—6.5 μ broad, striae 10-12 in 10 μ. — Sample 51. (Fig. 34).

_E. formica_ Ehrenberg (cf. Hustedt, Kieselalg. 2: 308, F. 775. Cholnoky, 1962b: 23). Numerous individuals of this species occurred in one sample from the Hog's Back region. They showed considerable variation in shape and size. It is a recent new record for South Africa being reported from the Berg River, Western Cape (Cholnoky, 1962b). — Sample 51. (Fig. 35, 36.)

_E. gracilis_ (Ehr.) Rabh. (cf. Hustedt, Kieselalg. 2: 305, F. 771; Cholnoky, 1956: 66, F. 38). Typical examples were seen in a number of samples. This species has not apparently been recorded from the Cape Province, although present in the Transvaal and Natal. — Sample 48, 48a, 51, 75, 163.

_E. lunaris_ (Ehr.) Grun. (cf. Hustedt, Kieselalg. 2: 302, F. 769 a, b, d, e; 1949a: 70, T. 2, F. 11—15; Cholnoky, 1962b: 23). The species is known from many localities in the Cape Province but was rare in the investigated region of the Eastern Cape Province. — Samples 51, 75, 163.

_E. megalens_ 1962b, 24; Ty is widespread: _E. montana_ 354, F. 6, 7; _E. pectinatis_ Cholnoky, 19 E. pectinatis 763; — F. Cholnoky, 1962b 2: 298, F. 763 separation of a into each other E. pectinatis 298, F. 763 E. pectinatis: F. 763i). — In _E. polydennius_ Cholnoky, 1954c: variable species Africa and is p investigation b seen. — Samp _E. Stilidii_ Hü. F. 48—50; 1965c species agree n than they do v length from 1 finely punctate _E. sulcat_ Cholnoky 1957c: assigned to this proved difficulty very similar an ter differing m striae which ar in _E. sulcata_. — _E. tenella_ (Cholnoky, 19 broad, striae 16 _E. tenella_ vs sample a large
E. mogolensis CHOLNOKY (1954a: 123, F. 10; 1958a: 114, F. 64—67; 1962b: 24). Typical examples were seen in a number of samples. The species is widespread in South Africa. — Samples 51, 163. (Fig. 37, 38).


E. pectinalis var. minor f. impressa (EHR.) HUSTEDT (cf. HUSTEDT, Kieselalg. 2: 298, F. 763 g, h; CHOLNOKY, 1962b: 25). CHOLNOKY (l. c.) regards the separation of this form as purposeless as var. minor and f. impressa grade into each other. — Sample 51.


E. pectinalis var. undulata (RALFS) RABH. (cf. HUSTEDT, Kieselalg. 2: 298, F. 763 i). — Samples 48a, 163.

E. polydentula BRUN (cf. HUSTEDT, Kieselalg. 2: 292, F. 759 a, b; CHOLNOKY, 1954c: 277, F. 34, 35; 1960b: 243; 162b: 320, F. 19—24). This variable species has now been recorded from a number of localities in South Africa and is probably widespread, but is not frequent in the material under investigation being found in only two samples and very few individuals were seen. — Samples 48a, 30.

E. Stellii HUSTEDT (1952a: 143, T. 5, F. 13—15; CHOLNOKY, 1954c: 279, F. 48—50; 1960b: 243, F. 13—15). The small forms I have assigned to this species agree more closely with the figures by CHOLNOKY (1960b, F. 13—15) than they do with HUSTEDT'S original figures. The individuals seen vary in length from 15—19 µ and breadth 4.5—5 µ, striae 10—11 in 10 µ, very finely punctate. — Sample 51. (Fig. 39—42).

E. sulcata HUSTEDT (1937—1939, Suppl. 15: 173, T. 11, F. 7—9; CHOLNOKY 1957c: 62, F. 48—51; 1960a: F. 122; 1962b: 26). Many of the forms assigned to this species which were seen in samples from the Amatola region, proved difficult to separate from E. montana HUSTEDT (v. s.). The shapes are very similar and the number of striae in 10 µ the same, and the only character differing much in the two species seems to be in the punctuation of the striae which are about 30 in 10 µ in E. montana and around 42—45 in 10 µ in E. sulcata. — Samples 48, 48a, 51, 163. (Fig. 43).


E. tenella var. densestriata CHOLNOKY (1955a: 169, F. 49—50). In one sample a large number of individuals was observed which agree closely
with CHOLNOKY’s var. densestriata. In many cases, however, the striation was even closer than in his description, i. e. up to 30 in 10 μ. — Sample 48.

Fragillaria LYNGBYE 1819.

F. familiaris (KÜTZ.) HUSTEDT (1957: 229; Kieselalg. 2: 207, F. 697 c, as Synedra rumpens KG. var. familiaris (KG.) GRUN.). — Samples 31, 51, 75, 76.

F. kapponica GRUN. f. lanceolata HUSTEDT (1942a: 25, F. 21–23). I have very little doubt that the specimens I have placed under this species are correctly determined. They are identical in shape, size and the number of striae as described by HUSTEDT (1 c). However, HUSTEDT’s figures of the girdle view (Kieselalg. 2: 170, F. 678), of the typical form are unlike those seen in my material where they are groggily obese, having an intercalary band three to four times as wide as the valve. Similar girdle views are seen in Fragillaria pinulata Ehr. by HUSTEDT in A. S. Atl. T. 298, F. 70. Dimensions: 9—20 μ long, 4—6 μ broad, striae 9—12 in 10 μ. — Sample 146. (Fig. 44—46, valve; 47—48, girdle).

F. Japponica G. US. (1942a: 25, F. 21—23). I have very little doubt that the specimens I have placed under this species are correctly determined. They are identical in shape, size and the number of striae as described by HUSTEDT (1 c). However, HUSTEDT’s figures of the girdle view (Kieselalg. 2: 170, F. 678), of the typical form are unlike those seen in my material where they are groggily obese, having an intercalary band three to four times as wide as the valve. Similar girdle views are seen in Fragillaria pinulata Ehr. by HUSTEDT in A. S. Atl. T. 298, F. 70. Dimensions: 9—20 μ long, 4—6 μ broad, striae 9—12 in 10 μ. — Sample 146. (Fig. 44—46, valve; 47—48, girdle).

Frustulia GRUNOW 1865.

F. coffra n. sp. Valves linear-inflated in the middle, with rounded capitate ends, 38—40 μ long, 7—8 μ broad. Transapical striae slightly radiate in the middle, convergent near the ends, 28—30 in 10 μ; longitudinal striae forming irregular wavy lines of distinct puncta, about 22 in 10 μ.

This species has the shape of Frustulia vulgaris var. capitata KRASSKE (cf. HUSTEDT, Kieselalg. 2: 731, F. 697 c, but differs in the density of its striae both in the closer transapical and the wider longitudinal striae. It also shows close resemblance to F. subvulgaris CHOLNOKY (1959a, 27, F. 160) in shape, but separates from that species in its greater dimensions and particularly in the much wider longitudinal striae. Type slide 76. (Fig. 49, 50). — Sample 76.


Habitat in torrente uno parvo silvae Auckland in montibus Hog’s Back in vicinitate oppidi Grahamstown provinciae Capensis Africae Meridionalis. Typus: praeparatum Nr. 76 in collectione GIFFEN, Fort Hare, Cape Province. Iconotypus: figurae nostrae Nr. 49 et 50. F. javanica HUSTEDT (1937—1939, Suppl. 15: 215, T. 16, F. 3; CHOLNOKY, 1957a: 55, F. 95—98; 1959a: 27). This species, recorded by CHOLNOKY from Natal (1957a) and several samples further material species is at hand 30, 48a, 75, (F); F. rhomboides CHOLNOKY, 1966 F. rhomboides 1099; CHOLNOKY, F. rhomboides 1098b). A single example are re Amatola region Sample 30, 146. F. tegulae CHOLNOKY, which the marg specimens obese Not previously 76. (Fig. 53—73). F. vulgaris (1) CHOLNOKY 1951 form of the sp Province, and t 24, 26, 27, 28, 29 F. vulgaris var. 1957c: 63, F. 5d region under re and in very restr ecological limits.

G. angustata — Sample 25.

G. Clevei Ehr. The species is uncommon and Cape Province, Cape region. (1) G. gracile Ehr. HUSTEDT, Bacill uncommo and
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Natal (1957a) and from the South Western Cape (1959a) was found in
several samples but in each only one or two individuals were seen. Until
further material has been investigated, it is impossible to say whether the
species is at home ecologically in the region under investigation. — Samples
30, 48a, 75. (Fig. 51).

- F. rhomboides (EHR.) DE TONI (cf. HUSTEDT, Kieselalg. 2: 728, F. 1098a;

- F. rhomboides var. saxonica (RABL.) de TO

- F. rhomboides var. amphipleuroides GRUNOW (cf. HUSTEDT l.c. 729, F.
1098b). A single valve of this variety was seen in one sample, and until more
examples are recorded, little can be said of its place in the ecology of the
Amatola region. At present it must be regarded as a displaced form.
— Sample 30, 146.(Fig. 52).

s from the Hog's Back, though otherwise similar, differ in the degree to
which the margin in the middle of the valve, is constricted. In most of the
specimens observed, the constriction is very slight to completely absent.
Not previously recorded from the Cape Province. — Samples 48, 48a, 75, 76. (Fig. 53—56).

- F. vulgaris (THWAITES) DE TONI (cf. HUSTEDT, Kieselalg. 2: 730, F. 1100a;
CHOLNOKY 1959a: 28; 1962b: 28). As CHOLNOKY states (l.c.) the typical
form of the species is well re
in the Southern portions of the Cape
Province, and the same distribution is found in the Eastern Cape. — Samples
24, 26, 27, 28, 29, 31, 48, 51, 75, 76, 146.

- F. vulgaris var. angusta CHOLNOKY (1953b, 142, F. 17; 1954b: 214 F. 61;
1957c: 63, F. 58, 59). This variety is by no means as widely distributed in the
region under review as the typical species, and was seen in only two samples
and in very restricted numbers. It must be regarded here as outside its normal
ecological limits. — Samples 76, 146.

Gomphonema AGARDH 1824.

G. angustatum (KG.) RABH. (cf. HUSTEDT, Bacill.: 373, F. 690—694).
— Sample 25.

The species is common and abundant in the neutral waters of the Eastern
Cape Province. CHOLNOKY states that it is very infrequent in the Southern

uncommon and found in only one sample. — Sample 76.

135
G. longiceps Ehr. var. montanum (Schum.) Cleve (cf. Hustedt, Bacill.: 375, F. 707; Cholnoky, 1962b: 30). Widespread in the Cape Province, it occurs chiefly in the slightly acid waters of the Hog’s Back region. — Samples 26 (probably displaced), 75, 76, 146.

G. longiceps var. subelatum GRUN. (cf. Hustedt, Bacill.: 375, F. 707; Cholnoky, 1962b: 30). This variety is much more common in the region and is very variable in shape and size. Samples 75, 76, 146.

G. longiceps var. subelatum f. gracilis Hustedt (cf. Hustedt, Bacill.: 375, F. 706). Hustedt’s f. gracilis, which Cholnoky regards as inseparable from the variety as it glides completely into the broader normal forms, occurred in one sample and showed no intermediates in the Hog’s Back region. — Sample 163.

G. parvulum (K.G.) GRU. (cf. Hustedt, Bacill.: 372, F. 713 a—c; Cholnoky, 1962b: 30.) This is probably the most widespread species in the region and is present in waters which vary from slightly acid to slightly alkaline. It is also extremely variable in form. — Samples 25, 26, 51, 76.

G. perminutum Cholnoky (1957a: 56, F. 104; 1960a: 47, F. 143, 144; 1962b: 30). This small species was seen in several samples but is easily overlooked. Dimensions: 7—8 μ long, 2—2.5 μ broad, striae 26 in 10 μ. — Samples 31, 26, 27. (Fig. 57).

G. Schweickerdii Cholnoky (1953b: 56, F. 104; 1962b: 30). This was found in several samples from neutral waters of the region. It never occurred abundantly, but was not rare. — Samples, 24, 25, 26, 27. (Fig. 58).

Gyrosigma Hassall 1845.

G. scalpoides (Rabhi.) Cleve (cf. Cleve, 1894: 118; Hustedt, Bacill.: 226, F. 338; Cholnoky 1962b: 31). This is the only species of Gyrosigma recorded from the neutral waters of the region. — Samples 26, 27 (rare), 30, 31.

Hantzschia GRUNOW 1880.

H. amphioxys (Ehr.) GRUN. var. africana Hustedt (in A. S. Atl. T. 345, F. 31; Cholnoky, 1962b: 32). This occurred only in samples from neutral waters in the region and never in numbers. — Samples 26, 28, 30, 75.

H. amphioxys var. vivax (Hantzsch) GRUNOW (cf. Hustedt, Bacill.: 394, F. 750). — Sample 28 (rare).

M. granulata Kieselalg. 1: 25(51.

M. Roeseana 266, F. 112 c, d samples as isola material examine communities in observations).

Ross (1947) st be changed to a Roeseana (RABH teres E. (Ber. K1) This form ha — Samples: 26, M. varians apparent in apparently a in 28, 29, 30, 31.

M. circulare (a — h; Fricke ir 248; 1962b: 33) find that I agree the var. constric a break. — Sar

N. cari Ehr. Suppl. 15: 266,
N. carminata Giffen 1963: ? in the alkaline, to slightly acid wa mineralised spr percentages of here. — Sample
N. cincta (Eh 1962b: 36). — S
Melosira Agardh 1824.


M. Roeseana Ralfs. var. epideidrom Grun. (cf. Hustedt, Kieselalgen. 1: 266, F. 112 c, d; Cholnoky, 1960a: 51.) This variety occurred in several samples as isolated valves and cannot be regarded as autochthonous in the material examined. However, it has been frequently observed in diatom communities inhabiting mosses in the Hog's Back region (unpublished observations).

Ross (1947) states that according to the rules of priority the names should be changed to Melosira dendroteres (Ehr.) R. Ross and M. dendroteres var. Roeseana (Ralfs) R. Ross on account of Ehrenberg's Liparogyra dendroteres E. (Ber. Kgl. Akad. Wiss., Berlin 1848).

This form has not been previously recorded from the Cape Province. — Samples: 26, 28, 31, 48, 75, 76, 163.

M. varians Agardh (cf. Hustedt, Kieselalgen. 1: 240, F. 100). Abundant in most of the neutral to slightly acid waters of the region, this species is apparently a new record for the Cape Province. — Samples: 25, 26, 27 (rare), 28, 29, 30, 31.

Meridion Agardh 1824.

M. circulare (Greville) Agardh (cf. Hustedt, Kieselalgen. 1: 93, F. 627 a—b; Fricke in A. S. Atl. 1. 267, F. 34—49, 55—59; Cholnoky, 1960b: 248; 1962b: 33). This occurred in great numbers in only one sample and I find that I agree with Cholnoky (1962b: 33), that it is impossible to separate the var. constrictum (Ralfs) Van Heurck as it grades into the species without a break. — Sample 146.

Navicula Bory 1824.

N. carri Ehr. var. angusta Grun. (cf. Hustedt, Bacill.: 299; 1937—1939, Suppl. 15: 266, T. 20, F. 32.) — Samples 28, 48, 48a, 75, 163.

N. carinata Hustedt var. africana Cholnoky (1959: 35, F. 189, 190; Giffen 1963: 236, F. 65). The presence of this diatom which is widespread in the alkaline, brackish waters of South Africa is surprising in the neutral to slightly acid waters of the Hog's Back region. There are, however, highly mineralised springs feeding the rivers in the area, some containing small percentages of chlorides which may account for the presence of this species here. — Sample 24.

N. cinctaefornzjs HUSTEDT (cf. HUSTEDT, 1937—1939, Suppl. 15: 265, T. 19, F. 11—12; CHOLNOKY 1957c: 68, F. 68; 1962b: 36, f. 39). The few specimens seen in my material agree closely with those figured by CHOLNOKY (l.c.) both in form and size, being more or less 30 μ long. — Sample 51. (Fig. 59).

N. contenta GRUN. (cf. HUSTEDT, Kieselalg. 3: 209, F. 1328 a—d; CHOLNOKY 1962b: 37). This species occurred in only one sample, but is easily overlooked. — Sample 28.

N. contenta f. biceps (ARNOTT) GRUN. (cf. HUSTEDT, l.c. 209, F. 1328 b, i; CHOLNOKY, l.c.: 37). The forma proved to be much more abundant than the type, as has also been noted by CHOLNOKY (l.c.) in the Western Cape Province. — Samples 27, 28, 76, 146.

N. contenta f. parareta J. BOYE PETERSEN (cf. HUSTEDT, l.c.: 209, F. 1328 e—g; CHOLNOKY, l.c.: 37). — Sample 24, 28 (infrequent).

N. cryptocephala KO. (cf. HUSTEDT, Bacill.: Eastern C; 303, F. 527 as N. dicephala f. undulata OESTRUP; CHOLNOKY, 1962b: N. 48). The specimens seen were small viz. 21.5—24 μ long, with 13—15 striae in 10 μ, but there is no doubt as to their identity. — Sample 146.

N. disjuncta n. sp. Valve linear-lanceolate with convex margins and broad capitale, slightly truncate rounded ends, 20—24 μ long, 5 μ broad. Raphe straight thread-like, axial area lanceolate, moderately wide, central area slightly widened. Transapical striae 22—23 in 10 μ, radiate throughout, slightly shortened on both sides of the central nodule, often with one or two very short striae in the middle. Striae faintly punctate, the final puncta near the axial area more pronounced than the others. Type slide 20. This new species, which was rather scarce in one sample, is very similar in size and shape to Navicula disjuncta HUSTEDT (Kieselalg. 3: 143, F. 1274 a—4.) but differs in the wider lanceolate axial area and the oval and narrower central area. — Sample 30. (Fig. 60, 61).

Valvae lanceolatae, marginibus lateribus regulariter convexis, apicibus capitatis, capitulis in relatione magnis, latiisque, leviter truncato-roundatis, 20—24 μ longae, circiter 5 μ latae. Raphe directa, filiformis, parvis centralibus parvis, delitexis, fissuris terminalibus in eodem sensu flexis, marginae valvae polare distantibus. Area

Typus: praeparatum Nr. 30 in collectione GIFFEN, Fort Hare, Cape Province.

Iconotypus: figurae nostrae Nr. 60 et 61.

N. exigua (GREG.) O. MÜLLER (cf. HUSTEDT, Bacill.: 305, F. 538; 1949a: 97, T. 5, F. 10; CHOLNOKY 1959a: 38, F. 205; 1962b: 39). This species occurred only in two samples and never in great numbers. — Samples 51, 146.

N. Fritschii LUND (1946: 77, F. 7 A—G; = N. insociabilis HUSTEDT nec KRASSKE, HUSTEDT, Kiesielag. 3: 181, F. 1315a—h; see CHOLNOKY 1957a: 62, F. 130; 1959: 38, F. 209; 1960a: 59, F. 188). CHOLNOKY in his papers quoted above, has discussed the taxonomy of N. Fritschii LUND and N. insociabilis KRASSKE in detail and shows quite conclusively, in my opinion, that HUSTEDT is mistaken in maintaining the identity of the two species. Ecologically also they belong to different conditions. In the region under investigation N. Fritschii LUND inhabits neutral waters. In an earlier paper (GIFFEN, 1963, 237), I have recorded this species from the slightly alkaline and very slightly brackish waters of the Gulu River system of the Eastern Cape Coast. — Sample 24 (not common).

N. gastrum EHRENBerg (cf. HUSTEDT, Bacill.: 305, F. 537). The specimens seen, although on the small side, 29—30 μ long, agree closely with the type in shape, having distinctly capitate ends. They have, however, much closer striae, 13—14 in 10 μ, which place them near N. gastrum var. transvaalensis CHOLNOKY (1958a, 120, F. 91—93), which has 12—14 striae in 10 μ, and produced but not capitate ends. CHOLNOKY’s N. gastrum var. transvaalensis may be a new species. — Specimens 24, 146.

N. granoryza n. sp. Valva linear with very slightly conical or regularly rounded ends, 12—16 μ long, 3 μ broad. Raphe straight, thread-like, central pores moderately close; axial area narrow, linear, central area slightly widened through shortening of the middle striae. Striae parallel 16 in 10 μ, slightly convergent at the ends.

This new species is similar in shape and size to Navicula dispensata HUSTEDT ET MANGUIN f. rostrate MANGUIN (Kiesielag. 3: 240, F. 1366e) but differs in the wider striae, 16 as against 24 in 10 μ, and in the convergence in the end striae. Type slide 48. — Sample 48. (Fig. 62, 63).

Valvae lineares, apicibus regulariter sive levissime conice rotundatis, non protractis, 12—16 μ longae, circiter 3 μ latae. Raphe recta, filiformis, poris centrali-
bus, terminalibusque in eodem sensu deflexis, poris centralibus modice distantibus. Area axialis anguste linearis. in media parte dilatatione aream centralam distinctam, apiciter elongatam, lanceolatam, parvam formans. Striae, ultimis polaribus exceptis, parallelae, polares modice convergentes, 16 in 10 μ, ad polos versus densior posita.e.

Habitat in aquis destillantibus ad rupes doleriticas in silva Auckland dicta montium Hog's Back in vicinitatem oppidi Grahamstown provinciae Capensis in Africa Meridionalis.

Typus: praeparatum Nr. 48 in collectione Giffen, Fort Hare, Cape Province.

Iconotypus: figurae nostrae Nr. 62 et 63.


N. hungarica var. capitata (EHR.) CLEVE; (cf. HUSTEDT l.c. 298, F. 508; CHOLNOKY, 1962b, 41). — Samples 24, 26, 27, 30, 31.

N. lapidosa KRAASSE (cf. HUSTEDT, Kieselalg. 3: 162, F. 1296; CHOLNOKY 1960a, 67, F. 211). This species has not apparently been recorded from the Cape Province. — Sample 51. (Fig. 64).

N. mutica KÜTZ. (cf. HUSTEDT, Bacill.: 274—275, F. 435a, b). — Samples 26, 75, 146.

N. mutica f. nivalis (EHR.) HUSTEDT (cf. HUSTEDT, 1957: 31; as var. in Bacill.: 275, F. 453e). — Samples 28, 163.


N. obsoleta HUSTEDT (1942a: 69, f. 12—16; CHOLNOKY, 1957c: 70, F. 77, 78). Apparently this has not been recorded from the Cape Province. — Sample 146. (Fig. 65).

N. pelliculosa (BRÉB.) HILSE (cf. HUSTEDT, Kieselalg. 3: 172, F. 1035). A few forms occurred in one sample which I have assigned to this species on account of their shape and size and the marked middle rib with distant terminal nodules. The striae were not resolvable. This species has not apparently been recorded from South Africa. — Sample 146. (Fig. 66).

N. pseudosmaltophila CHOLNOKY (1960b: 74, F. 231—235; 1962b: 44; GIFFEN, 1963: 240, F. 76, 77). This species is apparently widespread in the Eastern Cape Province as well as in Natal, from which region it was first described. In the Hog's Back region it occurred rarely in the neutral waters. In the lower reaches of the Amatola Streams where the water becomes alkaline (pH of 8.2—8.4) it becomes very abundant and reaches its maximum development. — Samples 24, 27.

N. pupula KÜTZ. (cf. HUSTEDT, Bacill.: 281, F. 467a). — Samples 26, 30, 75.
N. pupula f. minutula CHOLNOKY (1957c: 70, F. 79). Small forms of N. pupula KG. were seen in one sample which are identical with CHOLNOKY’s f. minutula, 10—12 μ long, 5—6 μ broad, with 28 striae in 10 μ. — Sample 31.


N. ravinae CHOLNOKY (1960a: 77, F. 240). Numerous individuals of this small species were seen in several samples, which are identical in size and shape with N. ravinae CHOLNOKY. Certain individuals, however, showed a slightly greater length than given in the original description and in most of the specimens the middle radiate striae were exceptionally difficult to resolve even in phase contrast. Dimensions 16—21 μ long, 3—3.5 μ broad. — Samples 48, 48a, 76, 163. (Fig. 67).

N. rhynchocephala KÜTZ. (cf. HUSTEDT, Bacill. 269, F. 501). — Samples 24, 26, 27, 29, 30, 508.

N. Schroeteri MEISTER (cf. HUSTEDT, 1937—1939, Suppl. 15: 267, T. 18. F. 16; A. S. Atl. T. 405. F. 6—11; CHOLNOKY 1954b: 219, F. 91; GIFFEN 1963: 242). This species is apparently widely distributed in South Africa and particularly in the Cape Province. In the region under investigation, however, though plentiful in the neutral to slightly acid waters of the area, it does not reach the maximum development it shows in the more alkaline waters elsewhere. The specimens seen are usually more lanceolate and often taper gradually to a less rounded apex. These forms are clearly linked to the typical species by intermediate stages. — Samples 24, 26, 28, 29, 30, 31. (Fig. 68).

N. subatonioides HUSTEDT (cf. HUSTEDT, Kieselalg. 3: 271, F. 1400; CHOLNOKY 1957a: 67, F. 163—165). A few individuals of the species were seen in two samples and agree closely with both HUSTEDT’s figures and dimensions and also with those of CHOLNOKY. Dimensions 9—10 μ long, 6 μ broad, striae ca. 40 in 10 μ. — Samples 51, 75, 146. (Fig. 69).


N. subtilissima CLEVE (cf. CLEVE 1894: 141; HUSTEDT, Kieselalg. 3: 89, F. 1235; CHOLNOKY, 1962b: 47). Most of the specimens in the Hog’s Back material differ from HUSTEDT’s figures in possessing much less tapering margins and larger “capita”. Usually, also, they are shorter, being 16—20 μ long. — Samples 26, 48, 48a, 163. (Fig. 70).


N. tenelloides HUSTEDT (1937—1939, Suppl. 15: 269, T. 19, F. 13; CHOLNOKY 1956: 80, F. 98; 1962b: 48). — Sample 30. (Fig. 71).
N. tuscula (Ehr.) Grun. (cf. Hustedt in A. S. Atl. T. 272, F. 23—27; Bacill.: 308, F. 552; Cholnoky 1962b: 49). This species, which seems rare in South Africa, occurred in two samples and was extremely scarce in both, but has been noted in unworked samples from the same Hog's Back region. The species has been recorded previously from the Cape Province by Cholnoky (I. c.). — Samples 28, 76.


N. Zanoni Hustedt (1949: 92, T. 5, F. 1—5; Cholnoky 1959a: 55, F. 280; 1962b: 51; Giffen 1963: 243). This species was present in great numbers in only one sample (26), and very scarce in one other sample. As an indicator of neutral to basic waters, it is more or less outside its habitat in the investigated region. — Samples 26, very rare in 31.

Nemvium Pfitzer 1871.

N. affine (Ehr.) Cleve (1894: 68, 69; Hustedt, Bacill.: 242, F. 376). — Samples 75, 76.

N. affine f. hercynica (A. Mayer) Hustedt (cf. Hustedt, Bacill.: 242. A number of specimens were seen in one sample which I have assigned to this form as they agree with Hustedt’s description (I. c.). There are two other species with which it could be confused, viz. N. iridis (E.) Cle. f. vernalis Reichelt (Hustedt, Bacill.: 245, F. 380), which has a similar shape, but is larger and possesses 16—19 striae in 10 μ, i. e. much coarser than in the form in question; and N. Hermanni Hustedt (1937—1939, Suppl. 15: 408, T. 16, F. 11; Cholnoky 1957a: 71, F. 191) which is smaller with much closer striae, i. e. 34—36 in 10 μ. — Sample 51. (Fig. 72).


N. affine var. longiceps (Greg.) Cleve (cf. Hustedt, Bacill.: 244, F. 378). Abundant in some samples. — Samples 24, 75.

N. dabium (Ehr.) Cleve (cf. Hustedt, Bacill.: 246, F. 384). This species was moderately abundant in one sample. — Sample 51.

N. dilvis (Ehr.) Cleve (cf. Hustedt, Bacill.: 245, F. 379). This occurred very rarely in the material. Cholnoky (1957a: 69; 1962b: 52) considers that the species N. affine, N. iridis and N. productum require critical revision as the boundaries between these three species are not sharp and the maintenance of their individuality is doubtful. — Sample 26.
Nitzschia Hassall, 1845.


*N. Cholnoky* (1954b: 220, F. 98; 1957a: 74, F. 209—211). The specimens which I have placed here agree very closely with the original description and figures but are longer, being mostly 16—17 μ in length, carinal pores and transapical striae 16 in 10 μ. — Samples 28, 30. (Fig. 73, 74).

*N. Clausi* Hantzsch (cf. Hustedt, Bacill.: 421, F. 814; A. S. Atl. T. 336, F. 7—11). This species appeared in a number of samples, chiefly in neutral to slightly acid waters, but always in very restricted numbers. As *N. Clausi* Hantzsch reaches full development in alkaline waters, it can probably be regarded in the Hog’s Back area as displaced. — Samples 30, 48, 48a, 51, 75.


*N. irremissa* Cholnoky (1959a: 57, F. 298—300). The forms which I have placed here agree in shape with the original description but they are shorter than the limits given there. Dimensions 30—36 μ long, 3—4 μ broad, carinal pores 18 in 10 μ. — Samples 30, 31. (Fig. 75).

*N. linearis* (Ag.) W. Smith (1853: 39, pl. 13, F. 110 and pl. 31, F. 110; Hustedt, Bacill.: 409, F. 784). Generally distributed in the Amatola region. — Samples 24, 26, 27, 28, 29, 30, 31, 75, 76, 146.

*N. obtusa* W. Smith var. *scalpelliformis* Grunow (cf. Hustedt, Bacill.: 422, F. 817d; Cholnoky 1962b: 57). This species seems characteristic of basic and often saline waters and was never abundant in the material under investigation. — Samples 51, 75, 146.


*N. parvuloides* Cholnoky (1954b: 221; 1955a: 179, F. 72, 73). This species was rare in one sample but fits well with the original description.
and figures, dimensions being 36–38 μ long, 4 μ broad, carinal pores 9–10 in 10 μ, striae ca 35 in 10 μ. — Sample 51.


*N. sigma* (Kg.) W. SMITH (1853: 39, pl. 13, F. 108; HUSTEDT, Bacill.: 420, F. 813). Found in several samples from the neutral waters in the region. — Samples 24, 28, 29.


*N. subvitrea* HUSTEDT (cf. HUSTEDT in A. S. Atl. T. 347, F. 18; CHOLNOKY 1957 C: 78, F. 111 112). Only a single specimen was seen, so the species must be regarded as displaced. — Sample 28. (Fig. 76).

**Pinnularia Ehrenberg 1840.**

*P. acrosphaeria* BREBISSON (cf. HUSTEDT, Bacill.: 330, F. 610). This species is rare in the region investigated as only two or three specimens were seen in one sample and a broken frustule in another. — Samples 28, 75 (broken valve).


*P. eburnea* (CARLSON) ZANON (1941: 49, T. 3, F. 16–18; CHOLNOKY 1959: 62; 1960: 108, F. 324–331). This is one of the commonest species of *Pinnularia* in the Hog's Back region. — Samples 48, 48a, 51, 75, 76, 146, 163.

*P. gibba* EHR. var. *soneta* GRUNOW (cf. HUSTEDT 1937–1939, Suppl. 15: 395, T. 20, F. 35; 1949: 107, T. 6, F. 17, 20). — Samples 26, 51, 146. (Fig. 77–79).

*P. graciloides* HUSTEDT (cf. HUSTEDT, 1937–1939 Suppl. 15, T. 22, F. 9, 10). — Samples 26, 28. — (Fig. 80).

*P. interrupta* W. SMITH (1853: 59, pl. 19, F. 184; HUSTEDT, Bacill.: 317, F. 573). Widespread in the Cape Province. — Samples 51, 75, 146.

*P. major* (Kg.) CLEVE (1895: 89; HUSTEDT, Bacill.: 331, F. 614). — Samples 51, 163.


*P. stomatophora* GRUNOW (cf. HUSTEDT, Bacill.: 327, F. 605; A. S. Atl. T. 392, F. 14). Very few examples of this species were observed. They agree with HUSTEDT's figure (l. e.) in being without the lunate markings beside the central nodule. — Sample 75. (Fig. 81).


Thalassionema. O. Müller 1897.


Stauronela Ehrenberg 1843.

S. Abbotti Cholnoky and Claus (1961b: 338, F. 21, 22; Cholnoky 1962b: 67, F. 106). Examples of this recently described species, observed in one sample, differed somewhat from the author’s figures in being more linear in shape and without the capitulate ends. — Sample 48a (Fig. 82, 83).


S. Borrichii (Boye Petersen) Lund (1946: 63, F. 3 C—H; Hustedt, Kieselalg. 2: 803, F. 1151a, b). This species must be considered to be rare in the region as only a very few individuals were seen. These were completely typical. — Sample 51, 75. — (Fig. 84).


Stenopterobia Brébisson 1867.

S. intermedia (Lewis) Van Heurck (cf. Hustedt, Bacill.: 428, F. 830). — Sample 51. (Fig. 85).

Surirella Turpin 1828.

S. acanthophora n. sp. Valve heteropolar, ovate elliptic with broad rounded ends, 45—60 μ long, 30—35 μ broad; wing moderately wide with 35 to 45 canals in 100 μ. The edges of each canal are decorated
with 3 to 4 short strong conical spines. Axial area (pseudoraphe) narrow, lanceolate, beset with a row of spines along the middle line. Valve surface faintly striate, striae 25—28 in 10 μ.

This new species belongs to a group of tropical and sub-tropical species of *Smirella* such as *S. spinosa* HUSTEDT, *S. margaritacea* O. MÜLLER, *S. Chusel CHOLNOKY*, with ovate to elliptic valves in which the surface of the valve is decorated with spines or thorns of varying size and number. *S. acaulophora* differs from the above in the small number of spines, their distribution only along the edges of the canals and the single row of spines along the middle line of the valve. A point of interest seen under phase contrast, is that each rather robust spine is tipped with 3—4 fine bristles, stellately arranged upwards and outwards (Fig. 95). Type slide No. 30/6 in the GIFFEN Collection. — Samples 30, 31. — (Fig. 92—95).


Habitat in aquis dulcis torrentium in silva Auckland dicta montium Hog's Back prope oppidum Grahamstown in Provincia Capense Africae Meridionalis.

Typus: praeparatum Nr. 30/6 in collectione GIFFEN, Fort Hare, Cape Province. Iconotypus: figurae nostrae Nr. 92—95.

*S. anassae* CHOLNOKY (1957a: 84, F. 278, 279; 1959: 65, F. 342; GIFFEN 1963: 253, Pl. 8, F. 108). This species is widespread in the neutral to slightly basic waters of the coastal belt of South Africa from Natal through the Eastern Cape province to the Bot River in the South Western Cape. In the Eastern Cape it reaches larger dimensions than given in the author's original description (see GIFFEN, 1963: 253). — Samples 24, 27, 28, 29.

*S. angusta* KÜTZ. (cf. HUSTEDT, Bacill.: 435, F. 844, 845; GIFFEN 1963: 253). Widespread in Eastern Cape waters. Many abnormal specimens are seen, as in Fig. 86. — Samples 26, 30, 31, 146.

*S. bisieratia* BELBISSON var. *bifrons* (EHR.) HUSTEDT (cf. HUSTEDT Bacill.: 433, F. 831—833). This appeared in one sample from neutral to slightly acid water in the Hog's Back area. Dimensins 96—101 μ long, 35—37 μ broad, wing canals 13—16 in 10 μ. — Samples 48, 48a.

*S. cuspidea* HUSTEDT (1949a: 155, T. 15, F. 8—10; CHOLNOKY 1956: 91., F. 133). This species was not abundant and belonged to the narrow and short forms observed by Hustedt in the Congo. Dimensins of observed individuals varied from 62 to 80 μ long, 7—8 μ broad with 40 wing canals in 100 μ and 22—23 striae in 10 μ. — Sample 163. — (Fig. 87).
S. delicatissima LEWIS (cf. HUSTEDT, Bacill.: 436, F. 846, 847; CHOLNOKY 1957c: 84, F. 136; 1958a: 139, F. 165—167). All individuals seen conformed closely to the type; dimensions 45—55 μ long, 5—6 μ broad, canals 45 to 55 in 100 μ, striae 22—23 in 10 μ. — Sample 163. — (Fig. 88).

S. delicatissima var. africanus CHOLNOKY (1959: 65, F. 345). This very weakly silicified variety occurred in one sample and agrees well with CHOLNOKY’s description and figures, although a few forms do not show the pronounced and narrow ends and the striae appear to be slightly closer viz. 30—32 in 10 μ. — Sample 51. — (Fig. 89).

S. linearis W. SMITH (1853: 31, pl. 8, F. 58; HUSTEDT, Bacill.: 434, F. 837, 838). Abundant in many samples from the region investigated. — Samples 24, 26, 27, 28, 30, 31, 51, 75.

S. linearis var. constrieta (EHR.) GRUN. (cf. HUSTEDT, Bacill.: 434, F. 839). This variety is usually associated with the type in the samples. The constriction varies from barely perceptible to the degree usually figured. — Samples 24, 30, 31.

S. linearis var. helvetica (BRUN) MEISTER (cf. HUSTEDT, Bacill.: 434, F. 840; CHOLNOKY 1962b: 73). This variety is also usually associated with the type in the samples examined. CHOLNOKY (I. c.) discusses the diagnostic characters, namely the development of thorns and the better developed wing projection of this variety and finds that there is extreme variability of these characters. In consequence he doubts whether the variety should be maintained. In my material the thorns are never strongly developed. — Samples 28, 51.

S. margaritacea O. MÜLLER (1905: 37, T. 2, F. 12; in A. S. Atl. T. 245, F. 7; HUSTEDT in A. S. Atl. T. 309, F. 11—14; HUBER-PESTALOZZI 1942: 518, Pl. 175, F. 635). In the Hogs’ Back region of the Amatola Mountains this species occurred in a number of samples and agrees fully with the rather meagre description by MÜLLER (I. c.) and the small and inadequate figures both in his Nyasaland paper and in A. S. Atl. T. 245, F. 7. HUSTEDT’s figures (A. S. Atl. T. 309, F. 11—14) show forms of 38 to 60 μ long, 20—26 μ broad, with 28—40 wing canals in 100 μ. In F. 11 Hustedti shows a narrow pseudoraphe, in the other figures (12 and 13), the canals meet along the middle line of the valve. In the majority of my specimens there is a moderately wide lanceolate area. Measured examples show considerable variation in size from 43 to 95 μ long, 23 to 40 μ in width, with 23 to 40 canals in 100 μ (mostly 35). The canals and lanceolate area are closely beset with thorns. — Samples 26, 28, 146. — (Fig. 90, 91).

S. ostentata CHOLNOKY (1962a, 106; S. ovata KG. var. africana CHOLNOKY 1955b: 21, F. 46). Not uncommon in neutral waters but never seen in large numbers. — Samples 30, 51, 75, 146.


S. tenera Gregory (cf. Hustedt, Bacill. 439, F. 854, 855). Widespread in the region under review and often in considerable numbers. — Samples 24, 26, 28, 29, 30, 31, 75, 76.

S. tenera f. minor Cholnoky (1958a: 140, F. 168). Associated with the type were many very small individuals which I have assigned to the above form with which they agree closely. — Samples 26, 27, 75, 146.

S. tenera f. inornata Cholnoky (1958a: 140, F. 168). Associated with the type were many very small individuals which I have assigned to the above form with which they agree closely. — Samples 26, 27, 75, 146.

S. rupestris Kütz. (cf. Hustedt, Kieselalg. 2: 207, F. 697a, b). Abundant in one sample only. — Sample 76.

S. tabulata (Ag.) KG. var. fasciiculata (KG.) GRUN. (cf. Hustedt, Kieselalg. 2: 218, F. 710i–1; Cholnoky 1959a: 67, F. 349–352). This species which seems to reach its greatest development in slightly alkaline waters was seen in one sample from neutral water, never in great numbers. — Sample 76.


S. uba var. danica (KG.) GRUN. (cf. Hustedt, Kieselalg. 2: 200, F. 691a, f). — Samples 28, 31, 48a, 75, 76, 146.


Tabellarla Ehrenberg 1839.


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PLATES
Plate II
32, 33. *Eunotia exigua* BREB. — 34. *E. flexuosa* (BREB.) KG. var. transvaalensis
1. *lanceolata* HUSTEDT — 49. 50. *Frustulia caffra* sp. n. — 51. *F. javanica* HUST.
— 52. *F. rhomboides* (E.) De Toni var. uniplicaloides GRUN. — 53—56. *F. ingelec*
CHOLNOKY — 57. *Gomphonema perlithum* CHOLNOKY — 58. *G. Schweickertii*
CHOLNOKY — 59. *Navicula cinctaformis* HUST. — 60, 61. *N. dissuta* n. sp
Plate IV
91. Surtella margaritacea O. MÜLLER — 92—95. S. acanthophora sp. n.