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SOME HALOBION SPECTRA
(DIATOMS)

BY

JOHS. BOYE PETERSEN

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Of recent years not a little has been done to clear up the ecology of the Diatoms. The work carried out in this field has been reviewed by KOLBE (1932). The durability of the valves of Diatoms, which renders it easy to make lasting preparations of them, offers a strong inducement to statistical treatment of the composition of the individual communities; in this way more distinct results can no doubt be obtained than by the methods so far adopted.

Within the ecology of the Diatoms the best known field at present is their relation to the salinity of the water (more especially to its content of Cl ions), thanks to KOLBE's fundamental researches (1927, 1932) as well as the efforts of several other authors. These latter have partly tried to develop KOLBE's Halobion system by extending our knowledge as to how the individual species should be placed in the system (SCHULZ 1928; BUDDE 1930, 1931, 1932, 1933; BOYE PETERSEN 1930, 1932; KRASSKE 1932, 1933, 1939; HUSTEDT 1938, 1939), partly passed some criticism on it (LEGLER und KRASSKE 1940), and partly tried to apply it in ecological investigations.

KOLBE (1927, p. 129) already pointed out that in order to characterise the diatomaceous vegetation of a body of water with respect to its Halobia it is not enough to enumerate the species and mention their place in the system, account must also be taken of the proportional numbers of the individual species; and he adopted a method of estimation by which the species were given points from 1—100 according to their frequency. In this way a spectrum may be set up which will show, much better than a mere list of species, the dominance of the individual species in the vegetation and therefore give a truer picture of its Halobion character. Further, the percentage representation of the individual categories is calcutated, comparable spectra from the various bodies of water being thus obtained. This method was used by BOYE PETERSEN (1930) and in a modified (but not improved) form by SPRENGER (1930).

It depends on estimate, however, and the reliability of the figures is thus considerably diminished. Several authors have made counts of Diatoms, for instance BUDDE (1931), but he did not use the counts to set up Halobion spectra. A mode of investigating the microphytes in the limnetic littoral and profundal zones has been devised by THOMASSON (1925). His model must have been the method for pollen analysis adopted in the investigation of bogs, and it has the advantage of attempting a determination of the absolute amount of organisms found in a definite volume of a bottom sample or a definite area of the stem of a reed at the shore of a lake. The result is set out in a diagram which is reminiscent of a pollen diagram. This method was later adopted by CHOLNOKY (1929) for epiphyte investigations in the Balaton Lake. Its prerequisite is that the material should be collected in a certain way, but this cannot always be done, for instance in the case of expedition material from remote regions. The method has not been applied especially to the examination of Halobia.

For geological purposes J. IVERSEN (1937)[1] has mentioned, in a temporary communication, the results of counts of Diatoms in gytje deposits in various localities in northern Sealand. The percentage results are set down on the same principle as pollen diagrams and afford excellent support for the supposition that salt water periods have alternated with inland lake periods. The procedure adopted is not described in detail; but it would seem that a consistent systematic count of the Diatoms from certain layers of soil will afford reliable information as to the salinity of the water bodies of the past.

Presentation of the Problem.

The object of the present investigation is

1. To try to set up Halobion spectra from waters with a known chloride content on the basis of the generally accepted

[1] The method from B. HALDEN: Geologiska Föreningens i Stockholm Förhandlingar 1929, 311—366.

view as to the place of the species in the Halobion system; it will then appear whether or not these spectra change in proportion to the amount of chloride in the water. If they do, it will be an indication that the view as to the place of the species is correct; if they do not, it will show that the view is incorrect. By examining the Halobion spectra and chloride content of numerous water bodies, it will perhaps be possible to correct, in a rational manner, our conception of the position of the species in the system. This, however, has not been attempted in the present work.

2. By setting up Halobion spectra from water bodies with an unknown chloride content to try to draw conclusions as to their chloride content. Such conclusions can hardly be very far-reaching in the first instance; but it is probable that in the future, when more experience has been gained, it will be possible to draw fairly accurate conclusions from the Halobion spectrum as to the chloride content of the water.

Author's own Method.

Of the available material I made an ordinary styrax preparation either 1) by mixing a little of the material with a drop of distilled water on a cover glass, heating it on an iron plate, and then mounting it in styrax; or 2) by first treating the sample with sulphuric acid and sodium nitrate and then making the preparation of the cleansed material.

In each preparation a count was now made of how many cells of each species there occurred in 25 random fields of vision. For this purpose I used a Zeiss apochromatic 60 ×, ap. 1.40 and c. oc. 15 ×, allowing a field of vision with a diameter of 180 μ. Whether the field of vision be a little larger or a little smaller will hardly affect the final result, since this is ultimately calculated in percentages, which are tabulated. For each species is given the number of individuals found in the 25 fields of vision, how many per cent of the total this number constitutes, and the place of each species in the Halobion system (euhalobous, mesohalobous, halophilous, indifferent, halophobous). Finally the whole is summed up in a spectrum where it can be seen how many per cent of each category were found in the sample.

The absolute figures for each species should be included in the table, but they cannot be regarded as an expression of the absolute amount of the species in the samples, for the preparation may be made with more or less close-lying frustules of the same sample. On the other hand, these figures will tend to indicate how reliable the count is, for the more individuals you have counted the more it gains in this respect. The percentages show the relative proportions of the species occurring in the preparation and render possible a comparison with similar figures from other localities.

For the counts to be made in a satisfactory manner it is very important that the frustules should be evenly distributed throughout the preparation and should not lie too close together. If larger clumps of frustules are present it will be impossible to count the diatoms. Another difficulty will be that you may sometimes find entire frustules and sometimes loose valves. In preparations made by simple heating on cover-glasses by far the greater part of the frustules will be whole and this is indeed the most convenient; but in such preparations it is often difficult to get the cells evenly distributed on the cover-glass. This is more easily attained with material purified with acid, which, however, has the defect that many of the frustules have fallen apart. If it be assumed that the valves of all species are separated with equal ease this fact will not affect the final result, but there is some probability that the larger species are more fragile than the smaller ones.

Erroneous determinations may occur during the count, amongst other things because not all individuals are seen in valve view. Thus *Fragilaria* and *Eunotia* species are very difficult to identify in girdle view.

The spectra must be supposed to yield the best picture when many species are present. If, on the other hand, but few species are represented, you run the risk of obtaining a very one-sided spectrum, which perhaps on comparison with others may prove exaggerated. In the sequel I shall be able to show examples of how several spectra from the same locality proved surprisingly uniform despite the fact that they contained a different number of species, just as these were only partly the same in the different samples.

In the tables and spectra appearing in the sequel the species have as far as possible been referred to the categories in KOLBE's Halobion system by means of the information drawn from the works of a number of authors (KOLBE, KRASSKE, HUSTEDT, SCHULZ, BUDDE and others). These do not always agree in their view of the place of the species; but for most of the species there is general agreement. In cases where the authors have proved at variance I have placed the species according to the best of my judgment without considering my immediate experience. As to this question I refer the reader to my comments under the various species. The ecology of some species is still so little known that it has been impossible to place them in the system. This applies for instance to a number of species which will possibly prove to be more or less markedly halophobous. Altogether, their place in the system is the least known because the authors who have studied Halobia have principally concerned themselves with waters of such high chloride content that halophobous species have scarcely been present. Possibly some of the species now regarded as halophobous are more probably calciphobous.

It will often be difficult to decide whether a species is halophilous or mesohalobous, and as a matter of fact there is considerable vacillation among authors in their opinion of many species belonging to these groups.

We have seen examples of species being regarded by some as mesohalobous by others as indifferent. In such cases the species are markedly euryhaline. Such species I have classed as indifferent.

HUSTEDT (1935) and KRASSKE (1938) have maintained that some species which are usually considered halophilous are actually aerophilous species growing principally among mosses and in cushions of algae above the surface of the water. In the present work I have disregarded this view since these species, when growing in water, turn out to be halophilous.

Localities investigated.

The localities investigated fall into three groups:

1. Lakes and similar localities with alkaline-slightly acid water and a larger or smaller content of chloride.

2. Bogs. The water contains humus, is sometimes acid, sometimes alkaline, with a varying content of lime and chloride.

3. Heterogeneous localities, the chloride content of which is quite unknown or at least uncertain.

In each group the localities poorest in chloride are mentioned first.

Magle Lake.

The lake is situated in Asmindrup parish in Sealand near Tølløse and is surrounded by high hills (Grøntved Overdrev). Mentioned by WIINSTEDT (Bot. Tidsskr. **42**: 298) in a report of an excursion. It does not appear from this that there is anything especially noteworthy about the vegetation.

Analyses of the water made by SIG. OLSEN on the $^{20}/_{7}$ 41 yielded the following data:

Cl′	16 mg/l.
Hardness (D. H.)	8.5
pH actual	7.5
Min.	6.4
Max.	7.5[1]

The water must therefore be characterised as soft freshwater of about neutral reaction with a low chloride content.

The spectrum shows that the sample contains almost exclusively indifferent forms.

Gurre Lake.

Situated in the parish of Tikjøb in northern Sealand. Size 243 ha. Mentioned by IVERSEN (1929, p. 316).

On the $^{27}/_{7}$ 41 SIG. OLSEN examined the water with the following result:

Cl′	19 mg/l.
Hardness (D. H.)	5.2
pH actual	7.4
Min.	6.2
Max.	8.8

Isoëtes echinospora and *Lobelia Dortmanna* as well as *Littorella uniflora* are known to occur in the lake.

[1] These pH values were found by the method of IVERSEN (1929).

Table 1.
Magle Lake near Grøntved Overdrev (near Tølløse).
$^{20}/_{7}$ 41. Leg. Sig. Olsen.

	Number of individuals	%	
Achnanthes Clevei	+	—	indifferent
— minutissima v. crypt.	71	24.0	indiff.
— Østrupii	7	2.4	?
Amphora ovalis v. Pediculus	28	9.4	indiff.
Cocconeis placentula	17	5.8	indiff.
— — v. euglypta	+	—	indiff.
Cyclotella comta	6	2.0	indiff.
— Kützingiana?	1	0.3	indiff.
Cymbella affinis	19	6.4	indiff.
— lanceolata	+	—	indiff.
— microcephala	52	17.6	indiff.
— prostrata	5	1.7	indiff.
— ventricosa	2	0.7	indiff.
Epithemia sorex	+	—	indiff.
— zebra v. saxonica	12	4.1	indiff.
Fragilaria brevistriata	2	0.7	indiff.
— construens	+	—	indiff.
— — v. binodis	25	8.4	indiff.
— — v. venter	2	0.7	indiff.
— pinnata	9	3.0	indiff.
— sp. (in girdle view)	6	2.0	?
Gomphonema intricatum v. pumila	5	1.7	indiff.
— olivaceum	1	0.3	indiff.
Melosira arenaria	+	—	indiff.
— italica	2	0.7	indiff.
Navicula cocconeiformis	1	0.3	halophobous
— cryptocephala v. intermedia	5	1.7	indiff.
— — f. minuta	9	3.0	?
— radiosa	2	0.7	indiff.
— rotaeana	+	—	indiff.
— scutelloides	+	—	indiff.
Nitzschia sp.	5	1.7	?
Synedra rumpens?	+	—	indiff.
Tabellaria flocculosa	2	0.7	halophobous
	296	100.0	

Table 2.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	2	1.0
	indifferent	28	89.9
	halophilous	0	0.0
Mesohalobous		0	0.0
Euhalobous		0	0.0
?		4	9.1
	Total	34	100.0

The sample is from a crust of algae on sand by the shore. The preparation was made of material purified with acid.

Among the Diatoms the indifferent forms show marked dominance. It is true that as many as 6 species of halophobes were found, but in a very small number of individuals only. A remarkable feature is the occurrence of one mesohalobous species, viz. *Amphora coffæiformis*, which constituted 1.3% of the individuals counted. Perhaps the determination of this species is not quite reliable. The individuals were small and all seen in girdle view.

Table 3.
Gurre Lake. On sand; purified. 27/7 41. Leg. SIG. OLSEN.

	Number of individuals	%	
Achnanthes lanceolata	1	0.7	indifferent
— linearis	32	21.4	indiff.
— minutissima v. cryptoc.	16	10.7	indiff.
Amphora coffæiformis	2	1.3	mesohalobous
— ovalis	1	0.7	indiff.
Cocconeis placentula	16	10.7	indiff.
Cyclotella comta	8	5.3	indiff.
— sp.	3	2.0	?
Cymbella cistula v. maculata	1	0.6	indiff.
— microcephala	36	24.0	indiff.
— prostrata	1	0.7	indiff.
— sinuata	+	—	indiff.
Eucocconeis flexella v. alpestris	1	0.7	indiff.
Eunotia gracilis?	1	0.7	halophobous

(continued)

Table 3 (continued).

	Number of individuals	%	
Fragilaria construens	8	5.3	indiff.
— — v. binodis	+	—	indiff.
— pinnata	7	4.7	indiff.
— sp.	3	2.0	?
Gomphonema acuminatum	+	—	indiff.
Navicula cryptocephala v. exilis	1	0.6	indiff.
— — v. intermedia	2	1.3	indiff.
— — — f. minuta	3	2.0	?
— pseudoscutiformis	+	—	?
— pupula	1	0.7	indiff.
— radiosa	1	0.6	indiff.
Neidium affine v. amphirhynchus	+	—	halophobous
— — f. hercynica	+	—	halophobous
Nitzschia sp.	3	2.0	?
Pinnularia mesolepta	+	—	halophobous
Tabellaria flocculosa	2	1.3	halophobous
	150	100.0	

Table 4.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	6	2.7
	indifferent	18	88.0
	halophilous	0	0.0
Mesohalobous		1	1.3
?		5	8.0
	Total	30	100.0

Fure Lake.

Situated in northern Sealand. Its vegetation and other physical features have been described by Wesenberg-Lund in Furesøstudier (1917), and its plankton in Wesenberg-Lund, De danske Søers Plankton (1904).

The material for the spectrum was collected by Sig. Olsen on the $^{23}/_{11}$ 41 on the south-shore of the lake and consisted in scrapings off stones by the shore. Numerous *Cyanophyceae*

(*Rivularia*, *Nostoc* and others) as well as Diatoms occurred in the sample. The preparation was made of material purified with acid.

As to the character of the water the following data were found:

Cl′	20 mg/l.
Hardness (D. H.)	7.0
pH actual	8.2
Min.	6.8
Max.	8.6

In the above-mentioned works Wesenberg-Lund speaks of an abundant development of *Tabellaria fenestrata*, partly in the plankton, partly attached in the winter time; he also mentions *Tabellaria flocculosa* as very commonly attached to stones. I have observed none of these species in my material.

The spectrum shows marked dominance of indifferent forms, while no halophilous and no halophobous forms have been observed with certainty.

Of forms whose place in the Halobion system is not mentioned in the literature 11.2 % were found, *Navicula cryptocephala* f. *minuta* alone constituting 9.9 %.

Table 5.

Fure Lake; scrapings off stones. 23/11 41. Leg. Sig. Olsen.

	Number of individuals	%	
Achnanthes Clevei	2	1.0	indifferent
— — v. rostrata	+	—	indiff.
— exigua	1	0.5	indiff.
— minutissima v. cryptoc.	8	3.9	indiff.
— lanceolata	1	0.4	indiff.
Amphora ovalis	+	—	indiff.
— — v. pediculus	18	8.9	indiff.
Asterionella formosa	+	—	indiff.
Cocconeis Pediculus	1	0.5	indiff.
— Placentula	+	—	indiff.
Cymatopleura solea	+	—	indiff.
Cymbella cuspidata	1	0.5	indiff.
— helvetica	9	4.4	indiff.
— microcephala	10	4.9	indiff.

(continued)

Table 5 (continued).

	Number of individuals	%	
Cymbella prostrata	+	—	indiff.
— ventricosa	+	—	indiff.
Diatoma vulgare	50	24.8	indiff.
Epithemia intermedia	+	—	?
— sorex	16	7.9	indiff.
— zebra v. porcellus	5	2.4	indiff.
Fragilaria construens	+	—	indiff.
— — varr.	15	7.4	indiff.
— crotonensis	2	0.9	indiff.
— pinnata	+	—	indiff.
— Vaucheriae	4	1.9	indiff.
— — v. capitellata	2	0.9	indiff.
Melosira islandica	+	—	indiff.
Navicula cryptocephala v. intermedia	2	0.9	indiff.
— — f. minuta	20	9.9	?
— scutelloides	+	—	indiff.
— tuscula	2	0.9	indiff.
— vulpina	1	0.9	?
Nitzschia dissipata	3	1.4	indiff.
— fonticola	12	5.9	indiff.
— gracilis	8	3.9	indiff.
— palea	+	—	indiff.
— sigmoidea	+	—	indiff.
Pinnularia sp.	1	0.4	?
Rhoicosphenia curvata	+	—	indiff.
Rhopalodia ventricosa	3	1.4	indiff.
Stephanodiscus Astræa	+	—	indiff.
— — v. minutula	3	1.4	indiff.
Synedra Acus	2	0.9	indiff.
— Ulna	2	0.9	indiff.
	204	100.0	

Table 6.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	0	0.0
	indifferent	39	88.8
	halophilous	1	0.0
Mesohalobous		0	0.0
?		4	11.2
	Total	44	100.0

Bure Lake.

Situated in the parish of Uggeløse in northern Sealand, it is an elongate lake with an outlet into Roskilde Fjord. The sample was of algae from sand by the shore; collected on the 3/7 41 by SIG. OLSEN, who found the following data for the character of the water:

Cl′	22 mg/l.
Hardness (D. H.)	7.0
pH actual	8.2
Min.	7.2
Max.	8.2

The water must therefore be characterised as alkaline and poor in lime and chloride. The spectrum shows pronounced dominance of indifferent forms with a small number of halophobous and halophilous species.

Table 7.
Bure Lake; on sand. 3/7 41. Leg. SIG. OLSEN.

	Number of individuals	%	
Achnanthes conspicua	1	0.3	indifferent
— exigua	3	0.9	indiff.
— lanceolata	1	0.3	indiff.
— minutissima v. cryptoceph.	39	11.6	indiff.
Amphora ovalis v. pediculus	69	20.6	indiff.
Asterionella formosa	2	0.6	indiff.
Cocconeis placentula	2	0,6	indiff.
— — v. euglypta	+	—	indiff.
Cyclotella comta	+	—	indiff.
— Kützingiana?	8	2.4	indiff.
Cymbella affinis	37	11.0	indiff.
— lacustris	+	—	indiff.
— microcephala	44	13.2	indiff.
— obtusiuscula	+	—	?
— parva	+	—	indiff.
— prostrata	19	5.7	indiff.

(continued)

Table 7 (continued).

	Number of individuals	%	
Cymbella ventricosa	2	0.6	indiff.
— sp. (in girdle view)	2	0.6	?
Diploneis ovalis	1	0.3	indiff.
Epithemia Argus	1	0.3	indiff.
— intermedia	1	0.3	?
— sorex	10	3.0	indiff.
— zebra	1	0.3	indiff.
— — v. saxonica	3	0.9	indiff.
Eunotia arcus v. fallax	+	—	halophobous
Fragilaria brevistriata	21	6.2	indiff.
— construens	+	—	indiff.
— — v. venter	9	2.7	indiff.
— — v. binodis	6	1.8	indiff.
— pinnata	1	0.3	indiff.
— Vaucheriae	8	2.4	indiff.
— sp.	11	3.3	?
Gomphonema acuminatum v. coronatum	1	0.3	indiff.
— intricatum v. pumilum	3	0.8	indiff.
— olivaceum	2	0.6	indiff.
— parvulum	1	0.3	indiff.
— ventricosum	+	—	?
— sp. (in girdle view)	2	0.6	?
Mastogloia Smithii v. amphicephala	1	0.3	indiff.
— — v. lacustris	+	—	indiff.
Navicula cryptocephala v. intermedia	6	1.8	indiff.
— — f. minuta	3	0.9	?
— hungarica var.?	1	0.3	halophilous
— radiosa	+	—	indiff.
— scutelloides	+	—	indiff.
— subtilissima	2	0.6	?
— tuscula f. minor	1	0.3	halophilous
Nitzschia amphibia	1	0.3	indiff.
— sp.	3	0.9	?
Rhoicosphenia curvata	+	—	indiff.
Rhopalodia gibba	2	0.6	indiff.
Stephanodiscus Astræa	+	—	indiff.
Synedra amphicephala	1	0.3	?
— ulna	1	0.3	indiff.
Tabellaria flocculosa	2	0.6	halophobous
	335	100.0	

Table 8.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	2	0.6
	indifferent	40	91.0
	halophilous	2	0.6
Mesohalobous		0	0.0
?		11	7.8
	Total	55	100.0

Sct. Jørgens Lake.

The lake is an artificial one, a remnant of a former fortification, situated within the bounds of Copenhagen. It is about 5 m. deep, rectangular in shape, its greatest length extending in a N. N. E.—S. S. W. direction. It now belongs to the Copenhagen Water Works, and is used as a reservoir. In a dam laid across the middle of the lake runs a concrete aqueduct which leads the groundwater from borings at Sønder Lake to Copenhagen. When this aqueduct sometimes carries more water than necessary, the superfluous water is allowed to run into the lake. According to Mr. Pape's analyses the water in the lake contains 35 mg. Cl′ per l. Its lime content is high, measuring 16 German degrees of hardness.

I have examined two preparations from Sct. Jørgens Lake, viz.

a. From parts of plants; depth $5^1/_2$ m., north end of lake $^{31}/_7$ 1916. Material not purified. The spectrum is typical of pure freshwater whose species are all indifferent, while the halophobous species only constitute 1.6 %.

b. Bottom mud from a depth of 5 m., south end of lake $^{11}/_9$ 1912. Material purified with acid. This contained almost twice the amount of species found in the north end. Nevertheless the spectrum has almost the same appearance with a preponderance of indifferent species. Only there is a suggestion here that the halophilous species are somewhat more numerous. The difference between the two spectra is so insignificant, however, that it may easily be accidental.

Table 9.

Sct. Jørgens Lake, north end, on parts of plants $5^1/_2$ m. depth. $^{31}/_7$ 1916. Non-purified material.

	Number of individuals	%	
Achnanthes minutissima v. cryptoc...	42	22.1	indifferent
Amphipleura pellucida	+	—	indiff.
Cocconeis placentula	7	3.7	indiff.
Cyclotella comta	91	47.9	indiff.
Cymbella affinis	3	1.5	indiff.
— cymbiformis	3	1.5	indiff.
— lanceolata	+	—	indiff.
Epithemia Zebra v. saxonica	2	1.1	indiff.
Eunotia pectinalis	3	1.6	halophobous
Gomphonema acuminatum v. Brebissonii	2	1.1	indiff.
— — v. coronata	2	1.1	indiff.
— constrictum	2	1.1	indiff.
— intricatum v. pumilum	18	9.4	indiff.
— longiceps f. gracilis	4	2.1	?
Navicula vulpina	+	—	?
— sp.	4	2.1	?
— sp.	3	1.6	?
Nitzschia sp.	3	1.6	?
Rhoicosphenia curvata	1	0.5	indiff.
Rhopalodia gibba	+	—	indiff.
Synedra Ulna v. biceps	+	—	indiff.
	190	100.0	

Table 10.

Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	1	1.6
	indifferent	15	91.0
	halophilous	0	0.0
Mesohalobous		0	0.0
?		5	7.4
	Total	21	100.0

Table 11.

Sct. Jørgens Lake, bottom mud, 5 m. depth 11/9 1912.
South end; purified material.

	Number of individuals	%	
Achnanthes Clevei	+	—	indifferent
— lanceolata	1	1.6	indiff.
— minutissima v. cryptoceph.	1	1.6	indiff.
Amphora ovalis	1	1.5	indiff.
— — v. pediculus	9	14.0	indiff.
Caloneis sp.	+	—	?
Campylodiscus noricus v. hibernicus	2	3.1	indiff.
Cocconeis placentula	3	4.7	indiff.
Cyclotella comta	3	4.7	indiff.
— stelligera	+	—	indiff.
Diploneis ovalis	+	—	indiff.
Epithemia zebra v. porcellus	1	1.6	indiff.
Eunotia arcus	+	—	halophobous
— sp.	+	—	?
Fragilaria brevistriata	1	1.5	indiff.
— capucina	+	—	halophobous
— construens-forms	6	9.4	indiff.
— leptostauron	1	1.5	halophobous
— pinnata	2	3.1	indiff.
Gomphonema acuminatum	1	1.6	indiff.
— constrictum	+	—	indiff.
— intricatum	+	—	indiff.
— — v. pumilum	4	6.3	indiff.
Gyrosigma acuminatum	1	1.6	indiff.
— attenuatum	5	7.8	indiff.
Melosira arenaria	+	—	indiff.
— varians	+	—	indiff.
Navicula gregaria	1	1.6	halophilous
— oblonga	+	—	indiff.
Nitzschia acuta	1	1.6	indiff.
— dissipata	2	3.1	indiff.
— sp.	1	1.6	?
Pinnularia sp.	1	1.5	?
Stauroneis acuta	+	—	indiff.
Stephanodiscus astraea	4	6.3	indiff.
Surirella Capronii	+	—	indiff.
— elegans	3	4.7	indiff.
— robusta	+	—	halophobous
Synedra acus	+	—	indiff.
— parasitica	1	1.6	indiff.
— Ulna v. danica	2	3.1	indiff.
— — v. amphirhynchus	1	1.5	indiff.
	64	100.0	

Table 12.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	4	1.5
	indifferent	31	93.8
	halophilous	2	1.6
Mesohalobous		0	0.0
?		5	3.1
	Total	42	100.0

Dybe Lake.

Small lake near Rørvig. According to WIINSTEDT (1940, 327) it is a lagune only separated from the Kattegat by the low dunes and with the raised sea floor as a substratum.

SIG. OLSEN has found the following data for the water:

Cl′	35 mg/l.
Hardness (D. H.)	9.5
pH actual	8.0
Min.	6.6
Max.	8.4

From this lake there are two spectra, one of a sample of material scraped off stones by the shore, and another from sand with a coating of algae in shallow water. Both spectra show predominance of indifferent forms, with a small number of halophobous and halophilous species. In each of them there was also a small number of mesohalobous forms. In both samples it was a small *Amphora* determined as *A. coffaeiformis*, but the determination is hardly quite conclusive. The sample from sand further contained *Mastogloia elliptica* v. *Dansei*, which is not regarded as mesohalobous by all authors.

Nors Lake

is situated in Thy about 10 km. west of Thisted. Its size is about 350 ha. The lake has been described by SIG. OLSEN (1941) and only a few of its physical features will here be pointed out. The substratum is of chalk, sometimes cropping up freely and sometimes covered with sand or mud. The water might have been expected to be highly calciferous owing to the nature of the substratum but, as will appear from the analyses made by

Table 13.

Dybe Lake, scrapings off stones. 5/6 41. Leg. SIG. OLSEN.

Purified material.

	Number of individuals	%	
Achnanthes lanceolata	1	0.3	indifferent
— linearis	1	0.3	indiff.
— minutissima v. cryptoc.	171	54.9	indiff.
Amphora coffæiformis	1	0.3	mesohalobous
— ovalis	+	—	indiff.
— — v. pediculus	2	0.6	indiff.
Cocconeis placentula	9	2.9	indiff.
Cyclotella comta	40	12.8	indiff.
Cymatopleura elliptica	+	—	indiff.
— solea	+	—	indiff.
Cymbella affinis	1	0.3	indiff.
— Ehrenbergii	+	—	indiff.
— microcephala	22	7.0	indiff.
— obtusiuscula	+	—	?
— parva	14	4.5	indiff.
— prostrata	6	1.9	indiff.
— sinuata	+	—	indiff.
— ventricosa	1	0.3	indiff.
Diatoma elongatum	1	0.3	halophilous
Epithemia sorex	1	0.3	indiff.
— zebra v. saxonica	3	1.0	indiff.
Eucocconeis flexella	+	—	halophobous
— lapponica	3	1.0	halophobous
Fragilaria brevistriata	2	0.6	indiff.
— construens	+	—	indiff.
— crotonensis	5	1.6	indiff.
— Vaucheriae	2	0.6	indiff.
Gomphonema olivaceum	1	0.3	indiff.
Gyrosigma attenuatum	+	—	indiff.
Mastogloia elliptica v. Dansei	2	0.6	mesohalobous
— Smithii v. amphicephala	8	2.5	indiff.
— — v. lacustris	3	1.0	indiff.
Navicula cryptocephala v. intermedia	+	—	indiff.
— — f. minuta	2	0.6	?
— — v. veneta	+	—	indiff.
— oblonga	+	—	indiff.
— pupula	+	—	indiff.
— radiosa	3	1.0	indiff.

Table 13 (continued).

	Number of individuals	%	
Navicula tuscula	+	—	indifferent
— — f. minor	+	—	halophilous
— sp.	3	1.0	?
Neidium Iridis	1	0.3	halophobous
Nitzschia angustata	1	0.3	indiff.
Rhopalodia gibba	2	0.6	indiff.
Tabellaria flocculosa	+	—	halophobous
Synedra Ulna	1	0.3	indiff.
	313	100.0	

Table 14.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	4	1.3
	indifferent	34	95.6
	halophilous	2	0.3
mesohalobous		2	0.9
?		4	1.9
	Total	46	100.0

Table 15.
Dybe Lake, on sand. 5/6 41. Leg. Sig. Olsen.
Purified material.

	Number of individuals	%	
Achnanthes lanceolata	1	0.2	indifferent
— minutissima v. cryptoc.	236	52.6	indiff.
Amphora coffæiformis	1	0.2	mesohalobous
— ovalis	+	—	indiff.
— — v. pediculus	+	—	indiff.
Caloneis Silicula v. truncatula	1	0.2	indiff.
Cocconeis placentula	20	4.5	indiff.
Cyclotella comta	29	6.5	indiff.

(continued)

Table 15 (continued).

	Number of individuals	%	
Cymatopleura elliptica	+	—	indiff.
— solea	1	0.2	indiff.
Cymbella affinis	1	0.2	indiff.
— Ehrenbergii	2	0.5	indiff.
— microcephala	31	6.8	indiff.
— parva	3	0.7	indiff.
— prostrata	5	1.1	indiff.
— sinuata	+	—	indiff.
Diatoma elongatum	1	0.2	halophilous
Epithemia sorex	5	1.1	indiff.
— zebra v. saxonica	1	0.2	indiff.
Eucocconeis flexella v. alpestris	13	2.9	halophobous
Fragilaria brevistriata	4	0.9	indiff.
— construens	1	0.2	indiff.
— pinnata	+	—	indiff.
— Vaucheriae	3	0.7	indiff.
Gyrosigma attenuatum	2	0.5	indiff.
Mastogloia Smithii v. amphicephala	44	9.8	indiff.
Navicula cryptocephala	10	2.2	indiff.
— — v. intermedia	3	0.7	indiff.
— — f. minuta	9	2.0	?
— cuspidata	+	—	indiff.
— gastrum	+	—	indiff.
— oblonga	+	—	indiff.
— pupula	1	0.2	indiff.
— radiosa	2	0.4	indiff.
— tuscula	+	—	indiff.
— — f. minor	1	0.2	halophilous
— sp.	2	0.5	?
Neidium Iridis	+	—	halophobous
Nitzschia angustata	9	2.0	indiff.
— dissipata	2	0.5	indiff.
— sp.	1	0.2	?
Rhopalodia gibba	3	0.7	indiff.
Stauroneis Phoenicenteron	+	—	indiff.
Surirella sp.	+	—	?
Synedra sp.	1	0 2	?
	449	100.0	

Table 16.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	2	2.9
	indifferent	34	93.6
	halophilous	3	0.4
Mesohalobous		1	0.2
?		5	2.9
	Total	45	100.0

NYGAARD (1938), this is not the case. NYGAARD found between 43.1 and 52 mg. CaO/l. OLSEN (l. c.) determined the pH and found that it ranged from 6.8 to 8.7 (artificial minimum and maximum according to IVERSEN's method). In May 1942 I received a sample of the water which Mr. PAPE kindly analysed for me. He found the following data:

pH	7.29
Cl′	42 mg/l.
Total hardness (D. H.)	6.6
Carbonate	5.6
permanent	1.0
SO_3	traces
HCO_3	122 mg/l.

The water must therefore be characterised as alkaline with a small content of lime, chloride, and sulphate.

Two samples from Nors Lake were examined, both of them scrapings from stones in shallow water, but one of them from a limestone, the other from granite.

Unfortunately one of the spectra is not very informative since 15.3 % of the Diatoms present could not be referred to any place in the Halobion system by the aid of the literature. The other spectrum (from the limestone) shows that the flora consists almost exclusively of indifferent forms with an admixture of some few halophilous species (0.9 %).

Table 17.

Nors Lake, scrapings off granite stones. 21/8 39 Leg. Sig Olsen. 1.50—1.75 m. depth.

	Number of individuals	%	
Achnanthes Clevei	4	2.9	indifferent
— linearis	6	4.5	indiff.
— minutissima v. cryptoc.	5	3.7	indiff.
Amphora ovalis	+	—	indiff.
— — v. pediculus	32	23.5	indiff.
Caloneis bacillum	+	—	indiff.
Cocconeis placentula	7	5.2	indiff.
Cyclotella comta	2	1.5	indiff.
Cymbella æqualis	+	—	indiff.
— helvetica	+	—	indiff.
— lacustris	2	1.5	indiff.
— leptoceros	1	0.7	indiff.
— microcephala	6	4.5	indiff.
— parva	+	—	indiff.
— prostrata	+	—	indiff.
— ventricosa	+	—	indiff.
Diploneis ovalis	2	1.5	indiff.
Epithemia Hyndmannii	+	—	indiff.
— sorex	6	4.4	indiff.
— zebra v. porcellus	1	0.7	indiff.
— — v. saxonica	12	8.8	indiff.
Fragilaria brevistriata	2	1.5	indiff.
— construens	10	7.4	indiff.
— pinnata	1	0.7	indiff.
— Vaucheriae (small form)	1	0.7	indiff.
Gomphonema acuminatum	1	0.7	indiff.
Mastogloia Smithii v. amphicephala	+	—	indiff.
— — v. lacustris	2	1.5	indiff.
Navicula cryptocephala v. intermedia	7	5.2	indiff.
— — f. minuta	6	4.4	?
— radiosa	+	—	indiff.
— rhynchocephala	+	—	indiff.
— scutelloides	4	2.9	indiff.
— subhamulata	1	0.7	?
— subtilissima	8	5.9	?
— sp.	1	0.7	?
— sp.	1	0.7	?
Nitzschia palea	1	0.7	indiff.
— sp.	4	2.9	?
	136	100.0	

Table 18.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	0	0.0
	indifferent	30	84.7
	halophilous	2	0.0
mesohalobous		0	0.0
?		7	15.3
	Total	39	100.0

Table 19.
Nors Lake, scrapings off limestones; 0.25 m. depth. 14/8 39.
Leg. Sig. Olsen

	Number of individuals	%	
Achnanthes linearis	2	0.9	indifferent
— minutissima v. cryptoc.	23	10.6	indiff.
Amphora ovalis	1	0.5	indiff.
— — v. pediculus	6	2.8	indiff.
Cocconeis placentula	2	0.9	indiff.
Cyclotella comta	+	—	indiff.
Cymbella affinis	5	2.4	indiff.
— helvetica	1	0.5	indiff.
— lacustris	6	2.8	indiff.
— microcephala	66	30.1	indiff.
— parva	6	2.8	indiff.
— prostrata	14	6.4	indiff.
— ventricosa	3	1.4	indiff.
Diatoma elongatum	2	0.9	halophilous
Epithemia sorex	5	2.4	indiff.
Eucocconeis lapponica	+	—	halophobous
Fragilaria brevistriata	1	0.5	indiff.
— construens v. binodis	3	1.4	indiff.
— — v. venter	9	4.1	indiff.
— crotonensis	10	4.6	indiff.
— pinnata	1	0.5	indiff.
— Vaucheriae	+	—	indiff.
Gomphonema olivaceum	4	1.8	indiff.
— — v. calcareum	4	1.8	indiff.

(continued)

Table 19 (continued).

	Number of individuals	%	
Mastogloia Smithii v. amphicephala	3	1.4	indiff.
— — v. lacustris	27	12.4	indiff.
Navicula cryptocephala v. intermedia	1	0.5	indiff.
— radiosa	+	—	indiff.
— tuscula f. minor	+	—	halophilous
Nitzschia denticula	+	—	indiff.
— fonticola	8	3.7	indiff.
— sp.	2	0.9	?
Rhopalodia gibba	1	0.5	indiff.
Stephanodiscus Astraea	1	0.5	indiff.
Surirella linearis v. helvetica	+	—	indiff.
	217	100.0	

Table 20.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	1	0.0
	indifferent	30	98.2
	halophilous	2	0.9
mesohalobous		0	0.0
?		2	0.9
	Total	35	100.0

Amager Fælled, pool ($^{15}/_{7}$ 41).

The sample consists of *Characeae* with epiphytes. Purified Diatom material was made from it. On examination of the water Sig. Olsen found:

Cl′	97 mg/l.
Hardness (D. H.)	17.8
pH actual	7.4
Min.	6.8
Max.	8.2

According to these data the water from this locality seems to be of much the same sort as that from the lakes, so I have compared its spectrum with those from the lakes. The greater content of chloride is manifested in a vigorous development of *Navicula halophila* (34.7 %), which is regarded as a mesohalobe, whereas very few halophilous species occur (1.0 %).

Table 21.
Amager Fælled, pool. 15/7 41. Leg. SIG. OLSEN.

	Number of individuals	%	
Achnanthes lanceolata	+	—	indifferent
— minutissima v. cryptocephala	22	23.2	indiff.
Amphora ovalis	2	2.1	indiff.
Anomoeoneis sphærophora	1	1.0	halophilous
Gomphonema constrictum	1	1.0	indiff.
— intricatum	3	3.2	indiff.
— parvulum	3	3.2	indiff.
Navicula cryptocephala	4	4.2	indiff.
— halophila	33	34.7	mesohalobous
— hungarica	+	—	halophilous
— minima	2	2.1	indiff.
— pupula	3	3.2	indiff.
— rhynchocephala	+	—	indiff.
Nitzschia amphibia	2	2.1	indiff.
— frustulum	3	3.2	indiff.
— hungarica	+	—	mesohalobous
— sp.	4	4.2	?
Rhopalodia gibba	12	12.6	indiff.
	95	100.0	

Table 22.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	0	0.0
	indifferent	13	60.1
	halophilous	2	1.0
Mesohalobous		2	34.7
?		1	4.2
	Total	18	100.0

Compared with the succeeding sample it is an instance of the difficulty of drawing a line of distinction between halophilous and mesohalobous species.

It should be noted that in this sample *Navicula halophila* partly occurs in a small form approaching *N. Gregaria* and yet differing plainly from it by a more distinct striation and a somewhat dissimilar form.

Amager Fælled, ditch east of the shooting grounds.

The sample collected by Sig. Olsen on the $^{15}/_{7}$ 41 consisted of *Characeae* with epiphytes. Purified material was prepared of it.

The water was examined by Sig. Olsen with the following results:

Cl′	135 mg/l.
Hardness (D. H.)	19.5
pH actual	7.5
Min.	6.7
Max.	9.0

The spectrum shows a vigorous development of halophilous species (27.8 %), especially *Navicula hungarica*, *N. Gregaria* and *Diatoma elongatum*. Of mesohalobes there are 7.9 %, especially *Achnanthes Hauckiana* (7.4 %).

Table 23.

Amager Fælled, ditch. $^{15}/_{7}$ 41. Leg. Sig. Olsen.

	Number of individuals	%	
Achnanthes Hauckiana	13	7.4	mesohalobous
— lanceolata	22	12.4	indifferent
— minutissima v. cryptoc.	4	2.3	indiff.
Amphora ovalis	9	5.1	indiff.
Anomoeoneis sphærophora	7	4.0	halophilous
Caloneis silicula	+	—	indiff.
Cocconeis placentula	11	6.2	indiff.
Cyclotella Meneghiniana	1	0.6	halophilous
Diatoma elongatum	5	2.8	halophilous

(continued)

Table 23 (continued).

	Number of individuals	%	
Epithemia sorex	+	—	indiff.
— zebra	+	—	indiff.
Gomphonema sp.	2	1.2	?
Navicula cryptocephala	34	19.2	indiff.
— — v. intermedia	+	—	indiff.
— gregaria	7	4.0	halophilous
— halophila	+	—	mesohalobous
— hungarica	29	16.4	halophilous
— minima	8	4.5	indiff.
— pupula	+	—	indiff.
— pygmæa	1	0.5	mesohalobous
— rhynchocephala	3	1.7	indiff.
Nitzschia amphibia	+	—	indiff.
— apiculata	+	—	mesohalobous
— frustulum	19	10.7	indiff.
Pinnularia sp.	+	—	?
Rhoicosphenia curvata	1	0.5	indiff.
Synedra pulchella	+	—	mesohalobous
	177	100.0	

Table 24.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	0	0.0
	indifferent	15	62.6
	halophilous	5	27.8
Mesohalobous		5	7.9
?		2	1.7
	Total	27	100.0

Flynder Lake

is situated only ½ km. distant from Dybe Lake. Sig. Olsen found the following data for the character of the water:

Cl′	590 mg/l.
Total hardness (D. H.)	9.0
transient	0.3
permanent	8.7
pH actual	7.6
Min.	7.2
Max.	8.6

Thus the water is very much like that of Dybe Lake but differs from it especially by its high chloride content.

The Halobion spectrum shows this very plainly: 26.1 % halophilous and 12.3 % mesohalobous forms.

Table 25.

Flynder Lake, scrapings off stones. 5/6 41. Leg. Sig. Olsen.

	Number of individuals	%	
Achnanthes minutissima v. cryptoc.	129	30.7	indifferent
Amphora coffæiformis	24	5.7	indiff.
— commutata	+	—	mesohalobous
— ovalis	2	0.5	indiff.
Cocconeis placentula	2	0.4	indiff.
Cymbella æqualis	15	3.6	indiff.
— microcephala	5	1.2	indiff.
— parva	4	1.0	indiff.
— pusilla	46	11.0	halophilous
Diatoma elongatum	17	4.1	halophilous
Epithemia Argus	25	6.0	indiff.
Fragilaria brevistriata	4	1.0	indiff.
— lapponica	34	8.1	indiff.
Hantzschia amphioxys	1	0.2	indiff.
Mastogloia Braunii	1	0.2	mesohalobous
— elliptica v. Dansei	3	0.7	mesohalobous
— Smithii v. lacustris	10	2.4	indiff.
Navicula cincta	21	5.0	halophilous
— — v. Heufleri	+	—	halophilous
— cryptocephala v. veneta	7	1.7	indiff.
— elegans	+	—	euhalobous
— halophila	21	5.0	mesohalobous
— hungarica	+	—	halophilous

(continued)

Table 25 (continued).

	Number of individuals	%	
Navicula oblonga	+	—	indiff.
— protracta	+	—	mesohalobous
— pupula	1	0.2	indiff.
— radiosa	2	0.4	indiff.
Nitzschia capitellata	25	6.0	halophilous
— denticula	8	1.9	indiff.
— sp.	8	1.9	?
Pinnularia microstauron	1	0.2	indiff.
Rhopalodia gibba	1	0.2	indiff.
Synedra affinis	+	—	halophilous
— pulchella	3	0.7	mesohalobous
	420	100.0	

Table 26.
Spectrum.

	Number of forms	% of individuals
Oligohalobous: halophobous	0	0.0
Oligohalobous: indifferent	18	59.7
Oligohalobous: halophilous	7	26.1
Mesohalobous	7	12.3
Euhalobous	1	0.0
?	1	1.9
Total	34	100.0

Præstø Fjord.

The sample was taken in the narrow water inside the Mader at the mouth of the fjord and consists of filiform algae and Characeae with epiphytes. Collected by Sig. Olsen on the 18/8 41 (station 64). *Potamogeton pectinatus, Chara crinita* and *Zanichellia major* occurred here. The material was purified with acid.

About the water in the fjord Dr. Kaj Hansen says: The salinity shows some seasonal fluctuations, just as it varies somewhat in the different parts of the water. According to analyses made in the summer of 1941 the chloride content lies between

4000 and 6000 mg/l. The pH is likewise variable but always shows an alkaline reaction of the water; values ranging from 7.18 to 8.08 were found.

The water is sea-water diluted with freshwater, thus literally brackish water. According to its chloride content it corresponds to Redeke's mesohaline area.

The spectrum shows a predominance of indifferent forms (66.8 %) while the halophilous forms are sparse (6 %). In ad-

Table 27.

Præstø Fjord, on filiform algae and Characeae. Aug. 41. Leg. Sig. Olsen.

	Number of individuals	%	
Achnanthes brevipes	+	—	euhalobous
— longipes	+	—	euhalobous
— Hauckiana	4	3.0	mesohalobous
Amphora coffæiformis	3	2.3	mesohalobous
Campylodiscus Echeneis	+	—	euhalobous
Cocconeis pediculus	1	0.7	indifferent
— placentula	27	20.5	indiff.
— scutellum	11	8.3	euhalobous
— — v. parva	+	—	mesohalobous
Cyclotella Meneghiniana	1	0.7	halophilous
Epithemia sorex	16	12.3	indiff.
— turgida	32	24.3	indiff.
— zebra	8	6.1	indiff.
Fragilaria pinnata	+	—	indiff.
Grammatophora marina	+	—	euhalobous
Hyalodiscus scoticus	+	—	euhalobous
Mastogloia elliptica	8	6.1	mesohalobous
— pumila	9	6.8	euhalobous
— Smithii v. amphicephala	2	1.5	indiff.
Navicula gregaria	+	—	halophilous
Rhopalodia musculus	+	—	mesohalobous
— ventricosa	1	0.7	indiff.
Rhoicosphenia curvata	1	0.7	indiff.
Surirella ovata	+	—	indiff.
Synedra pulchella	1	0.7	mesohalobous
— tabulata	7	5.3	halophilous
	132	100.0	

Table 28.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	0	0.0
	indifferent	10	66.8
	halophilous	3	6.0
Mesohalobous		6	12.1
Euhalobous		7	15.1
	Total	26	100.0

dition there are 12.1% of mesohalobous forms and 15.1% of euhalobous littoral forms. It would seem that there is a mixture of two groups of species, euryhaline freshwater forms and euryhaline mesohalobous and euhalobous forms.

Lyngby Mose.

Situated on the northern side of Lyngby Lake in N. Sealand.

Table 29.
Lyngby Mose, squeeze of Sphagnum. 31/7 41. Leg. Sig. Olsen.

	Number of individuals	%	
Eunotia exigua	27	34.6	halophobous
— — forma	30	38.5	halophobous
Hantzschia amphioxys	+	—	indiff.
Pinnularia borealis	+	—	indiff.
— söhrensis v. inflata	11	14.1	halophobous
— subcapitata v. Hilseana	10	12.8	halophobous
	78	100.0	

Table 30.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	4	100.0
	indifferent	2	0.0
	Total	6	100.0

The analysed sample is a squeeze of Sphagnum collected by SIG. OLSEN on the $^{31}/_{7}$ 41. He found the following data for the water:

Cl′	6 mg/l.
Hardness (D. H.)	1.6
pH actual	3.6
Min.	3.6
Max.	6.0

Hence the water must be termed extremely acid with an unusually small content of chloride and other salts in solution.

Accordingly the Diatom flora comprises exclusively halophobous species, especially *Eunotiae,* as well as *Pinnularia söhrensis* v. *inflata* and *Pinnularia subcapitata* v. *Hilseana*.

Bøllemosen, near Skodsborg.

The sample was of bottom material collected by SIG. OLSEN on the $^{31}/_{7}$ 41. It was purified with acid.

SIG. OLSEN found the data of the water to be:

Cl′	22 mg/l.
Hardness (D. H.)	2.5
pH actual	3.7
Min.	3.7
Max.	3.8

Table 31.

Bøllemosen; Bottom material, purified. $^{31}/_{7}$ 41. Leg. SIG. OLSEN.

	Number of individuals	%	
Cymbella sp.	1	0.3	?
Eunotia alpina	263	75.2	halophobous
— lunaris	45	12.9	halophobous
— tenella	6	1.7	halophobous
— veneris	1	0.3	halophobous
Gomphonema sp.	1	0.3	?
Pinnularia Hilseana	28	8.1	halophobous
— sp.	1	0.3	?
Tabellaria flocculosa	3	0.9	halophobous
	349	100.0	

Table 32.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	6	99.1
	indifferent	0	0.0
	halophilous	0	0.0
Mesohalobous		0	0.0
?		3	0.9
	Total	9	100.0

The water must therefore be characterised as highly acid with a strong buffer effect, a small content of lime, but with a normal content of chloride.

The Diatom flora turned out to consist almost entirely of halophobous species intermixed with a few whose place in the Halobion system could not be determined.

Peatbog I, Lille Lyngby south of Arre Lake.

The sample was collected in a place where peat had been cut. It consisted of filiform algae and bottom parts adhering to Characeae. Sample collected by Sig. Olsen on the $^{27}/_{7}$ 41. Material purified with acid was prepared.

Sig. Olsen found the following data for the water:

Cl′	114 mg/l.
Hardness (D. H.)	17.2
pH actual	8.6
Min.	6.6
Max.	9.0

The water must thus be said to be alkaline, of considerable hardness, and containing no small amount of chloride. Whence this originates cannot be said.

The spectrum shows a predominance of indifferent forms but has a distinct contingent of halophilous and mesohalobous forms. A *Nitzschia* determined as *N. frustulum* constituted 24% of the total of individuals. This species has been regarded as halophilous, but I have considered it best to be cautious and tabulate it as indifferent.

Table 33.

Peatbog I, Lille Lyngby near Arre Lake. 27/7 41. Leg. Sig. Olsen.

	Number of individuals	%	
Achnanthes lanceolata	14	2.3	indifferent
— linearis	21	3.5	indiff.
— minutissima v. cryptoc.	84	13.9	indiff.
Amphora ovalis	2	0.3	indiff.
Cocconeis placentula	23	3.8	indiff.
Cyclotella Meneghiniana	+	—	halophilous
Cymbella helvetica	+	—	indiff.
Eunotia lunaris	6	1.0	halophobous
Fragilaria brevistriata	1	0.2	indiff.
Gomphonema acuminatum	19	3.1	indiff.
— lanceolatum	7	1.0	indiff.
— parvulum	30	5.0	indiff.
Hantzschia amphioxys	1	0.2	indiff.
Navicula cryptocephala	11	1.8	indiff.
— — v. exilis	24	4.0	indiff.
— — f. minuta	3	0.5	?
— gregaria	16	2.6	halophilous
— halophila	26	4.3	mesohalobous
— hungarica	11	1.8	halophilous
— minima	59	9.8	indiff.
— viridula	1	0.2	indiff.
— sp.	1	0.2	?
Nitzschia amphibia	40	6.6	indiff.
— dissipata	4	0.6	indiff.
— frustulum	145	24.0	indiff.
— gracilis forma?	1	0.2	indiff.
Nitzschia sp.	26	4 3	?
Rhoicosphenia curvata	8	1.3	indiff.
Stephanodiscus Astræa v. minuta	18	3.0	indiff.
Synedra affinis	2	0.3	halophilous
— ulna	+	—	indiff.
	604	100.0	

Table 34.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	1	1.0
	indifferent	21	85.0
	halophilous	4	4.7
Mesohalobous		1	4.3
?		4	5.0
	Total	31	100.0

Peatbog II, Lille Lyngby near Arre Lake.

Situated near the former. The material which was from Chara, that is to say, consisting largely of epiphytes, was purified with acid. The sample was collected by Sig. Olsen on the $^{22}/_{5}$ 41. The following data were found:

Cl′	124 mg/l.
Hardness (D. H.)	16.5
pH actual	8.3
Min.	6.6
Max.	8.6

The water resembles that of peatbog I in character, but it contains a little more chloride. The spectrum shows the distinct occurrence of halophilous species, especially *Synedra tabulata* (= *affinis*), while the only mesohalobous form is *Navicula halophila* (0.6 %).

Table 35.
Peatbog II, Lille Lyngby near Arre Lake $^{27}/_{7}$ 41. Leg. Sig. Olsen.

	Number of individuals	%	
Achnanthes lanceolata	6	1.9	indifferent
— linearis	4	1.3	indiff.
— minutissima v. cryptoc.	73	23.4	indiff.
Amphora ovalis	1	0.3	indiff.
— — v. pediculus	2	0.6	indiff.
Cocconeis placentula	1	0.3	indiff.

(continued)

Table 35 (continued).

	Number of individuals	%	
Cyclotella Meneghiniana	1	0.3	halophilous
Diatoma elongatum	2	0.6	halophilous
Fragilaria capucina v. mesolepta	10	3.2	indiff.
— construens var.	1	0.3	indiff.
— Vaucheriae	2	0.6	indiff.
Gomphonema lanceolatum	3	1.0	indiff.
— parvulum	6	1.9	indiff.
Meridion circulare	+	—	halophobous
Navicula cryptocephala	2	0.7	indiff.
— — v. exilis	16	5.1	indiff.
— gregaria	8	2.6	halophilous
— halophila	2	0.6	mesohalobous
— hungarica	16	5.1	halophilous
— minima	45	14.4	indiff.
Nitzschia amphibia	10	3.2	indiff.
— frustulum	17	5.4	indiff.
— sp.	7	2.2	?
Stephanodiscus Astræa v. minutula	33	10.6	indiff.
Synedra tabulata	45	14.4	halophilous
— Ulna	+	—	indiff.
	313	100.0	

Table 36.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	1	0.0
	indifferent	18	74.2
	halophilous	5	23.0
Mesohalobous		1	0.6
?		1	2.2
	Total	26	100.0

Peatbog by Ullerup Forest near Hundested.

The sample consisted of Chara with parts of the soil attached. The material was purified with acid. The sample was collected by SIG. OLSEN (22/6 41), who found the following data for the character of the water:

Cl′	170 mg/l.
Hardness (D. H.)	32
pH actual	7.4
Min.	6.8
Max.	8.9

The water must be characterised as alkaline hard water with a comparatively high content of chloride.

The spectrum suffers from the defect that there appears a small form of *Navicula* (resembling *N. cryptocephala*) which does not seem to agree with any of the described forms of this species[1]. Consequently no information as to its place in the Halobion system can be gathered from the literature; but judging from its occurrence in my samples it seems probable that it is somewhat halophilous, though highly euryhaline. As in the samples from the peatbogs near Lille Lyngby the mesohalobous *N. halophila* occurs here too (4.6 %).

Table 37.
Peatbog by Ullerup Forest near Hundested. 22/5 41.
Leg. SIG. OLSEN.

	Number of individuals	%	
Achnanthes minutissima v. cryptoceph.	83	21.4	indifferent
Anomoeoneis exilis	9	2.3	indiff.
Cyclotella Meneghiniana	+	—	halophilous
Cymbella Cesatii?	3	0.8	?
— cymbiformis	5	1.2	indiff.
— microcephala	67	17.2	indiff.
— parva	2	0.5	indiff.
Diatoma elongatum	13	3.3	halophilous
Epithemia argus	20	5.6	indiff.
Gomphonema intricatum	37	9.5	indiff.
— — v. pumila	53	13.5	indiff.
Navicula cryptocephala f. minuta	69	17.7	?
— halophila	18	4.6	mesohalobous
— radiosa	4	1.0	indiff.
Rhopalodia gibba	1	0.2	indiff.
Synedra Acus	4	1.0	indiff.
— Ulna	1	0.2	indiff.
	389	100.0	

[1] Described as *N. cryptocephala* var. *intermedia* f. *minuta* n. f.

Table 38.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	0	0.0
	indifferent	12	73.6
	halophilous	2	3.3
Mesohalobous		1	4.6
?		2	18.5
	Total	17	100.0

Well No. 629 at Reinsbjerg near Lejre $^{21}/_{4}$ 41.

This is an artesian well sunk by the Copenhagen Water Works by boring on the $^{9}/_{9}$—$^{4}/_{10}$ 1933. Its situation is at the bottom of a valley 1.31 m. above the level of the sea. When it was sunk a layer of mud containing seashells was traversed to a depth of 6.8 m, then various ice age strata down to green sand at a depth of 37.2—51.5 m. Lime with flint was met with here down to a depth of 55.2 m. The superimposed layer must be supposed to be a strand formation from the stone age, that is to say, elevated sea bottom, and it might therefore be anticipated that marine Diatoms were to be found in the mud of the well. This was not the case to any great extent, however, but there occurred a number of more or less demolished frustules of *Campylodiscus echeneis;* no entire shells of this species seemed to be present, so it must be presumed that it does not at the present day live on the spot.

The well was examined in April 1941. The bottom of the valley had been under water in the winter of 1940—41, but at the time of examination the water had sunk and there was now a small basin into which the water from a tube ran. From the basin a rill (c. 2 dm. wide) ran for 3—4 m. to a hole where the water disappeared into a drain-pipe. The temperature of the water in the emerging jet was 9° C.; it was ascertained, by Mr. Pape after the boring that it contained 3000 mg/l. Cl′, and it has therefore a distinctly salt taste.

Four samples in all were taken from the basin of the well and the rill, and the Diatoms in these determined. The number of species proved to be rather small, whereas some species were developed in very great number. Halobion spectra were made for all four samples. The dominant form in them all agrees closely with *Navicula cincta* f. *minuta* in Van Heurck Types Nr. 83. As to the place of this form in the Halobion system no information is available; I presume that it is halophilous just like the species (see p. 79). Subject to this supposition the halophilous species will show marked dominance (80.7—99.3 %), the indifferent species being sparsely represented (0.7—19.3 %). Only 2 mesohalobous species were present, viz. *Diploneis didyma* and *D. interrupta*. Only the latter was found in so great a number that it could be included in one of the spectra (sample 3) as 0.5 % of the total number. No halophobous species were present in any of the samples.

According to the scale in Budde (1931) this water would be referable to the boundary between the Oligohalobia and the β-Mesohalobia, and this agrees well with the 3000 mg Cl′/l. which were found.

For comparison we may also quote Krasske (1933), who examined the Diatom vegetation in "Drei Quellen" in Erfurt containing 1604—2248 mg. NaCl per l. or about 972—1356 mg Cl′ per l. Krasske has given lists of species, stating the frequency of the individual species in the various samples. Converting the frequencies into figures according to Kolbe, I have tried to set up Halobion spectra for the individual samples. It turns out that the spectra are almost the same for all the samples, so I shall only give one, that for sample 6. The species in this were:

	Number of species	%
halophobous	0	0.0
indifferent	23	54.9
halophilous	15	24.3
mesohalobous	13	20.8
	51	100.0

This spectrum differs from that from Lejre by the great number of indifferent and mesohalobous individuals. Hence despite the lower chloride content, the springs at Erfurt have a higher percentage of Mesohalobes than the spring at Lejre, but on the other hand the number of indifferent species is also far higher. Apart from the fact that no conclusive comparison can be drawn between the spectra since they are calculated in different ways, it is nevertheless probable that the results from the springs at Erfurt would have turned out to be much the same had my method of counting been adopted, and the question then arises what the cause of the disparity in the spectra may be. It is possible that the chemical composition of the water in other respects, which is unknown for both springs, may be the cause. But the disparity might also be due to the fact that, while the springs at Erfurt are ancient natural springs, the spring at Lejre has been produced artificially a few years ago. When the water began to flow, there were presumably in the place a number of Diatoms of the kind usually found in freshwater, the greater part indifferent and some halophilous. These were the species now present, which thrive best in very salt water, while many of the indifferent species died off. Even if mesohalobous species might grow excellently in the water, it may be conceived that they have not appeared yet. The circumstance that the well and its surroundings have been under water in the winter may also have contributed to destroy the mesohalobous species. It is only natural then that the halophilous forms which will tolerate the freshwater in the winter just as well as the salt water of the well, should have gained the ascendancy.

Table 39.

Well 629, sample 1. 24/4 41.

	Number of individuals	%	
Diploneis interrupta	+	—	meso-euhalob.
Hantzschia amphioxys	+	—	indiff.
Navicula cincta	+	—	halophilous
— — f. minuta	281	93.6	halophilous
— cryptocephala	1	0.4	indiff.
— Gregaria	13	4.3	halophilous
— viridula	1	0.4	indiff.
Nitzschia amphibia	+	—	indiff.
— commutata	3	1.0	halophilous
Pinnularia appendiculata v. budensis	+	—	mesohalobous
Surirella ovata	1	0.3	indiff.
	300	100.0	

Table 40.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	0	0.0
	indifferent	5	1.1
	halophilous	4	98.9
Mesohalobous		2	0.0
	Total	11	100.0

Table 41.
Well 629, sample 2. 21/4 41.

	Number of individuals	%	
Anomoeoneis sphærophora	+	—	halophilous
Diploneis didyma	+	—	mesohalobous
— interrupta	1	2.2	mesohalobous
Hantzschia amphioxys	2	4.5	indifferent
Navicula cincta f. minuta	36	80.0	halophilous
— Gregaria	4	8.9	halophilous
— rhynchocephala	+	—	indiff.
— viridula	1	2.2	indiff.
Nitzschia commutata	+	—	halophilous
Pinnularia microstauron	+	—	indiff.
Surirella ovata	+	—	indiff.
Synedra Ulna f.	1	2.2	?
	45	100.0	

Table 42.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	0	0.0
	indifferent	5	6.7
	halophilous	4	88.9
Mesohalobous		2	2.2
?		1	2.2
	Total	12	100.0

Table 43.
Well 629, sample 3 21/4 41.

	Number of individuals	%	
Diploneis interrupta	1	0.5	mesohalobous
Hantzschia amphioxys	2	1.0	indifferent
Navicula cincta	1	0.5	halophilous
— — f. minuta	175	83.5	halophilous
— cryptocephala v. veneta	1	0.5	indiff.
— Gregaria	1	0.5	halophilous
— rhynchocephala	+	—	indiff.
— viridula	15	7.2	indiff.
Nitzschia commutata	10	4.8	halophilous
Pinnularia microstauron	2	1.0	indiff.
Surirella ovata	1	0.5	indiff.
	209	100.0	

Table 44.
Spectrum.

	Number of forms	% of individuals
Oligohalobous halophobous	0	0.0
Oligohalobous indifferent	5	10.2
Oligohalobous halophilous	5	89.3
Mesohalobous	1	0.5
Total	11	100.0

Table 45.
Well 629, sample 4. 21/4 41.

	Number of individuals	%	
Diploneis interrupta	+	—	mesohalobous
Navicula cincta f. minuta	147	76.5	halophilous
— Gregaria	2	1.0	halophilous
— integra	1	0.6	halophilous
— rhynchocephala	1	0.6	indifferent
— viridula	17	8.8	indiff.
Nitzschia commutata	5	2.6	halophilous
Pinnularia microstauron	6	3.1	indiff.
Surirella ovata	13	6.8	indiff.
	192	100.0	

Table 46.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	0	0.0
	indifferent	4	19.3
	halophilous	4	80.7
Mesohalobous		1	0.0
	Total	9	100.0

Spring moor in Hammer Bakker.

The algal vegetation in this little spring moor, situated at the upper end of the so-called long valley of the preserved area of Hammer Bakker, has been described by BOYE PETERSEN (1932, p. 13), and already then I called attention to the remarkably large number of halophobous species of Diatoms as well as to the occurrence of 12 species of *Desmidiaceae*. From a Halobion spectrum erected on the basis of a preparation of Diatoms from withered leaves on the mud between the mounds in the spring moor (9/8 1928) it appears that the halophobous and the indifferent species constitute more than 90%, while there are only 2.0% of halophilous species. But notably it is remarkable that the Halophobes constituted 45.6%; it must be inferred, then, that the water is very poor in chlorides.

Table 47.
Hammer Bakker, spring moor; on withered leaves on mud between mounds. 9/8 1928.

	Number of individuals	%	
Cymbella gracilis	+	—	halophobous
— ventricosa	4	4.0	indifferent
Diploneis ovalis v. oblongella	+	—	indiff.
Eunotia gracilis	8	8.1	halophobous
— lunaris	1	1.0	halophobous
— pectinalis v. impressa	3	3.1	halophobous
— tenella	3	3.1	halophobous

(continued)

Table 47 (continued).

	Number of indu-viduals	%	
Gomphonema gracile v. naviculaceum	15	15.2	indiff.
— parvulum	+	—	indiff.
— subclavatum	2	2.0	halophilous
Navicula cocconeiformis	7	7.1	halophobous
— cryptocephala v. veneta	4	4.0	indiff.
— Placenta	1	1.0	indiff.
— variostriata	2	2.0	halophobous
Neidium affine v. amphirhynchus	1	1.0	halophobous
Nitzschia communis	5	5.1	indiff.
— debilis	2	2.0	indiff.
— thermalis v. intermedia	7	7.1	indiff.
— vermicularis v. terrestris	2	2.0	?
Pinnularia acrosphæria	1	1.0	indiff.
— divergens v. elliptica	+	—	?
— nodosa v. formica	+	—	halophobous
— subcapitata	1	1.0	indiff.
— viridis	3	3.0	indiff.
— sp.	3	3.0	?
Rhopalodia gibberula v. producta	3	3.0	indiff.
Surirella constricta	+	—	indiff.
— linearis	1	1.0	indiff.
Tabellaria flocculosa	20	20.2	halophobous
	99	100.0	

Table 48.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	10	45.6
	indifferent	15	47.4
	halophilous	1	2.0
?		3	5.0
	Total	29	100.0

Langemose at Ullerslev (Fyen).

The vegetation and topographical conditions of the bog have been described by SVEND ANDERSEN (1930). It is a very long-drawn bog harbouring in certain areas various halophytes among

Table 49.

Langemose at Ullerslev. Bottom material. Aug. 1930.
Leg. GRAVERSEN.

	Number of individuals	%	
Achnanthes minutissima v. cryptoc. . .	72	17.0	indifferent
Amphipleura pellucida	+	—	indiff.
Amphiprora paludosa	+	—	mesohalobous
Amphora coffæiformis	2	0.5	mesohalobous
— — v. acutiuscula . .	2	0.5	mesohalobous
— commutata	1	0.2	mesohalobous
— Normannii	+	—	halophobous
— ovalis	14	3.3	indiff.
— veneta	+	—	indiff.
Anomoeoneis sphærophora	+	—	halophilous
— exilis	+	—	indiff.
Caloneis amphisbæna v. subsalina	+	—	mesohalobous
— bacillum	1	0.2	indiff.
— Silicula	1	0.2	indiff.
— — v. truncatula	1	0.2	indiff.
Cocconeis placentula	2	0.5	indiff.
Cyclotella Meneghiniana	1	0.2	halophilous
Cymatopleura solea	+	—	indiff.
Cymbella æqualis	2	0.5	indiff.
— Cistula	1	0.2	indiff.
— obtusiuscula	2	0.5	?
— lanceolata	+	—	indiff.
— microcephala	2	0.5	indiff.
— parva	+	—	indiff.
Denticula tenuis	1	0.2	?
Diatoma elongatum	8	1.9	halophilous
Diploneis elliptica	2	0.5	indiff.
— interrupta	3	0.7	mesohalobous
— oculata	1	0.2	indiff.
— ovalis	7	1.7	indiff.
— pseudovalis	1	0.2	mesohalobous
Epithemia Argus	1	0.2	indiff.
Fragilaria brevistriata	32	7.6	indiff.
— construens v. venter	156	36.5	indiff.
— pinnata	3	0.7	indiff.
Gomphonema bohemicum	1	0.2	?
— constrictum	1	0.2	indiff.
— intricatum	19	4.4	indiff.
— olivac. v. subramosum .	1	0.2	indiff.
Gyrosigma acuminatum	2	0.5	indiff.
Hantzschia elongata	+	—	indiff.
Mastogloia Smithii	+	—	indiff.
— — v. lacustris	3	0.7	indiff.

(continued)

Table 49 (continued).

	Number of individuals	%	
Navicula cincta	+	—	halophilous
— cryptocephala v. intermedia	3	0.7	indifferent
— — var?	1	0.2	indiff.?
— dicephala	+	—	indiff.
— elegans	+	—	euhalobous
— Falaisensis	10	2.3	?
— Gregaria	+	—	halophilous
— halophila	4	0.9	mesohalobous
— — v. subcapitata	3	0.9	mesohalobous
— hungarica	15	3.5	halophilous
— oblonga	1	0.2	indiff.
— pupula	1	0.2	indiff.
— pygmæa	1	0.2	mesohalobous
— peregrina	4	0.9	mesohalobous
— radiosa	1	0.2	indiff.
— rhynchocephala	10	2.3	indiff.
— salinarum	1	0.2	mesohalobous
— viridula	3	0.7	indiff.
Neidium affine v. amphirhynchus	+	—	halophobous
— Iridis v. ampliata	1	0.2	halophobous
Nitzschia amphibia	5	1.2	indiff.
— communis	2	0.5	indiff.
— debilis	1	0.2	indiff.
— Denticula	+	—	indiff.
— hungarica	1	0.2	mesohalobous
— palea	1	0.3	indiff.
— Sigma	5	1.2	mesohalobous
— sigmoidea	+	—	indiff.
— sinuata	+	—	indiff.
— vitrea	+	—	mesohalobous
Pinnularia viridis	+	—	indiff.
Rhoicosphenia curvata	+	—	indiff.
Rhopalodia gibba	+	—	indiff.
— musculus	+	—	mesohalobous
Stauroneis legumen	1	0.3	indiff.
— producta	1	0.3	halophilous
— Smithii	+	—	indiff.
Surirella Moelleriana	+	—	halophilous
— ovata	+	—	indiff.
Synedra acus	1	0.2	indiff.
— pulchella	1	0.3	mesohalobous
— tabulata	1	0.3	halophilous
— ulna	2	0.5	indiff.
— — v. biceps	+	—	indiff.

Table 50.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	3	0.2
	indifferent	53	83.7
	halophilous	9	6.2
Mesohalobous		17	6.7
Euhalobous		1	0.0
?		4	3.2
	Total	87	100.0

the phanerogams. Their occurrence is supposed to be due to the presence of saltish groundwater which wells forth in certain places. Johs. Andersen and Ødum (1930) have mentioned the same locality (p. 74) and have had the water from the various parts of the bog analysed for *sodium chloride.* They found that the amount of this substance was rather variable, the values mentioned are from 0.26 to 0.77 ‰ NaCl (=160—470 mg. Cl′/l.), but it is intimated that the values are most probably too low, the samples having been collected after a heavy rain by which the water must be supposed to have received a rather large admixture of freshwater. Mr. Graversen collected Diatom material from the bog for me in August 1930. He took two samples, partly of mud from the bottom, partly of *Chara*, both samples being from Sv. Andersen's upper area of the bog, but from different places there. The *Chara* was identified by Dr. Johs. Iversen as a typical *Chara hispida.* A single specimen was, however, somewhat different and corresponded most nearly to *Ch. hispida* f. *longifolia* A. Br. A lot of epiphytic Diatoms were found on the *Chara.*

Part of each of the two samples was purified with sulphuric acid and potassium bichromate and from this styrax preparations were made. In the bottom mud a total of 87 forms was found, and 28 forms on the *Chara.*

The spectra for the two samples differ somewhat, that for the *Chara* showing a higher percentage of halophilous forms, whereas the bottom mud has the higher percentage of Mesohalobes; but both of them have thus a distinct contingent of brackish water forms.

If these spectra are compared with spectra from localities with a known chloride content, it turns out that they correspond most nearly to a salinity such as the lowest of the values found by ANDERSEN and ØDUM.

Table 51.
Langemose at Ullerslev, Aug. 1930. Leg. GRAVERSEN.
From Chara.

	Number of individuals	%	
Achnanthes minutissima v. cryptoc....	107	30.2	indifferent
Amphora coffæiformis	2	0.6	mesohalobous
— Normannii	1	0.2	halophobous
— ovalis	1	0.2	indiff.
Anomoeoneis exilis	39	11.0	indiff.
Cyclotella Meneghiniana	1	0.3	halophilous
Cymbella Cesatii	7	2.0	?
— cistula	+	—	indiff.
— cymbiformis	1	0.3	indiff.
— microcephala	38	10.7	indiff.
— parva	2	0.6	indiff.
Diatoma elongatum	39	11.0	halophilous
Eunotia Arcus	9	2.5	halophobous
Fragilaria brevistriata	+	—	indiff.
— capucina	2	0.6	halophobous
— crotonensis	1	0.3	indiff.
Gomphonema constrictum	+	—	indiff.
— intricatum	42	11.8	indiff.
— parvulum	1	0.3	indiff.
Navicula cincta	2	0.6	halophilous
— Gregaria	4	1.1	halophilous
— halophila	9	2.5	mesohalobous
— peregrina	1	0.3	mesohalobous
— viridula	+	—	indiff.
Nitzschia capitellata	7	2.0	halophilous
— palea	9	2.5	indiff.
Synedra Acus v. angust.	25	7.0	indiff.
— Ulna	5	1.4	indiff.
	355	100.0	

Table 52.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	3	3.3
	indifferent	16	76.3
	halophilous	5	15.0
Mesohalobous		3	3.4
?		1	2.0
	Total	28	100.0

Watering Trough for Camels, east gate of Kairouan.

The sample was collected in N. Africa by Professor C. RAUNKJÆR on the 22/2 1910. It consists of an *Oedogonium* sp. (sterile) with a number of Diatoms. The preparation is made of non-purified material and only contains 9 forms, one of which is very dominant, viz. *Synedra pulchella* (85%), which is generally classified as a Mesohalobe. KOLBE and TIEGS (1929) regard it as one of the most constant species in saliferous inland lakes. Indifferent species are very sparse and halophobous ones entirely absent. The obvious inference is that the water must have been of rather high salinity; but I shall refrain from any further comments hereon; these must be postponed till the future when it is better known what degree of salinity *Synedra pulchella* requires to develop vigorously. HUSTEDT (1939) regards it as fairly euryhaline.

Table 53.
Camels' watering trough, east gate, Kairouan. 22/2 1910.
Leg. C. RAUNKJÆR.

	Number of individuals	%	
Amphora coffæiformis	2	1.2	mesohalobous
— veneta	+	—	indifferent
Navicula cryptocephala v. veneta	3	1.8	indiff.
— hungarica	6	3.6	halophilous
Nitzschia fonticola	12	7.2	indiff.
— hungarica	2	1.2	mesohalobous
— palea	+	—	indiff.
Synedra tabulata	+	—	halophilous
— pulchella	140	85.0	mesohalobous
	165	100.0	

Table 54.
Spectrum.

		Number of forms	% of individuals
Oligohalobous	halophobous	0	0.0
	indifferent	4	9.0
	halophilous	2	3.6
Mesohalobous		3	87.4
	Total	9	100.0

General Remarks.

In some cases I have drawn up more than one spectrum for the water body in question, thus for Sct. Jørgens Lake, Dybe Lake, Nors Lake, Langemose, and Well No. 629. For each locality the spectra showed very good agreement despite the fact that the number of species in the samples often differed much, just as the composition of the flora frequently varied a good deal. This shows that the Halobion spectrum for a body of water is not something fortuitous but bears a relation to the character of the water.

As already mentioned at p. 7, the localities in which the chloride content of the water is known fall into two groups, 1) lakes and the like, and 2) bogs. These may again be divided into two subgroups a) bogs with acid water, poor in lime (Lyngby Mose, Bøllemose), and b) bogs with alkaline water more or less rich in lime. In Denmark we have, in addition, an important type of lake with acid water poor in lime; of such I have had no samples or analyses at my disposal.

The acid bogs occupy a special position by the fact that the spectra almost exclusively show halophobous forms (99—100 %), whereas the spectra of the alkaline bogs are more like those of the lakes. I have, however, preferred to tabulate separately the spectra from the lakes and the bogs since it turned out that the results in the two groups did not quite agree. The reason why this is so is presumably that, even though the chloride content, degree of acidity, and hardness of the water in the two kinds of localities are much the same, the water is nevertheless very different, seeing that the lake water does not contain humous substances in any appreciable amount, while such are present in abundance in the water of the bogs.

In both groups (Tables 55 and 56) it is seen that when there is more than 100 mg. Cl′ per litre, this is distinctly visible in the Halobion spectrum. As far as the bogs are concerned this appears less distinctly, amongst other reasons on account of the insufficiency of the material. If the lakes are considered separately, (Table 55), it turns out that up to about 100 mg. Cl′ per litre the indifferent forms constitute 80—95 %, but above this limit their number drops to 56—70 %, while halophilous and mesohalobous species increase correspondingly in number.

This agrees closely with REDEKE's (1922) division of waters according to their salinity, for he puts the lowest limit for oligohaline water at 100 mg. Cl′ per litre. He has arrived at this result by considering entirely different organisms from those treated here, namely plankton forms and animals, hence it is worth noting that in dealing with the Diatoms we arrive at almost the same limit, which may therefore be supposed to be a real biological limit.

This is somewhat in opposition to several other authors who hold that a far higher content of chloride is required for the water to be classed as brackish water. Thus KOLBE (1927), who has not investigated waters with less than 500 mg. Cl′/l., and the same applies to BUDDE (1930, 1931).

That the threshold for the effect of the chloride factor lies at approximately 100 mg. Cl′/l. seems to me to appear distinctly from the spectra.

If now we consider the spectra for waters below the limit indicated above, it will appear quite plainly that here other factors than the chloride content determine the character of the spectrum. On comparing the spectrum from Bøllemose (with 22 mg. Cl′/l.) with that from Bure Lake (with 22 mg. Cl′/l.), it will be seen that the halophobous species are absolutely dominant in Bøllemose, while only 6 % of the Diatoms in Bure Lake are halophobous. This disparity cannot be due to a difference in the chloride content of the water; more probably it is caused by the fact that the water in Bøllemose has pH 3.7—3.8, while that of Bure Lake has pH 7.2—8.2, or that the water in Bølle-

Table 55.

Lakes and similar localities	Cl′ mg/l.	Hardness (D. H.)	pH			Oligohalobous			Mesohalobous	Euhalobous	?	No. of species	Individuals counted
			Min.	actual	Max.	halo-phobous	indifferent	halo-philous					
Magle Lake	16	8.5	6.4	7.5	7.5	1.0	89.9	0.0	0.0	0.0	9.1	34	296
Gurre Lake	19	5.2	6.2	7.4	8.8	2.7	88.0	0.0	1.3	0.0	8.0	30	150
Fure Lake	20	7.0	6.8	8.2	8.6	0.0	88.8	0.0	0.0	0.0	11.2	44	204
Bure Lake	22	7.0	7.2	8.2	8.2	0.6	91.0	0.6	0.0	0.0	7.8	55	335
Sct. Jørgens Lake, bottom mud	35	16.0	?	?	?	1.5	93.8	1.6	0.0	0.0	3.1	42	64
— — — epiphyte vegetation	—	—	—	—	—	1.6	91.0	0.0	0.0	0.0	7.4	21	190
Dybe Lake, scrapings off stones	35	9.5	6.6	8.0	8.4	1.3	95.6	0.3	0.9	0.0	1.9	46	313
— — on sand	—	—	—	—	—	2.9	93.6	0.4	0.2	0.0	2.9	46	449
Nors Lake, scrapings off lime	42	6.6	6.8	7.29	8.7	0.0	97.3	0.9	0.0	0.0	1.8	35	217
— — , scrapings off granite	—	—	—	—	—	0.0	84.7	0.0	0.0	0.0	15.3	39	136
Amager Fælled, pool	97	17.8	6.8	7.4	8.2	0.0	60.1	1.0	34.7	0.0	4.2	18	95
— — , ditch	130	19.5	6.7	7.5	9.0	0.0	62.6	27.8	7.9	0.0	1.7	27	177
Flynder Lake, scrapings	590	9.0	7.2	7.6	8.6	0.0	56.1	26.1	12.3	0.0	5.5	34	420
Præstø Fjord	4-6000	?	7.2	?	8.08	0.0	66.8	6.0	12.4	15.1	0.0	26	132

Table 56.

Bogs	Cl′ mg/l.	Hardness (D. H.)	pH			Oligohalobous			Mesohalobous	Euhalobous	?	No. of species	Individuals counted
			Min.	actual	Max.	halo-phobous	indifferent	halo-philous					
Lyngby Mose	6	1.6	3.6	3.6	6.0	100.0	0.0	0.0	0.0	0.0	0.0	6	78
Bøllemosen	22	2.5	3.7	3.7	3.8	99.1	0.0	0.0	0.0	0.0	0.9	9	349
Peatbog I, Ll. Lyngby	114	17.2	6.6	8.6	9.0	1.0	81.5	4.7	4.3	0.0	8.5	31	604
— II, — —	124	16.5	6.6	8.3	8.6	0.0	72.9	23.0	0.6	0.0	3.5	26	313
— , Ullerup forest	170	32.0	6.8	7.4	8.9	0.0	73.6	3.3	4.6	0.0	18.5	17	389
Other localities													
Langemose at Ullerup	?	?	?	?	?	0.2	83.7	6.2	6.7	0.0	3.2	87	422
— - — (from *Chara*)	?	?	?	?	?	3.3	76.3	15.0	3.4	0.0	2.0	28	355
Well 629, sample 1	3000?	?	?	?	?	0.0	1.1	98.9	0.0	0.0	0.0	11	300
— —, — 2	—	?	?	?	?	0.0	6.7	88.9	2.2	0.0	2.2	12	45
— —, — 3	—	?	?	?	?	0.0	9.7	89.8	0.5	0.0	0.0	11	209
— —, — 4	—	?	?	?	?	0.0	19.3	80.7	0.0	0.0	0.0	9	192
Camels' watering trough, Kairouan	?	?	?	?	?	0.0	9.0	3.6	87.4	0.0	0.0	9	165
Hammer Bakker, spring moor	?	?	?	?	?	45.6	47.4	2.0	0.0	0.0	5.0	29	99

mose has a hardness of 2.5, but that of Bure Lake has 7.0. The lime content and the degree of acidity are to a certain extent interdependent quantities. Whether the species in Bøllemose should be called calciphobous or acidophilous in contrast with the normal freshwater species must be left open.

If, on the other hand, we compare the samples from Peatbogs I and II (Ll. Lyngby) and the peatbog at Ullerup Forest with the two almost similar ones, as far as the chloride content is concerned, derived from Amager Fælled, the spectra are in much better agreement. Here it is evident that the chloride factor has asserted itself.

The spectra for Magle Lake, Gurre Lake, Fure Lake, Bure Lake, Sct. Jørgens Lake, Dybe Lake, and Nors Lake resemble each other so much that no real difference can be held to exist between them, since the species whose place in the Halobion system is uncertain, could they be introduced into the spectrum, would do away with all differences. It is a natural inference, therefore, that in these lakes, where the chloride content ranges from 16 to 42 mg. Cl′ per litre, it is of no importance for the Diatom flora; other factors are of greater significance. In all these lakes the indifferent forms show great dominance, and in some of them there occurs a small percentage of halophobous and halophilous species, while Mesohalobes are practically absent.

If we pass from these to localities with a higher chloride content, such as Amager Fælled and Flynder Lake, with more than 100 mg. Cl′/l., it will be seen that halophobous forms do not occur at all. Halophilous forms are present in quantity, and Mesohalobes are represented by a distinct percentage. There is a difficulty here in keeping halophilous and mesohalobous species distinct. In one spectrum we find 34.7 % Mesohalobes but only 1 % halophilous species (pool, Am. Fælled); in another there are 27.8 % halophilous species and 7.8 % Mesohalobes (ditch, Am. Fælled), in spite of the fact that the two waters do not differ much in chloride content. The cause of these disparities is no doubt that several species are in reality on the border-line between halophilous and mesohalobous forms. Similar considerations apply to the samples from bogs.

Finally, euhalobous forms are represented in Præstø Fjord (15 %).

The material is not sufficient for an attempt to establish the limits of the chloride content in oligohalobous, mesohalobous, and euhalobous waters; but the method can presumably be used in future investigations with this object in view.

It is likewise probable that if several investigations of the same kind as this are made, it will be possible to introduce essential corrections in our conception of the place of the individual species in the Halobion system. In the present work I have almost entirely refrained from drawing such conclusions.

Summary.

1. It has proved possible, by using KOLBE's Halobion system in conjunction with the statistical method here described, to set up spectra that show fairly accurately the relation to the salinity of the water investigated.
2. From this it may be inferred that the generally accepted view of the place of the species in the Halobion system is on the whole correct, but with a reservation in the case of halophobous and halophilous-mesohalobous species.
3. The spectra set up would seem to show that the threshold for the influence of the chloride factor on the composition of the Diatom flora lies at about 100 mg. Cl′/l.
4. It will presumably be possible in future to draw fairly far-reaching conclusions as to the salinity of the water from a Halobion spectrum.

List of the Species Found.

With Remarks on the Place in the Halobion System.

Achnanthes brevipes Ag. Præstø Fjord (small number). KOLBE (1927) regards it as euhalobous, HUSTEDT (1939) as mesohalobous, euryhaline.

Euhalobous.

— *Clevei* Grun. Nors Lake (2.9 %), Fure Lake (1.0 %), and in Sct. Jørgens Lake and Magle Lake in small number, i. e. in lakes with at most 42 mg. Cl′/l. KOLBE (1927) and HUSTEDT (1938, 1939) regard the species as indifferent; SCHULZ (1928) takes it to be at least halophilous, more probably mesohalobous. My observations do not indicate that it is halophilous; I must therefore at present regard it as: Indifferent.

Achnanthes Clevei Grun. v. *rostrata*. Only found in a few specimens in Fure Lake; not referred to the Halobion system in the literature. Indifferent?

— *conspicua* A. Mayer. Found in small number in Bure Lake. Not referred to the Halobion system in the literature. ?

— *exigua* Grun. In Fure Lake and Bure Lake in small number. All authors agree in classing it as: Indifferent.

— *Hauckiana* Grun. According to SCHULZ (1928) and HUSTEDT (1939) the species is mesohalobous; in my material it does not occur in water with less than 130 mg. Cl′/l.: Præstø Fjord (3.0 %), Am. Fælled, ditch (7.4 %). Mesohalobous.

— *lanceolata* (Bréb.) Grun. Occurred in lakes with between 19 and 130 mg. Cl′/l., but only numerous (12.4 %) at the latter value (Am. Fælled, ditch). Further in bogs with 114 to 124 mg. Cl′/l. Regarded by KOLBE (1927) and HUSTEDT (1938) as indifferent and euryhaline; HUSTEDT states that it is most frequent in running water. HUSTEDT (1929) mentions it as mesohalobous and euryhaline. According to my material the species might seem to be somewhat halophilous, but highly euryhaline. For the present I will, however, regard it as: Indifferent.

— *linearis* W. Sm. Of the place of this species in the Halobion system no definite opinion is expressed in the literature. I have found it in water containing from 19—124 mg. Cl′/l., both in lakes and bogs, but only in great quantity at the lowest chloride content (Gurre Lake 21.4 %). It must therefore be regarded as oligohalobous and presumably most nearly Indifferent?

Achnanthes longipes Ag. Only found in Præstø Fjord in small number. According to Hustedt (1939) it is euhalobous. Euhalobous.

— *minutissima* Kütz. var. *cryptocephala* Grun. Species very common in the lake samples, occurs in them all, and in Dybe Lake constitutes more than 50 % of the Diatoms present. Likewise common in the samples from bogs with slightly acid-alkaline water, whereas it has not been seen in the highly acid bog localities. Distinctly indifferent and euryhaline. Kolbe (1927), Schulz (1928), and Hustedt (1938) all regard this form as oligohalobous. Indifferent.

— *Østrupii* (A. Cl.) Hustedt. Only observed in Magle Lake (2.4 %). Hustedt (1939) oligohalobous, indifferent. Indifferent.

Amphipleura pellucida Kütz. According to Kolbe (1927) and Hustedt (1939) oligohalobous, indifferent. Only observed in few specimens in Sct. Jørgens Lake and Langemose. Indifferent.

Amphiprora paludosa W. Sm. Only found in few specimens in Langemose. According to Kolbe (1927) mesohalobous and according to Hustedt (1939) also euryhaline. Mesohalobous.

Amphora coffæiformis Ag. All authors agree in classing the species as mesohalobous; but Hustedt (1938, 1939) adds that it is euryhaline, while Legler and Krasske (1940) regard it as stenohaline. In my material, forms which I have referred to this species occurred in Gurre Lake, Dybe Lake, Flynder Lake and Præstø Fjord, i. e. in water with from 19—6000 mg. Cl′/l. However, it is evident that deviating forms occur, which may also differ ecologically from the typical form. This will perhaps explain the above-mentioned disagreement among the authors as to whether it is steno- or euryhaline. Mesohalobous.

Amphora coffæiformis v. *acutiuscula* (Kütz). Only observed in Langemose in small number. KOLBE (1927): Mesohalobous.

— *commutata* Grun. Observed in Flynder Lake and Langemose in small numbers. According to KOLBE (1927) and HUSTEDT (1939) mesohalobous. Mesohalobous.

— *Normannii* Rabh. Only observed in Langemose in small number. According to HUSTEDT (1938) halophobous and aërophilous. Halophobous.

— *ovalis* Kütz. According to KOLBE (1927), SCHULZ (1928), and HUSTEDT (1938, 1939) the species is oligohalobous, and SCHULZ also terms it indifferent. I have found it, though in small quantity, in all lakes with between 19 and 590 mg. Cl′/l., also in two of the non-acid bogs. Evidently rather euryhaline. Indifferent.

— — v. *pediculus* Kütz. KOLBE (1927) and HUSTEDT (1939) tabulate this variety as oligohalobous; SCHULZ (1928) is doubtful whether to regard it as indifferent or halophilous. In fairly large numbers I have it from Nors Lake (23.5 °/o), Sct. Jørgens Lake (14.0 °/o), and Bure Lake (20,6 °/o), also in smaller number from Magle Lake, Fure Lake and Dybe Lake, as well as from Peatbog II, Ll. Lyngby (0.6 °/o). This does not seem to indicate that it is halophilous, so I class it as Indifferent.

— *veneta* Kütz. Found in small number in Langemose and a watering trough for camels in Kairouan. KOLBE (1927) regards it as indifferent and euryhaline, while BUDDE (1932) classes it as a doubtful Mesohalobe and highly euryhaline. It will therefore be best for the present to regard it as Indifferent.

Anomoeoneis exilis (Kütz.) Cl. HUSTEDT (1938): oligohalobous, prefers alkaline water. Found in small number in a peatbog at Ullerup (2.3 °/o), but in greater number in one of the samples from Langemose (11 °/o). Presumably: Indifferent.

Anomoeoneis sphærophora (Kütz.) Pfitzer. All authors agree in regarding the species as halophilous. Found in rather a small number (4.0 and 1.0 %) in the samples from Amager Fælled (97—130 mg. Cl'/l.), as well as in Well No. 629 and in Langemose, that is to say, all in all in distinctly saliferous localities. Halophilous.

Asterionella formosa Hass. This pronounced plankton species was found in Bure Lake and Fure Lake in small quantity. HUSTEDT (1939): oligohalobous. Presumably: Indifferent.

Caloneis amphisbaena (Bory) Cl. v. *subsalina* (Donk.) Cl. Occurred in small numbers in Langemose. According to SCHULZ (1928) and HUSTEDT (1939) it must be classed as: Mesohalobous.

— *bacillum* (Grun.) Mereschk. Occurred in small number in Nors Lake and Langemose. Regarded by HUSTEDT (1939) as oligohalobous and is presumably: Indifferent.

— *silicula* (Ehrb.) Cl. Occurred in small number in a ditch on Amager Fælled and in Langemose. All authors consider the species oligohalobous; only KOLBE (1927) suggests that it may be slightly halophilous. For the present it is best to regard it as: Indifferent.

— — v. *truncatula* (Grun.) Cl. Occurred in small quantity in Dybe Lake and Langemose. Regarded by KOLBE (1927) and HUSTEDT (1939) as oligohalobous like the species and is then presumably: Indifferent.

Campylodiscus Echeneis Ehrb. Only occurred in Præstø Fjord. The species is a pure saltwater form and must therefore be regarded as Euhalobous.

— *noricus* Ehrb. v. *hibernicus* (Ehrb.) Grun. Found in the bottom mud of Sct. Jørgens Lake in appreciable numbers (3.1 %). Regarded by KOLBE (1927) and HUSTEDT (1939) as oligohalobous and is probably: Indifferent.

Cocconeis pediculus Ehrb. This species which I have found in the sample from Præstø Fjord and from Fure Lake is classed by BUDDE (1930) and SCHULZ (1928) as halophilous, while KOLBE (1927) only regards it as euryhaline. HUSTEDT (1939) also considers it euryhaline, perhaps somewhat halophilous. For the present I will regard it as: Indifferent.

— *placentula* Ehrb. Occurred in all the lakes but not in the acid bogs. The highest percentage was found in Præstø Fjord (20.5 %), and in Gurre Lake (10.7 %). All authors agree that the species is indifferent. HUSTEDT (1938) notes that it avoids waters with a low pH. This applies to my samples also, where it proves to be highly euryhaline. Indifferent.

— — v. *euglypta* (Ehrb.) Cleve. Occurred in small number in Bure Lake and Magle Lake. KOLBE (1927) regards it as ecologically identical with the species. Indifferent.

— *scutellum* Ehrb. Occurred in Præstø Fjord only (8.3 %). According to HUSTEDT (1939) meso-euhalobous, highly euryhaline. It is essentially a marine species and I will therefore for the present regard it as: Euhalobous.

— — v. *parva* Grun. Only observed in small number in Præstø Fjord. Both KOLBE (1927) and HUSTEDT (1938) regard v. *parva* as verging between euhalobous and mesohalobous. SCHULZ (1928) simply classes it as Mesohalobous.

Cyclotella comta (Ehrb.) Kütz. Plankton form from lakes and streams, of very common occurrence. In my samples it was found in all the lakes with at most 42 mg. Cl′/l., and in several of them in considerable numbers. (Sct. Jørgens Lake 47.9 %!). Regarded by KOLBE (1927) and HUSTEDT (1939) as oligohalobous, but there seems to be a low limit to how much Cl′ it will tolerate in order to thrive. For the present it must be tabulated as: Indifferent.

Cyclotella Kützingiana Thw. I have found no information in the literature about the place of the species in the Halobion system. According to HUSTEDT (1930) it especially develops in plenty in forest pools. The form which I have with some doubt referred to this species was found in small number in Bure Lake and Magle Lake (with less than 22 mg. Cl′/l.), which would seem to indicate that it is very sensitive to Cl′. Provisionally it may be regarded as Indifferent?

— *Meneghiniana* Kütz. Only occurred in small quantity in the samples with at least 97 mg. Cl′/l. (Præstø Fjord; Amager Fælled, ditch; peatbog at Ullerup and peatbogs I and II, as also in Langemose). Regarded by all authors as Halophilous.

— *stelligera* Cleve et Grun. Observed in small number in the bottom sample from Sct. Jørgens Lake. HUSTEDT (1939) says that it is an Oligohalobe, so for the present I class it as: Indifferent?

Cymatopleura elliptica (Bréb.) W. Sm. Occurred in small number in the samples from Dybe Lake. Regarded by KOLBE (1927) and HUSTEDT (1939) as oligohalobous, and I presume that it must be classed as: Indifferent.

— *solea* (Bréb.) W. Sm. Occurred in small numbers in Dybe Lake and Fure Lake as well as in Langemose. According to KOLBE (1927) the species is oligohalobous (euryhaline?) and according to HUSTEDT (1939) oligohalobous, indifferent. Hence I regard it as: Indifferent.

Cymbella æqualis Sm. Found only in Flynder Lake in any number worth mentioning (3.6 %). According to HUSTEDT (1929) oligohalobous, so for the present I class it as: Indifferent.

— *affinis* Kütz. Occurred in small number in the lakes containing at most 42 mg. Cl′/l., most frequently in Bure Lake (11.0 %) with 22 mg.

Cl'/l. HUSTEDT (1938) calls the species oligohalobous and points out that he has found it in quantity at pH 8.5. Most probably it is: Indifferent.

Cymbella Cesatii (Rabh.) Grun. In small amount (0.8 %) in the peatbog at Ullerup Forest. Place in the Halobion system ?

— *cistula* (Hempr.) Grun. This otherwise widespread species I have only found in Langemose. According to KOLBE (1927) and SCHULZ (1928) indifferent, while HUSTEDT (1938, 1939) calls it oligohalobous. Indifferent.

— — v. *maculata* (Kütz.) V. H. Found in small number in Gurre Lake and Langemose. The variety probably has the same ecological requirements as the species, so it is presumably: Indifferent.

— *cuspidata* Kütz. Only observed in Fure Lake in small number. According to all authors oligohalobous, and according to KOLBE (1927): Indifferent.

— *cymbiformis* (Ag.) V. H. Observed in rather small number in Sct. Jørgens Lake, the peatbog at Ullerup, and in Langemose. According to SCHULZ (1928) and HUSTEDT (1938, 1939) oligohalobous, so it is probably Indifferent.

— *Ehrenbergii* Kütz. Observed in small number only in Dybe Lake. According to KOLBE (1927) oligohalobous, in the table: Indifferent.

— *gracilis* Rabh. Only observed in the spring moor in Hammer Bakker, in small number. According to SCHULZ (1928) and HUSTEDT (1939): Halophobous.

— *helvetica* Kütz. Occurred in waters with from 42—114 mg. Cl'l., but everywhere in rather small number. Tabulated by HUSTEDT (1939) as oligohalobous; for the present, however, best regarded as Indifferent.

Cymbella lacustris (Ag.) Cleve. Only found in noteworthy quantity in Nors Lake (1.5—2.8 $^0/_0$). According to Cleve (Syn. I, p. 167) it has been found in freshwater as well as in slightly brackish water, which would seem to indicate that it is rather euryhaline. For the present I will class it as Indifferent.

— *lanceolata* (Ehrb.) V. H. Only seen in small number in the samples. Is probably: Indifferent.

— *leptoceros* (Ehrb.?) Grun. Only seen in Nors Lake in rather small quantity (1.7 $^0/_0$). According to Hustedt (1938) it is an oligohalobous littoral form, especially in stagnant waters with an alkaline reaction. Probably: Indifferent.

— *microcephala* Grun. It was one of the commonest species in my samples, and one of those that showed the highest percentage. Found in Magle Lake (17.6 $^0/_0$) as well as in Flynder Lake (1.2 $^0/_0$). It showed the highest percentage in one of the samples from Nors Lake (30.1 $^0/_0$). Also in a peatbog at Ullerup (17.2 $^0/_0$) and in Langemose. So it occurred in water with from 16—590 mg. Cl′/l. and thus proved highly euryhaline. According to Kolbe (1927) oligohalobous, in the table indifferent, and according to Hustedt (1938) oligohalobous, mainly occurring in alkaline waters. Indifferent.

— *obtusiuscula* (Kütz.) Grun. The place of the species in the Halobion system is only mentioned by Schulz (1928) as oligohalobous; in my material it is very scarce. ?

— *parva* (W. Sm.) Cl. According to Schulz (1928) and Hustedt (1939) oligohalobous. Found in Bure Lake, Dybe Lake, Nors Lake and Flynder Lake, that is to say, in water with 22—590 mg. Cl′/l. Also in the peatbog at Ullerup (170 mg. Cl′/l.). It should then no doubt be regarded as: Indifferent.

Cymbella prostrata (Berk.) Cl. According to KOLBE (1927) indifferent, SCHULZ (1928) oligohalobous, HUSTEDT (1939) oligohalobous, indifferent. In my material it only occurs in lakes but not in those with more than 42 mg. Cl′/l. Indifferent.

— *pusilla* Grun. According to HUSTEDT (1938) halophilous-mesohalobous and (1939) halophilous. I have only found it in Flynder Lake (11.0 %) with 540 mg. Cl′/l. Halophilous.

— *sinuata* Greg. The species, which is considered oligohalobous by all authors (KOLBE 1927: indifferent), has only been observed in few specimens from Dybe Lake and Gurre Lake. Indifferent.

— *ventricosa* Kütz. Regarded by all authors as oligohalobous; KOLBE (1927) put it down as indifferent and euryhaline. Only seen in Nors Lake, Dybe Lake, Bure Lake and Magle Lake in rather a small number, also in the spring moor in Hammer Bakker. Indifferent.

Denticula tenuis Kütz. Not referred to the Halobion system. Only observed in Langemose. ?

Diatoma elongatum Ag. KOLBE (1927), SCHULZ (1928), and BUDDE (1930) all agree in classing the species as halophilous, but HUSTEDT (1939) considers it oligohalobous, indifferent. In my samples it was not observed at less than 35 mg. Cl′/l. Most abundant in Flynder Lake (4.1 %) (590 mg. Cl′/l.). Further it was found in 11.0 % in the sample from *Chara* in Langemose. Halophilous.

— *vulgare* Bory. Constituted a very essential part of the sample from Fure Lake (24.8 %). According to KOLBE (1927) halophobous—at most indifferent, while SCHULZ (1928) regards its position as doubtful. Provisionally I will class it as: Indifferent.

Diploneis didyma Ehrb. Only observed in small number in one of the samples from Well No. 629. Both

SCHULZ (1928) and HUSTEDT (1939) regard it as mesohalobous; the latter adds that it is euryhaline. Mesohalobous.

Diploneis elliptica (Kütz.) Cl. Only observed in Langemose (0.5 %). According to KOLBE (1927) and SCHULZ (1928) indifferent. Indifferent.

— *interrupta* (Kütz.) Cl. In small number in the samples from Well No. 629 and Langemose. According to SCHULZ (1928) and HUSTEDT (1939): Mesohalobous.

— *oculata* (Bréb.) Cleve. Only observed in Langemose (0.2 %). Regarded by HUSTEDT (1938) as oligohalobous. For the present I will class it as: Indifferent?

— *ovalis* (Hilse) Cleve. SCHULZ (1928) considers the species indifferent, HUSTEDT (1939) calls it oligohalobous. Only observed in small numbers in some of the lakes with less than 42 mg. Cl′/l., as also in Langemose. Indifferent.

— — v. *oblongella* Nägeli. Observed in small number in the spring moor in Hammer Bakker. SCHULZ (1928) regards it as indifferent, HUSTEDT (1939) as oligohalobous. Indifferent.

— *pseudovalis* Hustedt. The species only observed in Langemose (0.2 %). Also found by HUSTEDT in slightly saliferous inland waters. For the present I will put it as Mesohalobous?

Epithemia argus Kütz. HUSTEDT (1938) is not indisposed to regard the species as halophobous. My samples do not tend to show this, they seem to indicate that it is fairly euryhaline, as it was found in Flynder Lake (590 mg. Cl′/l. (6 %)) and in Bure Lake (22 mg. Cl′/l. (0.3 %)); also in the peatbog at Ullerup and in Langemose. Indifferent.

— *Hyndmannii* W. Sm. The species only observed in small number in Nors Lake. Classed by KOLBE (1927) as: Indifferent.

Epithemia intermedia Fricke. Scarce in the samples from Bure Lake (0.3 %). Its place in the Halobion system is not mentioned in the literature. Probably oligohalobous. ?

— *sorex* Kütz. Kolbe (1927) tabulates the species with doubt as halophilous; in which Schulz (1928) agrees with him. My material affords no support for this supposition, the species being common (12.3 %) in Præstø Fjord and found in small number in the lakes, except in Fure Lake where it was represented by 7.9 %. It must at any rate be highly euryhaline. This would also seem to be shown by Meister's statement (1912) that it is specially common in alpine lakes at a height of 1500—2200 m. I must conclude, therefore, that the species is: Indifferent.

— *turgida* (Ehrb.) Kütz. Both Kolbe (1927) and Schulz (1928) regard the species as indifferent, euryhaline. In my material I have only observed it from Præstø Fjord where it is represented by 24.3 %. Indifferent.

— *zebra* (Ehrb.) Kütz. Found in Præstø Fjord (6.1 %), on Amager Fælled in ditch, and in Bure Lake (0.3 %). The species is commonly regarded as indifferent. This is confirmed by my observations. According to Hustedt's observations (1938) it should be more sensitive to pH and prefer alkaline water. It is characteristic that neither the species nor any of the varieties has been found in any of the bog localities, in spite of the high pH values of some of these. Possibly, then, this is not the decisive factor, but perhaps the content of humous substances in the water. Indifferent.

— — v. *saxonica* (Kütz.) Grun. Usually regarded as indifferent (Kolbe 1927, Hustedt 1938, 1939). Found in nearly all the lakes with less than 42 mg. Cl′/l., but not in any of the bogs. Indifferent.

Epithemia zebra v. *porcellus* (Kütz.) Grun. Kolbe (1927) thinks that this variety is more halophilous than the other forms of the species. Schulz (1938) and Hustedt (1938), however, also regard this form as indifferent. Observed in Nors Lake (0.7 %), Sct. Jørgens Lake (1.6 %), and Fure Lake (2.4 %). Indifferent.

Eucocconeis flexella (Kütz.) Cl. Observed in very few specimens from Dybe Lake. Is the same as *E. minuta* Cl. which according to Kolbe (1927) is: Halophobous.

— — v. *alpestris* Brun. Observed in Dybe Lake on sand (2.9 %) and Gurre Lake (0.7 %). According to Kolbe (1927): Halophobous.

— *lapponica* Hustedt. Observed in small number in Nors Lake and Dybe Lake. According to Hustedt's information in Rabh. Kryptogamenfl. Bd. VII, 2: 415 it is presumably: Halophobous?

Eunotia alpina (Naeg.) Hustedt. Constituted 75.2 % of the Diatoms in the sample from Bøllemose. Occurs in swamps, springs and on wet rocks (Hustedt in Rabh. Kryptogamenfl. VII, 2). Is presumably, like most of the Eunotiaspecies, Halophobous?

— *arcus* Ehrb. Found in small numbers in Sct. Jørgens Lake and in Langemose. According to Hustedt (Rabh. Kryptogamenfl. VII, 2) less sensitive to lime than the other species of the genus; therefore possibly not so markedly halophobous. Schulz (1928) tabulates it as: Halophobous.

— — v. *fallax* Hustedt. Found in Bure Lake in small number. Presumably, like the species, Halophobous?

— *exigua* (Bréb.) Rabh. Constituted 34.6 % of all Diatoms in the sample from Lyngby Mose. All authors refer to the species as markedly sphagnophilous (Schulz 1928, Krieger 1930, Hustedt

1938). It must therefore be regarded, as by HUSTEDT 1939, as Halophobous.

Eunotia exigua forma. In Lyngby Mose 38.5 %. This somewhat diverging form is remarkable by the valve being nearly straight; such forms HUSTEDT likewise refers to *E. exigua*. It is therefore presumably: Halophobous.

— *gracilis* (Ehrb.) Rabh. Occurred in small number in Gurre Lake, but constituted 8.1 % in the spring moor in Hammer Bakker. Regarded by KOLBE (1927) and SCHULZ (1928) as halophobous, whereas HUSTEDT intimates that it is more probably indifferent. For the present I will class it as: Halophobous.

— *lunaris* (Ehrb.) Grun. Found in Bøllemose (12.9 %) and in the spring moor in Hammer Bakker (1.2 %). KOLBE (1927) and SCHULZ (1928) both consider the species halophobous. HUSTEDT (1938) thinks that it is not a pronounced halophobe, and this agrees with the fact that it occurs in appreciable numbers (1.0 %) in Peatbog I, Lille Lyngby with 114 mg. Cl'/l. Nevertheless it is probably in the main Halophobous.

— *pectinalis* (Kütz.) Rabh. Found in Sct. Jørgens Lake (1.6 %). Classed by KOLBE (1927) and SCHULZ (1928) as halophobous, while HUSTEDT thinks (1939) that it is not so pronounced a halophobe as the other species. Halophobous.

— — v. *impressa* O. Müll. Found in the spring moor in Hammer Bakker (3.1 %); like the species it is presumably: Halophobous.

— *tenella* (Grun.) Hustedt. According to HUSTEDT (1939) halophobous. Occurred in the spring moor in Hammer Bakker (3.1 %) and in Bøllemosen (1.7 %). Halophobous.

— *veneris* Kütz. Occurred in small quantity in Bøllemosen (0.3 %). According to SCHULZ (1928) and HUSTEDT (1939): Halophobous.

Fragilaria brevistriata Grun. KOLBE (1927) thinks that the species may be halophilous; but this is denied by SCHULZ (1928) and HUSTEDT (1938). According to my observations it must be rather euryhaline, since it occurs in lakes with from 16—590 mg. Cl'/l., though in rather small number. Most frequent in Bure Lake (22 mg. Cl'/l.) where it constitutes 6.2 %. Also found in Peatbog I, Ll. Lyngby and in Langemose. Indifferent.

— *capucina* Desm. Occurred in Sct. Jørgens Lake and in Langemose in small number. KOLBE (1927) tabulates the species as possibly halophobous, HUSTEDT (1939) classes it only as oligohalobous. Halophobous?

— — v. *mesolepta* (Rabh.) Grun. KOLBE (1927) gives the variety as oligohalobous and possibly halophobous. Its occurrence in water with 124 mg. Cl'/l. (Peatbog I, Ll. Lyngby) in appreciable number (3.2 %) would rather seem to indicate that it is indifferent. Indifferent.

— *construens* (Ehrb.) Grun. Both KOLBE (1927) and SCHULZ (1928) regard both the species and the varieties as indifferent and euryhaline. In the material at hand they have only been found in lakes with less than 42 mg. Cl'/l. Indifferent.

— — v. *binodis* (Ehrb.) Grun. Occurred in some of the same lakes as the species. Particularly abundant in Magle Lake (8.4 %). Indifferent.

— — v. *venter* (Ehrb.) Grun. Occurred together with the species in some of the lakes. It is remarkable that it constituted 36.5 % of all Diatoms in one of the samples from Langemose. Indifferent.

— *crotonensis* Kitt. Occurred in Fure Lake, Dybe Lake, and Nors Lake, as well as in Langemose in a rather small number. Regarded by KOLBE (1927), SCHULZ (1928), and HUSTEDT (1939) as: Indifferent.

Fragilaria leptostauron (Ehrb.) Hustedt (= *F. Harrisonii*). Occurred in rather a small quantity in the bottom sample from Sct. Jørgens Lake. KOLBE (1927) classes it with doubt as halophobous, while HUSTEDT (1939) merely calls it oligohalobous. Halophobous?

— *lapponica* Grun. SCHULZ (1928) terms the species indifferent. I have only found it in Flynder Lake (8.1 ⁰/₀). If it is indifferent it must also be euryhaline. Indifferent?

— *pinnata* Ehrb. Commonly recognised as an indifferent species. Only occurred in lakes with at most 42 mg. Cl′/l. and in negligible number in Præstø Fjord, possibly introduced accidentally. Indifferent.

— *Vaucheriae* (Kütz.) Boye P. (= *F. intermedia*). Occurred in rather a small amount in most of the lakes with under 42 mg. Cl′/l., as well as in Peatbog II, Ll. Lyngby (0.6 ⁰/₀). SCHULZ (1928) and KOLBE (1927) regard it as an oligohalobous, indifferent species. My observations indicate the same. Indifferent.

Gomphonema acuminatum Ehrb. Appeared in Gurre Lake, Sct. Jørgens Lake, and Nors Lake in small number. Also in Peatbog I, Ll. Lyngby (3.1 ⁰/₀). KOLBE (1927) and SCHULZ (1928) consider the species oligohalobous, indifferent. Indifferent.

— — v. *Brebissonii* (Kütz.) Cleve. Found in small quantity in Sct. Jørgens Lake. Supposed to bear the same relation as the species to the chloride content of the water. Indifferent.

— — v. *coronata* Ehrb. Noted from Sct. Jørgens Lake and Bure Lake in small number. KOLBE (1927) and SCHULZ (1928) both regard it as oligohalobous, Indifferent.

Gomphonema bohemicum Reichelt et Fricke. Identification uncertain. The species is very rare and so it has not been referred to the Halobion system in the literature. Noted in small number in the sample from Langemose. ?

— *constrictum* Ehrb. Occurred in Sct. Jørgens Lake, a pool on Amager Fælled, and Langemose in small number. Both Kolbe (1927), Schulz (1928) and Hustedt (1939) are agreed in regarding the species as indifferent, euryhaline. Indifferent.

— *gracile* Ehrb. v. *naviculacea* W. Sm. Occurred in the spring moor in Hammer Bakker (15.2 %). Regarded by Kolbe (1927) as indifferent, while Schulz (1928) and Hustedt (1938, 1939) class the species as a whole as oligohalobous. Indifferent.

— *intricatum* Kütz. All authors agree in regarding the species as oligohalobous, and Kolbe (1927) tabulates it as indifferent. In my material it occurred in waters with from 35—170 mg. Cl′/l., most frequently in the latter kind. Noted in Sct. Jørgens Lake, a pool on Amager Fælled (3.2 %), a peatbog at Ullerup (9.5 %), and in Langemose (4.4 and 11.8 %). Indifferent.

— — v. *pumila* Grun. Occurred in Magle Lake, Bure Lake, Sct. Jørgens Lake (6.3 and 9.4 %), in the peatbog at Ullerup (13.5 %), that is to say, in water with from 16—170 mg. Cl′/l. Probably stands in the same relation as the species to the chloride content of the water. Kolbe 1927: Indifferent.

— *lanceolatum* Ehrb. Occurred in Peatbogs I and II, Ll. Lyngby in rather a small quantity. Schulz (1928) and Hustedt (1938, 1939) tabulate the species as oligohalobous. It is presumably: Indifferent.

— *longiceps* Ehrb. f. *gracilis* Hustedt. Occurred in Sct. Jørgens Lake (2.1 %). This form does not seem to have been placed in the Halobion system in the literature. By HUSTEDT (1939) v. *subclavata* is tabulated as oligohalobous, indifferent. ?

Gomphonema olivaceum (Lyngb.) Kütz. Classed by KOLBE (1927) as oligohalobous, indifferent. HUSTEDT (1930) mentions that it also occurs in brackish water. In my material it was only sparsely represented in lakes with less than 42 mg. Cl′/l. (Magle Lake, Bure Lake, Dybe Lake, Nors Lake). Indifferent.

— — v. *calcareum* Cleve. Only observed in Nors Lake (1.8 $^0/_0$). SCHULZ (1928) tabulates the variety as oligohalobous; it is presumably: Indifferent.

— — v. *subramosum* (Kütz). V. H. Occurred in Langemose in small number. The ecology of the variety does not seem to be mentioned. Presumably: Indifferent.

— *parvulum* (Kütz.) Grun. According to KOLBE (1927) and BUDDE (1930, 1932) the species is halophilous. This is doubted by SCHULZ (1928) and denied by HUSTEDT (1938, 1939). The occurrence of the species in my samples might very well indicate that it is somewhat halophilous; at any rate it is highly euryhaline. For the present, however, I will class it as indifferent. Occurred in Bure Lake (0.3 $^0/_0$), Amager Fælled, pool (3.2 $^0/_0$), Peatbog II, Ll. Lyngby (1.9 $^0/_0$), and Peatbog I, Ll. Lyngby (5.0 $^0/_0$), that is to say, in water with from 22—124 mg. Cl′/l. Also in the spring moor in Hammer Bakker and in Langemose. Indifferent.

— *subclavatum* Grun. This species, which is regarded as halophilous by KOLBE (1927) occurred in the spring moor in Hammer Bakker (2.0 $^0/_0$). Halophilous?

Gomphonema ventricosum Greg. Occurred in small number in Bure Lake. Place in the Halobion system unknown. ?

Grammatophora marina (Lyngb.) Kütz. Purely marine form, seen only in small number in Præstø Fjord. According to HUSTEDT (1939) euhalobous, euryhaline. Euhalobous.

Gyrosigma acuminatum (Kütz.) Rabh. Occurred in Sct. Jørgens Lake (9.4 %) and in Langemose. SCHULZ (1928) and HUSTEDT (1939) without further explanation class it as oligohalobous. Presumably it is: Indifferent.

— *attenuatum* Kütz. This species is often stated to occur chiefly in brackish water; KOLBE (1927) says that in his experience it is oligohalobous, indifferent; and SCHULZ (1928) and HUSTEDT (1939) are of the same opinion. Found in Sct. Jørgens Lake (7.8 %) and in Dybe Lake in small number. Indifferent.

Hantzschia amphioxys (Ehrb.) Grun. All authors agree in classing the species as oligohalobous; but HUSTEDT (1938, 1939) points out its great power of adaptation to different environments. In my samples it only occurred sparsely, but in waters poor in salts as well as in waters rich in salts: Lyngby Mose, Peatbog I, Ll. Lyngby, Flynder Lake, and Well No. 629. Indifferent.

— *elongata* (Hantzsch) Grun. Only occurred in small number in Langemose near Ullerslev. KOLBE (1927): Indifferent.

Hyalodicus scoticus (Kütz.) Grun. Seen in small number in the sample from Præstø Fjord. Marine species, but may also occur in brackish water. HUSTEDT (1939): euhalobous, euryhaline. Euhalobous.

Mastogloia Braunii Grun. Only observed in Flynder Lake (0.2 %). SCHULZ (1928): Mesohalobous.

— — v. *Dansei* (Thwaites) Cl. In small number in Flynder Lake and Dybe Lake. According to

KOLBE (1927) and SCHULZ (1928) this variety is mesohalobous, in fact KOLBE (1927) even thinks that it is stenohaline. In HUSTEDT's opinion it is halophilous-mesohalobous. My observations do not give any decisive evidence. Mesohalobous.

— *elliptica* Ag. Only observed in Præstø Fjord (6.1 ‰). Regarded by SCHULZ (1828) and HUSTEDT (1939) as mesohalobous; the last-named author adds that it is euryhaline. Mesohalobous.

— *pumila* (Grun.) Cleve. Only in Præstø Fjord (6.8 ‰). Marine form, more rarely occurring in brackish water. HUSTEDT (1939): euhalobous, euryhaline. Euhalobous.

— *Smithii* Thw. v. *amphicephala* Grun. Occurred in Dybe Lake (up to 9.8 ‰), Nors Lake (1.4 ‰), and Præstø Fjord (1.5 ‰); finally in Langemose in small number. Var. *amphicephala* is said to be especially common in brackish water, while var. *lacustris* is presumed to be a freshwater form. SCHULZ (1928) considers the species as a whole as mesohalobous; whereas KOLBE (1927) does not venture to express any decisive opinion on the question. My observations mainly seem to indicate that both varieties are highly euryhaline. For the present, therefore, it will be most correct to regard it as indifferent. Indifferent.

— — v. *lacustris* Grun. Found in the same waters as v. *amphicephala*, most numerously in Nors Lake (12.4 ‰). See further var. *amphicephala*. Indifferent.

Melosira arenaria Moore. Occurred in small number in Sct. Jørgens Lake and Magle Lake. KOLBE (1927) and SCHULZ (1928) both regard the species as Indifferent.

— *islandica* (Ehrb.) Kütz. Observed in Fure Lake in small quantity. SCHULZ (1928) regards subsp. *helve-*

tica as indifferent and limnophilous, and the same probably applies to the species.
Indifferent?

Melosira varians Ag. Only observed in Sct. Jørgens Lake in small number. According to Kolbe (1927) indifferent, and according to Hustedt (1939) oligohalobous. Indifferent.

Meridion circulare Ag. Kolbe (1927), Schulz (1928), and Hustedt (1939) regard the species as halophobous. Its occurrence in Peatbog II (Ll. Lyngby) may be accidental. Halophobous.

Navicula cincta (Ehrb.) Kütz. Many authors (Kolbe 1927, Schulz 1928, Sprenger 1930, Krasske 1932, Hustedt 1938, 1939) simply regard the species as halophilous; Budde (1930) classes it as halophilous-mesohalobous, while later the same author (1932) calls it highly euryhaline and regards its position as obscure. Occurred in Flynder Lake (5.0 ‰), in Well No. 629 (small number), and in Langemose.
Halophilous.

— — v. *Heufleri* Grun. Only observed in Flynder Lake (small number). Not mentioned by any of the authors who have referred species of Diatoms to the Halobion system. Provisionally I will regard it as behaving like the species and class it as Halophilous?

— — f. *minuta* Grun. (V. H. Types 83). Was the dominant form in the samples from Well No. 629 and was found in as much as 76.5—93.6 ‰. This small form does not seem to be mentioned in the literature, but it is found in V. H. Types No. 83 in great quantity. It occurs here in company with several brackish water forms. For the present it must be presumed to be at least halophilous, possibly even mesohalobous. Halophilous?

— *cocconeiformis* Greg. According to Hustedt (1930) common in mountain streams; my own experience from Jan Mayen and Iceland shows a similar occurrence; I will therefore, like HUSTEDT (1939), regard it as Halophobous.

Navicula cryptocephala Kütz. Not observed in the waters poorest in chlorides (not under 35 mg. Cl′/l.). Most abundantly in a ditch on Amager Fælled (19.2 ‰), less numerously in a pool in the same place (4.2 ‰), in Dybe Lake, Peatbogs I and II, Ll. Lyngby.

According to KOLBE (1927) probably halophilous; SCHULZ (1928), BUDDE (1930) and SPRENGER (1930) are of the same opinion. BUDDE (1932) says that the species is strongly euryhaline, and LEGLER und KRASSKE (1940) call it extremely euryhaline. HUSTEDT (1938) classes the species as indifferent, almost ubiquist, occurring in fresh water. Here regarded as: Indifferent.

— — v. *exilis* (Kütz.) Grun. KOLBE (1927) and SCHULZ (1928) regarded v. *exilis* as probably halophilous like the species. BUDDE (1932) takes the variety to be highly euryhaline, and it may then for the present be most correct to class it as indifferent. Occurred in Gurre Lake (0.6 ‰), Peatbogs I and II Ll. Lyngby (4.0 ‰ and 5.1 ‰). Indifferent.

— — v. *intermedia* Grun. Found in most of the lakes, though in rather a small number: Magle Lake (1.7 ‰), Gurre Lake (1.3 ‰), Fure Lake (0.9 ‰), Bure Lake (1.8 ‰), Dybe Lake (0.7 ‰), Nors Lake (0.5 ‰ and 5.2 ‰), also in small number in a ditch on Amager Fælled and in Langemose. This form, which was transferred by CLEVE (Syn. II, p. 19) to *N. salinarum*, has been restored by HUSTEDT (1930) to N. *cryptocephala*. There are no definite indications of its place in the Halobion system; but judging by the statements as to its occurrence it must be inferred that it is Indifferent.

Navicula cryptocephala f. *minuta* n. f.

Valva lineari-lanceolata, levissime rostrata, long. 23 μ, lat. 5 μ striis 18 in 10 μ, radiantibus, prope apices convergentibus, in medio valvæ sæpe alternatim longioribus et brevioribus, area apicali angusta, centrali rotundata (Fig. 1).

Fig. 1. × 1700.

This small form, which is most similar to *N. cryptocephala* v. *intermedia*, in company with which it often occurs, differs especially from the smaller forms of the species by the fact that the midmost striae often are alternately long and short. Here is a list of the localities in which it occurs, and its percentage frequency: Nors Lake (4.4 %), Dybe Lake, sand (1.3 %), stones (0.6 %), Bure Lake (0.9 %), Fure Lake (9.9 %), Gurre Lake (2.0 %), Magle Lake (3.0 %), Peatbog Ullerup (17.7 %), Peatbog I, Ll. Lyngby (0.5 %).

It will be seen from this that it occurs in water with from 16—170 mg. Cl′/l. Most numerous in the peatbog at Ullerup and in Fure Lake. This would seem to indicate that it is highly euryhaline. For the present I shall refrain from placing it in the Halobion system. ?

— — v. *veneta* (Kütz.) Grun. Occurred in Dybe Lake and Flynder Lake (1.7 %), in the springmoor in Hammer Bakker (4.0 %), in a watering trough for camels in Kairouan (1.8 %), and in Well No. 629 (0.5 %). According to Kolbe (1927) and Schulz (1928) it is probably halophilous. Budde (1932) and Legler und Krasske (1940) point out that it is highly euryhaline. It will therefore be most cautious to class it as Indifferent.

— *cuspidata* Kütz. Only observed in small number in Dybe Lake. According to Kolbe (1927) and Hustedt (1939) oligohalobous, indifferent. Indifferent.

Navicula dicephala (Ehrb.) W. Sm. Only observed in small number in Langemose. According to KOLBE (1927) oligohalobous, indifferent. Indifferent.

— *elegans* W. Sm. Observed in Flynder Lake and Langemose in small number. Actually a salt water form which often occurs in brackish water. Presumably euhalobous, euryhaline. Euhalobous.

— *Falaisensis* Grun. Only observed in Langemose (2.3 %). Does not seem to have been placed in the Halobion system by any investigator. ?

— *gastrum* Ehrb. Only observed in Dybe Lake in small number. According to KOLBE (1927): Indifferent.

— *gregaria* Donk. Found chiefly in localities with more than 100 mg. Cl′/l., though in small number in Sct. Jørgens Lake (1.6 %). Other localities: Amager Fælled, ditch (4.0 %), Præstø Fjord (small number), Peatbogs I and II, Ll. Lyngby (2.6 %), as well as Well No. 629 and Langemose. According to SCHULZ (1928) and BUDDE (1930, 1932), halophilous. HUSTEDT (1938) says: halophilous or perhaps more probably indifferent. HUSTEDT (1939): mesohalobous, euryhaline. Halophilous.

— *halophila* (Grun.) Cleve. According to KOLBE (1927) mesohalobous and HUSTEDT (1938) halophilous-mesohalobous. Only occurred in waters with c. 100 mg. Cl′/l. or more, viz. Amager Fælled, pool (34.7 %), ditch (in small number), Flynder Lake (5.0 %), Peatbog, Ullerup (4.6 %), Peatbog I, Ll. Lyngby (4.5 %), II (0.6 %). Further in Langemose. Mesohalobous.

— — v. *subcapitata* Østr. Only observed in Langemose (0.7 %). KOLBE (1927): Mesohalobous.

— *hungarica* Grun. As to the position of this species in the Halobion system opinions have been somewhat divided. KOLBE (1927) regards v. *capi-*

tata as halophilous?; SCHULZ (1928) considers the species halophilous, but v. *capitata* as indifferent. BUDDE (1930): halophilous, and HUSTEDT (1938 and 1939): the species indifferent, in some forms halophilous. I have only found the species in any considerable quantity in a ditch on Amager Fælled (f. *typica*, 16.4 %) and in Peatbog II, Ll. Lyngby (f. *typica*, 5.1 %). Observed in small quantity in Bure Lake, a pool on Amager Fælled, Peatbog I, Ll. Lyngby, watering trough for camels at Kairouan, and in Langemose. Altogether it seems to me most probable that the species must be regarded as Halophilous.

Navicula integra (W. Sm.) Ralfs. Found in small quantity only (0.6 %) in one of the samples from Well No. 629. HUSTEDT (1939): Halophilous.

— *minima* Grun. Found in a pool and ditch on Amager Fælled (2.1 and 4.5 %), as well as in Peatbogs I and II, Ll. Lyngby (9.8 % and 14.4 %). According to HUSTEDT (1938) oligohalobous and eurytopic, so it is presumably: Indifferent.

— *oblonga* Kütz. Only occurred in small number in my samples: Sct. Jørgens Lake, Dybe Lake, Flynder Lake and Langemose. According to KOLBE (1927) indifferent, while SCHULZ (1928) and HUSTEDT (1938, 1939) class it as oligohalobous. Indifferent.

— *peregrina* (Ehrb.) Kütz. In rather a small amount (0.3, 0.9 %) in Langemose. According to KOLBE (1927), SCHULZ (1928) and HUSTEDT (1939): Mesohalobous.

— *placenta* Ehrb. Only observed in the spring moor in Hammer Bakker (1.0 %). According to HUSTEDT (1938) oligohalobous, aerophilous, atmophytic spring form. It is possible that the species is actually halophobous: but for the present I will regard it as: Indifferent.

Navicula protracta Grun. Only observed in small number in Flynder Lake. According to KOLBE (1927) and SCHULZ (1928) it is mesohalobous, while HUSTEDT (1939) classes it as halophilous.
Mesohalobous.

— *pseudoscutiformis* Hustedt. Observed in small quantity in Gurre Lake. HUSTEDT (1930) states that it occurs in bottom mud in lakes in Holstein as well as in Fichtelgebirge. Place in the Halobion system doubtful. ?

— *pupula* Kütz. Occurred in rather a small number in several of the lakes, indeed both in Gurre Lake and in Flynder Lake (0.7 % and 0.2 %). Further in Dybe Lake, a pool and a ditch on Amager Fælled, and in Langemose. KOLBE (1927), SCHULZ (1928) and HUSTEDT (1938) regard the species as indifferent.
Indifferent.

— *pygmœa* Kütz. Only observed in small number in a ditch on Amager Fælled and in Langemose. Regarded by KOLBE (1927) and SCHULZ (1928), as well as HUSTEDT (1938, 1939) as
Mesohalobous.

— *radiosa* Kütz. KOLBE (1927) and SPRENGER (1930) think that this species is somewhat halophilous; but SCHULZ (1928) and HUSTEDT (1938) regard it as indifferent. This agrees well with my experience, for it is found in small number in all the samples from the lakes, regardless of their degree of salinity; whereas it has not been observed in any of the samples from bogs. Indifferent.

— *rhynchocephala* Kütz. Occurred in small number in Nors Lake, ditch and pool on Amager Fælled, Well No. 629, and Langemose; that is to say, not in waters with less than 42 mg. Cl′/l. KOLBE (1927) and HUSTEDT (1938, 1939) consider it indifferent. Only SCHULZ (1928) thinks that it is somewhat halophilous. Indifferent.

Navicula rotaeana (Rabh.) Grun. Only observed in small number in Magle Lake. According to Schulz (1928), Hustedt (1938, 1939): oligohalobous. For the present I will regard it as: Indifferent.

— *salinarum* Grun. Only observed in Langemose (0.2 %). Regarded by Kolbe (1927), Schulz (1928), and Hustedt (1939) as mesohalobous. Mesohalobous.

— *scutelloides* W. Sm. Found in small number in Magle Lake, Fure Lake, and Bure Lake, also in Nors Lake (2.9 %), that is to say, only in waters with less than 42 mg. Cl′/l. By Kolbe (1927) and Hustedt (1938) regarded as indifferent, while Schulz (1928) thinks that it has a somewhat halophilous character. Indifferent.

— *subhamulata* Grun. Only seen in Nors Lake (0.7 %). There seems to be no information about the place of this species in the Halobion system. ?

— *subtilissima* Cleve. According to Schulz (1928) it is halophobous. The occurrence of the species in Nors Lake (5.9 %) does not seem to indicate that it is markedly halophobous. ?

— *tuscula* (Ehrb.) Grun. Only seen in Fure Lake and Dybe Lake in small number. In Kolbe's opinion (1927) it is indifferent, while Schulz (1928) takes it to be slightly halophilous. For the present, however, it is no doubt best to regard it as: Indifferent.

— — f. *minor* Hustedt. Observed in small number in Bure Lake, Dybe Lake, and Nors Lake. According to Hustedt (1930, p. 309) it is this form which is mentioned by Schulz (1926) and Kolbe (1927) by the name *N. torneensis*, and is taken by Kolbe to be: Halophilous?

— *variostriata* Krasske. Only observed in the spring moor in Hammer Bakker (2.0 %). Hustedt (1930) says: In swamps, especially with *Sphagnum*. Hence it is presumably sphagnophilous and: Halophobous.

Navicula viridula Kütz. Met with in Peatbog I, Ll. Lyngby (0.2 %) as well as in Well No. 629 and in Langemose. KOLBE (1927), SCHULZ (1928), and HUSTEDT (1938, 1939) all state that the species is oligohalobous. Is probably Indifferent.

— *vulpina* Kütz. Does not seem to have been placed in the Halobion system by any author. Only observed in Fure Lake (0.9 %) and Sct. Jørgens Lake (in small number). ?

Neidium affine (Ehrb.) Cl. v. *amphirhyncus* (Ehrb.) Cl. Occurred in Gurre Lake and Langemose in small numbers, likewise in the spring moor in Hammer Bakker. Regarded by KOLBE (1927) as halophobous, while SCHULZ (1928) thinks it is indifferent. HUSTEDT (1939) classes it as oligohalobous. It is probably somewhat, though not markedly: Halophobous.

— — f. *hercynica* (A. Mayer) Hustedt. Only observed in Gurre Lake in small number. Its ecology is probably the same as for var. *amphirhyncus.* Halophobous?

— *iridis* (Ehrb.) Cl. Only occurred in small number in Dybe Lake. Both KOLBE (1927), SCHULZ (1928) and HUSTEDT (1938) agree that the species is somewhat halophobous. HUSTEDT in 1939 is more cautious and classes it as oligohalobous. Halophobous.

— — v. *ampliata* (Ehrb.) Cl. Only noticed in Langemose. SCHULZ (1928) says: presumably halophobous (because it lives in bog water). Halophobous?

Nitzschia acuta Hantzsch. Only in Sct. Jørgens Lake (1.6 %). According to KOLBE (1927), indifferent. SCHULZ (1928) regards it as var. of *N. dissipata,* but also considers it: Indifferent.

— *amphibia* Grun. KOLBE (1927), SCHULZ (1928) and HUSTEDT (1938) agree in regarding the species as oligohalobous, while KOLBE calls it indifferent and HUSTEDT eurytopic. BUDDE (1932) differs in regarding it as β-mesohalobous. For the present I will regard it as indifferent. Occurred in Bure Lake (0.3 %), a pool on Amager Fælled (2.1 %), a ditch in the same locality (in small number), Peatbogs I and II, Ll. Lyngby (6.6 %, 3,2 %), and in Langemose (1.2 %), as also in Well No. 629 (in small number). These occurrences would seem to indicate that the species is somewhat halophilous.

Indifferent.

Nitzschia angustata (W. Sm.) Grun. It is with some doubt that I have referred a form in Dybe Lake to this species. It was represented by 2.0 % and 0.3 % in the samples. According to Kolbe (1927) indifferent, while Hustedt (1939) merely calls it oligohalobous. Indifferent.

— *apiculata* (Greg.) Grun. Only observed in small number in a ditch on Amager Fælled. According to Kolbe (1927) and Schulz (1928).

Mesohalobous.

— *capitellata* Hustedt. Occurred in Flynder Lake (6.0 %) and Langemose. Hustedt (1930) says: in fresh and slightly saline water, scattered, perhaps halophilous. Halophilous?

— *communis* Rabh. Observed in the spring moor in Hammer Bakker (5.1 %) and in Langemose (0.5 %). Kolbe (1927) regards it as indifferent, while Schulz (1928) and Hustedt (1938) more cautiously class it as oligohalobous. Indifferent.

— *commutata* Grun. Occurred in the sample from Well No. 629 in varying number (1.0—4.8 %). According to Hustedt (1938) halophilous-mesohalobous and Hustedt (1939) halophilous.

Halophilous.

— *debilis* (Arnott) Grun. Found in the spring moor in Hammer Bakker (2.0 %) and in Langemose (0.2 %). Kolbe (1927) does not venture to place it in the Halobion system. Schulz (1928) thinks that it is probably mesohalobous, while Hu-

STEDT (1938, 1939) points out that it occurs in heterogeneous localities and regards it as: Indifferent.

Nitzschia denticula Grun. Occurred in Nors Lake and Langemose, in small numbers, also in Flynder Lake (1.9 %). According to KOLBE: Indifferent.

— *dissipata* (Kütz.) Grun. Occurred in Fure Lake (1.4 %), Sct. Jørgens Lake (3.1 %), Dybe Lake (0.5 %), and in Peatbog I, Ll. Lyngby (0.6 %). According to KOLBE (1927) it is indifferent, and according to SCHULZ (1928) and HUSTEDT (1938) it is oligohalobous. Indifferent.

— *fonticola* Grun. Occurred in Fure Lake (5.9 %), Nors Lake (3.7 %), and a watering trough for camels at Kairouan (7.2 %). According to SCHULZ (1928) it is oligohalobous, and HUSTEDT (1938 and 1939) is of the same opinion. LEGLER und KRASSKE (1940) characterise it as extremely euryhaline. It is therefore denoted as Indifferent.

— *frustulum* (Kütz.) Grun. Occurred in a pool and ditch on Amager Fælled (3.2 % and 10.7 %) as wel as in Peatbogs I and II, Ll. Lyngby (24.0 and 5.4 %). Highly different opinions have been expressed about the position in the Halobion system of this species; thus KOLBE (1927) indifferent and euryhaline; SCHULZ (1928) oligohalobous; BUDDE (1932) euhalobous!; HUSTEDT (1938) the larger forms halophilous, the small forms indifferent; LEGLER und KRASSKE (1940) extremely euryhaline. Disregarding BUDDE's view, the species must be supposed to be Indifferent.

— *gracilis* Hantzsch forma. In KOLBE's opinion (1927) the species is oligohalobous, indifferent, while SCHULZ (1928) and HUSTEDT (1938) call it oligohalobous. Occurred in Fure Lake (3.9 %) and in Peatbog I, Ll. Lyngby (0.2 %). Indifferent.

Nitzschia hungarica Grun. Occurred in a pool on Amager Fælled (small number), in a watering trough for camels at Kairouan (1.2 %), and in Langemose (0.2 %). KOLBE (1927) and SCHULZ (1928) regard the species as mesohalobous, while HUSTEDT (1938, 1939) thinks that it is more probably halophilous. Mesohalobous.

— *palea* (Kütz.) W. Sm. Occurred in Fure Lake (small number), Nors Lake (0.7 %), camels' watering trough at Kairouan and in Langemose (0.3 % and 2.5 %). KOLBE (1927) and HUSTEDT (1938) think that the species is: Indifferent.

— *sigma* W. Sm. Occurred in Langemose (1.2 %). According to SCHULZ (1928) mesohalobous and according to HUSTEDT (1938) also euryhaline. Mesohalobous.

— *sigmoidea* (Ehrb.) W Sm. Observed in small numbers in Fure Lake and Langemose. According to KOLBE (1927) and HUSTEDT (1939) indifferent. Indifferent.

— *sinuata* (W. Sm.) Grun. Only in Langemose (small number). According to SCHULZ (1928) oligohalobous. Indifferent?

— *thermalis* Kütz. v. *intermedia* Grun. Found in the spring moor in Hammer Bakker (7.1 %). According to KOLBE (1927): Indifferent.

— *vermicularis* (Kütz.) Grun. v. *terrestris* Boye P. Only observed in the spring moor in Hammer Bakker (2.0 %). Place in Halobion system uncertain. ?

— *vitrea* Norm. Only observed in Langemose, in small number. Accordingto KOLBE (1927) mesohalobous, and according to HUSTEDT (1939) also euryhaline. Mesohalobous.

Pinnularia acrosphæria Bréb. Found in the spring moor in Hammer Bakker (1.0 %). Taken by SCHULZ (1928) and HUSTEDT (1938, 1939) to be oligohalobous. For the present I will therefore regard it as: Indifferent?

Pinnularia appendiculata (Ag.) Cl. v. *budensis* Grun. Found in small number in one of the samples from Well No. 629. According to KOLBE (1927): Mesohalobous?

— *borealis* Ehrb. Found in small number in Lyngby Mose. Characterised thus by the various authors: KOLBE (1927) oligohalobous, indifferent; SCHULZ (1928) oligohalobous; HUSTEDT (1938) oligohalobous, eurytopic; HUSTEDT (1939) oligohalobous. Indifferent.

— *divergens* W. Sm. v. *elliptica* Grun. In small quantity in the spring moor in Hammer Bakker. SCHULZ (1928) the species oligohalobous. Should probably not for the present be placed in the system. ?

— *mesolepta* (Ehrb.) W. Sm. In small number in Gurre Lake. According to SCHULZ (1928) halophobous, while HUSTEDT (1938) calls it indifferent and HUSTEDT (1939) oligohalobous. Is no doubt somewhat: Halophobous.

— *microstauron* (Ehrb.) Cleve. Occurred in Flynder Lake (0.2 ‰) and Well No. 629. According to SCHULZ (1928), and HUSTEDT (1938, 1939) oligohalobous. I have previously supposed this species to be halophobous; but it would be more cautious to regard it as: Indifferent.

— *nodosa* Ehrb. v. *Formica* Ehrb. Occurred in small number in the spring moor in Hammer Bakker. I have previously (Boye Petersen 1932) taken it to be: Halophobous.

— *söhrensis* (Krasske) Boye P. v. *inflata* Krasske. Boye Petersen (1932, p. 21), mentions the occurrence of this form in Hammer Bakker and arrives at the result that it must be regarded as a halophobe. Found in Lyngby Mose with 6.2 mg. Cl'/l. (14.1 ‰). Halophobous.

— *subcapitata* Greg. Occurred in Hammer Bakker in the spring moor, in small number. Supposed by SCHULZ (1928) to be a halophobe, while HU-

STEDT (1938, 1939) regards it as indifferent and oligohalobous. Indifferent.

Pinnularia subcapitata v. *Hilseana* (Janisch) O. Müll. Occurred in Lyngby Mose (12.8 °/o) and Bøllemosen (8.1 °/o). According to SCHULZ (1928) it is halophobous, while HUSTEDT (1938) thinks that, like the species, it is indifferent. Halophobous?

— *viridis* (Nitzsch) Ehrb. Found in the spring moor in Hammer Bakker (3.0 °/o) and in Langemose (small number). According to KOLBE (1927) and HUSTEDT (1939): Indifferent.

Rhoicosphenia curvata (Kütz.) Grun. Found in Fure Lake and Bure Lake (in small numbers), also in Sct. Jørgens Lake (0.5 °/o), a ditch on Amager Fælled (0.5 °/o), Præstø Fjord (0.7 °/o). Peatbog I, Ll. Lyngby (1.3 °/o), and Langemose. The following authors have classified this species: SCHULZ (1928) oligohalobous and euryhaline, BUDDE (1930) hardly halophilous, HUSTEDT (1939) euryhaline, halophilous. Should for the present be regarded as: Indifferent.

Rhopalodia gibba (Kütz.) O. Müll. Found in Bure Lake, Sct. Jørgens Lake, Dybe Lake, Nors Lake, Flynder Lake (everywhere less than 1 °/o); further in a pool on Amager Fælled (12.6 °/o), and in a peatbog at Ullerup (0.2 °/o). KOLBE (1927), SCHULZ (1928), HUSTEDT (1938, 1939) all agree in denoting the species as: Indifferent.

— *gibberula* (Ehrb.) O. Müll. v. *producta* (Grun.) O. M. Only in the spring moor in Hammer Bakker (3.0 °/o). KOLBE (1927) has the species as indifferent, while HUSTEDT (1939) says: An extremely eurytopic species, which may occur in freshwater as well as in the sea and in addition can do with very small amounts of moisture. Indifferent.

— *musculus* (Kütz.) O. Müll. Occurred in Præstø Fjord and Langemose, both places in small amounts.

According to KOLBE (1927), SCHULZ (1928), HUSTEDT (1938 and 1939), and KRASSKE (1932): mesohalobous, while LEGLER und KRASSKE (1940) say: mesohalobous, euryhaline.
Mesohalobous.

Rhopalodia ventricosa (Kütz.) O. Müll. Found in Fure Lake (1.4 ‰) and Præstø Fjord (0.7 ‰). According to KOLBE (1927) and HUSTEDT (1938, 1939):
Indifferent.

Stauroneis acuta W. Sm. Only observed in the bottom sample from Sct. Jørgens Lake (in small number). According to KOLBE (1927) indifferent, whereas SCHULZ (1928) and HUSTEDT (1939) merely call it oligohalobous. Indifferent.

— *legumen* (Ehrb.) Kütz. Only in Langemose at Ullerslev (0.3 ‰). According to KOLBE (1927) indifferent, while SCHULZ (1928) designates it as oligohalobous. Indifferent.

— *phoenicenteron* Ehrb. Seen only in Dybe Lake in small number. Both KOLBE (1927) and HUSTEDT (1938, 1939) class it as Indifferent.

— *producta* Grun. Only observed in Langemose (0.3 ‰). According to HUSTEDT (1939) halophilous, perhaps mesohalobous. Halophilous.

— *Smithii* Grun. Only in Langemose (small number). According to KOLBE (1927) indifferent, while SCHULZ (1928) and HUSTEDT (1939) designate it as oligohalobous. Indifferent.

Stephanodiscus astræa (Ehrb.) Grun. Found in small numbers in Fure and Bure Lakes, also in Sct. Jørgens Lake (6.3 ‰) and Nors Lake (0.5 ‰). According to KOLBE (1927) and SCHULZ (1928):
Indifferent.

— — v. *minutula* (Kütz.) Grun. Found in Fure Lake (1.4 ‰) and in Peatbogs I and II at Ll. Lyngby (3.0 ‰ and 10.6 ‰). HUSTEDT (1939) states that its place in the system is the same as that of the species.
Indifferent.

Surirella Capronii Bréb. Only in Sct. Jørgens Lake in small number. According to KOLBE (1927) and HUSTEDT (1938): Indifferent.

— *constricta* Ehrb. Occurred in the spring moor in Hammer Bakker in small number. Regarded by SCHULZ (1928) and HUSTEDT (1938) as oligohalobous. For the present I will class it as Indifferent.

— *elegans* Ehrb. Occurred in the bottom material from Sct. Jørgens Lake (4.7 $^0/_0$). Classed by SCHULZ (1928) and HUSTEDT (1938, 1939) as oligohalobous, by KOLBE (1927) as: Indifferent.

— *linearis* W. Sm. Only in the spring moor in Hammer Bakker (1.0 $^0/_0$). Tabulated by SCHULZ (1928) and HUSTEDT (1938, 1939), as oligohalobous. Probably: Indifferent.

— — v. *helvetica* (Brun) Meister. In small number in Nors Lake. In the literature there is no definite statement about its place in the Halobion system. Probably, like the species, it is: Indifferent?

— *Moelleriana* Grun. Only seen in Langemose in small number. HUSTEDT (1930) classes it as probably halophilous. Halophilous?

— *ovata* Kütz. Found in Præstø Fjord and in Langemose in small numbers, in addition in all the samples from Well No. 629 (up to 6.8 $^0/_0$). Registered by KOLBE (1927), SCHULZ (1928), and HUSTEDT (1939) as indifferent. KRASSKE (1932) tabulates it as halophilous. Indifferent.

— *robusta* Ehrb. Only observed in small number in the bottom sample from Sct. Jørgens Lake. SCHULZ (1928) considers it oligohalobous, whereas HUSTEDT (1938) classes the species as halophobous, but v. *splendida* as indifferent. Halophobous.

Synedra acus Kütz. Found in Fure Lake (0.9 $^0/_0$), the peatbog at Ullerup (1.0 $^0/_0$) and Langemose (0.2 $^0/_0$), as well as in Sct. Jørgens Lake in small amount. According to KOLBE (1927) it is oligohalobous, indifferent, while SCHULZ (1928) and HUSTEDT (1938) merely designate it as oligohalobous. Indifferent.

Synedra acus v. *angustissima* Grun. Only in Langemose from *Chara* (7.0 %). According to SCHULZ (1928) indifferent and limnophilous. Indifferent.

— *amphicephala* Kütz. Only found in Bure Lake (0.3 %). Does not seem to have been classified in the Halobion system in the literature. ?

— *capitata* Ehrb. Only in the peatbog at Ullerup (0.3 %). Designated by KOLBE (1927) as: Indifferent.

— *parasitica* (W. Sm.) Hustedt. Only in the bottom sample from Sct. Jørgens Lake (1.6 %). Classed by KOLBE (1927) as indifferent, by SCHULZ (1928) and HUSTEDT (1938, 1939) as oligohalobous. Indifferent.

— *pulchella* Kütz. Represented by less than 1 % in a ditch on Amager Fælled, Flynder Lake, Præstø Fjord, and Langemose. In a watering trough for camels at Kairouan the species was dominant (85.0 %). According to KOLBE (1927), SCHULZ (1928), and HUSTEDT (1939) it is mesohalobous; the latter adds: euryhaline. Mesohalobous.

— *rumpens* Kütz. Only in Magle Lake, in small number. KOLBE (1927) designates v. *familiaris* as indifferent, while HUSTEDT (1938) states that the species and varieties are oligohalobous. Indifferent?

— *tabulata* (Ag.) Kütz. (= *S. affinis*). Occurred in Præstø Fjord (5.3 %), Peatbogs I and II, Ll. Lyngby (0.3 % and 14.4 %), as also in Langemose (0.3 %). It was likewise found in small numbers in Flynder Lake and in a watering trough for camels at Kairouan. By KOLBE (1927), SCHULZ (1928), SPRENGER (1930) and HUSTEDT (1939) regarded as mesohalobous. BUDDE

(1932) and HUSTEDT (1938, 1939) strongly emphasise that it is euryhaline, so here I have merely classed it as: Halophilous.

Synedra ulna (Nitzsch) Ehrb. Found in Fure Lake (0.9 $^0/_0$), Bure Lake (0.9 $^0/_0$), Sct. Jørgens Lake (4.6 $^0/_0$), Dybe Lake (0.3 $^0/_0$), Peatbogs I and II, Ll. Lyngby (small number), Peatbog at Ullerup (0.2 $^0/_0$), Well No. 629 (sample 2: 2.2 $^0/_0$), and Langemose (0.3 $^0/_0$ and 1.4 $^0/_0$). By KOLBE (1927), SCHULZ (1928), and HUSTEDT (1938, 1939) stated to be indifferent and euryhaline.
Indifferent.

— — v. *biceps* (Kütz.) v. Schönf. Only in Langemose, in small number. According to HUSTEDT (1939) oligohalobous and: Indifferent.

Tabellaria flocculosa (Roth) Kütz. Found in Magle Lake (0.7 $^0/_0$), Gurre Lake (1.3 $^0/_0$), Bure Lake (0.6 $^0/_0$), and Dybe Lake (in small number); likewise in Bøllemosen (0.9 $^0/_0$) and in the spring moor in Hammer Bakker (20.2 $^0/_0$). That is to say, that it has not been observed in water with more than 35 mg. Cl'/l. Stated by KOLBE (1927), SCHULZ (1928), and HUSTEDT (1939) to be:
Halophobous.

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