

AN INVESTIGATION  
OF THE PLANKTONIC POPULATION OF  
DIATOMS OF THE "ZANDKREEK" DURING THE  
PERIOD MARCH 1959 TO MARCH 1960

J. H. SCHUURMANS STEKHOVEN

*(Botanical Museum and Herbarium, Utrecht)*

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INTRODUCTION

In the province of Zeeland the State Department for the Maintenance of Ways and Waterworks has planned, as part of the so-called "Three-Islands-Project", for Noord Beveland, Zuid Beveland and Walcheren—, two dikes in a channel called the Zandkreek, which runs between the three islands. At the west end of the channel, off Veere, there will be a big sea dike, and a smaller dike at the east end, where the Zandkreek discharges into the East Scheldt. On May 4th 1960 the east dike was completed, and the west dike has been completed except for a gap of 150 metres. In the spring of 1961 this gap will be closed and thereafter the tidal flow will no longer occur in the Zandkreek. In the future "Lake of Veere" the mean temperatures of the water will be higher in the summer and lower in the winter than in the adjoining North Sea and East Scheldt. It is expected that the concentration of salt will decrease only slowly because there will be no fresh water supply except rainfall. A few pumping engines, which pump water from the nearby polders, deliver brackish water only and the "Walcheren Channel" is brackish as well.

It will be clear that the ecological conditions in the Zandkreek will be changed by both the factors just mentioned, salt and temperature, after the completion of the dikes, and this will have an influence on the flora and fauna present in this area.

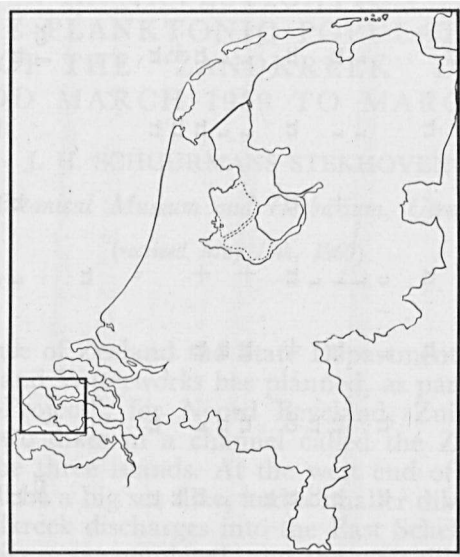
Because these changes were expected an investigation was started just a year before the first sealing off to follow the changes in the flora. This investigation was at first restricted to the planktonic Diatoms and extended to other groups of plants and animals later. In the Diatoms a cycle of a year was investigated during the period March 1959 to March 1960.

METHODS

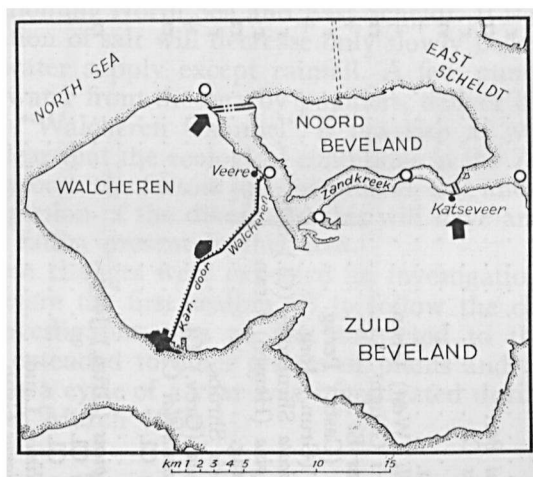
Five points were selected for monthly sampling, three lying within the area to be enclosed and two outside it, (see map). Measurements were made at these points of the temperature and the concentration of salt in the water. Samples were taken both at high tide and low tide, so that ten samples were taken each month. The samples were taken by filtering ten pails of water, equalling about 100 litres of

	1959	1960
	March 4th	Jan. 8th
	April 3rd	Feb. 8th
	May 1st	Jan. 8th
	June 1st	Jan. 8th
	July 30th	Jan. 8th
	August 27th	Jan. 8th
	Sept. 28th	Jan. 8th
	Nov. 26th	Jan. 8th
<i>Asterionella japonica</i> Cl.	.	.
<i>Bellerophon malleus</i> Brightw.	.	.
<i>Biddulphia aurita</i> (Lyngb.) Bréb.	.	.
<i>B. granulata</i> Rop.	.	.
<i>B. rhombus</i> (E.) W.Sm.	.	.
<i>B. regia</i> W.Sm.	.	.
<i>B. sinensis</i> Grev.	.	.
<i>Cerataulina bergoni</i> Per.	.	.
<i>Chaetoceros danicus</i> Cl.	.	.
<i>C. decipiens</i> Cl.	.	.
<i>C. radians</i> Schütt.	.	.
<i>Ditylum brightwellii</i> (West) Grun.	.	.
<i>Coccinodiscus granii</i> Gough	.	.
<i>Eucampia zodiacus</i> E.	.	.
<i>Guinardia flaccida</i> (Castr.) Perag.	.	.
<i>Porosira glacialis</i> (Grun.) Jörg.	.	.
<i>Rhizosolenia imbricata</i> Shrubsolei (Cl.) Schr.	.	.
<i>R. habetata semispina</i> (Hensen) Gran	.	.
<i>R. stollertfothi</i> Perag.	.	.
<i>Streptotheca thamesis</i> Shrubs.	.	.
<i>Scletonema costatum</i> (Grev.) Cl.	.	.
<i>Thalassiosira nordenskiöldi</i> Cl.	.	.
<i>Chaetoceros debilis</i> Cl.	.	.
<i>C. curvisetus</i> Cl.	.	.
<i>Thalassiosira decipiens</i> (Grun.) Jörg.	.	.
<i>Actinocyclus roperi</i> Cl.	.	.
<i>Chaetoceros densus</i> Cl.	.	.
<i>Bacteriasterium hyalinum</i> Laud.	.	.
<i>Chaetoceros lorenzianus</i> Grun.	.	.
<i>Coccinodiscus concinnus</i> W.Sm.	.	.
<i>Lauderia borealis</i> Gran.	.	.
<i>Leptocylindrus danicus</i> Cl.	.	.
<i>Chaetoceros affine Willei</i> (Gran) Hust.	.	.
<i>C. dydimus</i> E.	.	.
<i>C. costatus</i> Pav.	.	.
<i>C. compressus</i> Laud.	.	.
<i>Coccinodiscus gigas</i> var. <i>praetexta</i> (Janisch) Hust.	.	.
<i>Chaetoceros anastomosans</i> (Gran) Hust.	.	.

water, through a plankton-net, the width between the meshes being  $70\mu$ .



Map. 1. Map of the Netherlands with area investigated.



Map 2. Area investigated. ○ point of sampling. ↗ new dike.

## RESULTS

A survey of the planktonic Diatoms which occurred is now presented. The following symbols are used to represent the estimated abundance:

	approximate percentage of the planktonic Diatoms:
rr = very rare . . . . .	1- 5
r = rare . . . . .	5- 25
+ = common . . . . .	25- 50
c = very common, not dominating in the sample. .	50- 75
cc = very common, dominating in the sample . . .	75-100

The data in the following list give the mean value of the ten samples. In nearly all cases, all the samples from one sampling date were similar to each other.

In these results there are some points which merit particular attention. *Eucampia zoodiacus* E. is present in large quantities on June 1st and dominates all other species then, including *Guinardia flaccida* (Castr.) Perag. A month later this latter species shows a maximum and *Eucampia zoodiacus* E. can scarcely be found. Competition may be a cause of this quick succession of the maxima. At the sampling on July 30th three *Chaetoceros*-species appear at the same time and constitute the greater part of the plankton. These species are *Chaetoceros affine williei* (Gran) Hustedt, *C. compressus* Laud. en *C. costatus* Pav. The latter seems to have a more southern distribution.

A remarkable find is *Coscinodiscus gigas* var. *praetexta* (Janisch) Hustedt, which was present regularly in small quantities from the end of August onwards. It is a new species for the Netherlands. HUSTEDT (1930) mentions this species as occurring in the Mediterranean Sea. This suggests that the warm summer of 1959 was responsible for the very northerly occurrence of this species: the temperature of August 29th was 20,4° C. However this species was found in the samples of January 8th and February 8th when the temperatures were 6,4° C and 3,3° C respectively.

Fig. 1 represents a cell,  $\times 400$

Fig. 2 represents various drawings of a cell.

1. part of the disc.
2. areoles near the centre of the disc.
3. chromatophores.
4. pleura seen in face view.

In contradiction to what Hustedt writes, the valva is obviously concave.

Another species new for the Netherlands is *Porosira glacialis* (Grun.) Jörgensen, which was found in very large quantities (cc) on April 3rd. HUSTEDT (1930) mentions the species as "vorwiegend neritisch an den Küsten des nördlichen Eismeerer besonders im Winter auch an den südlicher gelegenen Küsten (Westküste Norwegens)".

Fig. 3 represents a part of the disc.

Fig. 4 represents a cell, magnification 1000 times.

In addition to the description of this author it was found that:

1. the areoles on the disc from the centre to the border are somewhat undulate and not in straight radial rows.

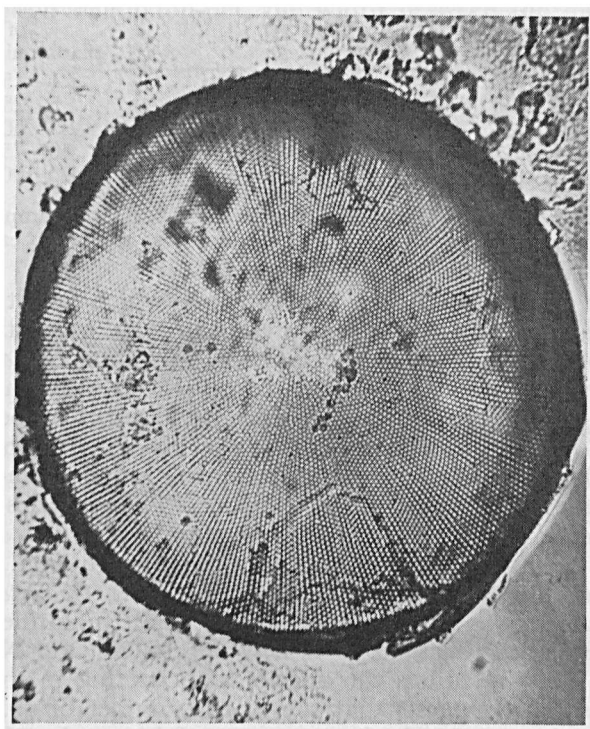


Fig. 1. Cell of *Coscinodiscus gigas* var. *praetexta* (J.) Hust.

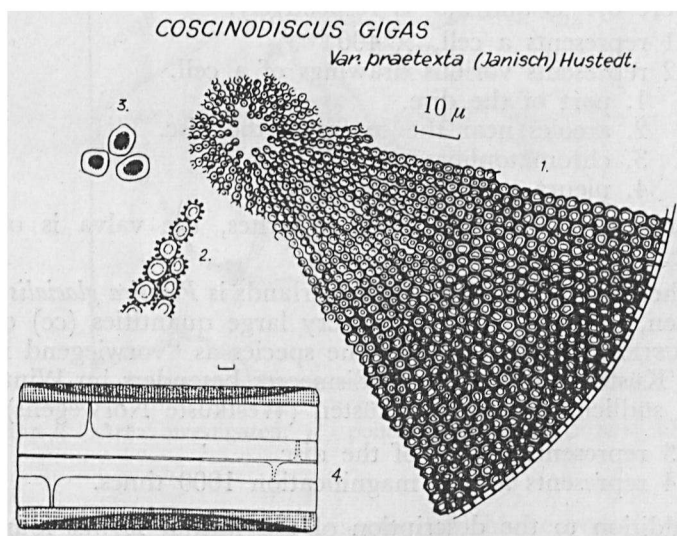


Fig. 2. *Coscinodiscus gigas* var. *praetexta*. 1. part of the disc; 2. areoles near the centre of the disc; 3. chromatophores; 4. pleura seen in face view.

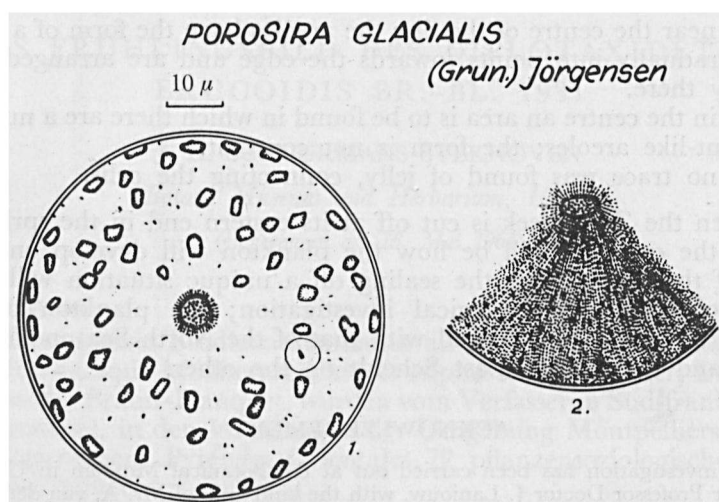


Fig. 3. *Porosira glacialis* (Grun.) Jörgensen. Part of the disc.

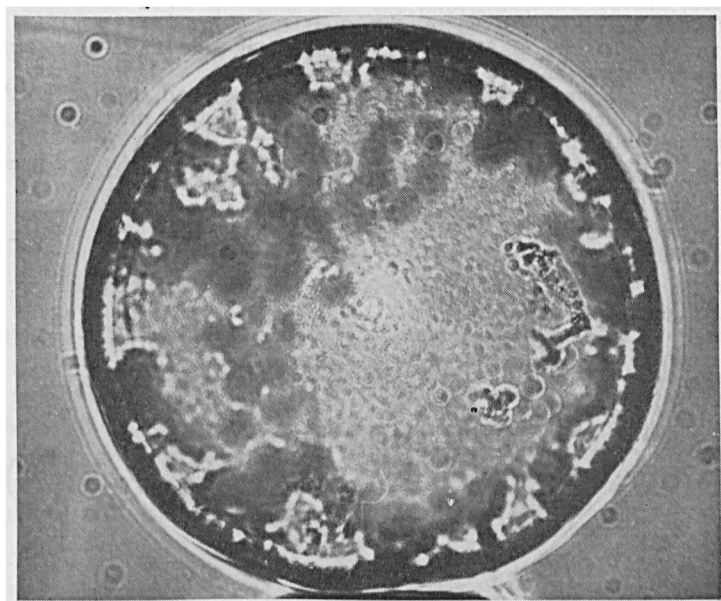


Fig. 4. *Porosira glacialis* (Grun.) Jörgensen. Cell.

2. near the centre of the disc the areoles have the form of a dash, pass gradually into points towards the edge and are arranged irregularly there.

3. in the centre an area is to be found in which there are a number of point-like areoles; the form is not constant.

4. no trace was found of jelly, connecting the cells.

When the Zandkreek is cut off at its eastern end in the spring of 1961, the question will be how the plankton will develop on each side of the dikes. After the sealing off a unique situation will arise for ecological hydrobiological investigation; the plankton of the Zandkreek will be compared with that of the North Sea on the one hand and that of the East Scheldt on the other.

#### ACKNOWLEDGEMENT

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#### SUMMARY

In a channel, which will be cut off soon, an investigation has been started in which the influence of the changing ecological factors will be studied. A year's cycle of Diatoms, investigated in the period March 1959 to March 1960 yielded some interesting results. In early June *Eucampia zoodiacus* E. showed a maximum, whereas *Guinardia flaccida* (Castr.) Perag. showed its maximum in July, when *Eucampia zoodiacus* E. was in its turn rare.

*Porosira glacialis* (Grun.) Jörgensen, which comes from more Northern areas showed a maximum in early April.

*Coscinodiscus gigas praetexta* (Janisch) Hustedt appeared regularly from late August, (temp. 20,4° C), until February 1960 (temp. 3,3° C). Hustedt mentions this species as occurring in the Mediterranean Sea.

Some additions are made to the existing descriptions of the two last mentioned species.

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