

Det Kongelige Danske Videnskabernes Selskab

Biologiske Meddelelser, bind 18, nr. 17

Dan. Biol. Medd. 18, no. 17 (1951)

# PHYTOPLANKTON STUDIES

2. A NEW BIOLOGICAL TYPE WITHIN  
THE GENUS *CHAETOCEROS*,  
*CHAETOCEROS SESSILIS* SP. NOV.

BY

JUL. GRØNTVED



København

i kommission hos Ejnar Munksgaard

1951



DET KONGELIGE DANSKE VIDENSKABERNES SELSKAB udgiver følgende publikationsrækker:

*L'Académie Royale des Sciences et des Lettres de Danemark publie les séries suivantes:*

	Bibliografisk forkortelse <i>Abréviation bibliographique</i>
Oversigt over selskabets virksomhed (8°) <i>(Annuaire)</i>	Dan. Vid. Selsk. Overs.
Historisk-filologiske Meddelelser (8°)	Dan. Hist. Filol. Medd.
Historisk-filologiske Skrifter (4°) <i>(Histoire et Philologie)</i>	Dan. Hist. Filol. Skr.
Arkæologisk-kunsthistoriske Meddelelser (8°)	Dan. Arkæol. Kunsthist. Medd.
Arkæologisk-kunsthistoriske Skrifter (4°) <i>(Archéologie et Histoire de l'Art)</i>	Dan. Arkæol. Kunsthist. Skr.
Filosofiske Meddelelser (8°) <i>(Philosophie)</i>	Dan. Filos. Medd.
Matematisk-fysiske Meddelelser (8°) <i>(Mathématiques et Physique)</i>	Dan. Mat. Fys. Medd.
Biologiske Meddelelser (8°)	Dan. Biol. Medd.
Biologiske Skrifter (4°) <i>(Biologie)</i>	Dan. Biol. Skr.

Selskabets sekretariat og postadresse: Ny vestergade 23, København V.  
Selskabets kommissionær: EJNAR MUNKSGAARD's forlag, Nørregade 6, København K.

*L'adresse postale du secrétariat de l'Académie est:  
Ny vestergade 23, Copenhague V, Danemark.*

*Les publications sont en vente chez le commissionnaire:  
EJNAR MUNKSGAARD, éditeur, Nørregade 6, Copenhague K, Danemark.*

---

Det Kongelige Danske Videnskabernes Selskab

Biologiske Meddelelser, bind **18**, nr. 17

Dan. Biol. Medd. **18**, no. 17 (1951)

# PHYTOPLANKTON STUDIES

2. A NEW BIOLOGICAL TYPE WITHIN  
THE GENUS *CHAETOCEROS*,  
*CHAETOCEROS SESSILIS* SP. NOV.

BY

JUL. GRØNTVED



København

i kommission hos Ejnar Munksgaard

1951

**Printed in Denmark.**  
**Bianco Lunos Bogtrykkeri.**



## Introduction.

The *Chaetoceros* species to be described in what follows was found in the southern North Sea in May 1948. At that time phytoplankton samples were collected simultaneously at a great number of stations covering the North Sea, the Skagerrak, the Norwegian Sea and the Faroe—Shetland Channel, furthermore on the following sections: The Faroes—the Hebrides and the Shetland—Orkney Islands. This plankton sampling took place coincident with hydrographic investigations initiated by THE INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA; at sea the work of the combined investigations was performed by Danish, Swedish, Norwegian, English, and Dutch research ships, which simultaneously made cruises in different parts of the area of investigation. As to the working up of the plankton material the present writer examined the samples collected in the southern North Sea in May 1948 (Sections R, S, T, U; see fig. 7) furthermore a number of samples collected by the Danish research ship DANA in May 1947 (Sections Q, R, and S). The results of the quantitative examination of the whole material will be published later by T. BRAARUD, K. RINGDAL GAARDER, and the author; what follows is an account of a taxonomical study.

For the microscopical examination of the said plankton material I have received economic support from THE RASK-ØRSTED FOUNDATION, which also, together with FONDET FOR DANSK-NORSK SAMARBEJDE, paid travelling expenses in connection with the work. My best thanks are due to the directors of these foundations for the aid rendered to me.

Further I am greatly indebted to Dr. CHR. BROCKMANN, Bremerhaven, for having seen my *Chaetoceros sessilis* preparations and for good informations.

### Taxonomy and Occurrence of *Chaetoceros sessilis* sp. n.

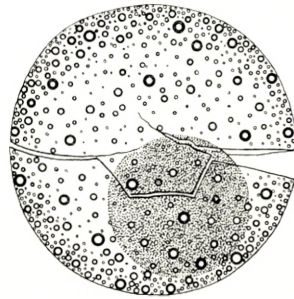
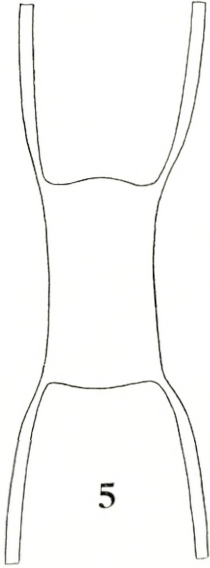
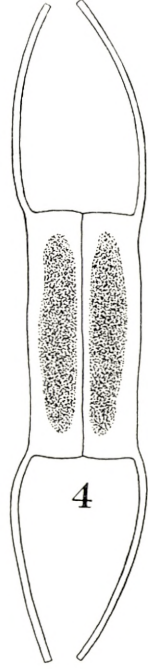
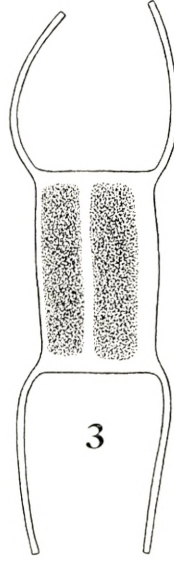
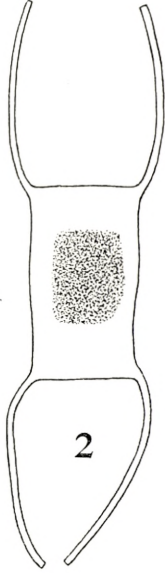
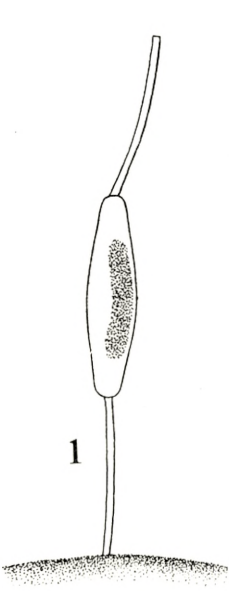
The shape of the valve is linear-lanceolate; in broad girdle view the cell is rectangular, being considerably broader than long; the girdle zone could not be distinguished from the valve mantles; the bristles are short and thick, arising from the valve corners; their basal part curved, directed diagonally outwards; distally they are straight, parallel to the apical axis, or irregularly curved; often the bristle of one valve is directed towards or even cross that of the other; they are blunt, open at the tips. The cell wall is slightly siliceous. One large chromatophore is situated on the broad girdle side. Resting spores were not observed. As to dimensions the following measures were found: Apical axis: 18—33  $\mu$ , transapical axis: 7—9  $\mu$ , length of the bristles: 16—35  $\mu$ .

Only solitary cells were seen, most frequently they occurred attached to spherical bodies, one or, generally, two of the bristles touching the substratum with the tips, which are mucous and adhere to it (see Pl. I); the cells are not embedded in mucilage, only the distal parts of the bristles are adhesive and here the mucilage is often seen as a thickening; probably it is secreted through the open tips of the bristles. The cells of *Chaetoceros sessilis* seem to be well adapted to the attached mode of life: when two of its bristles adhere to the substratum there is always one from each valve, thus after cell division the two daughter cells are from birth attached to the same body as the parent cell. Even if chains of two or a few cells are to be found in the case of *Chaetoceros sessilis* individuals being rapidly dividing up, yet, the formation of real chains seems impossible in this sessile species, each valve of the cell being attached by one of the bristles to the substratum.

---

Fig. 1—5. *Chaetoceros sessilis* from St. S<sub>3</sub>. ( $\times 1000$ ). — 1. Cell in valve view, adhering to the substratum. 2—5. Cells in broad girdle view, 3 and 4 showing early divisional stages. 5. Glow preparation; in the slightly siliceous cells the bristles are flattened by the glowing and the girdle region shows an elongation, likewise due to preparation; junction between the girdle zone and the valve mantles not to be distinguished.

Fig. 6. The spherical body which serves as a substratum to the *Chaetoceros sessilis* individuals found at St. S<sub>3</sub>; this one without covering of diatoms; the body has got a crack from the pressure of the cover glass; perforations are seen on the surface. ( $\times 275$ ).



Latin diagnosis.

*Chaetoceros sessilis* species nova.

Frustulis e facie connectivali visis rectangularibus, latioribus quam longioribus; valvis lineari-lanceolatis, ad 18—33  $\mu$  longis, 7—9  $\mu$  latis; setis e margine frustulae orientibus, crassis, plus minus curvatis, 16—35  $\mu$  longis. Phaeophora laminiformia, singula, zonae connectivali adposita. Sporis perdurantibus non observatis. Frustulis parce siliceis, solitariis vel binatim conjunctis, ad corpuscula natantia adherentibus.

Habitat in mari Germanico; rarissime.

As to the taxonomical position of our species the character of its being attached by the bristles to deposited or floating bodies is so far unknown within the genus *Chaetoceros*; however, we are not justified in setting up a new genus on account of this biological character, and as it is possible to refer it to *Chaetoceros* for morphological reasons, this has been done; within this genus it belongs to the subgenus *Hyalochaete* on account of its single, large chromatophore; further we may place it in the section *Simplicia* as no chain formation was observed.

It is well-known that many *Chaetoceros* species show great morphological variation, and this fact must be taken into consideration when new species are set up; *Chaetoceros sessilis*, however, does not only differ from the other species within this genus with regard to morphological characters, but also in its attached mode of life, and this is one reason why we regard it as a distinct species.

*Chaetoceros sessilis* was found at two localities, viz. at Stations S<sub>3</sub> and 6844 (see fig. 7); at the former station, where plankton was sampled on 8th May 1948, the individuals were attached only to one kind of substratum: hollow, spherical bodies (see fig. 6), their diameters being 100—200  $\mu$ ; the walls, which are provided with perforations of various sizes, seem to be slightly silicified; the origin of these bodies is unknown to me; they were found only at this station and only in the net sample, thus under pelagic conditions; most of them were without any covering but about thirty were found covered with *Chaetoceros sessilis*, generally without other diatoms being present; however, a few were observed covered with this species together with pennate bottom diatoms; in this case it is probable that the substratum had been deposited on the bottom when the diatoms attached themselves to it. In the net sample



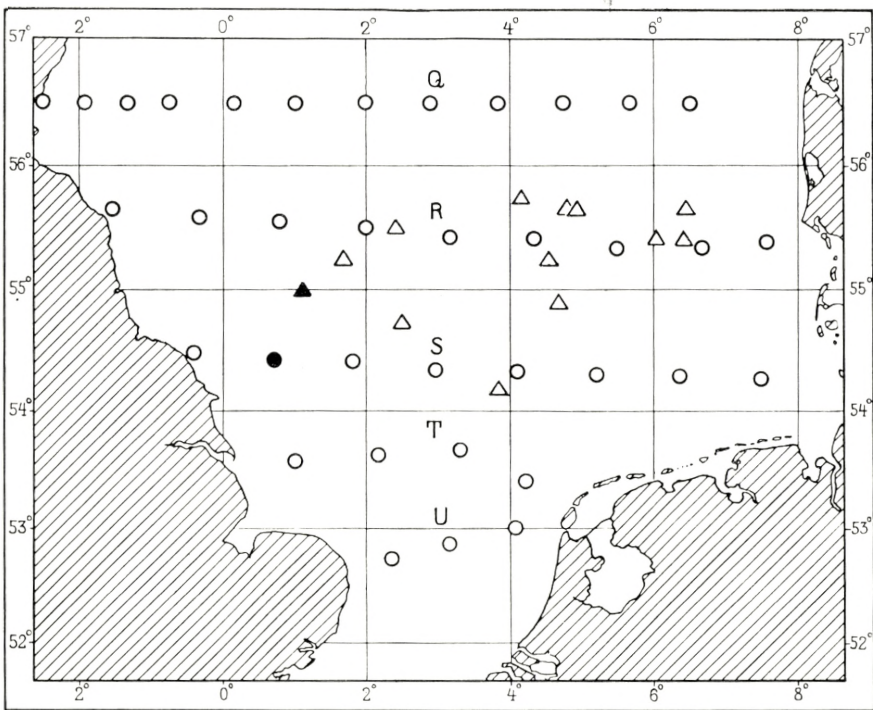


Fig. 7. Map of the southern part of the North Sea showing the positions of the plankton stations in May 1948; at the stations marked with open circles water samples were collected at the following depths: 0, 10, 20, and 50 m. (or bottom); further net sampling took place in the surface at the stations of Sections R and S; with  $\Delta$  are marked stations for net sampling only. The filled-in circle and triangle indicate St.  $S_3$  and St. 6844 respectively, where *Chaetoceros sessilis* was found in May 1948. In May 1947, when plankton was sampled along Sections Q, R and S, this species was observed at St. 6572 ( $55^{\circ}25'$  N. Lat.;  $1^{\circ}27'$  W. Long.). (See postscript).

from St. 6844 gathered on 23rd May 1948, *Chaetoceros sessilis* was found together with numerous pennate bottom diatoms fixed to other sorts of suspended matter, without doubt lately arisen from the bottom; also the spherical substratum from St.  $S_3$  may properly belong to the bottom deposits; thus it seems likely that *Chaetoceros sessilis* has a preference for living on the bottom, and perhaps the circumstance that in our material only a few cells were dividing up is due to the floating condition; but nothing can be said with certainty as to its proper habitat; it is a rare species in our area in the spring plankton, being found only in two of the numerous samples collected all over the North

Table I. Hydrographical Conditions at the Sts. where  
*Chaetoceros sessilis* was Found.

St. S<sub>3</sub>.  $\frac{8}{5}$ , 1948. (Depth 63 m).

Depth in metres . . . . .	0	10	20	30	50	60
Temperature, °C . . . . .	9.21	8.04	7.52	7.50	7.47	7.47
Salinity, per mille . . . . .	34.43	34.51	34.51	34.55	34.51	34.57
$\sigma_t$ . . . . .	26.66	26.91	26.98	27.01	26.98	27.03

St. 6844;  $\frac{23}{5}$ , 1948. (Depth 40 m).

Depth in metres . . . . .	0	38
Temperature, °C . . . . .	10.38	8.21
Salinity, per mille . . . . .	34.71	34.69
$\sigma_t$ . . . . .	26.67	27.02

Sea in May 1948; and in May 1947, when plankton was sampled in the southern part of this area (Sections Q, R and S; see fig. 7), it was met with only at one St. (see postscript).

The hydrographical data from the two positive stations in 1948 are recorded in Table I; it appears from this table that the water masses show a certain degree of stratification; consequently the possibilities of bottom diatoms being brought up in water by turbulent activities were not great; at St. 6844 no water samples were collected, but in the water samples from St. S<sub>3</sub> the following species of littoral diatoms were found: *Actinoptychus undulatus*, *Campylosira cymbelliformis*, *Cocconeis scutellum*, *Navicula distans*, *Pleurosigma angulatum*, *Rhaphoneis surirella*. As the total number of diatom species in these samples amounted only to 14, the littoral forms were fairly well represented; probably they had been carried by horizontal currents to this place from bottom habitats in more shallow parts, and it does not seem improbable that the *Chaetoceros sessilis* individuals found originate from the same or similar biotopes; possibly the species has a wider di-

stribution on the bottom than that indicated on the map (fig. 7), but no samples were collected here during our investigations.

As a matter of fact little is known about the microflora living on the bottom of the North Sea, apart from the Waddensea and the coastal waters outside it; yet, BROCKMANN (1937)<sup>1</sup> examined samples of bottom material from several stations near the Dogger Bank; and in one locality, at a depth of 46 m, he found an autochthonous diatom flora rich in species; it appears from this that great areas of the sea bottom in the southern and central part of the North Sea are within the euphotic zone in so far as the benthic diatoms are concerned, and it would be of great interest to have made investigations on the diatom populations living here.

---

<sup>1</sup> Küstennahe und küstenferne Sedimente in der Nordsee.—Abhdl. Nat. Vereins Bremen. Bd. 30, Heft 1—2.

---

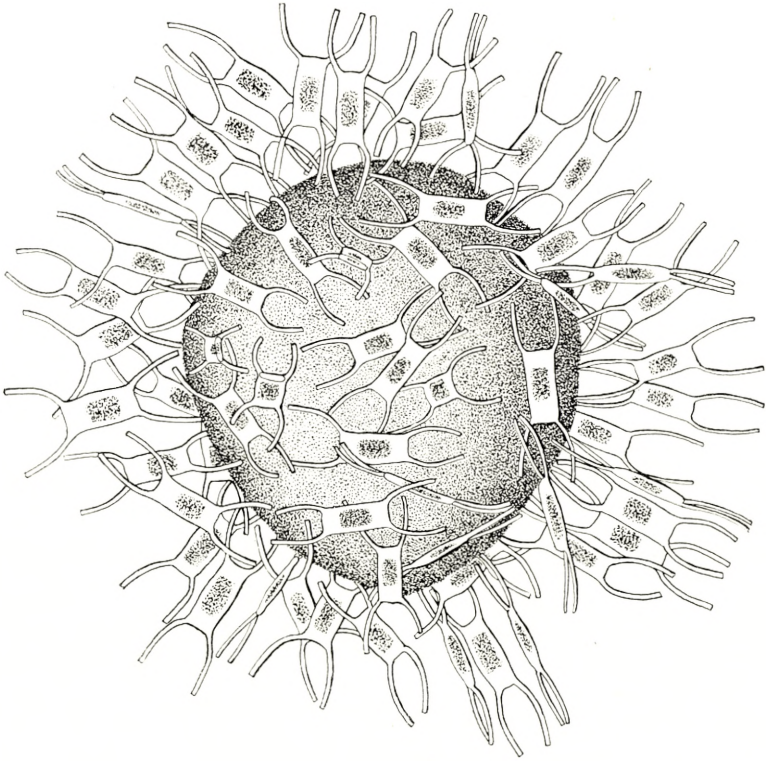
### Postscript.

After printing of the preceding pages I have on a special occasion made a renewed examination of the surface net samples from the plankton stations of the Sections Q, R and S, May 1947. In one of the samples, that from St. 6572 ( $55^{\circ}25' N.$  Lat.;  $1^{\circ}27' W.$  Long.), I found *Chaetoceros sessilis*; only one "secondary colony" like that shown in Plate I was observed.



### Explanation of Plate I.

*Chaetoceros sessilis* individuals from St. S<sub>3</sub>, attached to the spherical substratum; the *Chaetoceros* cell adheres to the foreign body with the tips of one or two of the bristles; in the preparation some of the individuals are lying with their bodies close to the substratum, this is due to pressure from the cover glass, the spherical substratum has become somewhat deformed on the same account; the sculpture of its surface is not drawn. ( $\times 500$ ). Drawn by Miss INGEBORG FREDERIKSEN.







# Det Kongelige Danske Videnskabernes Selskab

Biologiske Meddelelser

(Dan. Biol. Medd.)

Bind 18

(*uafsluttet/en cours de publication*)

	kr. ø.
1. BOHR, HANS H.: Measurement of the Blood Volume by Means of Blood Corpuscles Labelled with P <sup>32</sup> . 1950 .....	2.00
2. LARSEN, POUL: The Aspects of Polyploidy in the Genus Solanum. II. Production of dry Matter, Rate of Photosynthesis and Respiration, and Development of Leaf Area in some Diploid, Autotetraploid and Amphidiploid Solanums. 1943 ....	4.50
3. WESTERGAARD, M.: The Aspects of Polyploidy in the Genus Solanum. III. Seed Production in Autopolyploid and Allopolyploid Solanums 1948 .....	2.00
4. HAGERUP, O.: <i>Thrips</i> Pollination in <i>Calluna</i> . 1950.....	1.50
5. HAGERUP, O.: Rain-Pollination. 1950.....	1.50
6. JENSEN, P. BOYSEN: En Metodik til Undersøgelse af Landbrugsplanternes Vandøkonomi og Stofproduktion. Mit deutscher Zusammenfassung. 1950 .....	3.00
7. JENSEN, P. BOYSEN: Investigations on the Growth and Differentiation of Tobacco Tissue Cultures in Vitro. 1950 .....	1.50
8. BØRGESEN, F.: <i>Vaughaniella</i> . A New Genus of the <i>Dictyotaceae</i> . 1950 .....	1.00
9. CHRISTIANSEN, H.: A Tetraploid <i>Larix Decidua</i> Miller. 1950...	1.50
10. JENSEN, P. BOYSEN: Untersuchungen über Determination und Differenzierung. 1. Über den Nachweis der Zellulosenbildner und über das Vorkommen und die Lage derselben in Wurzelhaaren und Trichoblasten. 1950.....	1.50
11. BØRGESEN, F.: Some Marine Algae from Mauritius. Additions to the Parts Previously Published. II. 1950.....	5.00
12. GRØNTVED, JUL.: Phytoplankton Studies. 1. <i>Nitzschia Frigida</i> Grun., an Arctic-Inner-Baltic Diatom Found in Danish Waters. 1950 .....	2.00
13. BØCHER, TYGE W.: Studies on Morphological Progression and Evolution in the Vegetable Kingdom. 1951.....	4.00
14. KLENOW, HANS: The Enzymatic Oxidation of 2-Amino-4-Hydroxy-6-Formylpteridine. 1951 .....	2.00
15. HAGERUP, O.: Pollination in the Faroes - in Spite of Rain and Poverty in Insects. 1951 .....	5.00
16. BØRGESEN, F.: Some Marine Algae from Mauritius. Additions to the Parts Previously Published. III. 1951 .....	7.00
17. GRØNTVED, JUL.: Phytoplankton Studies. 2. A New Biological Type within the Genus <i>Chaetoceros</i> , <i>Chaetoceros sessilis</i> sp. nov. 1951 .....	1.50



Bind 21

(uafsluttet/en cours de publication)

	kr. ø.
1. BÖCHER, TYGE W.: Studies on the Sapropelic Flora of the Lake Flyndersø with Special Reference to the Oscillatoriaceae. 1949.....	4.00
2. JENSEN, P. BOYSEN: The Production of Matter in Agricultural Plants and its Limitation. 1949.....	2.00
3. JENSEN, P. BOYSEN: Causal Plant-Geography. 1949. ....	2.00
4. LARSEN, ELLINOR BRO: Activity and Migration of <i>Plusia Gamma</i> L. Studies on the Activity of Insects III. 1949.....	3.00
5. BØRGESEN, F.: Some Marine Algae from Mauritius. Additions to the Parts previously published. 1949.....	6.00
6. JENSEN, AD. S., and VOLSØE, HELGE: A Revision of the Genus <i>Icelus</i> ( <i>Cottidae</i> ). With Remarks on the Structure of its Urogenital Papilla. 1949. ....	3.00