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# A PRELIMINARY CHECK-LIST OF THE PHYTOPLANKTON OF THE NORTHERN BALTIC SEA

Guy Hällfors<sup>1</sup>

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The phytoplankton species known to the author on the basis of own investigations and literature data are listed. Their distribution in the northern Baltic proper, the Gulf of Finland, the Bothnian Sea, and the Bothnian Bay is recorded. The list is provided with annotations, and the better-known species are ecologically characterized.

Index words: Phytoplankton, Baltic Sea, check-list, ecology, taxonomy.

## 1. INTRODUCTION

The study of phytoplankton in Finnish coastal waters and surrounding sea areas has for a long time been hampered by the lack of a modern determination manual. Determination work often has to be based on an extensive taxonomical special literature which in part is difficult to obtain, in part is now obsolete. The flora of Pankow (1976) may be of much help, but from a systematical and nomenclatural point of view it is old-fashioned in many respects. In addition, its coverage of small flagellates in general and of the flora of the northern Baltic Sea in particular, is rather incomplete.

To improve the situation even a little, I have been persuaded by several persons to prepare the present list. It is intended to be used as an easily cited source in nomenclatural matters and to record the present state of knowledge of the distribution of phytoplankton species in the sea

areas around the Finnish coasts. Besides, I have added some ecological data on trial.

I hope that this preliminary list will stimulate people working with phytoplankton of the northern Baltic Sea to publish new floristic and ecological observations. I shall be grateful for any corrections, improvements or additions which would serve to make the next version as useful as possible.

## 2. ARRANGEMENT OF THE LIST

For the purpose of the present check-list the northern Baltic Sea is divided into five subareas (Fig. 1): the Northern Baltic proper (NB), the Gulf of Finland (GF), the Archipelago Sea (AS), the Bothnian Sea (BS), and the Bothnian Bay (BB). To facilitate rapid location of samples well

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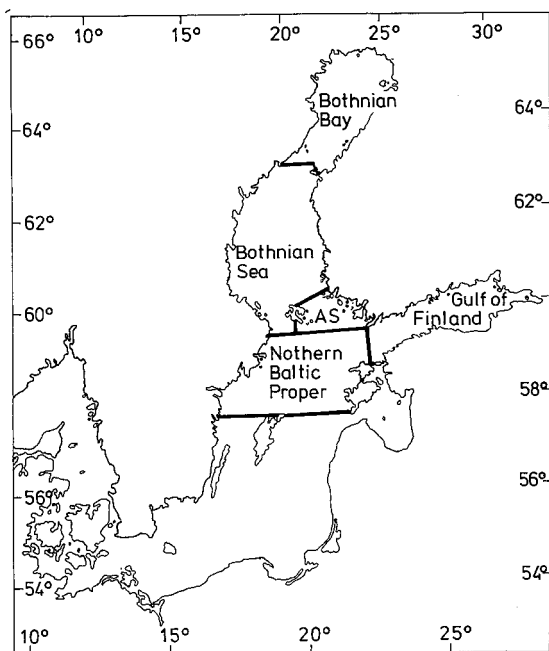


Fig. 1. The Baltic Sea with the subareas indicated for which records of planktonic species are included in the check-list.

defined borders have been endeavoured which differ somewhat from previously proposed "natural" borders. When considering division of the area for other purposes the borders suggested by Ekman (1931) and Wattenberg (1949) should be taken into consideration.

The southern border of the area for which data are included is 58°N. The eastern border of NB between Saaremaa and Hiiumaa is drawn along 22°30'E. The border between NB and GF is 23°E, while the southern border of GF at Vormsi Island is 59°N. The northern border of NB is 59°45'N. The Archipelago Sea is delimited by the line Uusikaupunki-Isokari-Koksna-Geta, the line 20°E from Lemland Järsö to 59°45'N, and this latitude eastwards to 23°E. The border between BS and BB follows 63°30'N from the Swedish coast to Valsörarna/Valassaaret Islands, and further over the shallowest sills to the mainland.

When a species has been recorded from an area there is a symbol in the proper column. However, due to the scanty material available the Archipelago Sea is omitted from the present list.

#### Explanation of symbols:

- + = occurrence without ecological characterization
- c = cold water species (< 10° C)
- w = warm water species (> 10° C)
- L = main occurrence in the littoral
- f = freshwater species which does not tolerate the full salinity of the area
- E = main occurrence in eutrophied waters

As to the nomenclature I have tried to consider changes made lately, except within the Cyanophyta, where, for the present, I find the conventional grasp safer than that of e.g. Parke and Dixon (1976). The most important synonyms used in the northern Baltic area are given in brackets below each species. The number in brackets after a name refers to an annotation at the end of the list. For the sake of clarity authors' names are mostly given in full. For abbreviations, see Christensen and Thomsen (1974) and Parke and Dixon (1976).

The list is not to be considered complete. It is mainly based on my own and Åke Niemi's material and experience supplemented with literature data. The literature coverage is, however, not yet exhaustive. I have corrected some clearly erroneous records. Other possibly wrong determinations or dubious records I have so far left out altogether. I have also left out the many freshwater littoral diatoms mentioned solely by Halme and Mölder (1958). Their occurrence in plankton seems to be rather fortuitous. Moreover, they can usually be determined only with the aid of diatom preparations from which it is impossible to conclude whether they were alive at the time of sampling. Thus they are of little importance in quantitative phytoplankton work. As regards some taxonomical groups, our knowledge is so far very incomplete, which fact I have tried to point out in annotations. This regards in particular small naked or scaly flagellates.

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I thank Prof. Åke Niemi for help and encouragement and Prof. Hans Luther for advice concerning the subdivision of the area.

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Guy Hällfors

## LOPPUTIIVISTELMÄ

Tämän alustavan pohjoisen Itämeren kasviplanktonlajiston luettelon tarkoituksena on toimia helposti referoitavana lähteenä kotimaisissa nimistöasioissa ja kartoittaa tämän hetken tietämyksemme planktonlevien levinneisyydestä meri-alueillamme. Lisäksi luetteloon sisältyy jonkin verran ekologista tietoa.

Käsitteltävä alue on jaettu viiteen osaan (kuva 1): varsinainen pohjoinen Itämeri (NB), Suomenlahti (GF), Saaristomeri (AS), Selkämeri (BS) ja Perämeri (BB). Milloin lajista on joltakin alueelta havainto, asianomaisessa sarakkeessa on siitä merkintä. Saaristomeri on kuitenkin käytettävissä olevan aineiston vähyydestä johtuen toistaiseksi jätetty luettelosta pois.

Merkkien selitykset:

+ = esiintyminen ilman ekologista luonnehdintaa

c = kylmän veden laji (< 10° C)

w = lämpimän veden laji (> 10° C)

L = lajin pääasiallinen esiintyminen litoraalissa

f = makean veden laji, joka ei siedä kyseisen alueen täyttä suolaisuutta

E = lajin pääasiallinen esiintyminen rehevöityneissä vesissä

Nimistöissä on pyritty ottamaan huomioon viimeaikaiset muutokset. Tärkeimmät meillä käytetyt synonyymit esiintyvät suluissa kunkin lajin alla. Suluissa oleva numero nimen perässä viittaa luettelon lopussa olevaan huomautukseen tai lisäselvitykseen.

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## Notes

- (1) Requires taxonomic re-investigation.
- (2) Halme & Mölder (1958) further report the species *C. dubium* Grunow and *C. minutissimum* Lemmermann from the Pojo Bay. See, however, Pankow (1976, p. 26).
- (3) All species in this genus need taxonomic re-investigation.
- (4) See Pankow (1976, p. 21).
- (5) In all areas probably several species are present which need to be worked out.
- (6) This species has mostly been recorded as *Anabaena flos-aquae* (Lyngbye) Brébisson. In my opinion *A. flos-aquae* and *A. lemmermannii* should be kept as separate species. All samples with akinetes from the Baltic Sea that have been studied have been *A. lemmermannii*. This species has also been confused with *A. baltica* (see Niemi & Hällfors 1974).
- (7) The determination needs confirmation.
- (8) Recorded from the sea only without akinetes. Akinete formation is at times abundant in certain brackish-water rock-pools (Hällfors, unpubl.).
- (9) Järnefelt (1964) reports most probably this species under the name *A. circularis*.
- (10) Accidentally planktonic filaments are easily confused with *Oscillatoria* spp.
- (11) The species have not yet been worked out.
- (12) Recorded as *D. acuta* Ehrenberg by Niemi et al. (1970).
- (13) Main occurrence in rock-pools (see Droop 1953).
- (14) See Parke & Dixon (1976).
- (15) Erroneously named *Diplopsalis lenticula* (Niemi & Hällfors 1974) and *Glenodinium lenticula* (Niemi 1971, 1972). *Diplopsalis lenticula* Bergh (= *Glenodinium lenticula* (Bergh) Schiller), however, is a separate species which has not yet been observed in the area.
- (16) The record is based on the observation of single scales only.
- (17) See Thomsen (1979).
- (18) In older literature the species has been comprehended in a collective sense, including the other species of the genus.
- (19) Hällfors, unpublished.
- (20) See Niemi & Hällfors (1974). Later studies indicate that this is not *C. affinis*, but an undescribed species.
- (21) Leegaard (1920) incorrectly used the name *C. debilis* for this species.
- (22) In addition to solitary cells the species also forms chains which apparently have been referred to *C. eibenii* Grunow (e.g. Wołczyńska 1935) and *C. borealis* Bailey (several papers).
- (23) Chains with very narrow apertures have previously been determined as *C. crinitus* according to Hustedt (1927–1930). However, the genuine *C. crinitus* Schütt is quite different (see Grøntved 1956).
- (24) In addition, the paper of Halme & Mölder contains some dubious determinations from the Pojo Bay.
- (25) Niemi et al. (1970) report this species erroneously as *C. oculus-iridis* Ehrenberg. Apparently the same species is also reported as *C. asteromphalus* Ehrenberg in several papers. *C. granii* is well characterized by the eccentric curvature of the valve, girdle bands tapering towards the ends and the wedge-shaped girdle view. *C. oculus-iridis* and *C. asteromphalus* probably do not belong to the recent flora of the northern Baltic Sea.
- (26) Literature records of this species from the open sea (e.g. Mölder 1962) probably should be ascribed to *C. caspia*.
- (27) See Leegaard (1920). I have no own observations of this species. It should not be confused with the green alga *Planctonema lauterbornii*.

- (28) In addition, Halme & Mölder (1958) mention f. *seriata* O. Müller, var. *alpigena* Grunow and var. *livata* (Ehrenberg) Bethge from the innermost part of the Pojo Bay.
- (29) *S. bantzschii* var. *pusilla* has repeatedly been reported from eutrophied waters. In Finnish literature, however, this epithet probably covers several small centric species, among others *Thalassiosira guillardii*.
- (30) See Hasle (1978).
- (31) Additional species of this genus occur accidentally in plankton.
- (32) See Tynni (1978).
- (33) Main occurrence in shallow bays in the innermost archipelago.
- (34) Common in coastal plankton and in the littoral.
- (35) Mostly var. *constricta* Grunow in plankton.
- (36) See Dawson (1974).
- (37) See Lange-Bertalot (1977).
- (38) Comprises several varieties which need to be investigated.
- (39) See Tynni (1976, Fig. 108b).
- (40) According to Patrick & Reimer (1966) the correct name would be *S. fasciculata* (Agardh) Kützing.
- (41) Requires taxonomic and nomenclatural re-investigation.
- (42) See Komárková-Legnerová (1969).
- (43) Apparently recorded by Välikangas (1926) partly as *Dactylococcopsis raphidioides* Hansgirg (Cyanophyceae), partly as *Ankistrodesmus falcatus* var. *mirabile* W. & G.S. West. In Finnish literature the species has frequently been incorrectly named *Ankistrodesmus spiralis*. The genuine *A. spiralis* is rather a species of acid freshwater, and has not been observed in brackish water.
- (44) Sterile, accidentally planctonic filaments can generally not be determined to the species.
- (45) Undetermined species of this genus occur more or less regularly in estuarine areas.
- (46) Recorded by Niemi et al. (1970). Systematic position uncertain, see Parke & Dixon (1976, p. 557).
- (47) See Crawford (1978).

## CYANOPHYTA

### Cyanophyceae

#### Chroococcales

##### Aphanocapsa Nägeli

- elachista* W. & G.S. West var. *elachista*  
– var. *planctonica* G.M. Smith

w f  
w f

##### Aphanothece Nägeli

- clathrata* W. & G.S. West

+ w f +

##### Chroococcus Nägeli

- limneticus* Lemmermann  
*minutus* (Kützing) Nägeli (1)  
*turgidus* (Kützing) Nägeli

w w f  
w w f

##### Coelosphaerium Nägeli (2)

- kuetzingianum* Nägeli

w f w

##### Gomphosphaeria Kützing

- lacustris* Chodat var. *lacustris*  
(*litoralis* Häyrén)  
– var. *compacta* Lemmermann  
*naegeliana* (Unger) Lemmermann  
(*Coelosphaerium naegelianum* Unger)

w w w w  
w w w w  
+ + +

	NB		GF		BS	BB
<b>Merismopedia Meyen (3)</b>						
<i>glauca</i> (Ehrenberg) Nägeli				+		
<i>punctata</i> Meyen				+		
<i>warmingiana</i> Lagerheim				+		
( <i>affixa</i> P. Richter)						
( <i>minima</i> G. Beck)						
( <i>punctata</i> f. <i>minor</i> Lagerheim)						
( <i>tenuissima</i> Lemmermann)						
<b>Microcystis Kützing</b>						
<i>aeruginosa</i> (Kützing) Kützing (4)	w	f	w	f		
( <i>flos-aquae</i> (Wittrock) Kirchner)						
<i>reinboldii</i> (Richter) Forti (4)	w	E	w	E	w	w
( <i>Aphanocapsa delicatissima</i> W.& G.S. West)						
( <i>Microcystis incerta</i> (Lemmermann)						
Lemmermann)						
( <i>M. pulverea</i> (Wood) Forti)						
( <i>M. pulverea</i> var. <i>incerta</i> (Lemmermann) Crow)						
<b>Rhabdoderma Schmidle &amp; Lauterborn</b>						
<i>lineare</i> Schmidle & Lauterborn				f		
<b>Nostocales</b>						
<b>Achroonema Skuja (5)</b>						
<i>lentum</i> Skuja				+		
<i>proteus</i> Skuja				+		
<i>proteiforme</i> Skuja				+		+
<b>Anabaena</b>						
<i>baltica</i> Schmidt	w		w			
( <i>A. spiroides</i> f. <i>baltica</i> (Schmidt) Pankow)						
<i>circinalis</i> Rabenhorst			w	f		
( <i>A. spiroides</i> f. <i>hassallii</i> (Kützing) Pankow)						
<i>inaequalis</i> (Kützing) Bornet & Flahault	w		w		w	
<i>lemmermannii</i> P. Richter (6)	w		w		w	+
( <i>A. flos-aquae</i> f. <i>lemmermannii</i> (P. Richter)						
<i>Canabacus</i> )						
<i>spiroides</i> Klebahn			w	f		
<i>subcylindrica</i> Borge (7)	w	f	w	f		
<i>variabilis</i> Kützing ex Bornet & Flahault (7,8)			w	f		
<b>Anabaenopsis V. Miller</b>						
<i>elenkinii</i> V. Miller (9)			w	E		
<b>Aphanizomenon Morren ex Bornet &amp; Flahault</b>						
<i>flos-aquae</i> (L.) Ralfs ex Bornet & Flahault	w(c)		w(c)		w(c)	+
<i>gracile</i> (Lemmermann) Lemmermann	w		w			+
<b>Beggiatoa Trevisan</b>						
<i>alba</i> (Vaucher) Trevisan	w	L E	w	L E		
<i>leptomitiformis</i> (Meneghini) Trevisan	w	L E	w	L E		
<i>minima</i> Winogradsky	w	L E	w	L E		
<i>mirabilis</i> Cohn	w	L E	w	L E		





	NB	GF	BS	BB
<b>Dinophysiales</b>				
Dinophysis Ehrenberg				
acuminata Claparède & Lachmann (1)	w	w	w	w
(lachmannii Paulsen)				
baltica (Paulsen) Kofoid & Skogsberg (1)	+	+		
(ovum var. baltica Paulsen)				
norvegica Claparède & Lachmann (12)	w	w	w	w
rotundata Claparède & Lachmann	w	w	w	w
(Phalachroma rotundatum (Clap. & Lachm.)				
Kofoid & Michener)				
<b>Gymnodiniales</b>				
Amphidinium Claparède & Lachmann				
longum Lohmann (7)	+	+		
pellucidum C. Herdman	(+)	+	+	
Gymnodinium Stein (3, 5)				
simplex (Lohmann) Kofoid & Swezy (7)	c	c		
Gyrodinium Kofoid & Swezy (5)				
fissum (Levander) Kofoid & Swezy		+		
(Gymnodinium fissum Levander)				
(Spirodinium fissum (Lev.) Lemm.)				
Hemidinium Stein				
nasutum Stein		?		
ochraceum Levander (13)		+		
Katodinium Fott (11)		+		
(Massartia Conrad)				
Oxyrrhis Dujardin				
marina Dujardin (13)		+		
<b>Peridinales</b>				
Ceratium Schrank				
hirundinella (O.F. Müller) Schrank		f		
Entzia Lebour				
acuta (Apstein) Lebour		f		f
(Peridinium latum Paulsen)				
Glenodinium Ehrenberg				
gymnodinium Penard		f		
paululum Lindemann (7)		+		
penardiforme (Lindemann) Schiller (7)		+		
Gonyaulax Diesing				
catenata (Levander) Kofoid	c	c	c	c
grindleyi Reinecke	w	w	w	w
(Protoceratium reticulatum				
(Clap. & Lachm.) Bütschli)				

	NB	GF	BS	BB
<i>spinifera</i> (Claparède & Lachmann) Diesing	w	w		
<i>triacantha</i> Jörgensen	w	w	w	
<i>verior</i> Sournia	w	w		
( <i>diacantha</i> (Meunier) Schiller)				
<b>Heterocapsa</b> Stein				
<i>triquetra</i> (Ehrenberg) Stein	w	w		
( <i>Peridinium triquetrum</i> (Ehr.) Lebour)				
<b>Oblea</b> Balech				
<i>rotunda</i> (Lebour) Balech	w	w (E)	w	w
( <i>Peridiniopsis rotunda</i> Lebour)				
( <i>Glenodinium rotundum</i> (Lebour) Schiller)				
( <i>Peridinium limnophilum</i> Lindemann)				
<b>Peridinium</b> Ehrenberg				
<i>balticum</i> (Levander) Lemmermann		+		
( <i>Glenodinium balticum</i> Levander)				
<i>cinctum</i> (O.F. Müller) Ehrenberg			f	
<i>hangoei</i> Schiller (7)	+	+	+	
( <i>P. gracile</i> Lindemann)				
<i>inconspicuum</i> Lemmermann		w	f	f
<i>willei</i> Huitfeld-Kaas			f	
<b>Protoperidinium</b> Bergh				
( <i>Peridinium</i> p.p.)				
<i>achromaticum</i> (Levander) Balech	w	w	w	w
( <i>Peridinium achromaticum</i> Levander)				
<i>avellana</i> Meunier (7)	+	+	+	+
( <i>Peridinium avellana</i> (Meunier) Lebour)				
<i>bipes</i> (Paulsen) Balech	cw	cw	cw	
( <i>Glenodinium bipes</i> Paulsen)				
( <i>Peridinium minusculum</i> Pavillard)				
( <i>Minuscula bipes</i> (Paulsen) Lebour)				
<i>brevipes</i> (Paulsen) Balech	cw	cw	cw	cw
( <i>Peridinium brevipes</i> Paulsen)				
<i>granii</i> (Ostenfeld) Balech	c	c	c	c
( <i>Peridinium granii</i> Ostenfeld)				
( <i>Peridinium finlandicum</i> Paulsen)				
( <i>Peridinium divergens</i> var. <i>levanderi</i> Lemmermann)				
<i>pellucidum</i> Bergh	w	w	w	+
( <i>Peridinium pellucidum</i> (Bergh) Schütt)				
<b>Pyrophacus</b> Stein				
<i>horologicum</i> Stein		+		
<b>Scrippsiella</b> Balech ex Loeblich III				
<i>trochoidea</i> (Stein) Loeblich III (1, 14)	w	w		
( <i>Peridinium trochoideum</i> (Stein) Lemmermann)				
<b>Zygabikodinium</b> Loeblich fil. & Loeblich III				
<i>lenticulatum</i> Loeblich fil. & Loeblich III (15)	w	w	w	
( <i>Diplopsalis lenticula</i> f. <i>minor</i> Paulsen)				
( <i>Glenodinium lenticula</i> f. <i>minor</i> (Paulsen)				
Pavillard)				
( <i>Diplopeltopsis minor</i> (Paulsen) Pavillard)				

	NB	GF	BS	BB
<b>Ebriales</b>				
Ebria Borgert tripartita (Schumann) Lemmermann	+	+	+	+
<b>PRYMNESIOPHYTA (HAPTOPHYTA)</b>				
<b>Prymnesiophyceae (Haptophyceae)</b>				
<b>Isochrysidales</b>				
Gephyrocapsa Kamptner huxleyi (Lohmann) Reinhardt (16, 17)		+		
Hymenomonas Stein carterae (Braarud & Fagerland) Manton & Peterfi (17)		+		
roseola Stein (7)		+		
<b>Papposphaerales</b>				
Balaniger Thomsen & Oates balticus Thomsen & Oates (17)		+		
Pappomonas Manton & Oates virgulosa Manton & Sutherland (17)		+		
<b>Prymnesiales</b>				
Chrysochromulina Lackey (5) birgeri Hällfors & Niemi		c		
mantoniae Leadbeater (16, 17)		+		
<b>CHRYSOPHYTA</b>				
<b>Chrysophyceae</b>				
<b>Ochromonadales</b>				
Anthophysa Bory vegetans (O. F. Müller) Stein		+		
Bicoeca James-Clark ainikkiae Järnefelt		f		+
lacustris James-Clark		f		
multiannulata Skuja		f		+
petiolata (Stein) E.G. Pringsheim		f		
Bodo Stein (5) ovatus (Dujardin) Stein		+		
Dinobryon Ehrenberg balticum (Schlitt) Lemmermann	w(c)	w(c)	w(c)	
(pellucidum Levander)				
bavaricum Imhof		f	f	f
divergens Imhof		f	f	+
petiolatum Willén	w	w	w	(+)
sertularia Ehrenberg		f		

	NB	GF	BS	BB
sociale Ehrenberg		f		
suecicum Lemmermann		f		f
cylindricum Imhof				f
<b>Chryso-sphaerella Lauterborn</b>				
brevispina Korschikov (16, 17)		f		
salina Birch-Andersen (17)		+		
<b>Mallomonas Perty</b>				
akrokomos Ruttner (16, 17)		f		
caudata Iwanoff		f		
producta (Zacharias) Iwanoff		f		
reginae Teiling (17)		f		
tonsurata Teiling (17)		f		
<b>Paraphysomonas de Saedeleer (5)</b>				
butcheri Pennick & Clarke (17)		+		
imperfiorata Lucas (17)		+		
vestita (Stokes) de Saedeleer (17)		f		
<b>Spiniferomonas Takahashi</b>				
bourelii Takahashi (17)		+		
trioralis Takahashi (17)		+		
<b>Synura Ehrenberg</b>				
petersenii Korschikov (16, 17)		f		
sphagnicola Korschikov		f		
spinosa Korschikov (16, 17)		f		
uvella Ehrenberg (18)		f		
<b>Uroglena Ehrenberg</b>				
americana Calkins	w	w	w	w
volvox Ehrenberg		f		
<b>Chromulinales</b>				
<b>Apedinella Thronsdon</b>				
spinifera (Thronsdon) Thronsdon (19)		+		
<b>Calycomonas Lohmann (7)</b>				
ovalis Wulff		w		
vangoori (Conrad) Lund		w		
wulffii Conrad & Kufferath		w		
<b>Chryso-coccus Klebs</b>				
rufescens Klebs		+		
<b>Kephyrion Pascher</b>				
hemisphaericum (Lackey) Conrad		+		
<b>Monas Ehrenberg (5)</b>				
uniguttata Skuja		+		
<b>Pseudopedinella N. Carter</b>				
elastica Skuja (19)		+		

	NB	GF	BS	BB
<b>Stichogloales</b>				
Stichogloea Chodat doederleinii (Schmidle) Wille		f		
<b>Xanthophyceae (Heterokontae)</b>				
<b>Mischococcales</b>				
Ophiocytium Nägeli elongatum W. & G.S. West		f		
Schilleriella Pascher anuraea Pascher (46)		+		
<b>Tribonematales</b>				
Tribonema Derbes & Solier affine G.S. West viride Pascher		L f L f		
<b>Bacillariophyceae</b>				
<b>Biddulphiales (Centrales)</b>				
Actinocyclus Ehrenberg octonarius Ehrenberg (ehrenbergii Ralfs)	w	w	w	w
Attheya T. West decora T. West zachariasii Brun		+	f	f
Chaetoceros Ehrenberg cf. affinis Lauder (20) borealis Bailey (7) calcitrans (7) (simplex var. calcitrans Paulsen) ceratosporus Ostenfeldt (21) danicus Cleve (22) decipiens Cleve densus Cleve diadema (Ehrenberg) Gran (subsecundus (Grunow) Hustedt) gracilis Schütt holsaticus Schütt muelleri Lemmermann septentrionalis Östrup similis Cleve (7) simplex Ostenfeldt subtilis Cleve wighamii Brightwell (23)	w + + c(w) w + + + + + c w E cw + + cw	w + + c(w) w + + + + + c w E cw + + E cw	w + + c(w) w + + + + + c w E cw + + + cw	w + + (w) w + + + + + c w E cw + + + cw
Coscinodiscus Ehrenberg (24) granii Gough (25) rothii (Ehrenberg) Grunow	w	w f	w	

	NB	GF	BS	BB
<i>Cyclotella</i> Kützing				
<i>caspia</i> Grunow	w	w	w	w
<i>comta</i> (Ehrenberg) Kützing		f		+
<i>kuetzingiana</i> Thwaites (26)	f	f	f	+
<i>meneghiniana</i> Kützing		f		
<i>stelligera</i> Cleve & Grunow		f		
<i>striata</i> (Kützing) Grunow		+		
<i>Leptocylindrus</i> Cleve				
<i>minimus</i> Gran (27)	+	+	+	
<i>Melosira</i> C.A. Agardh				
<i>ambigua</i> (Grunow) O. Müller		w f	w f	w f
<i>arctica</i> (Ehrenberg) Dickie	c	c	c	c
( <i>hyperborea</i> (Grunow) Schütt)				
<i>distans</i> (Ehrenberg) Kützing (28)		f		f
<i>dubia</i> Kützing		L		
<i>granulata</i> (Ehrenberg) Ralfs var. <i>granulata</i>		f		
– var. <i>angustissima</i> O. Müller		f		
<i>islandica</i> O. Müller ssp. <i>helvetica</i> O. Müller		f		f
( <i>helvetica</i> (O. Müller) van Goor)		f		
<i>italica</i> (Ehrenberg) Kützing ssp. <i>italica</i> var. <i>italica</i>		f		
( <i>crenulata</i> (Ehrenberg) Kützing)				
– var. <i>valida</i> Grunow		f		
ssp. <i>subartica</i> O. Müller		f		
<i>lineata</i> (Dillwyn) C.A. Agardh (47)	L	L	L	L
( <i>juergensii</i> C.A. Agardh)				
<i>moniliformis</i> (O.F. Müller) C.A. Agardh	L	L	L	L
( <i>borreri</i> Greville)				
<i>nummuloides</i> (Dillwyn) C.A. Agardh	L	L	L	L
<i>varians</i> C.A. Agardh		f		
<i>Rhizosolenia</i> Brightwell				
<i>cylindrus</i> Cleve	+			
<i>eriensis</i> H.L. Smith		f		f
<i>longiseta</i> Zacharias		f		f
<i>minima</i> Levander	w	w (E)		
<i>Skeletonema</i> Greville				
<i>costatum</i> (Greville) Cleve	(c)	(c)	(c)	(c)
<i>subsalsum</i> (Cleve-Euler) Bethge		E		E
<i>Stephanodiscus</i> Ehrenberg				
<i>astraea</i> (Ehrenberg) Grunow		f		+
( <i>astraea</i> var. <i>minutula</i> (Kützing) Grunow)				
(? <i>rotula</i> (Kützing) Hendey)				
<i>dubius</i> (Fricke) Hustedt		f		
<i>hantzschii</i> Grunow (29)		f		
( <i>hantzschii</i> var. <i>pusilla</i> Grunow)				
<i>Thalassiosira</i> Cleve				
<i>baltica</i> (Grunow) Ostenfeld	(c)	(c)	(c)	(c)
<i>guillardii</i> Hasle (30)		+		
<i>lacustris</i> (Grunow) Hasle	c	c	c	?
( <i>Coscinodiscus lacustris</i> Grunow)				
<i>levanderi</i> van Goor	c	c		
<i>weissflogii</i> (Grunow) Fryxell & Hasle		(E)		
( <i>fluviatilis</i> Hustedt)				

	NB	GF	BS	BB
<b>Bacillariales</b>				
<b>Achnanthes Bory (31)</b>				
<i>biasolettiana</i> (Kützing) Grunow		L	L	
<i>hauckiana</i> Grunow	L	L	L	L
<i>taeniata</i> Grunow	c	c	c	c
<b>Amphiprora Ehrenberg (32)</b>				
<i>alata</i> Kützing (7)	L	L		
<i>kjellmannii</i> Cleve		c		c
<i>ornata</i> Bailey		f		
<i>paludosa</i> W. Smith var. <i>paludosa</i>	L	L	L	L
– var. <i>subsalina</i> Cleve				+
<b>Amphora Ehrenberg (31)</b>				
<i>coffeaeformis</i> (C.A. Agardh) Kützing				
var. <i>coffeaeformis</i>	+	+	+	+
– var. <i>perpusilla</i> (Grunow) Cleve	+	+		
<i>ovalis</i> Kützing var. <i>ovalis</i>		L		
(var. <i>libyca</i> Ehrenberg) Cleve				
– var. <i>pediculus</i> Kützing	+	+		
<b>Asterionella Hassall</b>				
<i>formosa</i> Hassall				
( <i>gracillima</i> (Hantzsch) Heiberg)	f	f	f	f
<b>Bacillaria Gmelin</b>				
<i>paxillifer</i> (O.F. Müller) Hendey	L	L		
( <i>paradoxa</i> Gmelin)				
<b>Berkeleya Greville</b>				
<i>rutilans</i> (Trentepohl) Grunow	L	L		
( <i>Amphipleura rutilans</i> (Trentepohl) Cleve)				
<b>Brebissonia Grunow</b>				
<i>boeckii</i> (Ehrenberg) Grunow		L	L	L
<b>Caloneis Cleve (31)</b>				
<i>amphisbaena</i> (Bory) Cleve var. <i>amphisbaena</i> (33)		L		L
– var. <i>subsalina</i> (Donkin) Cleve		L		
<i>permagna</i> (Bailey) Cleve (33)		L		
<b>Campylodiscus Ehrenberg (33)</b>				
<i>bicostatus</i> W. Smith		+		
( <i>clypeus</i> var. <i>bicostata</i> (W. Smith) Hustedt)				
<i>clypeus</i> Ehrenberg		+		
<i>echeneis</i> Ehrenberg		+		
<b>Cocconeis Ehrenberg (31)</b>				
<i>pediculus</i> Ehrenberg	L	L	L	L
<i>placentula</i> Ehrenberg	L	L	L	L
<i>scutellum</i> Ehrenberg var. <i>scutellum</i>	L	L	L	
– var. <i>parva</i> Grunow		L		
<i>stauroneiforme</i> (Van Heurck) Okuno		L		
( <i>scutellum</i> var. <i>stauroneiformis</i> Van Heurck)				
<b>Cylindrotheca Rabenhorst</b>				
<i>gracilis</i> (Brébisson) Grunow (19)		+		



	NB	GF	BS	BB
<i>Cymatopleura</i> W. Smith (33)				
<i>elliptica</i> (Brébisson) W. Smith		+		
<i>solea</i> (Brébisson) W. Smith		+		+
<i>Cymbella</i> C.A. Agardh (31)				
<i>aspera</i> (Ehrenberg) Cleve		L		L
<i>cistula</i> (Hemprich) Grunow		L		L
<i>ventricosa</i> Kützing		L		L
<i>Diatoma</i> De Candolle				
<i>elongatum</i> (Lyngbye) C.A. Agardh (34)	+	+	+	+
<i>vulgare</i> Bory (35)	L	L	L	L
<i>Diploneis</i> Ehrenberg (31)				
<i>didyma</i> (Ehrenberg) Cleve	?			
<i>smithii</i> (Brébisson) Cleve		L	L	L
<i>Epithemia</i> Brébisson (31)				
<i>sorex</i> Kützing	L	L	L	L
<i>turgida</i> (Ehrenberg) Kützing	L	L	L	L
<i>zebra</i> (Ehrenberg) Kützing				L
<i>Eunotia</i> Ehrenberg (31)				
<i>pectinalis</i> (Kützing) Rabenhorst var.				
<i>ventralis</i> (Ehrenberg) Hustedt		f		f
<i>Fragilaria</i> Lyngbye (31)				
<i>capucina</i> Desmazières		L		+
<i>construens</i> (Ehrenberg) Grunow var. <i>construens</i>		L		
– var. <i>subsalina</i> Hustedt		L		
<i>crotonensis</i> Kitton	f	f		f
<i>intermedia</i> Grunow		L		
<i>pinnata</i> Ehrenberg	L	L	L	
<i>Gomphoneis</i> Cleve				
<i>olivaceum</i> (Lyngbye) Dawson (36)	L	L	L	
( <i>Gomphonema olivaceum</i> (Lyngbye) Kützing)				
<i>Gomphonema</i> C.A. Agardh (31)				
<i>acuminatum</i> Ehrenberg		L f		
<i>constrictum</i> Ehrenberg		L f		
<i>Grammatophora</i> Ehrenberg				
<i>marina</i> (Lyngbye) Kützing (7)	L	L		
<i>oceanica</i> Ehrenberg	L	L	L	
<i>Gyrosigma</i> Hassall (33)				
<i>acuminatum</i> (Kützing) Rabenhorst		(f)		
<i>attenuatum</i> (Kützing) Rabenhorst		(f)		
<i>balticum</i> (Ehrenberg) Cleve		+		
<i>distortum</i> (W. Smith) Cleve var. <i>distortum</i>		+		
– var. <i>parkeri</i> (Harrison) Cleve		+		
<i>fasciola</i> (Ehrenberg) Griffith & Henfrey		+		
<i>kuetzingii</i> (Grunow) Cleve		f		
<i>macrum</i> (W. Smith) Cleve		+		
<i>scalproides</i> (Rabenhorst) Cleve var. <i>eximia</i> (Thwaites) Cleve		+		
<i>spenceri</i> (W. Smith) Cleve			+	

	NB	GF	BS	BB
<i>strigilis</i> (W. Smith) Cleve		+		
<i>tenuirostris</i> (Grunow) Cleve-Euler		+		
<i>wansbeckii</i> (Donkin) Cleve		+		
<b>Licmophora C.A. Agardh (31)</b>				
<i>communis</i> (Heiberg) Grunow	L	L		
<i>debilis</i> (Kützing) Grunow	L	L		
<i>gracilis</i> (Ehrenberg) Grunow var. <i>anglica</i> (Kützing) Peragallo	L	L	L	
<b>Mastogloia Thwaites (31)</b>				
<i>smithii</i> Thwaites		L		
<b>Navicula Bory (31)</b>				
<i>avenacea</i> Brébisson		L		
( <i>viridula</i> var. <i>avenacea</i> (Brébisson) Van Heurck)				
<i>cryptocephala</i> Kützing var. <i>cryptocephala</i>		L		
– var. <i>veneta</i> (Kützing) Cleve		L		
<i>elegans</i> W. Smith		L		
<i>gracilis</i> Ehrenberg		L		
<i>gregaria</i> Donkin		L		
<i>humerosa</i> Brébisson		L		L
<i>marina</i> Ralfs		L		
<i>peregrina</i> (Ehrenberg) Kützing var. <i>peregrina</i>				
– var. <i>kefvingiensis</i> (Ehrenberg) Cleve				
<i>radiosa</i> Kützing		L f		
<i>rhombica</i> Gregory		L		
<i>rhynchocephala</i> Kützing	L	L	L	L
<i>salinarum</i> Grunow		L		
<i>vanhoeffenii</i> Gran	c	c	c	c
(? <i>septentrionalis</i> (Östrup) Cleve)				
<i>viridula</i> Kützing		L		
<b>Nitzschia Hassall (31)</b>				
<i>acicularis</i> W. Smith		L (f)		+
<i>actinastroides</i> (Lemmermann) van Goor		(L)		(L)
( <i>Synedra actinastroides</i> Lemmermann)				
( <i>Nitzschia holsatica</i> Hustedt) (37)				
<i>closterium</i> (1, 7)	+	+		+
<i>cylindrus</i> (Grunow) Hasle	c	c	c	c
( <i>Fragilaria cylindrus</i> Grunow)				
( <i>Fragilariopsis cylindrus</i> (Grunow) Krieger)				
<i>dubia</i> W. Smith (33)		L		
<i>filiformis</i> (W. Smith) Hustedt				L
<i>fonticola</i> Grunow		L		
<i>frigida</i> Grunow	c	c	c	c
<i>frustulum</i> (Kützing) Grunow (37)		L		
<i>gracilis</i> Hantzsch ex Rabenhorst		L (f)		
<i>hungarica</i> Grunow (33)		L		
<i>hybrida</i> Grunow (33)		L		
<i>intermedia</i> Hantzsch ex Cleve & Grunow (37) ( <i>capitellata</i> Hustedt)				+
<i>longissima</i> (Brébisson) Ralfs (1)	+	+	+	+
<i>lorenziana</i> Grunow (33)		L		
<i>microcephala</i> Grunow		L		
<i>palea</i> (Kützing) W. Smith	L	L	L	
<i>paleacea</i> Grunow (37)		L		

	NB	GF	BS	BB
<i>perpusilla</i> (Kützing) Lange-Bertalot (37)		L		
<i>punctata</i> (W. Smith) Grunow (33)		L		
<i>pusilla</i> (Kützing) Grunow em. Lange-Bertalot (37) (kuetzingiana Hilse)		L f		
<i>scalaris</i> (Ehrenberg) W. Smith (33)		L		
<i>sigma</i> (Kützing) W. Smith (33)		L		
<i>sigmoidea</i> (Nitzsch) W. Smith (33)		L		
<i>subtilis</i> (Kützing) Grunow		L		
<i>tryblionella</i> Hantzsch (33, 38)		L		L
<i>vermicularis</i> (Kützing) Grunow (33)				L
<i>Opephora</i> Petit				
<i>martyi</i> Héribaud	L	L	L	
<i>Phaeodactylum</i> Bohlin				
<i>tricornutum</i> Bohlin (13)		+		
<i>Pinnularia</i> Ehrenberg				
<i>quadratarea</i> (A. Schmidt) Cleve var. <i>stuxbergii</i> Cleve (1, 39)	c	c	c	c
<i>Pleurosigma</i> W. Smith (33)				
<i>angulatum</i> (Quekett) W. Smith		L		
<i>elongatum</i> W. Smith		L		
<i>subsalsum</i> Wislouch & Kolbe		L (f)		
<i>Rhoicosphenia</i> Grunow				
<i>curvata</i> (Kützing) Grunow	L	L	L	L
<i>Rhopalodia</i> O. Müller				
<i>gibba</i> (Ehrenberg) O. Müller var. <i>gibba</i>	L	L	L	L
– var. <i>ventricosa</i> (Kützing) Grunow	L	L	L	L
<i>gibberula</i> (Ehrenberg) O. Müller		L		
<i>Stauroneis</i> Ehrenberg (31)				
<i>spicula</i> Hickie		L		L
<i>Stenopterobia</i> Brébisson				
<i>intermedia</i> Lewis (33)		L		L
<i>Surirella</i> Turpin (31)				
<i>capronii</i> Brébisson (33)		L f		
<i>gamma</i> (Ehrenberg) Kützing	+	+		
<i>ovalis</i> Brébisson var. <i>ovalis</i>		L		
– var. <i>crumena</i> (Brébisson) Van Heurck		L		L
<i>ovata</i> Kützing		L		L
<i>striatula</i> Turpin (33)		L		
<i>tenera</i> Gregory var. <i>nervosa</i> A. Schmidt (33)		L		
<i>Synedra</i> Ehrenberg (31)				
<i>acus</i> Kützing var. <i>acus</i>		L f		L
– var. <i>angustissima</i> Grunow		f		+
<i>pulchella</i> Ralfs	L	L	L	L
<i>rumpens</i> Kützing		L f		
<i>tabulata</i> (C.A. Agardh) Kützing (38, 40)	L	L	L	L
<i>ulna</i> (Nitzsch) Ehrenberg (38)		L f		L
<i>vaucheriae</i> Kützing		L f		L

	NB	GF	BS	BB
Tabellaria Ehrenberg				
fenestrata (Lyngbye) Kützing		L f		L
flocculosa (Roth) Kützing		L f		L f
Tropidoneis Cleve (3)				
dannfeltii Cleve-Euler (33)		+		+

## Rhaphidophyceae (Choromonadophyceae)

### Rhaphidomonadales

Gonyostomum  
sp.

f

## EUGLENOPHYTA

### Euglenophyceae

#### Euglenales

Astasia Dujardin (5)

+

Colacium Ehrenberg  
  arbuscula Stein  
  vesiculosum Ehrenberg

f

(f)

(f)

Euglena Ehrenberg (31)  
  oxyuris Schmarda  
  viridis (O.F. Müller) Ehrenberg

f

E f

Eutreptia Perty (5)

+

Eutreptiella da Cunha (5)

+

+

Lepocinclis Perty (5)

f

Phacus Dujardin (5)

f

f

Strombomonas Deflandre  
  deflandrei (Roll) Deflandre

f

Trachelomonas Ehrenberg  
  hispida (Perty) Stein em. Deflandre  
  volvocina Ehrenberg

f

f

## CHLOROPHYTA

### Prasinophyceae

#### Pedinomonadales

Pedinomonas Korshikov (5)

+

#### Pterospermatales

Micromonas Manton & Parke  
  pusilla (Butcher) Manton & Parke (17)

+

	NB	GF	BS	BB
<i>Pseudoscourfieldia</i> Manton <i>marina</i> (Thronsen) Manton (17)		+		
<b>Pyramimonadales</b>				
<i>Pyramimonas</i> SchmarDA (5) <i>orientalis</i> Butcher (17)	+	+	+	+
<b>Chlorophyceae</b>				
<b>Volvocales</b>				
<i>Brachiomonas</i> Bohlin <i>submarina</i> Bohlin (13)		+		
<i>Carteria</i> Diesing (5)		+		
<i>Chlamydomonas</i> Ehrenberg (5)		+		
<i>Eudorina</i> Ehrenberg <i>elegans</i> Ehrenberg <i>unicocca</i> G.M. Smith		f f		
<i>Gloeocystis</i> Nägeli <i>planctonica</i> (W. & G.S. West) Lemmermann		f		
<i>Gonium</i> O.F. Müller <i>sociale</i> (Dujardin) Warming		f		
<i>Pandorina</i> Bory em. Ehrenberg <i>morum</i> (O.F. Müller) Bory		f		
<i>Planctococcus</i> Korshikov <i>sphaerocystiformis</i> Korshikov		f		
<i>Planktosphaeria</i> G.M. Smith <i>gelatinosa</i> G.M. Smith		f		
<i>Sphaerocystis</i> Chodat em. Korshikov <i>schroeteri</i> Chodat		(f)	+	+
<b>Chlorococcales</b>				
<i>Actinastrum</i> Lagerheim <i>hantzschii</i> Lagerheim		f		
<i>Ankistrodesmus</i> Corda <i>falcatus</i> (Corda) Ralfs		f		
<i>Botryococcus</i> Kützing <i>braunii</i> Kützing	+	+	+	+
<i>Coelastrum</i> Nägeli <i>cambricum</i> Archer <i>microporum</i> Nägeli <i>reticulatum</i> (Dangeard) Senn		f f f		

	NB	GF	BS	BB
<i>Crucigenia</i> Morren				
<i>quadrata</i> Morren		f		
<i>rectangularis</i> (A. Braun) Gay		f		
<i>tetrapedia</i> (Kirchner) W. & G.S. West		f		
<i>Dictyosphaerium</i> Nägeli				
<i>ehrenbergianum</i> Nägeli		f		
<i>elegans</i> Bachmann		f		
<i>pulchellum</i> Wood		(f)		+
<i>simplex</i> Skuja (41)		+		
<i>Elakatothrix</i> Wille				
<i>gelatinosa</i> Wille (7)		f		
<i>viridis</i> (Snow) Printz (7)		f		+
<i>Golenkinia</i> Chodat em. Korshikov				
<i>radiata</i> Chodat	f	f		
<i>Kirchneriella</i> Schmidle				
<i>contorta</i> (Schmidle) Bohlin		f		
<i>lunaris</i> (Kirchner) Möbius		f		
<i>obesa</i> (W. West) Schmidle		f		
<i>Lagerheimia</i> Chodat				
<i>genevensis</i> Chodat		f		
<i>longiseta</i> (Lagerheim) Printz		f		
<i>Micractinium</i> Fresenius				
<i>pusillum</i> Fresenius	f	f		
( <i>Richteriella botryoides</i> (Schmidle) Lemmermann)				
<i>Monoraphidium</i> Komárková-Legnerová (42)				
<i>braunii</i> (Nägeli) Komárková-Legnerová		f		
( <i>Ankistrodesmus braunii</i> (Nägeli) Brunnthaler)				
<i>contortum</i> (Thuret) Komárková-Legnerová (43)	+	+	+	+
( <i>Ankistrodesmus angustus</i> Bernard (?))				
<i>griffithii</i> (Berkeley) Komárková-Legnerová		(f)		+
( <i>Ankistrodesmus acicularis</i> (A. Braun) Korshikov)				
<i>minutum</i> (Nägeli) Komárková-Legnerová		+		+
( <i>Selenastrum minutum</i> (Nägeli) Collins)				
<i>mirabile</i> (W. & G.S. West) Pankow	+	+		
( <i>Ankistrodesmus mirabilis</i> (W. & G.S. West)				
Lemmermann)				
<i>setiforme</i> (Nygaard) Komárková-Legnerová		f		
( <i>Ankistrodesmus falcatus</i> var. <i>setiformis</i> Nygaard)				
<i>Nephrocyticum</i> Nägeli				
<i>agardhianum</i> Nägeli		f		
<i>lunatum</i> W. West		f		
<i>Oocystis</i> Nägeli (4)				
<i>borgei</i> Snow	+	+	+	+
<i>lacustris</i> Chodat	+	+	+	+
<i>submarina</i> Lagerheim	+	+		+
<i>Pediastrum</i> Meyen				
<i>biradiatum</i> Meyen		f		

	NB	GF	BS	BB
boryanum (Turpin) Meneghini	f	f		
duplex Meyen		f		
(gracillimum (W. & G.S. West) Thunmark)				
(limneticum Thunmark)				
tetras (Ehrenberg) Ralfs		f		
<b>Polyedriopsis Schmidle</b>				
spinulosa Schmidle		f		
<b>Scenedesmus Meyen (31)</b>				
acuminatus (Lagerheim) Chodat	+	+	+	+
acutus Meyen	+	+	+	+
apiculatus (W. & G. S. West) Chodat		f		
arcuatus Lemmermann		f		
armatus (Chodat) G.M. Smith		+		+
bicaudatus (Hansgirg) Chodat		f		
bicellularis Chodat (7)		+		
brasiliensis Bohlin		f		
brevispina (G.M. Smith) Chodat		f		
denticulatus Lagerheim		+		+
ecornis (Ralfs) Chodat var. ecornis		f		
– var. disciformis Chodat		f		+
ellipsoideus Chodat		f		
granulatus W. & G.S. West		+		
gutwinskii Chodat		f		
intermedius Chodat		+		+
lefevrii Deflandre		f		
opoliensis P. Richter		+		
ovalternus Chodat		f		
quadricauda Chodat		+		+
sooi Hortóbagyi		f		
spinosus Chodat		+		
<b>Schroederia Lemmermann</b>				
setigera (Schröder) Lemmermann		f		
(Ankistrodesmus setigerus (Schröder) G.S. West)				
<b>Selenastrum Reinsch</b>				
capricornutum Printz		f		
<b>Sorastrum Kützing</b>				
spinulosum Nägeli		f		
<b>Tetraëdron Kützing</b>				
limneticum Borge		f		
minimum (A. Braun) Hansgirg		f		
planctonicum G.M. Smith		f		
trigonum (Nägeli) Hansgirg		f		
<b>Trebauria Bernard</b>				
triappendiculata Bernard		f		
<b>Ulotrichales</b>				
<b>Chlorhormidium Fott</b>				
flaccidum (A. Braun) Fott		c		

	NB	GF	BS	BB
<i>Planctonema</i> Schmidle <i>lauterbornii</i> Schmidle	+	+	+	+
<b>Oedogoniales</b>				
<i>Oedogonium</i> Link ex Hirn (44)		L		
<b>Zygnemales</b>				
<i>Arthrodesmus</i> Ehrenberg <i>incus</i> (Brébisson) Hassall		f		
<i>Closterium</i> Nitzsch (31, 45) <i>aciculare</i> T. West		f		+
<i>acutum</i> Brébisson var. <i>variabile</i> (Lemmermann) Krieger		f		f
<i>Cosmarium</i> Corda (45)		+		
<i>Mougeotia</i> C.A. Agardh (44)	L	L	L	L
<i>Spirogyra</i> Link (44)	L	L	L	L
<i>Staurastrum</i> Meyen (31, 45) <i>planktonicum</i> Teiling		f		
<i>Zygnema</i> C.A. Agardh (44)		L		