Supplements

**Table S1.** Algae found in and under pack ice in the Barents Sea. Species marked with an * are observed in cleaned samples or in qualitative samples (ice lumps). *Polarella* are found in the ice, the others as sub-ice species. Species inside the ice are given as cell $l^{-1}$, the rest as cells $m^{-2}$.

| Species | $x10^6$ cells $m^{-2}$ | Month |
|---|---|---|
| **Bacillariophyceae** | | |
| *Attheya septentrionalis* (Østrup) Crawford | 170 | May |
| *Actinocyclus curvatulus* Janish | 16.4 ($x10^6$ cells $l^{-1}$) | October |
| *Bacterosira bathyomphala* (Cleve) Syvertsen & Hasle | 11.3 | May |
| *C. concavicornis* Mangin | 0.1 | June |
| *C. convolutes* Castracane | 0.7 | August |
| *C. debilis* Cleve | 4.1 | May |
| *C. decipiens* Cleve | 0.3 | May |
| *C. fragilis* Meunier | 3.2 | July |
| *C. furcellatus* Bailey | 7.6 | May |
| *C. gelidus* Chamnansinp, Y. Li, Lundholm & Mostrum | 355 | April |
| *C. mitra* (Bailey) Cleve | 0.18 | August |
| *C. similis* Cleve | 0.7 | May |
| *C. wighamii* Brightwell | 18.6 | July |
| *Cylindrotheca closterium* (Ehrenberg) Lewin & Reimann | 11.0 | April |
| *Diploneis litoralis* var. *arctica* Cleve | * | May |
| *D. litoralis* var. *clathrata* (Østrup) Cleve | * | May |
| *Eucampia groenlandica* Cleve | 2.0 | May |
| *E. zodiacus* Ehrenberg | * | |
| *Entomoneis cryophila* (Cleve) Okolodkov | 0.6 | April |
| *E. kjellmanni* (Cleve in Cleve & Grunow) Poulin & Cardinal | 31.9 | May |
| *E. paludosa* var. *hyperborea* (Grunow) Poulin & Cardinal | 26.2 | May |
| *Fossulaphycus arcticus* S. Blanco | 12352 | May |

| | | |
|---|---|---|
| *Fragilariopsis cylindrus* (Grunow) Krieger | 6.5 | May |
| *F. oceanica* (Cleve) | 207 | April |
| *F. oceanica* resting spores | 2.1 | May |
| *Gyrosigma hudsonii* Poulin & Cardinal | 0.4 | May |
| *Hantzchia weyprechtii* Grunow | 1.2 | May |
| *Haslea crucigeroides* (Hustedt) Simonsen | 0.8 | May |
| *Melosira arctica* (Ehrenberg) Dickie | 23.2 | May |
| *Navicula directa* (W. Smith) Ralfs in Pritchard | 1.3 | May |
| *N. gelida* Grunow | * | May |
| *N. glaciei* Van Heurck | 0.1 | June |
| *N. granii* (Jørgensen) Gran | 5.7 | May |
| *N. hudsonii* Poulin & Cardinal | 53 | Mai |
| *N. kariana* Grunow in Cleve & Grunow | 94.8 | April |
| *N. kariana* var. *detersa* Grunow | * | May |
| *N. kariana* var *frigida* (Grunow in Cleve & Grunow) Cleve | * | June |
| *N. pelagica* (Jørgensen) Gran | 389 | April |
| *N. septentrionalis* (Grunow) Gran | 266 | May |
| *N. transitans* var. *derasa* (Grunow) Cleve | 7.6 | August |
| *N. vanhoeffenii* Gran | 881 | April |
| *Nitzschia arctica* Cleve | * | May |
| *N. frigida* Grunow | 2965 | April |
| *N. leavissima* Grunow | 6.6 | May |
| *N. longissima* (Brébisson) Ralfs | 0.2 | May |
| *N. neofrigida* Medlin | 5.5 | May |
| *N. promare* Medlin | 3478 | May |
| *N. valida* Cleve & Grunow | 0.15 | May |
| *Pauliella taeniata* (Grunow) Round & Basson | 68 | May |
| *Pinnularia quadratarea* var. *constricta* (Østrup) Heiden | 0.25 | August |
| *Plagiotropis* sp. | * | |
| *Pleurosigma clevei* Grunow | 0.25 | August |

| | | |
|---|---|---|
| *P. stuxbergii* Cleve & Grunow | 2.9 | May |
| *Porosira glacialis* (Grunow) Jørgensen | 583 | August |
| *Pseudogomphonema arcticum* (Grunow) Medlin | 1951 | May |
| *P. groenlandicum* (Østrup) Medlin | * | May |
| *P. septentrionale* (Østrup) Medlin | * | May |
| *Pseudo-nitzschia delicatissima* (Cleve) Heiden in Heiden & Kolbe | 816 | May |
| *P. pseudodelicatissima* (Hasle) Hasle | 0.2 | May |
| *P. seriata* (Cleve) H Peragallo in H & M Peragallo | 4.7 | July |
| *Rhizosolenia hebetata* f. *hemispina* (Hensen) Gran | 1.0 | August |
| *Shinodiscus bioculatus* Alverson, Kang & Theriot | 168 | April |
| *Staurioneis radissonii* Poulin & Cardinal | * | May |
| *Stenoneis inconspicua* var. *baculus* (Cleve) Cleve | 0.42 | August |
| *S. obtuserostrata* (Hustedt) Poulin | * | May |
| *Synedropsis hyperborea* (Grunow) Hasle, Medlin & Syvertsen | 509 | May |
| *Thalassiosira angulata* (Gregory) Hasle | 14.7 | May |
| *T. antarctica* var. *borealis* Fryxell, Doucette & Hubbard | 18.4 | July |
| *T. antarctica* var. *borealis* resting spores | 2.25 | May |
| *T. bulbosa* Syvertsen | 4.8 | May |
| *T. constricta* Gaarder | * | May |
| *T. hyalina* (Grunow) Gran | 17.2 | May |
| *T. nordenskioeldii* Cleve | 341 | April |
| | | |
| **Chrysophyceae** | | |
| *Dictyoca speculum* Ehrenberg | 40.9 | August |
| *Dinobryon balticum* (Schütt) Lemmermann | 2.7 | August |
| | | |
| **Dinophyceae** | | |
| *Ceratium arcticum* (Ehrenberg) Cleve | 0.26 | May |
| *Gymnodinium* spp. | 0.54 | May |

| | | |
|---|---|---|
| *Peridiniella catenata* (Levander) Balech | 0.4 | July |
| *P. danica (Paulsen) Okolodkov & Dodge* | 0.20 | May |
| *Polarella glacialis* Montresor, Procaccani & Stoecker | 2.26<br>0.33 (x$10^6$ cells $l^{-1}$) | June |
| *P. glacialis* cysts | 1.0<br>0.15 (x$10^6$ cells $l^{-1}$) | June |
| *Protoperidinium bipes* (Paulsen) Balech | 0.4 | May |
| *P. brevipes* (Paulsen) Balech | 0.25 | August |
| *P. pellucidum* (Bergh) Balech | 0.75 | August |
| *P. depressum* (Bailey) Balech | 0.20 | May |
| *P. monovelum*(T.K.Abé) Balech | 0.6 | May |
| Cysts | | |
| | | |
| **Haptophytes** | | |
| *Phaeocystis pouchetii* (Hariot) Lagerheim | 1682 | May |
| | | |
| **Flagellates** | | |
| Flagellates spp. | 109 | May |
| | | |

**Table S2.** Comparison of dominating and/or most common algal species in sea ice and in concurrent ice edge blooms of the Barents Sea.

| Year | Month | Species in sea ice | Species in water |
|---|---|---|---|
| 1986 | April | *Porosira glacialis, Thalassiosira nordenskioeldii, Shinodiscus bioculatus, Fragilariopsis oceanica, Navicula vanhoeffenii, N. pelagica, Nitzschia frigida*, *Pseudogomphonema arcticum,* *Chaetocerosgelidus, C. wighami, Attheya septentrionalis, Synedropsis hyperborea* | *Phaeocystis pouchetii, Fragilariopsis oceanica* |
| 1990 | April | *Nitzschia frigida , Fragilariopsis oceanica* | Flagellates (no bloom) |
| 2001 | April | *Nitzschia frigida, N. promare, Navicula pelagica* | Flagellates (no bloom) |
| 1996 | May | *Nitzschia frigida, N. promare, Fossulaphycus arcticus, Fragilariopsis oceanica, Navicula kariana, Pseudogomphonema arcticum* | Flagellates (no bloom) |
| 1997 | May | *Nitzschia frigida, N. promare, Fossulaphycus arcticus,* | *Phaeocystis pouchettii* |
| 2003 | May | *Nitzschia frigid, Navicula kariana, F. oceanica,* dinoflagellate cysts | *Phaeocystis pouchettii,* *Fragilariopsis oceanica* |

| | | | |
|---|---|---|---|
| 2004 | May | *Nitzschia frigida, Synedropsis hyperborea* | *Phaeocystis pouchetii, Chaetoceros* spp. |
| 1995 | June | *Nitzschia frigida*<br>*Melosira arctica* | *Phaeocystis pouchettii*<br>*Thalassiosira antarctica* var. *borealis*<br>*Dinobryon balticum* |
| 1996 | July-August | *Melosira arctica, Thalassiosira nordenskioeldii, T. antarctica* var. *borealis, Shinodiscus bioculatus, Fragilariopsis oceanica, Nitzschia frigida, Chaetoceros wighamii* | *Thalassiosira nordenskioeldii, Shinodiscus bioculatus, Chaetocerosgelidus, C. wighamii, Fragilariopsis oceanica,* flagellates |
| 2003 | August-September | *Dictyoca speculum, Thalassiosira* spp., *Fragilariopsis oceanica, Nitzschia frigida*, naked dinoflagellates | *Fragilariopsis oceanica, Thalassiosira* spp*., Emiliania huxleyi, Dictyoca speculum, Dinobryon* sp*.,* naked dinoflagellates, flagellates |

**Table S3.** Correlation matrix for physical parameters from the Barents Sea ice: ice thickness (cm), snow depth (cm), under-ice light (µmol $m^{-2}$ $sec^{-1}$), nutrients in surface water (nitrate, phosphate, silicate, µmol $l^{-1}$). Biological parameters are: cell numbers and % of total cell numbers of the most common species [*Nitzschia frigida* (Nf), *N. promare* (Np), *Fossulaphycus arcticus* (Fa), *Porosira glacialis* (Pg), *Attheya septentrionalis* (As), *Synedropsis hyperborea* (Sh)], total number of species and total cell numbers. Values used are from the spring season, numbers show Pearson correlation coefficient between two and two variables. Symbols giving statistical significance level: * = P< 0.05, ** = P< 0.01, *** = P< 0.001. Non-significant values (P ≤ 0.05) are not presented

| | Ice thickness | Snow depth | Light u/ice | Nitrate 0 m | Silicate 0 m | *N.frigida* cells | *N.frigida* % of total | *N.prom.* cells | *N.prom.* % of total | *F.arcticus* cells | *F.arcticus* % of total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ice thickn. | | | | | | | | | | | |
| Snowdepth | 0.378 ** | | | | | | | | | | |
| Light u/ice | -0.470*** | | | | | | | | | | |
| Nitrate 0m | | | -0.520** | | | | | | | | |
| Silicate0m | | | -0.590*** | 0.841*** | | | | | | | |
| *N.fri.* cells | 0.499** | | | | 0.576*** | | | | | | |
| *N.fri.* % | 0.821*** | 0.614*** | -0.530** | -0.370* | | 0.611*** | | | | | |
| *N.pro* cells | | | | 0.644*** | 0.636*** | | -0.600** | | | | |
| *N.pro.* % | | | | 0.549** | 0.561** | | -0.670*** | 0.855*** | | | |
| *F.arc* cells | | | | 0.528* | | | -0.640* | 0.761*** | | | |
| *F.arc.* % | | -0.671** | | | | | -0.690** | | | 0.481* | |
| *P.gla* cells | | | | | | | | 0.999* | 0.998* | | |
| *P.gla.* % | -0.629* | | | | | | -0.580* | | | 0.999* | |
| *A.sep* cells | 0.525** | | | | | | | | | | |
| *A.sep.* % | | | | | | | | -0.420* | | | -0.530* |
| *S.hyp* cells | | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *S.hyp*. % | | | 0.419* | | | | | | | | -0.510* |
| No.species | -0.521*** | -0.470* | 0.438* | | | | -0.700*** | | | | |
| Total cells | | | | 0.346* | | 0.720*** | | 0.423* | | 0.932*** | |
| Total chl | 0.575*** | | -0.410* | | 0.576*** | 0.731*** | 0.546** | 0.505* | | 0.675** | |

| | *P.glacial.* cells | *A.septen.* cells | *A.septen.* % of total | *S.hyper.* cells | No. species | Total cell numbers |
|---|---|---|---|---|---|---|
| Ice thickn. | | | | | | |
| Snowdepth | | | | | | |
| Light u/ice | | | | | | |
| Nitrate 0m | | | | | | |
| Silicate 0m | | | | | | |
| *N.fri.* cells | | | | | | |
| *N.fri.* % | | | | | | |
| *N.pro* cells | | | | | | |
| *N.pro*. % | | | | | | |
| *F.arc* cells | | | | | | |
| *F.arc.* % | | | | | | |
| *P.gla* cells | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| *P.gla.* % | 0.981*** | | | | | |
| *A.sep* cells | | | | | | |
| *A.sep.* % | | 0.616** | | | | |
| *S.hyp* cells | | 0.622*** | | | | |
| *S.hyp.* % | | 0.607*** | 0.434* | 0.864*** | | |
| No species | | | | | | |
| Total cells | | | | | 0.296* | |
| Total chl | | | | | | 0.318* |