**Supplementary data**

Table S3: Taxa full names and eventual groups

|  |  |  |
| --- | --- | --- |
| Nb | Full name | Shortcut |
| 1 | Actinocyclus | Actinocyclus |
| 2 | Akashiwo sanguinea | A\_sanguinea |
| 3 | Alexandrium | Alexandrium |
| 4 | Amphidinium | Amphidinium |
| 5 | Amphidomataceae | Amphidomataceae |
| 6 | Asterionella formosa | A\_formosa |
| 7 | Asterionellopsis glacialis | A\_glacialis |
| 8 | Bacillaria paxillifera | B\_paxillifera |
| 9 | Bacillariaceae | Bacillariaceae |
| 10 | Bacillariophyceae | Bacillariophyceae |
| 11 | Bacteriastrum | Bacteriastrum |
| 12 | Bellerochea | Bellerochea |
| 13 | Biddulphia | Biddulphia |
| 14 | Brockmanniella brockmannii | B\_brockmannii |
| 15 | Cerataulina pelagica | C\_pelagica |
| 16 | Chaetoceros | Chaetoceros |
| 17 | Chaetoceros diadema | C\_diadema |
| 18 | Chaetoceros didymus + protuberans | e-species(C\_didymus) |
| 19 | Chaetoceros socialis + socialis f. radians | Chaetoceros socialis + socialis f. radians |
| 20 | Chrysophyceae | Chrysophyceae |
| 21 | Ciliophora | Ciliophora |
| 22 | Cochlodinium | Cochlodinium |
| 23 | Corethron | Corethron |
| 24 | Coscinodiscus + Stellarima | Coscinodiscus + Stellarima |
| 25 | Cryptophyceae | Cryptophyceae |
| 26 | Cylindrotheca closterium + Nitzschia longissima | C\_closterium + N\_longissima |
| 27 | Dactyliosolen fragilissimus | D\_fragilissimus |
| 28 | Detonula | Detonula |
| 29 | Dictyocha | Dictyocha |
| 30 | Dinobryon | Dinobryon |
| 31 | Dinophyceae | Dinophyceae |
| 32 | Dinophysis | Dinophysis |
| 33 | Diploneis | Diploneis |
| 34 | Diplopsalis + Diplopelta + Diplopsalopsis + Preperidinium + Oblea | e-genus(Diplopsalis) |
| 35 | Ditylum brightwellii | D\_brightwellii |
| 36 | Entomoneis | Entomoneis |
| 37 | Eucampia zodiacus | E\_zodiacus |
| 38 | Euglenia | Euglenia |
| 39 | Fragilariaceae | Fragilariaceae |
| 40 | Gonyaulax | Gonyaulax |
| 41 | Gonyaulax spinifera | G\_spinifera |
| 42 | Guinardia delicatula | G\_delicatula |
| 43 | Guinardia flaccida | G\_flaccida |
| 44 | Guinardia striata | G\_striata |
| 45 | Gymnodiniaceae | Gymnodiniaceae |
| 46 | Gymnodiniales | Gymnodiniales |
| 47 | Gymnodinium | Gymnodinium |
| 48 | Gyrodinium | Gyrodinium |
| 49 | Helicotheca | Helicotheca |
| 50 | Heterocapsa | Heterocapsa |
| 51 | Heterocapsa triquetra | H\_triquetra |
| 52 | Katodinium | Katodinium |
| 53 | Lauderia + Detonula | e-genus(Lauderia) |
| 54 | Lepidodinium chlorophorum | L\_chlorophorum |
| 55 | Leptocylindrus | Leptocylindrus |
| 56 | Leptocylindrus, complexe danicus groupe des larges (danicus + curvatus + mediterraneus + aporus + convexus + hargravesii + adriaticus) | Leptocylindrus, complexe danicus |
| 57 | Leptocylindrus, complexe minimus groupe des fines (L. minimus + Tenuicylindrus belgicus) | Leptocylindrus, cplx minimus |
| 58 | Licmophora | Licmophora |
| 59 | Lithodesmium | Lithodesmium |
| 60 | Mediopyxis | Mediopyxis |
| 61 | Melosira | Melosira |
| 62 | Melosiraceae | Melosiraceae |
| 63 | Mesodinium rubrum | M\_rubrum |
| 64 | Meuniera membranacea | M\_membranacea |
| 65 | Navicula + Fallacia + Haslea + Lyrella + Petroneis | e-genus(Navicula) |
| 66 | Naviculaceae | Naviculaceae |
| 67 | Noctiluca scintillans | N\_scintillans |
| 68 | Odontella | Odontella |
| 69 | Odontella sinensis | O\_sinensis |
| 70 | Paralia sulcata | P\_sulcata |
| 71 | Phaeocystis | Phaeocystis |
| 72 | Plagiogramma | Plagiogramma |
| 73 | Plagiolemma | Plagiolemma |
| 74 | Plagiolemma distortum | P\_distortum |
| 75 | Pleurosigma + Gyrosigma | Pleurosigma + Gyrosigma |
| 76 | Polykrikos | Polykrikos |
| 77 | Porosira | Porosira |
| 78 | Proboscia | Proboscia |
| 79 | Prorocentrum | Prorocentrum |
| 80 | Prorocentrum balticum + cordatum | e-species(P\_balticum) |
| 81 | Prorocentrum gracile | P\_gracile |
| 82 | Prorocentrum micans + arcuatum + gibbosum + scutellum | e-species(P\_micans) |
| 83 | Prorocentrum triestinum | P\_triestinum |
| 84 | Protoperidinium + Peridinium | Protoperidinium + Peridinium |
| 85 | Protoperidinium bipes | P\_bipes |
| 86 | Pseudo-nitzschia | Pseudo-nitzschia |
| 87 | Pseudo-nitzschia, complexe americana (americana + brasiliana) | Pn, cplx americana |
| 88 | Pseudo-nitzschia, complexe delicatissima, groupe des fines (calliantha + delicatissima + pseudodelicatissima + subcurvata) | Pn, cplx delicatissima |
| 89 | Pseudo-nitzschia, complexe seriata, groupe des effilées (multiseries + pungens) | Pn, cplx seriata elong |
| 90 | Pseudo-nitzschia, complexe seriata, groupe des larges (australis + fraudulenta + seriata + subpacifica) | Pn, cplx seriata large |
| 91 | Pseudo-nitzschia, groupe des larges asymétriques (australis + seriata + subpacifica) | Pn, larges asym |
| 92 | Pseudo-nitzschia, groupe des larges symétriques (fraudulenta) | Pn, larges sym |
| 93 | Pseudo-nitzschia, groupe des sigmoïdes (multistriata) | Pn, sigm |
| 94 | Pyrocystis | Pyrocystis |
| 95 | Raphidophyceae | Raphidophyceae |
| 96 | Rhaphoneis + Delphineis | Rhaphoneis + Delphineis |
| 97 | Rhizosolenia imbricata + styliformis | e-species(R\_imbricata) |
| 98 | Rhizosolenia setigera + setigera f. pungens | e-species(R\_setigera) |
| 99 | Scenedesmus | Scenedesmus |
| 100 | Scrippsiella | Scrippsiella |
| 101 | Skeletonema | Skeletonema |
| 102 | Striatella | Striatella |
| 103 | Synedra + Toxarium | Synedra + Toxarium |
| 104 | Thalassionema | Thalassionema |
| 105 | Thalassiosira + Porosira | Thalassiosira + Porosira |
| 106 | Thalassiosira gravida | T\_ gravida |
| 107 | Thalassiosira levanderi + minima | e-species(T\_levanderi) |
| 108 | Tiarina | Tiarina |
| 109 | Torodinium | Torodinium |
| 110 | Trigonium alternans | T\_alternans |

Table S4: The main taxa’s mean abundance (cells/ L) per season (all sites). The colours highlight gradient from high densities (red) to low densities (blue). The order given correspond to the frequency of appearance (but some taxa in between are not represented because of low mean seasonal abundance). The detailed nomenclature for each taxa is in Table S3.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Taxa** | **Spring** | **Summer** | **Autumn** | **Winter** |
| *Phaeocystis* | 4 142 692 | 1 015 604 | 20 313 | 23 470 |
| *Chaetoceros socialis + socialis f. radians* | 171 087 | 841 352 | 374 631 | 58 630 |
| *Pn, cplx delicatissima* | 112 174 | 35 853 | 23 256 | 2 374 |
| *Chaetoceros* | 103 023 | 558 904 | 61 240 | 5 064 |
| *A\_glacialis* | 75 742 | 168 751 | 9 641 | 8 415 |
| *D\_fragilissimus* | 74 959 | 48 593 | 2 686 | 532 |
| *Pn, larges asym* | 73 932 | 76 175 | 660 | 1 398 |
| *Thalassiosira + Porosira* | 70 227 | 8 401 | 2 584 | 8 210 |
| e-species(*T\_levanderi*) | 57 157 | 5 865 | 6 257 | 9 502 |
| *G\_delicatula* | 54 999 | 50 197 | 11 654 | 1 193 |
| *Plagiogramma* | 50 268 | 4 147 | 3 846 | 4 389 |
| *Skeletonema* | 49 114 | 202 301 | 27 938 | 42 702 |
| *Pn, cplx seriata large* | 40 798 | 18 200 | 2 500 | 1 198 |
| *Cryptophyceae* | 38 774 | 227 855 | 55 254 | 15 168 |
| *Pn, cplx seriata elong* | 27 842 | 24 176 | 7 216 | 3 679 |
| *T\_ gravida* | 22 129 | 7 908 | 2 381 | 4 110 |
| e-genus(*Lauderia*) | 18 484 | 2 750 | 3 050 | 1 802 |
| e-species(*R\_imbricata*) | 16 779 | 22 458 | 9 270 | 540 |
| *H\_triquetra* | 15 705 | 1 322 | 597 | 788 |
| *Leptocylindrus* | 13 228 | 135 932 | 84 378 | 17 453 |
| *Leptocylindrus, cplx danicus* | 12 877 | 105 590 | 14 955 | 150 |
| *Pn, larges sym* | 10 147 | 7 681 | 425 | 3 278 |
| *B\_brockmannii* | 9 635 | 5 213 | 2 284 | 5 125 |
| *Rhaphoneis + Delphineis* | 8 952 | 5 508 | 18 575 | 10 715 |
| *D\_brightwellii* | 8 561 | 4 785 | 693 | 817 |
| e-species(*R\_setigera*) | 5 620 | 5 243 | 563 | 254 |
| *E\_zodiacus* | 5 419 | 45 746 | 6 017 | 800 |
| *C\_pelagica* | 5 092 | 4 657 | 995 | 401 |
| *Odontella* | 4 987 | 1 777 | 928 | 1 957 |
| *P\_sulcata* | 4 838 | 4 348 | 6 066 | 6 385 |
| *Leptocylindrus, cplx minimus* | 3 646 | 119 882 | 28 928 | 1 310 |
| *C\_closterium + N\_longissima* | 2 795 | 6 240 | 1 975 | 1 808 |
| *G\_striata* | 2 767 | 14 360 | 8 531 | 243 |
| *Gymnodinium* | 2 348 | 9 816 | 1 906 | 1 048 |
| *Pn, cplx americana* | 1 662 | 27 389 | 3 677 | 1 202 |
| *B\_paxillifera* | 1 484 | 717 | 725 | 1 428 |
| *Scrippsiella* | 764 | 6 356 | 13 749 | 237 |
| *Heterocapsa* | 603 | 6 429 | 694 | 1 362 |
| *Prorocentrum* | 600 | 17 531 | 1 679 | 139 |
| *M\_rubrum* | 410 | 2 441 | 191 | 253 |
| *Pn, sigm* | 300 | 7 806 | 22 753 | 592 |
| e-species(*P\_micans*) | 230 | 6 613 | 1 795 | 165 |
| *P\_triestinum* | 150 | 25 295 | 772 | 459 |
| *Dinophysis* | 100 | 2 050 | 840 | 100 |
| *L\_chlorophorum* | <LD | 156 378 | 2 740 | <LD |

Table S5 : CTA seasonal scores for the first and second axis for each site.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Axis 1 | Axis 2 |  |
| Spring |  |  | **05052020 CTA with seasonal facets-Axes 1 2** |
| Summer |  |  |
| Autumn |  |  |
| Winter |  |  |