

Supplementary material

Temporal changes in the phytoplankton community along the French coast of the eastern English Channel and the southern Bight of the North Sea

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Table S1. Assigned codes and taxonomic groups of phytoplankton taxa identified along the French Coast of the English Channel and the southern Bight of the North Sea between 1992 and 2011. Gray lines pointed to main taxonomic units analysed in this study.

<i>Group</i>	<i>Code</i>	<i>Species</i>	<i>Family</i>
Diatoms	<i>AchnG</i>	<i>Achnanthes</i> sp	Achnanthaceae
Diatoms	<i>Actinoc</i>	<i>Actinocyclus</i> sp	Hemidiscaceae
Diatoms	<i>Actinop</i>	<i>Actinoptychus</i> sp., <i>A. senarius</i> , <i>A. campanulifer</i>	Heliopeltaceae
Diatoms	<i>AsteAsteAste</i>	<i>Asterionella</i> sp, <i>Asterionella formosa</i> , <i>Asterionellopsis</i> sp, <i>Asterionellopsis glacialis</i> , <i>Asteroplanus</i> , <i>Asteroplanus karianus</i>	Fragilariaceae
Diatoms	<i>Attheya</i>	<i>Attheya armata</i>	Attheyaceae
Diatoms	<i>BacillaG</i>	<i>Bacillaria</i> sp, <i>B. paxillifera</i>	Bacillariaceae
Diatoms	<i>Bacteri</i>	<i>Bacteriastrum</i> sp	Chaetocerotaceae
Diatoms	<i>Belloro</i>	<i>Bellerochea</i> sp	Bellerocheaceae
Diatoms	<i>BiddulpG</i>	<i>Biddulphia</i> sp, <i>B. alternans</i> , <i>B. rhombus</i>	Biddulphiaceae
Diatoms	<i>Ceratul</i>	<i>Cerataulina</i> sp, <i>C. pelagica</i>	Hemiaulaceae
Diatoms	<i>ChaetocG</i>	<i>Chaetoceros</i> sp, <i>C. compressus</i> , <i>C. curvisetus</i> , <i>C. debilis</i> , <i>C. pseudocurvisetus</i> , <i>C. danicus</i> , <i>C. debilis</i> , <i>C. decipiens</i> , <i>C. lorenzianus</i> , <i>C. densus</i> , <i>C. impressus</i> , <i>C. didymus</i> , <i>C. didymus</i> var. <i>protuberans</i> , <i>C. rostratus</i> , <i>C. socialis</i> , <i>C. socialis</i> f. <i>radians</i>	Chaetocerotaceae
Diatoms	<i>Corethr</i>	<i>Corethron</i> sp, <i>C. pennatum</i>	Corethraceae
Diatoms	<i>CoscStel</i>	<i>Coscinodiscus</i> sp, <i>Stellarima</i> sp, <i>C. radiatus</i> , <i>C. marginatus</i>	Coscinodiscaceae
Diatoms	<i>Cylindr</i>	<i>Cylindrotheca closterium</i>	Bacillariaceae
Diatoms	<i>Dactyli</i>	<i>Dactyliosolen fragilissimus</i>	Rhizosoleniaceae
Diatoms	<i>Diplone</i>	<i>Diploneis</i> sp	Diploneidaceae
Diatoms	<i>Ditylum</i>	<i>Ditylum</i> sp, <i>D. brightwellii</i>	Lithodesmiaceae
Diatoms	<i>EucaClim</i>	<i>Eucampia</i> sp, <i>E. zodiacus</i> , <i>Climacodium</i>	Hemiaulaceae
Diatoms	<i>FragilaG</i>	<i>Fragilaria</i> sp	Fragilariaceae
Diatoms	<i>Grammat</i>	<i>Grammatophora</i> sp	Striatellaceae

Diatoms	<i>Guinard</i>	<i>Guinardia</i> sp, <i>G. delicatula</i> , <i>G. flaccida</i> , <i>G. striata</i>	Rhizosoleniaceae
Diatoms	<i>Helicot</i>	<i>Helicotheca</i>	Lithodesmiaceae
Diatoms	<i>LaudSchr</i>	<i>Lauderia</i> sp, <i>Schroederella</i> sp	Lauderiaceae + Skeletonemataceae
Diatoms	<i>Leptocy</i>	<i>Leptocylindrus</i> sp, <i>L. danicus</i> , <i>L. curvatulus</i> , <i>L. minimus</i>	Leptocylindraceae
Diatoms	<i>Licmoph</i>	<i>Licmophora</i>	Licmophoraceae
Diatoms	<i>LithodeG</i>	<i>Lithodesmium</i>	Lithodesmiaceae
Diatoms	<i>MelosirG</i>	<i>Melosira</i> sp	Melosiraceae
Diatoms	<i>Meunier</i>	<i>Meuniera</i> sp, <i>M. membranacea</i>	Naviculaceae
Diatoms	<i>NaviFallHaslLyrePetr</i>	<i>Navicula</i> sp, <i>N. pelagica</i> , <i>Fallacia</i> sp, <i>Haslea</i> sp, <i>Lyrella</i> sp, <i>Petroneis</i> sp	Naviculaceae + Sellaphoraceae + Lyrellaceae
Diatoms	<i>NitzHant</i>	<i>Nitzschia</i> sp, <i>N. longissima</i> , <i>Hantzschia</i>	Bacillariaceae
Diatoms	<i>Odontel</i>	<i>Odontella</i> sp, <i>O. aurita</i> , <i>O. granulata</i> , <i>O. mobiliensis</i> , <i>O. regia</i> , <i>O. sinensis</i>	Triceratiaceae
Diatoms	<i>Paralia</i>	<i>Paralia sulcata</i>	Paraliaceae
Diatoms	<i>PlagBrock</i>	<i>Plagiogramma</i> sp, <i>Brockmanniella brockmannii</i>	Plagiogrammaceae + Cymatosiraceae
Diatoms	<i>Plagiogmop</i>	<i>Plagiogrammopsis</i> sp, <i>P. vanheurckii</i>	Cymatosiraceae
Diatoms	<i>PleuGyro</i>	<i>Pleurosigma</i> sp, <i>Gyrosigma</i>	Pleurosigmataceae
Diatoms	<i>PodoHyal</i>	<i>Podosira</i> sp, <i>P. stelligera</i> , <i>Hyalodiscus</i> sp	Hyalodiscaceae
Diatoms	<i>Probosc</i>	<i>Proboscia indica</i>	Rhizosoleniaceae
Diatoms	<i>Pseunitz</i>	<i>Pseudo-nitzschia</i> , <i>P. americana</i> , <i>P. delicatissima</i> , <i>P. pungens</i> , <i>P. seriata</i>	Bacillariaceae
Diatoms	<i>RhapDelp</i>	<i>Rhaphoneis</i> sp, <i>Delphineis</i> sp	Rhaphoneidaceae
Diatoms	<i>RhizosoG</i>	<i>Rhizosolenia</i> sp, <i>R. hebetata</i> , <i>R. imbricata</i> , <i>R. styliformis</i> , <i>R. robusta</i> , <i>R. setigera</i> , <i>R. pungens</i>	Rhizosoleniaceae
Diatoms	<i>Skeleto</i>	<i>Skeletonema costatum</i>	Skeletonemaceae
Diatoms	<i>Stauron</i>	<i>Stauroneis</i>	Stauroneidaceae
Diatoms	<i>Stephan</i>	<i>Stephanopyxis</i>	Stephanopyxidaceae
Diatoms	<i>Surirel</i>	<i>Surirella</i>	Surirellaceae
Diatoms	<i>SyneToxa</i>	<i>Synedra</i> sp, <i>Toxarium</i> sp	Fragilariaceae + Toxariaceae
Diatoms	<i>ThalPoro</i>	<i>Thalassiosira</i> sp, <i>T. angulata</i> , <i>T. antarctica</i> , <i>T. levanderi</i> , <i>T. minima</i> , <i>T. nordenskiöldii</i> , <i>T. rotula</i> , <i>T. gravida</i> , <i>Porosira</i> sp	Thalassiosiraceae
Diatoms	<i>ThalThalLiol</i>	<i>Thalassionema</i> sp, <i>Thalassionema nitzschioides</i> <i>Thalassiothrix</i> sp, <i>Lioloma</i> sp	Thalassionemataceae
Dinoflagellates	<i>Akashiw</i>	<i>Akashiwo sanguinea</i>	Gymnodiniaceae
Dinoflagellates	<i>Alexand</i>	<i>Alexandrium</i> sp, <i>A. minutum</i> , <i>A. ostenfeldii</i>	Gonyaulacaceae
Dinoflagellates	<i>Amphidi</i>	<i>Amphidinium</i> sp., <i>A. crassum</i>	Gymnodiniaceae
Dinoflagellates	<i>Ceratiu</i>	<i>Ceratium</i> sp, <i>C. minutum</i> , <i>Neoceratium furca</i> , <i>N. fusus</i> , <i>N. lineatum</i>	Ceratiaceae
Dinoflagellates	<i>Cochlod</i>	<i>Cochlodinium</i> sp	Gymnodiniaceae

Dinoflagellates	<i>DinophyG</i>	<i>Dinophysis</i> sp, <i>D. acuminata</i> , <i>D. sacculus</i>	Dinophysaceae
Dinoflagellates	<i>DiploDiploDiploZygaOble</i>	<i>Diplopsalis</i> sp, <i>Diplopelta</i> sp, <i>Diplopsalopsis</i> sp, <i>Zygabikodinium</i> sp, <i>Oblea</i> sp	Protoperidiniaceae
Dinoflagellates	<i>DissPyro</i>	<i>Pyrocystis</i> sp	Pyrocystaceae
Dinoflagellates	<i>GonyaulG</i>	<i>Gonyaulax</i> sp	Gonyaulacaceae
Dinoflagellates	<i>GymnGyro</i>	<i>Gymnodinium</i> sp, <i>Gyrodinium</i> sp, <i>Gyrodinium spirale</i>	Gymnodiniaceae
Dinoflagellates	<i>Heteroc</i>	<i>Heterocapsa</i> , <i>H. niei</i> , <i>H. rotundata</i> , <i>H. triquetra</i>	Peridiniida incertae sedis
Dinoflagellates	<i>Karenia</i>	<i>Karenia</i> sp, <i>K. mikimotoi</i>	Gymnodiniaceae
Dinoflagellates	<i>Karlodi</i>	<i>Karodinium</i> , <i>K. veneficum</i>	Gymnodiniaceae
Dinoflagellates	<i>Katodin</i>	<i>Katodinium</i> sp	Gymnodiniaceae
Dinoflagellates	<i>Micraca</i>	<i>Micracanthodinium</i> sp	Cladopyxidaceae
Dinoflagellates	<i>NoctiluG</i>	<i>Noctiluca scintillans</i>	Noctilucaceae
Dinoflagellates	<i>Oxyphys</i>	<i>Oxyphysis</i> sp	Amphisoleniaceae
Dinoflagellates	<i>Peridinie</i>	<i>Peridiniella</i> sp	Cladopyxidaceae
Dinoflagellates	<i>Phalacr</i>	<i>Phalacroma rotundatum</i>	Dinophysaceae
Dinoflagellates	<i>PolykriG</i>	<i>Polykrikos</i> sp, <i>P. schwarzii</i>	Polykrikaceae
Dinoflagellates	<i>Pronoct</i>	<i>Pronoctiluca</i>	Protodiniferaceae
Dinoflagellates	<i>ProroceG</i>	<i>Prorocentrum</i> sp, <i>P. micans</i> , <i>P. arcuatum</i> , <i>P. gibbosum</i> , <i>P. cordatum</i> , <i>P. blaticum</i> , <i>P. triestinum</i>	Prorocentraceae
Dinoflagellates	<i>Protoce</i>	<i>Protoceratium</i>	Gonyaulacaceae
Dinoflagellates	<i>ProtPeri</i>	<i>Protoperidinium</i> sp, <i>P. bipes</i> , <i>P. depressum</i> , <i>P. minutum</i> , <i>Peridinium</i> sp	Peridiniaceae + Protoperidiniaceae
Dinoflagellates	<i>PyrophaG</i>	<i>Pyrophacus</i> sp	Pyrophacaceae
Dinoflagellates	<i>ScriEnsiPentaBysm</i>	<i>Scrippsiella</i> sp, <i>Ensiculifera</i> sp, <i>Pentapharsodinium</i> sp, <i>Bysmatrum</i> sp	Peridiniaceae
Dinoflagellates	<i>Spatulo</i>	<i>Spatulodinium pseudonoclituca</i>	Kofoidiniaceae
Dinoflagellates	<i>Torodin</i>	<i>Torodinium</i> sp	Gymnodiniaceae
Dinoflagellates	<i>TriceraG</i>	<i>Triceratium</i> sp, <i>T. favus</i>	Gymnodiniaceae
Dinoflagellates	<i>WarnNemaNema</i>	<i>Warnowia</i> sp, <i>Nematodinium</i> sp, <i>Nematopsides</i> sp	Warnowiaceae
Chlorophytes	<i>Ankistr</i>	<i>Ankistrodesmus</i> sp	Selenastraceae
Chlorophytes	<i>Crucige</i>	<i>Crucigenia</i> sp	Trebouxiophyceae incertae sedis
Chlorophytes	<i>Pediastr</i>	<i>Pediastrum</i> sp	Hydrodictyaceae
Chlorophytes	<i>Pyramim</i>	<i>Pyramimonas</i>	Pyramimonadaceae
Chlorophytes	<i>Scenede</i>	<i>Scenedesmus</i> sp, <i>S. communis</i>	Scenedesmaceae
Cyanobacteria	<i>Microcy</i>	<i>Microcystis</i> sp	Microcystaceae
Euglenids	<i>Eugleni</i>	<i>Euglena</i> sp	Euglenaceae
Euglenids	<i>Eutreptie</i>	<i>Eutreptiella</i> sp	Eutreptiaceae
Haptophyta	<i>Chrysoc</i>	<i>Chrysochromulina</i> sp	Prymnesiaceae
Haptophyta	<i>Phaeocy</i>	<i>Phaeocystis</i> sp	Phaeocystaceae
Silicoflagellates	<i>DictyocG</i>	<i>Dictyocha</i> sp, <i>D. speculum</i>	Dictyochaceae
Raphidophytes	<i>ChattonG</i>	<i>Chattonella</i>	Chattonellaceae
Raphidophytes	<i>Heteros</i>	<i>Heterosigma</i> sp, <i>H. akashiwo</i>	Chattonellaceae
Ebridian flagellates	<i>Ebria</i>	<i>Ebria tripartita</i>	Ebriaceae

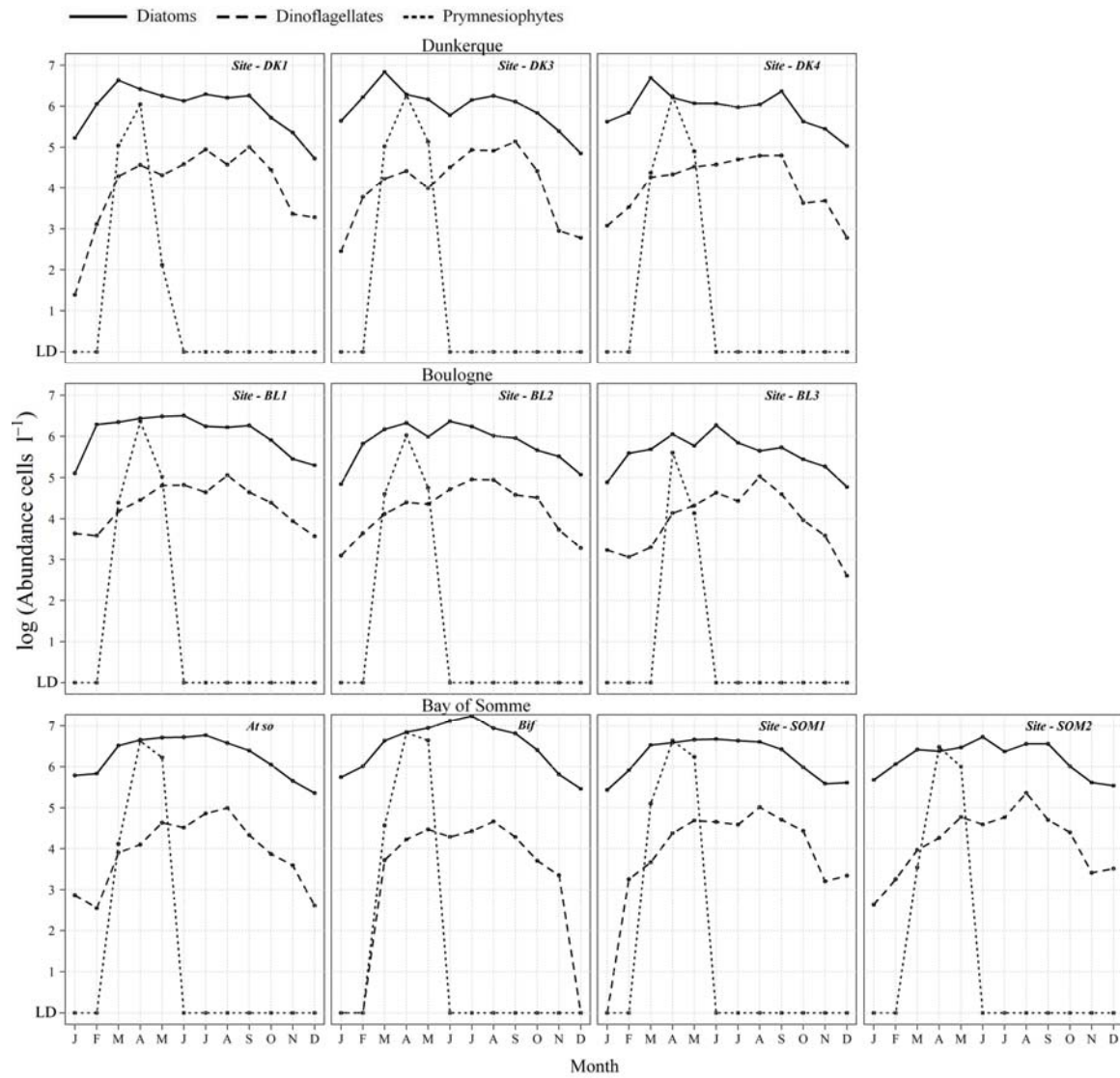


Figure S1: Median monthly abundance of the main phytoplankton taxonomic groups at ten stations along the French Coast of the English Channel and the southern Bight of the North Sea between 1992 and 2011. LD (*detection limit*).

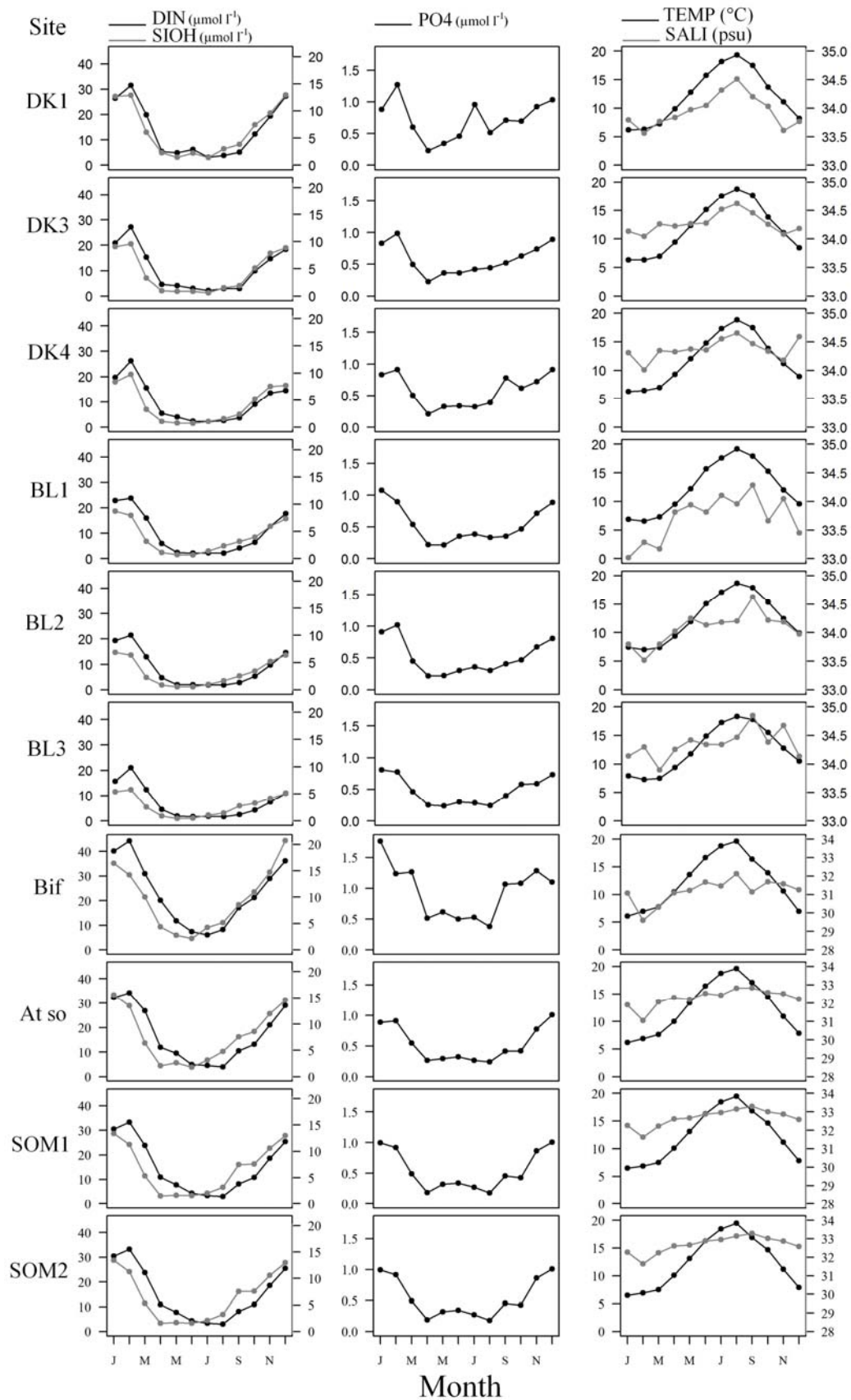


Figure S2. Seasonal patterns of environmental variables at ten stations along the French Coast of the English Channel and the southern Bight of the North Sea between 1992 and 2011. Abbreviations of environmental variables: DIN(dissolved inorganic nitrogen), SIOH (silicate), PO4 (phosphates), TEMP (temperature), SALI (salinity). Left and right scales for black and gray lines respectively.

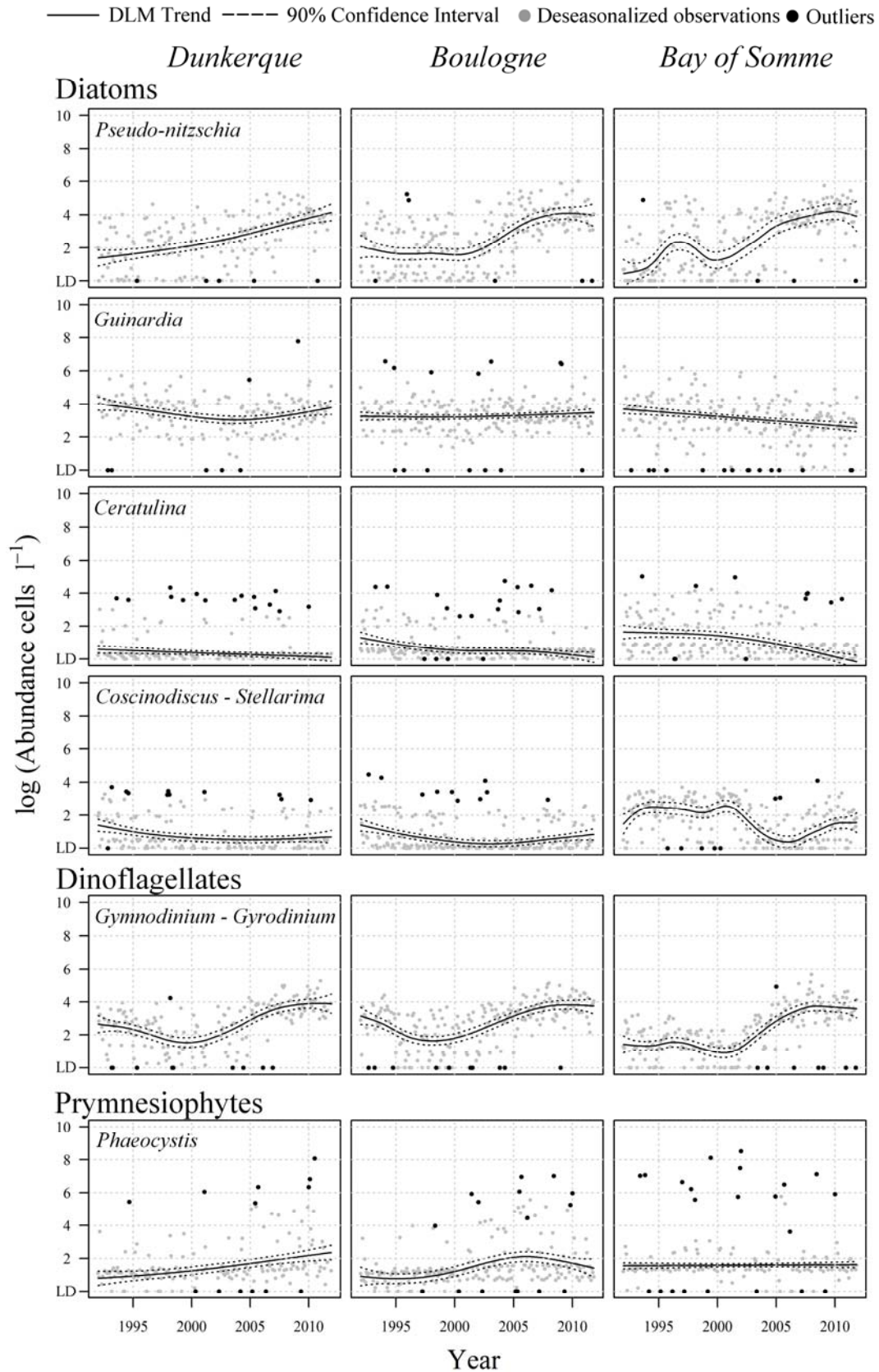


Figure S3. Long term trend in the abundance of six taxonomic units over the sampling period at Dunkerque, Boulogne and the Bay of Somme. Solid black lines and dotted lines represent trends and 90% confidence interval respectively, as predicted by the Dynamic Linear Model. Gray and dark dots correspond to deseasonalized observations and outliers respectively. *LD* (*detection limit*).