

Table S1. Information about the copepod species found in coastal waters of the eastern English Channel over the period 2007-2013: carbon conversion factor (mg C ind⁻¹), frequency of occurrence (%) and average biomass (µgC L⁻¹).

	Carbon conversion factor	Frequency	Average biomass
	mg C ind ⁻¹	%	µgC L ⁻¹
<i>Acartia clausi</i>	2.68	97	3090
<i>Calanus helgolandicus</i>	10.44	41	66
<i>Paracalanus parvus</i>	2.20	91	641
<i>Pseudocalanus elongatus</i>	2.43	81	281
<i>Temora longicornis</i>	5.59	92	1902
<i>Centropages typicus</i>	2.35	9	0.29
<i>Centropages hamatus</i>	7.57	92	1006
<i>Oithona nana</i>	0.16	3	0.02
<i>Ditrichocorycaeus anglicus</i>	2.40	14	40
<i>Euterpina acutifrons</i>	1.06	77	146

Table S2. Information about the diatom species in coastal waters of the eastern English Channel over the period 2007-2013: frequency of occurrence (%) and average biomass ($\mu\text{gC L}^{-1}$).

	Frequency %	Average biomass $\mu\text{gC L}^{-1}$
<i>Actinocyclus</i> spp.	17	0.02
<i>Asterionellopsis glacialis</i>	68	0.23
<i>Bacillaria paxillifera</i>	20	0.3
<i>Bacteriostратum hyalinum</i>	1	1.18 10-3
<i>Biddulphia rhombus</i>	29	0.23
<i>Brockmaniella brockmanii</i>	26	0.02
<i>Cerataulina pelagica</i>	31	0.98
<i>Ceratoneis closterium</i>	90	0.01
<i>Chaetoceros compressus/tortissimus</i>	36	0.08
<i>C. curvisetus/pseudo-curvisetus/debilis</i>	50	0.47
<i>C. danicus</i>	65	0.62
<i>C. decipiens</i>	26	0.6
<i>C. densus/eibenii</i>	46	0.28
<i>C. diadema</i>	18	0.15
<i>C. didymus</i>	19	0.01
<i>C. lauderit/teres</i>	10	0.01
<i>C. simplex/henuissimus</i>	36	1.34 10-3
<i>C. socialis</i>	80	1.12
<i>C. wighamii/perpusillus</i>	27	0.06
<i>Corethron criophilum</i>	5	0.06
<i>Coscinodiscus</i> spp.	10	1.12 10-3
<i>C. concinnus</i>	6	1.33
<i>C. radiatus</i>	27	0.2
<i>C. wailesii</i>	10	0.8
<i>Dactylosolen fragillissimus</i>	45	1.15
<i>Delphineis surirella</i>	30	0.38
<i>Diploneis</i> spp.	33	0.19
<i>Ditylum brightwellii</i>	69	11.42
<i>Eucampia zodiacus/bicornata</i>	20	0.68
<i>Guinardia delicatula</i>	88	7.15
<i>G. flaccida</i>	50	7.37
<i>G. striata</i>	65	8.51
<i>Helicotheca tamesis</i>	10	0.83
<i>Lauderia annulata</i>	52	3.08
<i>Leptocylindrus danicus</i>	64	7.17
<i>L. minimus</i>	36	0.03
<i>Meuneria membranacea</i>	45	0.17
<i>Navicula</i> spp.	56	0.02
<i>Neocalyptrella robusta</i>	7	0.73
<i>Nitzschia longissima</i>	43	0.03
<i>Odontella aurita</i>	20	4.53 10-3
<i>Odontella sinensis</i>	14	7.37
<i>Pseudo-nitzschia americana</i>	43	0.04
<i>P. delicatissima complex</i>	75	0.2
<i>P. fraudulenta</i>	58	1.48
<i>Porosira glacialis</i>	2	0.05
<i>Pseudo-nitzschia</i> spp.	33	0.01
<i>P. pungens</i>	62	0.2
<i>P. subpifica</i>	8	0.01
<i>Paralia sulcata</i>	93	0.36
<i>Pleurosigma</i> spp./Gyrosigma spp.	75	1.47
<i>Podosira stelligera</i>	11	0.04
<i>Proboscia indica</i>	1	7.16 10-4
<i>Raphoneis amphiceros</i>	65	0.11
<i>Rhizosolenia imbricata</i> var. <i>shrubslei</i>	81	26.35
<i>R. setigera</i>	27	0.02
<i>R. setigera f. pungens</i>	32	0.04
<i>Skeletonema</i> spp.	58	0.15
<i>Stephanopyxis turris</i>	2	0.02
<i>Thalassionema nitsochoides</i>	80	0.28
<i>Thalassiosira angulata/curviseriata</i>	8	0.13
<i>T. constricta</i>	15	0.06
<i>T. fallax</i>	12	0.02
<i>T. graviora</i>	57	2.17
<i>T. levanderi</i>	44	0.22
<i>T. nordenskioldii</i>	36	0.55
<i>T. punctigera</i>	20	0.09
<i>Thalassiosira</i> spp.	30	0.12
<i>Trigonium alternans</i>	15	0.03
<i>Trigonium mobilensis</i>	14	0.2
<i>Trigonium regia</i>	8	0.16

Table S3. List of the dinoflagellate species found in coastal waters of the eastern English Channel over the period 2007-2013 and their trophic mode (according to Gómez 2012) A: auto-, M mixo-, and H: heterotrophic species/genus.

Order Dinophysiales	Trophic mode*
<i>Dinophysis acuminata</i>	A-M
Order Gymnodiniales	
<i>Gymnodinium</i> spp.	A-M-H
<i>Gyrodinium spirale</i>	H
<i>Gyrodinium</i> spp.	H
<i>Herdmania litoralis</i>	A-M
<i>Lebouridinium glaucum</i>	H
<i>Torodinium robustum</i>	H
Order Noctilucales	
<i>Spatulodinium pseudonociluca</i>	A-M
Order Peridiniales	
<i>Diplopsalis</i> spp.	A-M
<i>Oblea rotunda</i>	H
<i>Protoperidinium bipes</i>	H
<i>Protoperidinium depressum</i>	H
<i>Protoperidinium leonis</i>	H
<i>Protoperidinium oblongum</i>	H
<i>Protoperidinium pallidum</i>	H
<i>Protoperidinium pentagonum</i>	H
<i>Protoperidinium steinii</i>	H
<i>Protoperidinium</i> spp.	H
<i>Scrippsiella acuminata</i>	A-M
Order Prorocentrales	
<i>Prorocentrum micans</i>	A-M
<i>prorocentrum minimum</i>	A-M
<i>Prorocentrum triestinum</i>	A-M
Order Pyrocystales	
<i>Dissodinium pseudolunula</i>	H
Order Tovelliales	
<i>Heterocapsa rotundata</i>	A-M

*A:auto-, M:mixo-, and H:hetero

Table S4. Ciliates, at the genus level, found in coastal waters of the eastern English Channel over the period 2007-2013.

Class Oligotrichea
Order Choreotrichida
<i>Strobilidium</i>
<i>Strombidinopsis</i>
<i>Leegardiella</i>
<i>Lohmnanniella</i>
Order Oligotrichida
<i>Strombidium</i>
<i>Laboea</i>
<i>Tontonia</i>
Class Litostomatea
Order Cyclotrichiida
<i>Mesodinium</i>
Order Haptorida
<i>Didinium</i>
Class Prostomatea
Order Prorodontida
<i>Balanion</i>

Table S5. Calculation of the defence trait against grazing. Coloniality is here defined according to Djeghri et al. (2019), i.e., as the capacity of copepods to ingest prey (Note that coloniality in Table 1 is defined for phytoplankton/diatom species).

Trait	Range/Category	References
Mucous/Toxins production capacity	0: No, 1: Yes	Halse and Syvertsen 1996, Hoppenrath et al. 2009
Coloniality	0: <500 µm; 1: >501 µm	Djeghri et al. 2019
Setae/spicule	0: No, 1: Yes	Halse and Syvertsen 1996, Hoppenrath et al. 2009
Degree of silicification	0: Slightly, 0.5: Medium, 1: Heavily	Halse and Syvertsen 1996, Hoppenrath et al. 2009

Table S6. Pearson correlation values with the first (COIA1), second (COIA2) and third (COIA3) co-inertia axes resulting from co-inertia analysis performed on the environmental variables and on both (A) diatom (N=63, RV=0.59, $p=10^{-3}$) and (B) copepod (N=63, RV=0.36, $p=310^{-3}$), including their functional structure in coastal waters of the eastern English Channel over the period 2007-2013. Significant r values ($p<0.05$) are in bold.

A	<i>Environment</i>				<i>Diatoms</i>			
		COIA1	COIA2	COIA3		COIA1	COIA2	COIA3
	Wind stress	-0.67	-0.11	-0.1	Species richness	-0.02	0.28	0.70
	DIN	-0.83	0.27	-0.06	Biomass	0.50	0.55	0.11
	DIP	-0.81	0.02	-0.17	CWM.MLD	0.33	-0.05	-0.53
	DSI	-0.71	-0.17	0.25	CWM.S/V ratio	0.70	-0.21	0.15
	T	0.47	-0.73	0.25	CWM.Start.bloom.timing	0.59	-0.45	-0.15
	PAR	0.88	-0.11	0.13	CWM.Coloniality	0.80	0.09	0.03
	S	0.51	0.29	0.20	CWM.Silicification	-0.92	0.09	0.13
	<i>Phaeocystis</i> biomass	0.33	0.76	-0.33	CWM.Tychopelagic	-0.41	-0.29	-0.28
	Phytoplankton C/Chla	0.35	0.52	-0.28	CWM.Defense	-0.09	0.83	0.43
	Protozooplankton biomass	0.45	0.14	0.06	DIN niche breadth	-0.74	0.53	0.10
	Copepod biomass	0.42	0.27	-0.16	DIP niche breadth	-0.81	0.41	0.22
	CWM.Maximum.Size	0.48	0.68	0.18	DSi niche breadth	-0.86	0.15	0.33
	CWM.Omnivory	0.43	0.65	-0.50	PAR niche breadth	0.79	-0.37	-0.09
	CSI Trophic regime	-0.39	-0.67	0.62	CWM.Environmental tolerance	-0.64	-0.27	0.23
	CSI.Feeding.mode	-0.12	0.09	0.80	SES-Fric	0.02	-0.28	-0.70
					SES-RaoQ	0.18	-0.42	-0.83
					SES-Fricdefence	0.02	-0.32	-0.74
					SES-RaoQdefence	0.16	-0.43	-0.83

B	<i>Environment</i>			<i>Copepods</i>		
		COIA1	COIA2		COIA1	COIA2
	T	-0.28	-0.74	Species richness	-0.1	-0.77
	S	0.48	-0.11	Biomass	0.41	-0.06
	<i>Phaeocystis</i> biomass	0.70	0.22	CWM.Feeding mode	0.93	0.40
	Protozooplankton biomass	0.43	-0.49	CWM.Maximum size	0.89	-0.01
	Diatom biomass	0.67	-0.21	CWM.Detritivory	0.81	0.69
	CWM-Diatom defence	0.57	-0.002	CSI index for trophic regime	-0.72	-0.74
	Jellyfish	0.36	-0.88	POC niche breadth	0.84	0.25
	Chaetognaths	-0.75	0.17	Chla niche breadth	-0.76	-0.30
	Fish larvae	0.67	-0.28	CWM.Environmental tolerance	0.35	0.91
				SES-Fric	0.06	0.75
				SES-RaoQ	0.13	0.67

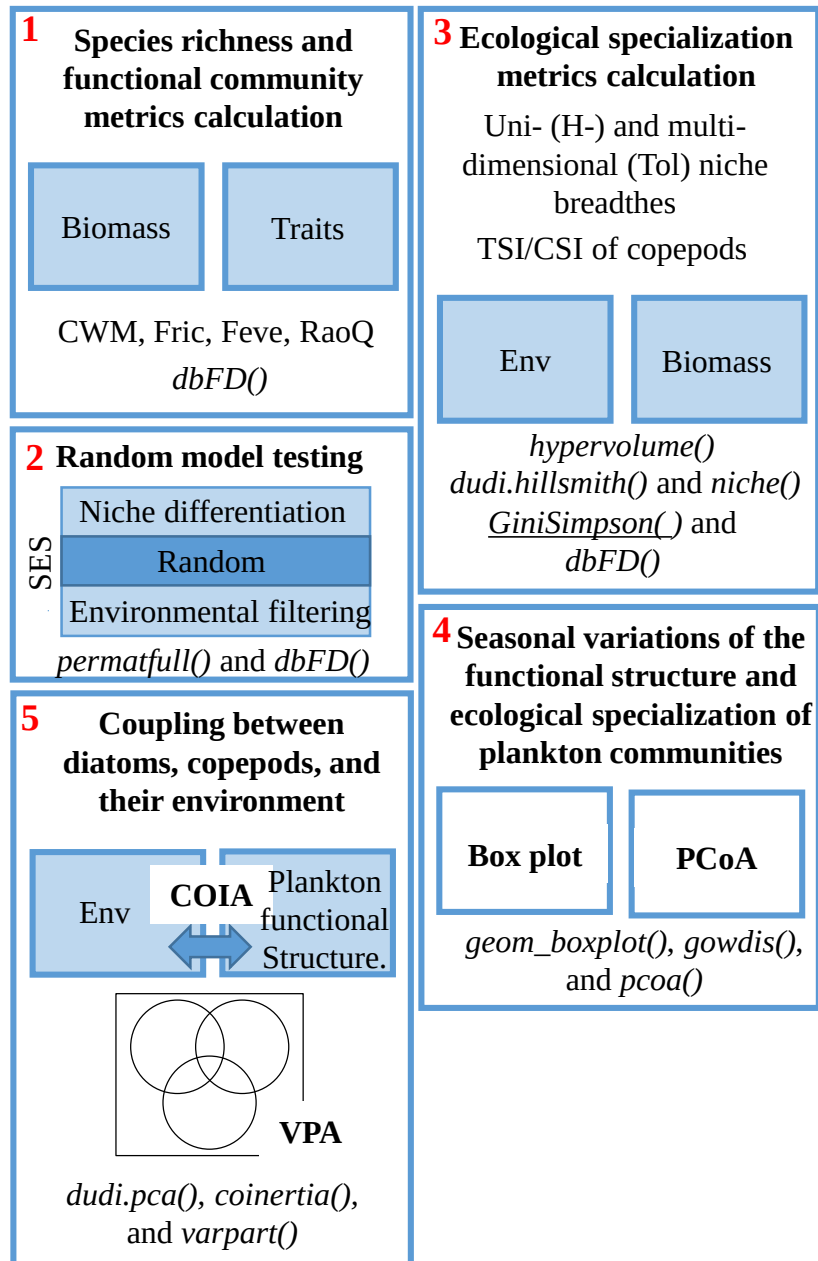


Fig.S1. The 5 steps in our statistical methodology to explore the seasonal variations in the biodiversity, ecological strategy and specialization of diatoms and copepods. Step 1: characterization of the plankton community trait distributions and biodiversity; Step 2: testing to infer mechanisms of plankton community assembly (SES: Standardized Effect Size); Step 3: characterization of the ecological specialization of the plankton community; Step 4: Box plots and Principal Coordinate Analysis (PCoA) to explore the seasonal variations of the functional structure and ecological specialization of the plankton communities; Step 5: Co-inertia analysis (COIA) and variation partitioning analysis (VPA) to explore the drivers of the functional structure and species richness of the plankton community. H-: unidimensional niche; Tol: environmental tolerance; breadthEnv: environmental variables; CWM: community-weighted mean; RaoQ: functional divergence; FEve: functional evenness, Fric: functional richness; TSI: Taxon Specialization Index; CSI: Community Specialization Index. The R functions used are in italics.

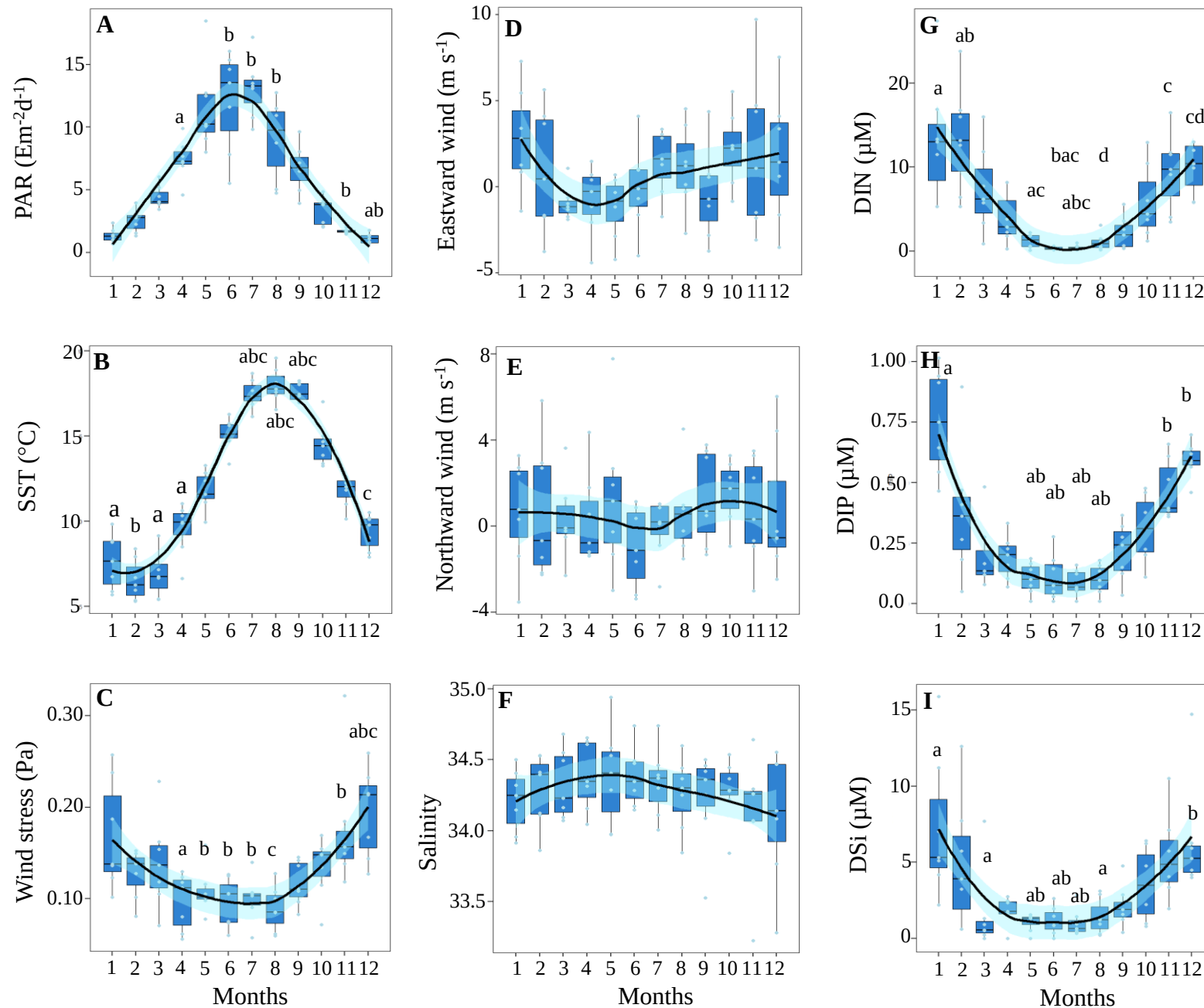


Fig. S2. Seasonal variations in (A) Photosynthetic Active Radiation at 10 m-depth ($\text{E m}^{-2} \text{d}^{-1}$), (B) Sea Surface Temperature (SST, $^{\circ}\text{C}$), (C) Wind stress (Pa), (D) Northward and (E) Eastward winds (m s^{-1}), (F) Salinity, and (G-I) Dissolved Inorganic Nitrogen (DIN, μM), Phosphorus (DIP, μM), and Silica (DSi, μM) in coastal waters of the eastern English Channel over the period 2007-2013. Black horizontal line inside box: median; box: first to third quartiles; whiskers: 1.5 times the interquartile range (IQR); dots: monthly data including outliers (>1.5 times IQR). The labels a-d show significant differences between months ($p < 0.05$, Nemenyi test). The solid line and ribbon represent LOESS smoothing and the 95% confidence interval, respectively.

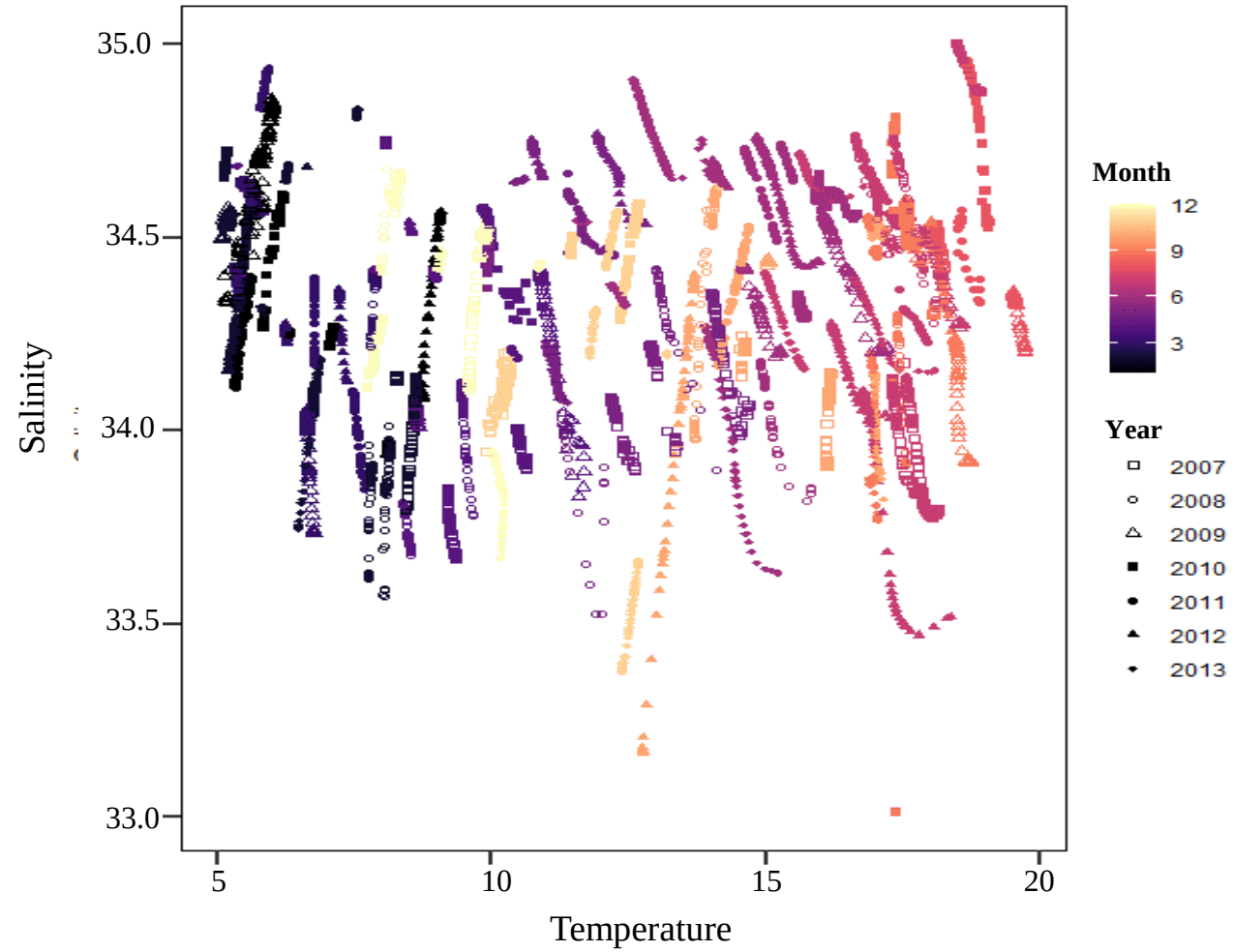
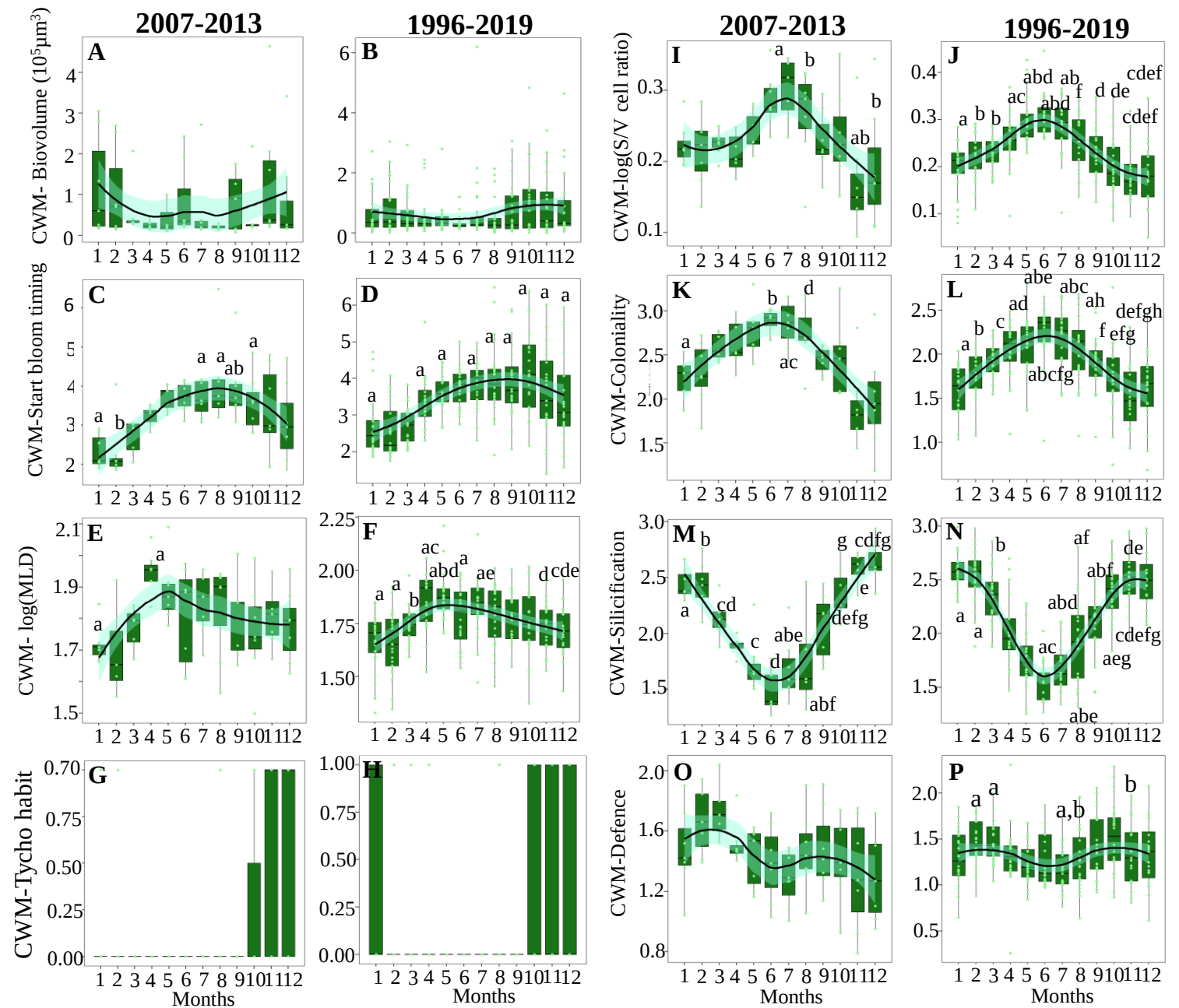


Fig. S3. Seasonal variations in temperature-salinity diagrams in coastal waters of the eastern English Channel over the period 2007-2013. The color scale displays monthly values from January (in black) to December (in light pink). Years are identified by means of different symbols.

Fig. S4. Seasonal variations in the Community-Weighted Means (CWM) of the diatom community of (A-B) cell biovolume ($10^5\mu\text{m}^3$), (C-D) start bloom timing, (E-F) Maximum Linear Dimension ($\log(\text{MLD})$), (G-H) Tychopeagic/benthic habit ('Tycho habit'), (I-J) the Surface to bioVolume ratio ($\log(\text{S/V cell ratio})$), (K-L) Coloniality, (M-N) the apparent degree of silification, and (O-P) Defence against predation, in coastal waters of the eastern English Channel over the period (A,C,E,G,I,K,M, and O) 2007-2013 and (B,D,F,H,J,L,N, and P) 1996-2019. Black horizontal line inside box: median; box: first to third quartiles; whiskers: 1.5 times the interquartile range (IQR); dots: monthly data including outliers (>1.5 times IQR). The labels a-g show significant differences ($p < 0.05$, Nemenyi test). The solid line and ribbon represent LOESS smoothing and the 95% confidence interval, respectively.



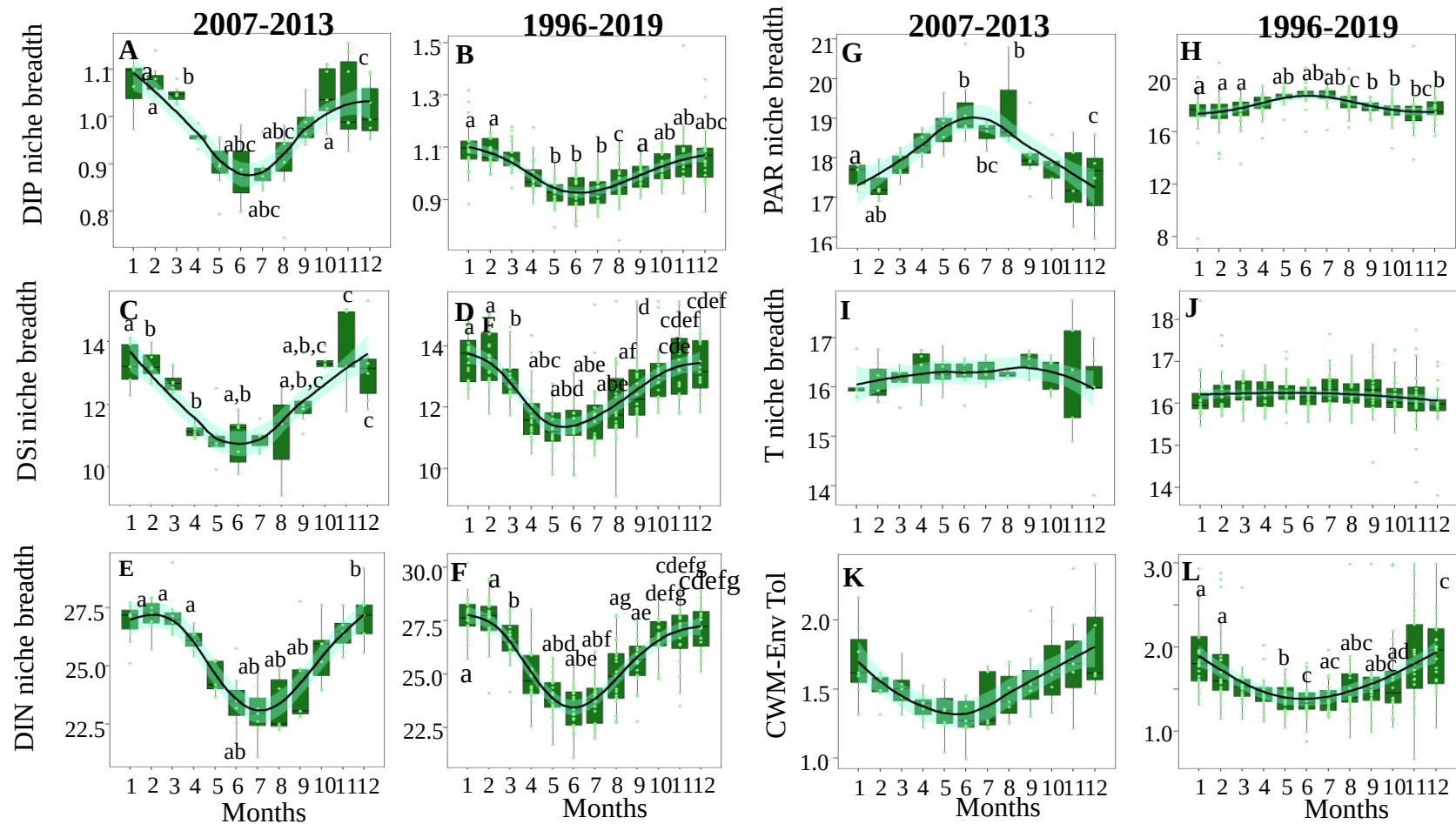


Fig. S5. Seasonal variations in the ecological specialization of the diatom community in coastal waters of the eastern English Channel over the period 2007-2013 (A,C,E,G,I, and K) and 1996-2019 (B,D,F,H,J, and L). Niche breadth of (A-B) Phosphorus (DIP), (C-D) Dissolved Silica (DSi), (E-F) Dissolved Inorganic Nitrogen (DIN), (G-H) Light, and (I-J) temperature, and (K-L) the Community Weight Mean (CWM) of the environmental tolerance. Black horizontal line inside box: median; box: first to third quartiles; whiskers: 1.5 times the interquartile range (IQR); dots: monthly data including outliers (>1.5 times IQR). The labels a-g show significant differences between months ($p < 0.05$, Nemenyi test). The solid line and ribbon represent LOESS smoothing and the 95% confidence interval, respectively. Env Tol: environmental tolerance.

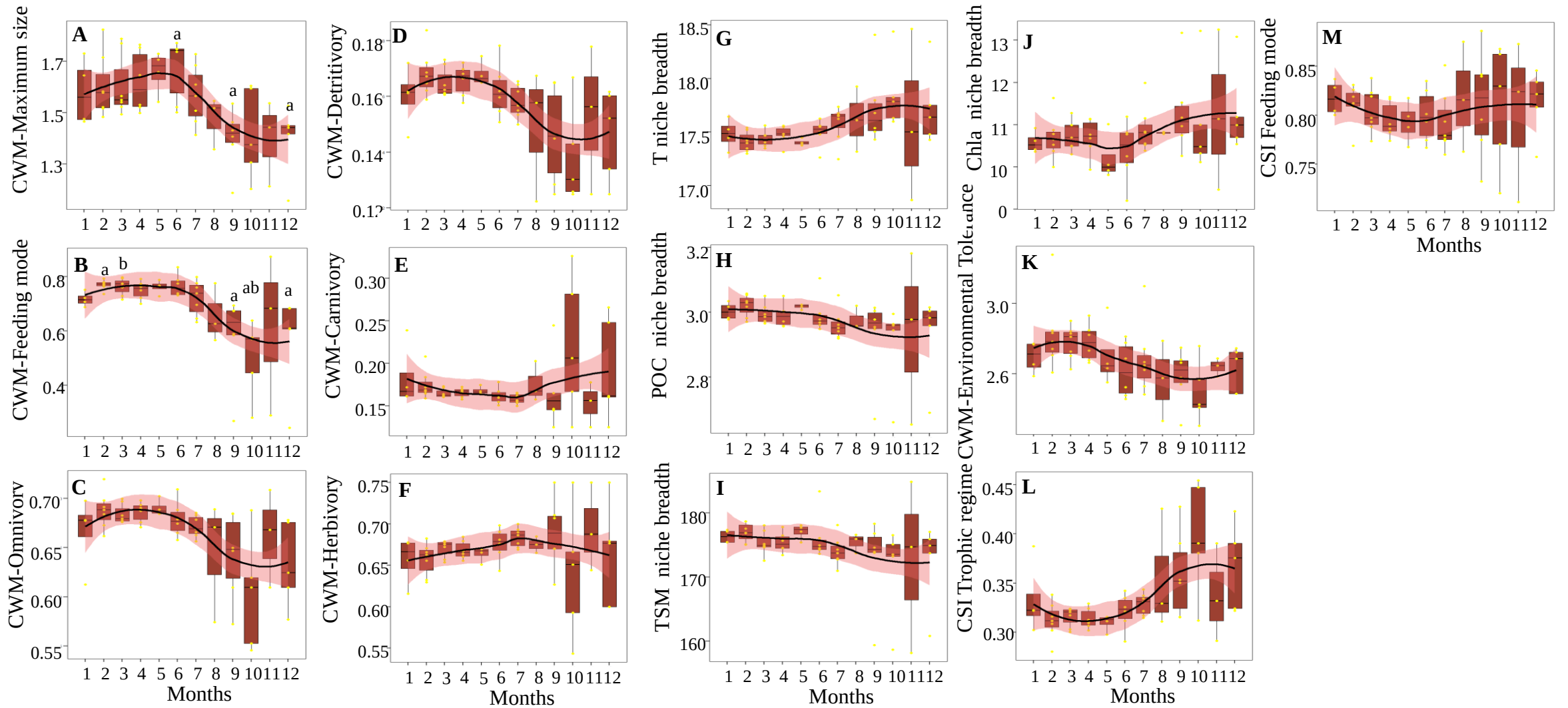


Fig. S6. Seasonal variations in the Community-Weighted Means (CWM) and the ecological specialization of the copepod communities in coastal waters of the eastern English Channel over the period 2007-2013. CWM of (A) Maximum size (mm), (B) Feeding mode, (C) Omnivory, (D) Detritivory, (E) Carnivory, and (F) Herbivory. Niche breadth of (G) Temperature (T), (H) Particulate Organic Carbon (POC), (I) Total Suspended Matter (TSM), and (J) Chlorophyll a, (K) the CWM of environmental tolerance. Community Specialization Index (CSI) for (L) Trophic regime and (M) Feeding mode. Black horizontal line inside box: median; box: first to third quartiles; whiskers: 1.5 times the interquartile range (IQR); dots: monthly data including outliers (>1.5 times IQR). The labels a-c show significant differences between months ($p < 0.05$, Nemenyi test). The solid line and ribbon represent LOESS smoothing and the 95% confidence interval, respectively.

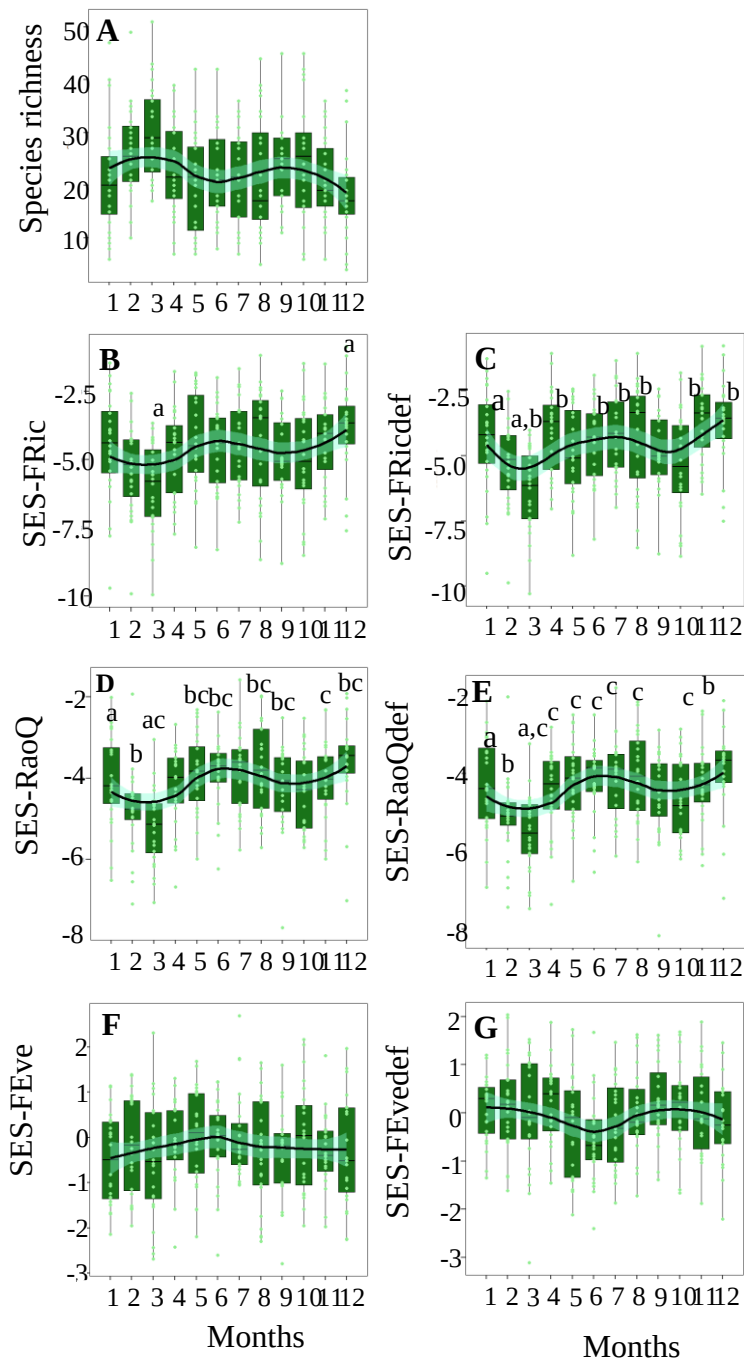


Fig. S7. Seasonal variations in the (A) species richness and the Standardized Effect Size (SES) of (B-C) functional richness (SES-FRic), (D-E) functional divergence (SES-RaoQ), and functional evenness (SES-FEve), and (F-G) of the diatom community in coastal waters of the eastern English Channel over the period 1996-2019, related to (B, D, and F) resources and (C, E, and G) defense against predation, respectively. Horizontal line inside box: median; box: first to third quartiles; whiskers: 1.5 times the interquartile range (IQR); dots: monthly data including outliers (>1.5 times IQR). The labels a-c show significant differences between months ($p < 0.05$, Nemenyi test). The solid line and ribbon represent LOESS smoothing and the 95% confidence interval, respectively. Def: defence against predation.)

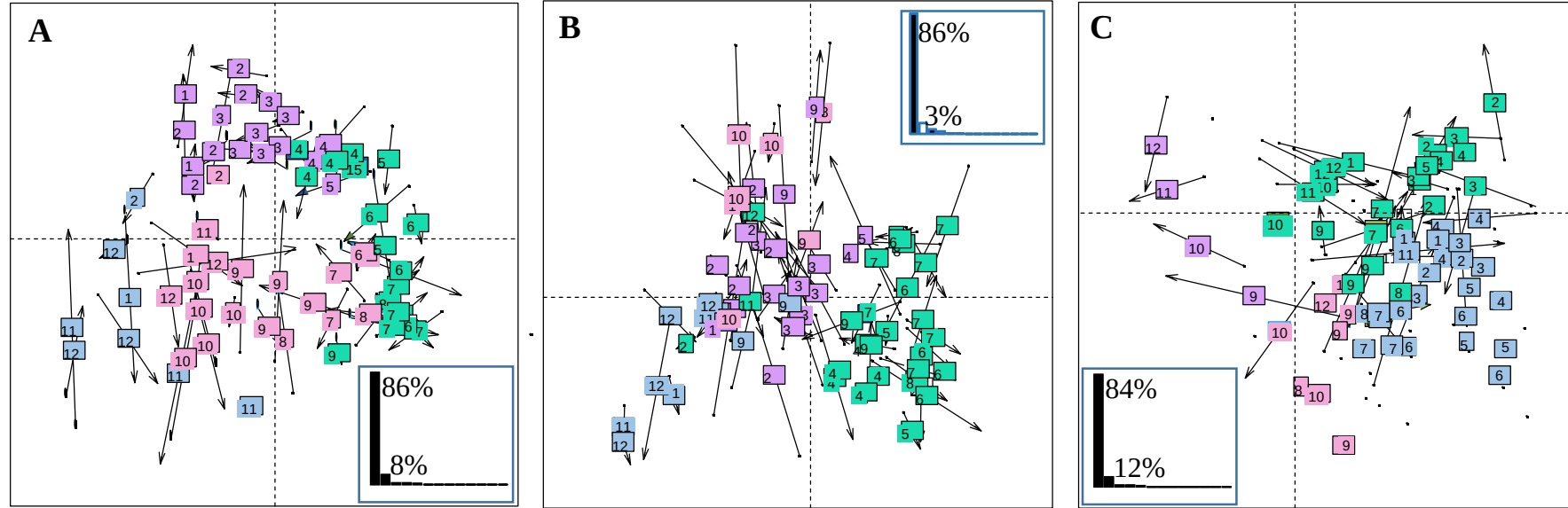


Fig. S8. Projection of the observations (samples) from the co-inertia analysis performed on the environmental variables and the species richness, functional structure, ecological specialization and functional diversity of the diatom ($N=63$, $RV=0.49$, $p=10^{-3}$; A: COIA1 vs COIA2 and B: COIA1 vs COIA3) and copepod ($N=63$, $RV=0.36$, $p=10^{-3}$; C: COIA1 vs COIA2) community in coastal waters of the eastern English Channel over the period 2007-2013. A Hierarchical Agglomerative Clustering (HAC, Ward's linkage) based on the first two components of the co-inertia analysis was performed to identify groups of observations.

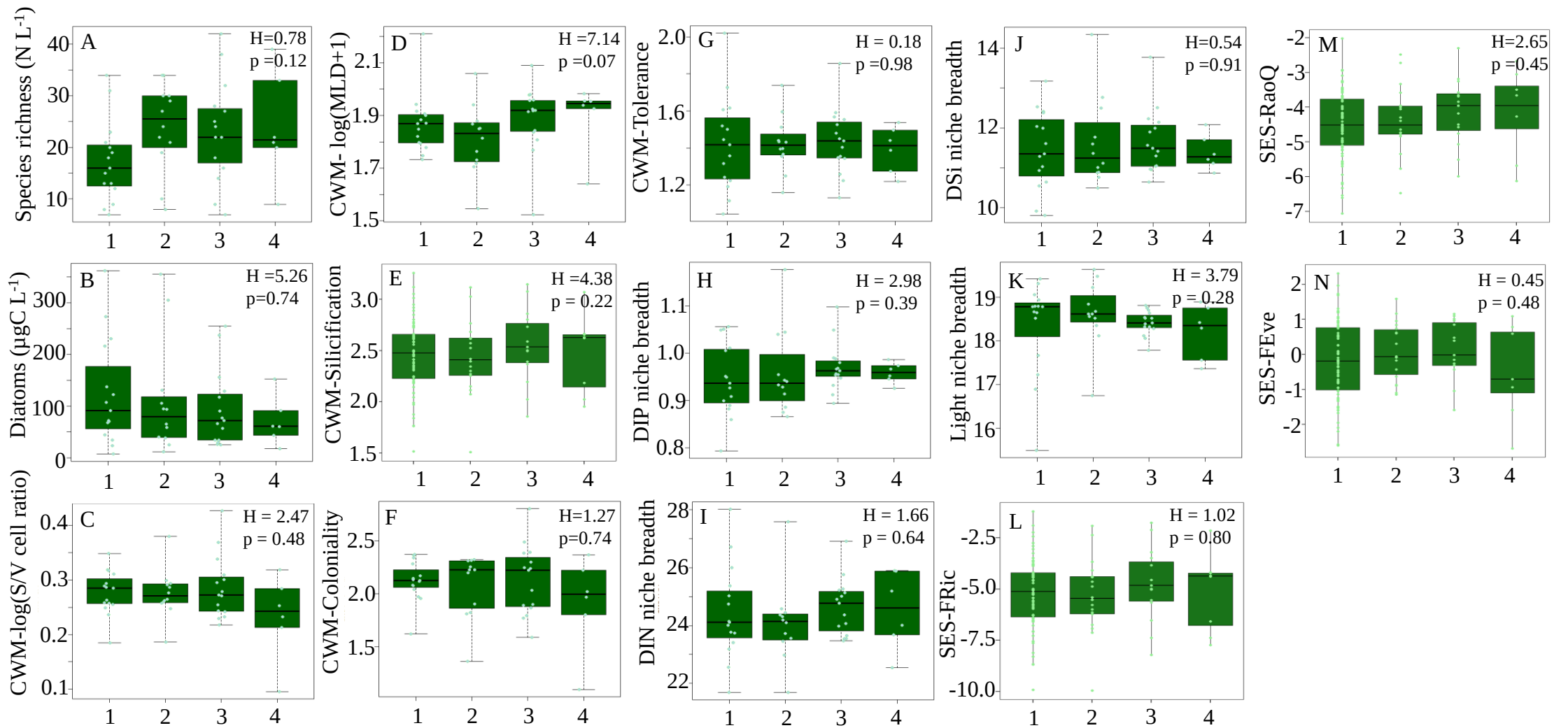


Fig. S9. Comparison (using Kruskal-Wallis test; H=H-value and p=p-value) of (A) diatom species richness, (B) diatom biomass ($\mu\text{gC L}^{-1}$), the Community-Weighted Means (CWM) of the (C) Surface to bioVolume ratio ($\log(\text{S/V cell ratio})$), (D) Maximum Linear Dimension ($\log(\text{MLD})$), (E) apparent degree of silification, (F) coloniality, (G) environmental tolerance, and (D-J) Dissolved Inorganic Phosphorus (DIP), Nitrogen (DIN, and Silica (DSi) and (K) Light niche breadths, and functional (L) richness (SES-FRic), (M) divergence (SES-RaoQ), and (N) evenness (SES-Feve) for different values of *Phaeocystis* biomass (1: <100; 2: [100,500]; 3: [500, 1000]; 4: >1000 $\mu\text{gC L}^{-1}$) in coastal waters of the eastern English Channel over the period 1996-2019. Black horizontal line inside box: median; box: first to third quartiles; whiskers: 1.5 times the interquartile range (IQR); dots: monthly data including outliers (>1.5 times IQR).

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