

Supplementary Materials

Table S1. List of phytoplankton, microzooplankton, and zooplankton groups analyzed and their estimated body mass. Most specimens were identified to the species or genus level and, when the morphological identification was not possible, unidentified specimens were pooled together in groups defined by their life history stage (e.g., Copepod nauplii, Total medusae), or size class (e.g., Small pennate diatoms) estimated from station L4 observations, if available. Body mass estimates are seasonal averages based on measurements taken on individuals from L4 samples, as detailed by Widdicombe et al. (2010) for phytoplankton and microzooplankton and Plymouth Marine Laboratory-derived data for mesozooplankton (Atkinson et al. 2019).

Phytoplankton		Microzooplankton		Mesozooplankton	
Taxon	Body mass (pgC cell ⁻¹)	Taxon	Body mass (pgC cell ⁻¹)	Taxon	Body mass (µgC ind ⁻¹)
<i>Odontella</i>					
<i>mobiliensis</i>	3570	<i>Diplopsalis</i>	3404	Total medusae	11.01
<i>Cerataulina</i>		Colourless		Total	
<i>pelagica</i>	519	<i>Gymnodinium</i>	217	Siphonophore	4.68
		Colourless			
		<i>Gymnodinium</i>		Polychaete larvae	
<i>Chaetoceros</i>	6	(small)	74	unidentified	11.17
<i>Chaetoceros affinis</i>	25	<i>Gyrodinium</i> (small)	317	Total Chaetognath	21.61
				<i>Bryozoa</i>	
		<i>Gyrodinium</i>		<i>cyphonautes</i>	
<i>Chaetoceros danicus</i>	195	(medium)	1436	larvae	0.97
<i>Chaetoceros debilis</i>	81	<i>Gyrodinium</i> (large)	2175	Gastropod larvae	0.46
<i>Chaetoceros</i>				<i>Limacina</i>	
<i>decepiens</i>	125	<i>Gyrodinium spirale</i>	15738	<i>retroversa</i>	0.46
<i>Chaetoceros densus</i>	274	<i>Katodinium glaucum</i>	213	Bivalvia	0.45
<i>Chaetoceros</i>				Total	
<i>didymus</i>	58	<i>Katodinium</i>	35	Echinodermata	0.16
<i>Chaetoceros simplex</i>	9	<i>Nematodinium</i>	2128	Appendicularia	4.28
		<i>Pronoctiluca</i>			
<i>Chaetoceros socialis</i>	12	<i>pelagica</i>	464	Total Fish Eggs	68.25
<i>Corethron pennatum</i>	903	<i>Protopteridinium</i>	4782	Fish larvae	339.29
<i>Dactyliosolen</i>		<i>Protopteridinium</i>			
<i>fragilissimus</i>	342	<i>bipes</i>	1214	Cirripede nauplii	1.98
		<i>Protopteridinium</i>			
<i>Delphineis</i>	44	<i>brevipes</i>	438	Cirripede cyprid	2.14

		<i>Protooperidinium</i>			
<i>Detonula pumila</i>	498	<i>curtipes</i>	9062	<i>Evadne</i> spp.	3.43
		<i>Protooperidinium</i>			
<i>Diploneis crabro</i>	157	<i>depressum</i>	51793	<i>Podon</i> spp.	2.36
		<i>Protooperidinium</i>			
<i>Ditylum brightwellii</i>	1138	<i>steinii</i>	2495	Isopoda	195.75
		Unidentified			
<i>Eucampia zodiacus</i>	272	<i>Peridinales</i> (small)	51	Gammariida	195.75
				Euphausiid	
<i>Guinardia delicatula</i>	342	<i>Torodinium teredo</i>	2321	<i>calyptopis</i>	31.3
				<i>Euphausiid</i>	
<i>Guinardia flaccida</i>	7850	<i>Torodinium</i>	426	<i>furcilia</i>	134
<i>Lauderia annulata</i>	669	<i>Warnowia</i>	317	Total Decapoda	30.72
<i>Leptocylindrus</i>					
<i>danicus</i>	21	<i>Strombidium</i> (small)	74	<i>Metridia lucens</i>	12.74
<i>Leptocylindrus</i>		<i>Strombidium</i>		Total <i>Acartia</i>	
<i>mediterraneus</i>	11	(medium)	353	<i>clausi</i>	2.06
<i>Leptocylindrus</i>					
<i>minimus</i>	3	<i>Strombidium</i> (large)	1526	<i>Candacia armata</i>	20.91
				Total <i>Temora</i>	
<i>Navicula</i>	11	<i>Strobilidium</i>	1020	<i>longicornis</i>	4.99
				Total <i>Calanus</i>	
<i>Navicula distans</i>	145	<i>Mesodinium</i> (small)	242	<i>helgolandicus</i>	33.75
				Total	
				<i>Clausocalanus</i>	
Small Pennate	30	<i>Mesodinium rubrum</i>	1704	spp.	1.69
				Total	
				<i>Ctenocalanus</i>	
Pennate 50µm	61	<i>Balanion</i>	95	<i>vanus</i>	1.58
				Total <i>Paracalanus</i>	
V. small Pennate	7	<i>Laboea strobila</i>	2502	<i>parvus</i>	1.82
				Total	
				<i>Pseudocalanus</i>	
<i>Nitzschia sigmoidea</i>	22	<i>Lohmanniella</i>	1591	<i>elongatus</i>	2.33
<i>Ceratoneis</i>					
<i>clsoterium</i>	17	<i>Prorodontida</i>	376	<i>Subeucalanus</i> spp.	54.21
<i>Psammodictyon</i>	157	<i>Rhabdoaskenasia</i>	88	<i>Oithona</i> spp.	0.41

panduriforme

Pseudo-nitzschia

delicatissima 7 *Tontonia* 1135 *Oncaea* spp. 0.98

Ditrichocorycaeus

Pseudo-nitzschia 44 *Uronema* 113 *anglicus* 3.66

Euterpina

Paralia sulcata 197 *Salpingella* 536 *acutifrons* 3.56

Goniopsyllus

Pleurosigma 519 *Tintinnopsis* 464 *clausi* 3.56

Pleurosigma

planctonicum 2802 Ciliate 432 Copepod nauplii 0.72

Podosira stelligera 2318 *Choanoflagellatea* 9

Proboscia alata

5µm 329

Rhizosolenia

setigera 5µm 165

Rhizosolenia

imbricata 10µm 1012

Rhizosolenia

imbricata 5µm 329

Rhizosolenia

imbricata 15µm 1747

Guinardia striata 135

Rhizosolenia

styliformis 6014

Roperia tessellata 608

Skeletonema marinoi 6

Meuniera

membranacea 660

Thalassionema

nitzschoides 19

Thalassiosira

punctigera 1631

Thalassiosira rotula 519

<i>Thalassiosira</i> 4µm	2
<i>Thalassiosira</i> 10µm	37
<i>Thalassiosira</i> 20µm	197
<i>Thalassiosira</i> 30µm	530
<i>Neoceratium fusus</i>	1231
<i>Neoceratium</i>	
<i>horridum</i>	5582
<i>Neoceratium</i>	
<i>lineatum</i>	1404
<i>Neoceratium tripos</i>	12502
<i>Dinophysis</i>	
<i>acuminata</i>	2321
<i>Karenia mikimotoi</i>	544
<i>Gymnodinium</i>	74
<i>Mesoporos</i>	
<i>perforatus</i>	712
<i>Micranthodinium</i>	148
<i>Prorocentrum</i>	
<i>micans</i>	1436
<i>Prorocentrum</i>	
<i>cordatum</i>	22
<i>Scrippsiella</i>	
<i>trochoidea</i>	389
<i>Emiliana huxleyi</i>	11
Flagellate 2µm	1
Flagellates 5µm	11
Flagellates 15µm	74
<i>Cryptomonadaceae</i>	11
<i>Dictyocha speculum</i>	134
<i>Eutreptiella</i>	208
<i>Phaeocystis</i>	18

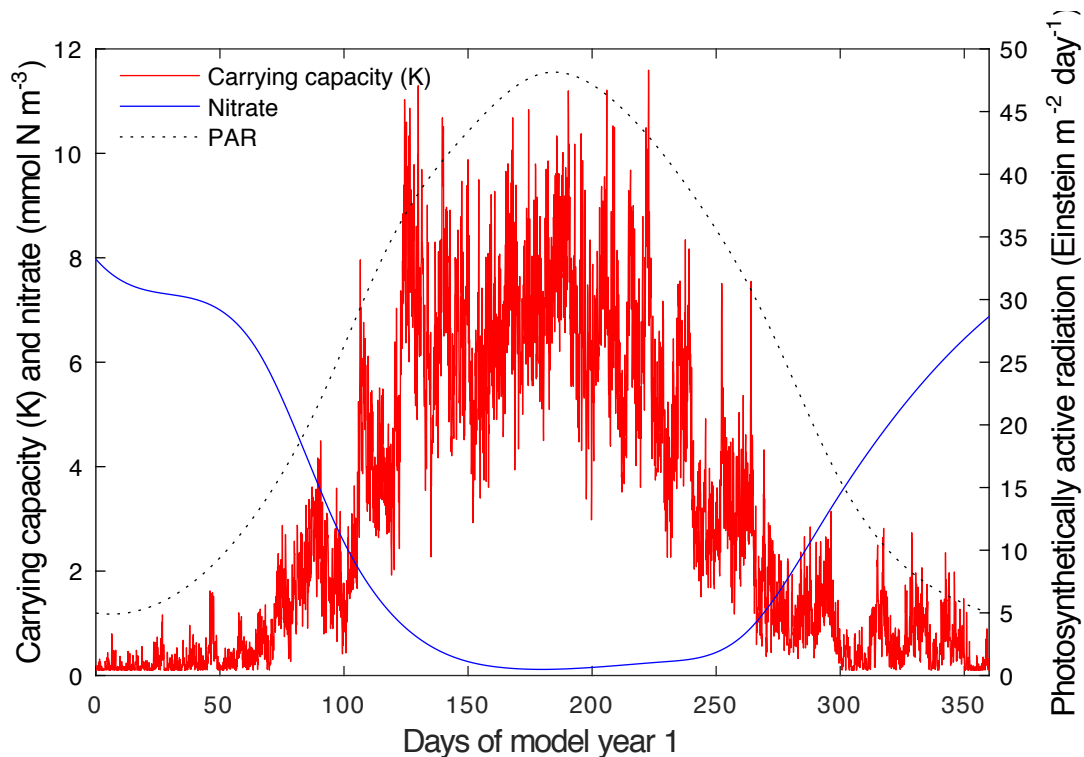


Figure S1. Climatological seasonal cycle of nitrate (blue line) and photosynthetically active radiation (PAR; dotted black line), with the carrying capacity (K) for model year one superimposed (red line). The overall seasonal timing of the carrying capacity time series is set by PAR, while the magnitude of K and added noise is set by nitrate. The model carrying capacity in subsequent years is not exactly the same.

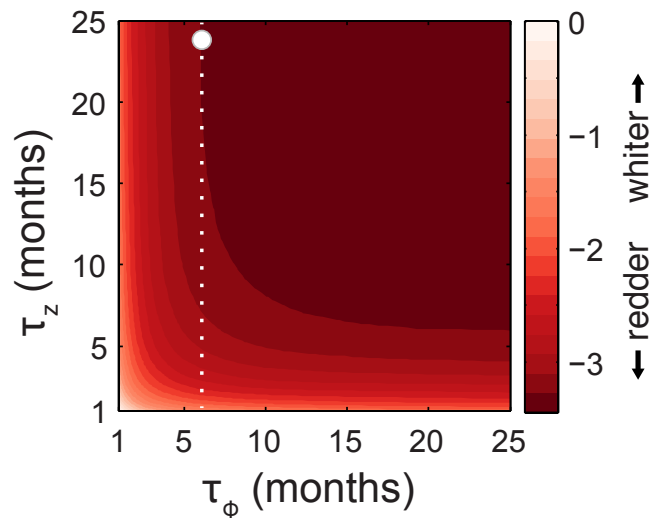


Figure S2. Power spectral slopes calculated after integrating equations 4 and 5 in the main text for equivalent white noise atmospheric forcing but a range of decorrelation timescales τ_ϕ for ocean surface variability and a range of generation lengths τ_z , from 1 to 25 months. The vertical dashed white line is positioned at $\tau_\phi = 6$ months, and shows that the power spectra slope decreases for longer τ_z . The white circle indicates the range of timescales used by Di Lorenzo and Ohman (2013), $\tau_\phi = 6$ months and $\tau_z = 24$ months. “redder” and “whiter” on the color bar refer to the color of environmental noise.

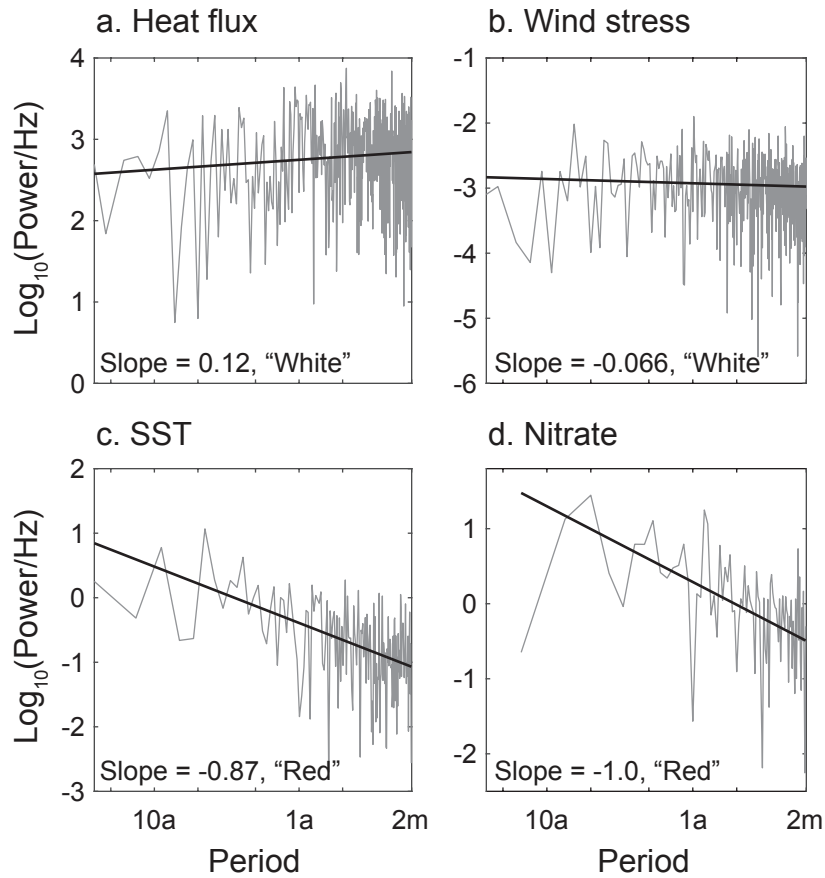


Figure S3. Power spectral slopes for net heat fluxes (a), wind stress (b), sea surface temperature (SST, c), and sea surface nitrate (d). “Red” and “White” refer to the color of environmental noise.