

Supplementary Material

1 SUPPLEMENTARY DATA

2 SUPPLEMENTARY TABLES AND FIGURES

2.1 Figures

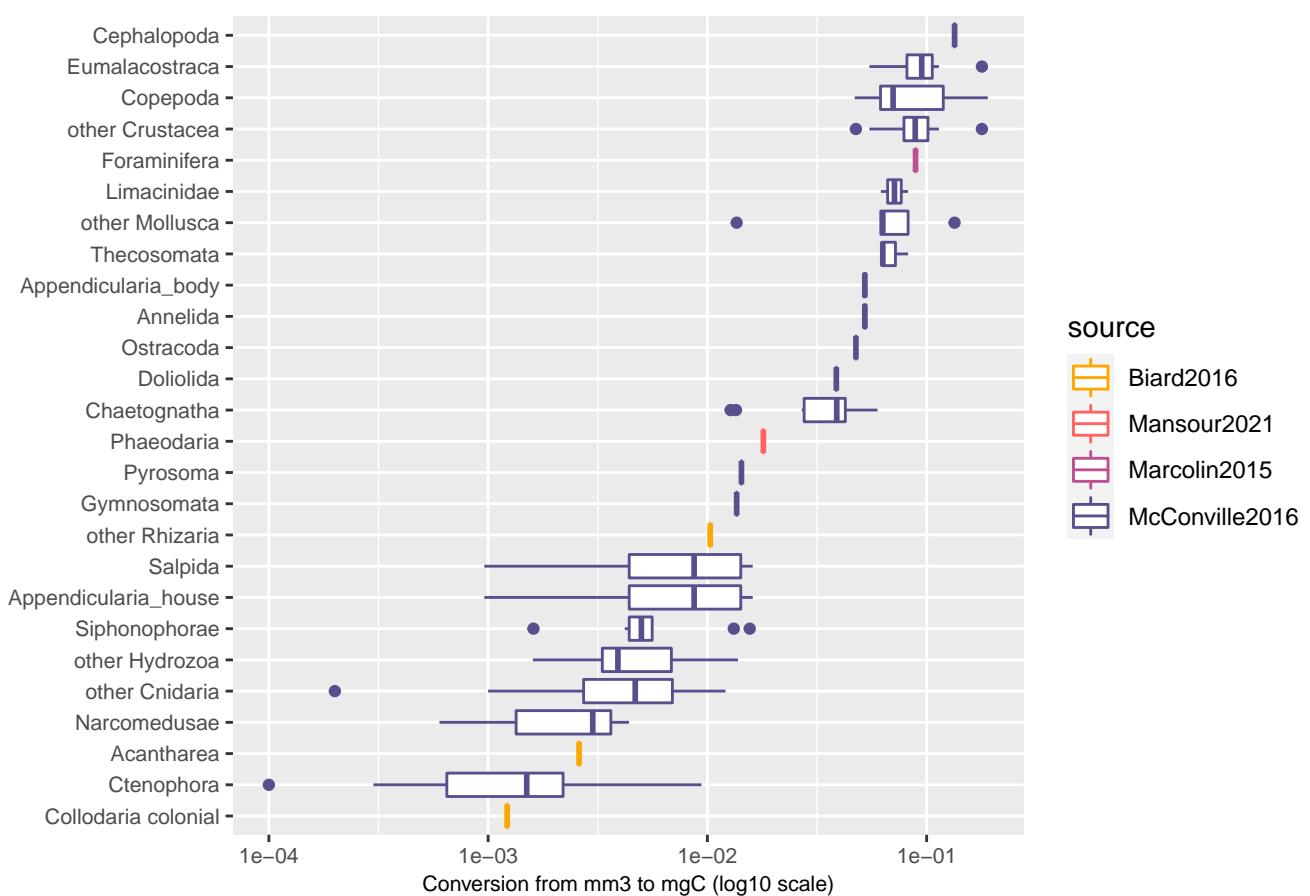


Figure S1: Distribution of the conversion factors from biovolume (mm^3) to biomass mgC in logarithmic scale) for the studied taxa according to their source in the literature. For Rhizaria, biovolume (mm^3) to carbon (mgC) conversions were done using factors from Biard et al., 2016, Mansour et al., 2021 and Marcolin et al., 2015. For other groups, the conversion from individual volume to individual wet weight assumed a density of $1gcm^3$ (Kiørboe, 2013). Then the conversion from individual wet weight to individual biomass in carbon units (mgC) was calculated using taxon-specific linear conversion factors from McConville et al. (2016); when several factors were available for a taxon, their median was used for each group). For solitary collodarians, the estimation of carbon ($0.189\ mgCmm^3$) by Mansour et al., 2021 applied as explained in the subsection 2.1.3

Supplementary figure 2

0–200m

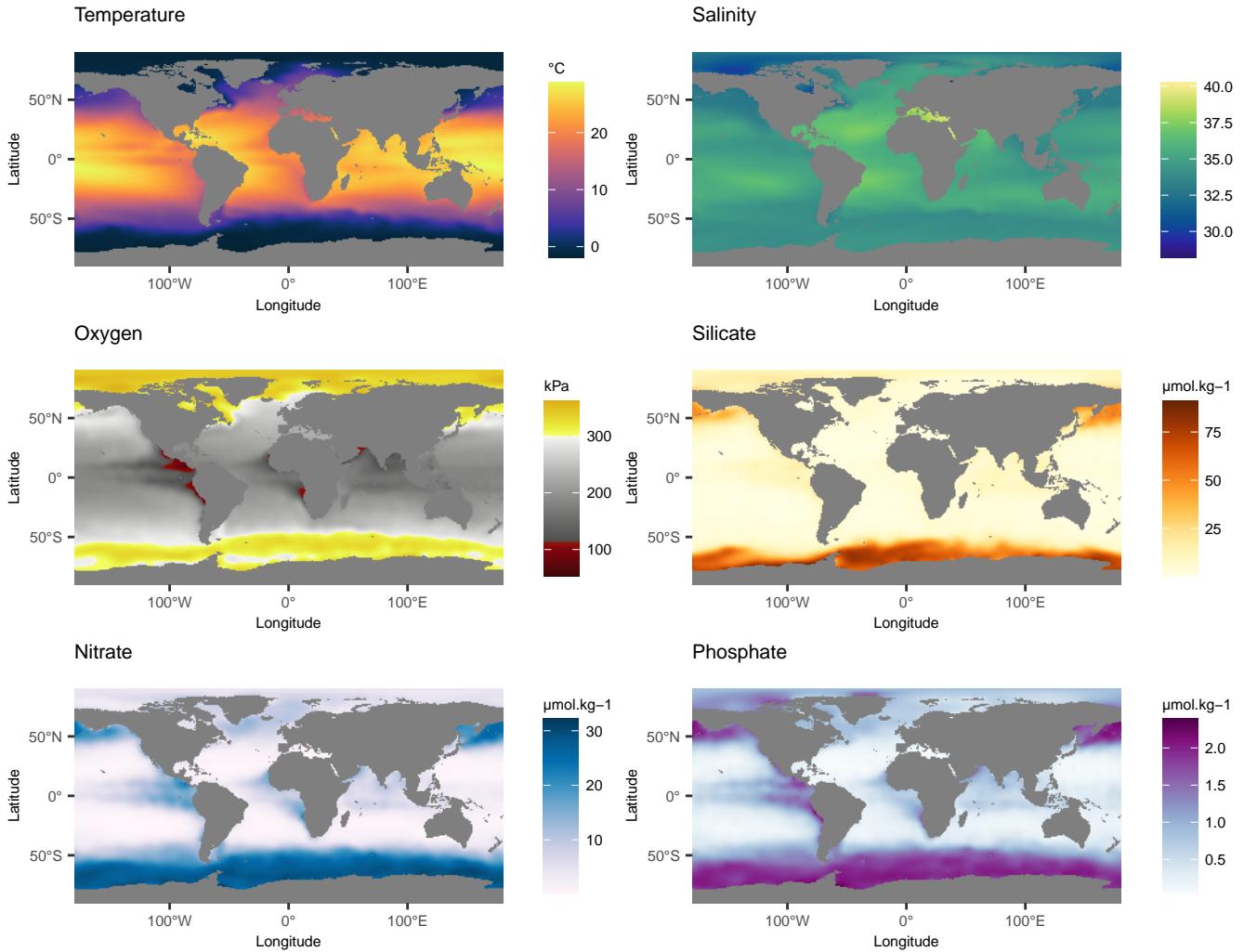


Figure S2: Distribution maps of the environmental variables used in the model in the layer 0-200 m

Supplementary figure 3

200–500m

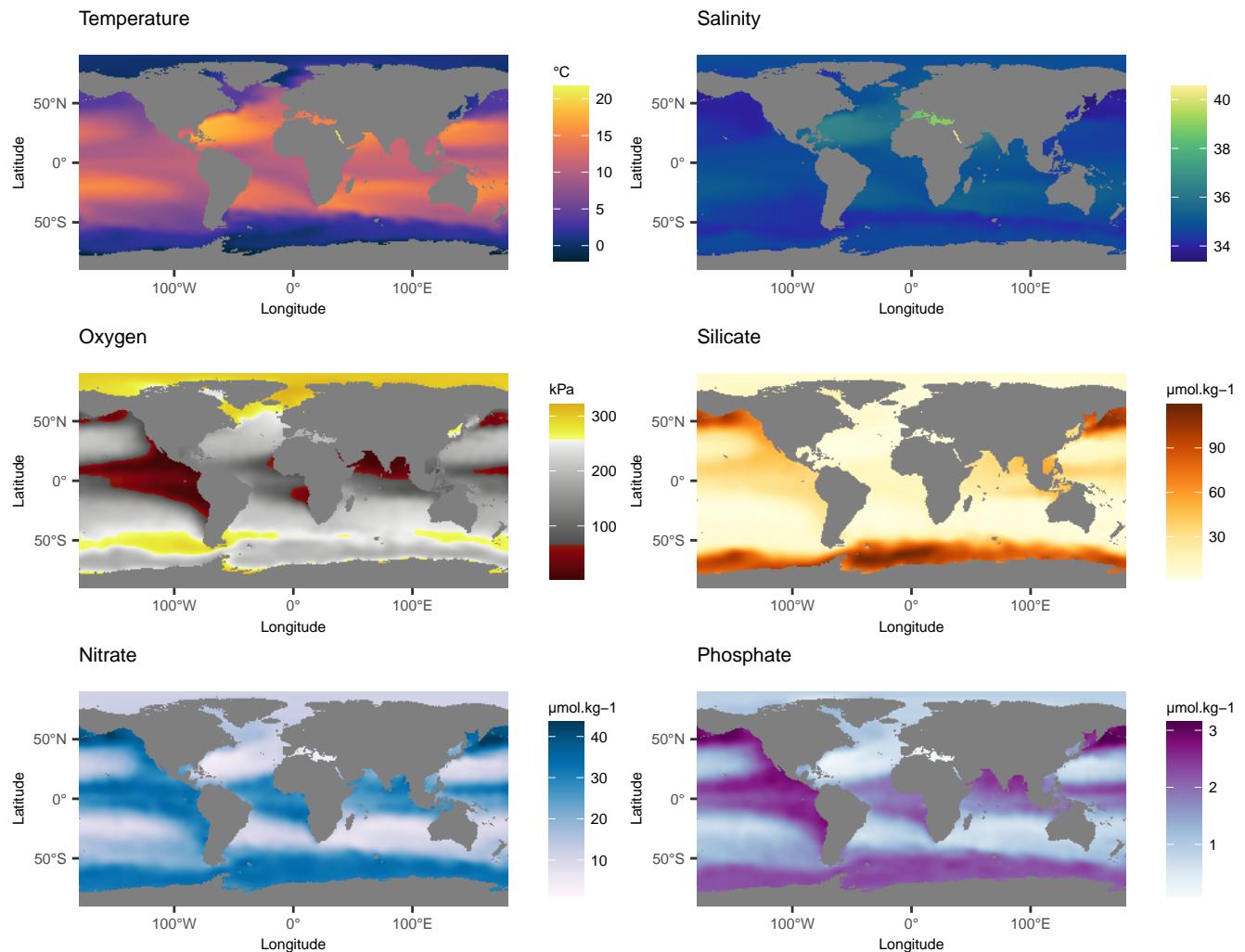


Figure S3: Distribution maps of the environmental variables used in the model in the layer 200-500 m

Supplementary figure 4

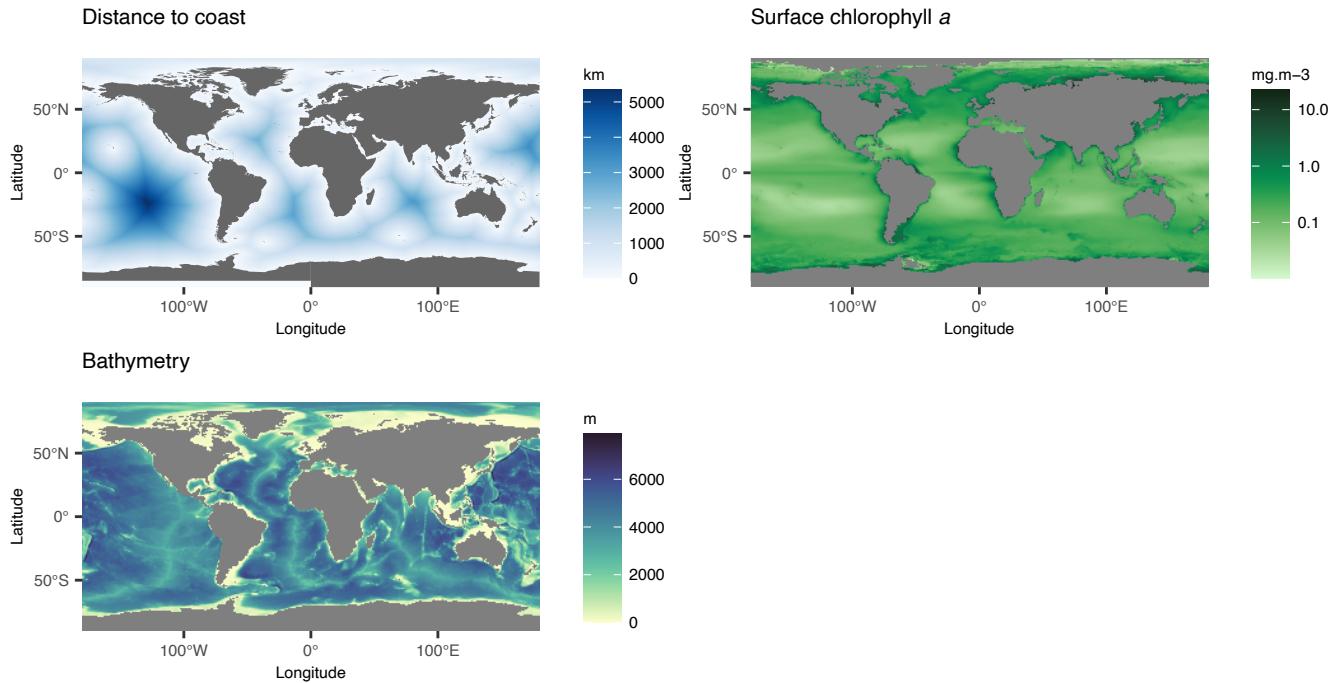


Figure S4: Distribution maps of the environmental variables used in all models

Supplementary figure 5

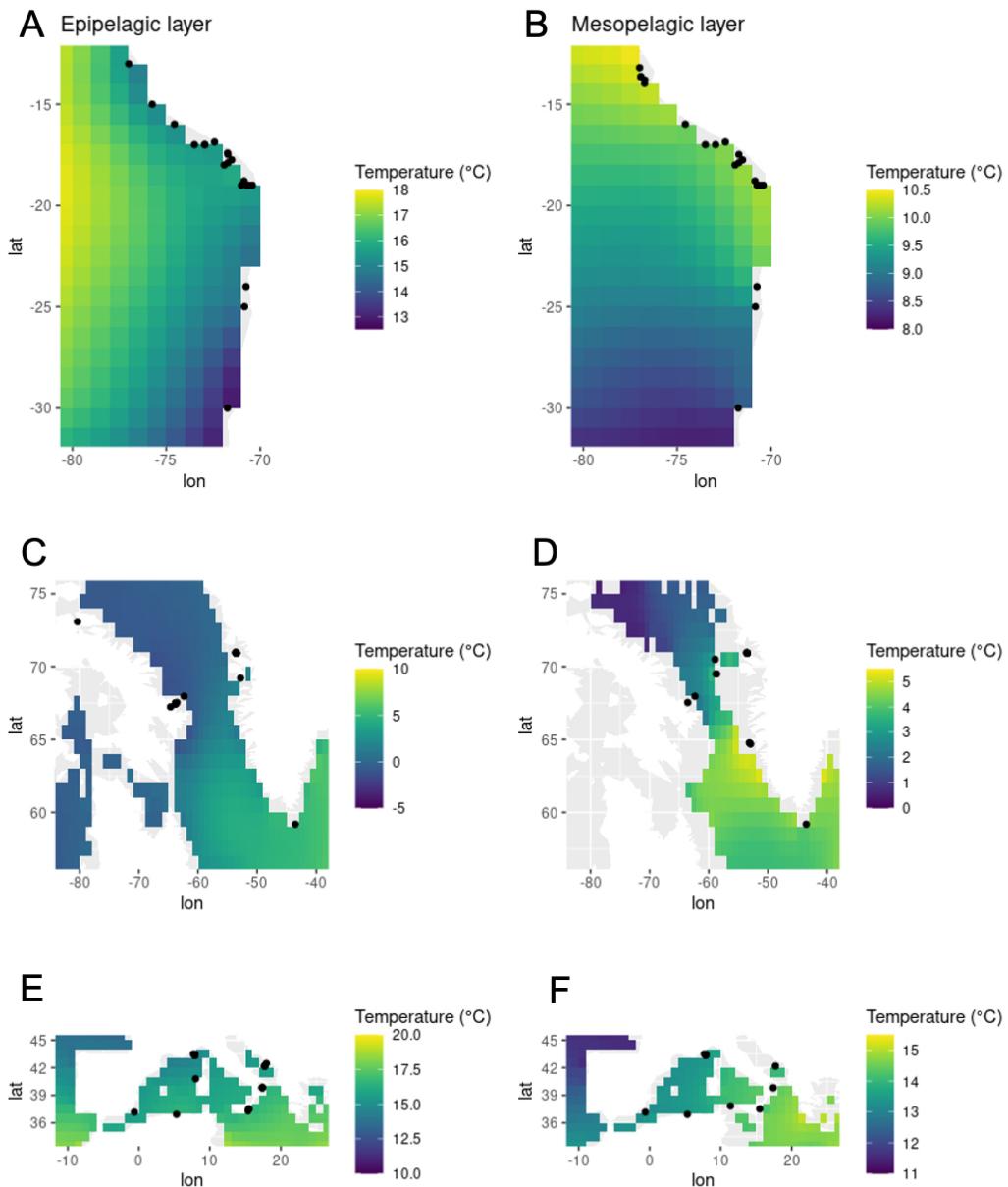


Figure S5: Distribution of UVP5 sampling points (symbolized by black dots) for which a match was found in the neighboring cell in the regions of the western coast of South America (A,B), in the Baffin Bay and Labrador Sea (C,D) and in the Mediterranean Sea (E,F). The colored cells represent the temperature (in C) from the WOA dataset. In the epipelagic layer, 142 points have a neighboring match out of which 130 points (91%) are represented here (The map A contains 20 points, C contains 51 points and E contains 59 points). In the mesopelagic layer, 104 points have a neighboring match out of which 81 points (78%) are represented here (The map B contains 22 points, D contains 24 points and F contains 35 points).

Supplementary figure 6

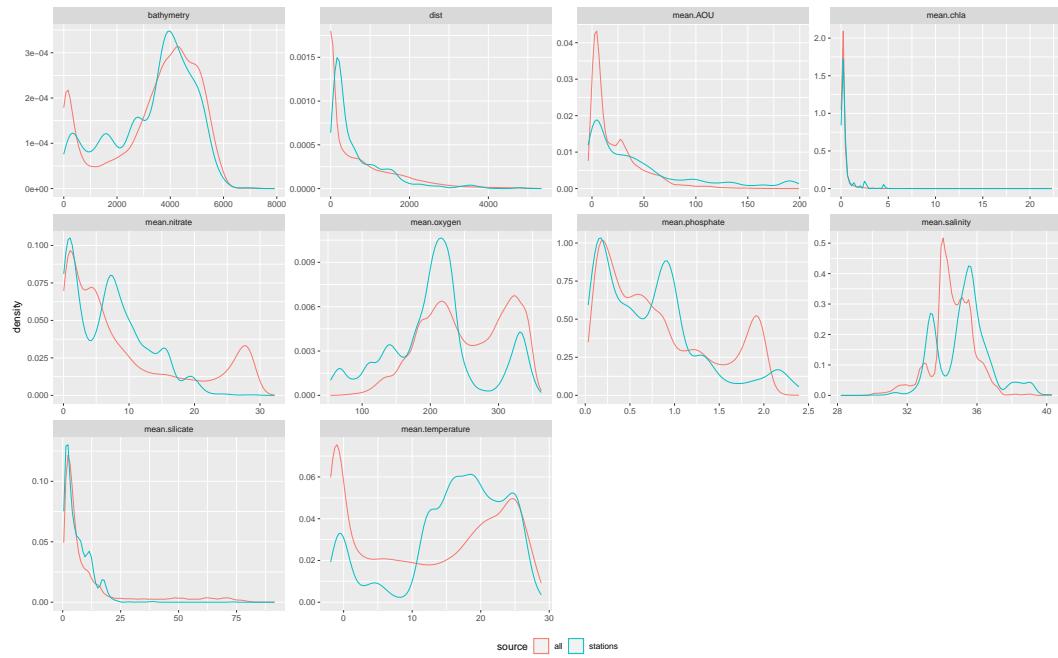


Figure S6: Distribution of sampling of environmental variables by UVP5 in red compared to global data from World Ocean Atlas in blue in the layer 0-200 m.

Supplementary figure 7

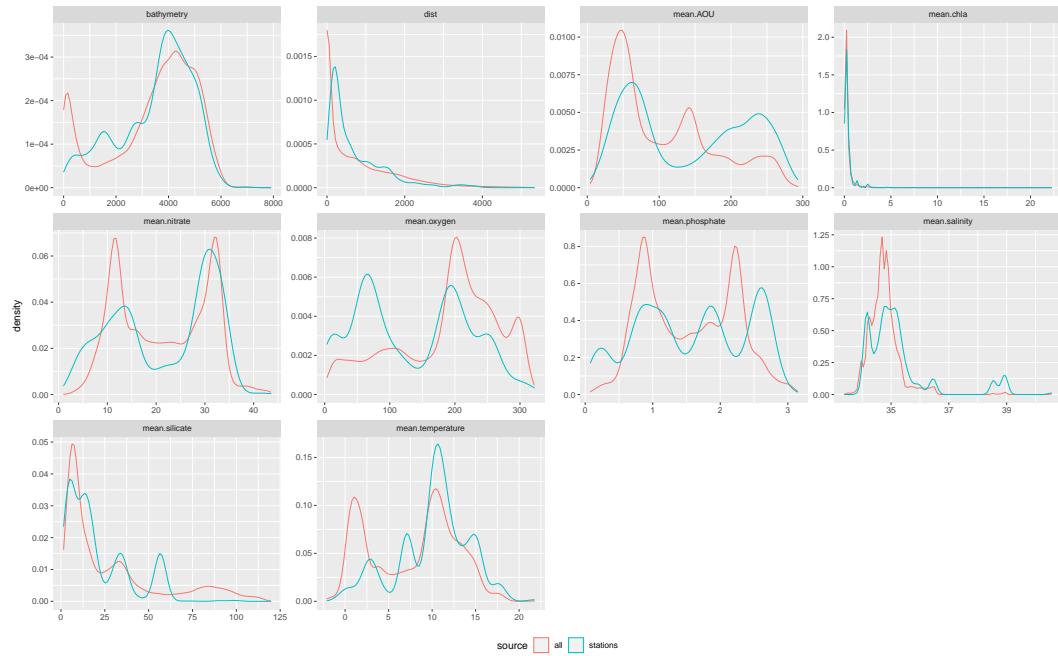


Figure S7: Distribution of sampling of environmental variables by UVP5 in red compared to global data from World Ocean Atlas in blue in the layer 200-500 m.

Supplementary Figure 8

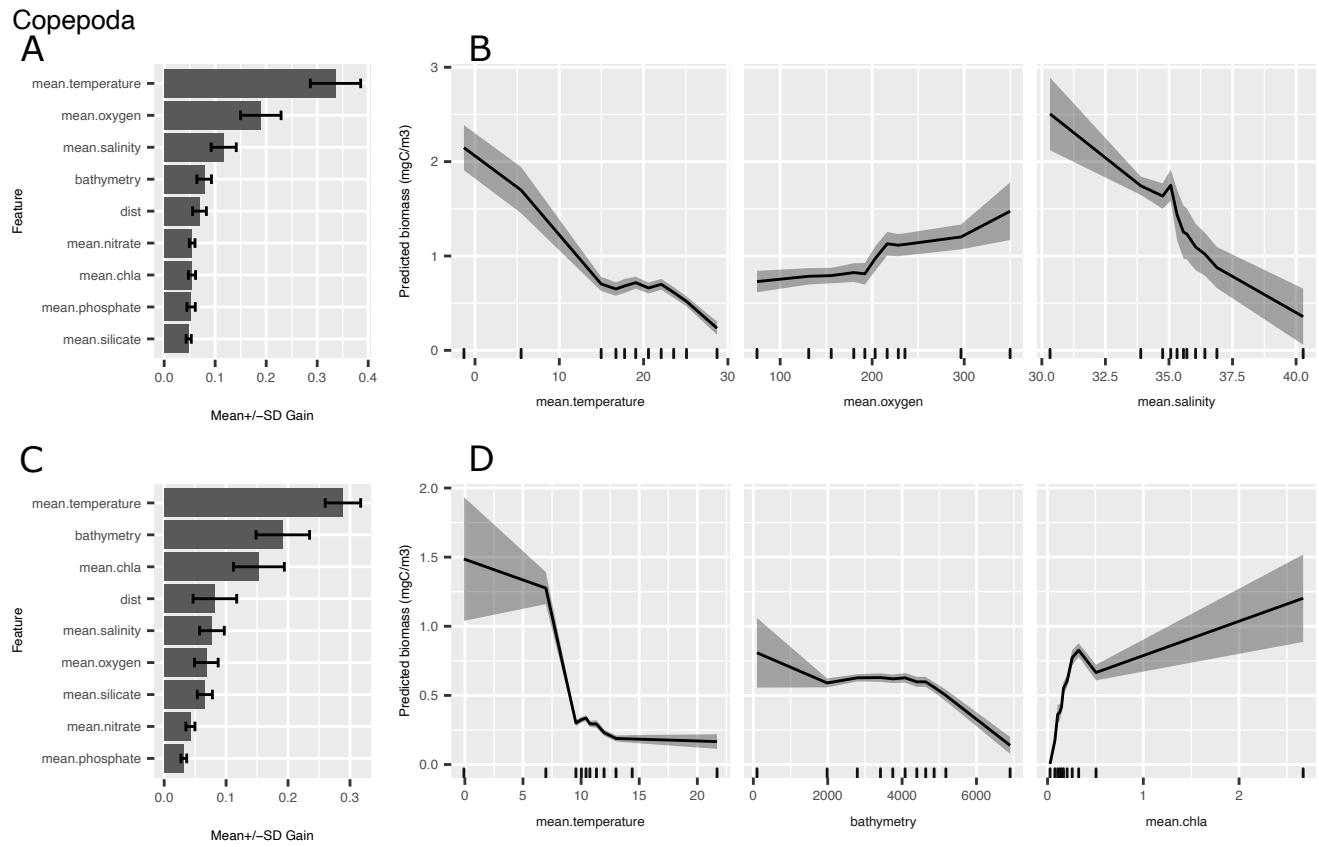


Figure S8: Distribution of the order of importance of variables in the model for Copepoda between 0-200 m (A) and 200-500 m (C). Partial dependence plots of the 3 most important variables in the model for 0-200 m (B) and 200-500 m (D). The ticks on the x axis inform on the probability of the predicted data. There is 10% of the prediction between 2 ticks.

Supplementary Figure 9

Eumalacostraca

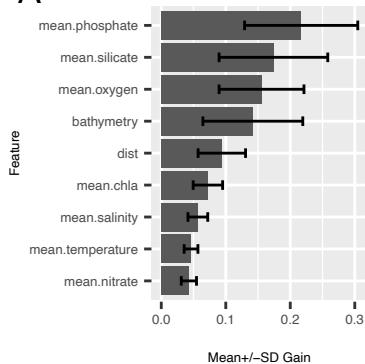
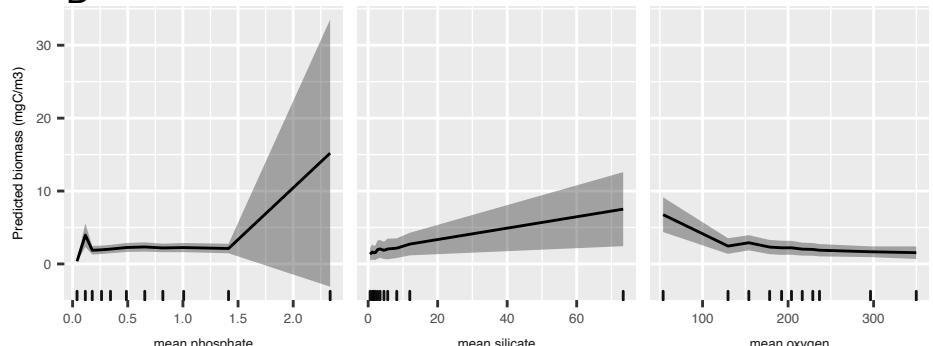
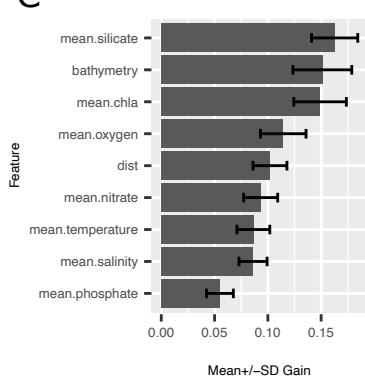
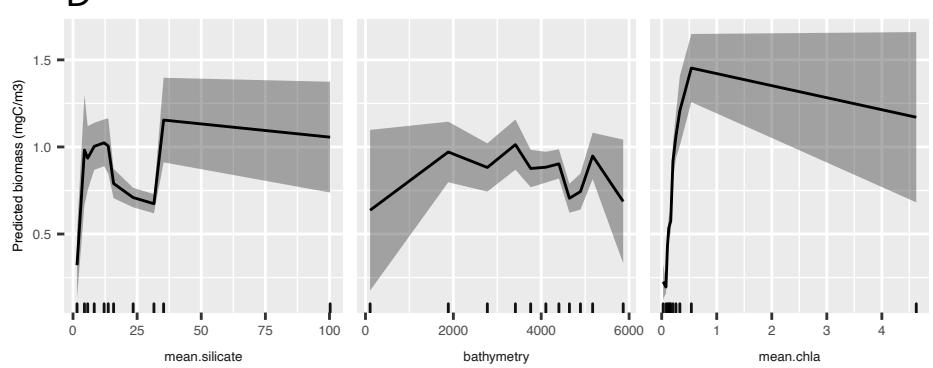
A**B****C****D**

Figure S9: Distribution of the order of importance of variables in the model for Eumalacostraca between 0-200 m (A) and 200-500 m (C). Partial dependence plots of the 3 most important variables in the model for 0-200 m (B) and 200-500 m (D). The ticks on the x axis inform on the probability of the predicted data. There is 10% of the prediction between 2 ticks. For this group the model for the 200-500 m layer does not yield a significant correlation between model and data and results are therefore not shown.

Supplementary Figure 10

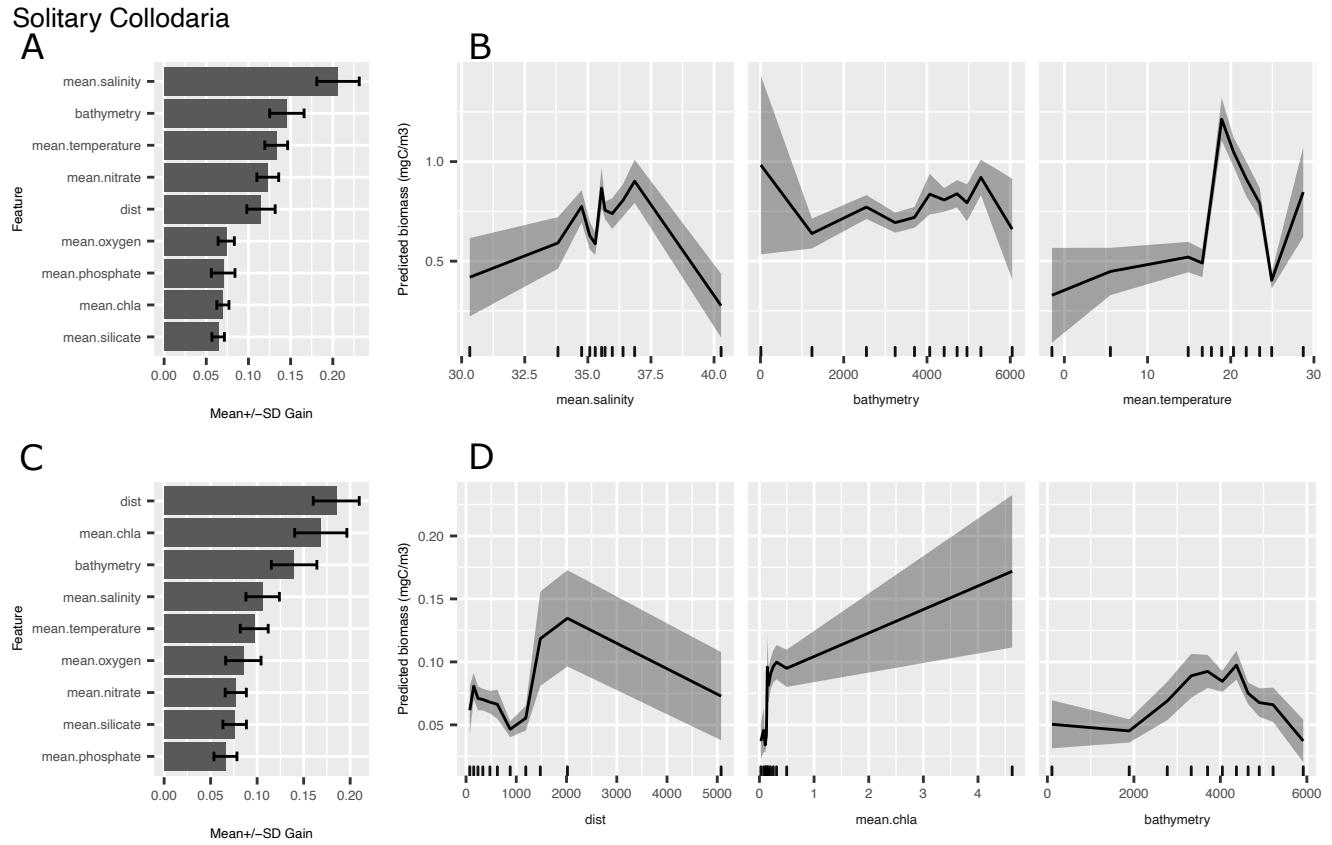


Figure S10: Distribution of the order of importance of variables in the model for solitary Collodaria between 0-200 m (A) and 200-500 m (C). Partial dependence plots of the 3 most important variables in the model for 0-200 m (B) and 200-500 m (D). The ticks on the x axis inform on the probability of the predicted data. There is 10% of the prediction between 2 ticks. For this group the model for the 200-500 m layer does not yield a significant correlation between model and data and results are therefore not shown.

Supplementary Figure 11

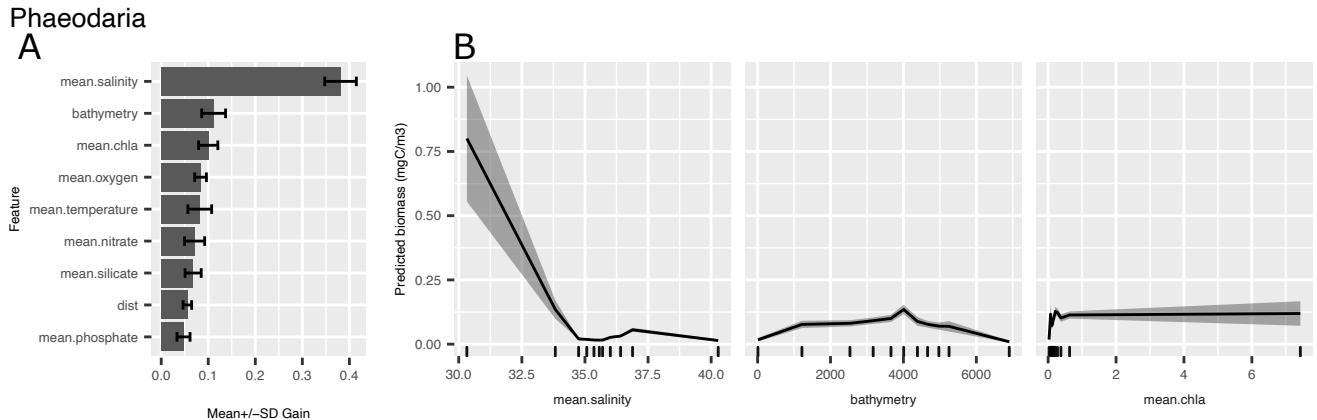


Figure S11: Distribution of the order of importance of variables in the model for Phaeodaria between 0-200 m (A). Partial dependence plots of the 3 most important variables in the model for 0-200 m (B). The ticks on the x axis inform on the probability of the predicted data. There is 10% of the prediction between 2 ticks.

Supplementary Figure 12

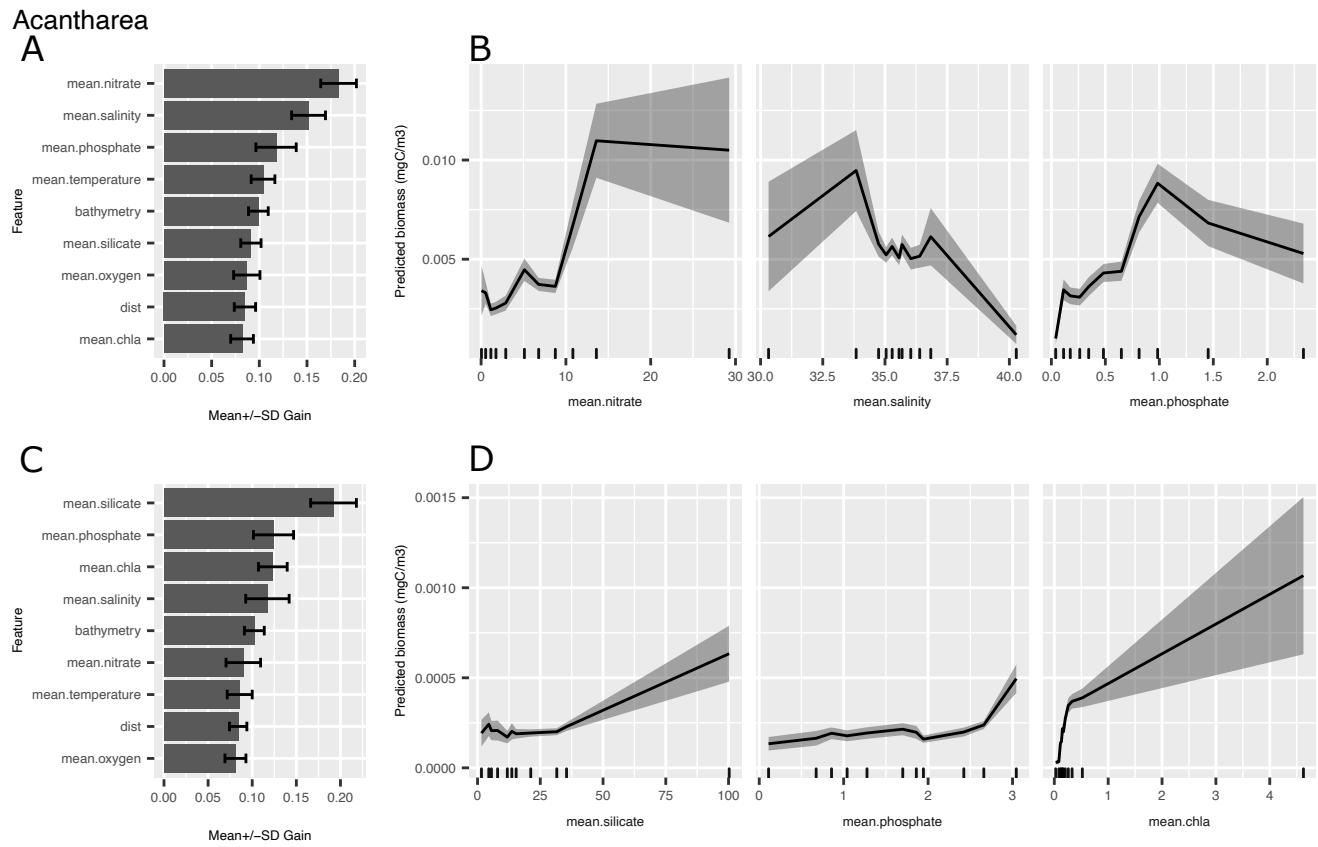


Figure S12: Distribution of the order of importance of variables in the model for Acantharea between 0-200 m (A) and 200-500 m (C). Partial dependence plots of the 3 most important variables in the model for 0-200 m (B) and 200-500 m (D). The ticks on the x axis inform on the probability of the predicted data. There is 10% of the prediction between 2 ticks.

2.2 Tables

Supplementary Table 1

Table S1. List of groups used for the analysis

Groups	Organisms classified as such
Acantharea	Acantharea
Annelida	Annelida
Appendicularia	Body or house of Appendicularia
Cephalopoda	Cephalopoda
Chaetognatha	Chaetognatha
other Cnidaria	Cnidaria with the exception of Hydrozoa
Colonial collodaria	Colonial collodaria
Copepoda	Copepoda or Copepoda-like
other Crustacea	Crustacea with the exception of Copepoda, Ostracoda and Eumalacostraca
Ctenophora	Ctenophora
Doliolida	Doliolida
Eumalacostraca	Eumalacostraca
Foraminifera	Foraminifera
Gymnosomata	Gymnosomata
other Hydrozoa	Hydrozoa with the exception of Narcomedusae and Siphonophorae
Limacinidae	Limacinidae
other Mollusca	Mollusca with the exception of Gymnosomata, Limacinidae, Cavolina and Creseis
Narcomedusae	Narcomedusae
Ostracoda	Ostracoda
Phaeodaria	Phaeodaria
Pyrosoma	Pyrosoma
other Rhizaria	Rhizaria with the exception of Acantharea, Collodaria, Foraminifera and Phaeodaria
Salpida	Salpida
Siphonophorae	Siphonophorae
Solitary Collodaria	Collodaria classified as Collodaria, solitary collodarians with dark central capsule, solitary collodarians with a fuzzy central capsule, solitary collodarians with a grey central capsule, solitary collodarians with a globule-like appearance
Thecosomata	Cavolina or Creseis

Supplementary Table 2

Table S2: Conversion factors used to convert from biovolume (mm^3) to biomass (mgC). The numbers in the column Source correspond to: 1) McConville et al., 2016; 2) Biard et al., 2016; 3) Mansour et al., 2021; 4) Marcolin et al., 2015

Taxon	Group	Species	Factor	Source
Annelida	Polychaeta	<i>Tomopteris carpenteri</i>	0.0534	1
Annelida	Polychaeta	<i>Vanadis antarctica</i>	0.051101	1
Cephalopoda	Cephalopoda	<i>Psychroteuthis</i> sp,	0.1341	1
Chaetognatha	Chaetognatha	<i>Aidanosagitta neglecta</i>	0.027857	1
Chaetognatha	Chaetognatha	<i>Caecosagitta macrocephala</i>	0.059717	1
Chaetognatha	Chaetognatha	<i>Eukrohnia bathypelagica</i>	0.029406	1
Chaetognatha	Chaetognatha	<i>Eukrohnia fowleri</i>	0.041904	1
Chaetognatha	Chaetognatha	<i>Eukrohnia hamata</i>	0.02694	1
Chaetognatha	Chaetognatha	<i>Parasagitta elegans</i>	0.0446	1
Chaetognatha	Chaetognatha	<i>Pseudosagitta scrippsae</i>	0.012768	1
Chaetognatha	Chaetognatha	<i>Sagitta elegans</i>	0.0407	1
Chaetognatha	Chaetognatha	<i>Sagitta gazellae</i>	0.0135	1
Chaetognatha	Chaetognatha	<i>Sagitta marri</i>	0.037168	1
Chaetognatha	Chaetognatha	<i>Sagitta nagae</i>	0.0503	1
Chaetognatha	Chaetognatha	<i>Solidosagitta zetesios</i>	0.041922	1
other Cnidaria	Coronatae	<i>Atolla wyvillei</i>	0.0077	1
other Cnidaria	Coronatae	<i>Periphylla periphylla</i>	0.0064	1
other Cnidaria	Leptothecata	<i>Eutonina indicans</i>	0.003382	1
other Cnidaria	Leptothecata	<i>Mitrocoma cellularia</i>	0.001008	1
other Cnidaria	Leptothecata	<i>Phialidium gregarium</i>	0.003666	1
other Cnidaria	Leptothecata	<i>Phialidium lomae</i>	0.002516	1
other Cnidaria	Leptothecata	<i>Phialidium</i> sp,	0.0107	1
other Cnidaria	Rhizostomae	<i>Catostylus mosaicus</i>	0.0117	1
other Cnidaria	Rhizostomae	<i>Cotylorhiza tuberculata</i>	0.005488	1
other Cnidaria	Rhizostomae	<i>Mastigias papua</i>	0.00671	1
other Cnidaria	Rhizostomae	<i>Nemopilema nomurai</i>	0.0055	1
other Cnidaria	Rhizostomae	<i>Rhizostoma octopus</i>	0.003528	1
other Cnidaria	Rhizostomae	<i>Rhizostoma pulmo</i>	0.0098	1
other Cnidaria	Rhizostomae	<i>Rhopilema esculentum</i>	0.0121	1
other Cnidaria	Rhizostomae	<i>Rhopilema hispidum</i>	0.0076	1
other Cnidaria	Semaeostomae	<i>Aurelia aurita</i>	0.001	1
other Cnidaria	Semaeostomae	<i>Chrysaora fuscescens</i>	0.0028	1
other Cnidaria	Semaeostomae	<i>Chrysaora hysoscella</i>	0.0018	1
other Cnidaria	Semaeostomae	<i>Chrysaora quinquecirrha</i>	0.00484	1
other Cnidaria	Semaeostomae	<i>Cyanea capillata</i>	0.00454	1

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Table S2 – *Continued from previous page*

Taxon	Group	Species	Factor	Source
other Cnidaria	Semaeostomae	<i>Pelagia noctiluca</i>	0.0035	1
other Cnidaria	Semaeostomae	<i>Poralia rufescens</i>	2.00E-04	1
other Cnidaria	Scyphomedusae	<i>Chrysaora hysocella</i>	0.0018	1
other Cnidaria	Trachymedusae	<i>Aglantha digitale</i>	0.0052	1
other Cnidaria	Trachymedusae	<i>Botrynema brucei</i>	0.0024	1
other Cnidaria	Trachymedusae	<i>Colobonema sericeum</i>	0.0081	1
other Cnidaria	Trachymedusae	<i>Eperetmus typus</i>	0.00344	1
other Cnidaria	Trachymedusae	<i>Gonionemus vertens</i>	0.006302	1
Copepoda	Calanoida	<i>Calanus acutus</i>	0.0685	1
Copepoda	Calanoida	<i>Calanus cristatus</i>	0.1014	1
Copepoda	Calanoida	<i>Calanus finmarchicus</i> female	0.1473	1
Copepoda	Calanoida	<i>Calanus glacialis</i> female	0.1177	1
Copepoda	Calanoida	<i>Calanus hyperboreus</i>	0.1902	1
Copepoda	Calanoida	<i>Calanus pacificus</i>	0.124	1
Copepoda	Calanoida	<i>Calanus plumchrus</i>	0.1725	1
Copepoda	Calanoida	<i>Calanus propinquus</i>	0.12922	1
Copepoda	Calanoida	<i>Candacia aetiopica</i>	0.0667	1
Copepoda	Calanoida	<i>Candacia columbiae</i>	0.0616	1
Copepoda	Calanoida	<i>Disseta palumbi</i>	0.047	1
Copepoda	Calanoida	<i>Eucalanus bungii</i>	0.0599	1
Copepoda	Calanoida	<i>Euchirella rostromagna</i>	0.07006	1
Copepoda	Calanoida	<i>Gaetanus tenuispinus</i>	0.0556	1
Copepoda	Calanoida	<i>Labidocera acutifrons</i>	0.052	1
Copepoda	Calanoida	<i>Metridia longa</i> female	0.1077	1
Copepoda	Calanoida	<i>Metridia okhotensis</i>	0.1191	1
Copepoda	Calanoida	<i>Paraeuchaeta birostrata</i>	0.108	1
Copepoda	Calanoida	<i>Pleuromamma xiphias</i>	0.058	1
Copepoda	Calanoida	<i>Pontellina plumata</i>	0.0665	1
Copepoda	Calanoida	<i>Rhincalanus nasutus</i>	0.0703	1
other Crustacea	Amphipoda	<i>Cyphocaris challengerii</i>	0.1014	1
other Crustacea	Amphipoda	<i>Parathemisto japonica</i>	0.0887	1
other Crustacea	Amphipoda	<i>Parathemisto libellula</i>	0.0675	1
other Crustacea	Amphipoda	<i>Platyscelus serratus</i>	0.0947	1
other Crustacea	Amphipoda	<i>Primno abyssalis</i> female	0.0716	1
other Crustacea	Amphipoda	<i>Themisto japonica</i> female	0.0811	1
other Crustacea	Decapoda	<i>Chorismus antarcticus</i>	0.1066	1
other Crustacea	Decapoda	<i>Lucifer reynaudii</i>	0.0548	1
other Crustacea	Euphausiacea	<i>Euphausia crystallorophias</i>	0.088	1
other Crustacea	Euphausiacea	<i>Euphausia pacifica</i>	0.0896	1
other Crustacea	Euphausiacea	<i>Euphausia superba</i>	0.1138	1
other Crustacea	Euphausiacea	<i>Tessarabrachion oculatus</i>	0.1007	1

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Table S2 – Continued from previous page

Taxon	Group	Species	Factor	Source
other Crustacea	Euphausiacea	<i>Thysanoessa inermis</i>	0.1787	1
other Crustacea	Mysidacea	<i>Antarctomysis maxima</i>	0.1046	1
other Crustacea	Mysidacea	<i>Meterythrops microphthalmalma male</i>	0.0788	1
other Crustacea	Mysidacea	<i>Siriella aequiremis</i>	0.0792	1
other Crustacea	Ostracoda	<i>Conchoecia antipoda</i>	0.04758	1
Ctenophora	Beroid	<i>Beroe ovata</i>	0.0016	1
Ctenophora	Beroid	<i>Beroe sp,</i>	0.0023	1
Ctenophora	Beroid	<i>Beroe sp,</i>	0.0021	1
Ctenophora	Cydippid	<i>Agmayeria tortugensis</i>	0.0094	1
Ctenophora	Cydippid	<i>Callianira antarctica</i>	0.0036	1
Ctenophora	Cydippid	<i>Mertensia sp,</i>	0.0046256	1
Ctenophora	Cydippid	<i>Pleurobrachia pileus</i>	0.0015	1
Ctenophora	Cydippid	<i>Pleurobrachia sp,</i>	0.0017673	1
Ctenophora	Lobata	<i>Bathocyroe fosteri</i>	1.00E-04	1
Ctenophora	Lobata	<i>Bolinopsis infundibulum</i>	7.00E-04	1
Ctenophora	Lobata	<i>Eurhamphaea vexilligera</i>	3.00E-04	1
Ctenophora	Lobata	<i>Mnemiopsis leidyi</i>	6.00E-04	1
Ctenophora	Lobata	<i>Mnemiopsis mccradyi</i>	8.00E-04	1
Ctenophora	Lobata	<i>Ocyropsis maculata</i>	9.00E-04	1
Ctenophora	Lobata	<i>Ocyropsis spp,</i>	5.00E-04	1
Doliolida	Thaliacea	<i>Doliolum denticulatum</i>	0.038739	1
Eumalacostraca	Decapoda	<i>Chorismus antarcticus</i>	0.1066	1
Eumalacostraca	Decapoda	<i>Lucifer reynaudii</i>	0.0548	1
Eumalacostraca	Euphausiacea	<i>Euphausia crystallorophias</i>	0.088	1
Eumalacostraca	Euphausiacea	<i>Euphausia pacifica</i>	0.0896	1
Eumalacostraca	Euphausiacea	<i>Euphausia superba</i>	0.1138	1
Eumalacostraca	Euphausiacea	<i>Tessarabrachion oculatus</i>	0.1007	1
Eumalacostraca	Euphausiacea	<i>Thysanoessa inermis</i>	0.1787	1
Eumalacostraca	Mysidacea	<i>Antarctomysis maxima</i>	0.1046	1
Eumalacostraca	Mysidacea	<i>Meterythrops microphthalmalma male</i>	0.0788	1
Eumalacostraca	Mysidacea	<i>Siriella aequiremis</i>	0.0792	1
Gymnosomata	Gymnosomata	<i>Clione limacina</i>	0.0136	1
other Hydrozoa	Anthoathecata	<i>Cladonema californicum</i>	0.008112	1
other Hydrozoa	Anthoathecata	<i>Euphsya tentaculata</i>	0.0032	1
other Hydrozoa	Anthoathecata	<i>Rathkea octopunctata</i>	0.0138	1
other Hydrozoa	Anthoathecata	<i>Sarsia princeps</i>	0.0037	1
other Hydrozoa	Anthoathecata	<i>Sarsia princeps</i>	0.0016	1
other Hydrozoa	Anthoathecata	<i>Stomotoca atra</i>	0.004128	1
Limacinidae	Thecosomata	<i>Limacina helicina</i>	0.0823	1
Limacinidae	Thecosomata	<i>Limacina inflata</i>	0.0618	1
other Mollusca	Thecosomata	<i>Clio pyramidata</i>	0.0631	1

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Table S2 – *Continued from previous page*

Taxon	Group	Species	Factor	Source
other Mollusca	Thecosomata	<i>Limacina helicina</i>	0.0823	1
other Mollusca	Thecosomata	<i>Limacina inflata</i>	0.0618	1
other Mollusca	Cephalopoda	<i>Psychroteuthis</i> sp,	0.1341	1
other Mollusca	Gymnosomata	<i>Clione limacina</i>	0.0136	1
Narcomedusae	Narcomedusae	<i>Aeginura grimaldii</i>	0.003	1
Narcomedusae	Narcomedusae	<i>Pegantha</i> sp,	0.00439	1
Narcomedusae	Narcomedusae	<i>Solmissus incisus</i>	6.00E-04	1
Ostracoda	Ostracoda	<i>Conchoecia antipoda</i>	0.04758	1
Pyrosoma	Thaliacea	<i>Pyrosoma atlanticum</i>	0.0143	1
Salpida	Thaliacea	<i>Cyclosalpa affinis</i>	9.60E-04	1
Salpida	Thaliacea	<i>Iasis zonaria</i>	0.0161	1
Salpida	Thaliacea	<i>Ihlea racovitzai</i>	0.00882	1
Salpida	Thaliacea	<i>Pegea confederata</i>	0.0115	1
Salpida	Thaliacea	<i>Salpa cylindrica</i>	0.0056049	1
Salpida	Thaliacea	<i>Salpa democratica</i>	0.0159104	1
Salpida	Thaliacea	<i>Salpa fusiformis</i>	0.0044	1
Salpida	Thaliacea	<i>Salpa maxima</i>	0.0142	1
Salpida	Thaliacea	<i>Salpa thompsoni aggregate</i>	0.0019	1
Salpida	Thaliacea	<i>Salpa thompsoni solitary</i>	0.0018	1
Salpida	Thaliacea	<i>Thalia democratica</i>	0.0087	1
Salpida	Thaliacea	<i>Thalia rhombooides</i>	0.0148	1
Salpida	Thaliacea	<i>Thethys vagina</i>	0.00451	1
Siphonophorae	Siphonophora	<i>Abyla</i> sp,	0.00511	1
Siphonophorae	Siphonophora	<i>Abylopsis tetragona</i>	0.0042	1
Siphonophorae	Siphonophora	<i>Apolemia</i> sp,	0.0156	1
Siphonophorae	Siphonophora	<i>Athorybia</i> sp,	0.00161	1
Siphonophorae	Siphonophora	<i>Calycopsis borchgrevinki</i>	0.005	1
Siphonophorae	Siphonophora	<i>Diphyes antarctica</i>	0.0045	1
Siphonophorae	Siphonophora	<i>Muggiaeaa atlantica</i>	0.0044	1
Siphonophorae	Siphonophora	<i>Prayidae</i> sp,	0.0132	1
Siphonophorae	Siphonophora	<i>Sphaeronectes gracilis</i>	0.0056	1
Thecosomata	Thecosomata	<i>Clio pyramidata</i>	0.0631	1
Thecosomata	Thecosomata	<i>Limacina helicina</i>	0.0823	1
Thecosomata	Thecosomata	<i>Limacina inflata</i>	0.0618	1
Acantharea			0.0026	2
colonial Collodaria			0.001221	2
solitary Collodaria			0.189	3
other Rhizaria			0.0103	2
Foraminifera			0.089	4
Phaeodaria	Aulosphaeridae		0.018	3