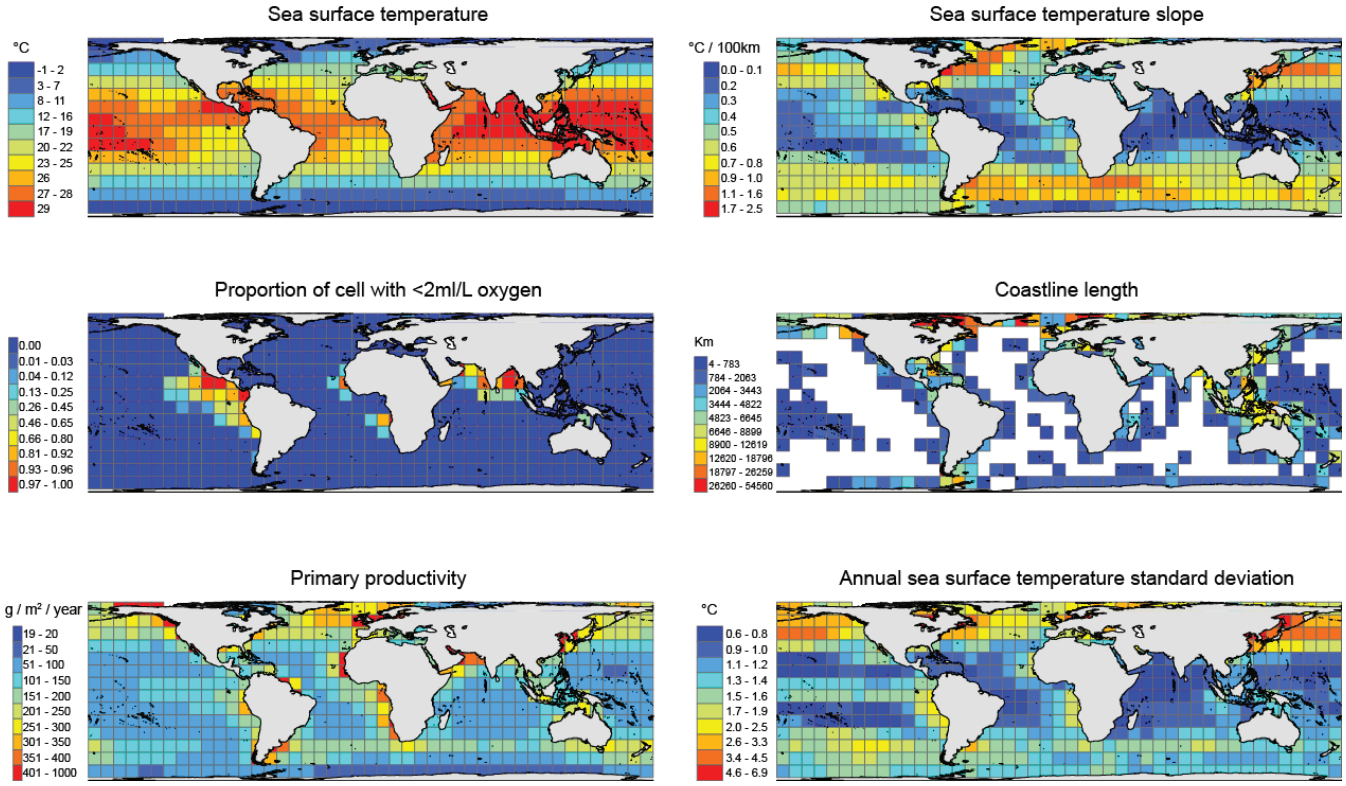
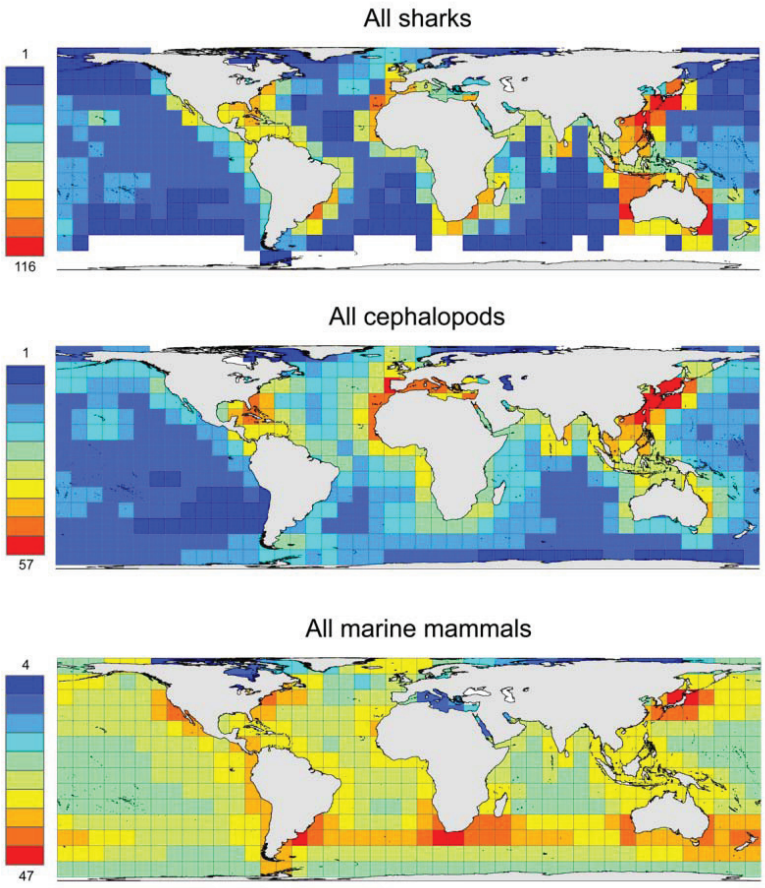
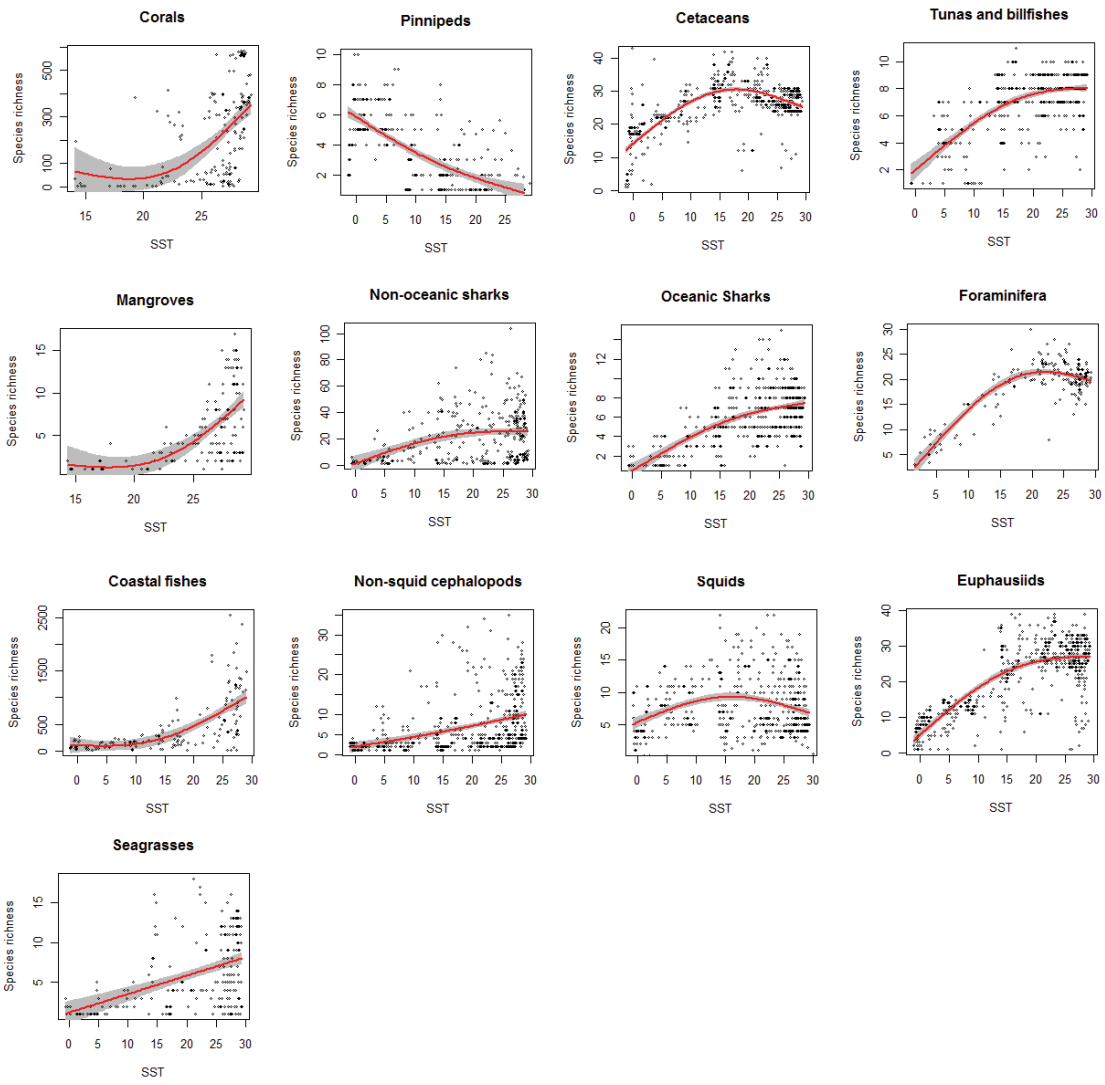
SUPPLEMENTARY INFORMATION



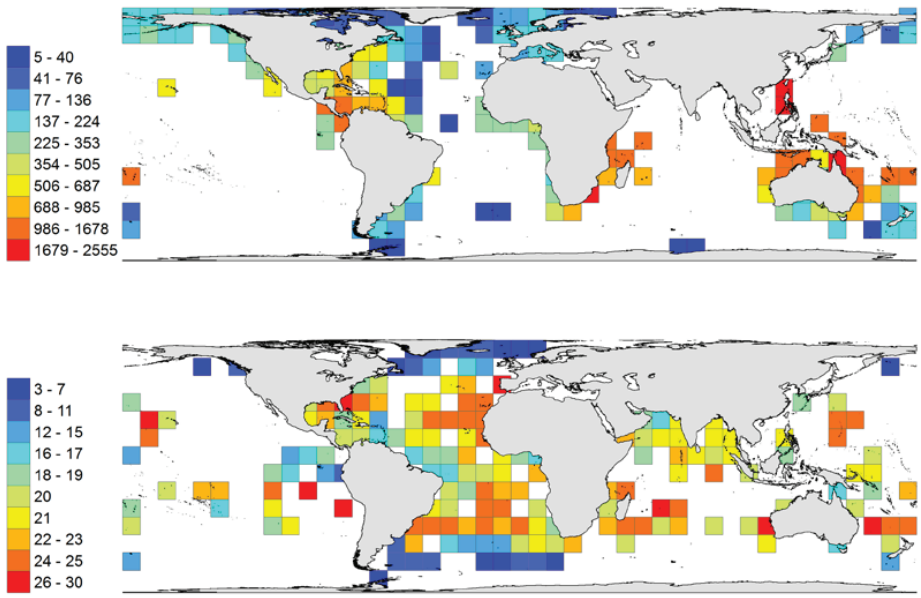
Supplementary Figure S1. Environmental variables used in the SLM and GLM analyses.



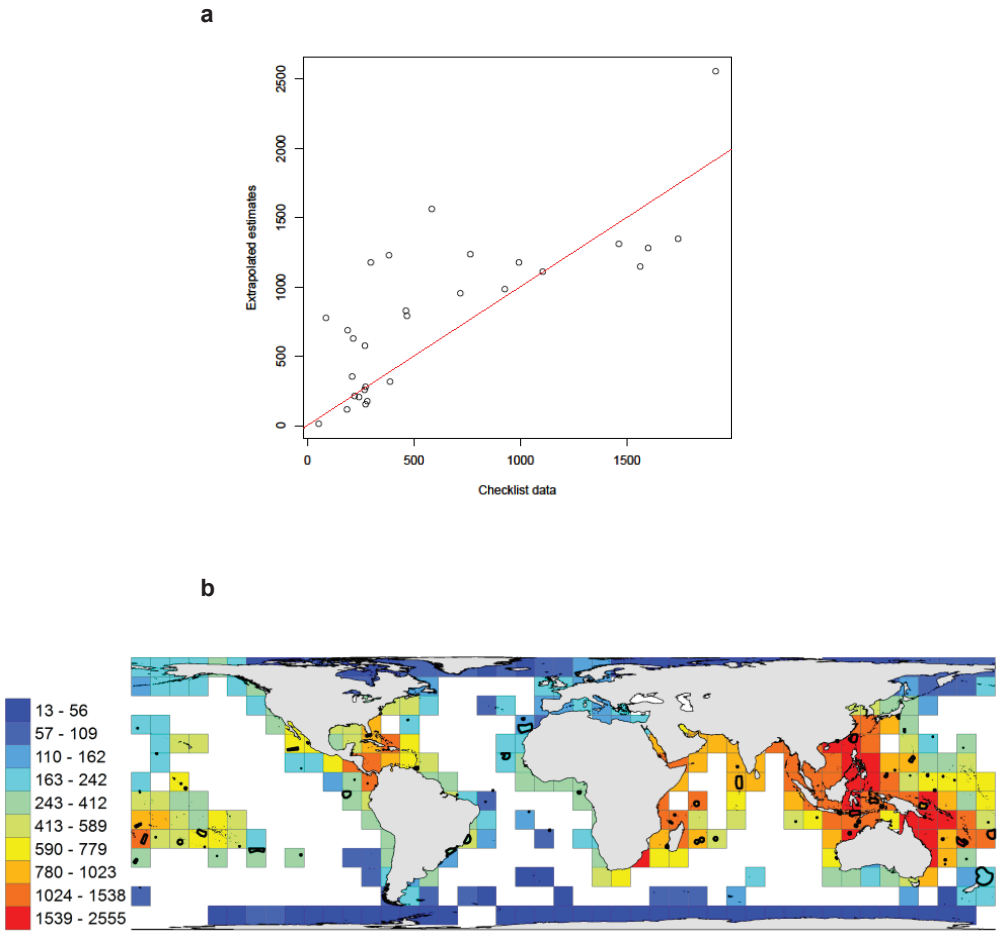
Supplementary Figure S2. Diversity patterns for species groups without partitioning into coastal and oceanic species.



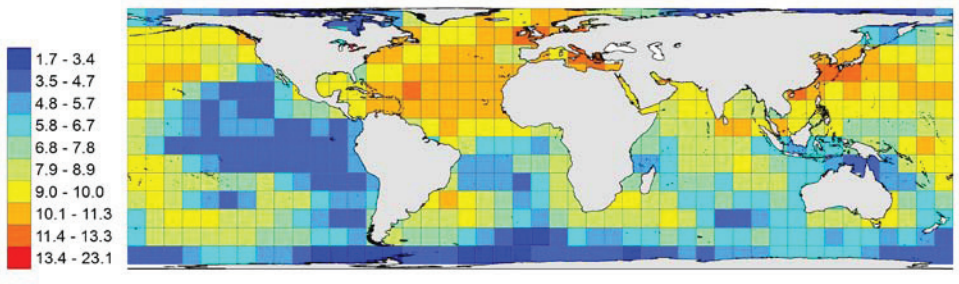
Supplementary Figure S3. Relationship between species richness and SST. Trends indicated by smoothed fit from generalized additive model with basis dimension 3 (red lines with grey area indicating 95% confidence limits).



Supplementary Figure S4. Unkriged richness for coastal fishes (top) and foraminifera (bottom).



Supplementary Figure S5: **(a)** Correlation between extrapolated estimates of richness and independently gathered coastal fish checklist data. The red line is 1:1. Given the difference in spatial extent, and in predicted vs. observed species, we would expect predictions to be equal to or higher than checklist values. **(b)** Distribution and richness of checklist locations (dark black borders) against extrapolated richness.



Supplementary Figure S6: Cumulative human impacts (relative index) derived from ref. 10.

Supplementary Table S1. Biological data sources used to construct species richness patterns

Biological data	Source (ref.)	Number of species	Total number of known species	Number of cells used in analysis	Type	Original resolution
Cephalopods - *Squids* - *Non-squids*	33,34	206	786 (Cephbase); range data only available for 209 species at present	523 (Squid) 519 (Non-squid)	Expert verified range maps	n/a
Corals (stony shallow-water)	35,66	794	833[67]	179	Expert verified range maps	n/a
Euphausiids	36	86	86[36]	528	Expert verified range maps	n/a
Fishes - *Coastal fishes*	OBIS* (www.iobis.org)	9,713 (coastal)	16,764 total (W. N. Eschmeyer, *pers. comm.*); ~12,350 coastal[29]	153	Point samples	n/a
Foraminifera	37	38	44-45 (planktonic only)[68]	178	Point samples	n/a
Marine Mammals -*Cetaceans* -*Pinnipeds*	38,66	120	120[38]	539 (Cetaceans) 274 (Pinnipeds)	Range maps	n/a
Mangroves	39,40	32	53-75[69]**	156	Range maps	n/a
Seagrasses	41-44	60	60[44]	212	Range maps, point data	n/a
Sharks - *Oceanic sharks* - *Non-oceanic sharks*	45	507	507[45]	450 (Oceanic) 330 (Non-oceanic)	Gridded	1 degree
Tunas and billfishes	7 combined with FAO catch data 1990-99***	12	19[7]	435	Gridded	5 degrees

* Ocean Biogeographical Information System

**Depending on the definition adopted and the classification provided by different authors, the number of mangrove species may vary between 48[70], 53 [71], 69[72], 75[73], and 101[74]. More general overviews consider 54-75 species[75] or 53-75[69].

***Derived from http://www.fao.org/fishery/statistics/tuna-catches/en

Supplementary Table S2. Environmental data sources used for SLM and GLM analyses.

Environmental data	Source	Units	Original resolution
Coastline length	World Database of Protected Areas (http://www.wdpa.org/)	km	n/a
Sea Surface Temperature (SST)	NASA optimum interpolation SST[49]	°C	1 degree
Oxygen <2 ml/L	World Ocean Atlas 2005[47]	ml/L	1 degree
Mean standard deviation of SST	AVHRR Pathfinder version 5.0[50]	°C	4 km
Primary Productivity	Vertically Generalized Productivity Model[51]	g C/m^2/yr	0.086 degree
Mean maximum SST slope	NASA optimum interpolation SST[49]	°C/100km	1 degree
Ocean basin	n/a	Categorical	n/a

Supplementary Table S3. Correlations between gridded species richness by taxon. Correlations with an absolute value of greater than 0.5 are indicated in bold.

	Corals	Euphausiids	Foraminifera	Cetaceans	Pinnipeds	Mangroves	Seagrasses	Oceanic sharks	Non-oceanic sharks	Tunas and billfishes	Squids	Non-squid cephalopods	Coastal fishes
Corals		0.25	0.12	0.07	0.03	**0.55**	**0.57**	-0.05	0.16	0.27	-0.16	0.24	**0.71**
Euphausiids	0.25		**0.73**	**0.61**	**-0.60**	-0.04	0.20	**0.57**	0.20	**0.72**	0.21	0.12	**0.61**
Foraminifera	0.12	**0.73**		0.43	**-0.78**	-0.20	0.28	0.49	0.20	**0.59**	0.06	0.22	0.36
Cetaceans	0.07	**0.61**	0.43		-0.39	0.06	0.27	0.45	0.45	0.41	0.32	0.25	0.43
Pinnipeds	0.03	**-0.60**	**-0.78**	-0.39		-0.36	-0.38	-0.47	-0.42	-0.42	-0.25	-0.30	-0.43
Mangroves	**0.55**	-0.04	-0.20	0.06	-0.36		0.37	-0.21	0.16	0.03	-0.03	0.47	0.38
Seagrasses	**0.57**	0.20	0.28	0.27	-0.38	0.37		0.22	**0.53**	0.23	0.01	0.48	**0.60**
Oceanic sharks	-0.05	**0.57**	0.49	0.45	-0.47	-0.21	0.22		**0.53**	0.47	0.27	0.30	**0.59**
Non-oceanic sharks	0.16	0.20	0.20	0.45	-0.42	0.16	**0.53**	**0.53**		0.13	0.46	**0.76**	**0.70**
Tunas and billfishes	0.27	**0.72**	**0.59**	0.41	-0.42	0.03	0.23	0.47	0.13		0.05	0.07	**0.52**
Squids	-0.16	0.21	0.06	0.32	-0.25	-0.03	0.01	0.27	0.46	0.05		**0.56**	0.24
Non-squid cephalopods	0.24	0.12	0.22	0.25	-0.30	0.47	0.48	0.30	**0.76**	0.07	**0.56**		**0.56**
Coastal fishes	**0.71**	**0.61**	0.36	0.43	-0.43	0.38	**0.60**	**0.59**	**0.70**	**0.52**	0.24	**0.56**	

Supplementary Table S4. Correlations between environmental data.

	SST slope	SST	Prop. Cell <2ml/L O_2	Length of coastline	Primary productivity	Annual SST range
SST slope		-0.32	-0.10	0.00	0.29	0.45
SST	-0.32		0.22	-0.30	-0.02	-0.43
Prop. Cell <2ml/L O_2	-0.10	0.22		-0.02	0.23	0.00
Length of coastline	0.00	-0.30	-0.02		0.22	0.29
Primary productivity	0.29	-0.02	0.23	0.22		0.47
Annual SST range	0.45	-0.43	0.00	0.29	0.47	

Supplementary Table S5. Single predictor spatial linear models (SLMs). Numbers are *z*-test values. Largest absolute *z*-test values for each taxon in bold; asterisks indicate significance of individual predictors: one asterisk is *P*<0.05, two asterisks is *P*<0.01, three asterisks is *P*<1e-05. (Ind.) and (Pac.) indicate contrasts against the Atlantic Ocean for the Indian and Pacific Oceans, respectively.

Taxon	SST	SST slope	Prop. cell <2ml/L O_2	Length of coastline	Primary productivity	Annual SST range	Ocean basin
Primarily coastal species							
Pinnipeds	**-6.8** ***	3.6**	-1.1	5.3***	5.3***	2.2*	-0.6 (Ind.) -1.3 (Pac.)
Non-oceanic sharks	3.8**	0.6	1.2	**12.4***	4.1**	-0.1	0.1 (Ind.) -0.5 (Pac.)
Coastal fish	**5.0***	1.5	0.4	4.9***	2.1*	-0.9	2.4* (Ind.) 2.3* (Pac.)
Non-squid cephalopods	**6.1***	-0.7	2.4*	5.9***	1.6	-2.5*	-1.2 (Ind.) -2.1* (Pac.)
Corals (shallow-water)	**6.7***	-2.6**	0.5	2.6**	-2.6**	-3.6**	1.9 (Ind.) 1.7 (Pac.)
Mangroves	**9.0***	-5.0***	2.7**	1.1	-2.5*	-4.1**	1.5 (Ind.) 1.0 (Pac.)
Seagrasses	**3.7****	-0.9	0.5	3.6**	-0.5	-2.4*	2.2* (Ind.) 1.7 (Pac.)
Primarily oceanic species							
Cetaceans	6.2***	1.6	1.1	2.1*	**11.8***	2.0*	-1.7 (Ind.) -3.0** (Pac.)
True oceanic sharks	**11.2***	-2.7**	0.8	5.5***	-1.0	-3.9**	3.0** (Ind.) 3.1** (Pac.)
Tunas and billfishes	**8.4***	-1.7	1.8	-0.7	-2.7**	-5.7***	1.7 (Ind.) 1.3 (Pac.)
Squids	2.2*	**3.6****	0.4	1.8	1.8	-0.1	-1.3 (Ind.) -1.9 (Pac.)
Euphausiids	**9.2***	-1.2	-0.9	-0.6	2.0*	-7.6***	1.6 (Ind.) 0.2 (Pac.)
Foraminifera	**14.7***	-1.00	-1.1	-2.3	0.2	-2.4*	0.9 (Ind.) 0.3 (Pac.)

Supplementary Table S6. Single predictor generalized linear models (GLMs). Numbers are *t*-test values. Largest absolute *t*-test values for each taxon in bold; asterisks indicate significance of individual predictors: one asterisk is $P<0.05$, two asterisks is $P<0.01$, three asterisks is $P<1e-05$. (Ind.) and (Pac.) indicate contrasts against the Atlantic Ocean for the Indian and Pacific Oceans, respectively.

Taxon	SST	SST slope	Prop. cell <2ml/L O_2	Length of coastline	Primary productivity	Annual SST range	Ocean basin
Primarily coastal species							
Pinnipeds	**-17.1*****	-1.4	-2.7**	5.9***	-2.3*	2.3*	2.0* (Ind.) 0.1 (Pac.)
Non-oceanic sharks	8.7***	-1.3	3.5**	**8.9*****	6.2***	-2.5*	2.5* (Ind.) -0.8 (Pac.)
Coastal fish	**9.0*****	-2.1*	1.7	3.4**	1.8	-4.7***	4.4*** (Ind.) 3.7*** (Pac.)
Non-squid cephalopods	**12.6*****	-5.8***	4.3**	11.4***	10.5***	-1.7	-1.3 -5.2*** (Pac.)
Corals (stony shallow-water)	**9.3*****	-6.6***	-1.1	1.8	-4.2**	-4.0**	6.6*** (Ind.) 6.9*** (Pac.)
Mangroves	**11.0*****	-8.4***	1.6	3.7**	-2.2*	-3.6**	0.1 (Ind.) 2.3* (Pac.)
Seagrasses	**8.2*****	-5.2***	-0.2	0.8	-2.3*	-4.9***	8.1*** (Ind.) 5.4*** (Pac.)
Primarily oceanic species							
Cetaceans	**18.9*****	4.7***	2.5*	-6.5***	13.2***	-4.8***	6.6*** (Ind.) 6.9*** (Pac.)
True oceanic sharks	**22.6*****	-6.0***	3.0**	0.4	-3.9**	-8.1***	0.2 (Ind.) 1.2 (Pac.)
Tunas and billfishes	**18.6*****	-3.8**	1.5	-2.7**	-0.7	-5.0***	3.0** (Ind.) 4.3** (Pac.)
Squids	3.8**	4.1**	1.3	4.4**	**11.1*****	4.0**	-8.0*** (Ind.) -8.9*** (Pac.)
Euphausiids	**24.6*****	-1.0	-0.1	-9.9***	-1.6	-11.4***	1.2 (Ind.) 3.0** (Pac.)
Foraminifera	**20.2*****	-5.8***	0.67	-2.6**	-3.2**	-7.1***	3.4*** (Ind.) 1.8 (Pac.)

Supplementary Table S7. GLM results for minimal adequate models. Numbers indicate *t*-values, asterisks indicate significance of individual predictors: one asterisk is *P*<0.05, two asterisks is *P*<0.01, three asterisks is *P*<1e-05. (Ind.) and (Pac.) indicate contrasts against the Atlantic Ocean for the Indian and Pacific Oceans, respectively.

Taxon	SST	SST slope	O_2 less than 2ml/L	Length of coastline	Primary productivity	SST range	Ocean	Pseudo-r^2
Primarily coastal species								
Pinnipeds	-19.7***	5.9***	2.2*	4.9***	5.9***	-2.6**	2.6** (Ind.) 2.2* (Pac.)	0.68
Non-oceanic sharks	13.6***	4.4**		14.5***	8.1***	-4.1***		0.63
Coastal fish	14.7***			9.3***			4.6*** (Ind.) 6.1*** (Pac.)	0.68
Non-squid cephalopods	16.5***	-4.2***		14.1***	7.0***		-0.7 (Ind.) -7.4*** (Pac.)	0.64
Corals (stony shallow-water)	13.3***	-6.0***		5.8***			10.9*** (Ind.) 10.4*** (Pac.)	0.66
Mangroves	-6.2***	-2.6**		5.0***				0.53
Seagrasses	9.8***		-4.3**	6.9***			8.5*** (Ind.) 6.3*** (Pac.)	0.52
Primarily oceanic species								
Cetaceans	10.2***	9.1***		-3.1**	12.1***	-8.7***	2.9** (Ind.) 4.1** (Pac.)	0.63
True oceanic sharks	20.5***	3.2**		4.6***	2.3*	-2.6**	-2.2* (Ind.) 1.4 (Pac.)	0.58
Tunas and billfishes	19.4***	5.3***		-3.1**				0.50
Squids	5.4***	3.0**		3.7**	5.4***		-7.1*** (Ind.) -8.5*** (Pac.)	0.33
Euphausiids	22.5***	9.2***	-3.6**	-4.5***		-5.6***		0.68
Foraminifera	19.4***	4.1**	-3.5**	-3.5**	2.5*	-2.4*		0.77

Supplementary Table S8. AIC and Morans I values for minimal adequate GLMs and SLMs.

Taxon & source	AIC (GLM)	AIC (SLM)	Morans I (GLM residuals)	Morans I (SLM residuals)
Primarily oceanic species				
Cetaceans	-715.1	-1190.4	0.64***	0.0044
True oceanic sharks	-255.1	-524.0	0.58***	-0.032
Tunas and billfishes	-428.0	-648.9	0.53***	-0.055
Squids	-213.5	-884.9	0.76***	0.0075
Euphausiids	-280.7	-548.8	0.46***	-0.046
Foraminifera	-361.1	-368.9	0.15**	-0.0038
Primarily coastal species				
Pinnipeds	-127.8	-322.7	0.63***	-0.069
Non-oceanic sharks	249.4	166.2	0.34***	-0.022
Coastal fish	104.6	92.1	0.22**	-0.012
Non-squid cephalopods	12.00	-427.7	0.58***	-0.058
Corals (shallow-water)	208.6	183.9	0.22***	-0.039
Mangroves	7.6	-123.8	0.65***	-0.036
Seagrasses	76.4	-14.9	0.44***	-0.0037

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