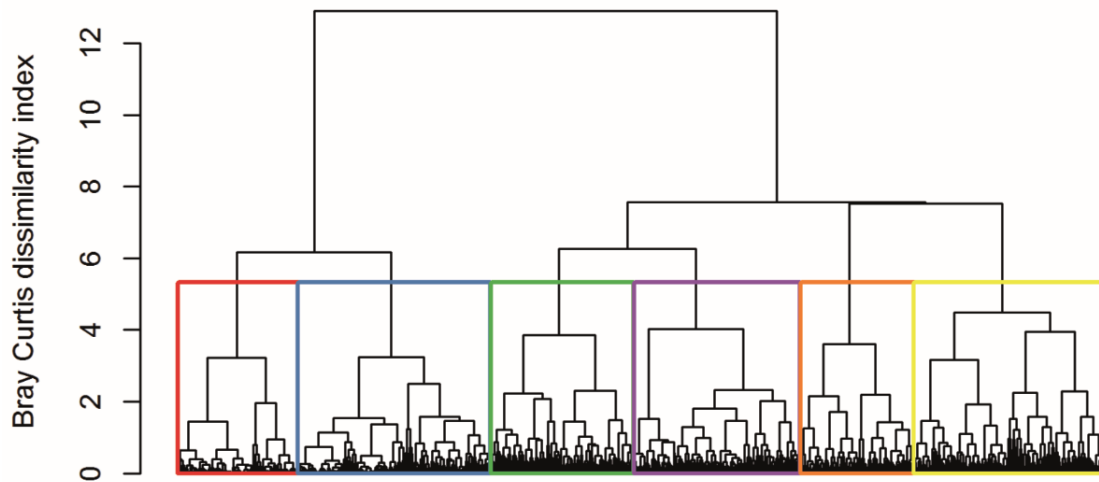# Supplementary material

Figure S1: Dendrogram of hierarchical clustering and the cut off level determining the number of clusters/assemblages. Colors of framing is according to fish assemblage 1 to 6; red, blue, green, purple, orange and yellow respectively.

Text S1: Descriptions of community assemblages

Assemblage 1 (Fig. S2) is highly represented in the deeper area on the continental shelf called the "Kangerdlugssuaq Trough" in the North, and more widely spread along the shelf break and on the shelf area further South. Mean depth of 571 ±164 m is significantly different from all other assemblages except assemblage 4. Mean temperature at 2.3 ±1.6°C is significantly different from the other shallow assemblages 4 and 5 and the deep warmer assemblage 6. This is the assemblage with the lowest temperatures which is also reflected in the species composition consisting of highest abundance of cold-water species such as the main indicator *Boreogadus saida*. Other indicators of this group are *Lycodes eudipleurostictus, Raja.radiata, Artediellus atlanticus, Hippoglossoides platessoides, Gadus morhua, Lycodes reticulatus, Leptagonus decagonus, Cottunculus microps, Careproctus reinhardti, Artediellus uncinatus, Lycodes esmarkii, Lycodes pallidus* and *Lycodes paamiuti* in ranked order (species response curve in supplementary Figs. 9-14, full species list in table S2).

Stations assigned to assemblage 2 (Fig. S2) are located along the edge and middle continental slope with mean depth of 901 ±193 and a mean temperature of 2.9 ±1.19 °C. Depth is significantly different from all other assemblages and temperature is significantly different from all except assemblage 1 and 3. Indicator species are *Macrourus berglax, Notacanthus chemnitzi, Bathyraja spinicauda* and *Gaidropsarus argentatus* in ranked order (species response curve in supplementary fig. 9-14, full species list in table S2).

Assemblage 3 (Fig. S2) is located in the lower parts of the middle continental slope at mean depth of 1298 ±150 m. This is the deepest assemblage and significantly different from all other assemblages. Temperature is significantly different from assemblage 4, 5 and 6 with mean 2.9 ±0.7 °C. The indicator species are typical deep-water species: *Alepocephalus agassizii, Antimora.rostrata, Serrivomer beanie, Borostomias antarcticus, Raja bathyphila, Hydrolagus affinis, Polyacanthonotus rissoanus, Raja hyperborean Malacosteus niger,*

1

Maulisia microlepis, Dipterus linteus in ranked order. (species response curve in supplementary fig. 9-14, full species list in table S2).

Assemblage number 4 (Fig. S2) is located at the shallower and warmer waters on the continental shelf and along the ridge and upper parts of the slope. Mean depths are 611 ±112 m and significantly different from depths of assemblage 2, 3 and 6. Mean temperature is at 4.1 ±0.8°C and significantly different from assemblage 1,2 and 3. The three indicator species of this assemblage are *Argentina silus, Brosme brosme and Sebastes viviparous* in ranked order (species response curve in supplementary fig. 9-14, full species list in supplementary table 2).

Location of assemblage number 5 (Fig. S2) is in the shallowest areas on the shelf and along the shelf break. Mean depth is 560 ±114 m and mean temperature is 4.0 ±0.7°C. Depth is significantly different from all assemblages except 6, and temperature is significantly different from assemblage 1, 2 and 3. Indicator species of the assemblage is; *Sebastes mentella, Sebastes marinus, Molva dipterygius, Raja fyllae, Anarhichas denticulatus, Anarhichas minor, Anarhichas lupus, Lycodes vahlii, Glyptocephalus.cynoglossus, Myxine glutinosa, and Hippoglossus hippoglossus* in ranked order (species response curve in supplementary fig. 9-14, full species list in table S2).

Assemblage number 6 is mainly located in the middle slope (Fig. S2). The depth range of this group is wide with mean 1071 ±234 m being significantly different from all other assemblages. Temperature range is a bit lower than within assemblage 4 and 5 and significantly different from assemblage 1, 2 and 3. Mean temperature is 3.6 ±0.9°C. Indicator species are *Coryphaenoides.rupestris, Reinhardtius hippoglossoides, Synapobranchus kaupi, Trachyrhynchus murrayi, Coryphaenoides guentheri, Centroscyllium fabricii, Lepidion eques, Notoscopelus kroeyeri, Aphanopus carbo, Alepocephalus bairdii and Rouleina maderensis* in ranked order (species response curve in supplementary Figs. 9-14, full species list in table S2.
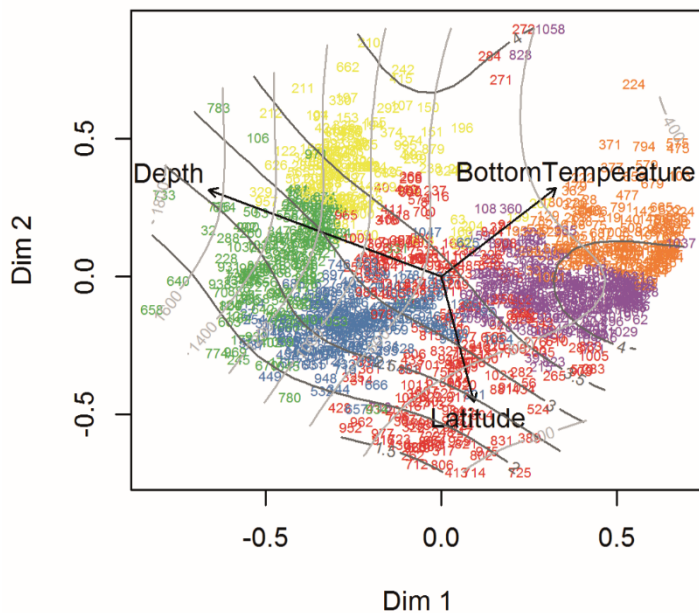

Figure S2: Non-metric multidimensional scaling (nMDS) plot of sites. Environmental variables are interpolated onto the ordination. Isolines represent depth (light grey) and bottom temperature (trawl temperature observations (TTOs)) (dark grey). Colors represent assemblages 1 to 6; red, blue, green, purple, orange and yellow respectively.
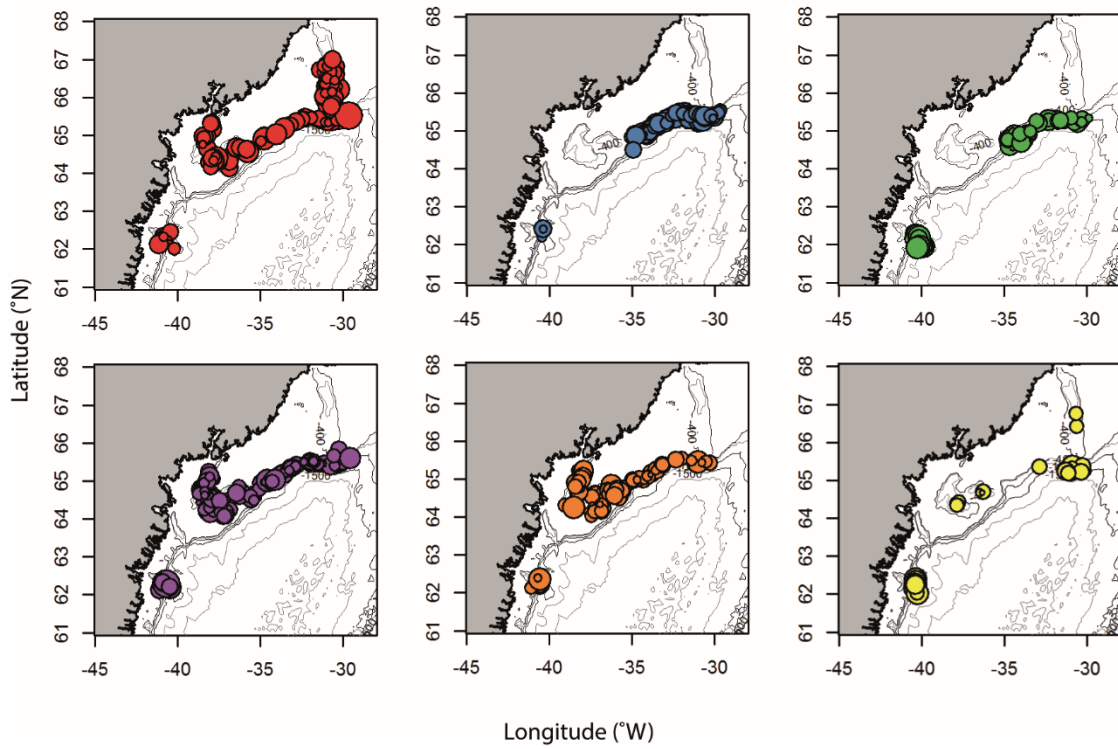
2

Figure S3: Maps of plotted sites according to assemblage affiliation Assemblages 1 to 6; red, blue, green, purple, orange and yellow respectively. Size of points are proportional to species richness at the site.
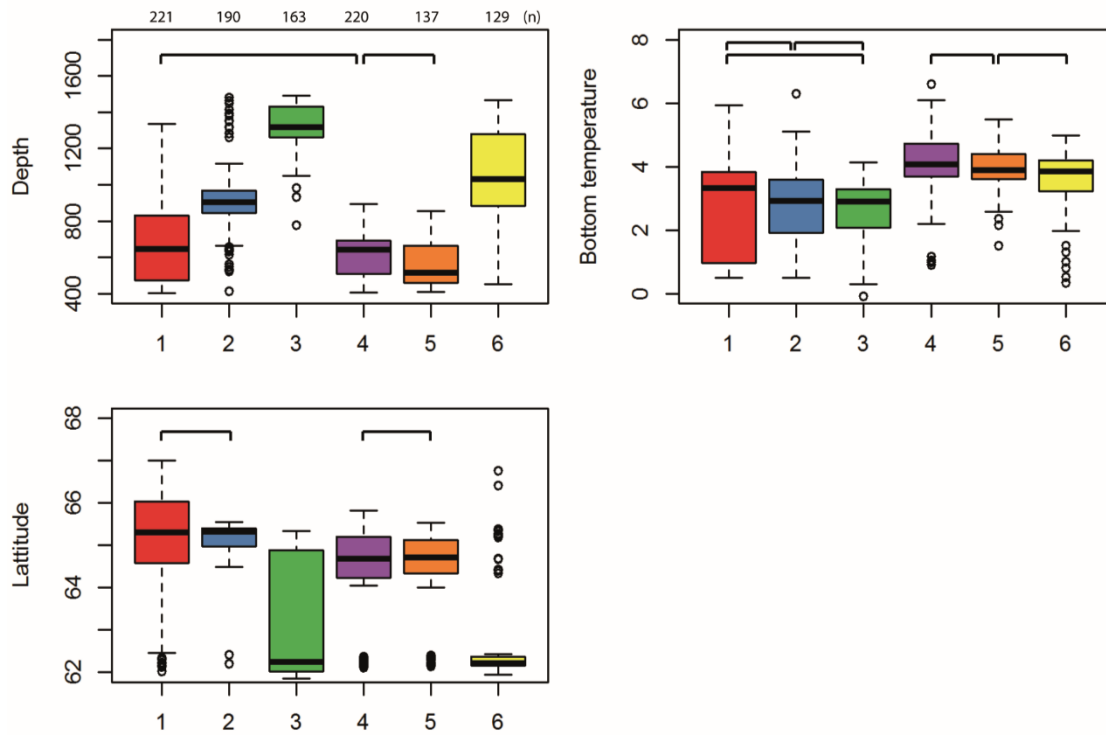
Figure S4: Box plots of depth-, Bottom temperature (trawl temperature observations (TTOs)- and latitude ranges within assemblages 1 to 6; red, blue, green, purple, orange and yellow respectively. Connecting lines above boxes indicate non-significant difference. All other assemblages are significantly different at p-value < 0. 001 (Table S2). Numbers above the boxplot represents number of samples/sites for each assemblage.
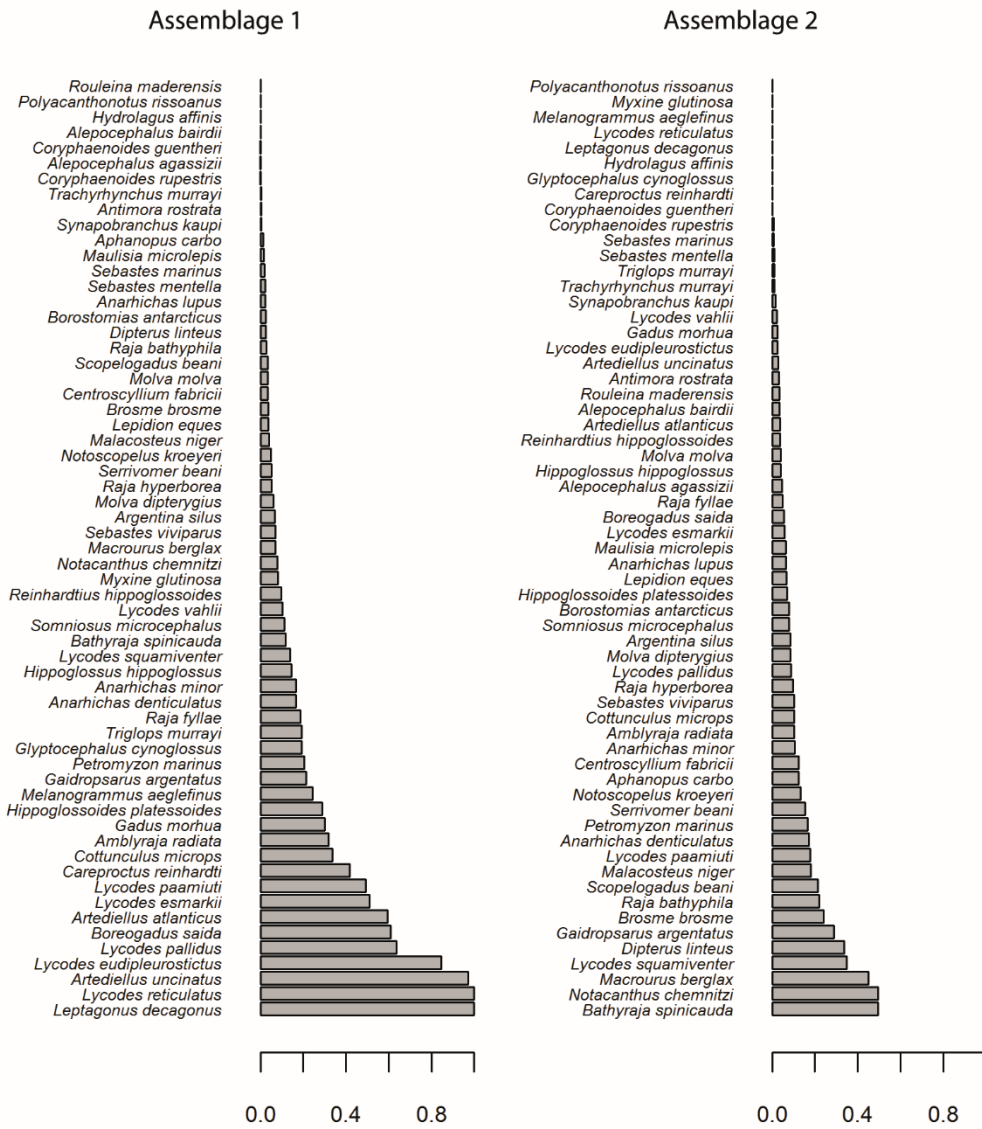
Figure S5: Species relative in assemblage 1 and 2 (relative abundance is calculated across all assemblages).

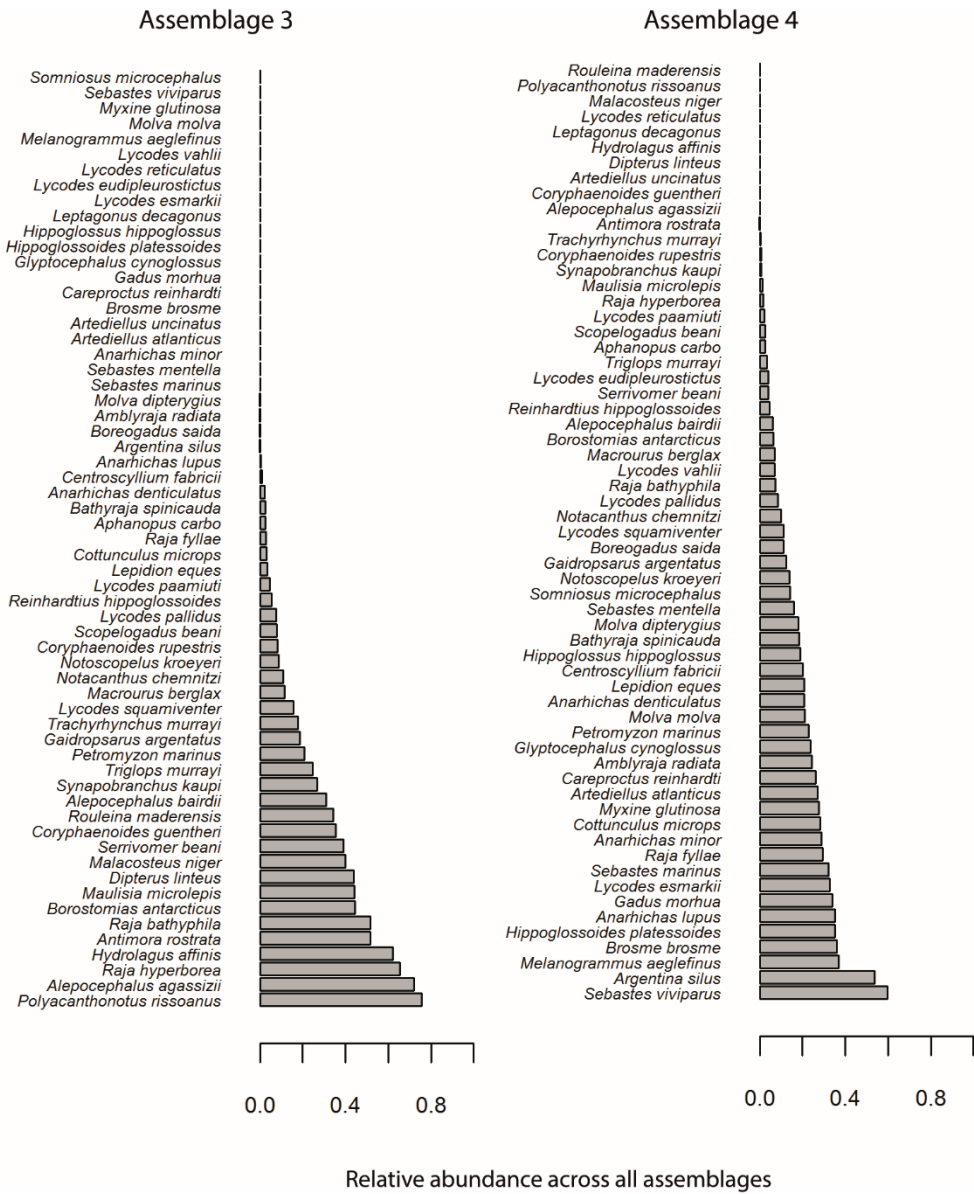Figure S6: Species relative in assemblage 3 and 4 (relative abundance is calculated across all assemblages).
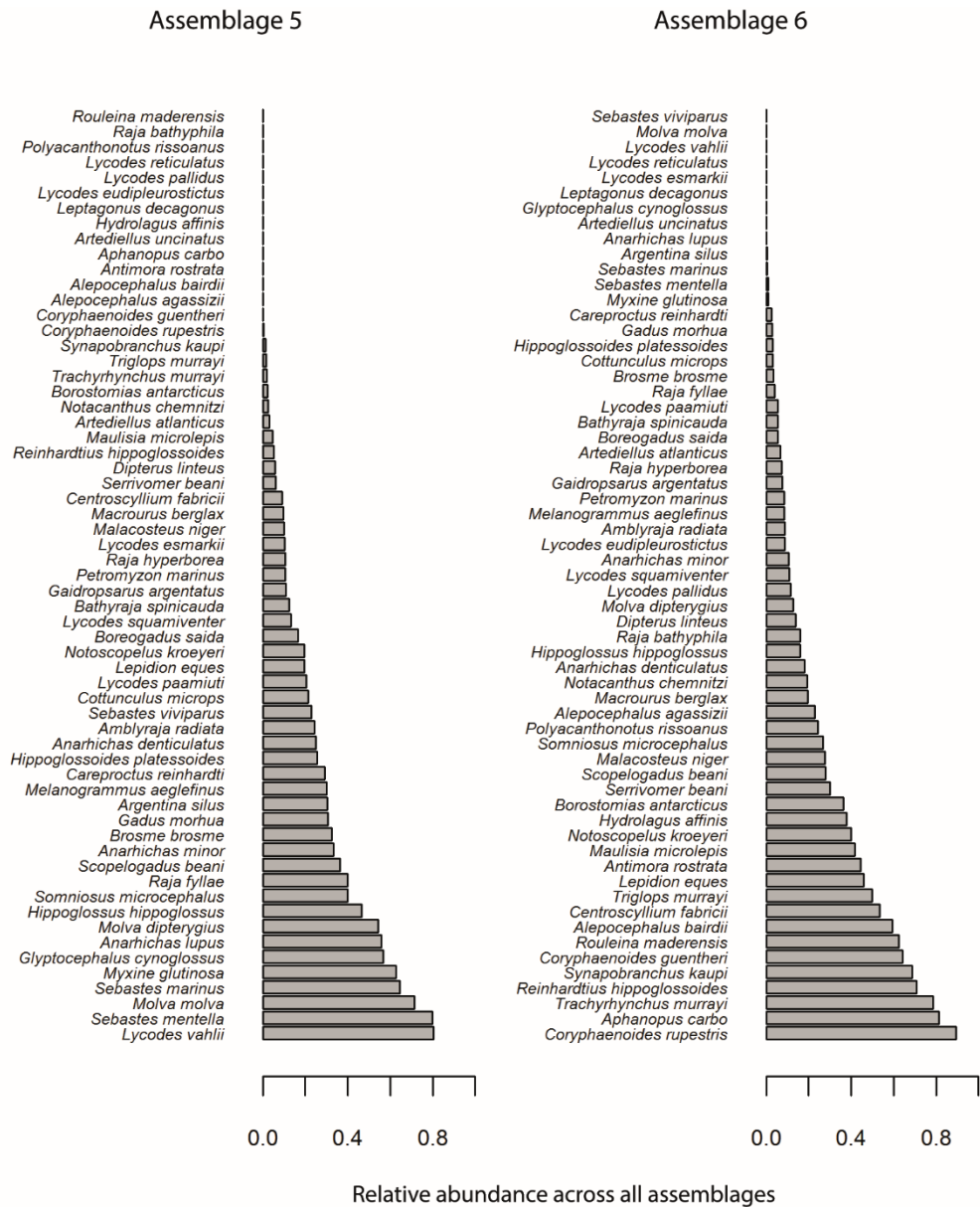
Figure S7: Species relative abundance in assemblage 5 and 6 (relative abundance is calculated across all assemblages).

Table S1: Species list with relative abundance of each species in each assemblage (1-6) Bold numbers marks significant indicator species (species with significant probability of obtaining as high an indicator values as observed over the specified iterations).

	Relative abundance in clusters/assemblages					
Species	**1**	**2**	**3**	**4**	**5**	**6**
Alepocephalus agassizii	0.002	0.046	**0.720**	0.001	0.000	0.230
Alepocephalus bairdii	0.000	0.035	0.309	0.062	0.000	**0.595**
Anarhichas denticulatusS	0.166	0.171	0.023	0.209	**0.249**	0.181
Anarhichas lupus	0.022	0.066	0.003	0.351	**0.558**	0.000
Anarhichas minor	0.166	0.107	0.000	0.288	**0.333**	0.107
Antimora rostrata	0.004	0.033	**0.516**	0.002	0.000	0.445
Aphanopus carbo	0.013	0.123	0.025	0.027	0.000	**0.812**
Argentina silus	0.067	0.084	0.003	**0.536**	0.305	0.005
Artediellus atlanticus	**0.593**	0.036	0.000	0.271	0.031	0.068
Artediellus uncinatus	**0.971**	0.029	0.000	0.000	0.000	0.000
Bathyraja spinicauda	0.118	**0.495**	0.024	0.184	0.124	0.055
Boreogadus saida	**0.609**	0.054	0.003	0.112	0.166	0.056
Borostomias antarcticus	0.024	0.079	**0.443**	0.066	0.023	0.365
Brosme brosme	0.037	0.242	0.000	**0.361**	0.325	0.035
Careproctus reinhardti	**0.418**	0.000	0.000	0.262	0.293	0.026
Centroscyllium fabricii	0.035	0.123	0.012	0.202	0.093	**0.536**
Coryphaenoides guentheri	0.002	0.001	0.355	0.000	0.001	**0.641**
Coryphaenoides rupestris	0.003	0.008	0.084	0.007	0.006	**0.894**
Cottunculus microps	**0.335**	0.104	0.032	0.282	0.214	0.032
Dipterus linteus	0.027	0.338	**0.439**	0.000	0.057	0.139

Gadus morhua	**0.302**	0.024	0.000	0.340	0.306	0.027
Gaidropsarus argentatus	0.214	**0.290**	0.186	0.124	0.109	0.077
Glyptocephalus cynoglossus	0.194	0.000	0.000	0.237	**0.568**	0.000
Hippoglossoides platessoides	**0.290**	0.071	0.000	0.352	0.256	0.031
Hippoglossus hippoglossus	0.145	0.040	0.000	0.189	**0.465**	0.162
Hydrolagus affinis	0.000	0.000	**0.622**	0.000	0.000	0.378
Lepidion eques	0.037	0.066	0.034	0.209	0.195	**0.459**
Leptagonus decagonus	**1.000**	0.000	0.000	0.000	0.000	0.000
Lycodes esmarkii	**0.511**	0.058	0.000	0.327	0.104	0.000
Lycodes eudipleurostictus	**0.847**	0.025	0.000	0.039	0.000	0.090
Lycodes paamiuti	**0.494**	0.178	0.045	0.023	0.205	0.054
Lycodes pallidus	**0.636**	0.088	0.078	0.085	0.000	0.114
Lycodes reticulatus	**1.000**	0.000	0.000	0.000	0.000	0.000
Lycodes squamiventer	0.139	0.348	0.159	0.111	0.135	0.108
Lycodes vahlii	0.104	0.022	0.000	0.071	**0.803**	0.000
Macrourus berglax	0.071	**0.449**	0.116	0.069	0.099	0.195
Malacosteus niger	0.042	0.180	**0.401**	0.000	0.101	0.276
Maulisia microlepis	0.016	0.065	**0.441**	0.014	0.045	0.419
Melanogrammus aeglefinus	0.244	0.000	0.000	0.369	0.302	0.084
Molva dipterygius	0.060	0.086	0.002	0.180	**0.545**	0.127
Molva molva	0.034	0.039	0.000	0.211	0.715	0.000
Myxine glutinosa	0.082	0.000	0.000	0.278	**0.628**	0.011
Notacanthus chemnitzi	0.080	**0.494**	0.108	0.100	0.024	0.194
Notoscopelus kroeyeri	0.049	0.132	0.088	0.138	0.195	**0.398**
Petromyzon marinus	0.206	0.165	0.209	0.229	0.107	0.084

Polyacanthonotus rissoanus	0.000	0.000	**0.755**	0.000	0.000	0.245
Raja bathyphila	0.028	0.221	**0.516**	0.075	0.000	0.160
Raja fyllae	0.186	0.050	0.028	0.296	**0.399**	0.041
Raja hyperborea	0.052	0.097	**0.653**	0.017	0.106	0.074
Amblyraja radiata	**0.319**	0.104	0.002	0.243	0.244	0.087
Reinhardtius hippoglossoides	0.098	0.038	0.057	0.047	0.052	**0.708**
Rouleina maderensis	0.000	0.034	0.342	0.000	0.000	**0.624**
Scopelogadus beani	0.034	0.216	0.081	0.025	0.365	0.280
Sebastes marinus	0.018	0.009	0.001	0.321	**0.647**	0.005
Sebastes mentella	0.021	0.009	0.001	0.161	**0.799**	0.009
Sebastes viviparus	0.070	0.103	0.000	**0.598**	0.229	0.000
Serrivomer beani	0.052	0.155	**0.389**	0.040	0.063	0.301
Somniosus microcephalus	0.112	0.080	0.000	0.141	0.399	0.267
Synapobranchus kaupi	0.006	0.018	0.269	0.007	0.014	**0.686**
Trachyrhynchus murrayi	0.003	0.012	0.177	0.003	0.019	**0.786**
Triglops murrayi	0.194	0.010	0.248	0.035	0.016	0.498

Table S2: Results from ANOVA analysis followed by a TukeyHSD testing for significant differences between groups in depth. Bottom temperature (trawl temperature observations (TTOs)) and latitude.

Depth

Assemblages	Difference in test scores	Lower diff. Conf. Int. 95%	Upper diff. Conf. Int. 95%	p-value
"4-5"	50.923	-0.489	102.335	0.0539
"1-5"	89.249	37.837	140.661	0.0000
"2-5"	348.484	294.878	402.090	0.0000
"6-5"	511.136	453.131	569.141	0.0000
"3-5"	738.004	683.862	792.147	0.0000
"1-4"	38.326	-6.652	83.304	0.1459

"2-4"	297.561	250.091	345.031	0.0000
"6-4"	460.213	407.826	512.600	0.0000
"3-4"	687.081	639.007	735.156	0.0000
"2-1"	259.235	211.765	306.706	0.0000
"6-1"	421.887	369.500	474.274	0.0000
"3-1"	648.755	600.681	696.830	0.0000
"6-2"	162.652	108.110	217.194	0.0000
"3-2"	389.520	339.106	439.934	0.0000
"3-6"	226.868	171.799	281.937	0.0000

Latitude

| Assemblages	Difference in test scores	Lower diff. Conf. Int. 95%	Upper diff. Conf. Int. 95%	p-value
"3-6"	0.691	0.327	1.055	0.0000
"4-6"	1.633	1.287	1.980	0.0000
"5-6"	1.774	1.391	2.158	0.0000
"2-6"	2.474	2.113	2.834	0.0000
"1-6"	2.474	2.128	2.821	0.0000
"4-3"	0.943	0.625	1.261	0.0000
"5-3"	1.083	0.725	1.441	0.0000
"2-3"	1.783	1.449	2.116	0.0000
"1-3"	1.783	1.465	2.101	0.0000
"5-4"	0.141	-0.199	0.481	0.8456
"2-4"	0.840	0.526	1.154	0.0000
"1-4"	0.841	0.543	1.138	0.0000
"2-5"	0.699	0.345	1.054	0.0000
"1-5"	0.700	0.360	1.040	0.0000
"1-2"	0.001	-0.313	0.315	1.0000

Bottom temperature (trawl temperature observations (TTOs))

| Assemblages	Difference in test scores	Lower diff. Conf. Int. 95%	Upper diff. Conf. Int. 95%	p-value
"1-3"	0.042	-0.263	0.347	0.9987
"2-3"	0.107	-0.213	0.426	0.9329
"6-3"	0.981	0.632	1.331	0.0000
"5-3"	1.298	0.955	1.642	0.0000
"4-3"	1.470	1.165	1.775	0.0000
"2-1"	0.064	-0.237	0.365	0.9905
"6-1"	0.939	0.607	1.271	0.0000
"5-1"	1.256	0.930	1.582	0.0000
"4-1"	1.427	1.142	1.713	0.0000
"6-2"	0.875	0.529	1.221	0.0000
"5-2"	1.192	0.852	1.532	0.0000
"4-2"	1.363	1.062	1.664	0.0000
"5-6"	0.317	-0.051	0.685	0.1377
"4-6"	0.488	0.156	0.821	0.0004
"4-5"	0.171	-0.155	0.498	0.6641

Assemblage 1
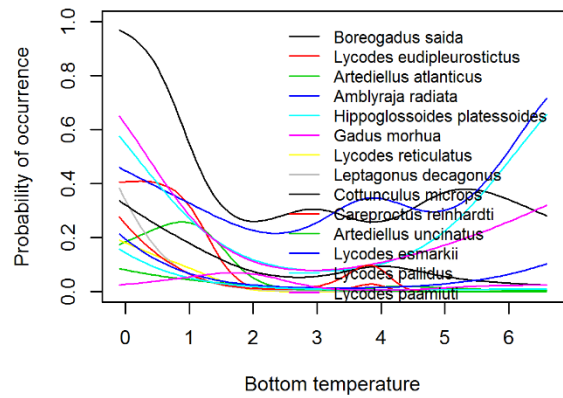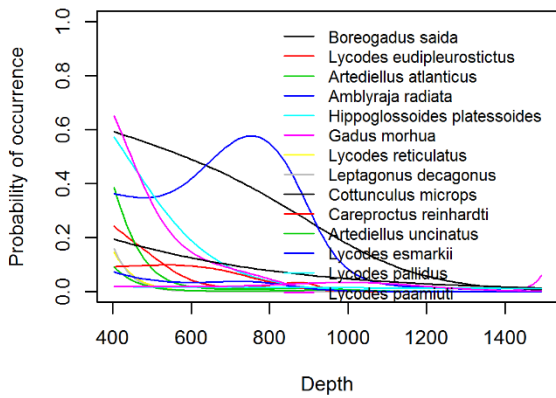
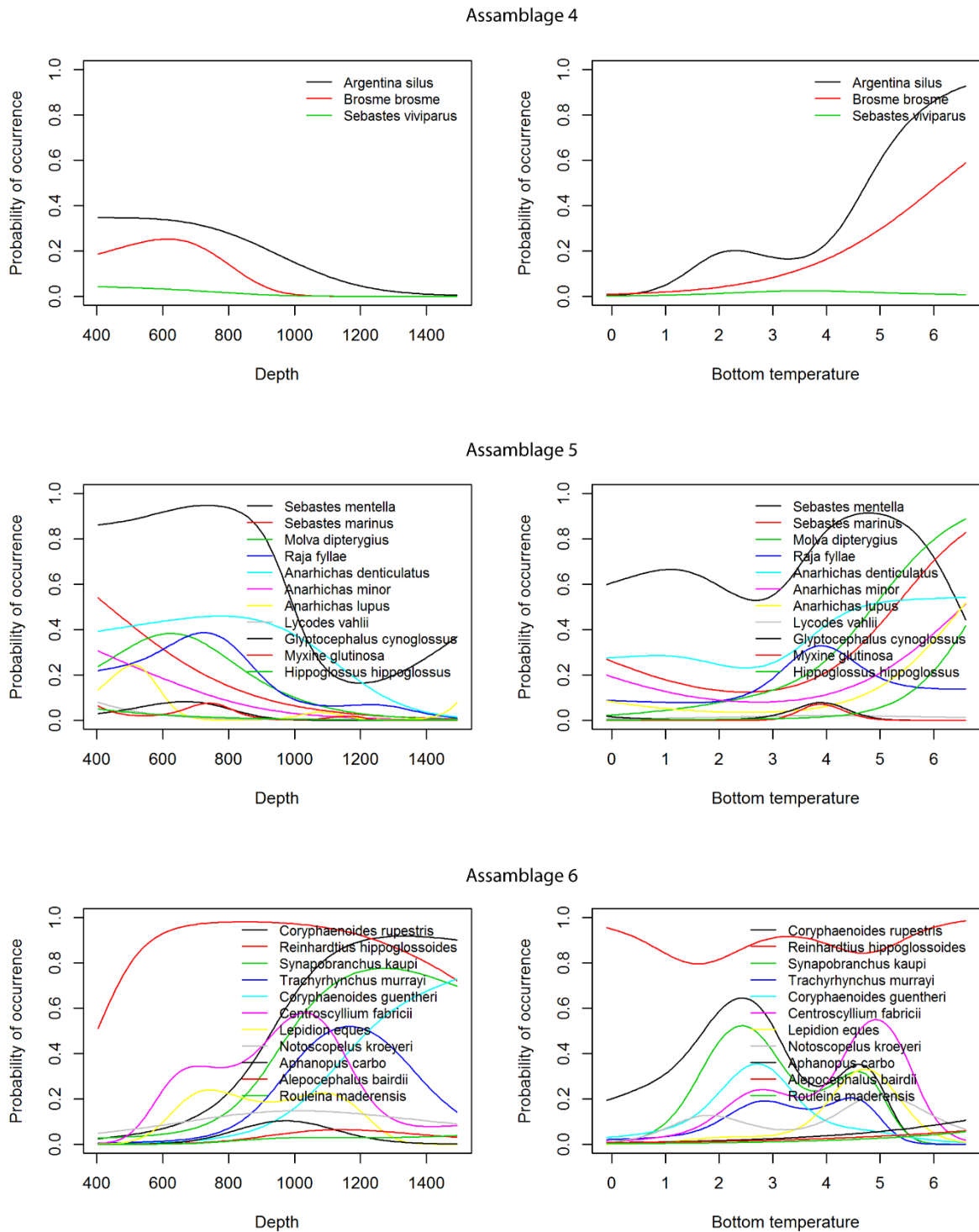## Assemblage 2
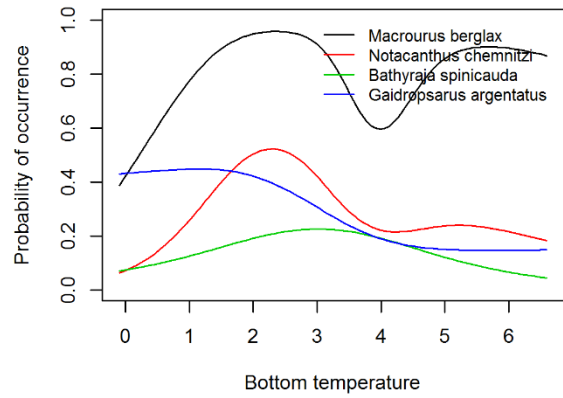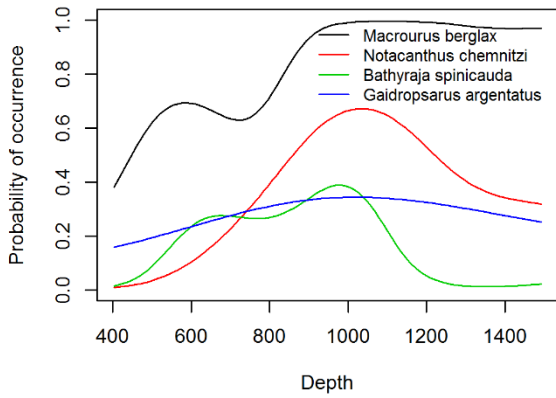
Assemblage 3
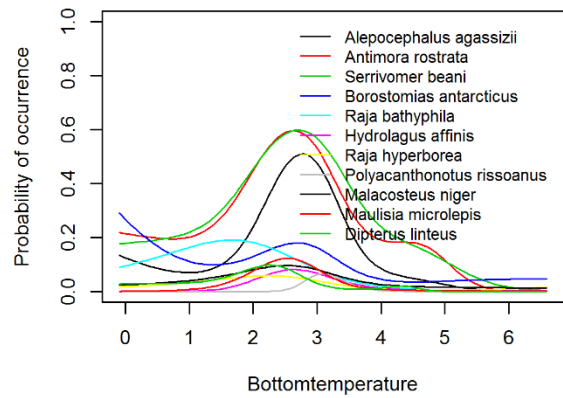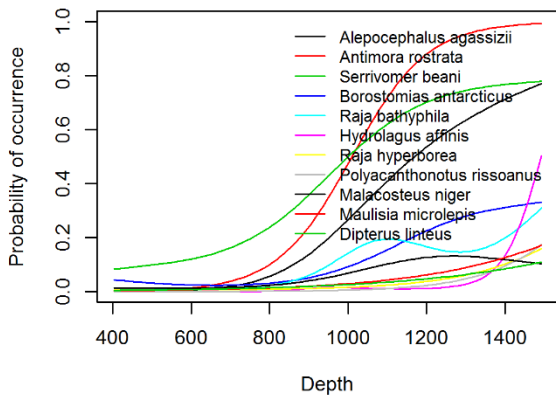
Figure S8: Species response curves of indicator species of each assemblage along the depth- and bottom temperature gradients (trawl temperature observations" (TTOs). Response curves are based on Generalized additive models (GAMs) with integrated smoothness estimation using the "goeveg" package in r.
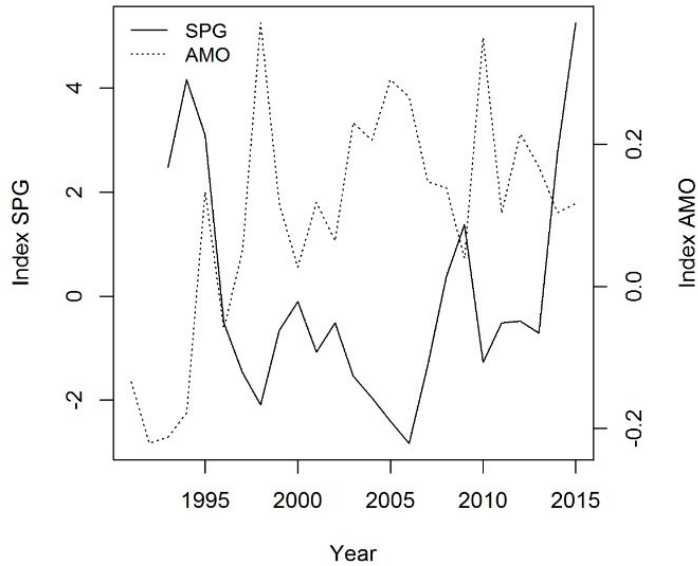
Figure S9: The Subpolar Gyre (SPG) index (solid line) and the Atlantic Multidecadal Oscillation (AMO) index (dashed line) over the study period.

Table S3: Output of Generalized Linear Model: AHOI bottom temperature as function of time (year) including an interaction term between Year (time) and Strata.

AHOI bottom temperature ~ *Year + Year*Strata ~ N(0σ2)*						
	Region North			**Region South**		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
(Intercept)	3.73	3.65 – 3.81	**<0.001**	4.64	4.59 – 4.69	**<0.001**
Year	0.01	0.00 – 0.01	**0.034**	0.02	0.02 – 0.03	**<0.001**
Stratum 800-1000m	-0.94	-1.05 – -0.82	**<0.001**	-0.49	-0.56 – -0.42	**<0.001**
Stratum 1000-1500m	-1.96	-2.07 – -1.84	**<0.001**	-1.57	-1.65 – -1.50	**<0.001**
Year:Stratum 800-1000m	0.00	-0.01 – 0.01	0.649	0.00	-0.00 – 0.01	0.676
Year:Stratum 1000-1500m	0.01	-0.00 – 0.01	0.315	0.00	-0.00 – 0.01	0.232
Observations	54			54		
Cox & Snell's R^2 / Nagelkerke's R^2	0.456 / 0.993			0.347 / 0.996		

Table S4: Output of Generalized Linear Model of species richness as function of time (year) including an interaction term between strata and time (year) and the covariates latitude and longitude.

	Region North			**Region South**		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
(Intercept)	15.42	-3.50 – 34.35	0.110	2.22	-18.20 – 22.65	0.831
Year	-0.02	-0.02 – -0.01	**0.001**	-0.01	-0.03 – 0.00	0.060
Stratum 800-1000m	-0.11	-0.27 – 0.04	0.152	0.36	0.09 – 0.63	**0.008**
Stratum 1000-1500m	-0.43	-0.59 – -0.27	**<0.001**	0.01	-0.20 – 0.23	0.913
Latitude	-0.21	-0.48 – 0.06	0.133	0.08	-0.28 – 0.45	0.655
Longitude	0.02	-0.02 – 0.06	0.276	-0.12	-0.36 – 0.11	0.300
Year:Stratum 800-1000m	-0.00	-0.02 – 0.01	0.634	-0.01	-0.03 – 0.01	0.371
Year:Stratum 1000-1500m	0.02	0.00 – 0.03	**0.027**	0.01	-0.01 – 0.02	0.547
Observations	408			281		
Cox & Snell's R^2 / Nagelkerke's R^2	0.184 / 0.339			0.141 / 0.284		

Table S5: Output of Generalized Linear Model: Total species abundance as function of time (year) including an interaction term between strata and time (year) and the covariates latitude and longitude. Abundance data of region North and -South displayed different distribution and so the gamma- with log-link and the normal distribution was used in the models respectively.

| **Total species abundance** ~ *Year*Strata + Longitude + Latitude ~ gamma(c. λ)/ N(0σ2*						
	Region North			**Region South**		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
(Intercept)	19.21	-9.92 – 48.35	0.197	-45.41	-82.71 – -8.10	**0.018**
Year	-0.02	-0.03 – -0.00	**0.025**	-0.03	-0.05 – -0.01	**0.014**
Stratum 800-1000m	-0.69	-0.94 – -0.43	**<0.001**	1.30	0.78 – 1.82	**<0.001**
Stratum 1000-1500m	-1.03	-1.28 – -0.78	**<0.001**	0.62	0.24 – 1.01	**0.002**
Latitude	-0.24	-0.66 – 0.18	0.258	0.49	-0.18 – 1.16	0.151
Longitude	-0.09	-0.15 – -0.02	**0.006**	0.41	-0.01 – 0.83	0.054
Year:Stratum 800-1000m	0.01	-0.01 – 0.03	0.342	-0.05	-0.10 – -0.01	**0.012**
Year:Stratum 1000-1500m	0.01	-0.01 – 0.03	0.219	-0.02	-0.05 – 0.01	0.131
Observations	408			281		
Cox & Snell's R^2 / Nagelkerke's R^2	0.121 / 0.415			0.129 / 0.357		
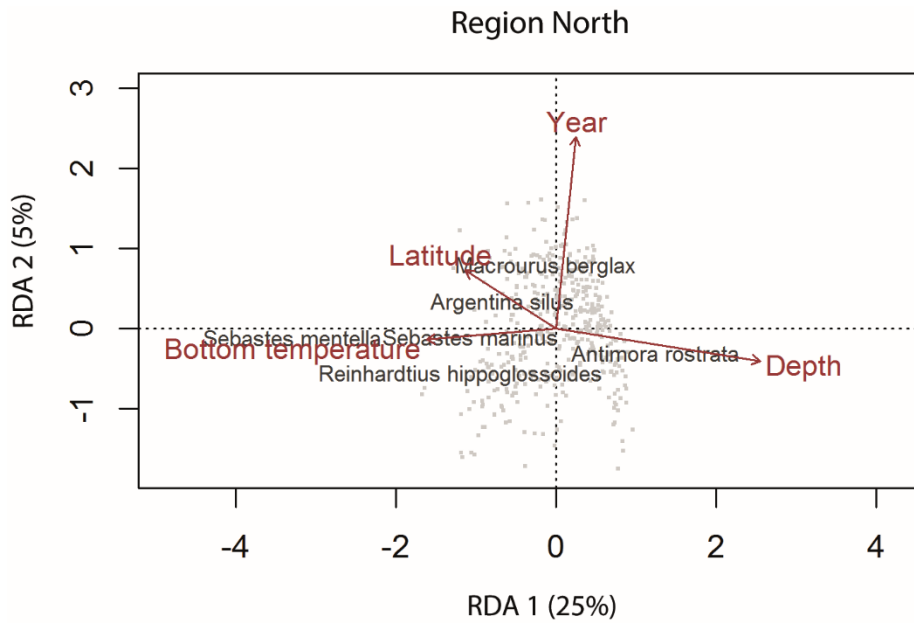
Figure S10: Redundancy analysis (RDA) triplot showing the samples (grey dots), species (black labels) and explanatory variables (red labels) of region North.
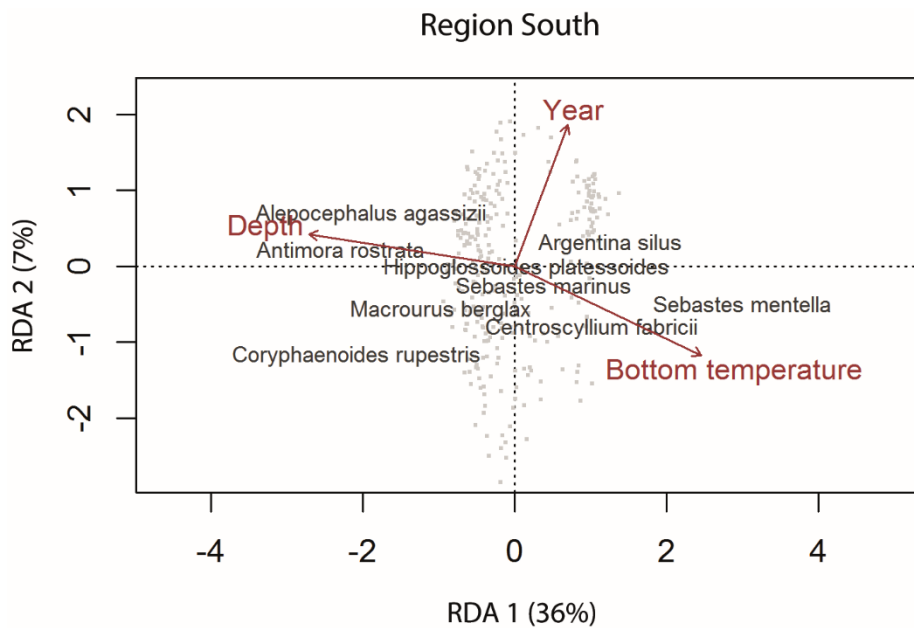

Figure S11: Redundancy analysis (RDA) triplot showing the samples (grey dots), species (black labels) and explanatory variables (red labels) of region South.
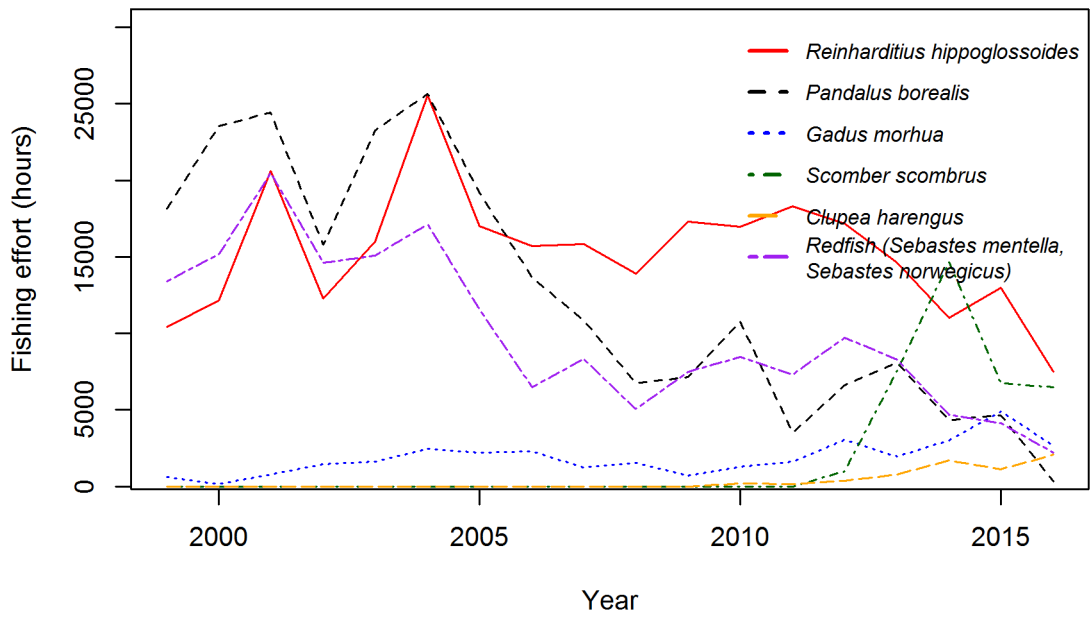
Figure S12: Fishing effort (hours) of commercial species in ICES area 14b.