APPENDIX

Optical observations and spatio-temporal projections of gelatinous zooplankton in the Fram Strait, a gateway to a changing Arctic Ocean

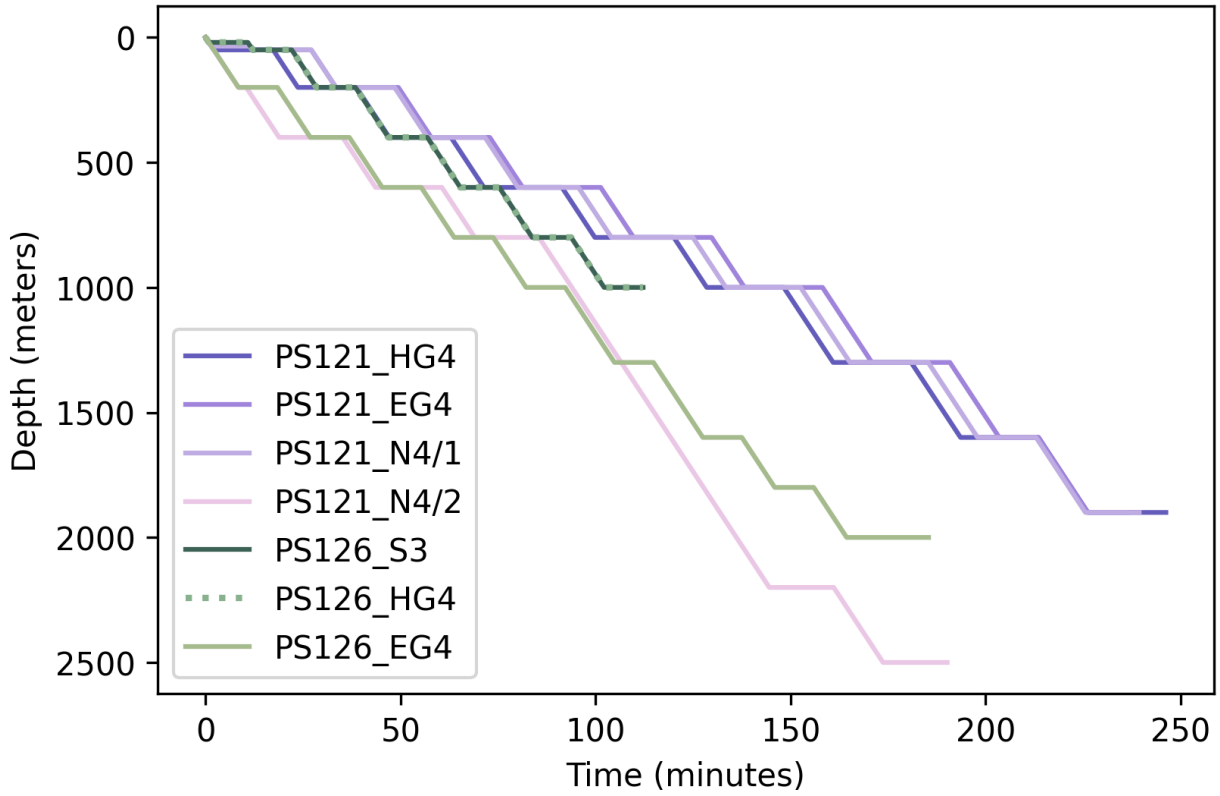
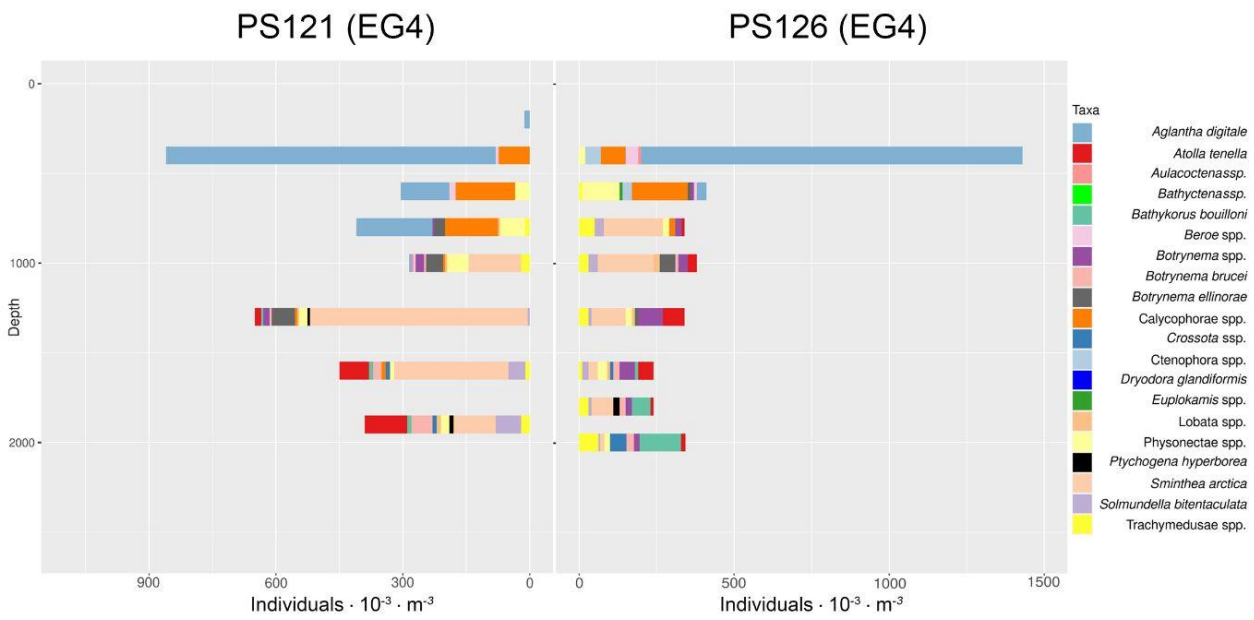
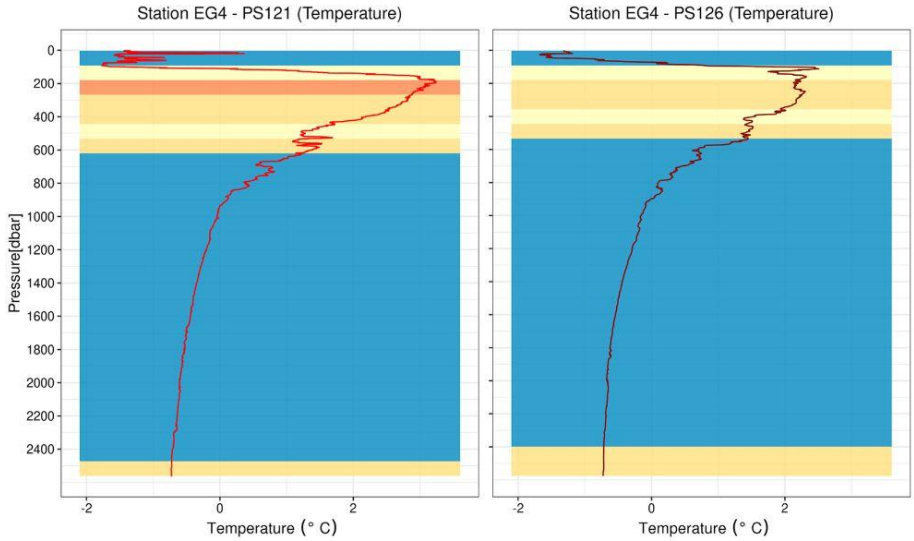
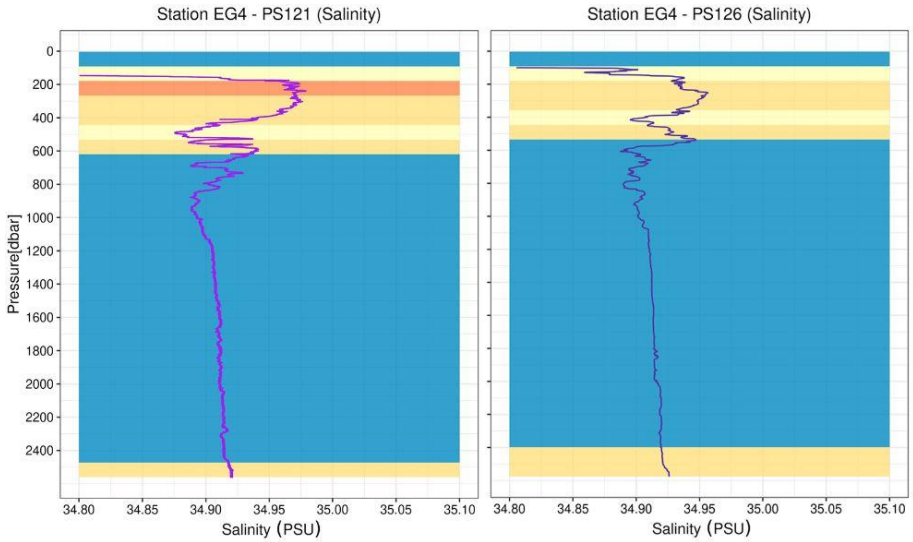


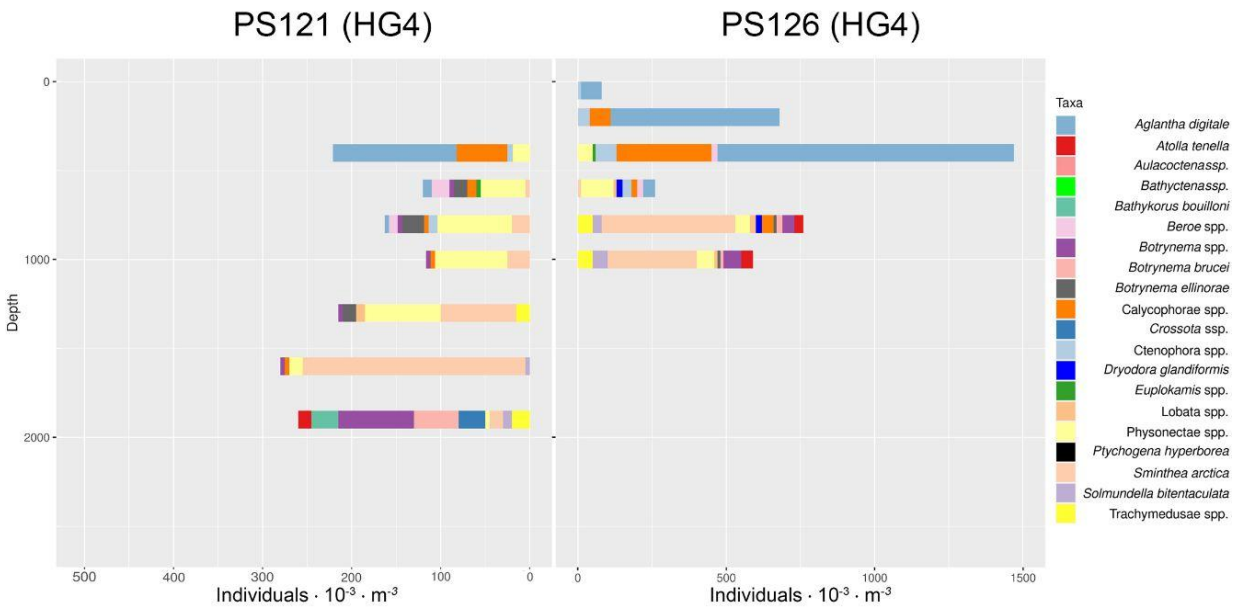
Figure S1. PELAGIOS transects at stations PS121 (HG4/2), PS121 (EG4), PS121 (N4/1), PS121 (N4/2), PS126 (S3), PS126 (HG4), PS126 (EG4). Only the horizontal sections were selected for analysis.

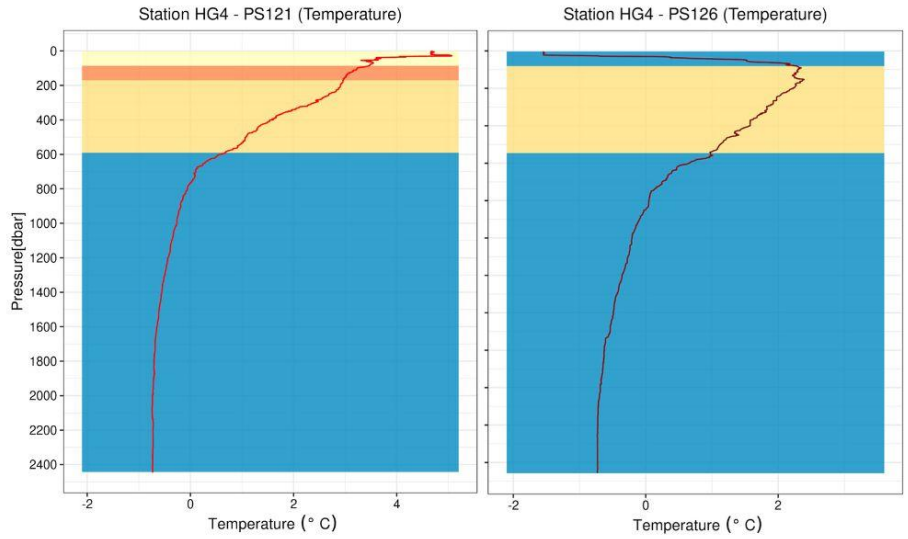


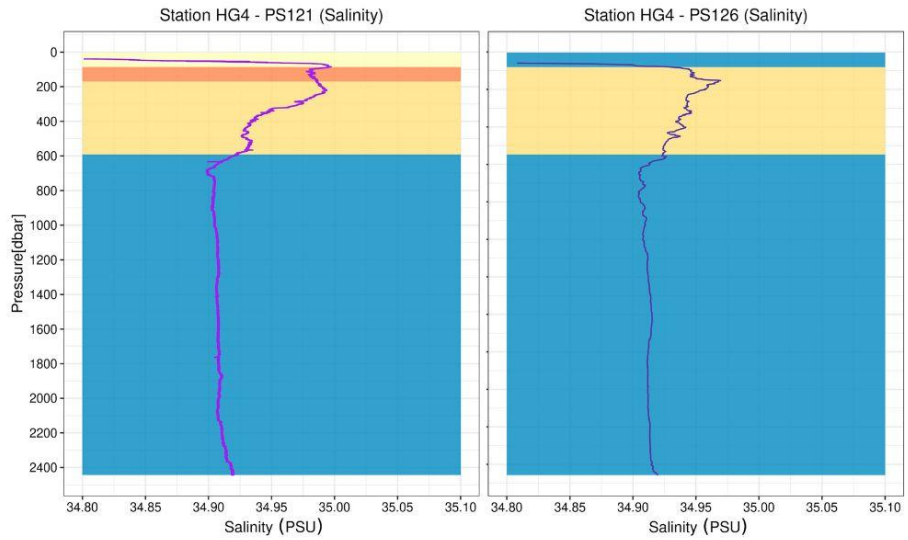




	Temperature (°C)	Salinity (PSU)
Polar Surface Water	> 1	< 34.00
Atlantic Water	> 3	> 34.92
Transformed Atlantic Water	< 3	> 34.92
Intermediate Water	> 1	34.00 - 34.92
Arctic Water	< 1	< 34.92

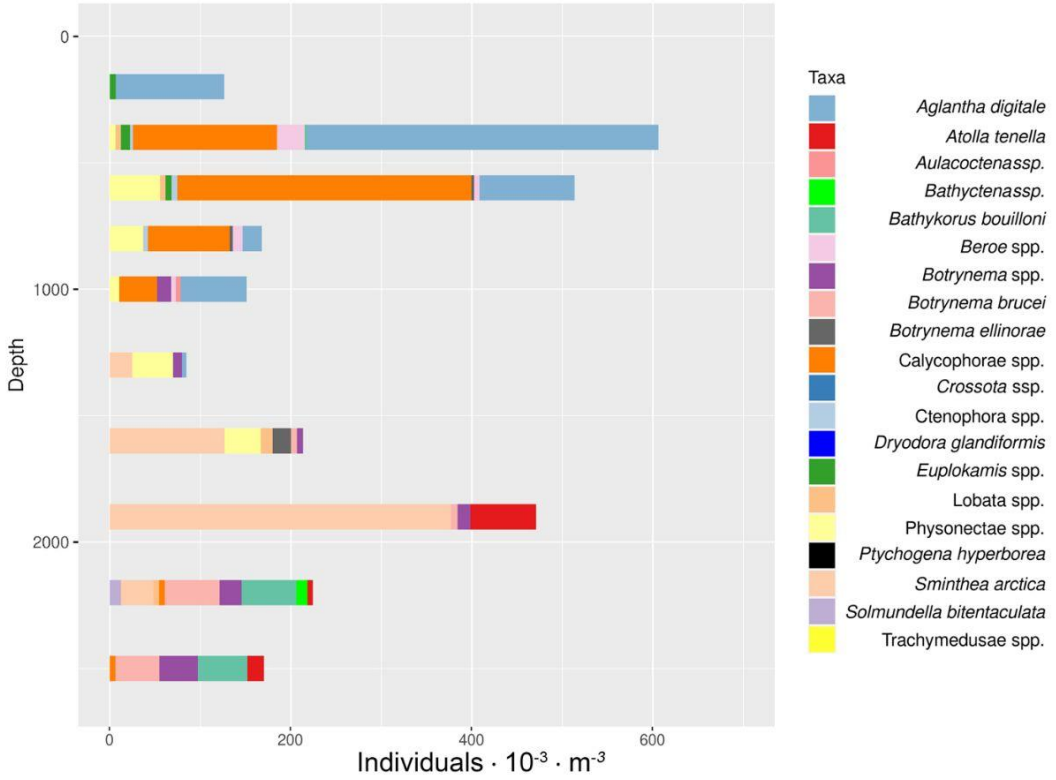


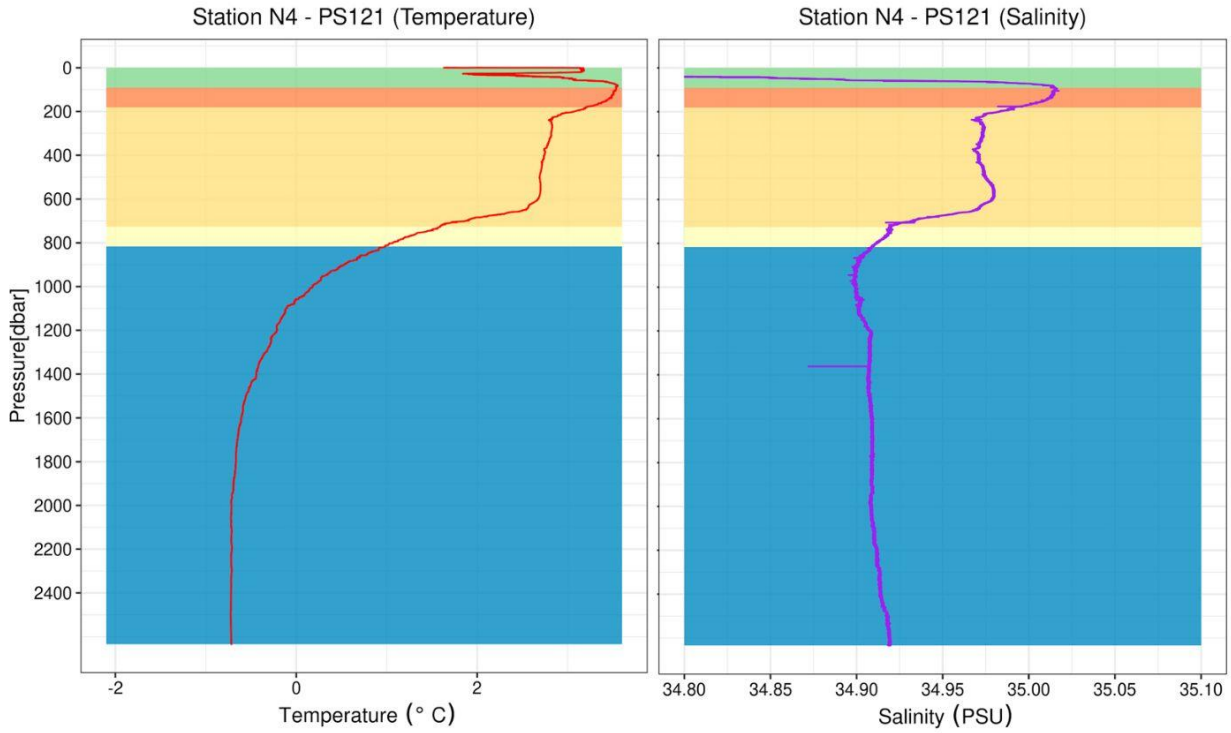




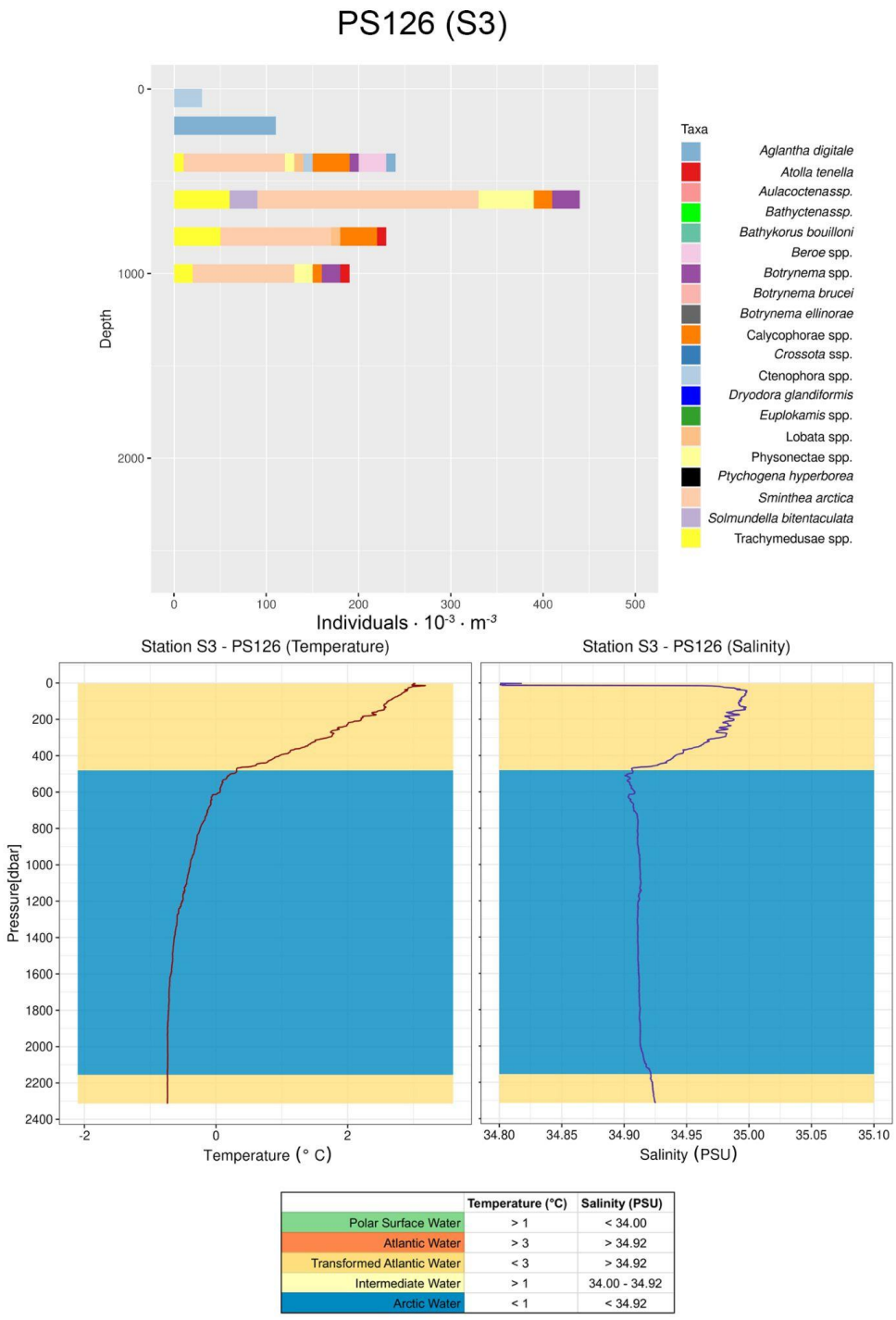
	Temperature (°C)	Salinity (PSU)
Polar Surface Water	> 1	< 34.00
Atlantic Water	> 3	> 34.92
Transformed Atlantic Water	< 3	> 34.92
Intermediate Water	> 1	34.00 - 34.92
Arctic Water	< 1	< 34.92

PS121 (N4)





	Temperature (°C)	Salinity (PSU)
Polar Surface Water	> 1	< 34.00
Atlantic Water	> 3	> 34.92
Transformed Atlantic Water	< 3	> 34.92
Intermediate Water	> 1	34.00 - 34.92
Arctic Water	< 1	< 34.92



	Temperature (°C)	Salinity (PSU)
Polar Surface Water	> 1	< 34.00
Atlantic Water	> 3	> 34.92
Transformed Atlantic Water	< 3	> 34.92
Intermediate Water	> 1	34.00 - 34.92
Arctic Water	< 1	< 34.92

Figure S2. Vertical distribution of faunal groups encountered with PELAGIOS and hydrographic profiles of the sampled stations. The water masses are grouped according to Beszczynska-Moller *et al.*, 2011, Walczowski *et al.*, 2012 and Mańko *et al.*, 2020.

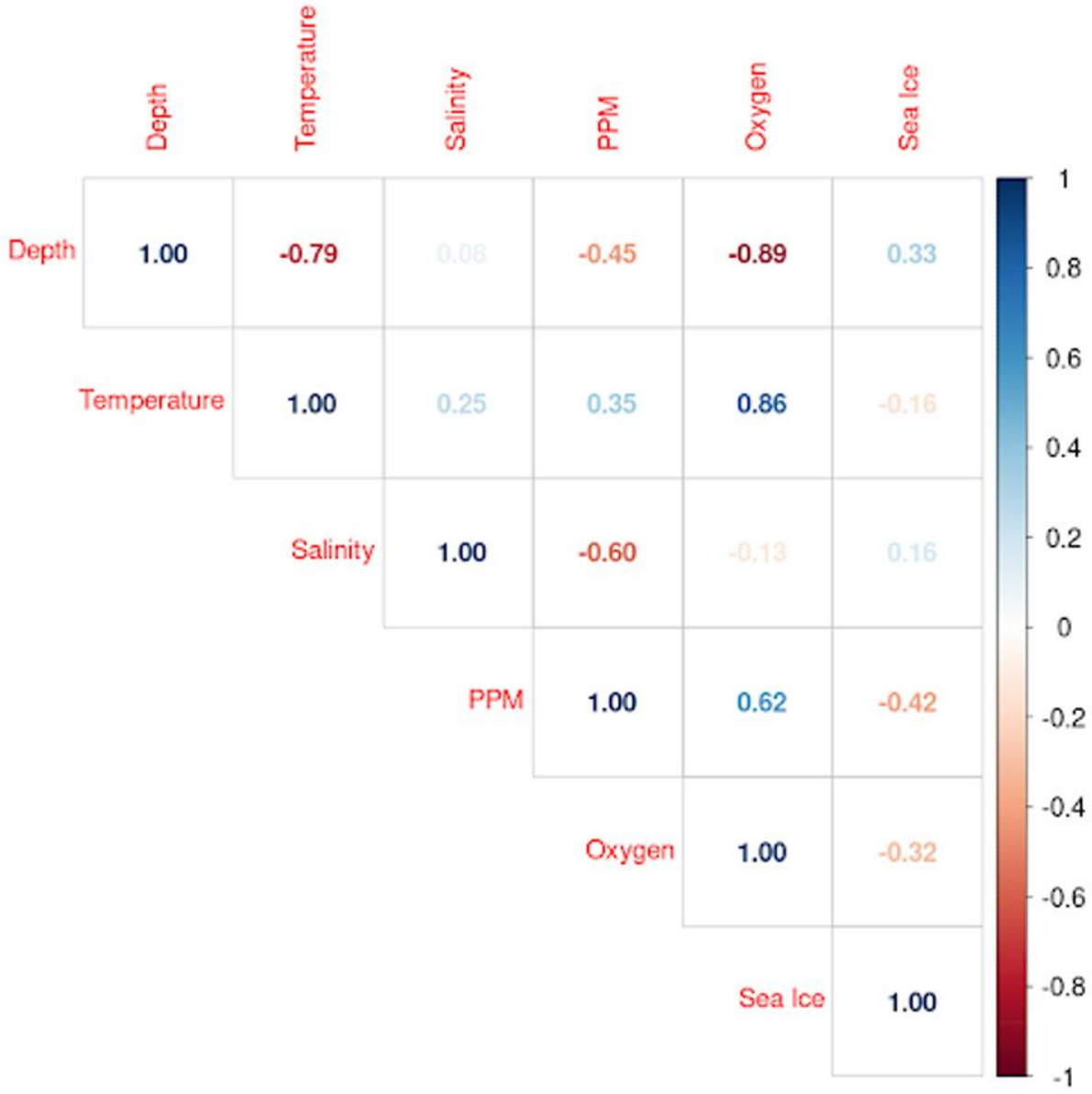


Figure S3. Pearson's correlation between environmental predictors

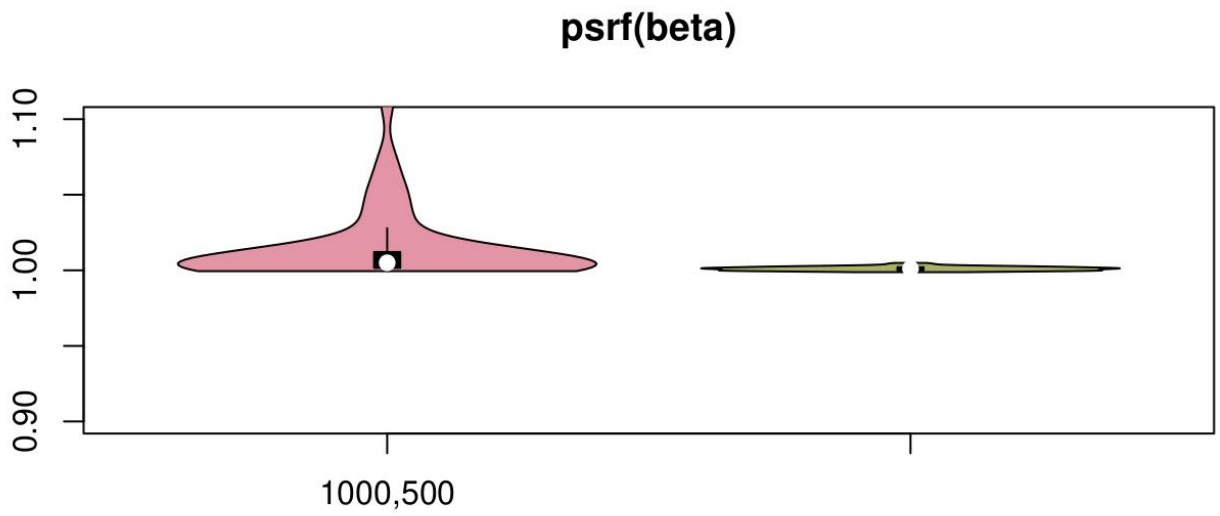


Figure S4. MCMC convergence diagnostics. A violin plots represents the potential scale reduction factors (β-parameter) of MCMC for poisson (left) and probit (right) models.

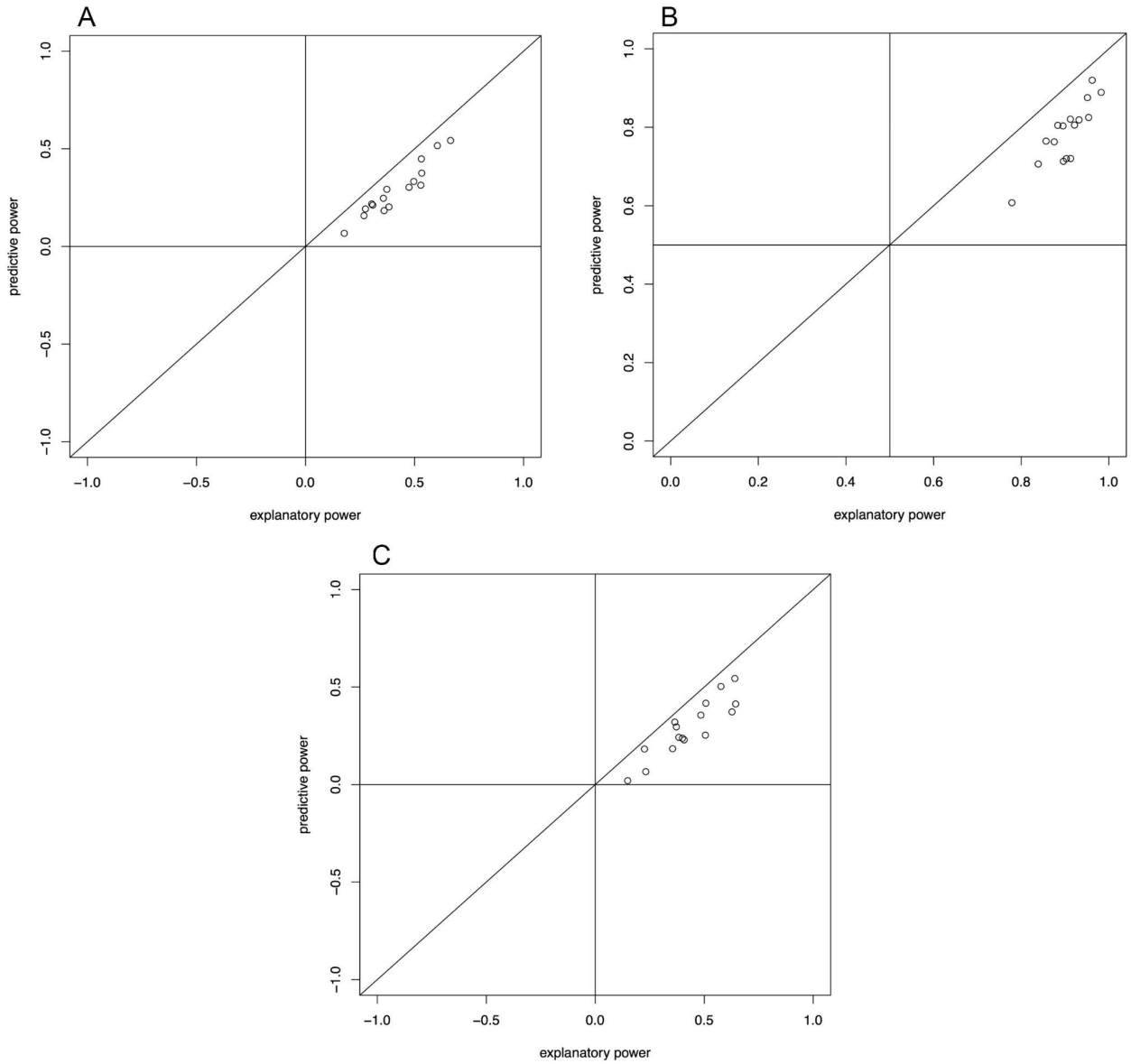


Figure S5. Explanatory and predictive power of probit model evaluated by TJuR2 (a), and AUC (b). Poisson model evaluated by pseudo-R2 (c).

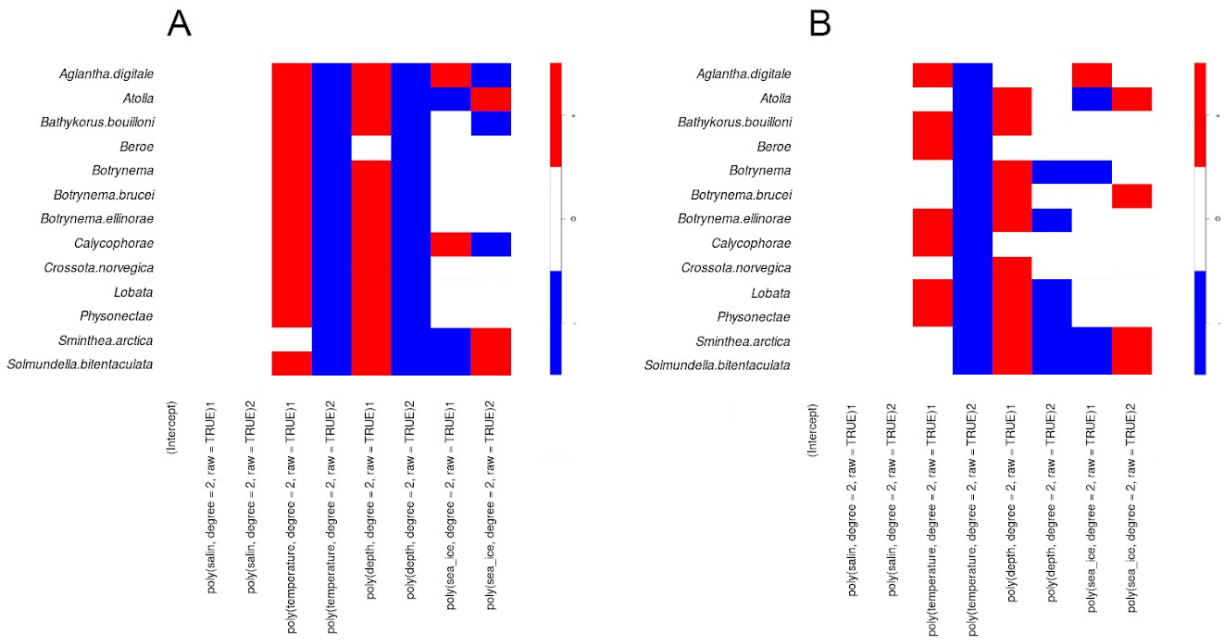


Figure S6. The responses of the species to environmental covariates. Panel (a) shows the results for the Poisson model and panel (b) for the presence-absence model. In both panels, responses that are positive with at least 95% posterior probability are shown in red, responses that are negative with at least 95% posterior probability are shown by blue, and responses that did not gain strong statistical support are shown in white.

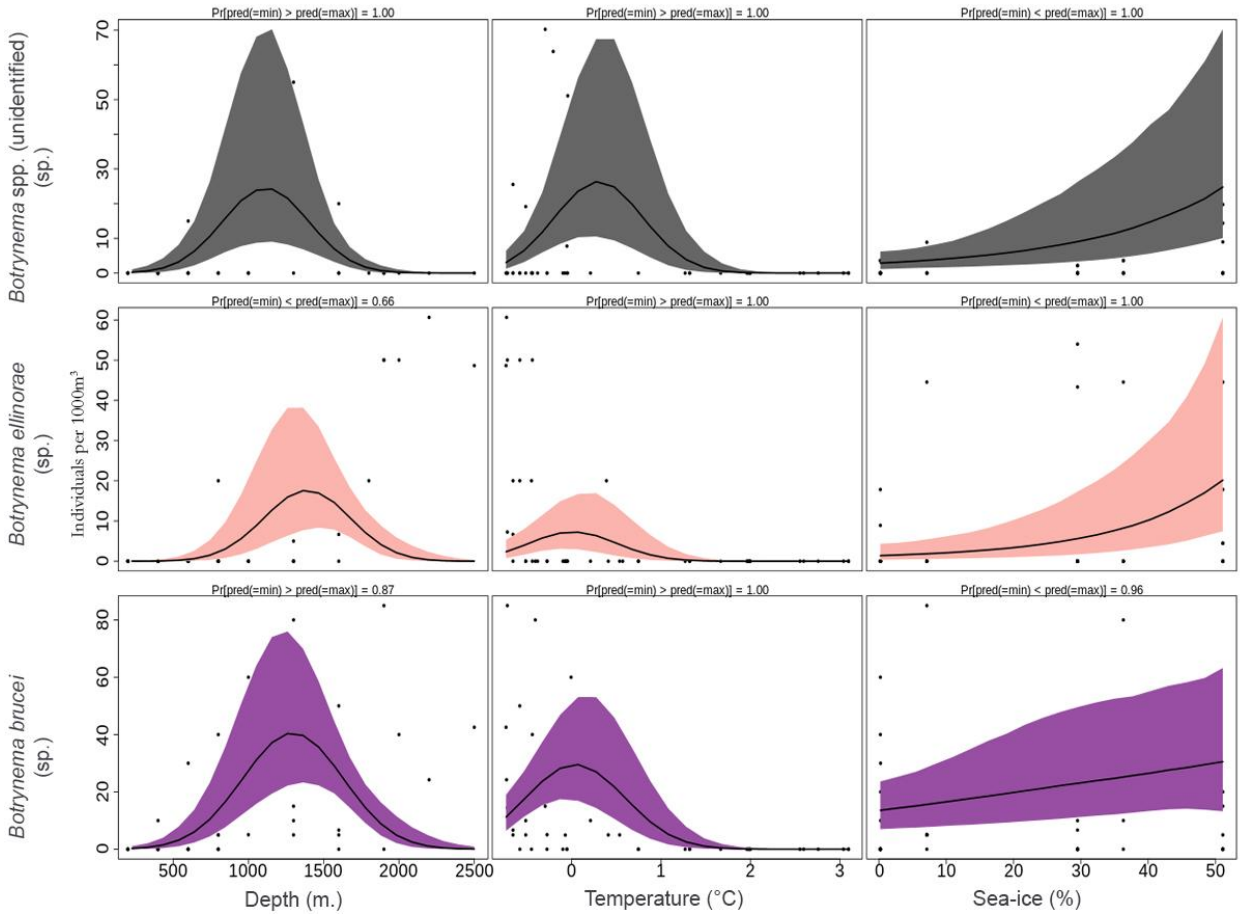


Figure S7 (a). Predicted gradients of total count (Poisson model) of the *Botrynema* genus.

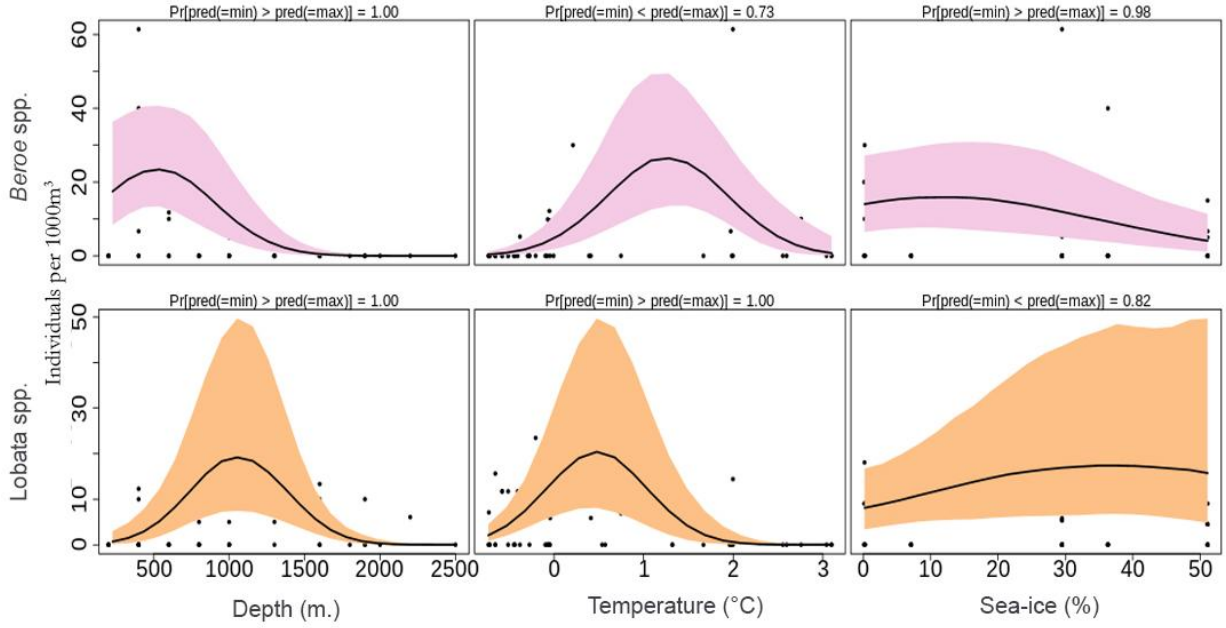


Figure S7 (b). Predicted gradients of total count (Poisson model) of the Ctenophora phylum.

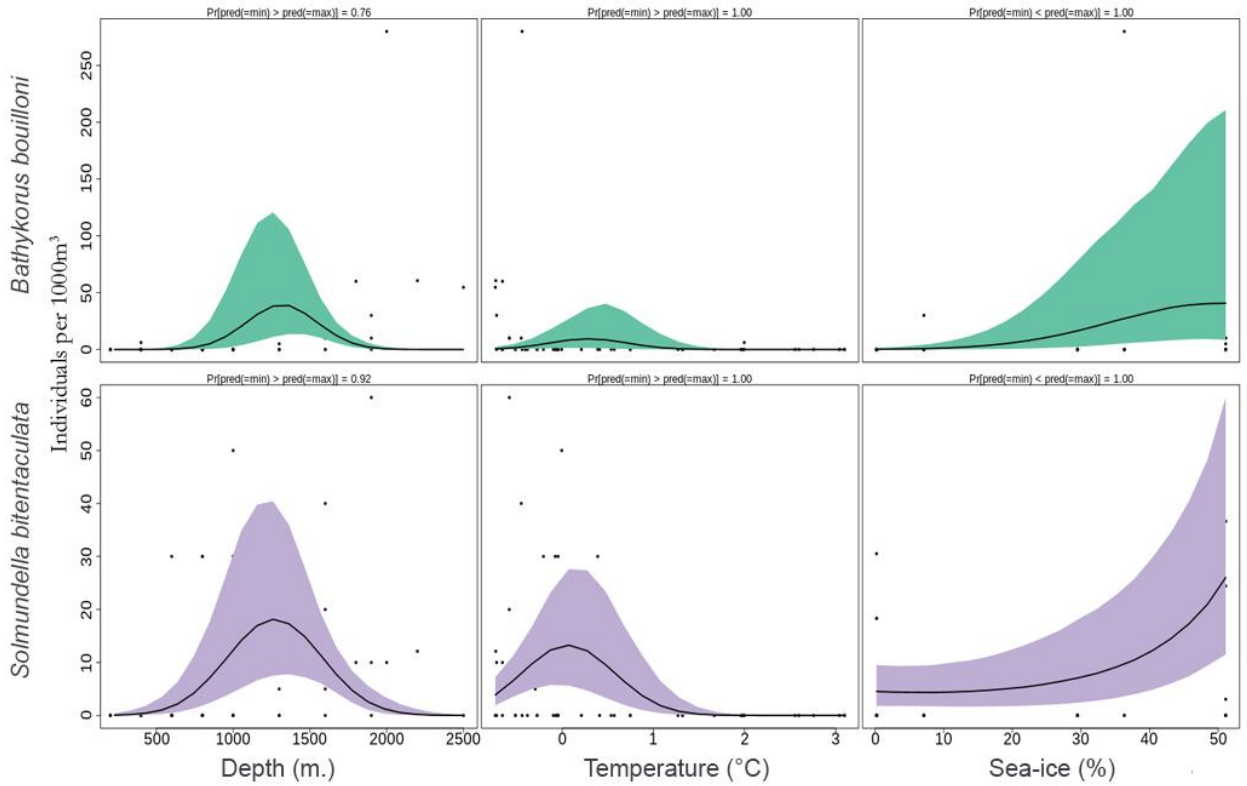


Figure S7 (c). Predicted gradients of total count (Poisson model) of the Aeginidae family.

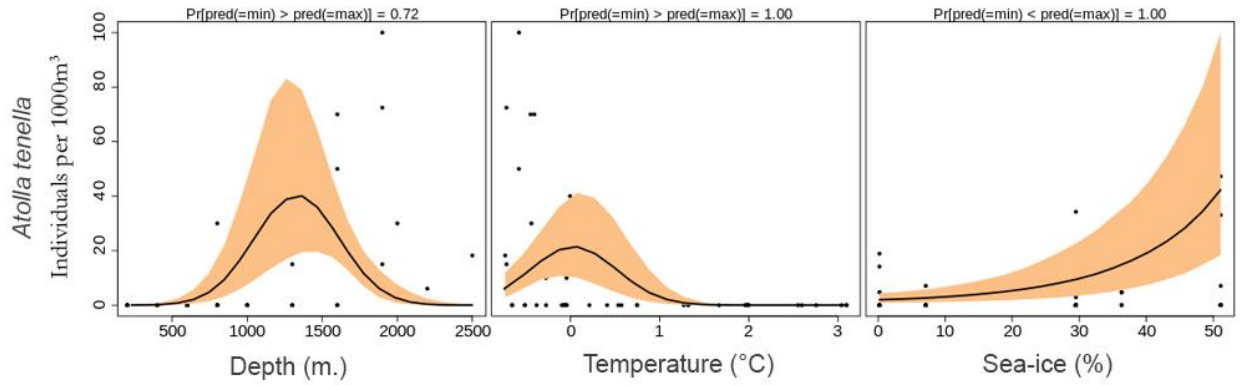


Figure S7 (d). Predicted gradients of total count (Poisson model) of *Atolla tenella.*

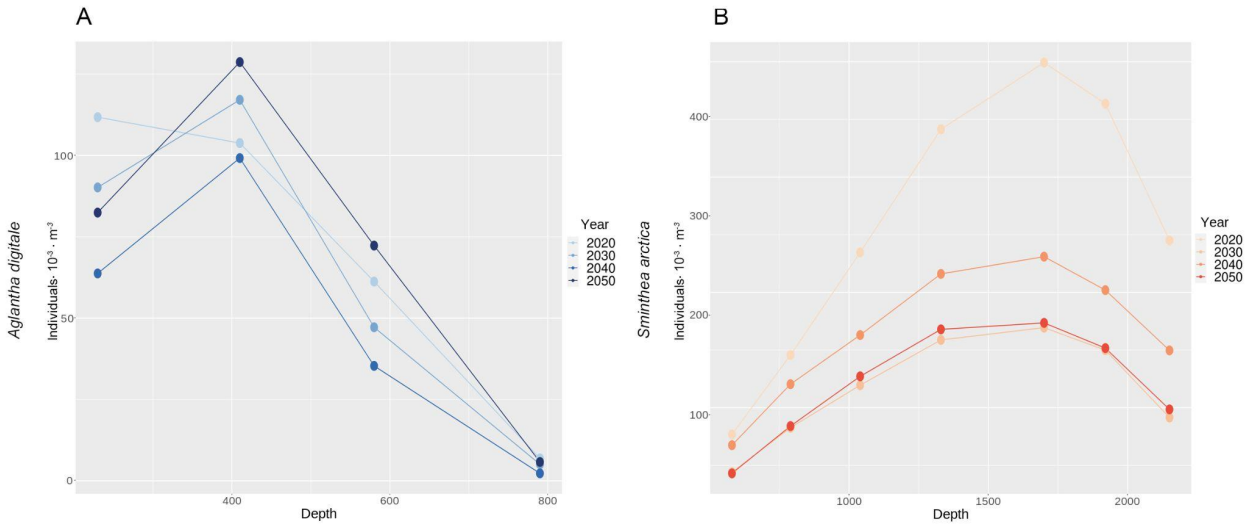
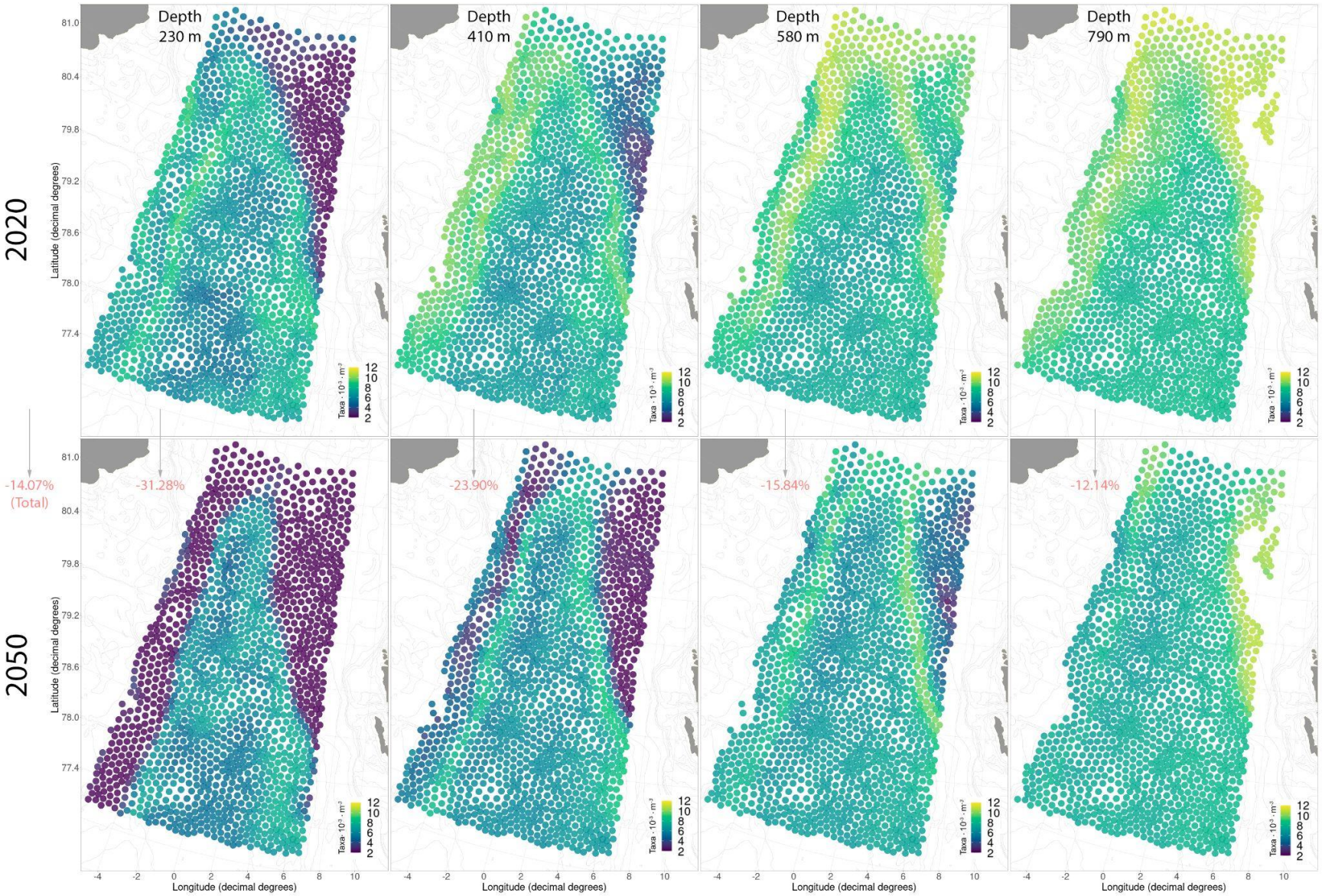
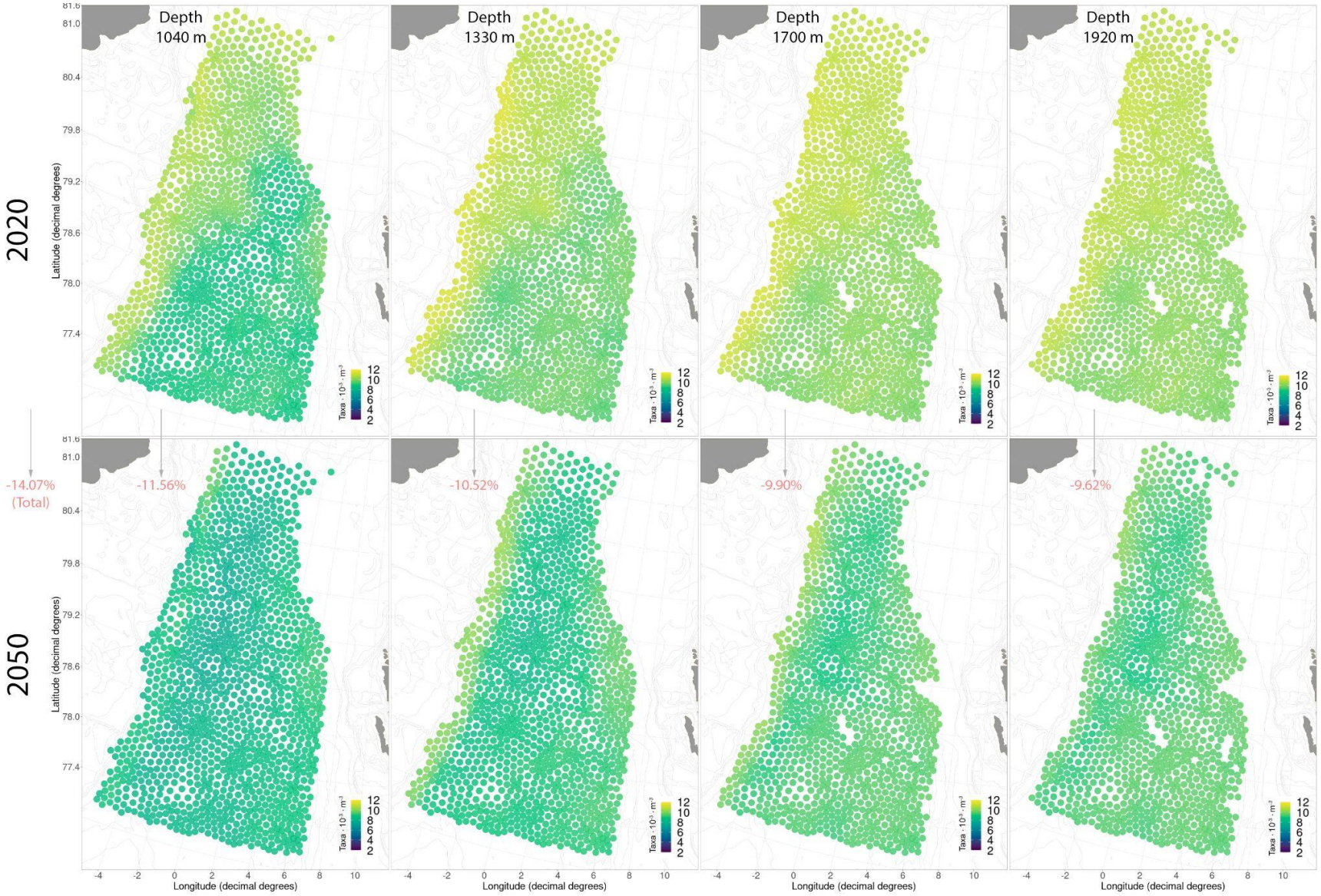


Figure S8. Current and future abundance (summer season) values of *Aglantha digitale* (a) and *Sminthea arctica* (b) at different depth layers. The abundance values were calculated as the mean for each depth layer.


2020
2050
Depth
230 m
Depth
410 m
Depth
580 m
Depth
790 m
-14.07%
(Total)
-31.28%
-23.90%
-15.84%
-12.14%
Latitude (decimal degrees)
Longitude (decimal degrees)
81.0
80.4
79.8
79.2
78.6
78.0
77.4
-4
-2
0
2
4
6
8
10
Taxa · 10⁻³ · m⁻²
12
10
8
6
4
2


2020
2050
Depth
1040 m
Depth
1330 m
Depth
1700 m
Depth
1920 m
-14.07%
(Total)
-11.56%
-10.52%
-9.90%
-9.62%
Latitude (decimal degrees)
Longitude (decimal degrees)
Taxa · 10⁻³ · m⁻³
12
10
8
6
4
2

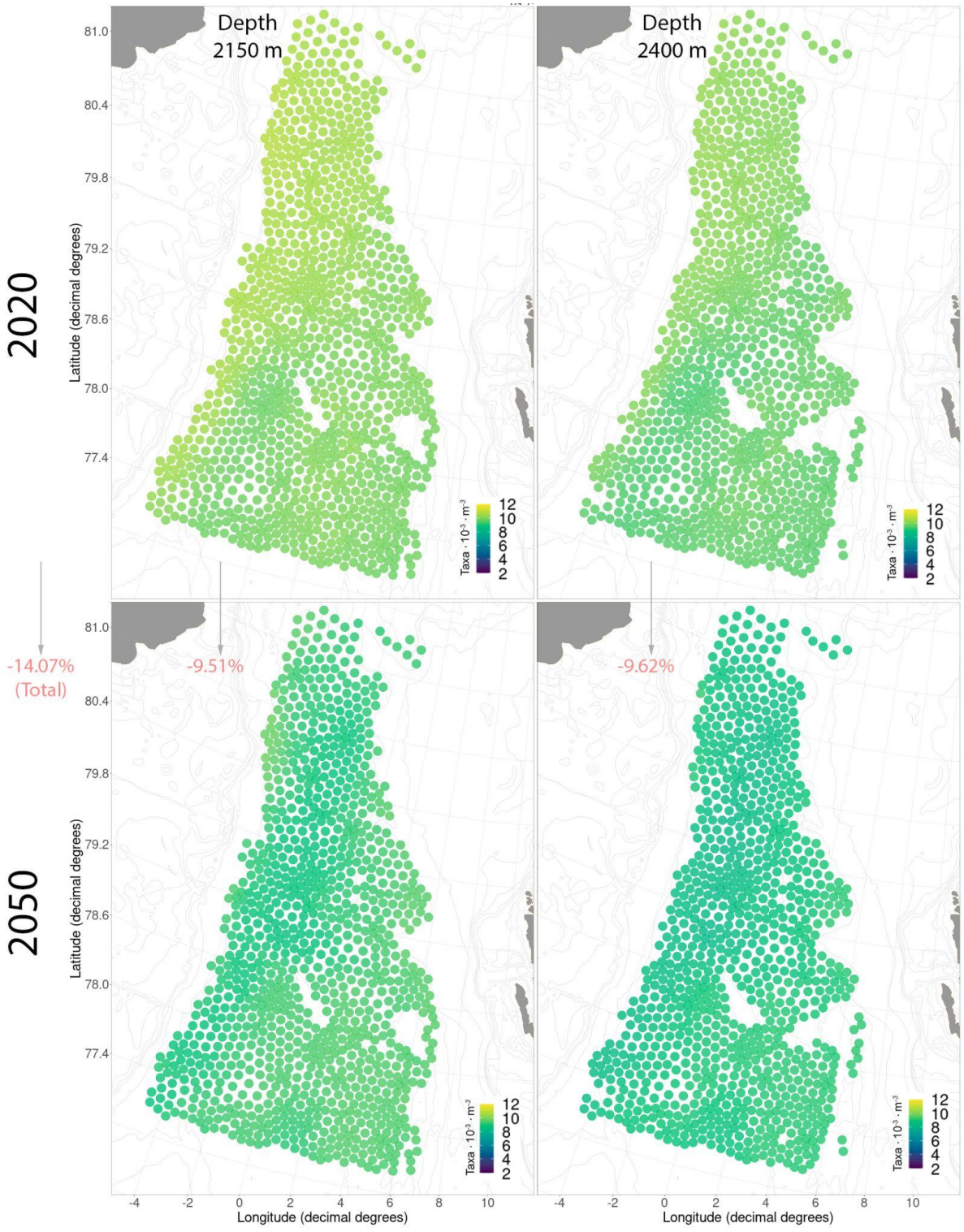


Figure S9. Current and future taxa richness in the studied region. The red values in parentheses give a comparative measure of the retreat/increase in richness of the selected taxa (summer season of 2050 compared to 2020).

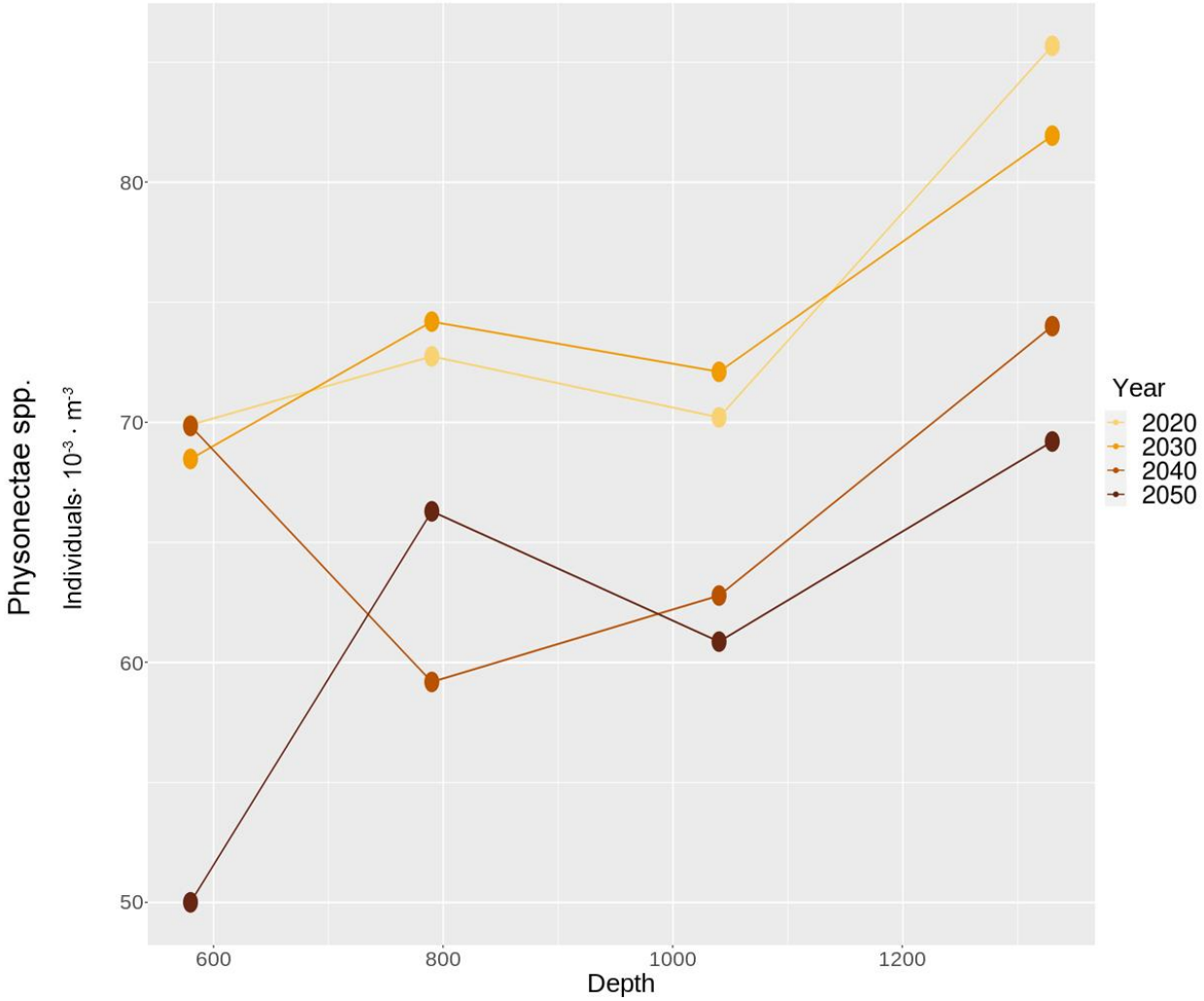


Figure S10. Current and future abundance values of Physonectae at different depth layers. The abundance values were calculated as the mean for each depth layer.

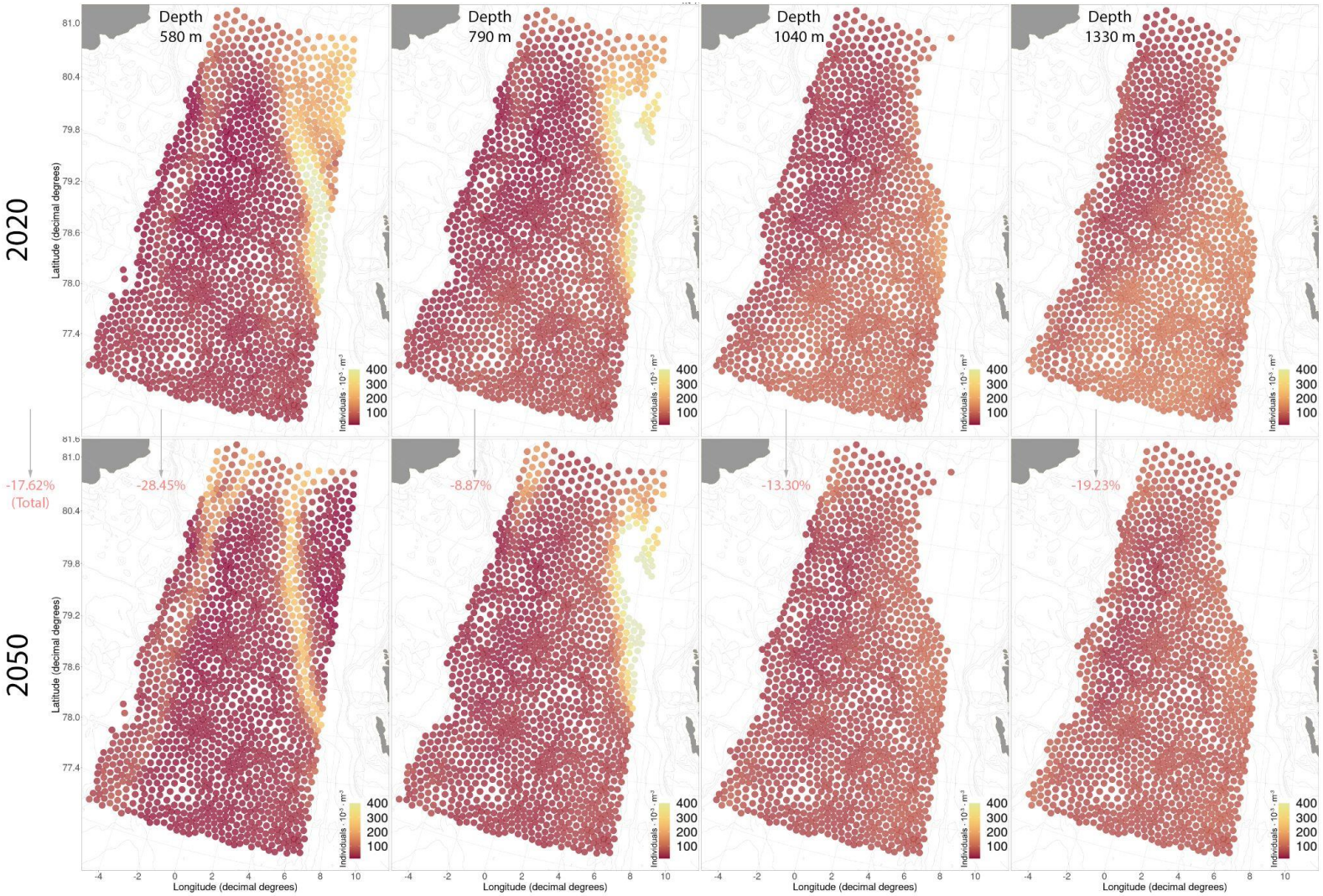


Figure S11. Current and future distributions of the suborder Physonectae in the studied region. The red values in parentheses give a comparative measure of the retreat/increase in abundance of the selected taxa (summer season of 2050 compared to 2020).

References

Beszczynska-Möller, A., Woodgate, R.A., Lee, C., Melling, H. and Karcher, M. (2011). A synthesis of exchanges through the main oceanic gateways to the Arctic Ocean. *Oceanography*, 24(3), 82-99.

Mańko, M.K., Gluchowska, M. and Weydmann-Zwolicka, A. (2020). Footprints of Atlantification in the vertical distribution and diversity of gelatinous zooplankton in the Fram Strait (Arctic Ocean). *Prog. Oceanogr.*, 189, 102414.

Walczowski, W., Piechura, J., Goszczko, I., & Wieczorek, P. (2012). Changes in Atlantic water properties: an important factor in the European Arctic marine climate. ICES Journal of Marine Science, 69(5), 864-869