Table S1. Overview of marine ecosystem models included in the ensemble projections (modified from Tittensor et al. 2018 and Bryndum-Buchholz et al. 2018). NPP: Net primary production. SST: Sea surface temperature.

Fish-MIP model	**Model description**	**Key ecological processes**	**Spatial and temporal scale for Fish-MIP simulations**	**Vertical resolution**	**Taxonomic scope**	**Key reference**
BiOeconomic mArine Trophic Size-spectrum (BOATS)	Size-structured model. Combines marine biogeochemistry with size-based trophic theory and metabolic constraints to calculate the production of commercially-harvested fish across multiple size spectra.	Applies empirical parameterizations to describe phytoplankton community structure, trophic transfer of primary production from phytoplankton to fish, fish growth rates, and natural mortality of fish. No direct/passive movement of fish, larvae or eggs between grid cells.	1˚ x 1˚ grid Monthly mean timestep	None (2-dimensional domain). NPP is vertically-integrated through the water column. Temperature changes with SST.	3 size groups (small, medium, large) defined by their asymptotic mass, representing all commercial fish.	Carozza et al. (2016)
Macroecological Model	Static size-structured model. Uses minimal input parameters together with ecological and metabolic scaling theory to calculate mean size composition and abundance of marine animals.	Simple characterization of marine ecosystems in terms of body mass distribution and marine animal abundance based on estimates of predator-prey mass ratios, transfer efficiency and changing metabolic demands with body mass and temperature.	1˚ x 1˚ grid Annual mean timestep	Single vertical layer (surface integrated).	180 body mass classes. Species are not resolved.	Jennings and Collingridge (2015)

		Animal movement is not included.				
Dynamic Pelagic Benthic Model (DPBM)	Dynamic size-and trait based model. Incorporates size-spectra of two functional groups - a pelagic predator and benthic detritivore.	Individual processes of predation, food-dependent growth, natural mortality, and reproduction give rise to emergent size spectra for each functional group.	1˚ x 1˚ grid Monthly mean timestep	2 vertical layers (sea surface and sea floor). No vertical transport/ movement.	1 pelagic predator and 1 benthic detritivore size spectrum, with 100 size classes each.	Blanchard et al. (2012)
Dynamic Bioclimate Envelope Model (DBEM)	Species distribution model based on bioclimatic envelopes defined for each species. Simulates changes in species abundance and carrying capacity under environmental change. Carrying capacity is a function of the environment and species' habitat preferences.	Population dynamics are dependent of habitat suitability and movement of adult species driven by a gradient of habitat suitability and population density. Larval dispersal is driven by currents and temperature. Growth, reproduction, and natural mortality are dependent on oxygen, pH, and temperature.	0.5˚ x 0.5˚ grid Annual mean ocean conditions	Vertical layers (sea surface and bottom) defined by species niche preferences.	892 commercial fish and invertebrate species.	Cheung et al. (2010)
EcoOcean	Trophodynamic model, based on species interactions and energy transfer across trophic levels. Ecosim-with-Ecopath (EwE) framework designed to evaluate the impacts of fisheries and	Combines a food web model (Ecopath; mass-balance component; input: biomass, production/biomass ratio, consumption/biomass ratio, diet composition, catches), a temporal	1˚ x 1˚ grid Monthly mean timestep	Vertical layers defined by food web interactions and habitat preference patterns. Vertical movement and	51 trophic biomass groups; including all trophic level and taxonomic groups (marine mammals, birds, fish, invertebrates,	Christensen et al. (2015)

	climate change on marine resources and ecosystems.	dynamic predator-prey component (Ecosim), and a spatio-temporal dynamic component (Ecospace; grid cell specific habitat attributes i.e. pH, water depth, temperature, and bottom type).		transportation considered through trophic links and the generation and consumption of dead organic matter linking pelagic organisms to demersal and benthic organisms.	primary producers and bacteria)	
Apex Predators ECOSystem Model (APECOSM)	Composite (hybrid) model. 3D dynamic energy budget Eulerian model of size-structured marine populations and communities, based on individual environmentally driven bio-energetics, trophic interactions and behaviors, that are upscaled to populations and communities.	Size-based predation, food- and temperature-driven growth, reproduction and senescence. Includes environmental impacts on vertical and horizontal movements and schooling.	1˚ x 1˚ grid Monthly mean timestep	3D explicit vertical movement considered.	Explicit size-based communities including 3 communities (epipelagic, migratory, mesopelagic); 95 species length classes and 100 size classes	Maury (2010)

Table S2: Summary of weighted log-linear regressions of mean projected biomass changes under two contrasting emissions scenarios (RCP2.6, RCP8.5) and mean fisheries landings for (A) 1990s, (B) 1980s, and (C) 2000s across NAFO divisions. Note that the Estimate refers to the estimate of the slope of the linear model.

A	Estimate	Std. Error	Adj. R^2	Pr(>|t|)
RCP2.6 2030s biomass changes				
NAFO landings 1990s	-6.650	1.755	0.3337	<0.001
RCP8.5 2030s biomass changes				
NAFO landings 1990s	-7.334	1.814	0.3623	<0.001
RCP2.6 2090s biomass changes				
NAFO landings 1990s	-7.003	2.297	0.235	0.005
RCP8.5 2090s biomass changes				
NAFO landings 1990s	-15.951	3.952	0.3616	<0.001
B Sensitivity analysis	Estimate	Std. Error	Adj. R^2	Pr(>|t|)
RCP2.6 2030s biomass changes				
NAFO landings 1980s	-7.044	1.580	0.4114	<0.001
RCP8.5 2030s biomass changes				
NAFO landings 1980s	-7.778	1.628	0.447	<0.001
RCP2.6 2090s biomass changes				
NAFO landings 1980s	-7.781	1.872	0.376	<0.001
RCP8.5 2090s biomass changes				
NAFO landings 1980s	-16.499	3.477	0.4434	<0.001
C Sensitivity analysis	Estimate	Std. Error	Adj. R^2	Pr(>|t|)
RCP2.6 2030s biomass changes				
NAFO landings 2000s	-7.538	2.492	0.2319	0.005
RCP8.5 2030s biomass changes				
NAFO landings 2000s	-8.079	2.618	0.2399	0.004
RCP2.6 2090s biomass changes				
NAFO landings 2000s	-6.552	3.270	0.1005	0.05
RCP8.5 2090s biomass changes				
NAFO landings 2000s	-17.292	5.889	0.2201	0.006

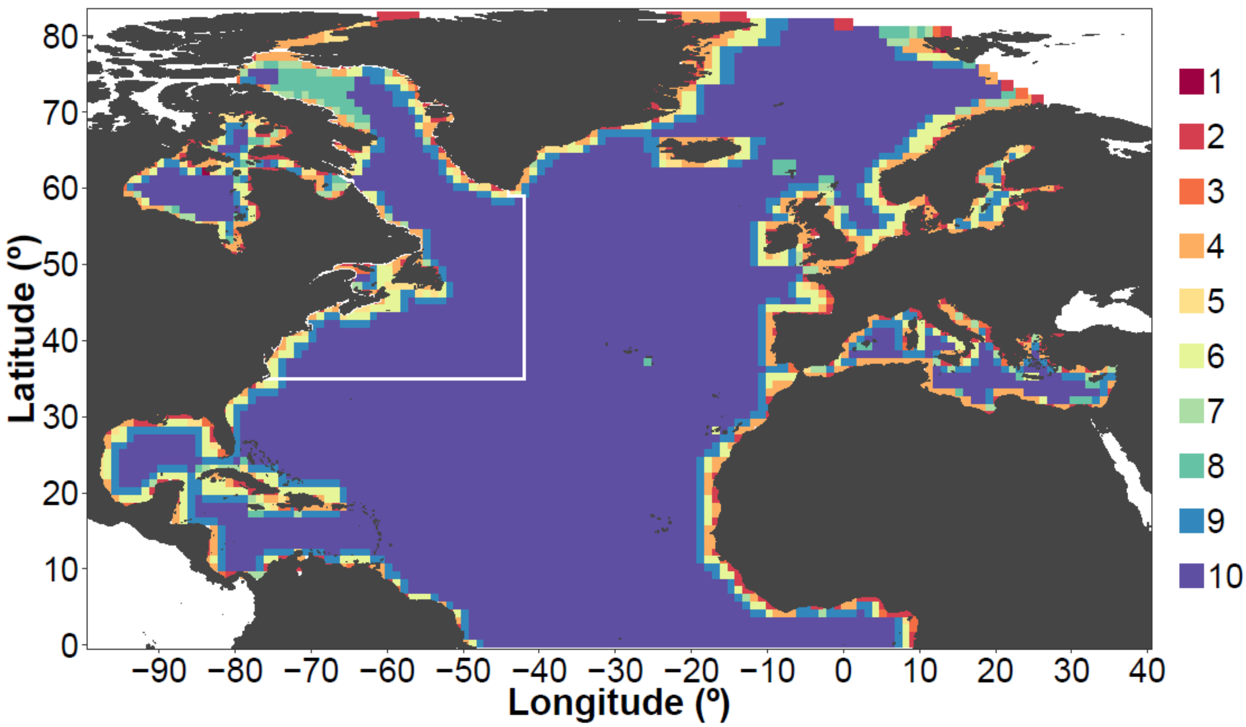

Fig. S1. Model coverage per 1˚ x 1˚ grid cell in the North Atlantic Ocean. Colour codes and numbers represent the number of marine ecosystem model-Earth system model combinations per grid cell. White outline denotes the NAFO convention area.

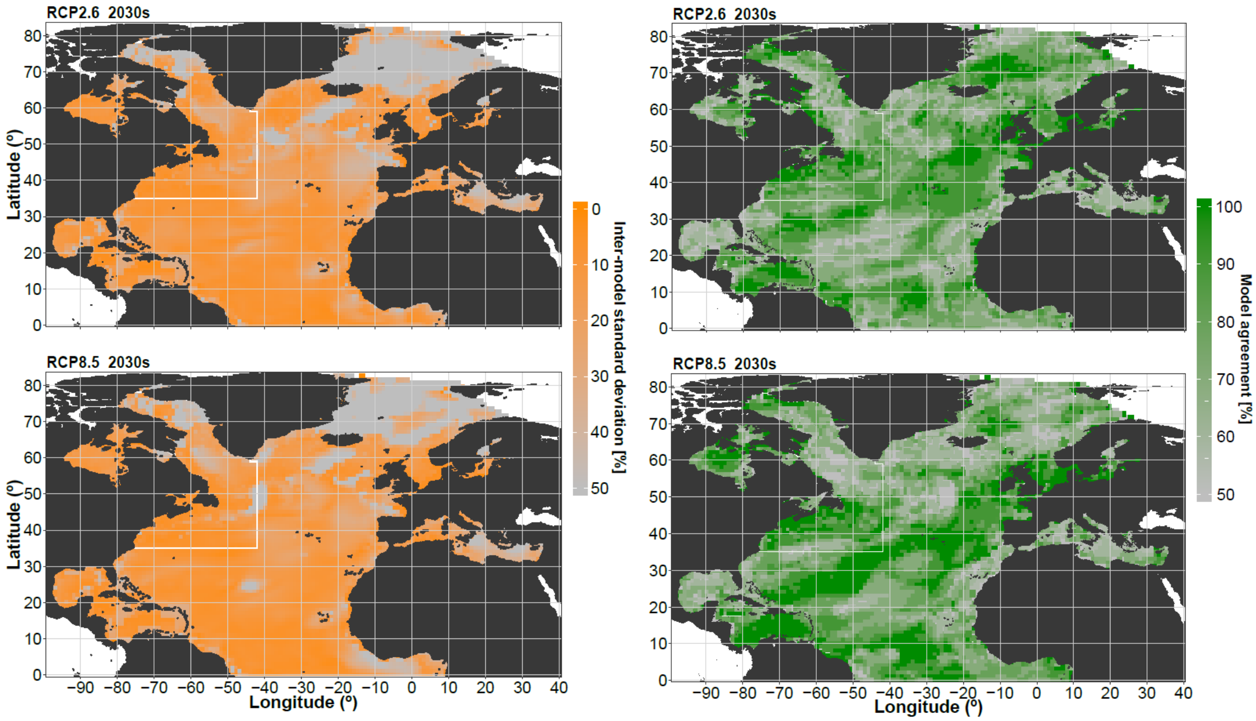

Fig. S2 Spatial patterns of model variability (left) and model agreement (right) in ensemble projections for RCP2.6 and RCP8.5 in the North Atlantic Ocean. Model variability is represented as the inter-model standard deviation of the projected ensemble mean biomass changes (expressed as % change) in the 2030s relative to the 1990s, while model agreement denotes the percent of models agreeing on the direction of change. White outline: NAFO convention area. Country shapefile retrieved from https://www.naturalearthdata.com. NAFO convention area shapefile modified from https://www.nafo.int/Data/GIS.

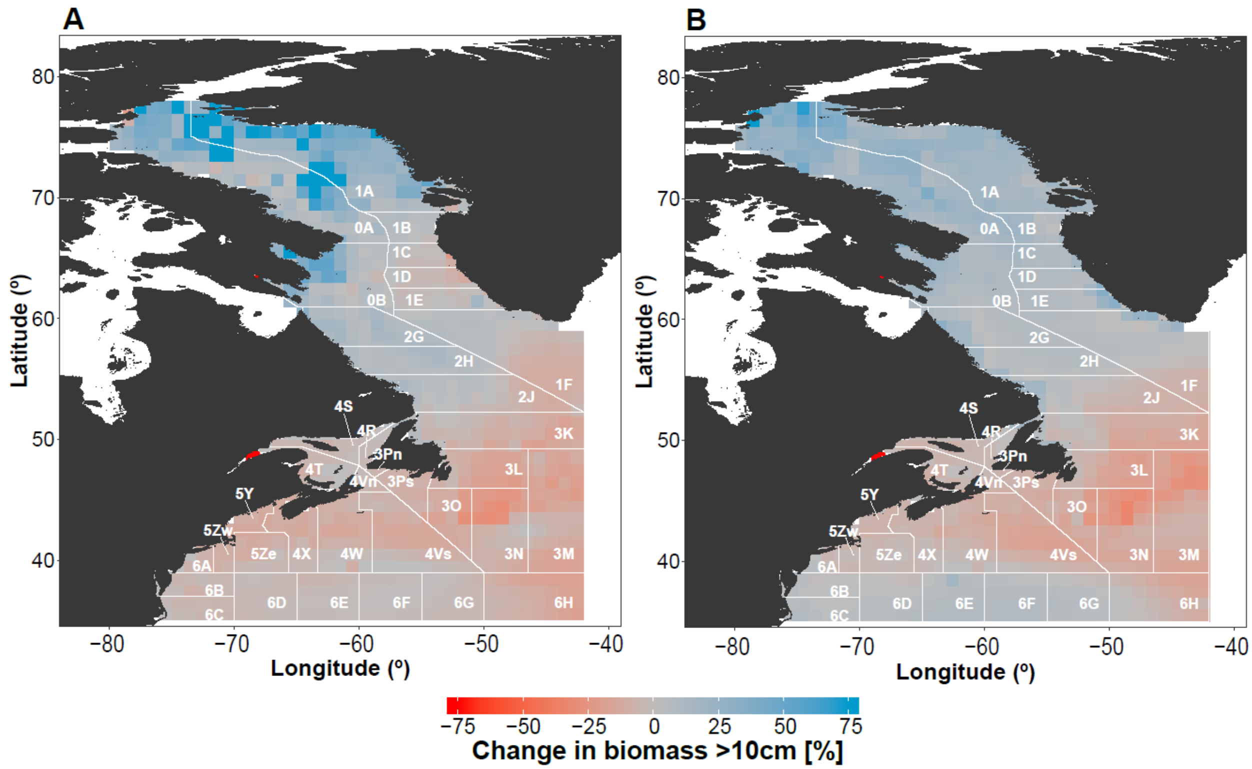

Fig. S3. Future ensemble mean changes (%) in biomass of animals >10 cm under RCP2.6 in the 2030s (A) and 2090s (B) relative to the 1990s across individual NAFO divisions. NAFO division shapefile retrieved from https://www.nafo.int/Data/GIS.

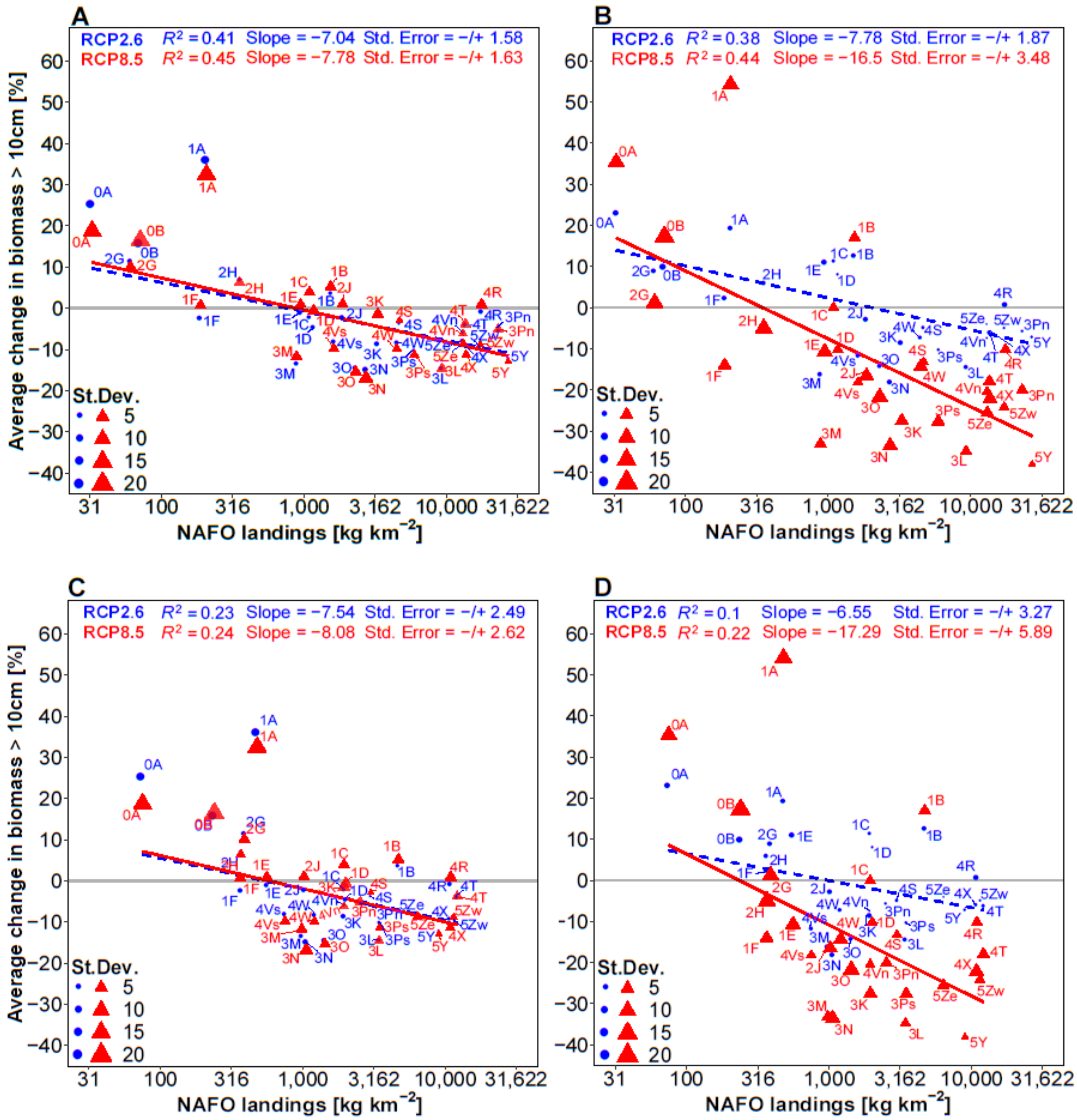

Fig. S4. Relationships between future ensemble mean changes (%) in biomass of animals >10 cm under RCP2.6 (blue) and RCP8.5 (red) in the 2030s (A, C) and 2090s (B, D) relative to the 1990s and fisheries landings in the 1980s (A, B) and 2000s (C, D) across individual NAFO divisions. Number–letter combinations correspond to NAFO divisions. Models were fit using inverse-variance weighted linear regressions. The gray line represents 0% change. Landings values are presented on a log scale.

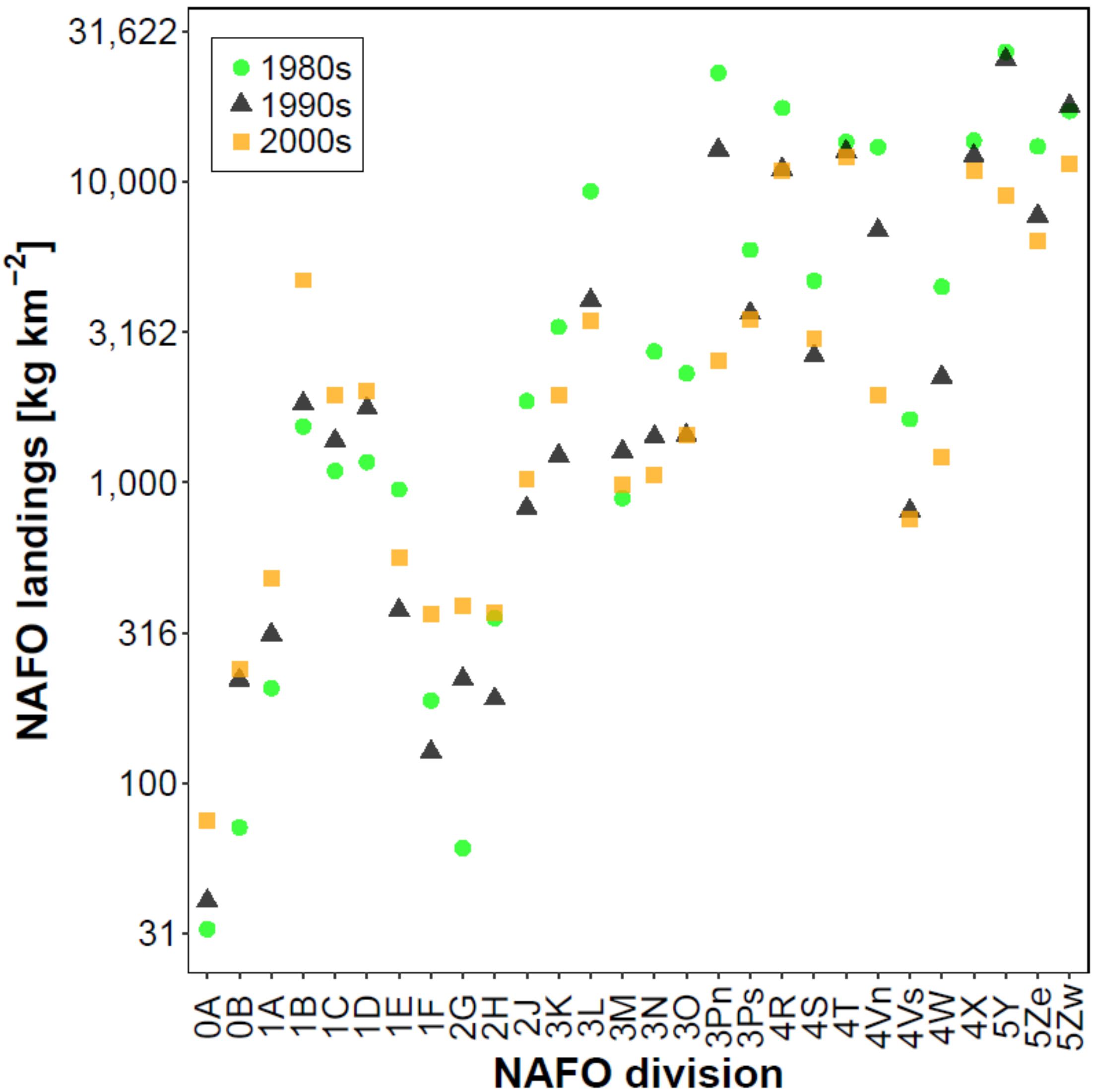

Fig. S5. Spatial distribution of fisheries landings in the 1980s (dot, green), 1990s (triangle, black), and 2000s (square, orange) across individual NAFO divisions. Although average landings in each NAFO division changed over the three decades, their spatial distribution did not alter substantially. Landings values are presented on a log scale.

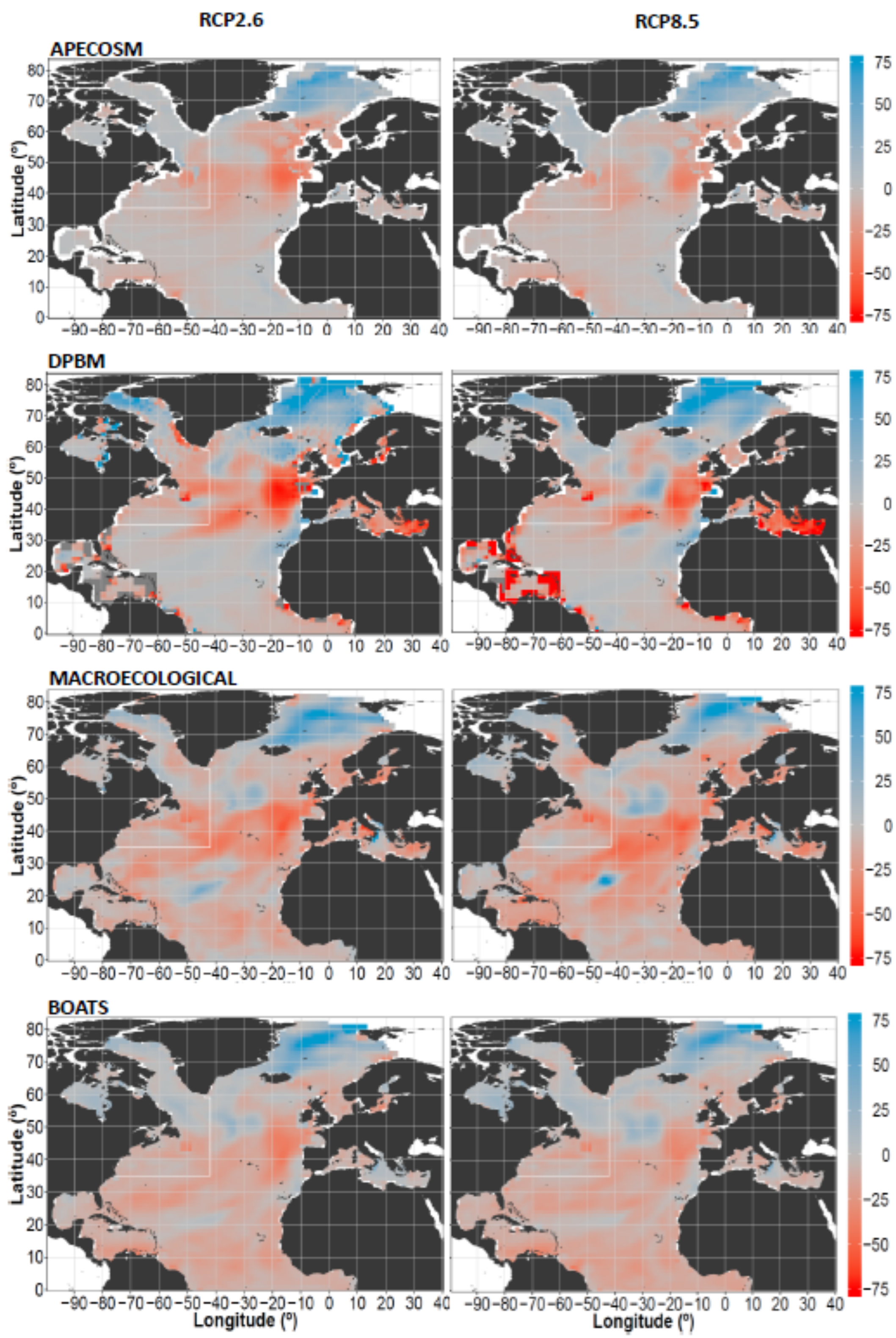

Fig. S6. Future individual marine ecosystem model projections of mean changes (%) in biomass of animals >10 cm under RCP2.6 (left) and RCP8.5 (right) in the 2030s relative to the 1990s. White outline: NAFO convention area.

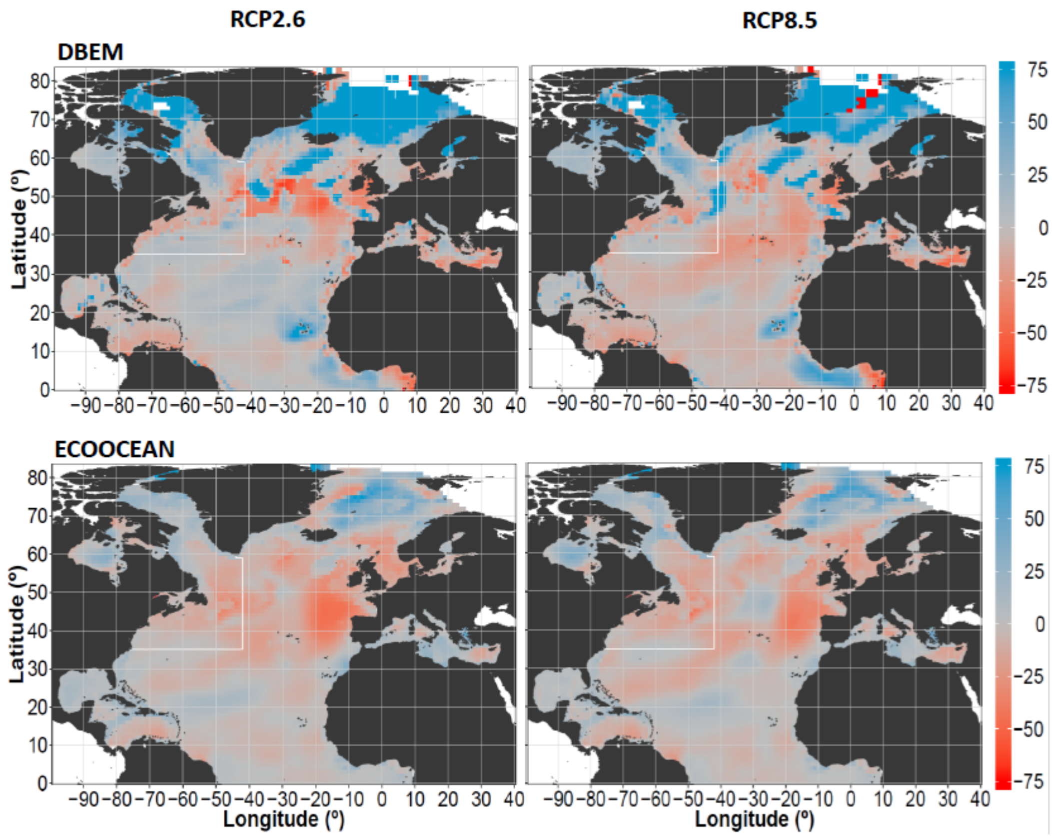

Fig. S6 continued. Future individual marine ecosystem model projections of mean changes (%) in biomass of animals >10 cm under RCP2.6 (left) and RCP8.5 (right) in the 2030s relative to the 1990s. White outline: NAFO convention area. Country shapefile retrieved from https://www.naturalearthdata.com. NAFO convention area shapefile modified from https://www.nafo.int/Data/GIS.

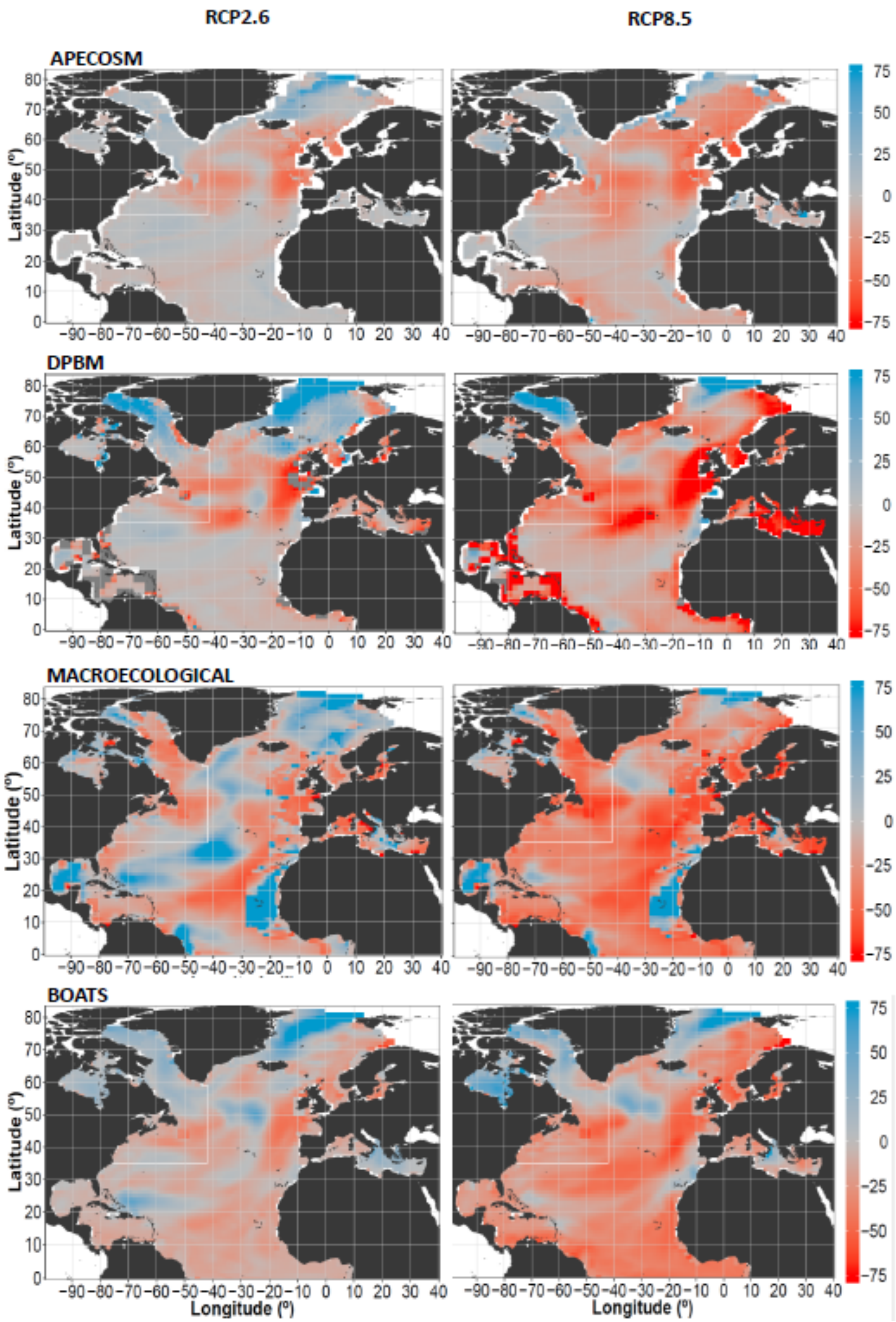

Fig. S7. Future individual marine ecosystem model projections of mean changes (%) in biomass of animals >10 cm under RCP2.6 (left) and RCP8.5 (right) in the 2090s relative to the 1990s. White outline: NAFO convention area.

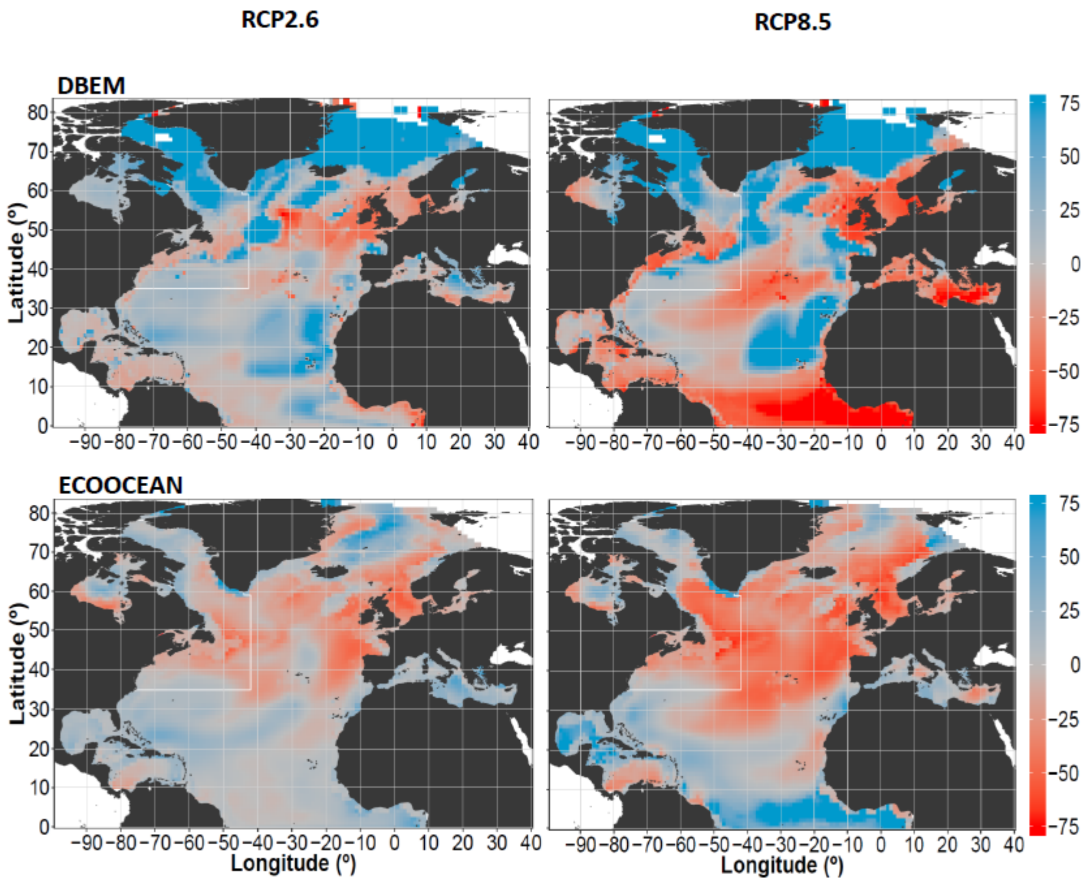

Fig. S7 continued. Future individual marine ecosystem model projections of mean changes (%) in biomass of animals >10 cm under RCP2.6 (left) and RCP8.5 (right) in the 2090s relative to the 1990s. White outline: NAFO convention area. Country shapefile retrieved from https://www.naturalearthdata.com. NAFO convention area shapefile modified from https://www.nafo.int/Data/GIS.

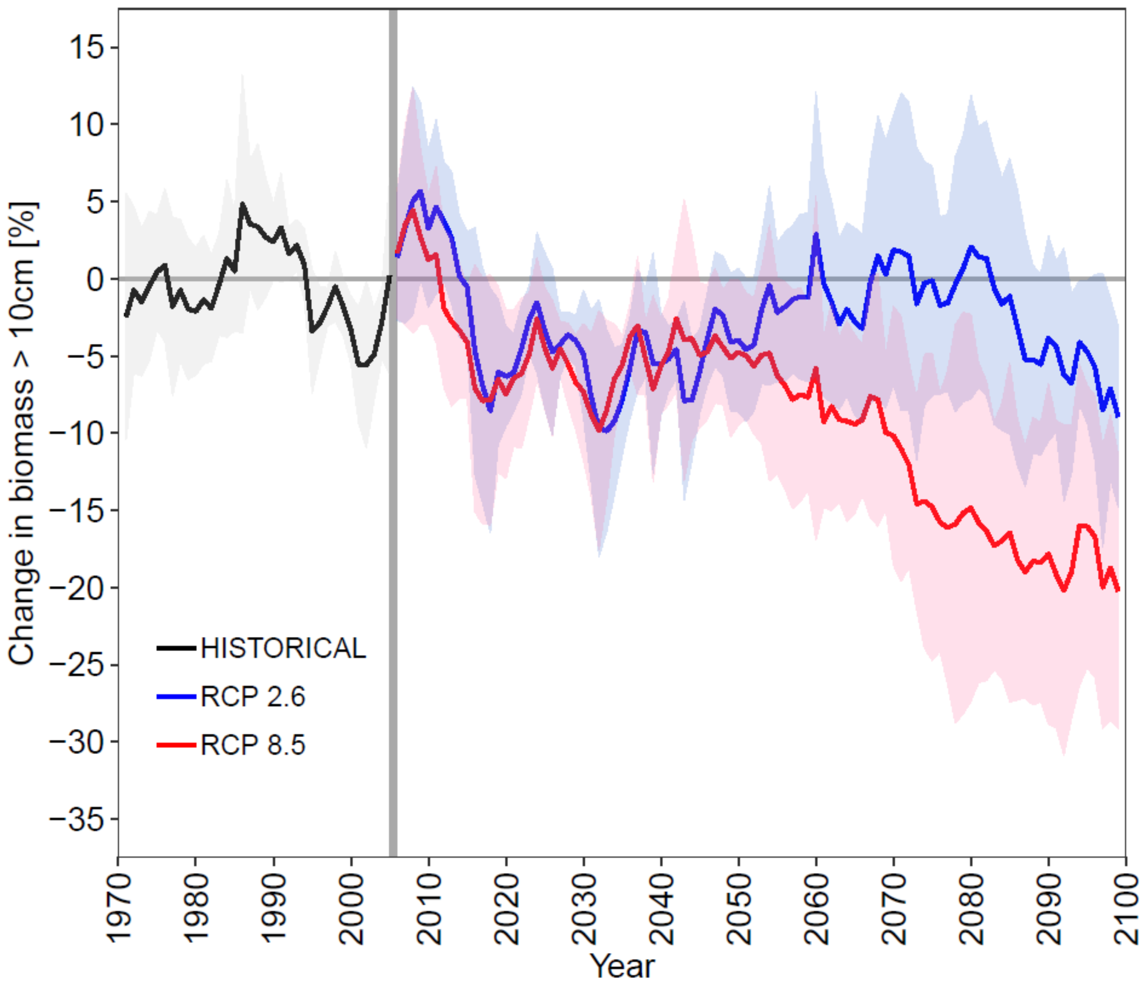

Fig. S8. Model projections of marine biomass of animals > 10 cm averaged over the NAFO regulatory area from 1971 to 2099 under two emissions scenarios (RCP2.6, RCP8.5). Trends are depicted as the projected annual mean change relative to 1990–1999 as percent change. Shading represents one inter-model standard deviation around the ensemble mean. Ensemble results are averaged across marine ecosystem model-Earth System Model combinations (n = 10). The vertical solid grey line denotes the separation of historical and future projections.

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